DISSERTATION

THREE ESSAYS ON FOREIGN DIRECT INVESTMENT

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WE HEREBY RECOMMEND THAT THE DISSERTATION PREPARED UNDER OUR SUPERVISION BY AGIM KUKELI ENTITLED "THREE ESSAYS ON FOREIGN DIRECT INVESTMENT" BE ACCEPTED AS FULFILLING IN PART REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY.

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ABSTRACT OF DISSERTATION
"THREE ESSAYS ON FOREIGN DIRECT INVESTMENT"

This dissertation examines, from both microeconomic and macroeconomic perspectives, foreign direct investment in general and especially in Central and Eastern European countries that experienced the transformation of their economies from central planning to market oriented system. The dissertation is organized in the form of three essays treating three different topics on international production.

Essay one, a game theory application, examines the strategic behavior of firms when they decide to enter a new market (possibly abroad) and exercise the real option under demand uncertainty as well as uncertainty about the strategic behavior of its competitor. Equilibrium has been derived showing that while firms play pure strategies on quantities of product they produce, they randomize their strategic behavior. In addition, the probability of entry into a foreign market has been derived using a mixed strategy equilibrium concept.

Essay two examines the role of institutional progress and economic policy performance in transition economies and their effect on the foreign direct investment inflow within these countries. A double log econometric model using Seemingly Unrelated Regression technique estimated that, in addition to economic policies aiming to control inflation, maintaining a stable economic situation in the country, political stability and civil liberties by in large drive foreign capital inflow.

Essay three is primarily concerned with the effect of foreign capital inflow (both as a physical capital and as a technology transfer) in the economic growth in the transition economies as measured by the rate of growth of gross domestic product. A semi-log econometric model has been estimated to evaluate the impact of foreign direct investment on the growth rate of gross domestic output. In addition, these effects have been estimated for different "modes of transition": namely for "shock therapy" and "gradualism".

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I dedicate this dissertation to

My parents Rabie and Shefki Kukeli,

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Prelude to Three Essays

The rate of foreign capital flow and volume of capital flowing across country borders is increasing, and this increase is leading to a growing interest in Foreign Direct Investment in the developing, industrialized, and transition economies of the world. In some industries, the transportation cost, once hindering the capital flow, is not a problem anymore (due to computers and other technologies available). More countries and their governments have taken steps to further the flow of foreign capital. Liberalization of the economic polices, refinement of foreign investment protection rules, and the advancement of political stability, has lowered the variability of returns on the capital employed in countries different from that of the origin. This capital flow increased production level and productivity of the factors of production. It also has effected the economic growth, unemployment, transfer of technology, management and marketing techniques.

Foreign direct investment (which "remains the prime destination (World Investment Report, 2001)") is especially important for developing countries of foreign direct investment) and in particular in transition economies, as it brings in physical capital, technology imbedded in this physical capital, new management and marketing technique. As a result, the recipient country benefits with higher rate of economic

growth, decreased unemployment, and enhanced internationalization of these economies. "Foreign direct investment continues to expand rapidly, enlarging the role of international production in the world economy" (World Investment Report, 2001).

I have envisioned foreign investment from two main angles: from microeconomic analysis as a decision problem firms face when they consider new plant location, and from macroeconomic analysis as a flow of capital into the economy enhancing the productivity of factors of production and economic growth (Lipsey, 2003). This dissertation considers both approaches within the terms of the economic branches to which they belong.

The dissertation consists of three different essays on three different topics. The commonality of these essays stands on the fact that they examine foreign direct investment from different angles and different objectives.

From the microeconomic view, an applied game theory model investigates the effect of randomness of the demand for a product when firms decide whether to enter a foreign market at a time when the demand is unknown or wait until the demand is resolved. In this scenario firms operate under another uncertainty. The firm faces the uncertainty concerning the behavior of the rival firm (its competitor). Rival firms have the same choices to make enter now and face the uncertain demand or wait until demand is known to enter.

We pose three important questions, which are the topics of these essays. The first question is concerned with the probability of a firm entering a new market (possible a foreign market) when faced with random demand while interacting with

other firms in the same quantity sale type of game. This question is examined at the microeconomic level.

Based on the assumption that firms are driven by profit maximization when they make choices on what to produce and when to produce, several propositions have been stated and proved by experimenting with pure Cournot equalibria, pure Stackelberg equailibria, and games of mixed strategies where the behaviors of firms have been assumed to be random. The main contribution of this essay stands on the theoretical findings of optimal quantities firms will produce abroad under the uncertain demand.

The two other questions investigate the macroeconomics of foreign direct investment. I am interested in FDI flow in transition economies. A flow that may be partly due to an increase in the volume and growth of FDI in these countries, and partly due to unique economic, political, social, and cultural transformations, they are undergoing in the aftermath of the collapse of central planning.

The second question and central theme of the second essay is to explore the impact of institutional reform progress and economic policies on FDI flows. Government policies are seen as a main factor in attracting FDI inflow in transition economies. We have considered these policies in two main plans: economic policies (exchange rate regime, control of inflation, and increase in the output) and institutional policies (property rights protection, political stability, civil liberties, to name a few). FDI is primarily a flow of capital from one country (home) to another country (foreign). As a capital flow, it can be analyzed by using the macroeconomic approach. Essays two and three have been written with this idea in mind.

Essay two has been written with a purpose of explaining the determinants of FDI in general and impact of institutional progress and economic policies in the performance of foreign direct investment inflow in transition economies. Recognizing that transition economies (I focus my study on Central and Eastern European countries) have undergone a rapid transformational reform from centrally planned economy to a market led economy, foreign direct investment inflow as a macroeconomic variable is effected by these transformation. Findings are presented in this essay and point to the importance of both institutional progress and economic policies performance on the foreign direct investment inflow.

The third question is whether FDI affects output growth rate in transition economies. I argue in this essay that FDI inflow will affect output in two ways. First, direct effect is connected with the injection of physical capital in the economy via FDI inflow. This in itself is going to affect the total production and growth rate of output (in the spirit of Solow-Swan neoclassical growth theory). An indirect effect comes from the increase in productivity of the existing labor force due to new managerial techniques, advanced production technologies, marketing, and learning experiences. The indirect effect of FDI in output growth has been argued in the light of new growth theory (i.e., the endogenous growth theory of P. Romer, 1990).

This third essay sheds light on the impact of foreign direct investment on the growth rate of output in Central and Eastern European countries. I exam the role of foreign direct investment from the physical capital inflow point of view as well as from the technology transfer and productivity enhancing effect point of view. I find, in this essay, that foreign direct investment has a large effect on the growth rate of output

manifested as an increase in existing stock of capital and through technology transfer. Further, these effects have been shown to be vary depend upon the different transition paths (i.e., the mode of transformation) that Central and Easter European economies choose to undertake in their quest to transforming from central planned economies to market oriented economies.

These three essays on foreign direct investment will contribute to a better understanding of international production in general and more specifically to the effect of choices made by different agents (firms, governments, households) on the economies of Central and Easter European countries.

Essay One

Uncertain Demand and Optimal Exercise of Strategic Real Option to Enter a New Market

1. Introduction

A perennial question in the foreign direct investment (FDI hereafter) literature is why a firm chooses to enter a market or country at a particular time. Although many explanations have been offered, this essay will offer a novel one, in which the explanation of the timing of entry is rendered equivalent to the optimal exercise of a strategic "real" option held by each of a set of potential competitors in the target market. Doing so allows a fundamental contribution to the FDI literature to be made, in which the timing of entry is related to an "exogenous" variable the degree of uncertainty surrounding the profitability of the entry decision by potential competitors.

More specifically, each firm faces uncertain demand for its good in the target market (we first assume homogeneous products; this can subsequently be relaxed), and each firm has two decision periods, distinguished by the realization of the demand uncertainty between periods one and two. At period one, a firm can enter the target market for some sunk cost G[1], but will know only the common-knowledge distribution of demand, not the actual value of the demand curve it faces, or the period one actions of its competitors. Firms can consider entering this market at period one (leading to

[1]The firm's fixed cost of entering a new market which cannot be recovered have the firm decided at another period to leave that particular market is the sunk cost (Dixit,1988).

Cournot type of game) and face the demand uncertainty. Moreover, there is a possibility of firms producing domestically or abroad at period one as well as at period two. One may think that one firm is considering (for whatever reasons) the possibility of entering the market at time one (and face the uncertain demand) and another firm (or firms) moves in this common market at period two when demand uncertainty is resolved.

If a specific firm enters the market, it will choose, however, an irreversible capacity/production level that will make it the "expected" Stackelberg leader in the period two sales game. If the firm postpones its entry decision until period two, it will know both the realization of demand and the period one actions of its competitors; however, by foregoing the early option exercise, it may find that it is relegated to a Stackelberg follower role.

We analyze a meta-game, in which any specific version of the above game is played for a specific set of moments for the demand distribution. We will derive equilibria for each of these cases, and chart how the equilibria change when the parameters of the demand distribution change. This essay is organized as follows: an overview of the problem is described in section one, in section 2, we look at literature that has been developed in this subfield with respect to production in general and games that firms may possibly play. Specific attention will be given to the literature with respect to foreign production. Then, in section 3, a model will be formally described considering an array of plausible strategies for two firms (to simplify things). In this section, and other sections as well, several propositions and claims (observations) will be derived and proved. In addition, we will derive the one time

Cournot output that firms might produce in this common market at time one, as well as, the possibilities that at period one firm one moves first, therefore becoming a leader, and another firm moving at period two when demand uncertainty is resolved, but it will be a follower. In section 4, we will look at uncertain demand with pure strategies, how the demand uncertainty affects equlibria, and possible equilibria properties. The final section, section 5, will be devoted to the endogenous order of play of these two firms. This will be done by considering mixed strategies approach where firms assign probabilities to the possibilities of entry of another firm (firms choose entry time and market: abroad or domestic, with probabilities). Unique equilibria over firms' mixed strategies will be derived using equating payoff method (Rasmusen, 2002). Conclusions and recommendations for further research appear in the last section.

2. Literature Review

Given that firms are driven by profit opportunities, there has been a growing interest in explaining the behavior of firms when these opportunities go beyond national borders. Firms seeking to maximize their profits will locate their production plants domestically or abroad depending on which gives them the highest value of return. When firms locate their plants in a foreign country it gives rise to foreign direct invest (FDI) and the firm becomes a multinational.

An array of explanations have been given for factors that influence and drive a given firm to move its production plant or open a new one in the foreign market. Ethier (1986) has incorporated multinational firm analysis into a general equilibrium

model based on Dunning's (1971) ownership, location and internalization paradigm (also called OLI framework). Helpman (1984) and Markusen (1995) have expanded the explanations, most notably, with multi-plant scale production. Another area of interest has been the focus of strategic interactions of firms to enter a foreign market. Recently, the literature in this area has expanded greatly (we survey a number of such articles, in what follows, that consider the strategic interaction of firms in the decision making process).

Goldsberg and Kolstad (1995) developed a two period model of a firm entering a foreign market when linear demand is uncertain and may be driven by the exchange rate fluctuations. Their assumption is that exchange rate fluctuations are observed very frequently, and the domestic currency cost of producing abroad is affected by that rate. Given this causality, the demand will be uncertain (the inverse demand, or prices). In their model, there is only one firm that decides to produce abroad in period one or two. If this firm enters in period one then it will face uncertainty of exchange rate fluctuations and uncertain demand.

However, both exchange rate and demand will be resolved in period two. Several propositions have been stated and prove with respect to prices and costs of producing abroad and domestically. There is no strategic interaction among firms. In addition, there are no mixed strategies with respect to timing of entry and the market they enter. The results have been derived for only one firm case with respect to different types of risks the firm may have in its preferences (risk neutral, risk averse, and risk loving). Theoretical derivations are then used to empirically test the model.

Rob and Vettas (2003) discuss the FDI and exports with growing demand. They consider, in their model, a foreign market in which demand grows stochastically over time. The market can be served via export or FDI. Their argument is that the FDI has an advantage over export due to lower variable cost of FDI, such as lower transportation costs, labor wages, tax subsidies or incentives, etc. However, on the other side, FDI means an irreversible investment (there is a cost associated with entry into this foreign market).

The trade off between exporting and foreign direct investment is used to derive theoretical results for pre-entry conditions (export abroad) of the seller. The post-entry cut off rule (export versus FDI) depends on the growth of the demand in the foreign market. They found that FDI and export are perfect substitutes in period one entry, and that the FDI will depend upon the fact that the demand never declines (FDI is positive over time).

Anderson and Engers (1994), in their hierarchical Stackelberg model, endogenize the timing of entry by considering cost and profit differentials of the firms that play the game. The model is solved in the spirit of sub-game perfection with pure strategies. There are n-firms that compete in a common market, and because there are cost differences, the authors correctly argue in their paper, there will be profit differentials. The demand that firms face is non-linear demand, but this would not drastically alter the results. There are no cost or demand uncertainties in their model.

Whichever firm moves first, due to lower cost of production, earns a hierarchical position in the market. Generally, firms compete over time of entry. Anderson and Engers are interested, not only in solving the timing problem but also in

the implications for prices and social surplus. Their model does not make any explicit assumption about the market firms competing over, or the possibility, of foreign production.

Buckley and Casson (1981) looked explicitly at the optimal timing of FDI in an attempt to fill the gap in the multinational literature. They consider different costs that a firm might incur in three modes of market servicing[2]: non-recoverable set-up cost, a recurrent fixed cost (independent of the rate of output), and recurrent variable cost. They assume that there is no change in host country's tax policy or in the transportation cost. Then the mode of entry is dependent on the cost of producing abroad. The optimal timing of a switch in the modes of production is specified with respect to cost of servicing a foreign market.

Luo (1998), in an attempt to empirically explore the timing decision of FDI, considers the investment and international performance in China. This study borrows from OLI framework[3] and adds the timing decision as an additional factor. Luo finds that early investors outperform late entrants in the host country. Moreover, there is an equal importance of timing with internalization, ownership, and location for international expansion. Lou suggests, based on the analysis carried out using general linear models (GLM) procedure over two time periods (1980-1981 and 1989-1990), that there is an interrelation among four factors analyzed (there is a high collinearity among TOLI; time, ownership, location, and internalization).

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[2] Modes of market servicing considered by Buckley and Casson (1981) are exporting, licensing and FDI.

[3] OLI paradigm owns to Dunning (1977, 1981) called also the eclectic theory, considers three attributes to the FDI flow in the receiving countries. The advantages over the ownership, location and internalization are the main factors that under any circumstance will be driving FDI flow.

Guiso and Parigi (1999) empirically investigate the effects of uncertainty of investment in Italian manufacturing firms. Although they refer to several theoretical papers upon which they base their empirical work, hypotheses they test are more of *ad hoc* for their specific sample and conditions. They find a negative relationship between investment and uncertainty of demand. Furthermore, this effect becomes stronger for investment cases where there exists irreversibility of investment.

In this essay, we use some of the common assumptions, used in a slightly different setting, to generate quite interesting results. We assume a duopoly case (which can easily be extended to n-firm case) with linear uncertain, as well as, certain demand and linear certain cost functions. The uniqueness of this essay stands on the fact that we have employed a more realistic strategic interaction (with pure and mixed strategies) of firms over time (dynamic interaction) and over markets (foreign and domestic) under uncertain demand conditions. Furthermore, we have incorporated the real option theory into our strategic model with more realistic assumptions. Firm's strategic interaction with mixed strategies is also an addition to the new explanations of foreign direct investment, which can be a contribution to FDI literature.

There is a vast amount of writing regarding real options. Examples of real options are deferring the entry into a new market until more is known (demand for that new product, or differentiated product), expand or contract the production capacity, abandon the production, stage investment, switch inputs or outputs in the production process, and grow (increase the production capacity at a certain rate). The real option we are concerned in this essay is that of deferring. A real option of deferring can be described as the strategy of a firm to wait before taking an action until more is known

or timing is expected to be more favorable (for more on real option see Smith and Smith, 2000).

3. The Model and the Exogenous Order of Play

The model we employ is a simple straight foreword one consisting of two symmetrical (identical[4]) firms, a duopoly model, deciding in investment and production of a nondurable homogenous good. This model is used to derive several propositions with respect to firm level decision making under stochastic demand conditions in the common market. Firms have to decide over investment and production of this good in either domestic or foreign market. There are no domestic firms in the foreign market producing the same good as the good firms under consideration produce.

Firms operate under the same domestic marginal cost if they invest and produce in the domestic market. They also face the same fixed (sunk) cost G:- the cost of activating a plant in the foreign market if they decide to invest and produce abroad the good that they are going to sell in the domestic market. As Pindyck (2001) argues, "Most major investment expenditures are at least partially irreversible: the firm cannot disinvest, so the expenditures are sunk costs." Fixed costs are similar to these sunk costs discussed by Dixit (1988). Firms have the option to produce abroad, which if exercised will add to the cost of production the sunk cost. There is a pre-commitment on part of the firm that decides to exercise this real option. That is, if the firm decides

[4] This assumption is not necessary to enable us to find equilibria or describe Cournot or Stackelberg behavior of firms. However, it is used as a starting point to facilitate the analysis.

to invest and produce abroad, the fixed cost is irreversible. Therefore, pre-commitment has a strategic value for the firm.

There are two periods (arbitrarily chosen) when firms can decide to enter this investment and production activity. The distinction between period one and period two is based on the demand uncertainty (period one is when demand is uncertain and period two when demand is resolved). Let us denote these as period one, and period two. Decisions made by firms whether to invest and produce in either market (home or abroad) in period one will be made under uncertain demand conditions, because the sale of this product will not occur until period two (there is no sale of this product until period two). In period two, all firms will know the demand conditions with certainty, as demand uncertainty is resolved in this period.

Both firms may decide to invest in period one (either home or abroad) and produce and sell in period two in the common market at home. In this case, there are three possible duopoly structures in the market. One possibility is for both firms to invest at home (a Cournot output will be produced at home). The second possibility, that of a duopoly structure, would consist of firms investing abroad, and the third structure will consist of one firm investing at home the other one investing abroad (by activating a new plant in the foreign country). These decisions are made under uncertain demand, yet the structure of duopoly depends upon the cost differences between investing in the domestic market and foreign market. If none of the firms enters the foreign market in the first period then all firms will produce Cournot output in the second period and the decisions will be made under known demand conditions.

Firms may commit to foreign production in period one as they realize the leadership status that they gain by exercising the real option. Therefore, pre-commitment gives the firm (that decides to invest in period one) a Stackelberg leader role. If the firm delays the investment until period two, then the firm is relegated to Stackelberg follower. In this case, an equilibrium output will be determined by the strategic values of pre-commitment to foreign production; that is the leadership status advantage. The leader will be choosing its output level under several uncertainties. Not only demand in period one is unknown, but also the actions taken by the follower firms are unknown. Therefore, firms' strategies under this case will be mixed strategies (strategies over the possibilities of followers entering in investment and production in period one or two as well as entering in domestic production market or foreign production).

We assume that the linear inverse market demand curve is $p_1 = \tilde{A} - Q$ in period one and $p_2 = A - Q$ in period two (the slope of the linear inverse demand curve is one). $\tilde{A} = A + \mu$, where μ is the unknown parameter, which is assumed to be random. We will assume that $A - Q > 0$, and $\tilde{A} - Q > 0$ since otherwise none of the firms will be interested in entering this investment and production game, and $Q = \sum q_i$, where q_i is firm (i)'s output level chosen to be produced in a specific period. Costs of producing at home (C) or abroad (θ) are the same for all firms. Firms are assumed to have identical belief about demand uncertainty in period one. All firms know their payoff functions and firms know that firms know that the payoff functions are known (common knowledge).

If the leader decides to invest in period one (to gain the Stackelberg leadership status), he will choose an output level that depends not only on the uncertainty of demand, but also on the choices made by the follower; the follower might assign probabilities to his pure strategies to produce in period one or period two. This will lead to another equilibrium output that is different from the output that the leader would have produced under the assumption that the follower will enter in period two.

Another interesting experiment, considers an enriched type of game, wherein the Stackelberg leader considers the possibility that the follower not only chooses the time of entry (for which the leader assigns probabilities), but also whether the follower will invest in the domestic market or in the foreign market in period one. The possibility that the follower will invest in the domestic or foreign market is also considered for period two. We will be using the mixed strategies procedure to solve for the equilibrium output firms will decide to produce. For the last case, where the leader considers the case of the follower investing abroad versus home, combined with the possibilities of the follower investing in period one versus period two. This case will be solved by using the equating payoff technique, used by Rasmusen (2002).

Let us denote quantities that the firms will choose to produce under different options as follows:

q_{ij}^{fC} = Cournot (C) quantity that firm i (i=1, 2) produces abroad (f) when it enters the investment and production in period j (j=1, 2);

q_{ij}^{fL} = Stackelberg leader's (L) quantity that firm i produce abroad when it invests in period j;

q_{ij}^{fF} = followers (F) quantity that firm (i) produces abroad when it invests in period j;

q_{ij}^{dC} = Cournot quantity that firm (i) produces when it invests in domestic (d) market in period j;

q_{ij}^{dF}, and q_{ij}^{dL} = respective quantities that the follower and the leader will produce when they invest in domestic market at period (j). For each specific case (invest and produce in the domestic market or foreign market, enter into this investment in period one or period two), the firm's (i) payoff function[5] is equal to the expected profit. Denote them by: $\Pi_{ij}^{dC}, \Pi_{ij}^{fC}, \Pi_{ij}^{dF}, \Pi_{ij}^{fF}, \Pi_{ij}^{dL}, \Pi_{ij}^{fL}$.

These profits can be:

$\Pi_{ij} = q_{ij}\left[p_j - C\right]$, if the firm decides to invest and produce in the domestic market, and

$\Pi_{ij} = q_{ij}\left[p_j - \theta\right] - G$, if the firm decides to invest and produce abroad.

The firm's cost is assumed for simplicity to be linear (quadratic cost functions are not believed to dramatically alter the results). In addition, firms are assumed to be risk neutral (they are concerned with the expected profits and not with the variability of the profits)[6].

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[5] In a textbook examples of static (Cournot) or dynamic (Stackelberg leader-follower) games a matrix of payoffs (profits in this essay) is given in a form of table. In the following sections, different equilibria have been generated by looking at the payoffs. From these profits (payoffs), the amount of output firms will produce has been given in a more "elegant" way; by tables. One should note that these tables are different from payoffs; however they come from profit functions which constitute the payoffs.

[6] This assumption is made for two purposes. One reason is that we are concerned in this essay with strategic behavior of firms when they are faced with an irreversible investment and real option exercise. Strategic behavior is assumed to drive the decision making process at the firm level. Second, risk neutrality of firms is assumed for simplicity of derivations and to enable us to get concrete results. Since the focus of this essay is the strategic real option of firms, we employ this heuristic assumption, which can subsequently be relaxed but would change the main objective. It would be interesting to derive these results for such a case in another paper.

Firms can choose actions from set of strategies viewed with respect to two general cases that will be explored later in this essay. Pure strategies (that are the same as actions) are exercised when firms have pure options: invest and produce in period one or period two; invest and produce in the domestic market or abroad. Therefore, pure strategies will be actions taken by firms over period of entry (one or two) and the market they can enter (domestic and abroad). If we introduce probabilities (that the firms assign) over pure strategies (that is looking at mixed and continued strategies) then actions are different from strategies.[7] In this case, there are an infinite number of strategies from which firm can choose to follow. Probabilities for each pure strategy give rise to an infinite number of mixed strategies from which firms can choose their actions. Probabilities will be discussed with respect to timing of entry (firm can be a leader or a follower) and with respect to the market they choose to enter in each period.

4. Uncertain Demand and Pure Strategies

We will first analyze the behavior of firms in a duopoly setting when firms use pure strategies. More specifically, we will assume that firms have pure strategies over the market they enter (domestic market or foreign market). Firms can enter the investment and production market at home (domestically) as well as abroad (foreign) at period one when demand for period two (when the sale of this product will occur) is uncertain. Firms are considered to face different costs of production depending on the market they decide to enter. These market entry decisions will be analyzed with

[7] See Rasmusen, 2002, for more discussion of the differences and similarities between strategies and actions.

respect to demand uncertainty and cost differences for one time entry (one-time game).

In addition, firms choose the timing of entry into either market. There are two arbitrary sequential periods that firms can enter these markets, denoted period one and period two. Periods are distinguished by the realization of demand. The period of time during which the demand is unknown will be considered as period one and once the demand uncertainty is resolved then firms are operating in period two. For whatever reasons, if a firm moves first (chooses to enter in period one) while the other firm is waiting, the first mover will have the advantage of being a Stackelberg leader and the other firm a follower.

4.1. Cournot competition with random demand

First, assume that there are two firms (duopoly market structure) that face a linear demand curve and linear cost function, considering the possibility of investing and producing a homogenous nondurable good. They can potentially invest and produce in the domestic market (with cost C) or in the foreign market (with cost θ and fixed sunk cost G). If firms decide to produce in either market in period one, they will face the uncertain demand (given by the inverse demand function discussed above).

The situation analyzed here is of perfect and complete information (firms know action the other firms take and their rival's payoff function). Firms are assumed to compete in common quantity sale games that will occur in period two in the domestic market. There are no foreign firms producing this good in the foreign market (for

simplicity and to derive interesting results, we assume that only two domestic firms can produce this homogenous good).

There are two decisions that the firms need to make: where to produce and when. Given the fact, the firms are considered identical and risk neutral there are several possibilities as to which outcome will be stable and may constitute Nash equilibrium.

Proposition I: For a Cournot quantity game played by two symmetrical firms with pure strategies of producing domestically (with constant marginal cost C) or abroad (with constant marginal cost θ, and fixed sunk cost G), and uncertain demand, there are multiple equilibria depending upon the costs differentials.

Proposition II: For the same game and conditions as above, uncertain demand has no effect on the strategies and the equilibrium outcomes of the game.

Proofs: Let us assume that firms invest in first period and face the uncertainty of the market demand conditions (demand will be resolved in period two when the sale of the product takes place). Both firms have decided to invest and produce in the domestic market with C cost of production. Each firm will choose the amount of output that it will produce to maximize the profits received from such an investment, taken as a given the fact that the other firm (the rival firm) will maximize its profits given the other firms output level. In short, they will choose the Cournot output in the domestic market.

Since firms are identical in every respect, the expected profits will be identical. Therefore, a representative firm will maximize the following function:

$$\prod_{11}^{dC} = q_{11}^{dC}\left[p_1 - C\right] = q_{11}^{dC}\left[\tilde{A} - q_{11}^{dC} - q_{21}^{dC} - C\right] \quad (1)$$

Taking first partial derivative with respect to the quantity that firm one will choose to produce, setting it equal to zero, and solving for it, we get:

$$\frac{\partial \prod_{11}^{dC}}{\partial q_{11}^{dC}} = \tilde{A} - 2q_{11}^{dC} - q_{21}^{dC} - C = 0 \quad (2)$$

$$2q_{11}^{dC} = \tilde{A} - q_{21}^{dC} - C \quad (3)$$

$$q_{11}^{dC} = \frac{\tilde{A} - q_{21}^{dC} - C}{2} \quad (4)$$

Since firms are symmetric, then quantities will be the same ($q_{11}^{dC} = q_{21}^{dC}$). Therefore,

$$q_{11}^{dC} = \frac{\tilde{A} - \frac{\tilde{A} - q_{11}^{dC} - C}{2} - C}{2} = \frac{2\tilde{A} - \tilde{A} + q_{11}^{dC} + C - 2C}{4} = \frac{\tilde{A} + q_{11}^{dC} - C}{4} \quad (5)$$

$$q_{11}^{dC} = q_{21}^{dC} = \frac{\tilde{A} - C}{3} \quad (6)$$

Therefore, $\frac{\tilde{A} - C}{3}$ will be the equilibrium Cournot output when both firms invest domestically at period one. If both firms decide to invest abroad in period one, then they will choose the amount of output in the same manner as they did when they invested domestically. The result will be both firms choosing Cournot level of output abroad, as follows:

$$q_{11}^{fC} = q_{21}^{fC} = \frac{\tilde{A} - \theta}{3}. \quad (7)$$

Let us assume that in a scenario where both firms decide to invest in period one, one firm (firm two) decides to invest in domestic market with certainty and the other firm (firm one) will produce in a foreign market. The respective reaction functions will be as following:

$$q_{11}^{fC} = \frac{\tilde{A} - q_{21}^{dC} - \theta}{2}, \text{ and} \tag{8}$$

$$q_{21}^{dC} = \frac{\tilde{A} - q_{11}^{fC} - C}{2}. \tag{9}$$

Substituting the quantity that firm two will produce in the domestic market (it comes from equation 9) into firm one's reaction function (equation 8) we find the optimal quantity that firm one will produce in the foreign market which is a Cournot quantity (in the sense that both firms as we assumed will commit to entering this market in period one). Then, firm one's quantity (when firm one produces abroad, firm two produces in the domestic market, and both firms commit to respective location productions in period one) is the following:

$$q_{11}^{dC} = \frac{\tilde{A} - \frac{\tilde{A} - q_{11}^{dC} - \theta}{2} - C}{2} = \frac{2\tilde{A} - \tilde{A} + q_{11}^{dC} + \theta - 2C}{4} = \frac{\tilde{A} + \theta - 2C + q_{11}^{dC}}{4} \tag{10}$$

$$q_{11}^{dC} = \frac{\tilde{A} + \theta - 2C}{3} \tag{11}$$

We do the same thing to find the quantity that firm two will produce in period one in the foreign market when firm one has committed to produce a Cournot quantity in period one in the domestic market. Substituting the quantity that firm one will produce in period one in the foreign market (equation 8) into firm two's reaction function (equation 9), we find the optimal quantity that firm two will produce in the

domestic market (when it enters this market in period one) when firm one has committed to enter the foreign market in period one. That is we find the following:

$$q_{21}^{fC} = \frac{\tilde{A} - \frac{\tilde{A} - q_{21}^{fC} - C}{2} - \theta}{2} = \frac{2\tilde{A} - \tilde{A} + q_{21}^{fC} + C - 2\theta}{4} = \frac{\tilde{A} + C - 2\theta + q_{21}^{fC}}{4} \tag{12}$$

$$q_{21}^{fC} = \frac{\tilde{A} + C - 2\theta}{3} \tag{13}$$

Since firms are symmetrical and identical these quantities (equation 11 and 13) would be the same for the case when firm one enters the domestic market and firm two enters the foreign market, both at the same time (period one). These results, summarized in the Table I.1, show that there are two Nash equilibria, depending upon the cost differences (including and for sufficiently small sunk cost G in the case of foreign production) between domestic investment and foreign investment.

Table I.1: Quantities Firm Produces Domestically or Abroad in Period One (Cournot Quantities)

		Firm II	
		Produce Domestically	Produce Abroad
Firm I	Produce Domestically	$q_{11}^{dC} = \frac{\tilde{A} - C}{3}$ $q_{21}^{dC} = \frac{\tilde{A} - C}{3}$	$q_{11}^{dC} = \frac{\tilde{A} + \theta - 2C}{3}$ $q_{21}^{fC} = \frac{\tilde{A} + C - 2\theta}{3}$
	Produce Abroad	$q_{11}^{fC} = \frac{\tilde{A} + C - 2\theta}{3}$ $q_{21}^{dC} = \frac{\tilde{A} + \theta - 2C}{3}$	$q_{11}^{fC} = \frac{\tilde{A} - \theta}{3}$ $q_{21}^{fC} = \frac{\tilde{A} - \theta}{3}$

This table, representing the quantities firms will choose to produce in period one when they invest in domestic or foreign markets, shows that there are three possible equilibria. One possible (equilibrium) is both firms invest and produce in the domestic market with respective quantities. The second possible equilibrium would be for both firms to invest and produce abroad in period one. This will be true for a certain value of marginal cost of producing abroad (we derive it from the quadratic function for theta). The third possible outcome (equilibrium) is that one firm produces at home while the other produces abroad (both will invest and produce in period one a Cournot quantity). All three possibilities, depending upon the cost differences between producing domestically and abroad, constitute Nash equilibrium in this simple game.

Observation I:

Equilibrium in a simultaneous quantity game with two firms competing over the same quantity sales market with the possibility of producing domestically with cost C and abroad with cost θ (and sunk cost G) is cost driven, and not strategy driven. Moreover, demand uncertainty has no impact on the equilibrium.

With a symmetrical duopoly in a one-time Cournot game, there are several equlibria. More notable there are two Nash equilibria (which to some extent is comparable with the Battle of the Sexes Game). These two equilibria are sensitive to cost conditions. Specifically, assuming that the cost is perfectly known to both firms and demand uncertainty is common knowledge (firms share exactly the same beliefs about the expected demand), and if the cost of producing abroad is less then the cost of producing domestically, then both firms will produce abroad with certainty.

The Nash equilibrium in this case constitutes equilibrium quantities of both firms producing abroad. Nevertheless, if the cost of producing abroad is higher, let us say, due to transportation costs, tariffs, and other factors, then firms will produce Cournot quantity domestically.

While depending upon the cost differential, there are two pure Nash equlibria in quantities and multiple equilibria for zero differential cost (including sufficiently small fixed cost G). In the last case, anything can happen, so the behavior of firms would be perfectly random, or the game may degenerate. We will show in the following sections that while in pure strategies there might be multiple equilibria as it was argued, in mixed strategies there will be a unique Nash equlibria over the probabilities of the pure strategies.

Observation II:

Firms will decide to produce abroad as long as the following condition about the randomness of deterministic demand parameter (price intercept) holds:

$$\tilde{A} > \frac{9G - C^2 - \theta^2}{2(C-\theta)}.$$

Proof: Firms will produce abroad as long as the profits from such an action will be greater than profits from producing domestically. Firms will decide to invest and produce abroad as long as profits from such an action outweigh the profits from investing and producing in the domestic market. If that is the case the following should hold:

$$\Pi_{11}^{fC} > \Pi_{11}^{dC} \qquad (14)$$

$$q_{11}^{fC}\left[\tilde{A}-2q_{11}^{fC}-\theta\right]-G>q_{11}^{dC}\left[\tilde{A}-2q_{11}^{dC}-C\right] \tag{15}$$

$$\frac{\tilde{A}-\theta}{3}\left[\tilde{A}-2\left(\frac{\tilde{A}-\theta}{3}\right)-\theta\right]-G>\frac{\tilde{A}-C}{3}\left[\tilde{A}-2\left(\frac{\tilde{A}-C}{3}\right)-C\right] \tag{16}$$

$$\left[\frac{\tilde{A}-\theta}{3}\right]^2-G>\left[\frac{\tilde{A}-C}{3}\right]^2 \tag{17}$$

$$\theta^2-2\tilde{A}\theta+2\tilde{A}C+C^2-9G>0. \tag{18}$$

For relatively small G, firms will produce abroad whenever θ is greater than the positive zero of the quadratic (the solution is: $\theta=\tilde{A}\pm\sqrt{C^2+9G-2C\tilde{A}+\tilde{A}^2}$, for the zero equality condition of the expression of equation 18):

$\theta^2-2\tilde{A}\theta+2\tilde{A}C+C^2-9G>0$.

So this means that the condition we stated as observation 2 should hold (the above expression should be greater than zero). Therefore, for a specific firm to move abroad the expected value of the demand parameter (price intercept) would be:

$$\tilde{A}>\frac{9G-C^2-\theta^2}{2(C-\theta)} \tag{19}$$

4.2. Sequential Entry and Random Demand

The simultaneous play described in the above section can be expanded into a more interesting game where firms choose their actions sequentially. Let us assume first that one firm will enter into this market (investing and producing at home or abroad) in period one and face the demand uncertainty. Furthermore, let us assume that firm two knows that firm one will choose the Stackelberg leader's quantity. Here again we will consider first the case where a firm moves first (produces abroad) and

gains Stackelberg leadership and another firm moves after that and is going to be a follower.

The leader however chooses its quantity under the uncertainty as to which demand it faces in period two (when the demand is known with certainty), and by doing that it will exercise the real option and gain Stackelberg leadership status. Nevertheless, the follower knows the demand and firm one's action and quantity of output it will produce. The fact that the demand is unknown in the first period and known with certainty in the second period is "common knowledge" (that means both firms know the probability distribution function of uncertain demand in period one and certain demand in period two).

Proposition III: In the leader-follower game described above there are two Nash equilibria that are sensitive to the uncertainty of demand.

Proof: Firms compete in a common sale quantity, which is generally given as: $Q = q_1 + q_2$. Firm two's decision, assuming that firm two will delay its investment decision to period two, is to maximize its profit given the fact that firm one has already invested in period one with its Stackelberg leader quantity. That is, firm two's reaction function will be given from the following derivations:

$$\begin{aligned} Max \prod_{22}^{dF} &= q_{22}^{dF}\left[p_2 - C\right] \\ &= q_{22}^{dF}\left[A - q_{22}^{dF} - q_{11}^{dL} - C\right] \end{aligned} \tag{20}$$

$$\frac{\partial \prod_{22}^{dF}}{\partial q_{22}^{dF}} = A - 2(q_{22}^{dF}) - q_{11}^{dL} - C = 0 \tag{21}$$

$$q_{22}^{dF} = \frac{A - q_{11}^{dL} - C}{2}. \tag{22}$$

The last equation constitutes in the follower's reaction function. Now, the leader's choice is going to come from its maximization problem as follows:

$$\begin{aligned} Max \prod_{11}^{dL} &= q_{11}^{dL}\left[p_1 - C\right] \\ &= q_{11}^{dL}\left[\tilde{\mathrm{A}} - q_{11}^{dL} - q_{22}^{dF} - C\right] \\ &= q_{11}^{dL}\left[\tilde{\mathrm{A}} - q_{11}^{dL} - \frac{A - q_{11}^{dL} - C}{2} - C\right] \\ &= q_{11}^{dL}\left[\frac{2\tilde{\mathrm{A}} - A - q_{11}^{dL} - C}{2}\right] \end{aligned} \tag{23}$$

Finding the partial derivative of the above profit function, setting that partial equal to zero, and solving for leaders quantity, we get:

$$\frac{\partial \prod_{11}^{dL}}{\partial q_{11}^{dL}} = \tilde{\mathrm{A}} - \frac{A}{2} - q_{11}^{dL} - \frac{C}{2} = 0 \tag{24}$$

$$q_{11}^{dL} = \frac{2\tilde{\mathrm{A}} - A - C}{2}. \tag{25}$$

The above quantity is the quantity that the leader chooses to produce and sell in period two when they invest in the domestic market in period one. The follower then produces the following quantity (substituting the leader's quantity from equation 25 into the followers reaction function (equation 22)):

$$\begin{aligned} q_{22}^{dF} &= \frac{A - \dfrac{2\tilde{\mathrm{A}} - A - C}{2} - C}{2} \\ &= \frac{2A - 2\tilde{\mathrm{A}} + A + C - 2C}{4} \\ &= \frac{3A - 2\tilde{\mathrm{A}} - C}{4} \end{aligned} \tag{26}$$

However, firms may play this "Stackelberg game" in the foreign market, which is they have the option to invest in the foreign market in period one or two. Suppose that firm one has decided to invest in the foreign market in period one and the follower will invest and produce in this market in period two. The leader will gain the Stackelberg leadership status by exercising the real option (investing abroad) and face the uncertain demand, and the follower will delay its investment abroad to the second period and therefore will be relegated to Stackelberg follower. The symmetry of this sequential play (assume that both firms will invest and produce abroad) will give the same results (using the profit maximization principle we used above). So the follower will solve:

$$\begin{aligned} Max\,\Pi_{22}^{fF} &= q_{22}^{fF}\left[p_2-\theta\right]-G \\ &= q_{22}^{fF}\left[A-q_{22}^{fF}-q_{11}^{fL}-\theta\right]-G \end{aligned} \tag{27}$$

$$\frac{\partial \Pi_{22}^{fF}}{\partial q_{22}^{fF}} = A-2(q_{22}^{fF})-q_{11}^{fL}-\theta=0 \tag{28}$$

$$q_{22}^{fF} = \frac{A-q_{11}^{fL}-\theta}{2}. \tag{29}$$

Then, the leader will solve:

$$\begin{aligned} Max\,\Pi_{11}^{fL} &= q_{11}^{fL}\left[p_1-\theta\right]-G \\ &= q_{11}^{fL}\left[\tilde{\mathrm{A}}-q_{11}^{fL}-q_{22}^{fF}-\theta\right]-G \\ &= q_{11}^{fL}\left[\tilde{\mathrm{A}}-q_{11}^{fL}-\frac{A-q_{11}^{fL}-\theta}{2}-\theta\right]-G \\ &= q_{11}^{fL}\left[\frac{2\tilde{\mathrm{A}}-A-q_{11}^{fL}-\theta}{2}\right]-G \end{aligned} \tag{30}$$

Find partial derivatives with respect to q_{11}^{fL}, set it equal to zero, and solve for q_{11}^{fL}, we get:

$$\frac{\partial \Pi_{11}^{fL}}{\partial q_{11}^{fL}} = \tilde{A} - \frac{A}{2} - q_{11}^{fL} - \frac{\theta}{2} = 0 \tag{31}$$

$$q_{11}^{fL} = \frac{2\tilde{A} - A - \theta}{2}. \tag{32}$$

Substituting the leader's quantity from equation (32) into the follower's reaction function (equation 29); we find the quantity that the follower will produce. That is:

$$\begin{aligned} q_{22}^{fF} &= \frac{A - \frac{2\tilde{A} - A - \theta}{2} - \theta}{2} \\ &= \frac{2A - 2\tilde{A} + A + \theta - 2\theta}{4} \\ &= \frac{3A - 2\tilde{A} - \theta}{4} \end{aligned} \tag{33}$$

These results have been summarized in Tables I.2 and I.3. As we can see, the leader can choose to produce abroad or at home depending upon the expected profits. The expected profits will be different in each case because the production costs might be different in addition to the fixed cost (irreversible sunk cost) of producing abroad.

Under these circumstances then the leader will produce abroad as long as the following condition holds:

$$\begin{aligned} &\Pi_{11}^{fL} > \Pi_{11}^{dL} \\ &q_{11}^{fL}\left[\tilde{A} - q_{11}^{fL} - q_{22}^{fF} - \theta\right] - G > q_{11}^{dL}\left[\tilde{A} - q_{11}^{dL} - q_{22}^{dF} - C\right] \\ &\left\{\left[\frac{2\tilde{A} - A - \theta}{2}\right]\left[\tilde{A} - \frac{2\tilde{A} - A - \theta}{2} - \frac{3A - 2\tilde{A} - \theta}{4} - \theta\right] - G\right\} > \\ &\left\{\left[\frac{2\tilde{A} - A - C}{2}\right]\left[\tilde{A} - \frac{2\tilde{A} - A - C}{2} - \frac{3A - 2\tilde{A} - C}{4} - C\right]\right\} \end{aligned} \tag{34}$$

Carrying through some of the simplifications in the above expression, we get the following condition:

Table I.2: Quantities Firm Produce Domestically (Sequential order of play)

Firm I \ Firm II	ENTER PERIOD ONE	ENTER PERIOD TWO
ENTER PERIOD ONE	$q_{11}^{dC} = \frac{\tilde{A} - C}{3}$ $q_{21}^{dC} = \frac{\tilde{A} - C}{3}$	$q_{11}^{dL} = \frac{2\tilde{A} - A - C}{2}$ $q_{22}^{dF} = \frac{3A - 2\tilde{A} - C}{4}$
ENTER PERIOD TWO	$q_{12}^{dF} = \frac{3A - 2\tilde{A} - C}{4}$ $q_{21}^{dL} = \frac{2\tilde{A} - A - C}{2}$	$q_{12}^{dC} = \frac{A - C}{3}$ $q_{22}^{dC} = \frac{A - C}{3}$

Table I.3: Quantities Firm Produce Abroad (Sequential order of play)

Firm I \ Firm II	ENTER PERIOD ONE	ENTER PERIOD TWO
ENTER PERIOD ONE	$q_{11}^{fC} = \frac{\tilde{A} - \theta}{3}$ $q_{21}^{fC} = \frac{\tilde{A} - \theta}{3}$	$q_{11}^{fL} = \frac{2\tilde{A} - A - \theta}{2}$ $q_{22}^{fF} = \frac{3A - 2\tilde{A} - \theta}{4}$
ENTER PERIOD TWO	$q_{12}^{fF} = \frac{3A - 2\tilde{A} - \theta}{4}$ $q_{21}^{fL} = \frac{2\tilde{A} - A - \theta}{2}$	$q_{12}^{fC} = \frac{A - \theta}{3}$ $q_{22}^{fC} = \frac{A - \theta}{3}$

$$\left[\frac{(2\tilde{A}-A-\theta)^2}{8}-G\right]>\left[\frac{(2\tilde{A}-A-C)^2}{8}\right]$$

$$(2\tilde{A}-A-\theta)^2-8G>(2\tilde{A}-A-C)^2 \tag{35}$$

$$\theta^2-(4\tilde{A}-2A)\theta-C^2+4\tilde{A}C-2AC-8G>0$$

Setting the above expression equal to zero, we find two solutions about the value of marginal cost abroad:

$$\theta=2\tilde{A}-A\pm\sqrt{(A+C)^2+4\tilde{A}(\tilde{A}-A-C)+8G}\,. \tag{36}$$

Therefore, the leader will produce abroad for as long as the foreign marginal cost is greater than the positive value of the above equation.

5. Entry with Mixed Strategies

Let us assume that there is a strategic move by the follower (firm two decides to enter in the second period, to be a follower, and firm one has entered the market in period one). Firm two can choose the location of entry, as to whether he will enter the foreign market or not with a probability to enter denoted by ε, and (1- ε) not to pre-commit to an entry into this foreign market.

This firm has chosen to be a follower, and it will know the action taken by the other firm (namely the leader), quantity they have chosen to produce, and the demand condition already revealed in the market in the second period.

If the follower enters the foreign market then there is a reaction function, and it will choose a quantity capacity under certainty of the market demand, based on which demand parameter will happen, corresponding with the follower's decision to produce abroad. If the follower decides to produce domestically (with probability 1- ε), then

there is another reaction function of the follower that will be relevant in this exercise (those of producing in the domestic market).

The leader then will maximize the following profit function:

$$\begin{aligned}
&\Pi_{11}^{fL}(\tilde{A}, A, \varepsilon, \theta, C, G) = \varepsilon\left[q_{11}^{fL}\left(\tilde{A} - q_{11}^{fL} - \frac{A - q_{11}^{fL} - \theta}{2} - \theta\right) - G\right] + \\
&(1-\varepsilon)\left[q_{11}^{fL}\left(\tilde{A} - q_{11}^{fL} - \frac{A - q_{11}^{fL} - C}{2} - \theta\right) - G\right] \\
&= \varepsilon\left[q_{11}^{fL}\left(\frac{2\tilde{A} - 2q_{11}^{fL} - A + q_{11}^{fL} + \theta - 2\theta}{2}\right) - G\right] + \\
&(1-\varepsilon)\left[q_{11}^{fL}\left(\frac{2\tilde{A} - 2q_{11}^{fL} - A + q_{11}^{fL} + C - 2\theta}{2}\right) - G\right].
\end{aligned} \tag{37}$$

Which can be simplified and solved:

$$\begin{aligned}
&\Pi_{11}^{fL} = \varepsilon\left[q_{11}^{fL}\left(\frac{2\tilde{A} - A - q_{11}^{fL} - \theta}{2}\right) - G\right] + (1-\varepsilon)\left[q_{11}^{fL}\left(\frac{2\tilde{A} - A - q_{11}^{fL} + C - 2\theta}{2}\right) - G\right] \\
&= \frac{2\varepsilon\tilde{A}q_{11}^{fL} - \varepsilon A q_{11}^{fL} - \varepsilon(q_{11}^{fL})^2 - \varepsilon\theta q_{11}^{fL} - 2\varepsilon G +}{2} \\
&\frac{(1-\varepsilon)(2\tilde{A}q_{11}^{fL} - Aq_{11}^{fL} - (q_{11}^{fL})^2 + Cq_{11}^{fL} - 2\theta q_{11}^{fL} - 2G)}{2} \\
&= \frac{2\tilde{A}q_{11}^{fL} - Aq_{11}^{fL} + Cq_{11}^{fL} - 2\theta q_{11}^{fL} - 2G - \varepsilon Cq_{11}^{fL} + \varepsilon\theta q_{11}^{fL} - (q_{11}^{fL})^2}{2} \\
&= \frac{q_{11}^{fL}(2\tilde{A} - A + C - 2\theta - \varepsilon C + \varepsilon\theta) - (q_{11}^{fL})^2}{2} - G.
\end{aligned} \tag{38}$$

Solving this maximization problem, by taking the first derivative and setting it equal to zero, we find the quantity that the leader is going to produce under a random demand parameter and randomness of follower's action (enter/not enter foreign production). Therefore, we have the following:

$$\frac{\partial \prod_{11}^{fL}}{\partial q_{11}^{fL}} = \frac{2\tilde{A} - A + C - \varepsilon C - 2\theta + \varepsilon\theta}{2} - q_{11}^{fL} = 0$$
$$q_{11}^{fL} = \frac{2\tilde{A} - A + (1-\varepsilon)C + \varepsilon\theta}{2} - \theta \qquad (39)$$

The follower's decision to produce, home or abroad, will depend upon the profits that the follower will receive from each action it takes. The follower will produce abroad whenever the profits from doing so are greater than the profits from producing in the domestic market. That is, the following should hold (simply substituting the quantity of output that the follower will produce in the foreign market from equation 29 and in the domestic market from equation 22 (notice here that equation 22 should be amended for the case when firm 2, the follower, produces abroad)):

$$\prod_{22}^{fF} > \prod_{22}^{dF}$$
$$\left[q_{22}^{fF}\left(A - q_{22}^{fF} - q_{11}^{fL} - \theta\right) - G\right] > \left[q_{22}^{dF}\left(A - q_{22}^{dF} - q_{11}^{fL} - C\right)\right]$$
$$\left[\frac{A - q_{11}^{fL} - \theta}{2}\left(A - \frac{A - q_{11}^{fL} - \theta}{2} - q_{11}^{fL} - \theta\right) - G\right] > \qquad (40)$$
$$\left[\frac{A - q_{11}^{fL} - C}{2}\left(A - \frac{A - q_{11}^{fL} - C}{2} - q_{11}^{fL} - C\right)\right]$$
$$\left[\frac{(A - q_{11}^{fL} - \theta)^2}{4} - G\right] > \left[\frac{(A - q_{11}^{fL} - C)^2}{4}\right]$$

This can be simplified further to the identical condition stated below:

$$2q_{11}^{fL}(\theta - C) > 2A(\theta - C) + C^2 - \theta^2 + 4G. \qquad (41)$$

Substituting in this last condition for the value of (q_{11}^{fL}) from above and when the follower will produce in the foreign market (which means ε=1) we find an entry condition which is cost dependent. First, we know that if ε=1 then the amount of

output the leader will choose to produce in the foreign market is: $q_{11}^{fl} = \frac{2\tilde{A} - A - \theta}{2}$.

Therefore, we will have the following condition for the follower to enter the foreign market in period two:

$$2\frac{2\tilde{A} - A - \theta}{2}(\theta - C) > 2A(\theta - C) + C^2 - \theta^2 + 4G \tag{42}$$

$$\theta > \frac{C(C + 2\tilde{A} - 3A) + 4G}{2\tilde{A} - 3A + C} \tag{43}$$

We also are interested to know the behavior of the follower with respect to the unknown demand parameter. It should be true that there is a certain value of the demand parameter $\tilde{A}$ for which a firm becomes a leader and the follower considers the value of the uncertain demand parameter and all other information that becomes available and determines to enter the foreign market. From the equation 42, we can calculate the demand parameter considering the case when the follower and leader know the cost of investing and producing abroad and at home with certainty. That is, the following should hold when the follower enters the foreign market:

$$\begin{aligned} &2\tilde{A}\theta - A\theta - \theta^2 - 2\tilde{A}C + AC + \theta C - 2A\theta + 2AC - C^2 + \theta^2 - 4G > 0 \\ &\tilde{A} > \frac{(3A - C)}{2} + \frac{2G}{\theta - C} \end{aligned} \tag{44}$$

Substituting $\tilde{A} = A + \mu$ in the equation for $\tilde{A}$, we obtain the following condition:

$$\mu > \frac{A - C}{2} + \frac{2G}{\theta - C} \tag{45}$$

The interpretation of this condition is that for sufficiently small sunk cost of producing then the firm will enter the foreign market whenever the random parameter μ is greater than [(A-C)/2 +2G/(θ-C)]. In addition, for a given value of the sunk cost,

G, the value of the parameter μ depends on the difference between foreign and domestic marginal costs. If foreign marginal cost is equal to domestic marginal cost then the value of μ that would have an impact on followers entering foreign market is (A-C)/2. On the other side, if domestic marginal cost is greater than foreign marginal cost, then the value of μ is smaller compared with the case when both marginal costs are identical. Therefore, in addition to cost conditions firm will consider the uncertainty of the demand when entering a new market.

Observation IV:

In the mixed game described above, there exists a solution over probabilities of the follower to enter the foreign market. That probability is not zero or one (therefore, there are no pure strategies).

We take the optimum quantity that the leader is going to produce (equation 39) when they invest in period one in the foreign market and substitute in the expected profit function (equation 38). The expected profit function, then, becomes:

$$\begin{aligned}\Pi_{11}^{fL} &= \frac{q_{11}^{fL}(2\tilde{\mathrm{A}} - A + C - 2\theta - \varepsilon C + \varepsilon\theta) - (q_{11}^{fL})^2}{2} - G \\ &= \frac{\left(\frac{2\tilde{\mathrm{A}} - A + (1-\varepsilon)C + \varepsilon\theta}{2} - \theta\right)(2\tilde{\mathrm{A}} - A + C - 2\theta - \varepsilon C + \varepsilon\theta)}{2} \\ &\quad - \frac{\left(\frac{2\tilde{\mathrm{A}} - A + (1-\varepsilon)C + \varepsilon\theta}{2} - \theta\right)^2}{2} - G\end{aligned} \tag{46}$$

Knowing that for small changes in the follower's probability (that is for small changes in ε) the expected profits will not change, taking the first derivative of the profit

function with respect to ε, and set it equal to zero, we find a solution for ε. The solution is given by the following expression:

$$\varepsilon = \frac{(8C\theta - 4C^2 + 4q_{11}^{fL}(C-\theta) - 4\theta^2 \pm 2(C-\theta)D}{2(6C\theta - 3C^2 - 3\theta^2)} \tag{47}$$

where, D is equal to:

$$\sqrt{3A^2 + C^2 + q_{11}^{fL}(6A - 8C + 4q_{11}^{fL} + 14\theta - 12\tilde{A}) + 2\theta(3A - C + 2\theta) - 12\tilde{A}(A + \theta) + 12\tilde{A}^2}\ .$$

Therefore, the follower plays completely mixed strategy with respect to entry into the foreign market; however, it plays pure strategy with respect to output.

Observation V:

The expected profits of both the follower and the leader depend on the uncertainty of the demand in period one. However the marginal effects of a change in this unknown parameter ($\tilde{A}$) are different for the follower and leader, when they enter in investing and producing in the foreign market and in the domestic market.

We find that the profits (profits are the same as the ones we found in equations 34 and 35) of the leader (in the foreign market and domestic market) are:

$$\begin{aligned}
\Pi_{11}^{fL} &= q_{11}^{fL}\left[\tilde{A} - q_{11}^{fL} - q_{22}^{fF} - \theta\right] - G \\
&= \left\{\left[\frac{2\tilde{A} - A - \theta}{2}\right]\left[\tilde{A} - \frac{2\tilde{A} - A - \theta}{2} - \frac{3A - 2\tilde{A} - \theta}{4} - \theta\right] - G\right\} \\
&= \left[\frac{(2\tilde{A} - A - \theta)^2}{8} - G\right]
\end{aligned} \tag{48}$$

$$\begin{aligned}\Pi_{11}^{dL} &= q_{11}^{dL}\left[\tilde{A}-q_{11}^{dL}-q_{22}^{dF}-C\right] \\ &= \left\{\left[\frac{2\tilde{A}-A-C}{2}\right]\left[\tilde{A}-\frac{2\tilde{A}-A-C}{2}-\frac{3A-2\tilde{A}-C}{4}-C\right]\right\} \\ &= \left[\frac{(2\tilde{A}-A-C)^2}{8}\right]\end{aligned} \tag{49}$$

We find the partial derivatives of these profit functions with respect to $\tilde{A}$, which are:

$$\frac{\partial \Pi_{11}^{fL}}{\partial \tilde{A}} = \frac{2\tilde{A}-A-\theta}{2} \tag{50}$$

$$\frac{\partial \Pi_{11}^{dL}}{\partial \tilde{A}} = \frac{2\tilde{A}-A-C}{2} \tag{51}$$

The profits of the follower (producing in the domestic market or foreign market) will depend upon the market they enter, and will be given by the following equations:

$$\begin{aligned}\Pi_{22}^{fF} &= q_{22}^{fF}\left[p_2-\theta\right]-G \\ &= q_{22}^{fF}\left[A-q_{22}^{fF}-q_{11}^{fL}-\theta\right]-G \\ &= \left[\frac{3A-2\tilde{A}-\theta}{4}\right]\left[A-\frac{3A-2\tilde{A}-\theta}{4}-\frac{2\tilde{A}-A-\theta}{2}-\theta\right]-G \\ &= \left[\frac{3A-2\tilde{A}-\theta}{4}\right]\left[\frac{3A-2\tilde{A}-\theta}{4}\right]-G \\ &= \frac{(3A-2\tilde{A}-\theta)^2}{16}-G\end{aligned} \tag{52}$$

$$\begin{aligned}\Pi_{22}^{dF} &= q_{22}^{dF}\left[p_2-C\right] = q_{22}^{dF}\left[A-q_{22}^{dF}-q_{11}^{dL}-C\right] \\ &= \left[\frac{3A-2\tilde{A}-C}{4}\right]\left[A-\frac{3A-2\tilde{A}-C}{4}-\frac{2\tilde{A}-A-C}{2}-C\right] \\ &= \left[\frac{3A-2\tilde{A}-C}{4}\right]\left[\frac{3A-2\tilde{A}-C}{4}\right] \\ &= \frac{(3A-2\tilde{A}-C)^2}{16}\end{aligned} \tag{53}$$

Taking the first derivative of the profit functions (from equations 52 and 53) with respect to uncertain demand parameter, we find respectively the following marginal effects:

$$\frac{\partial \prod_{22}^{fF}}{\partial \tilde{A}} = \frac{2\tilde{A} - 3A + \theta}{4} \tag{54}$$

$$\frac{\partial \prod_{22}^{dF}}{\partial \tilde{A}} = \frac{2\tilde{A} - 3A + C}{4} \tag{55}$$

Comparing these marginal effects (marginal profits from a change in the unknown demand parameter for the leader and for the follower in both markets respectively) we find that they are different. The idea that the unknown demand parameter can be forecasted before firms consider it in the decision making process, allows us to derive and compare such marginal effects. The marginal effect of the leader is positive and the value of marginal effect of the follower is negative. It is not a surprise that the follower's marginal effects are less than the leader's. That may mean that the follower would have been better off moving into investing in the first period but given the follower status it cannot do that. One implication and clarification to be made is the fact that the follower does not become such due to unknown demand (both firms are identical and risk neutral).

5.1. Commitment of the follower to enter the market

It is a plausible assumption to think that the follower (firm two in our case) may decide to enter the foreign production market in period one as it knows that it will give the firm Cournot output as opposed to the follower (Cournout quantity is greater than followers quantity and also this hold for their respective profits). Now suppose

that the leader (firm one) does not know with certainty whether the follower (firm two) will enter in period one or in the second period. Let us denote this probability respectively (the probability that the follower (firm two) will enter the foreign production market in period one or period two) with β, and (1-β). Also in period two, the follower enters the domestic production with probability (1-ε) and the foreign production with probability ε.

Proposition IV: Under the condition that firms have mixed strategies with respect to time and market entry (both strategies at the same time), there exists a unique Nash equilibrium. Under these circumstances, firms play mixed strategies on the timing and market that they enter and pure strategies on the quantities they choose to produce.

Proof: Following the above assumptions, the leader is going to choose a quantity that will maximize their expected profits; therefore, they will solve another maximization problem, which can be written as follow:

$$\max \prod_{11}^{fL}(\tilde{A}, A, \varepsilon, \beta, C, \theta, G) = \beta\left[q_{11}^{fC}\left(\tilde{A} - q_{11}^{fC} - q_{21}^{fC} - \theta\right) - G\right] + (1-\beta)$$
$$\left[\varepsilon\left(q_{11}^{fL}\left(\tilde{A} - q_{11}^{fL} - q_{22}^{fF} - \theta\right) - G\right) + (1-\varepsilon)\left(q_{11}^{fL}\left(\tilde{A} - q_{11}^{fL} - q_{22}^{dF} - \theta\right) - G\right)\right] \quad (56)$$

In this case, we are interested to know the quantity that the leader will produce. Quantity that the leader (firm one) will produce when firm two enter the market in period one is identical with the quantity of the "follower" (firm two in this case behaves as a Cournot firm). Therefore, we can say that $q_{11}^{fC} = q_{21}^{fC} = q$, where q is the quantity that the leader (firm one will produce). This quantity will be the same with the quantity that the leader will produce when firm two will enter in period two.

By substituting in the above profit function the quantities firms will produce (from Tables I.1, I.2, and I.3), maximizing problem will give us an optimal quantity that the leader will choose to produce when it invests abroad in period one. That profit function is as follows:

$$\Pi_{11}^{fl} = \beta\left[q\left(\tilde{A}-q-q-\theta\right)-G\right]+(1-\beta)$$
$$\left[\varepsilon\left(q\left(\tilde{A}-q-\frac{A-q-\theta}{2}-\theta\right)-G\right)+(1-\varepsilon)\left(q\left(\tilde{A}-q-\frac{A-q-C}{2}-\theta\right)-G\right)\right] \quad (57)$$

From the solution of the above equation (find the first derivative with respect to q, set it equal to zero, and solve for q), we find the optimal value of q:

$$q_{11}^{fl}(\beta,\varepsilon) = \frac{2(\tilde{A}-\theta)-(1-\beta)[(A-C)-\varepsilon(C-\theta)]}{2(1+3\beta)} \quad (58)$$

Let us assume that (see Table I.4, below):

(a) β (probability that a firm one will produce abroad in period 1) is the same for both firms,

(b) $q_{11}^{fC} = q_{21}^{fC} = q$

(c) $q_{12}^{fC} = q_{22}^{fC} = q_2^f$

(d) $q_{12}^{dC} = q_{22}^{dC} = q_2^d$.

We will assume that a firm may or may not choose to produce abroad in period one to gain the Stackelberg leadership in this common market for a homogenous product. This firm is going to assign probabilities to a possibility of entry in period one to foreign investment and production by its rival firm, denoted by β, and will assign probabilities to the possibilities that the rival firm will produce abroad if the firm in question has delayed its investment until period two, denoted by (1- β).

Table I.4: The matrix of quantities firms would produce in two possible periods and two possible markets with respective probabilities

			Firm II			
			Period I	β	Period II	(1-β)
			Domestic (1-ε)	Foreign (ε)	Domestic (1-ε)	Foreign (ε)
Firm I	Period I	Domestic (1-ε)	q_{11}^d q_{21}^d	q_{11}^d q_{21}^f	q_{11}^d q_{22}^d	q_{11}^d q_{22}^f
	β	Foreign ε	q_{11}^f q_{21}^d	q_{11}^f q_{21}^f	q_{11}^f q_{21}^d	q_{11}^f q_{21}^f
	Period II	Domestic (1-ε)	q_{12}^d q_{21}^d	q_{12}^d q_{21}^f	q_{12}^d q_{22}^d	q_{12}^d q_{22}^f
	(1-β)	Foreign ε	q_{12}^f q_{21}^d	q_{12}^f q_{21}^f	q_{12}^f q_{22}^d	q_{12}^f q_{22}^f

Now the firm in consideration has two payoffs; a payoff (expected profit) from direct foreign investment and production in period one, and a payoff (expected profits) from deferring the production location and quantity decision until the second period.

Then it should be true that the expected profits from entering foreign production in period one are equal to the expected profits from entering in period two (the payoffs from entering in period one should be equal to the payoff of deferring entry into second period). Without loss of generality, let us denote the expected profit of entering foreign production in period one by $\prod_1^e$ and the expected profits of entering in period two by $\prod_2^e$. Using conditions (a, b, c, and d from above), the firm's

expected profit from entering in period one and period two will be respectively as follows:

$$\begin{aligned}&\Pi_1^e = \beta\left[q\left(\tilde{A}-q-q-\theta\right)-G\right]+\\&(1-\beta)\left[\varepsilon\left(q_{11}\left(\tilde{A}-q-q_2^f-\theta\right)-G\right)+(1-\varepsilon)\left(q\left(\tilde{A}-q-q_2^d-\theta\right)-G\right)\right]\end{aligned} \tag{59}$$

$$\begin{aligned}&\Pi_2^e = \beta\left[\varepsilon\left(q_2^f\left(A-q-q_2^f-\theta\right)-G\right)+(1-\varepsilon)\left(q_2^d\left(A-q-q_2^d-C\right)\right)\right]\\&+(1-\beta)\left[\varepsilon\left(q_2^f\left(A-q_2^f-q_2^f-\theta\right)-G\right)+(1-\varepsilon)\left(q_2^d\left(A-q_2^d-q_2^d-C\right)\right)\right]\end{aligned} \tag{60}$$

With identical firms such equality ($\Pi_1^e = \Pi_2^e$) will be as follows (which should hold with certainty):

$$\begin{aligned}&\beta\left[q\left(\tilde{A}-2q-\theta\right)-G\right]+\\&(1-\beta)\left[\varepsilon\left(q_{11}\left(\tilde{A}-q-q_2^f-\theta\right)-G\right)+(1-\varepsilon)\left(q\left(\tilde{A}-q-q_2^d-\theta\right)-G\right)\right]\\&=\beta\left[\varepsilon\left(q_2^f\left(A-q-q_2^f-\theta\right)-G\right)+(1-\varepsilon)\left(q_2^d\left(A-q-q_2^d-C\right)\right)\right]\\&+(1-\beta)\left[\varepsilon\left(q_2^f\left(A-2q_2^f-\theta\right)-G\right)+(1-\varepsilon)\left(q_2^d\left(A-2q_2^d-C\right)\right)\right]\end{aligned} \tag{61}$$

By substituting the reaction functions of firm two (equation 22 and 29 respectively) for the quantities they will produce when investing in the foreign market or domestic market in period two we have the following:

$$\begin{aligned}&\beta\left[q\left(\tilde{A}-2q-\theta\right)-G\right]+\\&(1-\beta)\left[\varepsilon\left(q\left(\tilde{A}-\frac{A+q+\theta}{2}\right)-G\right)+(1-\varepsilon)\left(q\left(\tilde{A}-\frac{A+q+2\theta-C}{2}\right)-G\right)\right]\\&=\beta\left[\varepsilon\left(\frac{A-q-\theta}{2}\left(A-q-\frac{A-q-\theta}{2}-\theta\right)-G\right)+(1-\varepsilon)\left(\frac{A-q-C}{2}\left(A-q-\frac{A-q-C}{2}-C\right)\right)\right]+(1-\beta)\\&\left[\varepsilon\left(\frac{A-q-\theta}{2}\left(A-2\frac{A-q-\theta}{2}-\theta\right)-G\right)+(1-\varepsilon)\left(\frac{A-q-C}{2}\left(A-2\frac{A-q-C}{2}-C\right)\right)\right]\end{aligned} \tag{62}$$

This can be more simplified as:

$$\beta(q\tilde{A} - 2q^2 - q\theta - G) +$$
$$(1-\beta)\left[\varepsilon(q\left(\frac{2\tilde{A}-A+q+\theta}{2}\right)-G)+(1-\varepsilon)(q\left(\frac{2\tilde{A}-A+q+2\theta-C}{2}\right)-G)\right]$$
$$=\beta\left[\varepsilon(\left(\frac{A-q-\theta}{2}\right)^2-G)+(1-\varepsilon)\left(\frac{A-q-C}{2}\right)^2\right]+ \quad (63)$$
$$(1-\beta)\left[\varepsilon(\left(\frac{A-q-\theta}{2}\right)\left(\frac{A+2q}{2}\right)-G)+(1-\varepsilon)\left(\frac{A-q-C}{2}\right)\left(\frac{A+2q}{2}\right)\right]$$

Substituting q (from equation 58) in this equality, we get a polynomial. Solving this polynomial for β, we find that such a solution exits (we make use of rules for finding a root for the polynomial of higher degrees, using elementary algebra). Furthermore, the value of β is different from zero and different from one. That means that the follower does not enter or stay out but rather randomizes its behavior. That shows that a Nash equilibrium (the value β) in the mixed strategies does exist, and that firms randomize their entry (both time and place: foreign and domestic) strategies, but they play pure strategies in quantities.

We have made no assumptions about the properties of the firm that will be a leader (potentially firm one in our simplified example). This can subsequently be relaxed by looking at the business history of firms entering a market in the conditions of demand uncertainty and what contributes in general to the leadership status of a firm, such as market power, management skills, access to specific recourses, connections with other players in the new market to name a few.

6. Results and Summary

This essay has explored the specific problem of firms entering a foreign market, which is related to a more generic problem of foreign direct investment (FDI),

under the conditions of the demand uncertainty. An attempt to bridge the real option approach with market structure (and possibly simple game theory applications) has been made. Several claims and propositions have been stated and derived with respect to two major experiments: time and market entry decisions of firms when they employ pure strategies and in the other case when they have mixed strategies.

As it has been shown, although the uncertain demand, which was thought to be driving the behavior of firms, has an effect on the firm's decision, these effects are different when firms have pure strategies (certainty) with respect to timing of entry and market they target to enter and when firms have mixed strategies. In addition, with pure strategies we saw that there are multiple equilibria and the firm's behavior is exogenously given. These equlibria are cost sensitive (they depend upon cost differential). Therefore, a firm's decision with pure strategies is cost driven and exogenously determined. The demand uncertainty plays no role on the one time play by symmetric firms. Especially with sequential order of play, we get more than one equilibria. However, these are sensitive to changes on the distribution of random demand in period one.

With pure strategies, we saw that there are multiple equilibria and the firm's behavior is exogenously given. More simply firms play strategically with respect to entry time and place, but they have pure strategies over the quantities they choose to produce even under mixed strategies. A firm's behavior with mixed strategies has been endogenized.

There are several extensions to be made which consist of consideration of more than two firms competing over the same market. A natural one would be to

explore the possibility of n-firms existing in the domestic market and experiment how the equilibria and the behavior of firms would change. Another one would be the case where (especially with the sequential move) one firm acts as a leader and others a competitive fringe. It would be interesting to chart these results for nonlinear demand and quadratic cost functions.

Essay Two

Foreign Direct Investment in Transition Economies: An Institutional Approach

1. Introduction

Transition economies in general have been one of the main fields of research for economists for the last decade. This is due to many questions that arise about the economic system as a whole and the uniqueness of such a great and unprecedented transformation. In this study, an institutional approach to foreign direct investment (FDI[8] thereafter) inflow is investigated to identify some relevant factors that have shaped and influenced transition economies.

The policy advices given to these countries focused in the set of actions that these countries should take in order to transform these economies from centrally planned to market oriented economies. Soon after the transition started, these actions were implemented and the institutional part of the transition process was set in place.

FDI inflow is considered a very important factor on the transition process. Such importance lies in the ability of foreign capital to spur economic growth, enhance comparative advantages, and introduce new and modern technology in the

[8] FDI takes place when a firm acquires ownership control of a production unit in a foreign country. There are three basic forms of FDI: -establishing new branch, -acquiring control share of an existing firm, and –participating jointly in a domestic firm. World Bank defines FDI as follow: "**Foreign direct investment** is net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor."

production process. A brief overview of different theories that have been developed (in a relative short period) to explain FDI flows is being presented. These theories include Hymer's thesis (1960), transaction cost theory and internalization (Williamson, 1985), ownership-location-internalization (short OLI) Dunning's eclectic approach (1977, 1988), and product cycle theory (Vernon, 1966). A survey of empirical work on FDI in transition economies and institutional factors that determine FDI flows is introduced.

The approach that has been proposed draws on institutionalists' theses asserting that underlying institutions in general drive economic activity. We take this idea and apply it to FDI inflow in transition economies. This is because these countries have undertaken great institutional transformation in their efforts to move their planned economies to market oriented economies. This approach to foreign direct investment flows will increase our understanding of both institutional and FDI in these countries.

Conclusions drawn are that institutions, as the core part of an economic system in transformation, play a crucial role in the flow of FDI, which in turn facilitates and accelerates economic reform. These forces are dualistic in nature in the sense that some can be transformed fast but the embedded force will be a barrier for the change to have a full effect on the economy. The embedded institutions (to be fully explained and developed in a simple model later in this essay) are those coming from the inherited tradition, culture, and informal interactions of agents in the market.

The econometric model proposed in this study is that of fixed effect panel data econometric analysis. A Seemingly Unrelated Regression Estimation (SURE) will be

used to correct for heteroscedasticity and contemporaneous correlation (Dielman, 1989). This will allow capturing FDI variations in time and space and explain the variation on FDI by the variation of independent variables. A number of hypotheses are posited, methodology and data gathering are described, and econometric technique and results are discussed. The transition economies covered in this study are those of Central and Eastern Europe: Albania, Bulgaria, Croatia, Czech Republic, FRY[9] Macedonia, Hungary, Poland, Slovak Republic, and Slovenia.

2. The purpose of the Essay

This essay aims to shed light on the institutional factors that affect the inflow of Foreign Direct Investment in Central and Eastern European countries in general as well as in the individual countries within the group. In addition economic policies influence in determining the FDI inflow has been investigated. One would argue that there is an interconnection between institutional progress and the performance of economic policies in transition economies, and that both play a crucial role on the FDI inflow. What the effects of these two sets of factors are on the FDI inflow is an important question to be answered from the theory and empirical point of view.

A simple model has been examined to explore the role and the development of market institutions in the transition economies. Importance has been given not only to formal institutions but to informal institutions as well. Both institutions have shaped the transition process and the socio-economic environment in Central and Easter European countries, which are the focus of this essay. Then this institutional

[9] FRY Macedonia is the official name of Federal Republic of Yugoslavia Macedonia after its separation from the Yugoslav federation.

development model along with economic policies has been assumed to affect FDI inflow. An integrated double-log econometric model is proposed and tested.

More than a decade has passed since the transition started in 1989, and there are still problems that need to be recognized as well as understood by policy makers in order to alleviate the process of transition to a market-led economy. At the start of the transition period in Central and Eastern Europe, most experts would advise these countries to do more or less four things: macro-stabilization, price and market reform, restructuring and privatization, and redefining the role of the state (World Economic Outlook, October 2000, IMF). The result of such steps would be controlled inflation and budget deficit, price liberalization and trade reform, private sector development, legal and institutional reform. Moreover, the FDI inflow will increase and be of an important component of development in the region.

What was probably not realized at that time and to some degree even today is how to go about taking the advised steps; that is, sequencing the transition stages in different countries. Socialist economies were operating more or less based on similar philosophy and ideology but there were differences among these economies in the way they applied these philosophies in practice.

This caused divergence of the economic performance within socialist countries as well as in the formal and informal constraints that governments and individuals created, adopted and advanced over more than forty years. Pre-transition reforms[10] that have been different in different countries will affect the overall outcomes of

[10] Pre-transition reform is referred to efforts done by some countries to introduce elements of market within the CPE countries, like Hungary etc. Transition found these countries in a great advantage compare to others that had taken no steps towards reforming their economies.

transition reform (countries initiated transition at the same time but from different economic and institutional starting points).

The political stability of a country will have a major role in the transition process. Not all the countries considered in this study have taken the same approach with respect to the sequencing of reform.

Some countries, such as Poland, Albania, and Czech Republic, adopted a more rapid approach to transition, often called a "shock therapy," which consisted of a fast replacement of command and control mechanism with the market mechanism (the price mechanism through fast liberalization). Other countries, such as Hungary, Slovenia, Slovak Republic, took different approaches, called "gradualism", where the speed of the reform was slower than in "shock therapy" countries and sequencing spanned many years.

The absolute and relative levels of FDI will depend upon the approach that countries took to transform their economies to market oriented economies. If the move toward market is successful, then there will be more FDI inflows as these countries offer market opportunities for western businesses.

Pre-transition reform steps were taken in almost every centralized country. The differences were in the deepness and the direction of these reforms. Most of them focused on the improvement of management, like offering incentives to managers to increase their interest in productivity. A few introduced some semi-market elements, as in Hungary, for example. A striking feature of the data shows a positive relationship between FDI inflow and the level of pre-transition (economic and institutional) reform.

3. Theories of Foreign Direct Investment

International production theory has a relatively short history. The theory can be grouped in terms of the approach that they use to answer the question why a business wants to expand its production activity abroad. The common theme is that there are advantages in doing it as well as disadvantages. If we can put some monetary values on them, the comparison becomes a cost-benefit analysis problem. Companies will choose to go multinational if the benefits outweigh the costs of such action, providing that firms are driven by profit maximizing. The review of different theories in FDI and international production is done with respect to the economic approaches that have been taken to explain capital flows and chronology of introduction of such theories in the economic body's knowledge.

i) Hymer's Market Imperfections Theory

Hymer's theory has spawned a great deal of research in the field as it is a pioneering work focused on the industry structure as a source of market power and a cause of FDI. He stresses three important reasons as to why firms might go multinational. First is that it is profitable to control an enterprise in more than one country in order to remove competition between them. A removal of conflict is profitable as one firm will be controlling all the enterprises rather than having separate firms in each country that produce and sell same product. "... it is profitable to substitute centralized decision making for decentralized decision making (Hymer, 1960)."

A second reason, according to Hymer, is because some "firms have advantages in a particular activity, and they may find it profitable to exploit these advantages by establishing foreign operations." FDI is motivated by market imperfections, which permit the multinationals to exploit its monopolistic advantages in foreign markets (Buckley 1996). Kindleberger (1969) has advanced Hymer's theory by stressing that market imperfections in fact gave to multinationals a compensation for the disadvantages that a foreign firm has when it operates in an international market.

A third relatively "minor reason" has to do with diversification. The diversification that a multinational firm undertakes is the potentially higher profits from an activity in some other country. By so doing, a multinational firm uses FDI as a means of spreading the risk across different products and different countries. This insight is important, because in the 1960's the theory of asset pricing was still unknown (Buckley, 1996). Rugman (1986) provides some empirical evidence that supports Hymer's thesis that companies use diversification in both dimensions, product diversification and geographical dispersion.

ii) Transaction Cost Theory of FDI

This theory is a challenge to the neoclassical approach that postulates a stringent assumption of nonexistence of transaction cost. The first economist credited for bringing in a new approach is Coase (1937) with his work on the existence of the firm. His work, as Dunning and Rugman (1985) indicated, that Hymer "missed the distinction between structural and transaction-cost (cognitive) market imperfection."

The transaction costs (Williamson (1985) type of transaction cost) are those that represent different kinds of market imperfection.

Transaction costs are the main force that drives internalization in a given multinational enterprise and are one of the factors to give rise to FDI. If market transaction costs are higher than intra-firm costs of producing either a new product or the same product at a new place, then it is feasible for a firm to internalize production and become multinational. Some others have discussed separately two theories (transaction cost theory and internalization theory) of FDI creation and movement (e.g. Buckley, 1996).

One line of argument takes transaction costs as the cost of running an economic system (cited from Arrow in Williamson's analysis). As Williamson discuses, this cost has been a preoccupation of the neoclassical paradigm. He continuous, exploring the transaction costs that are due to governance[11] (Williamson, 1985). His analysis has been expanded and used to incorporate the contracts, which can be seen as a form of property and legal rights, as a driving force of internalization of benefits that a firm might possess and can be kept internally by going multinational, through FDI.

Dunning (1977) expanded internalization to include even cultural factors when he poses the following question: "Behind the identification and evaluation of the different kinds of cross-border market failure that may both prompt the internalization of value added activity and determine its form , lies the question 'Why,' or 'What

[11] See Williamson (1985), page 24. His graphical representation of the cognitive map of contracts is very telling about the way the transaction costs come to play a major role in internalizing with respect to international production.

causes these markets to fail?'." Then he observed that the failures might be linked not only to technical but to cultural factors and their interrelations as well.

iii) Product Life Cycle Theory

The idea of product life cycle, introduced and developed by Vernon (1966), advanced the above theories of FDI to incorporate the life cycle of a product. He suggested that the most advanced economies have the privilege to be the one that will invent new products and new technologies. This is for two reasons: one, that higher incomes allow the creation of new demand, consumers can afford to switch their purchases from traditional products to new ones; and two, rich countries spend more on research and development and this alone enables them to be more innovative than other countries. Then, the product develops as the demand increases.

Later phases will be the standardization of the new product; hence, the product enters the growth stage. After all the benefits of marketing and selling this product (first in domestic market then later in international market), in addition to economies of scale benefit, have been accrued to the FDI, the licensing out stage can happen.

Vernon (1966) suggests that after all benefits have been reaped to the innovating firm, the firm might go international to take advantage of its monopoly position (due to technical barriers to entry), internalization of transaction costs and diversification. Later, Vernon (cited in Buckley, 1996) categorized multinationals in terms of the source of a market power of monopoly: innovation based monopoly, mature oligopolies, and aging oligopolies.

iv) Eclectic Theory of FDI

The eclectic theory was originated and developed by John Dunning (1977, 1988), known as OLI (ownership, location, and internalization) paradigm. This draws upon the work done by Coase (1937), Hymer (1960), Williamson (1985) and others. In some ways he blended all the theories to give a more holistic and elegant approach. He suggests that the firm expands its production internationally to benefit from all the factors that come from three basic advantages: ownership advantage, location advantage, and internalization advantage.

Ownership advantages, which are firm specific, guarantee superior returns in comparison with its competitors. These advantages can be tangible or intangible firm specific. The firm might possess a special way of processing a product, due to a strong and very specific managing ability, a patent, or a copyright etc. The first one, which can be referred to as expertise, is an intangible asset that a firm possesses and uses to generate returns by expanding its production across borders. Some might argue that this specific possession is a "public good" type of good that can be enjoyed by other firms too.

Location advantages are due to factors that make a particular place or country more preferable for international expansion of production compared to other places. In these factors, according to Dunning, the trade barriers that a country might have in place, the richness in relatively cheap natural resources, labor force conditions, and government intervention policies, are the most appealing ones that a multinational would like to go FDI. These factors along with others are the major causes of geographical dispersion of multinationals.

As with respect to internalization advantages, firms are considered to possess the ability to expand production in order to lower the transaction cost. This is argued to be more profitable than either trade of a product or licensing out. Therefore, firms may go through establishing new plants abroad to take advantage of vertical or horizontal internalization.

Dunning's (1977) OLI paradigm has led to a large amount of empirical research in the field of multinationals. Some criticism concludes that the explanatory power of this model is limited to US firms, and that this theory will explain only Greenfield operations and not acquisitions. His theory, as Buckley (1996) suggests, has given great insight into the FDI and international production.

4. Survey of Empirical Studies

Empirical studies on the FDI inflows can be grouped into two categories: studies on FDI inflows and outflows in transition economies, and studies focused on the institutional aspects of FDI. The second group of studies has been done with reference to developing countries, like Latin American countries and other developing countries. The first group of studies is mostly country case studies (we focus on studies done with respect to transitional economies).

Fabry (2001), in "The role of inward-FDI in the transition countries in European analytical framework", has studied the different effects (roles) that FDI might have in a transition economy. She has divided these roles in two groups: FDI contribution with reference to modernization and an increase in efficiency, therefore reorienting the production process, and FDI impacts- absorption of FDI from host

country, assimilation and diffusion of knowledge. By using Granger causality test, the author argues that FDI may help the transition economy up-grade, but FDI itself is not suited to replace industrial and technological changes for long-term growth.

Using firm-level data based on a worldwide survey of companies in 1995 and covering 25 transition economies, S. H. Zeghni (2001), shows that there is a positive relationship between countries' transformation progress and the probability of a country being chosen for FDI inflows. Applying a probit model the following factors are chosen to be as determinants of FDI in this study: GDP per capita (as an proxy for the size of the market), growth rate of GDP, transition progress, regional tension, entry cost index, WTO (World Trade Organization) membership and/or applicant, and telephone lines. His two major findings are: a positive relationship between countries progress in transforming the economy towards market and FDI attraction, and decrease in regional tension and FDI inflows.

Szanyi (2001) has studied different aspects, like Greenfield investment versus privatization and FDI evolution, of FDI in Hungarian economy during its unique transition from centralized economy to a free market. The author concludes, "The motivations of foreign investors are combined differently in privatization and Greenfield investments. Market seekers tend to participate more in privatization; resource seekers prefer Greenfield investments." In addition, he points out the importance of creating basic political and economic stability and a working institutional framework to increase the efficiency of FDI inflows. His analysis is more of a survey in nature and his conclusions are not backed by data.

Antaloczy and Sass (2001), using data, argue that Greenfield FDI is due to IFTZ's (industrial free trade zone) adding to the location component of Dunning's OLI thesis. IFTZ's were first introduced in 1982 with an objective of attracting export-oriented high technology FDI to Hungary.

Empirical studies on FDI inflows in transition economies have been limited due to the lack of data and short period of time in which countries have been undergoing major changes. These studies are more of a case study of a particular country than of a general study of a region. Institutional factors that influence the FDI have more often been theorized and hypothesized than tested.

Political stability and government policies have been recognized as factors that influence FDI flows along with others, like market imperfections, size of the market, and geography. Nigh (1986) studied two classes of political events (intra-nation, and inter-nation events) and their effect in the FDI decisions of US multinational firms to invest in Latin American countries.

He used a panel data analysis to examine the relationship between political events and FDI for two reasons: to increase the sample size and the reliability of estimates of the regression parameters. Data used are time series for 21 years (1954-1975) crossed over eight countries (Mexico, Panama, Columbia, Venezuela, Peru, Brazil, Chile, and Argentina). The conclusion of his study is that "investors assess political events in general rather than investment-specific terms."

His approach uses political events to explain the variation on FDI flows. The expansion of this approach, by using a combination of institutional factor (political stability and civil liberties) and policy factor (trade index, inflation, and exchange rate

control) as determinants of FDI flows would be more appropriate for transition economies. The focus will be studying the relationship between FDI and institutions that affect its flow in different countries, i.e., transition economies. In addition, there will be an empirical estimation of the effects of institutions and policies in FDI flows in these countries. An analysis of how institutional changes take place in these countries is proposed in this essay in order to provide the background for the relationship between institutions, policies (government), and FDI inflow.

5. The Institutional Approach to FDI in Transition Economies

North (1990) has defined institutions to be "... rules of the game or ... humanly devised constraints that shape human interaction." As such they can be both formal constraints (also called formal institutions: laws passed by legislative body, or generally any written rule, and to some degree binding, that agents in the economy are to follow) and informal constraints (called informal institutions: rules used by individuals based on customs, religion, culture, etc.). Informal constraints are those that have been adopted and embodied in the society's structure, therefore more difficult to be changed promptly. North's analysis goes on to argue, "Institutions affect the performance of the economy by their effect on the cost of exchange and production."

Although his analysis is directed to a more general case, it can be applied and extended to a particular group of countries, namely those countries in transition that are of interest in this study. The question that I will try to answer is this, 'Whether there is any general path that countries can follow when transforming their economies

from classic socialism to open market economies?' is not new but not yet completely resolved.

After the "Big Bang" in 1989, most economists advised these countries' governments to liberalize everything and move promptly toward a market economy, despite the questionable feasibility of this move (which was based on neoclassical analysis, as most of the advising economists associate themselves with this school of thought). The majority of scholars recognized that socialism was based upon its fundamental features: property ownership by the state, centralized planning of production, consumption, and distribution of goods and services, and one party control of government.

What they advised was the introduction of large-scale private property, abandonment of planning in the economy, openness with the rest of the world, and allowing a multiparty system for governing the country. Everything was right, except that all the features of socialism were rooted somewhere else, in its institutions as well.

Therefore, transformation of institutions will affect and determine the outcome of reform. Introducing institutions and their relationships with pre- and post- transition economic transformation analysis will be more complete and capture more aspects of such transformation. An institutional approach will allow us to draw some general conclusions.

Institutions alone cannot account for all the changes that a society wants to undertake. Rather a combination of actions of three agents in the economy, namely households, firms (domestic and international), and government, is what enhances or

deters the institutionally initiated changes. Each agent's action is important in its own right, but the focus will be on the government action. This is at least for two reasons. The first reason is inherited from the past experience. Economies that are undergoing transition for more than four decades have experienced a strong government. Households watch the policy that a government undertakes and a government's response to any new phenomenon that comes along.

A second reason has to do more with a new role of a policy in a new environment. The new role of policy is conditioned by the degree of society's choice to open and interact with the rest of the world. On the other hand, all the "diseases" that come with openness will be blamed on the government. Households and firms expect the government to protect them from unemployment, inflation, and competition.

Policy can be developed within an institutional setting and can affect the market factors. By opening the economy to foreign goods and foreign capital, the households will be better off as far as consumption goes. A combination of actions of all agents in a given economy with institutional changes will be transmitted not in a mechanical way, but through a process, Cantwell (1989) identified in terms of "cumulative causation." Changes are initiated at the level of formal institutions, which in turn will change firm's ability to adopt and compete in a new environment; this will cause changes in the way firms interact with each other and with international firms. A new demand for formal and informal institutions will be created. More private property rights will be needed as well as enhanced ability of government agencies to protect these private property rights.

FDI inflow will be affected by institutional progress of countries in transition and policies applied by their governments. It should be noted that government policies here are considered ones that will open the economy to the rest of the world, stabilize prices and exchange rates, and enforce the rules of game. The last one, enforcing the rules of game, is interconnected with institutional (formal and informal) progress in the country. Policies alone can enhance institutional progress in the country as the institutions may enhance the ability and willingness of the government to conduct more sound policies.

i) Analysis of Institutional Factor Determination

In developing an institutional approach model of transformation that will enable us to capture a broad range of possibilities (not only "shock therapy" and "gradualism"), we need to modify several assumptions:

- It is an imperative to transform these economies from centrally planned economies (hereafter CPE) to market economies.

- Countries differ from each other due to the level and direction of pre-transition reforms or transformations.

- Society is "willing" to accept some cost for more democratization.

- Once countries decide to move forward with market economy transformations there is no possibility of reversal.

- Institutions are important part of transition and can be created (new institutions specific for countries conditions and in line with tradition and culture) and adopted (from other successful countries experience).

The Importance of Institutions

"Institutions fix the confines of and impose upon activities of human beings" (Hamilton, 1932). Transition is not a "one step" transformation; rather, it is a more complicated process. It involves economic transformation, social changes, political reforms and more at the same time. Once it is initiated, it becomes a multi-step process of transformation. In general, every kind of broad transformation needs some "railroads", or a method of transporting an economy from one state to another. The "railroads" that will facilitate and guarantee the process of transformation are institutions.

History has shown that transformations are difficult to undertake, especially when there is no previous experience in theory or in practice. It is true that there is neither in theory (particularly with neoclassicism which neglects the importance of institutions) nor in practice such experience that, using radicals' language, would guide transformations from a "higher state level: socialism", to a "lower level: capitalism".

Institutions not only facilitate the ways of social-economic transformation but also help to lower the level of uncertainty. Once the level of uncertainty is addressed, then society's confidence enables them to go forward, while reducing the fear of reversals.

"Intermediate" and "endowment" institutions

One fact should be stated here: not all the CPE countries have had the same level of closeness. Recognizing this helps to better understand why the outcomes of

transition differ across countries and how to avoid the "transformation traps" (Portes, 1994). CPE countries before the "Big Bang," despite central planning policies, undertook steps to reform their economies within the existing set of institutions. These reforms were mainly geared towards management and improving the efficacy of production. Countries like Hungary, Poland, and Czech Republic and others experienced some level of opening with countries in the West before the "Big bang". Others, like Albania, did undertake reforms but in the meantime, the economy and country in general become increasingly closed.

The level of institutions that countries had before transition will be referred to as "endowment." The level of institutions is comprised of the "endowment" and "institutions of openness." Institutions of openness are not only laws that countries adopted to make the economic operations more flexible, but also changes in cognition reflected in altered habits throughout society as a whole.

Depreciation of institutions

There is a relationship between these institutions and full openness of economies. The more pre-transition reforms, the more "intermediate" institutions were developed, and fewer endowment of institutions that served centralization. It does not necessarily hold that if pre-transition reforms have been shallow, that there will be more reform the less endowment (a case such as the Soviet Union, where the pre-transition reforms faded way since they could not survive). A good indication of the pre-transition reform (level of economic reforms and development "intermediate" institutions) is the degree of economic freedom that countries had in 1989. This index

indicates that the economic freedom level was 23 in Poland, 37 in Hungary, and 0 in Albania (Murrel, 1996) out of scale of 0 to 100.

Transition, in order to be successful, as has been pointed out above, required a demand for institutions, either new ones or modifying existing institutions, which can lower uncertainty and facilitate reforms. As Fan and Fan (2003) conclude in their study regarding the institutional design, "the design of mechanisms and institutions should be a high priority in these transition economies." The demand for institutions comes from the initial attempt to transform the economy through reform. This is not the only source, since the initial reform inherits all the pre-transition institutions.

The initial reform has to be reconciled with the old in order to succeed. This process calls for adaptation rather than the creation of new institutions. After all, the demand is bounded by initial endowment as well as by the social cost that is associated with the introduction of new institutions. Regardless of whether a country chooses a "shock therapy" or "gradualism", it cannot discard all the old institutions within a very short time period. Some of them fade away since they were not only "out of fashion" but also became a roadblock to the progress of transformation: -they "depreciate." It is obvious that the more demand for new institutions, the more depreciation of old institution would occur.

A country has two choices: start from the endowment level of institution or from the demand for new institution. If a country's transformation path is such that the pre-transition reform has been taken into account in the demand for new institutional adjustments then "gradualism" transformations have been chosen as a path for that country. If the country instead chooses the desired institutional transformation without

taking into consideration the level of pre-transition reform then country may be following either "shock therapy", or "gradualism" depending upon how far the country wants to go from the initial conditions.

If a country adopts a policy such that it induces the demand for institutions greater than it would have been if it considered the endowment approach then certainly it faces a "shock therapy." The endowment level of institutions and the demand for new rules of game are considered complementary at a given point in time. From time to time, this relationship might change, reflecting the adaptation of discontinuous (abrupt) changes (changes in the formal institutions) by informal institutions.

Graphically (Figure II.1 and II.2), we can consider two countries (denoted by A and B) with different levels of "endowment" of institutions and different adoption functions (Figure II.1 showing the case with fast institutional adjustment and Figure II.2 with slow institutional adjustment). This will be shown in negative part of Y-axis, and measured (in absolute value) by an index of pre-transition reform. From there we see that the process of adjustments takes time.

If a country is more endowed (B) with pre-transition reforms and consequently institutions, then, the time it needs to fully adapt to a market economy is lower than if the level of pre-transition "endowment" was lower (case A versus B). In the first quadrant, we have the relationship between the demands for institutions and time (and the social cost that the society faces: privatization, for example, will retard employment, by requiring more training in the light of new mode of production; inflation will increase as prices rise, causing purchasing power

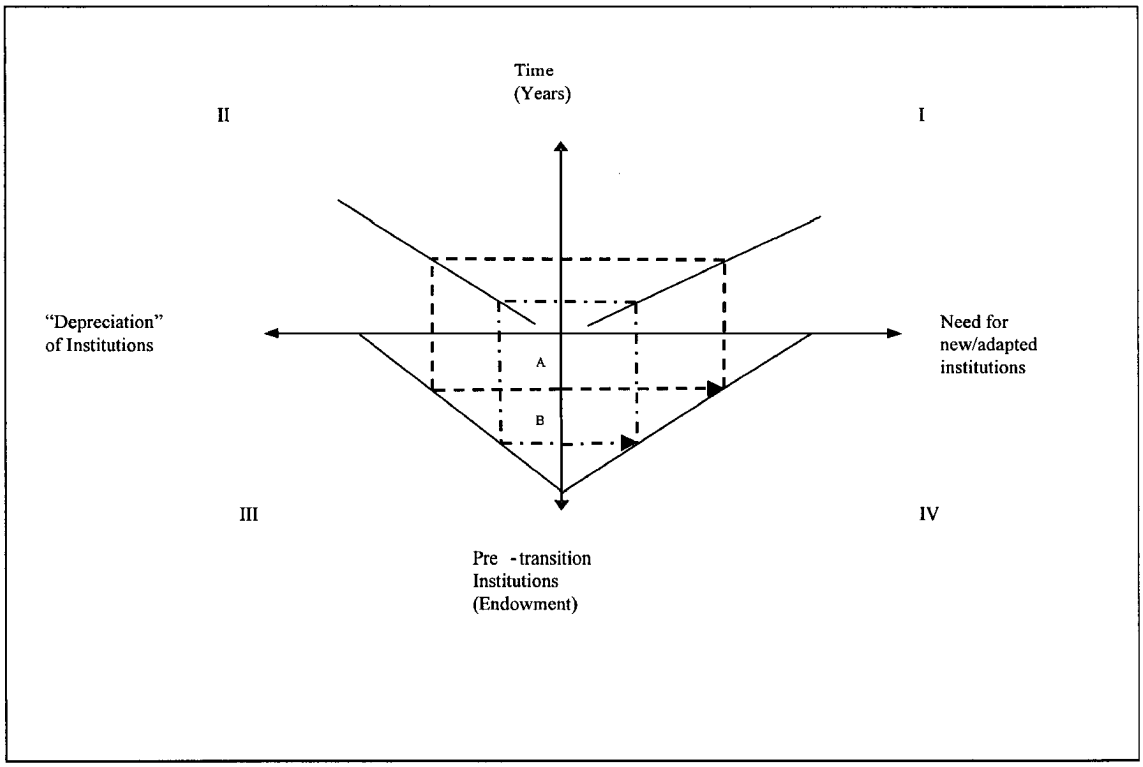

Figure II.1: Institutional path-dependence evolution
(with fast institutional adjustment (adaptation) function)

decrease) needed to get society adjust to new institutions. This relationship can be depicted by an "adaptation function." The curve showing this function should be flat for countries that have high adaptation rate relative to countries that have lower adaptation rate.

The second quadrant relates "depreciation" with time that institutions of transformations need to be fully internalized and infused in the economy and society (this is another additional cost, a cost of change). Greater social cost is associated with greater "voluntary" (and not so voluntary) depreciation of old institutions.

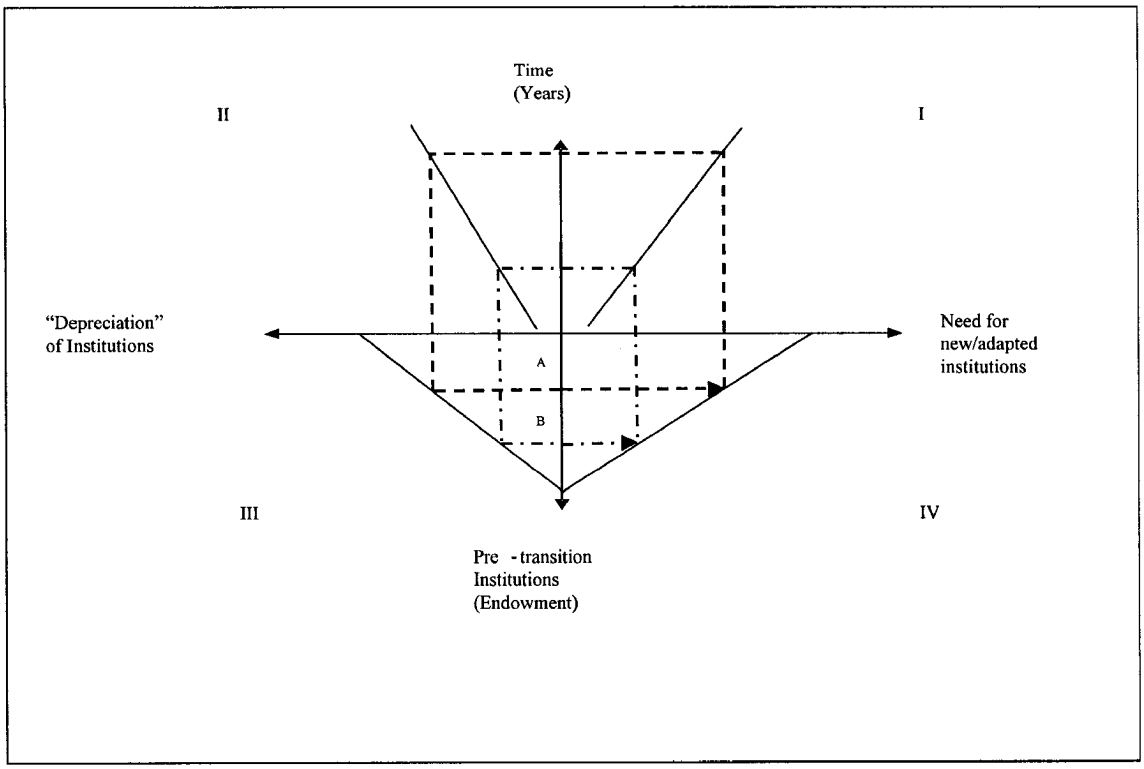

Figure II.2: Institutional path-dependence evolution
(with slow institutional adjustment (adaptation) function)

This relationship can also be blocked by government policies and the vested interest that politicians have at a given point in time. A steeper curve would show that less depreciation will occur for a given amount of time, and maybe government and society has been dominated by the idea of smooth changes giving results that are more desirable or government is interested to protect its status for a longer period.

In the third quadrant, we have the relationship between institution endowment and depreciation of the old institutions, which have a one to one relationship. The initial process starts at the level of institutional endowment and goes counter-clockwise. In the fourth quadrant, we have a bounded relationship between endowment and demand implying an inverse relationship between the two during the initial period. This relationship would resemble a nonlinear function for two reasons.

One is that institutional changes in post transition are more discontinuous (formally: a governmental-decree type of change) than those changes that happened before transition. Informal institutions (cultural behavior, customs, and informal contractual behavior) tend to evolve in a smooth fashion. The resultant change would be blended step function plus smooth-linear function of both formal and informal institutional changes. According to this model, there are several conclusions that can be drawn.

Balanced transformation, which takes into account the initial endowment level of institutions, is most likely to be less costly for society. The adaptation of institutions should be more feasible than creating new ones. This does not imply that new institutions should not be created, but it suggests that policy makers should take into account the costs and benefits associated with such action. There are two types of path dependency (cumulative processes) that can be distinguished vicious versus virtuous. Vicious cumulative process can be caused by wrong institutional setting and by negative effects coming from tension between new and existing institutions. As a result, a country's level of output declines continuously.

Virtuous cumulative process results from creating and/or adopting new institutions that will have less friction with existing formal and informal institutions that do exist in the country. As such, economic performance of that country will be enhanced by the positive effect of new institutional design. This calls for responsible political process and government policies that are not heavily affected by conflicts of interest. This institutional design will be creating a more "inviting" atmosphere for FDI flows into the country.

As it has been shown, the transformation process of formerly centralized economies to market oriented economies is a cumulative process. Great changes in the formal institutional settings are possible, but those alone cannot guarantee to take the economy to a higher development stage, unless changes in the informal institution have also taken place. It is difficult for these latter changes to happen at a fast pace, because they are embedded in society. This type of discontinuity, which is different across different countries, will affect among other variables in the economy the capital accumulation including the FDI flows.

Several specialized institutions measure the institutional development index for all countries. We will make use of the data published from Freedom House (Nation in Transit, 1998, and 2002). These data index political rights, civil liberties and freedom (Tables II.1 and II.2).

ii) Analysis of Policy Factors Determination

Government action at any time, in democratic societies, is determined by unwritten contracts that the government has with voters (a principal – agent problem). While this is crucial, government's actions are also influenced form the political philosophy they are pursuing and the individual representative self-interest behavior. There are also international binding commitments that constraint the government's action. In addition, vision and commitment of the government to the future of the country they are serving and voters' reaction in case governments go too far against the perceived voter's policy (or government does not do enough) determines the government's policy and actions it takes to meet the targets.

Table II.1: Political rights index

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Albania	7	7	4	4	2	3	3	4	4	4	4	4
Bulgaria	7	3	2	2	2	2	2	2	2	2	2	2
Croatia	-	-	3	4	4	4	4	4	4	4	4	4
Czech Republic	6	2	2	2	1	1	1	1	1	1	1	1
Hungary	4	2	2	2	1	1	1	1	1	1	1	1
Macedonia, FYR	5	5	6	3	3	4	4	4	4	3	3	3
Poland	4	2	2	2	2	2	1	1	1	1	1	1
Romania	7	6	5	4	4	4	4	2	2	2	2	2
Slovak Republic	6	2	2	2	3	2	2	2	2	2	1	1
Slovenia	5	5	2	2	1	1	1	1	1	1	1	1

Table II.2: Civil liberties index

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Albania	7	6	4	3	4	4	4	4	4	5	5	5
Bulgaria	7	4	3	3	2	2	2	3	3	3	3	3
Croatia	-	-	4	4	4	4	4	4	4	4	4	4
Czech Republic	6	2	2	2	2	2	2	2	2	2	2	2
Hungary	3	2	2	2	2	2	2	2	2	2	2	2
Macedonia, FYR	4	4	5	4	3	3	3	3	3	3	3	3
Poland	3	2	2	2	2	2	2	2	2	2	2	2
Romania	7	5	5	4	4	3	3	3	2	2	2	2
Slovak Republic	6	2	2	2	4	3	3	4	4	2	2	2
Slovenia	4	4	3	2	2	2	2	2	2	2	2	2

Then it is clear that the policy itself is multifaceted and bounded. The government wants to keep promises made to the voters that their welfare will be improved. From an economic analysis, there is strong evidence that supports free trade and free capital movement in and out of the country. We suppose as a plausible assumption that any transition country's government is interested in coping with major problems, such as unemployment. To do that, government policies must encourage capital inflows through FDI.

Among all economic policies that one government can conduct to ease the process of transformation one can identify liberalization of trade (as a measure of openness), exchange rate regime (fixed versus flexible, see Table II.3), controlling inflation to be the most important ones that can directly affect the FDI inflow in transition economies.

Government policies will be focused on setting rules as far as property rights go, providing information for interested multinationals to move in, inviting them to participate in the privatization of state owned enterprises and restructuring process. As indirect policies, that the governments might take would be enhancing liberalization, controlling inflation, and instituting financial sector reform and development. The governments cannot change the location factor to attract FDI, but the governments can also encourage economic and political stability.

Everything else being constant across countries and across time, the more stable the economy, the more FDI will flow in the country. The integration of institutional factors with the policy that the government might take will be leading factors that will affect the flow of FDI in transition economies.

Table II.3: Mode of transition and Exchange rate regime[12]

Mode of Transition and Exchange Rate Policy	Shock Therapy	Gradualism	Fixed Exchange Rate	Flexible Exchange Rate
Albania	x			x
Bulgaria	x			x
Croatia		x	x	
Czech Republic	x		x	
Hungary		x	x	
Macedonia, FYR		x	x	
Poland	x		x	
Romania		x		x
Slovak Republic		x	x	
Slovenia		x		x

Imbedded informal institutions bound discontinuous changes in formal institution.

Changes in the informal institutions are continuous; therefore, formal institutions may be held back from the integration of institutional factors with the policy that the government might take. This causal relationship between informal and formal institutions will be leading factor affecting the flow of FDI in transition economies. Discontinuous changes in formal institutions are bounded by imbedded informal institutions. Changes in the latter are continuous; therefore, formal institutions may be held back from the desired change level. As a whole, both changes (continuous in informal institutions- cultural changes, for example; and discontinuous

[12] Mode of transition classification has been adopted from de Melo and Gelb (1996) and Marangos (2002). Exchange rate regime is for initial period of transition. These are discussed in Fischer, Sahay, and Vegh (1996).

in informal institutions: changes in the legislations or decrees issued by legislative body or government) affect jointly FDI flows.

We have shown that institutions (whether formal or informal and whether created or adopted) along with government policies (mode of transition and exchange rate regime for example) are very important forces that will attract FDI flow. The problem with institutions is that one would face very difficult job to measure them or their progress. This issue has been tentatively solved in our essay by employing data from Freedom House (Nation in Transit, 1998 and 2002).

iii) FDI Inflow, Institutional Reform, and Economic Policies

In the previous subsections, it has been shown that institutional reform and economic policies in transition economies is far more complicated than what the "Washington consensus" has suggested. It also can be stated that both affect the FDI inflow in transition economies. A model in which institutional reform and economic stabilization policies play a crucial role on the FDI inflow is presented.

Let us denote the FDI inflow, as a dependent variable with (Y) and assume that it depends on two general (composite) variables. FDI depends on the institutional reform, denoted by (Z), and on the economic policies that transition economies have undertaken to stabilize their countries during transformation process, denoted by (X).

The graph below (Figure II.3) shows that a given FDI inflow in transition economies (Y) results from a combination of institutional reform and economic policies that country has adopted and undertaken. The FDI inflow is represented on the vertical axes. The institutional reform and economic policies has been measured on

the two horizontal axes. The relationship between institutional reform progress and economic policies performance can be stated as, $Y = F(X, Z)$.

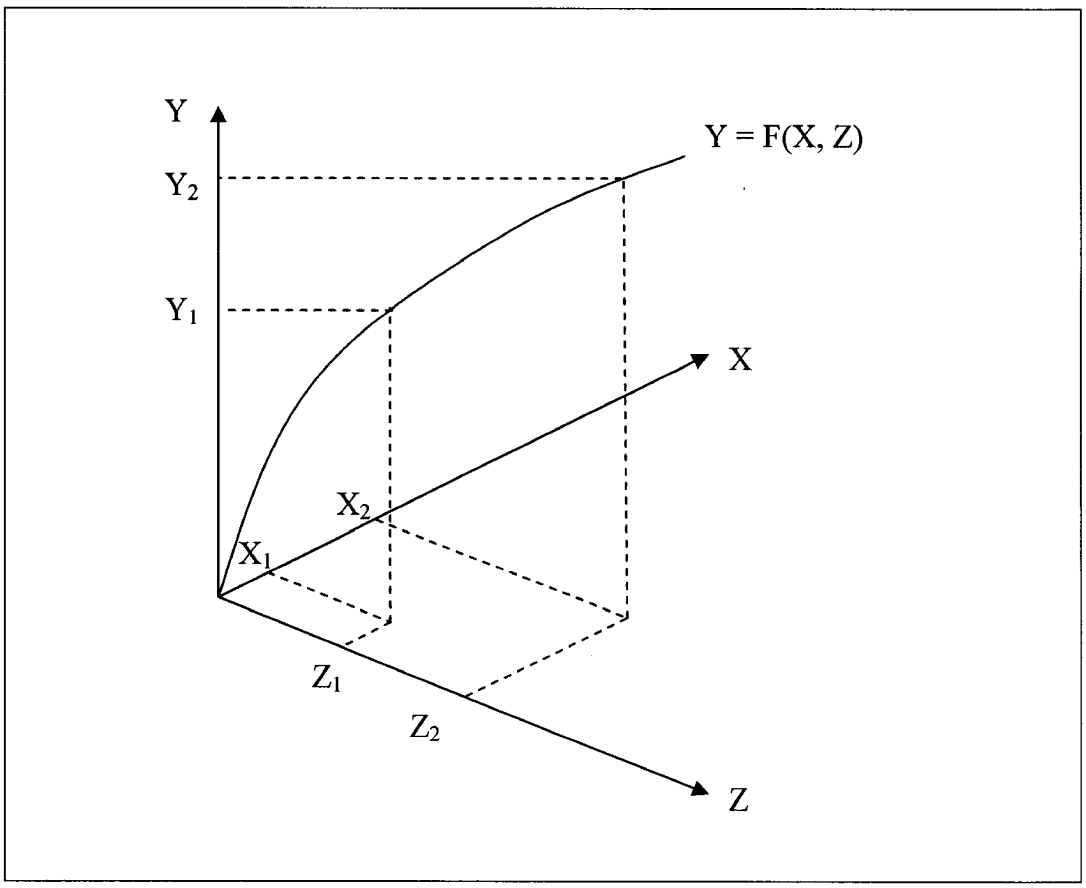

Figure II.3: Graphical Representation of FDI Determinants

Suppose that the initial institutional progress has been at the level (1) as denoted on the Z-axes by (Z_1). Also at that level of institutional advancement, the economic polices were at (X_1) level. The resulting FDI inflow in this case will be at (Y_1). As the country progresses, shown by an increase in the institutional reform performance (Z_1 to Z_2) and in the economic policy (X_1 to X_2), the FDI inflow will increase from (Y_1) to (Y_2).

The graphical representation of FDI determinants in transition economies shows that FDI inflow increases at a decreasing rate as (X) and (Z) factors increase. That means it is a maximum level of FDI flowing in the country at the maximum institutional and economic policy performance.

The model presented here does not intend to capture every single determinant of FDI in transition economies as suggested by other theories that have been developed up to this point. However, the case that institutions and economic policies heavily influence FDI has been made and it will be evaluated empirically. We will use political stability index and civil rights index as measures that can capture the institutional reform and progress. The variation on the inflation rate and exchange rate will be used for economic policy variables.

6. The Model, Data, and Hypotheses

We will postulate that the amount of FDI in a given country will be determined by two factors, the institutions to be developed (formal and informal institutions), and the countries' policy with respect to foreign investments. From the institutional progress point of view, the one that will most likely affect the level of FDI will be political stability (to be defined below), degree of privatization of state properties, and development and enforcement of private property rights (included in the civil liberties index). The policy factors that will affect inflows of FDI will be economic stability expressed in two measurements; controlling of inflation, and an exchange rate regime that a country adopts. Also, the level of openness will determine capital inflows.

The panel data (a combination of time series with cross sectional data) model will be used to study such effects. Symbolically the model we are using can be written in a log-log form as follow:

$$\ln(Y_{it}) = \alpha_i + \beta_1 \ln(X_{1it}) + \beta_2 \ln(X_{2it}) + \beta_3 \ln(X_{3it}) + \gamma_1 \ln(Z_{1it}) + \gamma_2 \ln(Z_{2it}) + \gamma_3 \ln(Z_{3it}) + \varepsilon_{it}. \quad (1)$$

Where i = 1, 2, …, N refers to cross-sectional units, hereafter referred to as countries, and t = 1,2, …, T refers to a given time period. Thus Y_{it} is the value of a dependent variable (foreign direct investment) for a country i at time t, and X_{kit} (and Z_{kit}) is the value of the k-th explanatory variable for country i at time t. The β_{kit} and γ_{kit} are unknown response coefficients of variation in Y for changes in X's and Z's independent variables. Dependent and independent variables are in the natural logarithm. The equation (1) estimates the elasticities of FDI with respect to GDP (gross domestic production), inflation rate, exchange rate fluctuations, the level of openness of the economy to international market, political stability index, and civil liberties index.

We employ fixed effect method based on the observation that the intercept is different for each country and that the time length of data used is relatively short. Therefore, we will have intercept varied across countries. This is captured by a dummy variable for country, hence the name Least Squares Dummy Variable model (LSDV).

The independent variables are as listed:

X_{1it} = country's Gross Domestic Product, measured in thousand of dollars;

X_{2it} = inflation rate level;

X_{3it} = exchange rate in transition country against U. S. dollar.

Z_{1it} = openness index. It is calculated as a ratio of total trade (exports plus imports) to GDP;

Z_{2it} = political stability index for each country over time. This index is in the scale from 1 (when political rights are high) to 7 (the least political stability);

Z_{3it} = civil liberties indexes, also varies from 1(the highest level) to 7 (the lowest level of civil liberties in the country);

We run a regression employing pooled cross-sectional data described above using EVIEWS. We assume that the intercept is nonrandom and varies across countries. Slope coefficients are constant across countries and across time. Given the fact that countries are different in size (fact that will be reflected in different magnitudes of data on independent and dependent variables) heteroscedasticity across sections is present (meaning that the error term is correlated within sections).

To correct for cross section heteroscedasticity we use the weighted least square method. This method alone, however, does not correct for any contemporaneous correlation. To correct for cross sectional heteroscedasticity, contemporaneous correlation, and unbalanced panel data we use the Seemingly Unrelated Regression Model (SURE), which is becoming a popular method of estimation when such problems exist (Baltagi, 2001).

Countries chosen:

This study will be limited to ten transition economies: Albania, Bulgaria, Croatia, Czech Republic, Hungary, Macedonia (FYR), Poland, Romania, Slovak Republic, and Slovenia. There are at least two reasons for this selection. The first

reason is the commonality in space; they are geographically similar. All these countries belong to a region called Central and Eastern Europe. The second reason is similarities in terms of the socialist and political systems that these countries had before the 1990s and after. In that region one country is left out, namely Yugoslavia (Serbia and Montenegro), because its political and economic situation is quite different from those selected.

Despite the cited similarities, Central and Eastern European countries vary greatly with respect to the economic conditions prevailing at the time of transition as well as the approaches they took with respect to transition. Since our interest is over the transition years, twelve-years-time-series of all variables for a given country will be used.

Data will be taken from the World Development Indicators published in 2003 by the World Bank (GDP, FDI inflow, inflation rate, total trade to GDP for openness index, and exchange rate) and Nations in Transit published every year from Freedom House (indexes for political stability and civil liberties progress[13]). Data used are for a period of twelve years, from 1990-2001. The size of the sample is 120 observations potentially, however due to some missing observations the panel data is unbalanced (and the number of observations used for the regression will be less than 120).

Hypotheses:

A number of hypotheses will be tested for two purposes. Testing will be for the purpose of accepting or rejecting the institutional progress and economic policy integrated model, and to draw conclusions about the policies that countries can

[13] We use these indexes for two reasons. One is because they are available to the public, therefore in the public domain. Secondly, because they are free of charge.

undertake to enhance institutions and the level development by increasing the amount of foreign direct capital that flows in these countries. Hypothesis regarding the effect of market size, inflation rate, exchange rate fluctuations, openness of the economy to the international market, political stability, and civil liberties on FDI inflow will be tested to increase the understanding of their impact on the FDI inflows in these countries.

H1: FDI varies directly with political stability and political rights. An improvement in political rights indirectly creates a welcoming atmosphere for international businesses by lowering the level of uncertainty. Reforms and policies can become more predictable from a business point of view. This relationship is derived from the institutional path-dependence evolution model as described earlier. Countries have an adaptation function that is specific depending on the countries' reforms and level of development before the transition period. A flatter curve for this function means that the country can easily adopt new institutions and create a welcoming atmosphere for FDI flowing into the country.

Data on political stability for transitional economies shows that there is a positive relationship between progress in political stability and FDI inflows into the country. FDI varies directly with economic stability in a country. This variable will be designed to capture all the economic reforms including the development of property rights, privatization progress, and others. This hypothesis is different compared to the first one as it tries to explain difference in FDI by variations in the economic environments.

What is the relationship between FDI flows and privatization in the country? The expectations would be that there is a positive relationship if privatization was opened to foreigners. If foreigners were not allowed to participate in direct privatization of state owned assets then it may be the case that there is a lagged positive relationship between FDI flow and privatization. This can be explained by the possibility of the domestic buyers willing to sell privatized assets to foreigners. The privatization index will be composed as a percentage of GDP privatized in a given year for a given country.

H2: FDI will vary inversely with inflation. Inflation can be seen as a negative sign for multinational that wants to invest in a country for at least two reasons. The first reason has to do with returns on invested capital that varies inversely with inflation in the economy. An increase in the inflation rate, for example, will decrease the real returns on the FDI inflow. Rate of return is a primary concern of businesses if it wanted to locate their production abroad. The other reason is that inflation signals foreign investors that the country's policy is "out of hand." High inflation means that a government's policies and a central bank's monetary policy are not satisfactory, and therefore the FDI inflow will decrease as inflation increases.

H3: FDI inflow varies directly with exchange rate fluctuations (the exchange rate here is defined as a ratio of Local Currency Units to U. S. dollar). This is assumed to happen for the same reasons as those for inflation. A two-fold effect will cause such relationship between exchange rate and FDI inflow. First, a stable exchange rate will signal investors that the government policies are working and the country's economy is not shocked by any policy variable that will effect their investment and returns.

In an economic environment with small exchange rate fluctuations, returns on the investment expressed in dollars will be safer. Second, an increase in the exchange rate (causing local currency devaluation) will decrease the initial cost of FDI inflow (it takes less dollars to acquire the same amount of capital in this particular country).

H4: FDI varies directly with the level of country's openness. The level of openness is a determining factor on the FDI inflow. Openness index, measured as a percentage of trade to GDP, is a policy variable affected by the institutional development in the country and in the analysis it is considered as such (however, it has been denoted by (Z) in the model expressed by equation (1)). This is the first necessary condition for FDI to flow into a country. The less restrictive policy is on international trade (and capital movement), the more FDI flows in a country. Foreign firms (multinationals and/or FDI) will find it easy to export it products abroad if there are less restrictions on the export of goods. Less restriction on the imported goods means that the cost of moving part of the capital from the home country to a host country will be lower. This process is cumulative as the general economic environment becomes more promising for "followers."

7. Seemingly Unrelated Regression (SURE) Technique

The objective of this section is to define and justify the econometric method (pooled cross-section: panel data) used in analyzing the determinants of FDI. Since we are interested in transition economies, we are constrained by the time period if we were to study a particular country. The time length of data available for each country individually is twelve years, which is not enough to run regressions for one country

alone (the problem of very small sample). Borrowing from panel data analysis we will be able to overcome this data difficulty. Baltagi (2001) has stated several advantages of using panel data. These include controlling for heterogeneity, data that are more informative, more variability, less collinearity among the variables, more degrees of freedom, and more efficiency[14].

Panel data analysis in our case can be done by using Ordinary Least Squares method (OLS), Feasible Generalized Least Squares method (GLS or FGLS) when heteroscedasticity is present in the data, or with Seemingly Unrelated Regression Estimation (SURE).

Seemingly Unrelated Regression Estimation can be defined as a set of equations that may be related not because they interact, but because their error terms are related. This technique is appropriate to use when dealing with panel data (pooled cross section data) that exhibit two problems:

(i) There is a presence of heteroscedsticity in the data. That is the error term conditional on the value of independent variables for different observations is not constant. In notation, it can be written as follow:

$Cov(\varepsilon_{it}, \varepsilon_{jt}) \neq o$, for i $\neq$ j. (2)

We have all the reasons to believe that heteroscedasticity is present. We are dealing with ten transition economies that are different in size as measured by GDP. This is to say, that at a given point in time the variance of the two error terms for two different countries is not the same.

[14] For a detailed advantages and use of panel data, see Baltagi (2001), page 5-9.

(ii) The error term is correlated over time (i.e. we have contemporaneous correlation). That is, we have Dielman's (1989) definition of contemporaneous correlation, as follows:

$$Cov(\varepsilon_{it}, \varepsilon_{i(t+k)}) \neq o\,. \tag{3}$$

Let us start by stating the model we are interested in estimating. For one section (country in our case), we will have:

$$Y_i = X_i\beta_i + \varepsilon_i \tag{4}$$

for i=1...N. This equation can be rewritten as:

$$Y = X\beta + \varepsilon \tag{5}$$

$$Y = \begin{bmatrix} Y_1 \\ Y_2 \\ \vdots \\ Y_N \end{bmatrix},\ X = \begin{bmatrix} X_1 & 0 & \cdots & 0 \\ 0 & X_2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & X_N \end{bmatrix},\ \beta = \begin{bmatrix} \beta_1 \\ \beta_2 \\ \vdots \\ \beta_N \end{bmatrix}, \text{ and } \varepsilon = \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \varepsilon_N \end{bmatrix}. \tag{6}$$

Then in the matrix form equation (5) can be written as the following:

$$\begin{bmatrix} Y_1 \\ Y_2 \\ \vdots \\ Y_N \end{bmatrix} = \begin{bmatrix} X_1 & 0 & \cdots & 0 \\ 0 & X_2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & X_N \end{bmatrix} \begin{bmatrix} \beta_1 \\ \beta_2 \\ \vdots \\ \beta_N \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \varepsilon_N \end{bmatrix} \tag{7}$$

The variance-covariance matrix of the disturbance vector ε can be written as follow:

$$E(\varepsilon_i\varepsilon_i^{'}) = \sigma_i^2 I_T \tag{8}$$

$$\Omega = \sigma_i^2 I_T = \Sigma \otimes I \tag{9}$$

Where $\otimes$ is the Kronecker[15] product, and

[15] $\otimes$ denotes the Kronecker product. This product is defined as follow:

$$\Sigma = \begin{bmatrix} \sigma_1^2 & \sigma_{12} & \cdots & \sigma_{1N} \\ \sigma_{21} & \sigma_2^2 & \cdots & \sigma_{2N} \\ \vdots & \vdots & \ddots & \vdots \\ \sigma_{N1} & \sigma_{N2} & \cdots & \sigma_N^2 \end{bmatrix}, \tag{10}$$

I is a TxT identity matrix, σ_{ij} ($i \neq j$) is the covariance of the disturbance (error) terms from the i-th and j-th equation.

If the covariance in the error terms were zero then the Ordinary Least Squares (OLS) would give best, linear, unbiased, efficient estimators (BLUE β-s) and can be applied to each of the equations in the panel data model. In the case where error terms are correlated, OLS estimates are no longer BLUE. In this case, the generalized least squares estimates will be more appropriate and will be coming from the following estimator[16]:

$$\beta_{SURE} = (X'\Omega^{-1}X)^{-1}X'\Omega^{-1}Y. \tag{11}$$

Another interesting point to discuss is the size of the sample. We have limited number of years we can use in our analysis. Given the short period of the data on transition economies, a fixed effect (FE) model as opposed to random effect (RE) model is used (suggested by Gujarati, 2003). FE model is compatible with SURE in the sense that both heteroscedasticity and contemporaneous correlation can be corrected using SURE with fixed effect model of pooled cross-section data.

$\Sigma \otimes I = \begin{bmatrix} \sigma_1^2 I & \sigma_{12} I & \cdots & \sigma_{1N} I \\ \sigma_{21} I & \sigma_2^2 I & \cdots & \sigma_{2N} I \\ \vdots & \vdots & \ddots & \vdots \\ \sigma_{N1} I & \sigma_{N2} I & \cdots & \sigma_N^2 I \end{bmatrix}$. Where, I is a TxT identity matrix.
An example of Kronecker's product is given in Dielman (1989), page 31.

[16] See theorem 12, in Ruud (2000) page 432. Note that β there (in theorem 12) is for diagonal matrix of covariance of the error term (Ω_0) which applies to GLS and as well as SURE.

9. Discussion of the Results and Conclusions

This section presents the results of regression analysis, main findings and discuses them. It also contrasts empirical analysis results with hypotheses stated earlier in this essay. SURE model of pooled cross section data is estimated to obtain intercepts (different for each country) and slope (β and γ) coefficients. Table II.4 shows the descriptive statistics of data (variables) used in regression analysis.

FDI and GDP are both measured in millions of U. S. dollars. The civil liberties index and political stability[17] index are a measurement of a county's performance on institutional advancement to market economy. They vary from 1 (the best performance level) to 7 (the worst performance). This is to be considered when coefficients are presented and discussed as the negative sign on the respective coefficients for political rights and civil liberties means a positive relation between these indexes and FDI inflow.

Exchange rate is in real terms expressed in local currencies one needs to buy the same amounts of goods and services in the domestic market as the dollar would buy in U. S. A. Inflation is given as an annual percentage calculated using GDP deflator. The openness index represents the percentage of GDP exported and imported (traded with the rest of the world).

Equation (1) is estimated using a double log econometric model with the SURE technique. All coefficients have the expected signs and the adjusted R^2 is

[17] Political process examines national executive and legislative elections, the development of multiparty systems, and popular participation in the political process. Civil liberties assesses the growth of nongovernmental organizations, their organizational capacity and financial sustainability, and the legal and political environment in which they function; the development of free trade unions; and interest group participation in the policy process.

Table II.4: Descriptive Statistics of the Variables Used in the Models

	FDI (in millions of dollars)	GDP (in millions of dollars)	CL (index ranging from 1 to 7)	ER[18] (real effective exchange rate)	INF (percentage annually)	PR (index ranging from 1 to 7)	OPN (percentage)
Mean	121.6086	3231.055	2.92	0.38	62.28	2.46	90.19
Sum	12160.86	323105.5	292.00	38.34	6227.81	246.00	9019.35
Median	38.66500	2013.781	3.00	0.35	14.32	2.00	91.36
Maximum	934.1000	17625.62	7.00	0.75	1466.78	7.00	157.78
Minimum	0.000000	70.97600	2.00	0.11	-1.19	1.00	39.14
Std. Dev.	181.5308	3673.3768	1.11	0.14	178.40	1.43	28.78
Observations	100	100	100	100	100	100	100

[18]The real effective exchange rate is given by the nominal exchange arte (ration of LCU per dollar) multiplied by the price ratio. Notice that an appreciation on the nominal exchange rate will cause an appreciation of the real exchange rate (the local currency has depreciated in this case). This is measured by the purchasing power parity conversion factor. It is the number of units of a country's currency required to buy the same amount of goods and services in the domestic market as a U.S. dollar would buy in the United States. Official exchange rate refers to the exchange rate determined by national authorities or to the rate determined in the legally sanctioned exchange market. It is calculated as an annual average based on monthly averages (local currency units relative to the U.S. dollar).

relatively high (it suggests that 80 percent of variation in FDI inflow is explained by the independent variables in the model). A report of the estimated coefficients is presented in Tables II.5 and II.6.

Table II.5: SURE Estimation of Determinants of FDI, Equation (1) with GDP Included

Dependent Variable: LOG(FDI)
Method: Seemingly Unrelated Regression
Total panel (unbalanced) observations: 98

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(GDP)	0.093854	0.289392	0.324313	0.7465
LOG(OPN)	1.860754	0.258696	7.192807	0.0000
LOG(PR)	-0.802942	0.158865	-5.054238	0.0000
LOG(CL)	-0.674568	0.239965	-2.811116	0.0062
LOG(INF)	-0.177878	0.058999	-3.014928	0.0034
LOG(ER)	0.716058	0.221357	3.234851	0.0018

R-squared	0.834686	Mean dependent var.	3.661097
Adjusted R-squared	0.804446	S.D. dependent var.	1.738266
S.E. of regression	0.768687	Sum squared resid.	48.45211

Table II.6: SURE Estimation of Determinants of FDI, Equation (1) with GDP Excluded

Dependent Variable: LOG(FDI)
Method: Seemingly Unrelated Regression
Total panel (unbalanced) observations: 98

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(OPN)	1.841944	0.256213	7.189102	0.0000
LOG(PR)	-0.834605	0.132046	-6.320548	0.0000
LOG(CL)	-0.654351	0.217038	-3.014913	0.0034
LOG(INF	-0.224497	0.035758	-6.278279	0.0000
LOG(ER)	0.547402	0.209790	2.609278	0.0108

R-squared	0.836617	Mean dependent var.	3.661097
Adjusted R-squared	0.809058	S.D. dependent var.	1.738266
S.E. of regression	0.759568	Sum squared resid.	47.88630

From the coefficients of the independent variables, only GDP (a proxy for the size of the market variable) is statistically insignificant. All other coefficients are

statistically significant as statistical t's are higher than the critical value of 2.66 (there are 92 degrees of freedom after we subtract number of variables from the total number of observations). For this reason, another regression is run excluding GDP as an independent variable.

Next, a discussion of these coefficients is presented. Since a double logarithmic econometric model is used, all coefficients on the independent variables represent elasticities (they show the percentage change on FDI inflow for a percentage change on the independent variable).

Let us denote elasticities with E. For example, elasticity of FDI inflow with respect to GDP (given as a percentage change in FDI inflow for a percentage change in the GDP) will be given as follows:

$$E_{Y,X_1} = \beta_1 = \frac{\partial Y}{\partial X_1}\frac{X_1}{Y}. \qquad (12)$$

Analogously, all other β 's estimated using equation (1) represent respective elasticities of FDI with respect to X's and Z's variables.

Let us first discuss the effect of the size of the market on the FDI inflow. From the regression analysis, the coefficient representing GDP effect on the FDI inflow is not statistically significant. The economic significance is questionable from the estimation point of view (its coefficient relative size is small compare with other variables in the model). Why is this case? Size of the market should affect FDI inflow; however, in this case FDI inflow is peculiar in the sense that most of it is in the form of change of ownership of the country's assets.

It is difficult to obtain data represented as a percentage of FDI due to privatization. The World Investment Report (2001) emphasizes this (FDI through

privatization) as a key factor that might have decreased the importance of the size of the market effect. The conclusion from the data available is that FDI inflow in countries in Central and Eastern Europe are neither market seeking nor resource seeking.

Another regression without GDP as a measure of the size of the market is run and presented in Table II.6. The result is not different than the regressions with GDP included, leading to the conclusion that the model is not misspecified. One possibility is that the coefficient of openness, which is relatively large (1.86) might have captured the size of the market effect.

The openness coefficient shows that policies and institutions that attract FDI would be those that have liberalized the FDI inflow restrictions as measured by percentage of total trade to GDP. That is, the higher the level of exports and imports in the country, the greater the FDI inflows. The volume of trade is related, among other things, to the favorable regime of taxes and tariffs that country has adopted. This policy aims to increase foreign direct investment and improve the social conditions in the country.

FDI elasticity with respect to openness is 1.86. That means that a one percent increase in the openness has caused 1.86 percent increase in the FDI inflow. As an example, if openness index increased from 90 to 92 percent (2.2 percent) the FDI inflow will increase by (1.86x2.2 percent or 4 percent) 4 percent or in absolute terms, it will increase from 120 millions to 125 millions (by 5 million U. S. dollars).

Next, we analyze the results of estimation with respect to institutional progress in transition economies. Political stability and civil liberties have a significant impact

on the FDI inflow. As shown in the Table II.5, FDI elasticity with respect to these variables is relatively large (FDI elasticity with respect to political stability is 0.80 and the FDI elasticity with respect to civil liberties index is 0.67). The negative sign is due to the way indexes have been measured (an increase in the index shows that political stability and civil liberties has worsened).

As an illustration, suppose that political stability index changed from 2.8 to 2.5 showing a progress towards more stability in the country. This is approximately a 10 percent improvement in the political stability index. This will cause FDI inflow to increase by 8 percent (0.8x10 or 8 percent) or FDI will change from 120 million U. S. dollars to 129.6 million (an absolute increase by 9.6 million dollars). The same progress in the civil liberties (an improvement of civil environment from 2.8 to 2.5, for example) will increase the flow of FDI by 6.7 percent or by 8 million dollars.

Foreign firms view political stability and civil liberties as factors that lower the uncertainty of their business and profits. In addition, a stable country may have settled official and unofficial rules (formal and informal institutions) to favor and welcome foreign investors. A positive attitude towards foreign investment is very attractive for foreign firms to consider when actually moving into the country.

The empirical results reveal that FDI inflow is affected more by the political stability as compared with civil liberties.

Inflation is a significant factor determining the level of FDI (FDI elasticity with respect to inflation rate is - 0.17). All that we can say about inflation's impact on FDI inflows is that inflation when under control (kept at a lower level) attracts more FDI in the country and in the region. In addition, a low inflation rate signals investors

that the monetary policy is being handled properly and the real returns from investing in these countries will be closely matching investor expectations.

With respect to the effect of the exchange rate variability in the FDI flow, the estimated elasticity is statistically significant and is relatively large (FDI elasticity with respect to changes in the real exchange rate is 0.7). Findings are consistent with and supportive of the hypothesis stated earlier and show that foreign firms see exchange rate as a factor that affects their purchasing power. A real depreciation of domestic currency by one percent will increase FDI inflow by 0.7 percent.

Several policy implications can be drawn from these results. First, policy lessons for these countries and their respective governments are to strengthen the institutions that determine both political stability and civil liberties and also formulate and carry out sound economic policies. Applying and monitoring well-formulated economic and social policies would attract more foreign direct investment in these countries. Another very important lesson is that countries should liberalize their export and import regimes. These will affect both exports, imports, i.e. the total trade and will increase the level of FDI inflow.

This study is limited by the time (12 years potentially, but actual data used are for 9 years after accounting for non-balanced panel data). Contributions include an effort to formalize and expand the understanding of development of institutions in the transition economies, linking it with FDI flows, and generating results that show not only the effects that these institutions have on FDI but also show the way policy can be formulated.

Essay Three

FDI and Growth in Transition Economies:

Does the Mode of Transition Make a Difference?

1. Introduction

Economists, businesspersons, governments, and international institutions have watched the economic growth process in transition economies for two main reasons. One reason has been the great interest that economists and institutions have had about these countries as they experienced the unprecedented economic changes from centrally planned to market oriented economy. Both economists and institutions have been frequently asked to prescribe policies that these countries should adopt to cope with difficulties of change. It is not new (Blanchard, 1997 and Lavigne 1999) to state that almost all the transition economies experienced a rapid decrease in the output, and the growth rate remained negative for first two to three years of transition but started to increase in the following years.

Many explanations have been offered for this decrease in the output level and for the growth rate increase in the second half of this last decade. Borrowing from the new growth theory (namely, the endogenous growth theory), we will explore the impact of Foreign Direct Investment (FDI) in the growth process in transition economies. Many agree that FDI would affect the growth rate of output, especially in

transition economies, for at least two reasons. An increase in FDI can be seen as an increase in the level of physical capital (along with domestic capital) in the country that may have low productivity. Second, FDI brings in the country new technology, management styles, marketing techniques that enhance the productivity of the stock of domestic capital as well as the productivity of the existing labor force. These factors in turn will contribute to the increase in overall productivity, which is considered the main engine of growth.

We will be interested in explaining the FDI effect on growth for transition economies that adopted different modes of transition. These countries, at the beginning of transition, had two options to proceed with reforms leading to a market led economy. One option, called "shock therapy," is to liberalize prices, trade restrictions, and fast privatization in order to achieve the results of an open market economy. This approach to transition, which is consistent with the "Washington Consensus[19]," was adopted by countries like Poland, Czech Republic, Albania, and Bulgaria. Another approach, called "gradualism," applies the reform to market economy more gradually by taking time to lift government controls in the economy. Therefore, we have two modes of transition whose growth rate may vary differently with the differing FDI flows.

In this essay, we introduce transition economies and discuss the general performance of macro variables (section two). In section three, the importance of FDI in transition economies is highlighted. Section three stresses the importance of FDI in

[19] Roland (2000) summarizes the Washington consensus as "...policy advice ...derived from textbook economics ...with strong emphasis on (1) liberalizing prices, (2) tight monetary policy and balanced budgets to stabilize the macroeconomy, and (3) privatizing state-owned enterprises in order to induce profit-maximizing behavior." More on Washington Consensus and its "origin" can be found on Willamson (1990).

transition economies. Then, in section five, we will briefly discuss the related literature with respect to growth in general and transition economies. An econometric model is presented and discussed, section six, along with several hypotheses that will be tested empirically. In addition, the data sources and their description are given in this section. In section seven, we discuss the results of the empirical work. In this section, all the regression equation output are presented and discussed with respect to the significance and importance of the coefficients estimated using SURE technique. The last section summarizes the findings of this essay.

2. Backgrounds on Transition Economies

The world witnessed the most significant economic transformations right after the fall of Berlin Wall in 1989. A new era of great restoration of capitalism started. Political and economic divergences, once the major barriers of former socialist countries to communication with capitalist countries, had been lowered. These opened a new venue for both "camps"[20] to cooperate in so-called reforms to restore market-led economies.

Before the "Big Bang"[21], countries had encountered an economic hardship: output dropped at an astounding pace, unofficial unemployment rose dramatically, and "black markets" took place in major economic activities. The features of these

[20] Here, we refer to once called capitalist and socialist camps, pointing to two different economic and ideological organizations of society and economy.

[21] "Big Bang" refers to so called shock therapy applied for the first time in Poland, since 1989, as an approach that applauds fast transformation of centralized economy into a market-led economy.

economies, before opening up to the rest of the world, were linked with central planning in every economic aspect.

Following the first "Big-Bang" in 1989 in Poland, the same kind of "chain reaction" was spread almost in all countries with central planning (central planning economies:- CPE hereafter). This change was a multi-factor change, in the sense that it touched every aspect of life - starting with political turmoil, downward spirals of economic collapse and changes in social structure.

Replacement of the socialist system with a market system is a multifaceted task that includes both ideological and economical reforms. Liberalization of prices, trade, economic decisions, macroeconomic stability, and openness of trade with the rest of the world, are just a few examples. Institutions, which lower the level of uncertainty for the country as a whole as well as for individual entrepreneurs, have to be built in such a way that will mitigate economic transformation. All these institutions, such as property rights, contracts, social security net, and others have to assure that domestic private business, international businesses, and other private agents are protected.

With respect to institutional reform, a question has been posed whether to adopt and reform the existing institutions or build new ones. A trade-off, between adopting existing institutions and creating new ones, that looks to be easily grasped, has to consider (as it interferes with) the level of pre-transition reform and institutions that come with it. Figure III.1 shows that for the economy to move to a free market system, four elements have a direct effect on the success and the speed of transformation: price reform (liberalization of prices), privatization (creating and

assigning property rights), macroeconomic stability (maintaining reasonable level of unemployment, inflation, exchange rate, etc.), and opening of the economy to free trade.

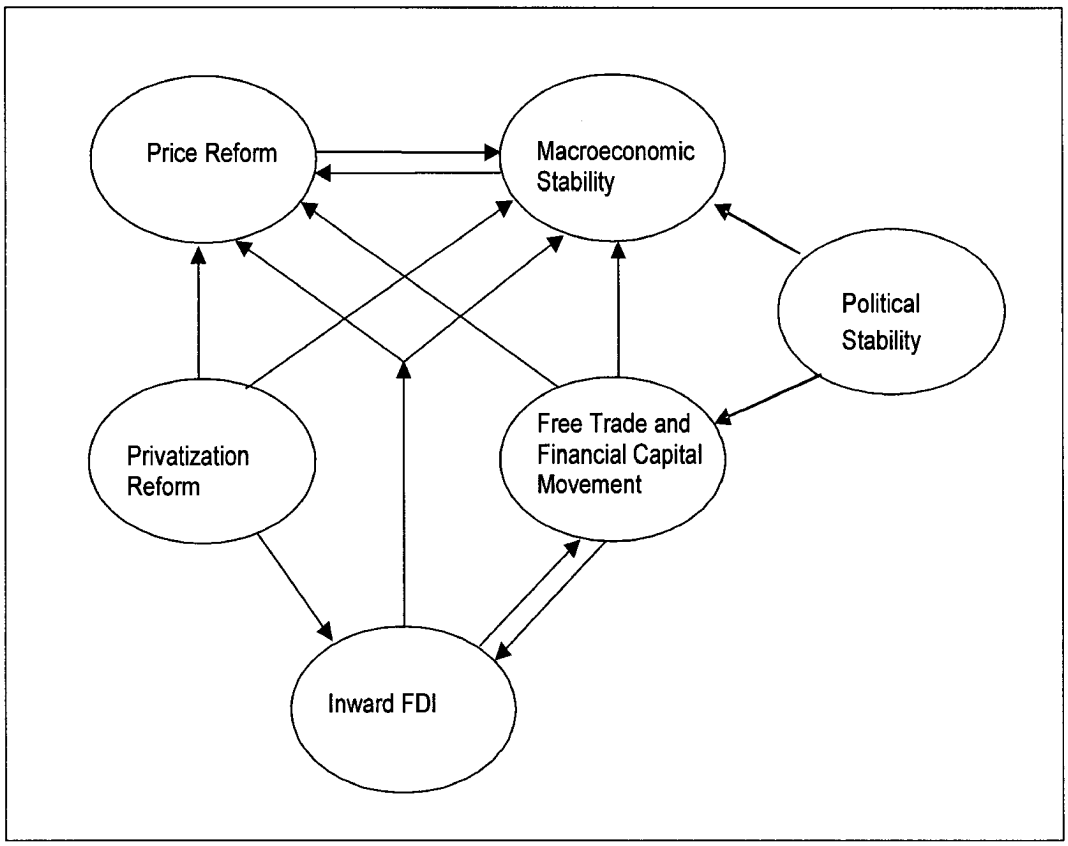

Figure III.1: The Interactions of Elements of Reforming the Transition Economies

There are two major effects through which FDI affects the socio-economic structure and conditions of a given transition country. One is a direct effect; an increase in the level of FDI (through M&A[22] or through Greenfield[23] investment) will improve the rules of game (institutions), the other, an indirect effect, has to do with

[22] M&A refers to merger and acquisition.

[23] Greenfield investment refers to investment on a new plant or a brand new investment.

improving macro-variables in the economy (exchange rate, balance of payments, inflation and unemployment). The inflows of capital into a country will enhance formal institutional settings. New rules such as well-defined property rights and their protection will include domestic as well as foreign ownerships. As FDI flows into the country, a refinement of rules that have been adopted may be initiated and advanced due to the experience of a new activity. The refinement of formal rules might be due to a malfunction of the first generation of rules as they were designed, and the necessity to bring them in line with informal institutions.

Macroeconomic variables (presented in Appendix Tables A.1 through A.8 for major variables and Table III.1 as an average of some key indicators) will be improved by FDI inflows as well. More resources will be available causing a shift out of the production possibility frontier. The consequences of such resource use include an increase in the level of output and in the employment rate. Exchange rate and price stability is more of an "adopted" policy to ensure more FDI flows into the country. Privatization of state owned properties would have a direct effect on the level of FDI inflow. For one reason, those privatized entities will increase the pool of choice for foreign ownership. Some transition economies have applied privatization through selling state-owned enterprises to domestic and foreign buyers.

The adoption of free trade will enhance the flows of goods and services through export and import (Appendix Table A.6 and A.7) on one hand, and FDI flows on the other, by opening up new possibilities to both domestic consumers and domestic and foreign producers. Most of the countries in our analysis opened to

Table III.1: Averages of some characteristic variables for ten transition economies*

Averages of:	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Exports	27.77	40.78	44.35	39.59	38.65	38.52	38.94	41.75	41.29	42.45	49.20	47.81
FDI	0.19	1.06	1.57	1.89	1.58	2.61	2.17	2.66	3.77	4.09	5.53	6.00
GDP growth	-6.09	-12.23	-5.60	-0.30	4.06	5.01	3.22	0.99	2.88	2.76	4.25	3.01
Inflation	14.56	88.46	266.98	243.59	61.96	22.05	25.13	119.40	16.27	9.19	9.42	8.59
Imports	31.28	42.88	52.31	47.41	42.69	43.91	46.06	49.51	48.86	49.52	56.45	56.33
Trade	59.04	83.65	96.65	86.99	81.34	82.42	85.00	91.27	90.15	91.98	105.65	104.14
Unemployment	6.47	10.18	12.50	15.05	14.58	13.69	12.69	13.05	12.74	14.82	16.96	17.27

* Calculations are based on the data taken from the Appendix Tables A.1-A.8. Data on the rate of unemployment (Appendix Table A.8) level is taken from three different sources: World Development Indicators 2003, World Economic and Social Survey 2003, and Consumer Eastern Europe 1996

foreign trade and by the end of last decade, the volume of trade as a percentage of GDP surpassed fifty percent (Appendix Table A.3).

Two other aspects of transition steps, namely macroeconomic stability, free trade, and financial capital movement, will be affected by political stability. The more stable the socio-political situations, including less riots (or no riots at all), common agreements of all political parties on the steps of reform and its speed, the more steady capital inflows will come into the country, more goods and services will flow in and out, and more stable will be macro variables of the economy.

All the above steps need a right environment in which to work, namely both formal and informal human constraints, to lower the uncertainty of different actions that agents in the economy may want to take. This is what might be called a reform. Formal constraints are easier to be formulated, passed by legislation and adopted (or put in place), providing that there is a willingness of legislators to take steps.

Looking at GDP growth in transition economies for years 1990-2001 (Appendix Table A.1), several striking features are noticed. The beginning of a transition process is characterized by a decrease in the growth rate of output. The decrease in output (negative growth rate of output) lasted on average four years (three years in Albania, five years in Bulgaria, four years in Czech Republic, four years in Hungary, two years in Poland, four years in Romania, Slovenia and Slovakia, respectively). There is a moderate to strong increase in the growth rate of output in almost all the countries in our sample; however, this growth rate did not last very long. Some countries experienced another recession by mid 90's (e.g. Albania, Bulgaria, and Romania). There are two major characteristics of this second recession.

First, it was short in duration, two to three years and second, it was not as deep as the first recession[24]. Transition economies experienced not only a deep recession in the first years of reforms but also a high unemployment rate, often in double digits (Appendix Table A.8).

Transition economies were hit by a rapid increase in the price level (Appendix Table A.2). Prices of goods and services increased at four digits rates for Croatia, Macedonia and Bulgaria. Given the rigidities in these fragile economies, high level of inflation caused a rapid decrease in the purchasing power in these countries that resulted in ultimate increase in the cost of living and decrease in the standard of living. This, in addition to other factors, might have contributed to internal tensions in these countries and to a political and economic instability. By the end of last decade, almost all transition economies, except Macedonia, had inflation under control (at a relatively low level of single digit).

Net FDI flow, measured as percentage of GDP, shows an interesting pattern over the twelve years of transition. It increased in the beginning of transition; it slowed down, and then increased again. This pattern has been observed in all transition economies included in our study with the exception of Poland (Appendix Table A.4). This is, to some extent, similar to the pattern of GDP growth. It may suggest that FDI not only influences the GDP growth but also is one of the main contributors.

Exchange rate (Appendix Table A.5), measured as local currency per US dollar averaged out for the given year, which could be seen as an indicator for the cost of investing abroad, increased drastically following the trade liberalization.

[24] First recession refers to the one that occurred in the first years of transition. The second recession term is used for the decrease in the output after the transitional economies started recovering from first recession.

One explanation is that exchange rate was kept constant and overvalued from planning committees of transitional economies prior to opening of these countries. Therefore, one might argue that the increase is a natural reaction to openness and reaction to artificially overvalued of exchange rate for many years.

3. The Importance of FDI for Countries in Transition

Foreign Direct Investment is seen as an important component of transition economies in their struggle to move to the market-led economic system. Transition economies can be considered as economies that are in need not only of change (transition) but also in need of development (to increase output growth). Among the different forms of capital inflows, like portfolio investment and bank loans, FDI has advantages that are more specific. FDI contributes to the development of a country through multiple channels.

The importance of FDI in a given country's economy is that it is a means of injecting real capital into that country. This capital can come in many forms, physical capital and human capital in the case of physical location of a foreign investment, or in the form of human capital and its spillovers that come with it in the case of acquisition of existing home country assets. This direct effect of FDI in countries' development is of paramount importance especially in countries in transition as they may often lack the ability to accumulate capital in their own way (due to low income level and low saving rates). Injection of real capital will have its effect in the whole economy through direct and indirect effects (Figure III.2). The increase of FDI can be viewed as an increase of the amount of physical capital in the economy.

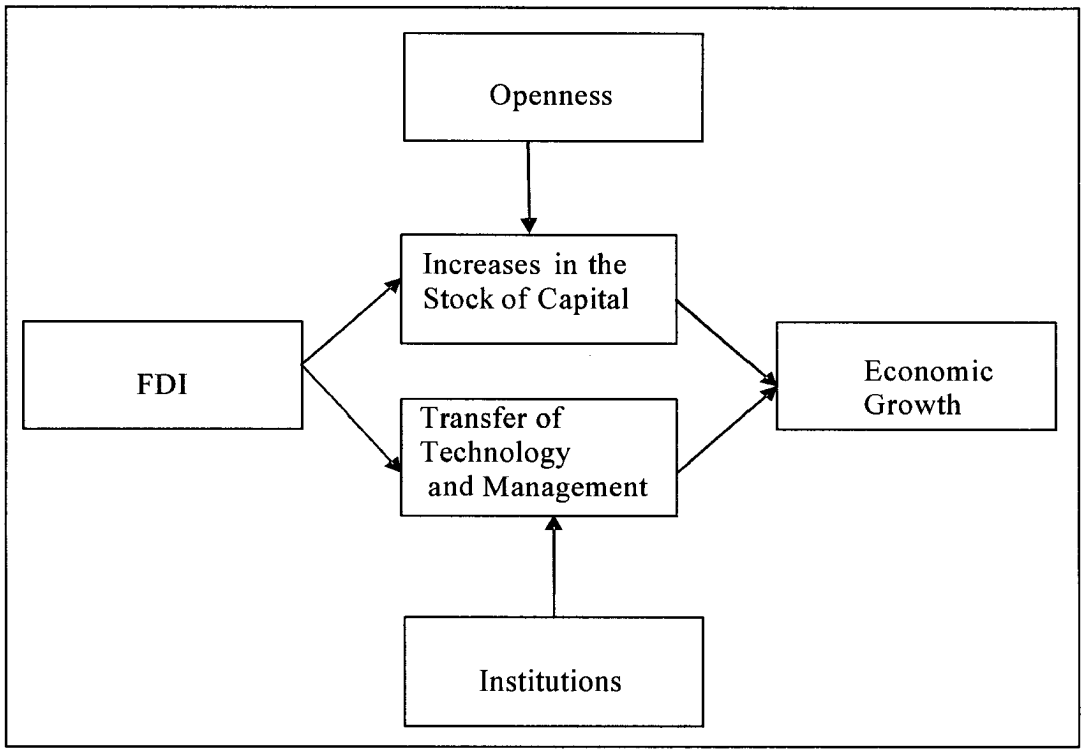

Figure III.2: Direct and Indirect Impacts of FDI on Economic Growth

This will have a direct effect on the total output produced. Therefore, the aggregate level of output will increase, and along with it, the level of unemployment will decrease. As shown on the Figure III.2, the increase of the amount of physical capital (gross capital accumulation) via FDI inflow is enhanced by openness and liberalization of the capital flow restriction (these restriction in the capital inflow were in place in the transition economies before the reform started in late 80's).

FDI influences the total amount of output in an indirect way via technology transfer, new management, and new marketing techniques. FDI inflow brings into the country along with physical capital (new plants and machinery), new ways of organizing production. This new technology will increase the workers and managers

abilities to be more productive in the production process. If we think in terms of production possibilities frontier, with capital intensive and labor-intensive goods, then the direct effect will be an increase in absolute value of capital-intensive goods produced, and indirect effect with a shift out of the entire production possibility frontier.

The indirect effect of FDI on the production process, via technology and management transfer, will cause an upgrade in the economy and is affected by institutional structure into the country. The less rigid the institutional structures the more effective the FDI inflow into the country will have via technology transfer. These two simple visible effects will push the economy's progress upward in its development spiral, and guarantee movement of the economy towards stability.

Starting with the economy's production function, we can symbolically write:

$Y = Y_1 + Y_2 = F_1 (K_1 , L_1) + F_2 (K_2 , L_2)$.

Where,

Y = total output that the economy produces,

Y_1 = total output produced with domestic labor and capital,

Y_2 = total output produced with domestic labor and foreign capital (as proxy for FDI inflow in the country),

$F_1 (K_1 , L_1)$ = domestic production function,

$F_2 (K_2 , L_2)$ = FDI production function,

K_1 = capital employed by domestic firms,

K_2 = capital employed by foreign firms in the form of FDI,

L_1 = labor employed in domestic firms,

L_2 = labor employed in foreign firms.

Note that $K = K_1 + K_2$ is total amount of capital employed in the country, and $L = L_1 + L_2$ is total labor employed in the country. A deeper analysis can show that there is an interrelation between the two aggregate production functions. As more physical capital enters the country the total GDP will increase (a direct effect), and the domestic production function will change (an indirect effect: there are reasons to accept that even the domestic industries will be more efficient).

FDI will transfer, along with physical capital, the "embodied" more advanced technology to a host country (Kojima, 1978). New technology introduced through FDI is easier to be adopted by domestic workers and managers too. This creates a possibility for a further expansion of production as well as of products that can be offered to domestic and international buyers. Domestic firms' environment is becoming more favorable for production activities that were unknown before FDI entered the country. Firms learn new ways of managing and marketing their products.

Transition economies can be thought of as economies with changing comparative advantages as they move from the command and control method of production and distribution to the market oriented method. In this respect, FDI serves as a way of adapting to these changes. Once FDI begins moving in, the nature of comparative advantages changes and the country will end up producing and exporting goods and services that otherwise would not have been produced or exported. This is an indirect effect of FDI in mitigating the transition by improving efficiency in production and marketing.

FDI is an outcome, as well as a promoter, of trade liberalization and removal of trade barriers. The openness of transition economies with the rest of the world moves from demagogy into reality through international exchange of domestically produced goods and services, expansion of domestic production using domestic capital, and importing international production via capital flow in the country. A variety of goods and services that host countries export will increase as more foreign investment move in. Therefore, FDI enhances the openness of the economy to the international arena.

There is a potential negative effect with respect to introducing the new access to international market, in which FDI may compete out inefficient domestic firms. This is thought to be a negative effect if one considers that these countries need to help the domestic firms to remain in the market through protecting them from outside competition. This argument sounds very similar to the "infant industry" argument.

Introduction of foreign direct investment in a transition economy changes the productive capacities, like labor, capital, and existing natural resources will become more productive. This alone will affect the direction of the flow of goods and services from the host country to the rest of the other countries. Therefore, there is another important contribution of FDI in the country's development. FDI inflow changes the direction of trade flows by increasing intra-industry and intra-firm trade. Thus, they add more to the benefits of trade.

It is commonly acceptable to stress that at the heart of a market oriented economy is free competition, as this will guarantee efficiency. All measures taken to move the transition economies to a market oriented economy either directly or

indirectly serve the purpose of enhancing free competition. FDI enhances competition and with it the efficiency of domestic firms.

FDI has a paramount role to play in developing the transition economies, through injecting real physical and human capital, transferring new technology, new management method, changing comparative advantages, lowering the trade barriers, expanding trade flows and its benefits, increasing competition and efficiency. Therefore, it is of great importance to study FDI effects in transition economies.

4. Growth, Domestic Investment, and FDI: Stylized Facts

We will describe growth for ten transition economies over a decade and investigate the relationship between growth in output and the size of domestic investment and FDI. Once the transition process started, growth of output (as a measure of an increase in the standard of living) becomes very important factor that measures the progress these countries are making.

We will look at stylized facts of growth, domestic accumulation of capital, and FDI inflow in ten transition economies via respective profiles. The growth profile (Figure III.3) exhibits the pattern of average growth of output in these transition economies in Central and Easter Europe. The growth rate of output is measured as percentage growth annually.

Using traditional terminology we can say that on average these ten transition economies experienced two recessions (shown by a decrease on the growth rate of output) during twelve years (1990-2001). The first decline, which occurred as the countries were transitioning from a command and control (central planning) economy

to a market oriented economy, was relatively long and deep (Blanchard, 1997) when compared with second one; when the growth rate fell below negative 12 percent.

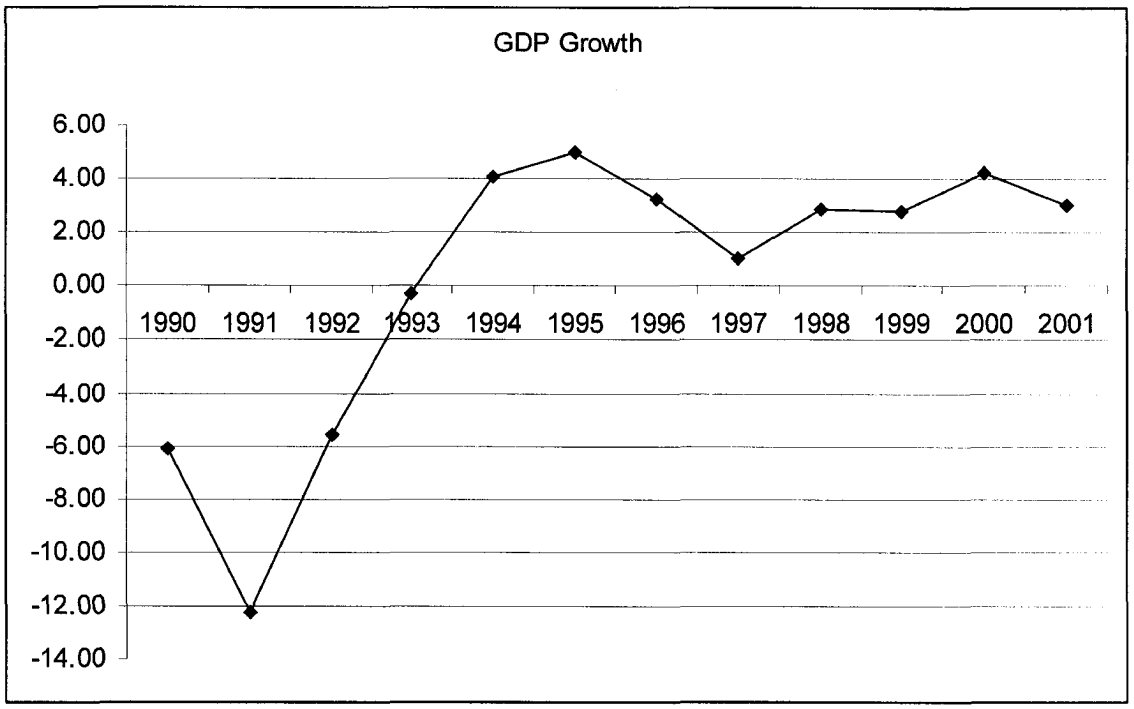

Figure III.3: Average GDP growth for ten transition economies (percentage annual)

The major factors that have contributed to this sharp decline in growth rate of output are disintegration of production process, demise of state sector in the economy accompanied by week and slowly growing private sector and regional disintegration of trade arrangements. Once the privatization process started transferring assets from the state sector to the private sector, followed by structural reform, we observe that the growth rate of output started increasing, and never fell in negative numbers.

It is not surprising that the same path is found with respect to growth rate of GDP per capita (Figure III.4). Figure III.4 shows the average growth rate of GDP per capita for ten transition economies. This growth rate fell at first (during first years of

transition) and then it started increasing. From 1993 up until 2001, it has varied in relatively small amounts around a three percent growth rate.

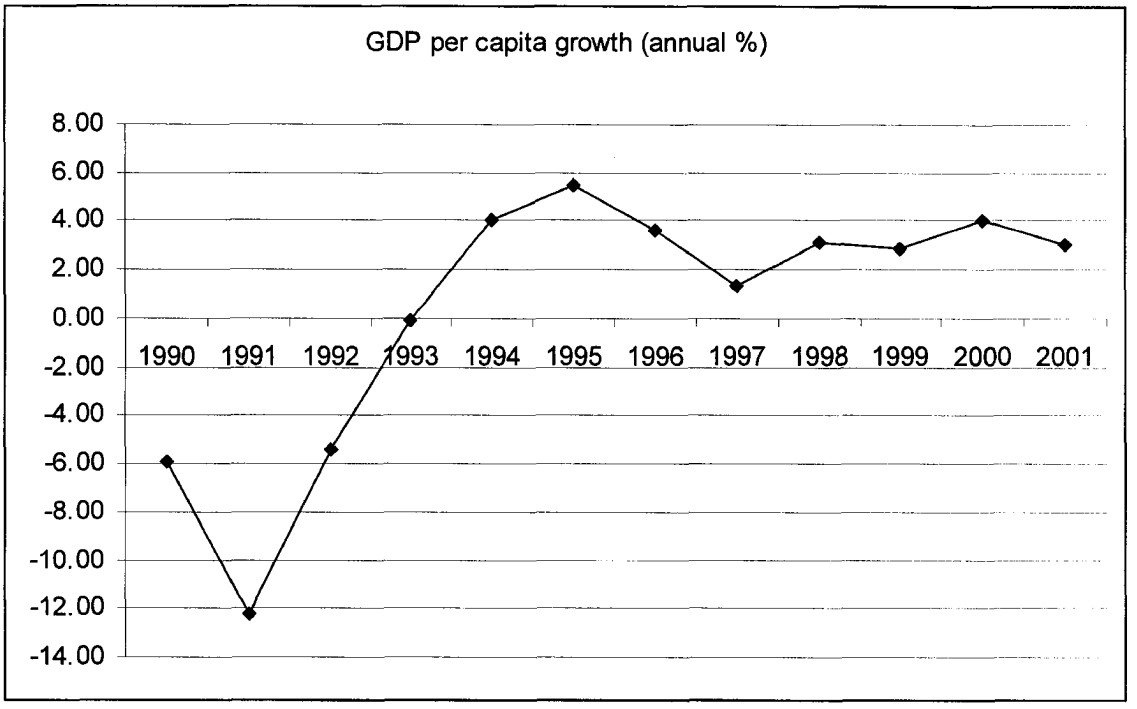

Figure III.4: Average GDP/Capita for ten transition economies

Figure III.5 shows the average FDI inflow in ten transition economies over 12 years (1990-2001). It is clear that there has been an increasing trend in the FDI inflow. Transition economies, due to restrictive policies under the prior planned economy approach, had received a negligible amount of FDI prior to reform. Once the countries opened up to the international markets, we see that FDI has increased steadily. There are three decreases in the FDI inflow, respectively in 1994, 1996, and 1999.

The increase in FDI has been attributed to structural and institutional reform that transition economies took in order to coupe with transformation programs. As noted in the second essay, political and civil rights progress (used as a proxy for

institutional development in these countries) has been the main determinant of an increase in FDI inflow.

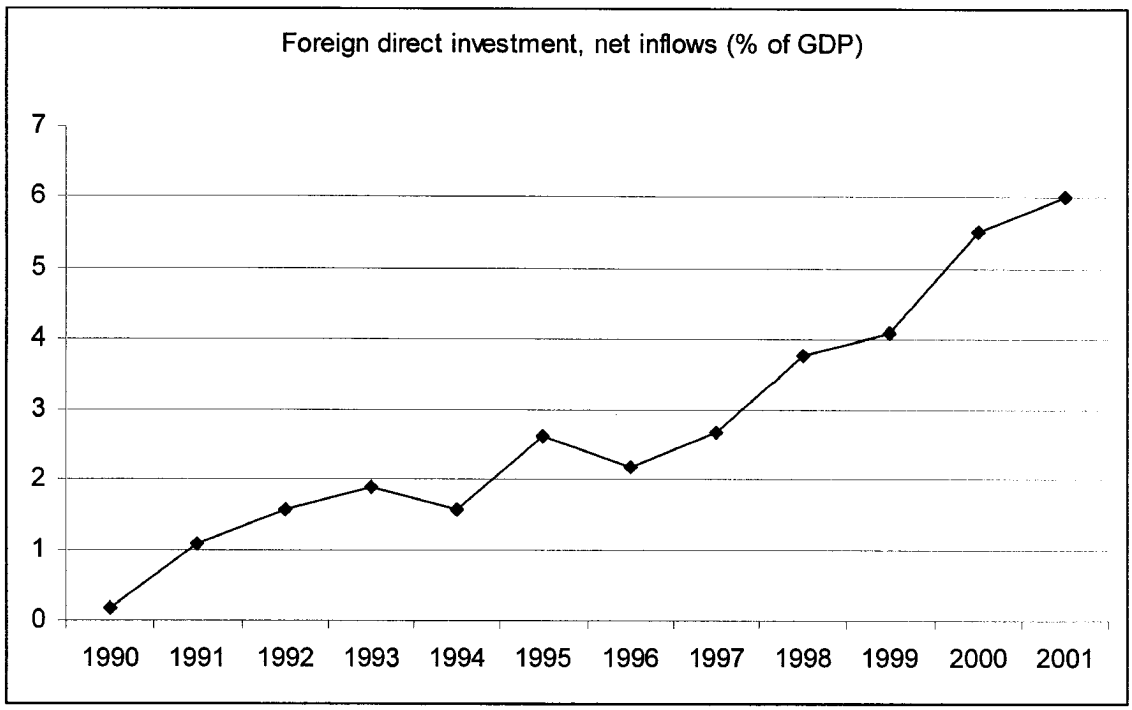

Figure III.5: Average FDI inflows for ten transition economies (percentage of GDP)

The exploration of FDI impact on the rate of growth of GDP is one objective of this essay. What remains to be studied is the content of FDI. A practical approach has been adopted in this essay by using FDI inflow as a proxy for foreign capital accumulation in transition economies. However, as noted by many authors, FDI often is a change in the ownership of existing capital through privatization during the first years of transition and the market for capital assets in the following years.

Figure III.6 exhibits the gross capital formation (measured in constant 1995 U. S. dollars, in millions). The behavior of this variable is distinguishably different from that of FDI for ten transition economies.

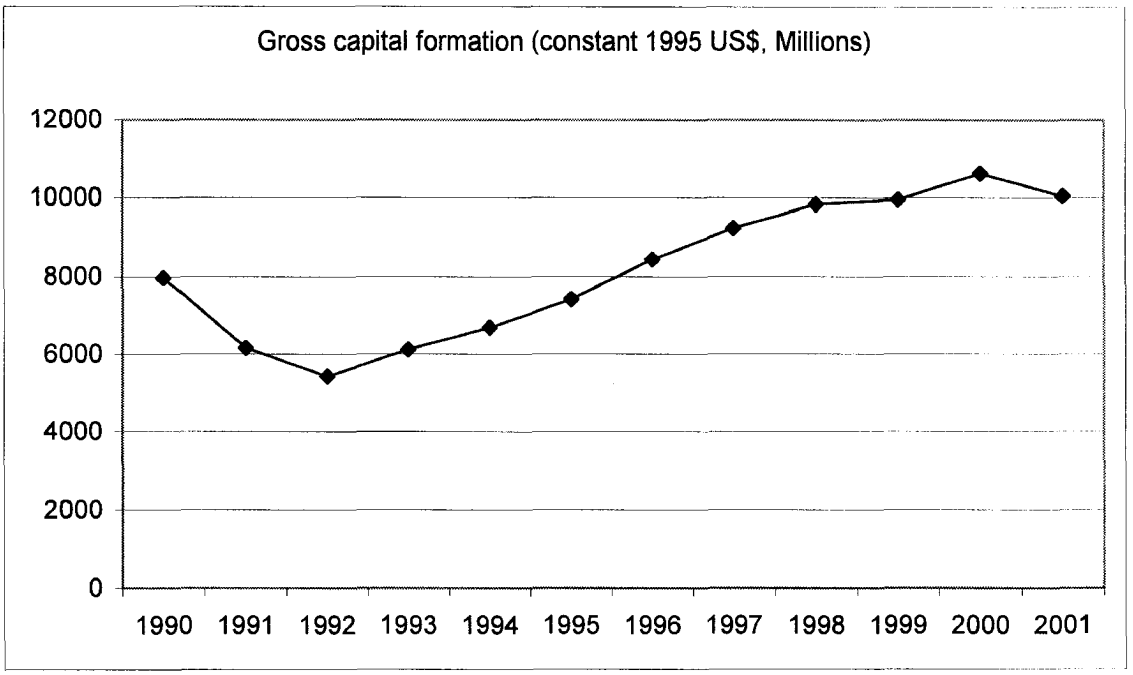

Figure III.6: Average Capital Formation in Ten Transition Economies

There is only one relatively deep decrease in domestic capital formation during 1992. Temptation is to attribute this decrease in domestic capital accumulation to the disintegration of production process in the early years of transition (Blanchard, 1997). It may be the case, in addition to the disintegration process, that in the early transition period the saving rate was relatively low.

5. Related Literature and the Empirical Work

In this section, we will discuss briefly theories of growth and their implications for transition economies. Numerous studies have been done in the quest to explain the nature of output growth in different countries using different variables as determinants of growth. These studies have attempted to go beyond the Solow and Swan model,

where growth comes from productivity[25]. In the Solow model where the output production function exhibits constant returns to scale (D. Romer, 2001) growth is explained by productivity progress which in turn is assumed to be exogenously given.

Models where rate of growth of output is attributed solely to productivity are referred to as the neoclassical growth[26] models. Neoclassical growth model has been extensively used to test for and measure the convergence of per capita GDP across countries (Barro and Sala-i-Martin, 1995).

In the late 80's most efforts had been focused to incorporate various factors that would explain the growth of productivity of the factors of production germane to the growth. These efforts, led by P. Romer (1990), gave rise to new-growth theory. The most simplistic version of this theory is the one that considers education as a factor that will influence labor's productivity (labor multiplied by the amount of education is called "efficient labor"). A review of literature with respect to new growth theory can be found in Barro and Sala-i-Martin (1995) and Aghion and Howitt (1998).

This essay is mostly interested on the output growth in transition economies in general and the effect of FDI on the output growth. Several papers have appeared in the literature dealing with growth in transition economies. Examples are Fischer, Sahay, and Vegh (1996), Sachs (1996), Selowsky and Martin (1997),

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[25] A good summary and discussion of implications of Solow model with technological progress can be found in Jones (1998).

[26] The neoclassical growth model is based on the assumption of diminishing marginal productivity of inputs used in the production process (additional capital in the production process will have less productivity) and substitutability between factors of productions. The economy's production function is considered that of Cob-Douglas production function with constant returns to scale.

Balasubramanyam, Salisu, and Sapsford (1996), and Campos and Kinoshita (2002). We reviewed their work and will be presenting there main findings below.

Early results of growth in transition economies are those presented by Fischer, Sahay, and Vegh (1996) in a study involving 26 transition economies over three years (1992-1994). The authors in trying to explain the growth process considered several factors: inflation, fiscal surplus, structural reform, and official assistance from abroad. The two regressions (using generalized least-squares procedure) are replicated below[27]:

GROWTH = 0.10 – 2.73 LINF + 0.24 FISCAL + 0.26 OFAST + 12.97 LIP

GROWTH = - 0.83 – 0.35 Y_0 + 0.62 GN + 3.17 SEC + 17.5 INV,

where GROWTH is the annual growth rate of GDP, LINF is the logarithm of annual inflation rate, FISCAL is the fiscal surplus as a percentage of GDP, OFAST is official external assistance as a percentage of GDP, LIP is reform index, Y_0 is the initial level of real per capita income, GN is the growth rate of population, SEC is the secondary school enrollment rate, and INV is the share of investment in GDP. Most of the variables are statistically significant at least at the 10 and 5 percent significance level (except FISCAL). The authors conclude, "The key to rapid growth in transition economies is thus investment and the policies to promote it," recognizing both the addition to the existing level of capital stock as well as the progress by government in reforming these countries (LIP independent variable which is statistically significant captures this effect).

Sachs (1996) finds very striking results from regression analysis of growth in 25 transition economies for the year 1995 and for the period 1989-1995.

[27] See Fisher et. al (1996), page 230-232.

His regressions[28] have one independent variable, which is IPR (index of reform progress). The two regressions Sachs estimated are the following:

Growth (1995) = - 18.80 + 0.77 (IRP),

Growth (1989-1995) = -23.15 + 0.62 (IRP).

All coefficients are reported to be statistically significant. R^2 and adjusted R^2 are respectively 0.50 and 0.38. Both growth regressions (one that explains the variation in growth rate in 1995 and the other one variation on the growth rate of the period 1989-1995) confirm that economic growth is positively correlated with reform progress. He asserts, "The first lesson of the past five years [of transition] is that rapid systemic transformation can work." He concludes that the reform of the first half of a decade of transition has proven the ability of centrally planned economies to move foreword to market led economies. Because his paper is not concerned about the different methods (shock versus gradualism) of attaining this transformation, one may get the impression that all transition economies adopted the same reforms. His analysis is not interested in the impact of FDI on the growth rate of output.

Selowsky and Martin (1997) are concerned with performance of the government's policies and growth rate of output in transition economies. Authors have noticed, "Slovenia, Estonia, Poland, Hungary, and Czech Republic have experienced both sustained growth and a reduction in inflation and are attracting significant foreign direct investment." Four equations have been estimated (two for growth rate of GDP and two for FDI inflow) using data from 25 transition economies for the period 1990-1995. They find that variability in GDP growth is affected by progress in liberalization

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[28] See Sachs (1996) page 129.

and policy reforms taken by governments. In addition, similar results are obtained for the case of FDI. The authors' conclusion is that "Earlier results show a strong and statistically significant impact of improved policies on growth and on the desire to invest in the country, as signaled by foreign direct investment flows."

While the role of FDI as a vehicle of technology transfer has been long recognized and debated, the empirical analysis to support it has been lacking. Balasubramanyam, Salisu, and Sapsford (1996) have tested the effect of FDI in the output growth in countries that adopted export promoting and import substituting policies. In their quest to test Bhagwati's hypothesis[29] concerning the efficiency effect of FDI in development countries (transition economies resembled the features of development countries in early 90's), they have used cross-sectional data for 46 countries for the period 1970 to 1985. Their main growth equation estimated is the following one:

$$y = \alpha + \beta l + \gamma(I/Y) + \psi(FDI/Y) + \phi x$$

where y is the logarithm of output, l is the logarithm of labor force, I total investment, Y total output, FDI is the foreign direct investment flow, and x is the logarithm of the volume of exports. The regression analysis provides significant evidence in support of Bhagwati's hypothesis that growth-enhancing effects of FDI are stronger in countries that pursue export promoting strategies.

Campos and Kinoshita (2002) have recently studied the impact of FDI in economic growth in transition economies. The authors, inspired by the early work done by Borensztein et al. (1998) on the effect of FDI in output growth in transition

[29] See Bhagwati (1978) for more details on the efficiency of FDI inflows in countries with export promoting strategies and import substituting policies.

economies and Mankiw et al. (1992) for other economies, empirically tested the significance of FDI in transition economies. They have adopted both model specifications used by Borensztein and Mankiw. The Borensztein's[30] model has been modified by adding domestic investment into the model, and the Mankiw's model (Mankiw et. al, 1992) by adding the population growth as an explanatory variable. The authors, using data on 25 transition economies for the period 1990-1998 (therefore, pooled cross section data), find that FDI has a positive and significant effect on growth in the recipient country.

This essay is fundamentally different from previous work (done by others) as it aims to differentiate two important effects of FDI on output growth. Based on the established consensus, that physical capital and technology embedded in the physical capital affect growth rate of output, and the new growth theory, I have considered the effect of FDI per worker to be different from the effect of FDI per output on the economic growth depicted by the rate of growth of output. Foreign direct investment per worker, as a measure of foreign capital per worker, which in itself can be used as a proxy for the level of workers productivity, will effect output growth via technology transfer and workers productivity. FDI per output, measuring the addition to the existing level of capital stock, effects output growth via increase in the capital stock in the economy. Another advantage we have is that both explanatory variables are stable and less effected by measurement problems. Moreover, SURE method (discussed in a more detail in the second essay) will produce unbiased and efficient estimates (coefficients) compared to simple OLS (Ordinary Least Squares) or GLS (Generalized Least Squares) methods.

[30] See Borensztein et. al (1998) for details.

Another contribution that makes this essay unique is the decomposition of FDI effect on growth with respect to the mode of transition. The idea that FDI inflow is affected by the institutional development in the country, coupled with two major approaches to transform the economies from centrally planned economies to market economies namely, "shock therapy" as a fast approach and "gradualism." A separate estimation has been carried out to account for these institutional effects. Using dummy variable techniques, we will be able to separate the productivity enhancing effect of FDI on output growth for those transition economies that adapted "shock therapy" from those that adopted "gradualism".

6. The Model, Hypothesis, and Data

The objective of this section is to state and discuss the econometric model that will be used, different hypothesis to be tested, and to describe the data and the source of data. First, we will be evaluating the economy's aggregate production function. Here we are explaining the variation on output by using the variation on labor force, capital, and foreign direct investment. We assume that the production function is as follows:

$$Y(t) = F[L(t), K^d(t), K^f(t)] \quad (1)$$

where, Y is the level of output, L is the total labor force, K^d is the amount of domestic capital accumulated, and K^f is the amount of foreign direct investment inflow, which can be used as a proxy for the amount of foreign capital accumulated. Note that time (t) enters the production function only through the factors of production (Romer, 2000). Additionally, we assume that the output level will be affected by the

level of foreign direct investment inflow, directly in the form of physical capital added to the domestic level of capital and in the form of new technology, management styles, marketing techniques that come with FDI.

The estimated equation will be a logarithmic version of the above equation. This log-log functional form has been extensively used when investigating issues in transition economies and as it is easily handled by the ordinary least squares estimation technique. Therefore the final equation to be estimated is:

$$\ln Y(t) = \beta_0 + \beta_1 \ln[L(t)] + \beta_2 \ln[K^d(t)] + \beta_3 \ln[K^f(t)] + \varepsilon(t). \quad (2)$$

We will estimate the above equation employing panel data analysis. Data on ten transition economies (Central and Eastern European countries) for a period of 1990-2001, taken from WDI 2003[31] of World Bank, will be used. FDI flow will be used as a proxy for foreign capital employed in the production of goods and services (denoted by K^f), is assumed to enter into this year production function through increasing the productivity of domestic factors of production.

The above equation will be estimated for all countries included in this study. Second, based on the rationale that the mode of transition matters, we will estimate equation (2) for countries that followed "shock therapy" and for countries that adopted "gradualism" as a method of transforming the economy into a market led economy. For this purpose, a dummy variable, "m" is introduced. This dummy variable will be assigned the values 1 if country has followed "shock therapy," and 0 if country has followed a "gradualism" approach. With respect to evaluating the production function, the following hypothesis will be tested:

[31] WDI 2003, World Bank CD Rom data.

H 1: The aggregate production function is largely determined by the domestic factors of production in addition to the foreign direct investment inflow. Labor force and domestic capital accumulation in these countries will be major factors in addition to FDI (as a proxy for foreign capital inflow) in determining output fluctuation in transition economies. While this is true, as it is that the factors of production account for output fluctuation in a given economy, it is interesting in itself to measure the FDI inflow contribution in addition to domestic capital and labor force (as primary factors of production).

H 2: FDI plays an important role in the aggregate output production in transition economies. We would expect that the elasticity of output with respect to FDI will be statistically and economically (size) significant while its magnitude will be relatively small compared with the elasticity of output with respect to the labor force and to capital accumulation in the economy. The theory predicts the elasticity of output with respect to FDI would be smaller as the country has more foreign capital endowment. In this line, counties that adopted "shock therapy" have received more FDI, and expectations are that elasticity of output with respect to FDI to be less compared with countries that followed "gradualism" approach.

H 3: Mode of transition (whether country adopted "shock therapy" or "gradualism" in its efforts to transform the economy from central planning to market oriented economy) has an impact on the role of FDI on aggregate output. This is a two-fold issue (the same direct and indirect argument discussed earlier in this essay can be used here, see Figure III. 2). One side of this argument can be illustrated by considering the case where country followed gradualism. It is obvious that since

barriers to FDI inflow will be gradually removed then there is relatively less FDI inflow into that country. Second, domestic factors of production will be less exposed to new technologies and techniques that might have otherwise come to a country via the inflow of FDI.

Concerning the growth of GDP in transition economies and in particular the FDI inflow effect on the growth, we will test the FDI impact on growth via capital accumulation and technological improvement. FDI can be considered as an addition to the stock of capital (measured in this essay as a ratio of FDI/GDP) and as an engine of technological improvement (that is it will increase productivity of domestic factors of production and we measure as a ratio FDI/Labor). Let us denote the amount of gross capital accumulation by the traditional notation K, the amount of labor force that can potentially contribute to the production process by L, the total amount of FDI inflow by F, and the total amount of output by Y. Then the following equations will be estimated using the same data and countries we used in evaluating the aggregate output:

$$g_Y = \gamma_0 + \gamma_1 \ln(L) + \gamma_2 \ln(K/L) + \gamma_3 \ln(F/L) + \varepsilon_\gamma \quad (3)$$

$$g_Y = \delta_0 + \delta_1 \ln(L) + \delta_2 \ln(K/Y) + \delta_3 \ln(F/Y) + \varepsilon_\delta, \quad (4)$$

where, g_Y is the growth rate of output. These two equations are estimated separately because of the interest in extracting the importance and the effect of FDI in transition economies as a technology-enhancing factor (which will be shown to be captured by equation 3) and as addition to existence stock of capital factor (captured by equation 4). The amount of FDI per worker, in addition to growth of labor force (a proxy for population growth) and of stock of capital per worker, will speed up the workers

productivity (this is consistent with the latest findings in support of the endogenous growth theory) which in turn will contribute to economic growth. The second equation is therefore used to estimate the effect of FDI in the economic growth based on the idea that FDI does contribute directly in the increase in the stock of capital.

One has to be careful in interpretation of the coefficients γ and δ. Let us denote with (k) the amount of capital per worker, (k`) the amount of capital per output, (f) the amount of foreign direct investment per worker and ($f$`) the amount of foreign direct investment per output. Since our models are linear-logarithmic the marginal effects and the elasticities[32] will be given respectively by the following formulas:

(i) Marginal effects (change in the dependent variable for one unit change in the independent variable):

$$dg_Y / dk = \gamma_2 / k, \tag{5}$$

represents the marginal effect of capital per worker (k) on the growth rate of output (g_Y) estimated by equation (3).

$$dg_Y / d(f) = \gamma_3 /(f), \tag{6}$$

represents the marginal effect of FDI per worker (f) on the growth rate of output (g_Y) estimated by equation (3).

$$dg_Y / d(k') = \delta_2 /(k'), \tag{7}$$

represents the marginal effect of capital per GDP (k`) on the growth rate of output (g_Y) estimated by equation (4).

[32] For more on the interpretation of estimates for different functional forms see R. Ramanathan (2002), page 235.

$$dg_Y / d(f') = \delta_3 /(f'), \quad (8)$$

represents the marginal effect of foreign direct investment per output (f`) on the growth rate of GDP (g_Y) estimated by equation (4).

(ii) Elasticities (percentage change in the dependent variable for a percentage change on the independent variable), denoted by E, are the following:

$$E_{g_Y,k}=[(dg_Y / dk)(k/g_Y)] = \gamma_2 / g_Y, \quad (9)$$

is the elasticity of growth rate of output (g_Y) with respect to capital per worker (k) as estimated by equation (3).

$$E_{g_Y,f}=[(dg_Y / d(f)((f)/g_Y)] = \gamma_3 / g_Y, \quad (10)$$

is the elasticity of growth rate of output (g_Y) with respect to of FDI per worker (f) as estimated by equation (3).

$$E_{g_Y,k`}=[(dg_Y / dk')(k'/g_Y)] = \delta_2 / g_Y,$$

(11) is the elasticity of growth rate of output (g_Y) with respect to capital per GDP (k`) as estimated by equation (4).

$$E_{g_Y,f`}=[(dg_Y / d(f')((f')/g_Y)] = \delta_3 / g_Y, \quad (12)$$

is the elasticity of growth rate of output (g_Y) with respect to of FDI per GDP (f`) as estimated by equation (4).

With respect to the effect of FDI (via technology transfer and increase in productivity of domestic factors of production and via increase in the existing stock of capital) the following hypotheses will be tested:

H 4: The physical foreign capital inflow (we measure it as FDI per output) will positively affect the growth rate of output. The more FDI inflow in the transition

economies the higher is the growth rate of output. We have stated earlier that one of the benefits from FDI inflow comes from the injection of new productive physical capital. The theory and practice of two different strategies of transition suggest that the role of FDI should be different for those who adopted "shock therapy" compared to countries that followed "gradualism." Furthermore, the FDI inflow will greatly affect those countries that followed "shock therapy." There is at least one plausible reason to expect this to be the case: countries that adopted "shock therapy" liberalized the economy relatively fast and physical capital inflow via FDI was not limited to certain sectors of production.

H 5: FDI affects the rate of output growth through technology transfer by increasing the productivity of domestic factors of production. The more FDI inflows in the country, the higher the growth rate of output. To capture this spillover (externality) effect we use the FDI per worker as a measure of possible technology transfer in the country. This proposition is true for all transition economies in the sample. As in the case with physical capital (FDI per output) the increase is of a more productive, foreign capital per worker, and growth rate will increase, however differences in the subgroups ("shock" versus "gradualism") will be observed. Rigidities in the countries that followed "gradualism" will hinder the spillover effect of FDI. In these countries government control in the economy does not wither away as fast as in the countries that followed "shock therapy".

The "mode of transition" effect on growth due to different behavior of FDI has been captured by using the qualitative dummy variable, denoted by (m). This variable takes value 1 if country has adopted a "shock therapy" mode of transformation and 0 if

country has adopted "gradualism" as a mode of transforming the economy from centrally planned economy to market oriented economy. The equations estimated for this purpose are the following:

$$g_Y = \gamma_0 + \gamma_1 \ln(L) + \gamma_2 \ln(K/L) + \gamma_3 \ln(F/L) + \gamma_4 \ln(L)\,\mathrm{m} + \gamma_5 \ln(K/L)\,\mathrm{m} + \gamma_6 \ln(F/L)\,\mathrm{m} + \varepsilon_{\gamma m} \tag{13}$$

$$g_Y = \delta_0 + \delta_1 \ln(L) + \delta_2 \ln(K/Y) + \delta_3 \ln(F/Y) + \delta_4 \ln(L)\,\mathrm{m} + \delta_5 \ln(K/Y)\,\mathrm{m} + \delta_6 \ln(F/Y)\,\mathrm{m} + \varepsilon_{\delta m}. \tag{14}$$

We use panel data for several reasons. Given the short period, evaluating each country separately is not possible due to the lack of data. In addition, panel date (pooled cross-section analysis) gives us the advantage of using a more rich and diverse data set (Baltagi, 1995 and Gujarati, 2003). The problem with panel data is with the estimation. In this essay we will use the same technique we used in the previous essay, that of Seemingly Unrelated Regressions (SURE), with fixed effect (FE). We have run regressions using simple Ordinary Least Squares Estimation and Generalized Least Squares in addition to SURE but due to the presence of heteroscedasticity and contemporaneous correlation, the SURE with FE will produce the most unbiased and efficient estimates (BLUE coefficients).

In order to test the stated hypothesis via estimation of the equations (2), (3), and (4) we employ the data provide by World Bank (World Development Indicators, 2003). A summary of descriptive statistics is given in the Table III.2. We have used the data for ten transition economies located in Central and Easter Europe (Albania, Bulgaria, Croatia, Czech Republic, Hungary, Macedonia (FYR), Poland, Romania, Slovak Republic, and Slovenia) for the period 1990-2001.

We use GDP measured in constant 1995 U.S. dollars (thousands), FDI is measured in thousands of current U. S. dollars, labor force in thousands, and capital (approximated by gross domestic investment) in thousands 1995 U. S. dollars. Variables are denoted as follow: GDP (Y), LABOR (L), CAPITAL (K), FDI (F), growth rate of GDP (g_Y), physical capital per worker (K/L), FDI per worker (F/L), capital per GDP (K/Y), and FDI per GDP (F/Y).

7. Discussions of the Empirical Results

This essay examines the relationship between FDI and economic growth in Central and Eastern European countries in general and the effect of mode of transition on the relationship between aggregate production and GDP growth and FDI. In this section, we will discuss the empirical results of the three estimations we have performed.

First, we discuss the impact of FDI on the aggregate production function in general and with respect to the transition path chosen by the countries. Next, we discuss the results of FDI effect on growth from the labor enhancing (technological transfer) point of view. Lastly, we look at the impact of FDI flow in transition economies as an addition to the existing stock of capital.

With respect to the aggregate production function, we notice (as expected) that all coefficients of the variables included in the regression model have a positive impact on the total output. Further, they are statistically significant at three levels of significance (respectively at 1%, 5%, and 10% significance level as the t-statistics are higher then the critical t-values) except for labor impact in the total output in the

Table III.2: Descriptive Statistics of Variables Used in the Regression Analysis

	GDP (Y) (thousand dollar)	LABOR (L) (thousand)	CAPITAL (K) (thousand dollar)	FDI (F) (thousand dollar)	g_Y (percentage annually)	K/L (dollar per worker)	F/L (dollar per worker)	K/Y	F/Y
Mean	34,553,050	5,754	8,579,143	1,247,250	1.85	1,771.38	215.34	0.23	0.03
Sum	3350000000	558106	832000000	121000000	179.67	171823.70	20887.58	22.18	2.97
Median	22256251	4239	6158920	443200	3.40	1344.06	122.94	0.22	0.03
Maximum	144000000	19904	39490218	9341000	9.60	6686.79	1098.97	0.37	0.12
Minimum	1856755	886	73009	4000	-12.92	45.93	0.90	0.04	0.00
Std. Dev.	34345671	5670	8855425	1827065	5.01	1428.53	233.43	0.07	0.03
Observations	97	97	97	97	97	97	97	97	97
Sections	10	10	10	10	10	10	10	10	10

countries that followed "shock therapy" model of transition. The summary of these results and the two regressions run using equation (2) are presented in Tables III.3, III.4, and III.5.

Since the model we have used is log-log (double log), the coefficients represent the elasticities. FDI flow (used as a proxy for the foreign capital accumulation in the aggregate production function) has a positive impact on output this year for all ten-transition economies included in the sample; the size of the impact varies with the mode of transition (captured by the dummy variable called "m" into regression).

Table III.3: Determinants of output [Dependent variable: log (Y), SURE Method]

Coefficients	All countries	Shock therapy	Gradualism
Log (L)	0.23	0.53	0.02
Log (K^d)	0.60	0.51	0.71
Log (K^f)	0.08	0.03	0.13
R^2	0.96	0.98	0.98
Adjusted R^2	0.96	0.97	0.97

Table III.4: Output of Econometric Estimation of Equation 2 for ten Transition Economies

Dependent Variable: LOG(GDP)
Method: Seemingly Unrelated Regression
Total panel (unbalanced) observations: 101

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	4.867632	0.126815	38.38381	0.0000
LOG(L)	0.228879	0.014548	15.73225	0.0000
LOG(K^d)	0.597554	0.014736	40.55077	0.0000
LOG(K^f)	0.082445	0.008503	9.696287	0.0000

R-squared	0.959443	Mean dependent var	16.90146
Adjusted R-squared	0.958189	S.D. dependent var	1.095793
S.E. of regression	0.224065	Sum squared resid	4.869911

Table III.5: Output of Econometric Estimation of Equation 2 for ten Transition Economies with Respect to the Mode[33] of Transition

Dependent Variable: LOG(GDP)
Method: Seemingly Unrelated Regression
Total panel (unbalanced) observations: 101

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	4.228480	0.130569	32.38499	0.0000
LOG(L)	0.017198	0.022487	0.764790	0.4463
$LOG(K^d)$	0.709675	0.017554	40.42709	0.0000
$LOG(K^f)$	0.129004	0.009423	13.68978	0.0000
LOG(L)*m	0.514911	0.032502	15.84251	0.0000
$LOG(K^d)$*m	-0.196350	0.020329	-9.658432	0.0000
$LOG(K^f)$*m	-0.098992	0.011092	-8.924529	0.0000

R-squared	0.975055	Mean dependent var.	16.90146
Adjusted R-squared	0.973463	S.D. dependent var.	1.095793
S.E. of regression	0.178506	Sum squared resid.	2.995248

For all transition economies (ten of them included in the sample) grouped together, an increase by one percent of FDI flow increases output by 0.08 percent. For countries that adopted "gradualism" this increase is at the level of 0.13 percent. An interesting result is that for countries that followed "shock therapy" the elasticity of output with respect to FDI inflow is less than that of all transition economies in our sample and these transition economies that adopted "gradualism" model. Specifically, for "shock therapy" economies, a one percent increase in FDI inflow will increase the total output by 0.03 percent.

For example, suppose that the FDI inflow is (for all transition economies) at its mean level (see Table III. 2), 1,250 million US dollars. A one percent increase in FDI is equal to 12.5 million dollars (one percent of 1,250). An increase in this amount on

[33] The dummy variable used to capture the differences due to the transition path countries chose takes value one if country applied "shock therapy" and value zero if country applied "gradualism". Therefore,
m = 1, if "shock therapy",
m = 0, if "gradualism".

FDI inflow will increase GDP by 27,642 million dollar in all transition economies (i.e., 12,5x0.08), by 44,918 million dollars in countries that followed "gradualism" approach (i.e., 12,5x0.13), and by 10,366 million dollars in the countries that followed "shock therapy" (i.e., 12,5x0.03)

The only explanation we have to offer is that of a high initial endowment of capital for countries (those adopted the "shock therapy") may have caused the effect of FDI to be smaller when compared to other countries in the sample. In general, we conclude that the aggregate output is dependent on FDI inflow. Countries that adopted "shock therapy" might be characterized by high speed of liberalization, openness, and privatization. All of three measures we mentioned have contributed to the smaller effect of FDI inflow on the aggregate production function. It remains to be explained what the nature of the relationship is between measures of "shock therapy" approach and the negative effect of FDI on the production function.

The model estimated can be modified to properly account for different types of FDI inflow in the transition economies. One natural extension would be to include separately FDI inflow via transfer of ownership and management (via privatization of state owned assets during the privatization process) and FDI inflow via Greenfield investment (that is accounting for new capital investment in transition economies). It would be interesting to see whether the aggregate production function is sensitive to the labor quality specification and "division of labor" (by this we mean dividing the total labor force into two subgroups: labor force that contributes to the aggregate production function via domestic capital, and the other subgroup accounting for labor force employed in the industry that employed FDI).

Next, I discuss the estimation of determinants of growth rate of output for ten transition economies over a period of 12 years. Tables III.6, III.7, and III.8 show the estimated coefficients and other statistical numbers related to the regressions run for ten countries as a group and for mode of transition effect. These results have been obtained by estimating equations (3) and (13).

The objective of this estimation has been the exploration of the effects of factors of production on the growth rate of output in general and specifically attention has been given to FDI per worker impact on growth rate of output.

Table III.6: Determinants of Growth [Dependent variable: Growth Rate of GDP (measured in percentage annually), SURE Method]

Coefficients	All countries	Shock therapy	Gradualism
Log (L)	-17.83	-43.98	45.20
Log (K/L)	5.38	3.56	5.70
Log (F/L)	1.24	1.59	0.28
R^2	0.39	0.41	0.41
Adjusted R^2	0.31	0.30	0.30

Table III.7: Output of Econometric Estimation of Equation (3) for ten Transition Economies

Dependent Variable: Growth Rate of GDP(g_Y)
Method: Seemingly Unrelated Regression
Total panel (unbalanced) observations: 99

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(L)	-17.82563	12.10003	-1.473189	0.1444
LOG(K/L)	5.377231	0.752661	7.144291	0.0000
LOG(F/L)	1.240066	0.184200	6.732179	0.0000

R-squared	0.394973	Mean dependent var.	1.678081
Adjusted R-squared	0.310551	S.D. dependent var.	5.150525
S.E. of regression	4.276639	Sum squared resid.	1572.909

Table III.8: Output of Econometric Estimation of Equation (13) for ten Transition Economies with Respect to the Mode of Transition

Dependent Variable: Growth Rate of GDP(g_Y)
Method: Seemingly Unrelated Regression
Total panel (unbalanced) observations: 99

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(L)	45.20206	19.50245	2.317764	0.0229
LOG(K/L)	5.698474	1.062117	5.365204	0.0000
LOG(F/L)	0.275103	0.289960	0.948764	0.3455
LOG(L)*m	-89.17912	29.00561	-3.074547	0.0029
LOG(K/L)*m	-2.140089	1.415980	-1.511383	0.1345
LOG(F/L)*m	1.311143	0.334373	3.921200	0.0002

R-squared	0.413727	Mean dependent var.	1.678081
Adjusted R-squared	0.307773	S.D. dependent var.	5.150525
S.E. of regression	4.285245	Sum squared resid.	1524.156

The coefficients, R^2, and adjusted R^2 are reported in the regression's output. The SURE technique has been used to account for problems faced when analyzing pooled cross section data (see the discussion about SURE technique in the second essay). As warned earlier one needs to transform coefficients into marginal effects and elasticities to be able to analyze the output of estimation.

Looking at the estimated coefficients (see Table III.6), we notice that the signs of them are the ones we expected except for the labor effect. For countries as a group, both capital and FDI per worker have statistically significant coefficients, respectively 5.38 and 1.24. For countries that followed the "shock therapy" path the coefficient of FDI per worker is statistically significant. However, it is interesting to note that the size of this coefficient is almost six times larger for "shock therapy" countries than for "gradualism" countries.

As an example of marginal effects of capital accumulation and FDI per worker on the growth rate of GDP let us apply the equations (5) an (6) respectively using mean values of (k = K/L) and (f = FDI/L) from Table III.2. We find the following: $dg_Y/dk = (5.38)/(1771.38) = 0.003$, $dg_Y/df = (1.24)/(215.34) = 0.0058$. One thing to notice here is that the coefficient itself can be misleading as far as marginal effects are concerned. In the above example, we have demonstrated that a small coefficient does not necessarily mean a small marginal effect (in our example the contrary is the case).

For transition economies as a group (ten included in the sample), we conclude that the total FDI inflow per worker has a higher contribution to the growth rate of output than does the domestic capital per worker. An increase in the FDI inflow by one U. S. dollars per worker will increase the growth rate of GDP by 0.0058 percent (or approximately two times more than the same increase in the domestic gross capital accumulation per worker)[34].

Let us illustrate this marginal effect of FDI per worker on the growth rate of output with an example. Suppose that the FDI per worker increases from 200 to 250 dollars per worker. This will increase the growth rate by 0.29 percent (50 times 0.0058). The findings support the "externalities" associated with FDI inflow. FDI contributes to the growth rate by increasing the productivity of all domestic factors of production as well as by introducing new technology, management and marketing techniques in the economy.

[34] An increase in the domestic capital accumulation by one US dollar will increase the growth rate of output by 0.003 ($dg_Y/dk = (5.38)/(1771.38) = 0.003$).

Calculating (using equations (4) and (5)) the marginal effects of (k) and (f) for countries that followed "shock therapy" and for those that followed "gradualism," to account for the "mode of transition" effect, we find the following:

(i) "Shock therapy"

$dg_Y/dk = (3.56)/(1771.38) = 0.002$, $dg_Y/df = (1.59)/(215.34) = 0.0074$

(ii) "Gradualism"

$dg_Y/dk = (5.7)/(1771.38) = 0.0032$, $dg_Y/df = (0.28)/(215.34) = 0.0013$.

The marginal effect of FDI per worker on growth rate of output in the countries that adopted "shock therapy" is 5.69 times larger than the same effect in countries that adopted "gradualism." These drastic differences, as we expected, are due to institutional infrastructure created in the countries that adopted "shock therapy." This evidence supports the hypothesis that the mode of transition does make a difference on the FDI's effect on the growth rate of output. As revealed by the calculated marginal effects, an increase in the FDI per worker by one dollar will increase the growth rate of output by 0.0074 percent for countries that followed "shock therapy" and by 0.0013 percent in the countries that followed "gradualism." An increase, for example, in the FDI per worker by 50 dollar will increase the growth rate by 0.37 percent in the countries that followed "shock therapy" and 0.065 percent in the countries that followed "gradualism."

Next, a discussion of the estimates obtained from running regressions for equations (4) and (14) is presented along with respective outputs in Tables III.9 (summary of both regressions), III.10, and III.11. The objective of these regressions is to empirically estimate the effect of domestic capital accumulation and FDI on the

growth rate of output. This is different from the estimation of equation (3) and (13) as here we are interested in the effect of domestic and foreign capital as a physical capital on the growth rate of output (the previous discussion was centered around the FDI role as a means of transferring technology, management, and marketing techniques in the transition economies).

Estimated coefficients have the expected signs (except for log of labor as in the previous regression). The significance level, R^2, and the adjusted R^2 are represented in the regression outputs along with other statistics (t and probability values).

Table III.9: Determinants of Growth [Dependent variable: Growth Rate of GDP (measured in percentage annually), SURE Method]

Coefficients	All countries	Shock therapy	Gradualism
Log (L)	-15.39	-44.70	49.38
Log (K/Y)	7.83	6.52	7.25
Log (F/Y)	1.26	1.48	0.34
R^2	0.42	0.43	0.43
Adjusted R^2	0.34	0.33	0.33

Table III.10: Output of Econometric Estimation of Equation 4 for Ten Transition Economies

Dependent Variable: Growth Rate of GDP(g_Y)
Method: Seemingly Unrelated Regression
Total panel (unbalanced) observations: 99

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(L)	-15.39012	13.55394	-1.135473	0.2593
LOG(K/Y)	7.834676	0.929057	8.432934	0.0000
LOG(F/Y)	1.262970	0.211159	5.981126	0.0000

R-squared	0.419353	Mean dependent var.	1.678081
Adjusted R-squared	0.338333	S.D. dependent var.	5.150525
S.E. of regression	4.189589	Sum squared resid.	1509.528

Table III.11: Output of Econometric Estimation of Equation (14) for Ten Transition Economies with Respect to the Mode of Transition

Dependent Variable: Growth Rate of GDP(g_Y)
Method: Seemingly Unrelated Regression
Total panel (unbalanced) observations: 99

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(L)	49.38475	19.53678	2.527784	0.0134
LOG(K/Y)	7.249682	1.242527	5.834629	0.0000
LOG(F/Y)	0.341846	0.314428	1.087200	0.2801
LOG(L)*m	-94.08345	28.62951	-3.286240	0.0015
LOG(K/Y)*m	-0.725734	1.887293	-0.384537	0.7016
LOG(F/Y)*m	1.139567	0.361953	3.148387	0.0023

R-squared	0.431677	Mean dependent var.	1.678081
Adjusted R-squared	0.328968	S.D. dependent var.	5.150525
S.E. of regression	4.219132	Sum squared resid.	1477.489

Calculating the marginal effects of gross capital accumulation and FDI per output on the growth rate of output (by using the equations (7) and (8) and mean values of (k`=K/Y) and ($f$`=FDI/Y) from Table III.2, yields the following:

(i) For ten transition economies

dg_Y/dk` = (7.83)/(0.23) = 34.04, $dg_Y/df$` = (1.26)/(0.03) = 42.00

(ii) "Shock therapy"

dg_Y/dk` = (6.52)/( 0.23) = 28.35, $dg_Y/df$` = (1.48)/(0.03) = 49.33

(iii) "Gradualism"

dg_Y/dk` = (7.25)/( 0.23) = 31.52, $dg_Y/df$` = (0.34)/(0.03) = 11.3

What does 34.04 (the marginal effect of capital per GDP on the growth rate of output) or 42 (the marginal effect of FDI per GDP on the growth rate of output) mean? Let us illustrate with an example. Suppose that the capital per GDP and FDI per GDP are respectively 0.2 an 0.03 (these are dollar of capital and FDI per every dollar of output, thus unit free). Say there is an increase in capital per GDP by 0.01, and an

increase in FDI per GDP by 0.01 (i.e., capital per output becomes 0.21 and FDI per output becomes 0.04). The increase in the growth rate of output will be respectively by 0.34 percent from increase in capital per GDP and 0.42 percent from an increase in FDI per GDP.

The results are supportive of the hypothesis stated earlier. FDI per GDP has a greater impact on the growth rate of output. That leads to the first conclusion that not only FDI brings in the country new technology but it also brings in more advanced and "sophisticated" capital (the marginal effect of FDI per output on the growth rate of output is 1.24 times larger than the marginal effect of capital accumulation per output, comparing 34 with 42 from the above calculations).

The second feature of the above regressions and calculations reveals the differences on the marginal effects of both capital accumulation and FDI per output on the growth rate of output for different transition economies. Specifically, FDI has a greater marginal effect (4.37 times larger) on the countries that followed "shock therapy" compared with countries that adopted "gradualism." These findings greatly support the idea that "mode of transition" does make a difference on the effect of FDI on the growth rate of output.

As an illustrative example, one can compare two transition economies that are relatively similar with respect to size of the economy, geographical location, culture, but they differ from each other on the "mode of transition." A country that adopted "shock therapy" as a mode of transition is Czech Republic, while Hungary adopted "gradualism." FDI effect on the growth rate of output in Czech Republic should be 4.37 times larger than the effect of FDI on the growth rate of output in Hungary.

8. Summary and Conclusions

This essay has explored the relationship between FDI and aggregate output, and growth rate of output and FDI, in Central and Eastern European countries, countries that have been coping with transition process during the last decade. These relationships have been studied using pooled cross section data on ten transition economies for 12 years. A SURE econometric technique has been used to better estimate these relations.

First, transition economies with a brief background and a description of major economic variables (as key indicators) have been introduced. Several arguments have been discussed to illustrate the importance of FDI in these countries. The role of FDI as a mean of injecting real physical capital in addition to "positive externalities" it brings through technology, management, and marketing techniques has been stressed.

Some stylized facts on growth rate of output, gross capital accumulation, and FDI inflow in these transition economies has been presented. The empirical work done in the last decade on the FDI-growth rate relation has been surveyed and discussed. The econometric model borrows on the neoclassical school tradition, where factors of production have been paid their respective marginal product.

After all econometric analysis, I discuss the findings regarding the role of FDI in production and growth rate of output. It was found that FDI plays an important role in the aggregate production and the growth rate of output in transition economies. Further, we find that the "mode of transition" does matter when one tries to estimate the effect of FDI on growth rate of output. FDI per worker and FDI per output, as a respective proxy for productivity increase and foreign capital inflow, have affected the

growth rate of output. The respective marginal effects are larger for countries that followed "shock therapy" compared with countries that instead adopted "gradualism" to transform their economies from centrally planned economies to market oriented economies.

The results strongly support the existing theory on the FDI impact on the growth rate of output. The novelty of this essay stands on the exploration and separation of FDI effect on growth rate of output as a physical capital inflow and productivity improvement (technological transfer). It also emphasizes the importance of the path of reform and tests whether the "mode of transition" does matter.

Epilogue

This epilogue briefly states the findings of the three essays and possibilities for further research. In this three essay dissertation, I have examined foreign direct investment from microeconomic and macroeconomic perspectives. An attempt is made to explain the timing of entry into a new market (domestic or foreign market) of a firm that operates in an environment where it cannot escape the mutual interdependence with other competitors. The determinants of foreign direct investment flow in specific Central and European countries exhibiting transition economies are identified with respect to institutional reform and economic policy variables. In addition, the effect of foreign direct investment on the growth rate of output in these same countries is investigated in light of the new growth theory.

The first essay examines a microeconomic decision-making problem individual firms face when they must decide where to locate their production and when to produce. This decision process is investigated considering the firm's real option of deferring. The conclusion we find is that firms behave strategically with respect to timing of entry into a particular market and the market they decide to enter (domestic versus foreign market). This is especially the case when firms face some sunk cost of leaving the production plant and the demand for a homogenous nondurable product is random. However, firms exhibit pure strategies with respect to quantities they decide to produce in spite of the fact that the behavior of its rival is also randomized.

An equilibrium quantity that firms choose to produce exists as well as the probability of entering a new market is derived using the mixed strategy quantity game. The results are limited to two risk neutral firms that have linear demand and linear cost functions.

This model could be extended in many directions. First, it would be interesting and theoretically important to derive the mixed strategy equilibria for an n-firm case with risk neutral firms facing linear demand and cost functions. Second, another extension could be the case in which firms face nonlinear demand and quadratic cost functions. Third, experimenting with firms that have some risk preferences (for example risk averse) may add more to the understanding the strategic behavior of firms. Fourth, other real options could be considered in a similar analysis.

The second essay contributes (from a macroeconomic perspective) to the general body of knowledge on the importance and the role of institutions and economic policies on the foreign direct investment inflow into transition economies. A simple integrated model of the effect of institutions and economic policies on the FDI inflow has been developed and empirically tested. I find that both, the institutions (measured by the political stability and civil right index) and economic polices have significant impact on the FDI inflow in transition economies.

The empirical evidence strongly supports the hypotheses that formal and informal institutions in addition to government economic policies affect FDI inflow. Suggestions for the policy makers can be inferred from the empirical work. In this essay, I have used a Seemingly Unrelated Regression Estimation (SURE) technique to

cope with presence of heteroscedasticity and contemporaneous correlation embedded in the twelve-year data for ten transition economies.

Future research can be focused on the particular institutions and on the particular policy maker's behavior to capture the potential principal-agent problems. Especially interesting would be to differentiate between different modes of FDI: that is, FDI can be in the form of physical capital inflow, or in the form of financial flow, loans, etc. The foreign firms can acquire domestic capital and production in different ways (through privatization of state owned assets for example). As data on the different types of FDI becomes more available, the investigation of determinants of FDI in transition economies would benefit the countries to design institutions and policies that would attract more foreign investors.

The third essay has empirically investigated the effect of FDI on the growth rate of output. I argue that FDI is a physical capital and technology embedded in the physical capital flow. Under this assumption, one would expect (in light of the new endogenous growth theory) a greater affect of FDI on the growth rate of output. The FDI has been considered from two angles. As a physical capital inflow, it has been measured as the FDI per gross domestic product. To account for technology, management, and marketing techniques transfer, I use another measure, FDI per worker. The estimations reveal that FDI has important and economic significance on the growth rate of output.

I also have investigated whether these effects are different for different modes of transition (i.e., the path of transformation of centrally planned economies to market led economies). The statistical evidence strongly supports the thesis that the role of

FDI on the growth rate of output is greater for "shock therapy" countries when compared with countries that followed a "gradualism" approach. The mode of transition effect has a strong effect on the FDI inflow and on the growth rate of output.

In spite of the contributions of this essay on the FDI effect on the economic growth in transition economies and the link between these effects and the "mode of transition" there are possibilities for further research. It would be of interest to see whether findings suggested by these essays hold for all transition economies including the Newly Independent States that broke with the former Soviet Union. A second extension would call for more research, and empirical work on the micro level and on the content of FDI. In this essay, FDI has been treated as homogenous, as either physical capital or technology enhancing variable. In practice, FDI means transferring the ownership of physical assets as well as flow of foreign capital into the country.

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Appendix

The purpose of this appendix is to give a brief expose of the key economic indicators of ten Central and Eastern European countries (transition economies) during years 1990-2001. There are eight tables representing different macroeconomic variables for each different country. These data has been used for the most part in third essay.

Data has been collected from three different sources: World Development Indicators 2003, World Economic and Social Survey 2003, and Consumer Eastern Europe 1996.

Table A.1: GDP growth rate in ten transition economies (annual %, from 1990-2001)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Albania	-9.58	-27.48	-7.20	9.60	9.40	8.90	9.10	-7.00	7.87	7.25	7.80	6.48
Bulgaria	-9.12	-8.45	-7.27	-1.48	1.82	2.86	-9.40	-5.60	4.00	2.30	5.40	4.00
Croatia	na	-21.09	-11.71	-8.03	5.87	6.83	5.90	6.80	2.52	-0.35	3.69	4.08
Czech Republic	na	-11.61	-1.93	0.57	2.70	6.43	4.82	-1.27	-1.04	0.47	3.26	3.26
Hungary	-3.50	-11.89	-3.06	-0.58	2.95	1.49	1.34	4.57	4.86	4.17	5.15	3.80
Macedonia, FYR	na	1.56	-6.56	-7.47	-1.76	-1.11	1.18	1.40	3.40	4.32	4.55	-4.06
Poland	na	-7.00	2.60	3.80	5.20	7.00	6.00	6.80	4.80	4.10	4.00	1.00
Romania	-5.60	-12.92	-8.78	1.53	3.94	7.12	3.95	-6.05	-5.40	-1.20	1.80	5.30
Slovak Republic	-2.67	-14.57	-6.72	-3.70	5.18	6.48	5.84	5.65	3.96	1.32	2.21	3.29
Slovenia	na	-8.90	-5.40	2.80	5.30	4.10	3.50	4.60	3.80	5.20	4.60	3.00

Table A.2: Inflation, GDP deflator (annual %)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Albania	-0.47	34.54	249.68	114.84	37.02	9.84	14.60	30.76	24.96	2.47	-1.19	2.80
Bulgaria	26.19	226.56	59.59	51.08	72.67	62.85	120.82	948.55	23.67	3.72	6.69	6.45
Croatia	na	99.33	594.85	1466.78	111.76	5.32	3.64	7.36	8.40	4.07	6.45	3.07
Czech Republic	na	36.19	14.55	17.69	14.89	9.72	8.61	8.22	10.63	2.96	1.04	5.29
Hungary	25.67	35.72	21.51	21.28	19.49	26.73	21.17	18.47	12.64	8.43	9.77	8.98
Macedonia, FYR	na	78.98	1271.76	442.15	151.89	17.09	2.87	3.97	1.37	2.76	8.18	2.78
Poland	na	55.23	38.51	30.57	36.62	28.61	18.75	14.04	11.83	6.74	7.08	4.30
Romania	na	195.00	199.90	227.30	139.00	35.30	45.26	147.17	56.23	47.77	44.06	36.95
Slovak Republic	6.86	34.62	11.43	27.06	13.67	9.92	4.40	6.70	5.20	6.43	6.40	5.39
Slovenia	na	na	207.97	37.14	22.62	15.16	11.14	8.77	7.82	6.59	5.74	9.86

Table A.3: Trade (% of GDP)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Albania	38.07	34.82	100.00	77.72	50.30	46.99	53.26	46.53	41.15	55.23	59.29	60.84
Bulgaria	69.85	82.65	100.06	84.03	90.73	90.92	105.45	111.93	93.90	94.89	116.76	118.87
Croatia	na	163.78	113.80	105.96	91.76	88.06	89.86	97.91	88.84	89.44	95.64	99.49
Czech Republic	87.78	98.51	108.03	110.14	103.65	112.03	111.11	119.02	118.22	122.03	142.55	144.84
Hungary	59.68	66.49	63.16	61.02	64.32	75.79	78.80	90.96	103.34	108.48	126.50	123.08
Macedonia, FYR	61.83	48.80	107.69	101.44	86.60	75.78	66.54	88.16	97.29	94.33	110.71	96.37
Poland	50.16	48.97	45.87	44.90	45.38	48.39	50.13	55.30	61.56	58.64	65.60	62.14
Romania	42.91	39.14	63.99	51.00	51.87	60.83	64.71	65.42	53.27	60.87	71.68	75.14
Slovak Republic	62.09	95.62	144.60	117.31	113.58	113.04	117.64	121.72	129.11	126.39	146.01	156.50
Slovenia	na	157.78	119.33	116.42	115.20	112.41	112.54	115.71	114.81	109.47	121.81	na

Table A.4: Foreign direct investment, net inflows (% of GDP)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Albania	0.00	0.00	2.82	4.72	2.66	2.89	3.35	2.07	1.47	1.12	3.81	5.04
Bulgaria	0.02	0.51	0.40	0.37	1.08	0.69	1.10	4.87	4.22	6.22	7.94	5.11
Croatia	na	na	na	1.10	0.80	0.61	2.57	2.63	4.31	7.27	5.66	7.46
Czech Republic	0.21	2.05	3.35	1.90	2.14	4.93	2.48	2.43	6.49	11.47	9.70	8.67
Hungary	0.94	4.37	3.97	6.09	2.76	10.12	5.04	4.74	4.33	4.11	3.53	4.70
Macedonia, FYR	na	na	na	0.00	0.70	0.21	0.25	0.42	3.30	0.82	4.90	12.94
Poland	0.15	0.38	0.80	1.99	1.85	3.31	3.44	3.30	4.02	4.69	5.93	3.24
Romania	0.00	0.14	0.31	0.34	1.21	1.31	0.79	3.50	5.86	2.90	2.68	2.99
Slovak Republic	0.00	0.00	0.00	1.50	1.78	1.23	1.71	0.82	2.56	1.75	10.40	7.21
Slovenia	na	na	0.89	0.89	0.81	0.80	0.92	1.84	1.10	0.53	0.75	2.68

Table A.5: Official exchange rate (Local Currency Unit per US$, period average)

	Local Currency	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Albania	lek	na	na	75.03	102.06	94.62	92.70	104.50	148.93	150.63	137.69	143.71	143.48
Bulgaria	lev	0.00	0.02	0.02	0.03	0.05	0.07	0.18	1.68	1.76	1.84	2.12	2.18
Croatia	kuna	na	na	na	3.58	6.00	5.23	5.43	6.10	6.36	7.11	8.28	8.34
Czech Republic	Czech koruna	na	na	na	29.15	28.79	26.54	27.14	31.70	32.28	34.57	38.60	38.04
Hungary	forint	63.21	74.74	78.99	91.93	105.16	125.68	152.65	186.79	214.40	237.15	282.18	286.49
Macedonia, FYR	denar	na	na	na	na	43.26	37.88	39.98	50.00	54.46	56.90	65.90	68.04
Poland	zloty	0.95	1.06	1.36	1.81	2.27	2.42	2.70	3.28	3.48	3.97	4.35	4.09
Romania	leu	22.43	76.39	307.95	760.05	1655.09	2033.28	3084.22	7167.94	8875.58	15332.8	21708.7	29060.7
Slovak Republic	Slovak koruna	na	na	na	30.77	32.04	29.71	30.65	33.62	35.23	41.36	46.04	48.35
Slovenia	tolar	na	27.57	81.29	113.24	128.81	118.52	135.36	159.69	166.13	181.77	222.66	242.75

Table A.6: Exports of goods and services (percentage of GDP)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Albania	14.87	7.22	11.49	15.42	11.35	12.48	12.97	10.64	9.21	16.15	18.89	19.18
Bulgaria	33.12	43.46	47.12	38.21	45.05	44.66	55.43	58.26	47.07	44.56	55.70	55.69
Croatia	na	77.65	59.63	52.39	45.84	38.58	40.19	41.09	39.64	40.58	45.01	46.72
Czech Republic	45.21	52.77	54.46	55.83	50.48	53.64	52.36	56.53	58.51	60.37	69.60	71.05
Hungary	31.14	32.76	31.45	26.41	28.92	37.26	38.86	45.50	50.62	53.00	61.24	60.47
Macedonia, FYR	25.88	22.93	54.34	46.75	38.19	33.01	28.18	37.31	41.21	42.17	48.31	40.48
Poland	28.65	23.52	23.70	22.94	23.77	25.37	24.29	25.49	28.16	26.14	29.34	29.12
Romania	16.73	17.60	27.79	23.02	24.90	27.62	28.14	29.18	22.62	28.02	33.01	33.52
Slovak Republic	26.55	46.32	70.33	56.15	59.08	57.37	53.25	56.08	59.24	61.03	71.79	74.02
Slovenia	na	83.53	63.14	58.75	58.89	55.19	55.75	57.44	56.64	52.52	59.13	na

Table A.7: Imports of goods and services (percentage of GDP)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Albania	23.20	27.59	88.51	62.29	38.95	34.51	40.29	35.90	31.94	39.08	40.39	41.66
Bulgaria	36.73	39.19	52.94	45.82	45.68	46.26	50.02	53.68	46.83	50.33	61.06	63.18
Croatia	na	86.13	54.16	53.57	45.92	49.48	49.67	56.82	49.20	48.87	50.63	52.77
Czech Republic	42.57	45.74	53.57	54.31	53.16	58.40	58.75	62.49	59.71	61.65	72.94	73.79
Hungary	28.53	33.73	31.71	34.61	35.40	38.53	39.94	45.46	52.72	55.48	65.26	62.61
Macedonia, FYR	35.95	25.86	53.35	54.69	48.41	42.77	38.36	50.85	56.09	52.15	62.39	55.89
Poland	21.51	25.44	22.17	21.96	21.61	23.02	25.84	29.80	33.40	32.50	36.26	33.01
Romania	26.18	21.53	36.20	27.99	26.97	33.21	36.57	36.24	30.65	32.85	38.66	41.62
Slovak Republic	35.54	49.30	74.27	61.17	54.49	55.67	64.40	65.64	69.87	65.36	74.22	82.48
Slovenia	na	74.25	56.19	57.66	56.31	57.22	56.79	58.26	58.17	56.94	62.68	na

Table A.8: Unemployment (annual or/and the-end-of period % unemployment)*

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Albania	9.5	9.1	9.4	22	18	12.9	12.4	14.9	17.8	18	16.9	14.5
Bulgaria	1.7	11.1	15.3	21.4	20.2	16.5	14.2	14.4	12.2	14.1	17.9	18.1
Croatia	8.2	14.9	17.2	16.8	17.3	15.9	10	9.9	11.4	13.5	20.6	23.1
Czech Republic	0.7	4.1	2.6	4.3	4.3	4	3.9	4.8	6.5	8.7	8.8	8.6
Hungary	1.7	8.5	9.8	11.9	10.7	10.2	9.9	8.7	7.8	7	6.5	8.4
Macedonia, FYR	23.6	24.5	26.3	27.7	30	35.6	38.8	41.7	34.5	44	45	45
Poland	6.5	11.8	13.3	14	14.4	13.3	12.4	11.2	10.7	12.5	16.7	16.2
Romania	na	3	8.2	10.4	8.2	8	6.7	6	6.3	6.8	10.8	8.6
Slovak Republic	1.6	6.6	11.4	12.9	13.7	13.1	11.3	11.8	12.5	16.2	18.9	18.6
Slovenia	4.7	8.2	11.5	9.1	9	7.4	7.3	7.1	7.7	7.4	7.5	11.6

* Data on this table come from three different sources: World Development Indicators 2003, World Economic and Social Survey 2003, and Consumer Eastern Europe 1996.