

Quantitative Evaluations of Foreign Direct Investments Impact on Productivity Development of Companies from Central and Eastern Europe

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***Abstract.** The approach of the foreign direct investments impact belonging to multinational companies on host country companies and on national economy is an extremely complex and present-day interest issue in the context of globalization phenomena, which at this time puts a mark on the human society evolution. During this period of rapid changes, the economies of those countries, which find them crossing a development process, can benefit a significant increase of productivity and an enhanced access to new resources and commodity markets, but at the same time they are subject to considerable risks. The purpose of this paper is to bring an empirical support at the current level of research, taking into consideration a set of Central and Eastern European countries, including Romania.*

Key words: foreign direct investment; productivity; Central and Eastern European countries.

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JEL Codes: F21.

REL Codes: 10F, 20F.

1. Introduction

Among other well-known authors that have discussed the problem of *the interactions of foreign direct investments impact on the economy of host countries* is Sanjaya Lall, who through his studies approached the primordial role of technological capacities in the process of economic competitiveness development of one country, focusing on the impact of foreign direct investments on the existing technological potential.

The international competitiveness is considered a vital issue for generating economic development in the industrialized countries. Because of globalization, this issue has become an important one for those countries that find them crossing a development process, too, including Romania. The achievement of competitiveness is a difficult process and needs more than a simple passive opening towards

the international markets. It is a process that needs to be well thought, mostly framed, and laid out; it is a complex, expensive and exigent process (UNIDO, 2002). According to a recent report⁽¹⁾, there have been ascertained 12 pillars of competitiveness classified in three categories, each with a different level of significance; in accordance with this, there has been put into effect a classification of all countries, having the global competitiveness as comparative criterion. As there can be easily noticed in the chart below, Romania, at the end of 2007, was on place 74 out of 131 countries, with a score of 3.97 out of the highest score equivalent to 7; this aspect indicates that in this section it has to be made visible efforts in order to place Romania at least on the same level as the developed countries in Central and Eastern Europe, recently accepted into the European Union, if not at the level of first member countries of the EU.

Classification of countries as function of global competitiveness

Table 1

Competitiveness indicators	The first 2 countries in the global ranking		The first 3 EU-27 countries in the global ranking			The last 3 EU-27 countries in the global ranking		
	USA	Switzerland	Denmark	Sweden	Germany	Greece	Romania	Bulgaria
<i>Main category</i>	23	4	1	6	9	48	88	76
• Existence of state institutions	33	4	2	6	7	49	94	109
• Infrastructure	6	4	7	12	1	35	100	84
• Macroeconomic stability	75	22	10	17	60	106	84	47
• Health& Primary education	34	14	3	5	40	42	52	56
<i>Determinant factors of efficiency</i>	1	7	4	8	11	57	62	72
• High education and trainings	5	7	3	2	20	39	54	66
• Efficiency of the goods market	12	6	3	7	14	60	74	90
• Efficiency on the labor market	1	3	5	37	47	120	85	73
• Degree of sophistication of financial markets	11	21	6	9	14	60	78	74
• Technological development	9	3	5	1	21	58	59	65
• Market size	1	37	45	34	5	39	43	61
• Factors related to innovation and sophistication	4	1	8	5	3	59	73	91
• Degree of sophistication of business	7	2	6	4	1	62	73	92
• Innovation	1	2	10	6	7	63	76	88
Place in the ranking (from 131 countries)	1	2	3	4	5	65	74	79
Dynamics over the previous year	↔ ↻		↔ ↻	↻	↻	↔ ↻	↻	↻

Source: World Economic Forum, The Global Competitiveness Index, 2007-2008.

One of the main reasons for which international competitiveness has become a very important problem is the level of technological development. The innovation speed – and its promising results – makes it almost impossible for the economies to isolate themselves from the international commerce and for the international investments to be extremely expensive. One of the important consequences of liberalization and technological changes occurring everywhere is the fact that technology and capital have become extremely mobile, the foreign direct investments playing a key-role in the resources mobility. In addition to the productive resources transfer, the role played by the investments of foreign companies is developed by organizing the activities in a manner different from the traditional one, as well as correlating the production and services with other places from which there can be obtained specific costs, capacities and advantageous logistics.

2. The foreign direct investments influence on the technology transfer and on the company productivity

2.1. Theoretical considerations

The most important contribution of foreign direct investments, in those countries they have their destination in, is represented by the technology transfer, as we stated in the above paragraph. We refer to any tangible or intangible resource that generates a plus of productivity for the resident companies⁽¹⁾. In specialized studies, the foreign direct investments are associated to the “hard” technologies transfer (devices, equipments, sketches and projects), as well as with the “soft” technologies transfer (organizational and managerial competences and practices, information). Therefore, the technology transfer has two dimensions: on one hand, there is the

generic know-how, as the organizational and managerial competences and practices and quality systems and, on the other hand, the specific know-how, which cannot be obtained by means of “arms-length” direct⁽²⁾ because of existing weaknesses and vulnerabilities inside the promoted policies and valid regulations (such as the protection of the rights for intellectual property) or because of existing stimuli and motivations for the operation internalization performed by the trans-national corporations.

The technology is created inside the research and development departments and it is supervised from the part of industrialized countries, as the source of foreign direct investments. This aspect facilitates the development of autochthonous research and development departments. The technology transfer can be performed in a direct manner corresponding to the subsidiary branch in which the multinational companies have already invested, or in an indirect manner following a *spillover*⁽³⁾ benefit on the local companies. There are four channels for transmitting spillovers: vertical connections between the subsidiary branches of multinational companies and the suppliers, subcontractors or clients from the host-country; horizontal connections between the subsidiary branches and autochthonous companies from the same industry field, as well as the internationalization of the activity performed inside the research and development departments.

In the economic theoretic system, it is a diversity of opinions regarding the technology transfer performed by means of foreign direct investments. Thus, Markusen and Maskus (1999) state that these multinational companies choose to perform the technology transfer inside the host countries by means of foreign direct investments to the prejudice of other market

alternatives such as licensing, due to the fact that this one is associated with two risks: the one corresponding to the deterioration of the host-company quality standards, as well as sharing its technological classified information. According to this theory, the multinational companies are able to initiate or to enter competitions with the local competitors that own elaborate knowledge with reference to the local market and its characteristics, because of superior technologies, management and know-how of marketing strategy. If the companies obtaining the licenses for this specific technology or if the local partners of multinational companies have access to the knowledge of the multinational companies, the value of this particular knowledge may dissipate. This process can take place due to a tight competition (Ethier, Markusen, 1991, Saggi, 1999, Blomström, 1999) or because of the fact that the local partner does not have sufficient resources to protect the knowledge of the multinational company (Horstman, Markusen, 1987). The dissipation effect can determine the company to invest or bring inside the firm old or less advanced technologies (Blomström, Sjöholm, 1999). The multinational company can also spend important resources in order to avoid the transfer of technology, even resorting to hire foreign managers or to pay additional salaries to the native managers in order to keep the professional classified information (Blomström, 1999).

The multinational company will allow the local companies to take possession of personal technology, in case they will guarantee the access to the autochthonous technology or the procurement of commercial advantages. Another important reason for which a multinational company may perform the technology transfer is the possibility of avoiding the costs needed for preventing the

transfer of technology, as well as increased efficiency inside the global network of multinational companies referring to the elaboration of manuals that allows a rapid technology transfer among the subsidiary branches of multinational companies (Blomström, 1999). Therefore, the foreign technology made available to the native companies is mainly owed to the foreign investors. The local companies spend resources for adopting new technologies, including the necessary resources for accomplishing a complementarity between the new technology with the existing productivity capacity, as well as for hiring the personnel from the multinational company, licenses and other incomes corresponding to the multinational company for the copyright (Blomström, 1999). Therefore, the effect of adopting the new technology and the quality of spillover is influenced negatively by the cost of implementing the new technology. Other factors that influence the demand and offer for the technology transfer would be: the particular conditions valid in the host country (the market structure, the existing mean gross incomes on the local market, the existing competition, the technological capacity of the local market, the presence or absence of some particular cheap factors of production), the governmental policies of the host country and, of course, the technological discrepancy between the autochthonous and foreign companies (Blomström, 1999, Findlay, 1978). An economy with a highly competitive market stimulates the local companies to search for adequate technology in order to survive on the market, but the technology transfer may be accomplished only if there is also the availability of foreign companies to perform this specific transfer. The centers of excellence

in the field of research and development of foreign direct investments inside the host countries create a development potential for the multinational companies, too, because they can have access to the existing technology.

The access to the existing technology inside the highly industrialized countries is restricted by:

- The absence of fundamental productive capacities, such as research institutions which need to suggest to the companies the necessity of using new technologies, such as museums and factories with practical demonstrations or different stimuli in order to encourage the companies to adopt and use the new technologies.
- The restriction of migration of the qualified work force, the restrictions inside the raw material exports, a certain rigid regime of rights for intellectual property, a high cost of licenses.
- Cultural impediments in cases of migration and export of the qualified work force in order to ensure the transfer of technology.

2.2. The current state of empirical research with reference to the foreign direct investments impact on the performance of companies

Along the years, in the specialized economic literature there were initiatives to demonstrate empirically the connection between the foreign direct investments and the technology transfer.

2.2.1. The impact on productivity

The earliest empirical attempts to detect the impact of foreign direct investments belong to case studies (Mansfield, Romeo, 1980). Caves (1974) formulates probably the first empirical model that estimates the effects of foreign direct investments on labor productivity

inside the country receiving the foreign direct investments. Using sectorial data from Canada and Australia, the author demonstrates the existence of some positive spillovers generated by the manufacture sector in which foreign direct investments were present. More recently, evidence of the existence of positive intra-sectorial spillovers owed to foreign direct investments was found also in highly industrialized countries, such as Great Britain (Haskel et al., 2002). As for the countries passing through the development process, the empirical studies generally measure the effects of foreign direct investments on the productivity of autochthonous companies inside one activity field, by means of a regression with a productivity index as a resulting variable, and an index of foreign presence inside that particular activity field as a factorial variable, as well as a series of other variables supposed to have an influence on the productivity of that branch. It is important to keep in mind that this specific approach does not emphasize the way spillovers are transmitted or disseminated, but it refers only to their presence or absence. The estimation of spillover effects on the intra-industrial productivity are thus obtained by estimating a regression such as follows:

$$\begin{aligned} \text{Index of productivity} &= \\ &= \delta_0 + \sum_{j=1}^{k-1} \delta_j \times X_j + \delta_k \text{ Index of ISD} + \varepsilon \end{aligned}$$

The dependent variable is an index of the output corresponding to that particular branch (Aitken, Harrison, 1999), or an index of labor productivity (Blomström, Sjöholm, 1999), or an index of the total factor productivity (TFP) (Chuang, Lin, 1999). Some studies have also used an index of efficiency as a measure for productivity, whereas the most advanced company from a technological point of view

represents a technological desideratum for other companies and their convergence on the level of the leader company represents a method of development of the technological performance in that specific branch (Aslanoglu, 2000, Blomström, 1986).

A parameter with a special emphasis is the coefficient used to estimate the foreign direct investments indicator, δ_k , which indicates the impact of foreign direct investments on the productivity of companies from that particular activity field. Even though along the years the authors have chosen different indexes in order to designate the foreign presence inside the autochthonous companies, the most used indexes of foreign direct investments were:

statistical weight of employees inside the companies which benefit of foreign capital in that particular activity field, statistical weight of the company capital which benefit of foreign capital in that particular activity field, as well as statistical weight of the output performed by the companies which benefit of foreign capital in that particular activity field. In some of the above-mentioned cases, these variables were taken into consideration due to their availability as compared to other relevant data and not in accordance with the existing theoretical researches at that specific moment in time. Some of the studies, which used the above stated variables for the defined regressions, were set forth in Table 2.

The variables used in empirical regression studies of economic researches

Table 2

Paper	Analysed country	Indicator of productivity	Indicator of FDI
Aitken and Harrison (1999)	Venezuela	O	LS
Aslanoglu (2000)	Turkey	IE, PM	OS
Blomström (1986)	Mexico	IE	LS
Blomström and Persson (1983)	Mexico	PM	LS
Blomström and Sjojorm (1999)	Indonesia	PM	OS
Bosco (2001)	Hungary	O	OS
Buckley et al. (2002)	China	PM	KS,LS
Chuang and Lin (1999)	Taiwan	TFP	KS
Damijan et al. (2003)	Transition economies (a)	O	OS
Djankov and Hoekman (2000)	Czech Republic	O	KS
Feinberg and Majumdar (2001)	India	O,IE	KS
Haddad and Harrison (1993)	Marocco	IE	KS
Kathuria (2002)	India	TFP	OS
Khawar (2003)	Mexico	PM	KS
Kinoshita (2000)	Czech Republic	O	LS
Kokko (1994)	Mexico	PM	LS
Kokko et al. (1996)	Uruguay	PM	OS
Konings (1999)	Bulgaria, Poland, Romania	O	OS
Liu and Wang (2003)	China	TFP	KS
Liu et al. (2001)	China	PM	KS
Lutz and Talavera (2004)	Ukraine	PM	OS
Rattsø et al. (2003)	Thailand	TFP	KS
Sadik and Bolbol (2001)	Arab countries (b)	O	OS
Sgard (2001)	Hungary	O	KS
Sinani and Meyer (2004)	Estonia	O	OS,LS,KS
Sjöholm (1999)	Indonesia	PM	OS
Thuy (2005)	Vietnam	PM	LS
Tian (2004)	China	O	OS
Vahter (2004)	Estonia, Slovenia	PM	KS
Yudaeva et al. (2003)	Russia	O	OS
Zhu and Tan (2000)	China	PM	KS

Note:

O= Output

IE= Indicator of efficiency

W= Labor productivity

TFP= Total factor productivity

LS= % employees from foreign capital enterprises/total sector

KS= % capital of the foreign capital enterprises/total sector

OS= % created output of the foreign capital enterprises/total sector

a) Here are included Bulgaria, Czech Republic, Estonia, Hungary, Poland, Romania, Slovakia and Slovenia.

b) Here are included Oman, Morocco, Saudi Arabia, Jordan, Tunisia and Egipt.

Even though they took into consideration the same variables, the studies concerning regression (1) had two differences regarding the delimitation of the companies which benefit from “foreign capital” and the type of data used for estimating the spillover effects (cross section or panel).

As for the first distinction, the studies have delimited the companies by means of national classifications, as well as of personal delimitations. For example, regarding the case studies which referred to China, the delimitation was made by taking into consideration the governmental definition of an company in which a foreign capital has been invested, which allowed the uniformity of the data considered by the authors (Sadih, Bolbol, 2001, Buckley et al., 2002, Wang, 2003). In other case studies, all companies that benefited of foreign direct investments were taken into account, no matter what their level was (Konings, 1999, Damijan et al., 2003). These studies use the capital or output weight, as well as the weight of employees of those particular companies as a measure of the presence of foreign investments. Other studies take the companies that benefit of foreign direct investments into consideration only if they have a weight of the foreign capital between 5 and 50% (Khawar, 2003). Therefore, this type of variables taken into account may lead to different results that point out to a different impact of foreign direct investments on the productivity of companies from the recipient country economy.

As for the second differentiation, there are recent studies (Damijan et al., 2003, Sinani, Meyer, 2004) which use aggregated data on the company level, whereas older studies (Blomström, Persson, 1983, Kokko, 1994) tend to use aggregated data on the industry level.

Recent economy analysis also uses panel data more often than cross-section data. The selection of existing data on the level of the industry is used when there is no access to the company data. For example, China does not publish any data on the level of the company on a regular basis, which is why the panel analysis needs to be founded on aggregated data on the level of the industry (Tian et al., 2004).

Since the productivity of recipient companies of foreign direct investments may register an improvement not only because of the impact of foreign direct investments, but also as an effect of conjugated action of foreign direct investments with other specific factors of each country and each economy. This is a question of the education level of work force, the investments in the research–development field, the quality of infrastructure and other characteristics of the sector taken into consideration, such as the level of concentration corresponding to the respective industry.

Following these empirical studies, different results were reached. Kumar (1996), intending to emphasize in his empirical study the impact of foreign direct investments on the companies productivity, reaches the conclusion that introducing new technologies had an effect on the companies productivity made visible only after a longer period of time, which leads to another conclusion regarding the fact that time series used in order to emphasize this correlation may not always reflect the truth. Moreover, before any benefic effect on the productivity is made visible, there is likely for the autochthonous companies to suffer due to an increase of market competition because of which some companies with a lower efficiency may need to refer to specific resources in order to perform investments that

are more efficient (Blomström, 1999). Local companies previously without any competitors will need to become more efficient in order to keep their market quota, leading to the development of the entire sector efficiency.

In general, the studies made on a microeconomic level, find the investment of foreign capital in the autochthonous companies with mixed capital, as well as their productivity under a positive correlation. Spillover effects for local companies which are not involved in a joint-venture partnership with foreign companies are very weak ones, especially in those countries which are passing through the development process (Blomström, 1999), Saggi and Kumar (1996). As for the developed countries, there are studies which identify positive spillover effects, such as Mexico, Uruguay or Indonesia (Kokko, 1994, Blomström, 1994, Sjöholm, 1999), whilst Haddad and Harrison (1993), as well as Aitken and Harrison (1991), find limited or even inexistent spillover effects for Morocco or Venezuela.

The empirical studies emphasizing the horizontal spillover effects, especially for autochthonous companies that are in a direct competition with the subsidiary branches of multinational companies, reach the conclusion that these are very rare cases, except the ones already existing between the companies operating in different sectors of activity (Saggi, OECD, 2002).

Foreign direct investments generate spillover effects, leading to an economic development only in certain contexts, here including the existence of *an efficient learning system* (Borensztein, 1998, Engelbrecht, 1997, OECD, 2002), *an efficient income system* (Blomström, 1994), existence of *developed financial markets* (Alfaro, 2000), *the degree of commerce opening* (Balasubramanyam,

1996). Other factors that have a positive influence on the dimension of spillover effects are the following:

- The autochthonous competitive frame;
- The characteristics of the labor market from the host country;
- The technological capacities or the absorbing capacity of autochthonous companies;
- The technological gap between the multinational companies and the autochthonous ones, the complementarity between the foreign technologies and the local ones;
- The nature of foreign direct investments;
- The characteristics and motivations of foreign investors.

On the level of Romanian companies, up until now there were not many empirical studies made in order to prove the positive correlation between foreign direct investments and the productivity. On the other hand, the only existing studies were concentrated on the companies from the processing industries with the corresponding data from 1998 (Boşcaiu et al., 2000).

2.2.2. *The impact on innovation, exports of industry and of human capital inside the host-country economy*

The foreign direct investments may seem to substitute the local activities of research and development, and consequently of innovation, as the company receiving the technology becomes a connection point between the global subsidiary branches network of the multinational company, subject to decision on a central basis. Multinational companies centralize the activities of research and development on the level of the host-company and the local

activity of research and development corresponding to the countries in which subsidiary branches are located is taken over only if it corresponds to the global strategy corresponding to the level of the multinational company (Kumar, 1996). This situation slows down the process of technology transfer inside the host countries.

Bernstein and Mohnen (1998) state that autochthonous companies may benefit of an increase of the innovation process precisely because of the fact that the presence of subsidiary branches of multinational companies leads to a tighter competitive frame and consequently to stimulating the local companies to innovate in order to remain competitive on the market.

The impact on the exports of industry inside the host-country economy is also highly debated and empirically studied by economists. The most distinguishable effects of stimulating the exports generated by the foreign direct investments and the operations of multinational companies inside the states of implantation, consequently inside the countries passing through the development process or with a transition economy, are found in the sector of processing industry. This is the field in which, along the 1970's and the 1980's, the competition based on costs corresponding to some goods more and more standardized, the convergence of consumption models along with decrease of transport expenses called upon the widening of the sphere of internationalizing strategies of the firms. The important oligopoly companies from the car-manufacturing industry and the electronic industry made the first move towards combining the generated advantages of scale economies with the ones resulting from the organization on regional or even global basis of some networks of

suppliers with lower costs and belonging to countries passing through the development process.

The key role of multinational companies regarding the stimulation of product exports corresponding to the receiving states of foreign direct investments is put in a concrete form by establishing from the very beginning some type of production operations having commerce as a goal. A second method by which foreign direct investments stimulate the exports of the host country is an indirect one, by means of the impact generated on the level of local companies, as suppliers of production inputs for the subsidiary branches of the foreign company. The respective companies thus become indirect export agents or even direct export agents in the situation in which different multinational companies facilitate contact with other subsidiary branches in their activity field, situated in host-countries or in third party markets. There is also the possibility that this kind of productive facilities oriented towards the export may not lead to the network development with the local firms, creating enclaves inside the host-economy.

The impact of foreign direct investments and of foreign companies operations on the exports of the host country sometimes is very significant. The other types of effects resulted from production internationalization may be best evaluated through an individual approach, each country representing different characteristics and a different position as a recipient of foreign direct investments.

The impact on the human capital is also obvious and leads to the increase of general production of companies. The operations effects corresponding to the subsidiary branches of foreign companies on the work

force inside the host-countries depend on numerous factors, such as the motivation and type of investment that is closely connected to the strategy of internationalization of the investing company. The local companies may benefit from the existence on the market of a work force that is trained highly and proficiently by the already existing multinational companies. On their turn, the foreign companies may benefit of employees that have useful information about the market.

The most important effects generated by the presence of subsidiary branches of multinational companies can be grouped in three categories, such as *generating new jobs, increasing the quality of work force and ameliorating the quality of work force*.

It is very difficult to draw up a balance of increases and reduction of the number of jobs generated by foreign direct investments of the multinational companies. Moreover, the situation varies along the periods. A short-term reduction of the available jobs may be counteracted by long-term effects regarding the economic development stimulated by the foreign direct investments that is equivalent to an increase of available jobs on the market. A very important specification is that *the net impact as to creating or cutting up the number of jobs by means of the activity performed by the transnational firms in an economy is not that important so that it exerts constraints on the macroeconomic management in those host-countries*. Statistics showing a clear image regarding the role of foreign companies in generating new jobs are generally missing.

Information offered by UNCTAD⁽⁴⁾ (*United Nations Conference on Trade and Development*) indicate on a global level a reduced dimension of manpower taken over by the foreign companies, an increasing, but

slow evolution of this one, as well as an increase rhythm lower to the one registered by other indexes of international production. This is why, from approximately 19 millions of available jobs in 1982, the subsidiary branches of foreign companies hired little over 24 millions of persons in 1990, reaching a value of over 57 millions in 2004. Between 1990 and 2004, the increase of available jobs inside the subsidiary branches of foreign companies was around 134.8%, the increase of global entries generated by the foreign direct investments was of 211 %, and the evolution of foreign total assets corresponding to the subsidiary branches of foreign companies was of 506%. The number of indirect jobs created by the transnational companies was higher than the number of direct jobs corresponding to the situations in which the development of a relationship with the local suppliers of goods and services was initiated.

With reference to the second type of effects, *the foreign companies finance the qualification increase of work force from the recipient economy in a greater extent than the local ones* in order to ensure that the transferred technologies are efficiently used. The decision to invest in more complex training models depends on the companies' expectations regarding future incomes, on the period in accordance with which they establish a functioning pattern, as well as on the level of the market competition. A very important aspect is the level of training itself that is made available through the internal education system.

At last, *work force directly designated by the subsidiary branches of the foreign companies is paid better and benefits of better conditions of work than the one hired by local companies*. If we refer to other factors than remuneration, the conditions of work and

employment standards are generally no less favorable than the local ones compared to the subsidiary branches of the foreign companies.

The interests of one particular country regarding the foreign direct investments involves the enhancement of certain types of investments, respectively of the ones corresponding to the activities with a high value added tax, the ones that generate exports and the greenfield ones which imply a complex and more thorough transfer of economic resources. All these categories of investments first imply the involvement of foreign investors in providing a superior qualification of work force, as well as a net positive contribution regarding the number of available jobs. Therefore, drawing these categories of investments will contribute to the provision of benefic effects regarding the work force. On the other hand, there needs to be specified the fact that state institutions need to ensure an adequate educational level, on all the three levels, a process found in a critical phase at the present moment, having the deterioration of training qualification of manpower as a complex consequence.

2.3. The impact of foreign direct investments on labor productivity. Empirical study on countries from Central and Eastern Europe

Foreign direct investments have a series of complex effects on the recipient economic systems, both on the real sector and the nominal sector, as well as on the level of *institutional quality*, of „organizational culture”, of quality of the market mechanisms and of the functioning method of the public authority system, etc.

Systematically, on the level of impact exerted on the internal labor productivity we mention the following effects:

- Foreign direct investments contribute to the provision of technological and financial resources in favor of the recipient economy;
- Foreign direct investments ensure *a conceptual transfer*, organizing systems and optimization of the productive processes;
- Foreign direct investments also recast, at least on the microeconomic level, the „organizational culture” of the autochthonous entities to which it contributes/of newly created entities with diffusion effects on the rest of the economic subjects;
- Foreign direct investments can contribute to the reduction of discrepancies between the sectorial labor productivity to the extent it is performed in an uniform manner (otherwise, the recipient economy can be described through the productivity dynamics as a bi-sectorial economy with a superior productivity sector in which foreign direct investments have reached a critical threshold and an autochthonous sector of low productivity made of autochthonous economic subjects).

As a formula:

$$\sum_{i=1}^N \lambda_{ti} = \sum_{i=1}^N \lambda_{ti} (isd_{ti}; I_{ti}; S_{ti}; \varepsilon_{ti})$$

where for a recipient economy of foreign direct investments made of N sectors, the productivity of labour is a function of sectorial foreign direct investments flows isd , an index of internal hard factors (the degree of material and financial resources and associated costs, human capital, production structures, etc. $-I$), an index of soft factors

(cultural paradigm and institutional quality and market mechanism -S) as well as of exogenous shocks – sole periods or multi-periods - ε .

In order to estimate the empirical connections between the dynamics of foreign direct investments and their exerted impact on the variations occurred on the productivity level of labour we suggest an empirical analysis based upon the regressions applied on a set of pool data. Following the data availability, the period of analysis taken into account was 2000-2006. There were 10 states taken into consideration, all from the Central and Eastern Europe, five of them also members of the European Union (UE-27).

The economic systems included in the sample are:

Economic	Symbol
Albania	alb
Bosnia	bsn
Croatia	cro
Czech Republic	cze
Hungary	hun
Macedonia	mac
Poland	pol
Romania	rom
Slovenia	ser
Slovakia	slo
Turkey	tky

The data was processed based on the information offered by the Central Banks of the countries which were taken into account, on the statistical data offered by Eurostat, UNCTAD and database of IndexMundi.

The general formula of a regression based upon the pool data is:

$$Y_{it} = \alpha + X'_{it} \times \beta_{it} + \delta_i + \gamma_t + \varepsilon_{it} \quad (1)$$

where Y is the vector of endogenous variables (they estimate the dynamics of foreign direct investments), X is the vector of exogenous variables (*index of opacity*),

ε_{it} represents the errors of the estimation $i = 1, 2, \dots, M$ transversal data observed for $t = 1, 2, \dots, T$ periods of observation. α represents the global constant of the mode whereas the parameters δ_i, γ_t represent the specific transversal or periodic effects (*fixed or random effects*). The estimation of the model implies an application of corresponding restrictions on parameters β . The data is balanced in the way that unavailable observations are eliminated, obtaining a more concrete representation of the results.

For the chosen models, a simplified alternative of the general form was taken into account, but it does not include the fixed or random effects, or any global constant:

$$Y_{it} = X'_{it} \times \beta + \varepsilon_{it} \quad (2)$$

A special observation needs to be made regarding the residual variables. For their estimation, a heteroscedasticity was taken into account specific to each period which allows a non-uniform variance for the observation periods corresponding to each residual variable (it is supposed that there are no transversal connections between the residual variables or the inter-period ones):

$$E(\varepsilon_{it} \varepsilon_{jt} | X_t^*) = \sigma_t^2 \quad (3)$$

$$E(\varepsilon_{is} \varepsilon_{jt} | X_t^*) = 0 \quad (4)$$

for all values i, j, s, t cu $s \neq t$. X_t^* contains all values of X_t and, if the estimation is made taking into account the fixed effects, as the parameters which describe the adequate transversal or periodic effects (δ, γ_t).

Using the vectors of transversal residual variables can be added:

$$E(\varepsilon_{it} \varepsilon_{jt} | X_t^*) = \sigma_t^2 \times I_M \quad (5)$$

where I_M is an identity matrix of M elements.

A proxy of the labour productivity increase defined as it follows represents the endogenous variable:

$$\lambda_t = \text{gdp}_t \% - \left[\frac{100 - u_t \%}{100 - u_{t-1} \%} \times 100 - 100 \right] \quad (6)$$

where $\text{gdp}_t\%$ represents the output increase

rate (variance of GDP) and $u_t\%$ is the unemployment rate.

The obtained results for a period of analysis equivalent to 2000-2006 for the economic systems series taken into account are the following:

Dependent variable: Real productivity of labor (%;-proxy)

Method: Pooled EGLS (Period SUR)

Period of observation: 2000 2006

Included observations: 6

Cross-sections included: 11

Total pool (balanced) observations included: 66

Standard errors and covariances: Period SUR (PCSE)

Variable	Coefficient	Standard error	t-Statistic	Probability
ALB	0.972886	0.005370	181.1758	0.0000
BSN	1.152356	0.007771	148.2963	0.0000
CRO	0.436095	0.009064	48.11310	0.0000
CZE	0.545788	0.007566	72.13569	0.0000
HUN	0.467347	0.005044	92.65363	0.0000
MAC	0.564406	0.017050	33.10213	0.0000
POL	0.280968	0.003550	79.15202	0.0000
ROM	0.499401	0.007393	67.55442	0.0000
SLV	0.506444	0.010733	47.18759	0.0000
SLO	0.436902	0.007318	59.70329	0.0000
TKY	0.747937	0.009956	75.12709	0.0000
Ponderated statistics				
R^2	0.443558	Mean dependent variable		4.966130
Adjusted R^2	0.342386	S.D. dependent variable		3.139781
S.E of regression	2.546155	Sum squared residual errors		356.5597
F-statistic	4.384225	Durbin-Watson stat		2.439024
Prob.(F-statistic)	0.000156			
Unponderated statistics				
R^2	0.252804	Mean dependent variable		4.309066
Sum squared residual errors	414.4934	Durbin-Watson stat		2.534335

For testing the model quality, it is highly recommended to use the

stationarity tests for ordinary residual variables as it follows:

Exogenous variables: Individual effects
 Newey-West bandwidth selection using Quadratic Spectral kernel

Method	Statistics	Prob.**	Observations	
			Cross-section	Obs
<i>Nule hypotesis: Unit roots (assuming common unit root processes)</i>				
Levin, Lin & Chu t*	-7.43065	0.0000	11	55
Breitung t-stat	-2.54197	0.0055	11	44
<i>Nule hypotesis: Unit roots (assuming common unit root processes)</i>				
Im, Pesaran and Shin W-stat	-2.50695	0.0061	11	55
ADF - Fisher Chi-square	45.9164	0.0020	11	55
PP - Fisher Chi-square	59.8328	0.0000	11	55
<i>Nule hypotesis: There are no unit roots (assuming common unit root processes)</i>				
Hadri Z-stat	9.98683	0.0000	11	66

** Probabilities for Fisher tests are computed assuming a *Chi-square* asymptotic distribution. All the other tests have a normal asymptotic distribution.

These results suggest that on the unitary roots level one can be identified certain individual unit root processes and, consequently, there exist certain systematic deviations corresponding to the stipulations made based on this empirical model. This result is not surprising due to the reduced dimension of the analysis series and of the sole criterion character of the model. Durbin - Watson test indicates the presence of certain auto-correlations to the right of the residual values. In general, the quality of the model can be described as satisfactory and allows the elaboration of preliminary conclusions.

These are the following:

- For all economic systems taken into account there is a possible positive effect of labour productivity development which can be identified under the impact of net foreign direct investments (resulted from the significant statistical association between these variables).
- The above-mentioned association is non-uniform for the observations set. There

can be identified the fact that its maximal levels are registered in countries such as Albania or Bosnia, whereas for Macedonia or Slovakia and Slovenia the intensity of connection between the dependent and exogenous variable is reduced.

- The connections set between the proxy variable for the global productivity of labour and the foreign direct investments vary along the period of analysis under the effect of modifications both on the level of other determining variables and inside the recipient structure of them.

The advanced analysis has a series of limits out of which we state:

- The insufficient volume of data and the sensitivity of connections taken into account for the exogenous shocks.
- The absence of control variables which can explain the difference between the economies taken into consideration both under the report of supply with factors of production, and

the degree of exogenous technology compared to the foreign direct investments.

- The absence of structural analysis that can point to the existing distinctions between various components of the recipient economic system, with reference to the absorption capacity.

In spite of these limits, we believe that advanced analysis allows the provision of some empirical evidences in favor of sustaining a positive impact on the global productivity exerted by financial and technological resources transfer, as well as the associated models of the organizational culture specific to the foreign direct investments.

4. Conclusions

The fast technological progress gives rise on a global level to some important changes with reference to the industrial activity, and the countries passing through a development process must acknowledge these changes and must take measures in order to reach the development of technological capacities. The isolation of economies from the international commerce and from the international investments is extremely expensive. An important consequence of liberalization and technological modifications is the fact that technology and capital have become extremely mobile and the foreign direct investments have a key role in the mobility of resources. In addition to the productive resources transfer, the role that the investments of foreign companies play is shown through the activity organization in a

different manner of the traditional one, as well as the correlation of production and services with other sources of advantageous technological capacities.

There is no doubt that foreign direct investments are extremely important in generating spillovers which improve the performance of the autochthonous companies by the technology transfers, a high productivity of labour, intensity of investments and exports, the qualification of manpower. In addition to the efforts of the autochthonous companies to assimilate the new technologies in order to improve their productivity, it is necessary to be a national strategy or policy for stimulating the technological development in addition to the foreign direct investments and the technologies and managerial capacities of them.

Global empirical studies, which quantify the impact of foreign direct investments on the productivity, had some positive, significant or limited, but also negative results, depending on the industry or economy taken into account. Even though they are numerous on an international level, the studies in Romania are just a few, because of the fact that the data are not available on a national level.

In this study, we have tried to quantify the impact of foreign direct investments in Romania, as well as in other 10 countries from the Central and Eastern Europe with reference to the impact of labour productivity. Such a study is very necessary because it takes into consideration a wider series of countries, the defined region never being taken into account previously in other empirical studies.

The main conclusions have demonstrated in an empirical manner the positive correlation between the foreign direct investments and the labour productivity in all countries taken into account, with some discrepancies concerning the intensity of this correlation. Therefore, we can state that in countries such as Albania or Bosnia the level of correlation is the maximum one; in countries such as Turkey, Macedonia, the Czech Republic and Romania the level is medium and low in countries such as

Slovenia or Poland. Among the possible differentiation factors, we mention the following: the unequal degree of structural, institutional and functional development between the economies taken into account; unequal structures of production; unequal degree and mobility with different level of imperfections and corresponding training of manpower; the specific characteristics and the degree of cultural divergence between the origin countries and the host-countries with reference to the foreign direct investments.

Notes

- ⁽¹⁾ See Blomström, 1999.
- ⁽²⁾ The dictionaries have the following definition for “arms-length“ transactions: those transactions that are performed and accomplished as if there is no other kind of connection between the involved bodies, besides the business relationship, thus avoiding any kind of

interest conflict (see “Dictionary of Finance and Investment Terms, Third Edition, New York, Barron’s Educational Series, Inc., 1991).

⁽³⁾ From English – transfer of technology.

⁽⁴⁾ See UNCTAD, World Investment Report 2005.

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