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Emerging Markets Queries in Finance and Business

Knowledge spillovers of FDI

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Abstract

The role of FDI in sustainable development is a long debated topic within scientists' community. Mainly generated positive effects in terms of increasing the technological level of the economy are often offset by negative effects on the competitiveness of national firms. However, spillover and propagation effects, especially in terms of technological knowledge and know-how, enable the creation of robust innovativeness growth both horizontally and vertically. The paper aims to seek the evaluation of knowledge spillovers intensity's effects on economic activity in the host country.

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Keywords: Knowledge spillovers, Foreign Direct Investments, sustainable development, innovation, technology transfer

1. Introduction

Stepping up the pace of globalization, a phenomenon that characterizes the global economy starting with the ninth decade of the twentieth century, led to an increase in the dynamics of investment flows and their spectacular expansion to emerging or developing economies. However, there were a number of politically changes designed to streamline the impact of foreign direct investment (FDI), especially as the main channel for achieving technology transfer. The literature establishes two main categories of FDI: horizontal and vertical. Horizontal FDI is characterized (Markusen, 1984), by duplicating production capacity in the host country being practically every market served by its own power. In general, horizontal FDI aimed at reducing transport costs (Markusen and Venables, 1998; Branstetter, 2006; Ramondo et al, 2011) and marketing of goods in a particular market (Roordin & de Vaal, 2010; Protsenko, 2003; Stancik, 2007 Ramondo et. al, 2014).

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Vertical FDI involves moving production capacity from the country of origin in the host country (Helpman, 1984) and overall are based on the price factor as a mechanism to increase the efficiency (Protsenko, 2003; Stancik, 2007, Naoto & Zang, 2013). Practical experience and empirical evidence have shown, however, that in reality cannot make a clear distinction between horizontal and vertical FDI, bringing into question the so-called hybrid FDI (Naoto & Zang, 2013). Of these, the most frequently mentioned in the literature are export platform FDI (export-platform FDI), FDI complex (complex FDI) and FDI network (networked FDI). Depending on the predominant size, FDI has the potential to generate both direct effects on employment and GDP and indirect effects on the nature and propagation effects drive both receiving economy and in the home and related effects. The direct effects of FDI have been the subject of numerous studies and researches in particular over the last three decades, most of them pointing out to the positive effects. But there is a fairly consistent literature which refers to quantify the crowding-out effects of FDIs on the immediate proximity of local economy which have been identified particularly in developing economies. From the perspective of spillover effects, the experts usually distinguish between technological incorporated spillovers and unincorporated spillovers, the latter being more difficult to perceive and evaluate. By knowledge spillovers most studies mean building capacity to innovate based on knowledge and understanding of other's research results. Acceptance of technology is not always easy; the interaction with new technologies can also generate rejection phenomena: hostility, depression, isolation. This raises the problem of the assessment of knowledge spillovers' effects on economic activity intensity in the host country and of the identification of the hot spots of the technology acceptance model specific to the host country.

2. Key features of FDI evolution in the early 2000's

As of 2000, the FDI development was oscillating but an ascending trend could still be noticed on the whole for the developing countries (fig. 1).

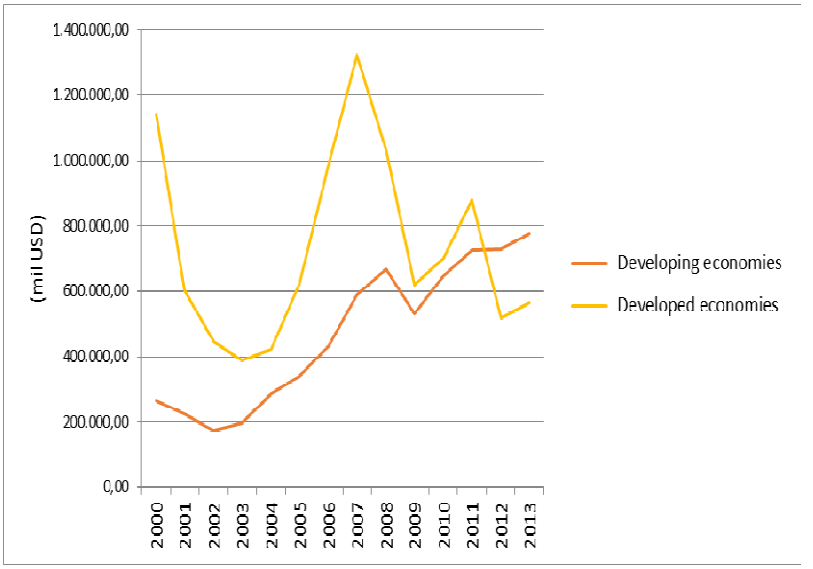


Fig. 1 FDI evolution in developed and developing countries
Source: own elaboration using data from WorldBank http://data.worldbank.org/indicator?display=default

In our opinion, this fact is due to the need of developed countries to identify new markets under the conditions in which, being in the proximity of a new technological leap, the volume of sales began to decrease. The statistical data highlights a strong tendency of concentrating investment flows towards developing countries from Asia and America as these countries attract constantly about 90% from the total FDI volume (Table 1).

Table 1 FDI distribution among developing countries

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Africa	3,61	8,82	8,48	9,20	6,06	9,08	8,25	8,69	8,86	10,52	7,26	6,63	7,56	7,35
America	36,78	35,73	34,00	24,38	33,90	22,92	22,84	29,23	31,57	28,34	29,24	33,65	35,08	37,52
Asia	59,55	55,36	57,45	66,25	59,91	67,90	68,58	61,88	59,22	60,78	63,10	59,41	56,91	54,78
Oceania	0,06	0,09	0,07	0,18	0,13	0,10	0,33	0,20	0,35	0,36	0,41	0,31	0,45	0,35

Source: own elaboration using data from WorldBank http://data.worldbank.org/indicator?display=default

The annual dynamics of FDI inflows should be also noticed, with respect to the situation of the developing countries (table 2).

Table 2 FDI annual rhythm in developing countries

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Africa	107,29	-26,74	24,32	-4,97	79,67	15,18	43,80	15,40	-5,46	-16,07	2,10	14,91	3,73
America	-17,59	-27,50	-17,83	100,41	-18,88	26,35	74,76	22,19	-28,52	25,58	28,71	4,90	14,15
Asia	-21,15	-20,93	32,12	30,36	35,95	28,05	23,24	8,26	-18,27	26,36	5,28	-3,60	2,71
Oceania	21,31	-39,06	181,43	4,27	-6,95	324,13	-17,23	96,66	-16,24	35,93	-13,53	44,52	-18,22
total	-15,18	-23,81	14,59	44,14	19,96	26,78	36,57	13,13	-20,36	21,71	11,82	0,64	6,71

Source: own elaboration using data from WorldBank http://data.worldbank.org/indicator?display=default

We observe that with respect to the annual dynamics the lowest oscillations were registered in Asia (57.1 p.p.) while at the level of Africa and America we have a variation of over 100 p.p. However, it should be noticed that, despite the fact that the most marked yearly average rate of growth regarding the volume of effective FDI inflows is registered here, Africa did not ever benefit of more than 39% from the FDI volume received by America.

Table 3 Africa's FDI inflows vs. America and Asia (%)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
America	9,81	24,68	24,94	37,73	17,89	39,63	36,13	29,73	28,07	37,14	24,82	19,69	21,57	19,60
Asia	6,06	15,93	14,76	13,89	10,12	13,38	12,03	14,04	14,97	17,31	11,50	11,15	13,29	13,43

Source: own elaboration using data from WorldBank http://data.worldbank.org/indicator?display=default

A possible explanation for this lag is represented by the low absorption capacity of developing countries from the African continent.

At the European Union level, the statistical data highlights an oscillating evolution, with high amplitude of the variation, the maximum of inflows being registered at the level of the year 2007, when the cumulated value of FDI inflows exceeded 1 bill. USD (Table 4).

Table 4 EU 28's FDI inflows (bill. USD)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
EU	625,64	294,54	314,17	268,37	218,69	751,37	707,78	1.048,85	852,63	361,43	323,2	461,69	261,68	278,81

Source: own elaboration using data from WorldBank http://data.worldbank.org/indicator?display=default

At the same time, it should be underpinned that among the new member states is found, for the analyzed period, a rather more marked trend of increasing the technological level of the economy, with the gross fixed capital formation share in GDP reaching 40% in Latvia in 2007. Despite the economic crisis, new member states of EU kept a good pace in catching up with the technological medium level.

The proximity to the technological cutting edge is still rather far for the majority of these countries the innovativeness level being extremely low. An exception is Estonia where the summary innovation index is closer to the EU average than to the other member countries (fig. 2).

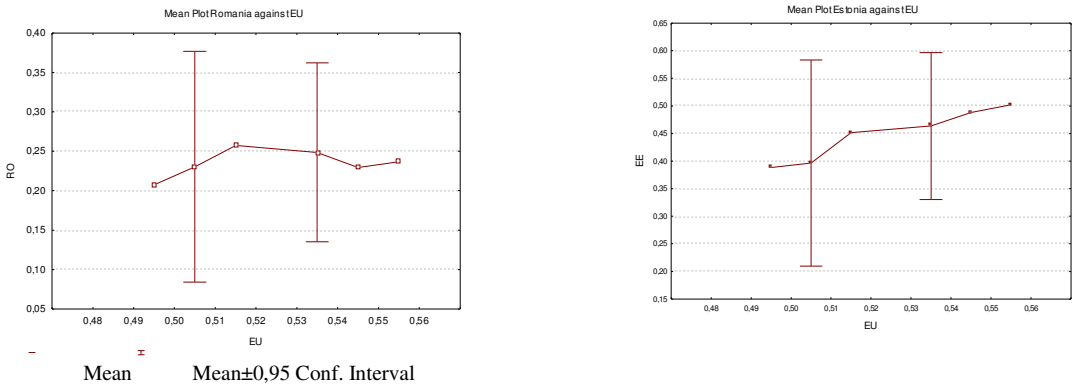


Fig. 2 Summary Innovation Index between 2006 – 2013 Romania and Estonia against EU

Source: own elaboration using data from Innovation Union Scoreboard 2014

While technological spillover formation usually measured by Technology Achievement Index there is almost unanimity about their existence and dynamics in relationship with FDI inflows, the formation of knowledge spillover remains for the time being somewhat controversial, mainly due to the fact that there are no conclusive research outcomes that would allow for their quantification.

3. Knowledge spillovers measuring – some proposals

The number of patents and licenses granted in the host country in upstream, downstream or connected/related fields of FDI are usually regarded as a good approximation of the knowledge spillover volume are regarded. In our opinion, it is necessary to make a distinction between knowledge spillover that have been materialized in the form of books, scientific articles, handbooks, syllabuses, etc. and the immaterial, intangible ones consisting in one hand from the knowledge and information gained by an individual as result of the interaction with the investment process, with the technology in itself, and with the other users of the technology (both from the origin and host country), or with the specific legislation and, on the other hand, in the behaviors, aptitudes, habits, beliefs, and competences generated by the triggering of the active learning processes in contact with the new technology or, to the contrary, generated by the rejection processes.

With respect to human skills generated by FDI we can use as proxy the employment in host industry, gross enrolment ratio (all levels combined except pre-primary) or gross enrolment ratio in science, engineering, manufacturing and construction at tertiary level, patent granted to residents per million people, receipts of royalty and license fees per 1000 people. Not in the last, we can use as a proxy the number of scientists involved in the industries connected to the same value chain with the host industry.

Quantification of behaviors, skills, habits, beliefs and competencies generated by triggering the processes of active learning is much more difficult. In the first instance, on the assumption that active learning is a group process that relies on repeated interactions and feedback, using the network model proposed by Stonedahl, F. and Wilensky, I (2008) set up a learning network composed of 25 agents active receptors, each having equal

individually knowledge assets. In the initial working hypothesis there is a 50% chance to create a bond between any two members of the learning network at a diffusion rate of 10% (Fig. 3).

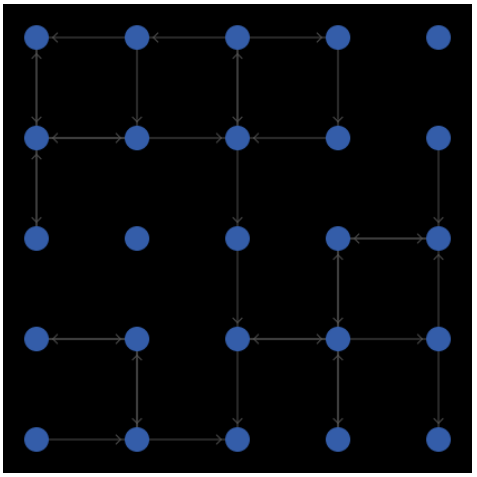
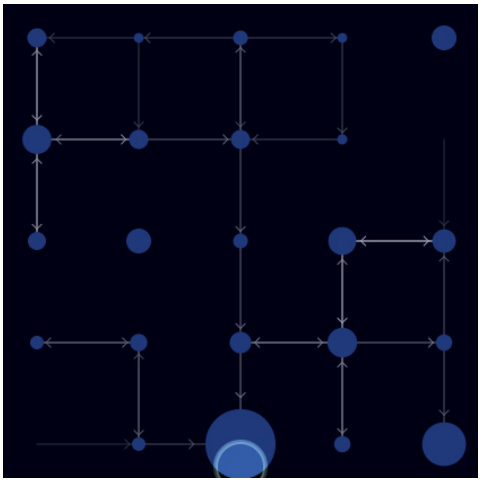


Fig. 3 Learning's diffusion network Stage 1 - the beginning



Stage 2 After 100 interactions with 10% diffusion rate

We repeated the experiment with a diffusion rate of 25%, then 60%, noting the emergence broadcast centers characterized by a high volume of available knowledge. The model shows that even in conditions that left the premises equal, individuals accumulate differently, depending on other factors - learning ability, reactivity and receptivity to new, personality, etc.

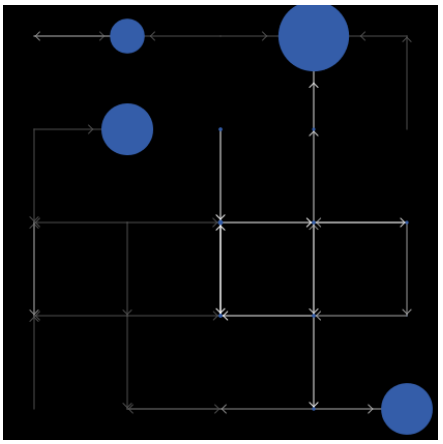
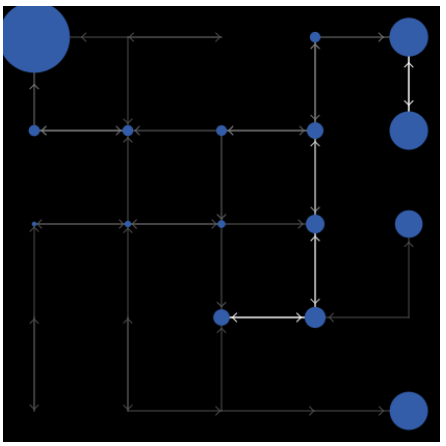


Fig. 4 Learning's diffusion network Stage 2 with 25% DR



Stage 2 After 100 interactions with 60% diffusion rate

Assuming that the group that interacts with new knowledge is heterogeneous in terms of initial assets owned, we tested the ethnocentric model. This states that the ethnocentric type behavior is influenced by different conditions, competing agents in a confined space similar interactions prisoner's dilemma, but with the advantage of the pre-existence of cultural heritage and genetic.

In a society, we can distinguish between four categories of people: People who cooperate with everyone (CC) People who cooperate only with people of the same type (CD) People who do not cooperate with anyone (DD) and People who cooperate only with people of different types (DC).

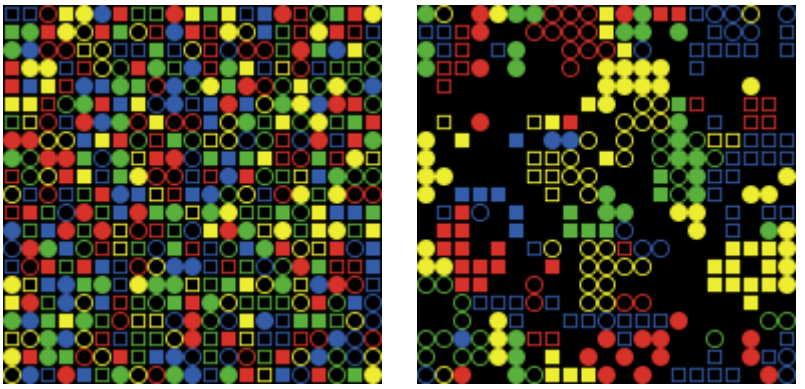


Fig. 5 Ethnocentric model of learning - initial status after 100 interactions

Fig. 6 People's transformation under learning's influence

We note from Fig. 5 that people tend to group by preferences and disperse equally to the other groups of persons belonging to the category DC -people who only cooperate with people of different types and also the downward trend in the number of people who refuse to cooperate (DD).

Based on ethnocentric model we can basically distinguish two categories of knowledge spillovers: The supplemental and the complementary, their role being to higher the value of the technology transferred through FDI. Their size depends on the ability of individual learning, but also of the existing technology gap.

4. Further research and conclusions

As a conclusion we want to highlight the importance of human skills and behavior pattern preceding FDI inflows in achieving a knowledge spillover effect. Our rresearch will be continued in two major directions: using agent-based modeling with information asymmetry and technological gap with on the one hand, and on the other hand ABM use based on empirical results of the social-media poll. We will try to find out if there is any influence of multinational corporation standard of behavior on the technology acceptance model in developing countries. Not in the last we will try to assess the crowding-out effect on knowledge spillover potential of FDI inflows, using both ABM and technology acceptance model.

References

Branstetter, L. (2006) "Is foreign direct investment a channel of knowledge spillovers? Evidence from Japan's FDI in the United States.", Journal of International Economics 68 (2006) 325-344

Chang, C., Chen, S. and McAleer, M. (2012) "Globalization and knowledge spillover: international direct investment, exports and patents". Economics of Innovation and New Technology, Taylor & Francis Journals, vol. 22(4), pages 329-352, June

Helpman, E. 1984. "A simple theory of international trade with multinational corporations." Journal of Political Economy 92(3): 451–471.

Krammer, S. (2013) "Assessing the relative importance of multiple channels for embodied and disembodied technological spillovers". MPRA Paper No. 53676. http://mpra.ub.uni-muenchen.de/53676/

Markusen, James R. 1984. "Multinationals, multi-plant economies, and the gains from trade." Journal of International Economics 16(3–4): 205–226.

Markusen, James R and Venables, AJ. (1998) "Multinational firms and the new trade theory" Journal of International Economics 46 (1998) 183–203

Naoto, J. and Zhang, X, "Innovation in the host country and the structure of foreign direct investment: evidence from Japanese multinationals".(2013) RIETI Discussion Paper 13-E-060

Protsenko, A. (2003) "Vertical and horizontal foreign direct investments in transition countries". Inaugural-Dissertation zur Erlangung des Grades Doctor oeconomiae publicae (Dr. oec. publ.) an der Ludwig-Maximilians-Universitat Munchen. http://edoc.ub.uni-muenchen.de/2105/1/Protsenko_Alexander.pdf

Ramondo, N., Rappoport, V. and Ruhl, Kim J. "Horizontal and vertical FDI: revisiting from US multinationals"(2011) http://www.stern.nyu.edu/cons/groups/content/documents/webasset/con_033837.pdf

Ramondo, N., Rappoport, V. and Ruhl, Kim J. "Horizontal and vertical FDI: revisiting from US multinationals"(2014) http://personal.lse.ac.uk/rappopor/papers/VerticalHorizontal.pdf

Roording, N. and deVaal, A. (2010) "Does horizontal FDI lead to more knowledge spillovers than vertical FDI?" NiCE Working Paper 10-101, http://www.ru.nl/nice/workingpapers

Stancik, J. (2007) "Horizontal and Vertical FDI Spillovers:Recent Evidence from the Czech Republic" Working Paper Series ISSN 1211-3298 CERGE-EI Prague, September

Stonedahl, F. and Wilensky, U. (2008). NetLogo Diffusion on a Directed Network model. http://ccl.northwestern.edu/netlogo/models/DiffusiononaDirectedNetwork. Center for Connected Learning and Computer-Based Modeling, Northwestern University, Evanston, IL.

Wilensky, U. (1999). NetLogo. http://ccl.northwestern.edu/netlogo/. Center for Connected Learning and Computer-Based Modeling, Northwestern University, Evanston, IL.