Available online at www.sciencedirect.com

ScienceDirect

Procedia Economics and Finance 20 (2015) 544 – 552

Procedia Economics and Finance

www.elsevier.com/locate/procedia

7th International Conference on Globalization and Higher Education in Economics and Business Administration, GEBA 2013

Assessing the magnitude of globalization-induced technology flows in expanded EU-sample: a multi-channel approach

Paula Puskarova[a,*]

[a]*Institute for Economics and Management, University of Economics in Bratislava, Dolnozemska cesta 1/b, Bratislava 85235, Slovakia*

Abstract

The paper is devoted to exploration of globalization impact on the Total Factor Productivity on selected EFTA and EU member and candidate countries. Based on the constructed longitudinal data, we conclude that globalization spurs TFP with overall elasticity more than one. Interferences report that when controlling for changes in domestic R&D expenditures and social changes the largest part of the overall impact is imputable to import. Furthermore, our results suggest that social manifestations of globalization might be at least as important as R&D expenditures in all sampled social regimes except the liberal one.

Peer-review under responsibility of the Faculty of Economics and Business Administration, Alexandru Ioan Cuza University of Iasi.

Keywords: technology; total factor productivity; globalization; trade; foreign direct investments; social capital; human capital

1. Introduction

Globalization as a multi-faceted phenomenon has been in the center of economic research uninterruptedly throughout the last decades. Although its impact on economic growth might have been viewed as positive at first, growing body of empirical literature, mostly from the 80's, on rising inequality and divergence among as within the economies challenged this conventional wisdom. In this context, the impact of brain drain (Bénassy and Brezis, 2013), institutional and social capabilities (Akçomak and terWeel, 2009; Lundvall, 2010) has been stressed.

* Corresponding author. Tel.: +421-2-6729-5172; fax: +421-2-6729-5101.
E-mail address: paula.puskarova@euba.sk

Peer-review under responsibility of the Faculty of Economics and Business Administration, Alexandru Ioan Cuza University of Iasi.
doi:10.1016/S2212-5671(15)00107-0

The main focus of the paper is on EU28 member, EFTA (Norway, Switzerland) and selected EU candidate (Macedonia, Iceland, Turkey) countries. Obviously, the sample is featured by some diversity – innovation leaders vs. innovation laggards (Puskarova, 2012), developed vs. countries in transition – as well as by similarities resulting mainly from free trade area, EU integration and growing law harmonization. Furthermore, considering geographical localization of technology diffusion (Keller, 2010), and the concentration pattern of innovation leaders and laggards in the EU, we may expect significantly high technology flows within the sample.

When constructing the panel data, we include KOF indices that capture the overall and each of the three dimensional effects of globalization in a single proxy. However, we go further and isolate the effects on three flows the globalization is commonly referred to (flows of goods and services, flows of labor, flows of capital). We control for domestic R&D funding as well as for social capabilities. We suggest these social capabilities to be referred to as social capital, and to test their impact in various social regimes. This approach is completely novel to the literature, as it is also the testing of simultaneous effects of the three channels of technology flows.

The paper is structured as follows: first, we explore the current research on the topic. Subsequently, we demonstrate the construction of longitudinal data and the model. Then the estimation results are presented and confronted with some results from other studies. The Conclusion summarizes the key findings of the paper.

2. Literature

In this paper, we are not as much interested in the overall impact of globalization on the Total Factor Productivity (TFP), but rather in the impact of its selected dimensions, and determination which ones (one) prevail(s) in magnitude and direction. Following the narrow understanding of the concept, globalization might be characterized as rising openness to international flows. Thus, we dismantled globalization into flows of goods and services, flows of capital and flows of labor, and the residual value where we assume changes in social capital to be dominant (over e.g. changes in institutions). The decomposition approach follows conventional wisdom and accords also with the composition of KOF indices.

2.1. Impact of trade

Recent literature exhibits booming evidence of trade impact on TFP. Limiting the research to the EU area, the impact is positive and outperforms in magnitude other channels of technology diffusion (Krammer, 2013).

In a similar vein, Mendi (2007) finds out that the technology gains from import differ by overall economic output and domestic innovation intensity. The world innovation-leading G7 countries seemingly do not benefit, however, OECD-not-G7 countries are able to collect significant gains through this channel.

Bottazzi and Peri (2003) support the thesis at the regional level, and Soukiazis and Antunes(2012) report positive and significant interaction between trade and patents as an alternative proxy of technology (Keller, 2010; Puskarova, 2012).

Furthermore, Miller andUpadhyay(2000) conclude that it is trade orientation (share of value-added trade) that matters for TFP growth.

2.2. Impact of foreign direct investments

The impact of Foreign Direct Investments (FDI) on TFP is mixed. Earlier studies on EU transition countries Damijan et al. (2003) declare that this is imputable to country bias – the effect is significant and positive in Hungary, Estonia and Slovenia, and significant and negative in the Czech Republic and Poland. Barbosa and Eiriz (2009) find no evidence of either horizontal or vertical spillovers from FDI; Ahmed (2012) finds them negative. However, a broad strand of literature supports the hypothesis of positive and significant efficiency gains through the conduit of FDI (Keller, 2010; Kemeny, 2010; Krammer, 2013), or more broadly, from openness to international capital flows (Kose et al., 2009).

The meta-analysis of Hanousek et al. (2011) reports direct and indirect FDI effects weakening over time and finds the reason in a publication bias and the fact that more sophisticated methods and more controls can be used once a sufficient time span is available. They further comment that panel studies are likely to find relatively lower

FDI spillover effects. Another meta-analysis (Irsova and Havranek, 2013) yields evidence that horizontal spillovers are on average zero, and that their sign and magnitude depend on the characteristics of the domestic country and foreign investors that have to dispose of technology advantage vis-à-vis the host country.

2.3. Impact of human capital migration, social and institutional capabilities

Lately emerged studies suggest that the positive FDI externalities on TFP are imputable to employees' migration within the multinational corporation (Ford and Rork, 2011; Simonen and McCann, 2008), or newly-formed communication channels (Javorcik and Spatareanu, 2008). Another strand of literature points out the theorem of migration-intensified trade based on the theorem that migration lowers informal barriers to trade (Combes et al., 2005; Gould, 1994; Javorcik et al., 2011). Nonetheless, inclusion of human capital into a growth regression is justified by the theorem of growing returns to human capital investments, aka their non-negligible role in convergence trajectories (Cuaresma et al., 2013).

On the case of the Portuguese economy, Teixeira and Fortuna (2010) conclude that technology gains from FDI seems to be strongly dependent on institutional circumstances, namely those related to human capital investments and incentives. The hypothesis of dependency of TFP growth on institutional and social capabilities is well-known to the literature. Following some earlier work ofAbramovitz (1986), FDI and trade may not discriminate well between countries that escaped the low development trap and those that continue to be poor (Fagerberg and Srholec, 2008; Rodrik et al., 2004). Even though there is some controversy in the issue (following the results of Woo (2009)), the role of government and financial institutions should not be neglected what is the core essence of the concept of national systems of innovation (Fagerberg et al., 2010; Lundvall, 2010).

In this paper, we suggest to draw special attention to social capabilities, or more precisely, to globalization-induced changes in social capital as we expect that migration and culture hybridization might depress its stock (Heidenreich, 2003).

3. Data and methods

3.1. Model

We start our model by augmented Cobb-Douglas production function (Equation 1).

$$Y = Ae^{\lambda} L^{\alpha} K^{1-\alpha} RD^{\psi} SC^{\mu} s_{Glob}^{\phi} \quad (1)$$

where Y stands for aggregate output in the economy (Gross Domestic Product, GDP), λ is the rate of external technological change, A is the constant. L and K stand for labor and physical capital employed in the production,respectively. RD denotes all research and development expenditures that include all domestic R&D investments (*DRD*), as well as funding of domestic R&D coming from abroad (*FRD*). SC represents social capital accumulated in the economy and its final effect is defined by the volume of social capital accumulated within the economy (more or less constant due to its long-run formation with respect to traditions, values, culture) and by its transitive element that emerges with migration, culture mixing, etc. Following this assumption, we suggest attributing this transitive element solely to impact of globalization denoted by *Sglob*.

Decomposition of the globalization effect follows the Equation 2. Trade (*T*) captures flows of goods and services, *FDI*stand for flows of capital, and migration of human capital (*HCM*) captures the relevant part of flows of labor. In addition, we control for R&D expenditures coming from abroad (*FRD*) and changes in social capital(*dSC*). *FRD* reflect possibilities to accumulate capital for domestic R&D activities from abroad and in the EU context, this measure indicates also ability to participate in EU structural funding. Difference in social capital (*dSC*), on the other hand, captures the social reaction to globalizing society and hybridization of cultures Heidenreich (2003).

$$s_{glob} = FRD^{\psi_2} dSC^{\mu_2} T^{\varphi_1} FDI^{\varphi_2} HCM^{\varphi_3} \quad (2)$$

Substituting *Sglob* in Equation 1, resolving it for *TFP*, and taking logarithms gives us the following equation form:

$$\ln TFP = \lambda + \psi \ln RD + \varphi_1 \ln T + \varphi_2 \ln FDI + \varphi_3 \ln HCM + \mu \ln SC \quad (3)$$

3.2. Data and their mutual interference

The panel is constructed on time span through 1995-2010. In the same vein as Lundvall (2010), we proxy trade by import (*impy*), and employ inward FDI stock instead of flows since FDI tend to generate technology gains throughout their life and not just in the first year of their provision (*fdistock*). Due to data availability constraints, human capital mobility is measured by a proxy of university student mobility (*hcm*). Following the empiric suggestions (Dreher et al., 2008b; Gemmel et al., 2008), all these proxies are denominated in GDP in order to account for relative openness of the economy. The data on import and FDI was derived from UNCTAD Stat and data on migration from Eurostat.

Recently developed KOF indices (Dreher, 2006; revised by Dreher et al., 2008a) capture globalization more comprehensively and can be acquired freely from ETH Zürich at http://globalization.kof.ethz.ch/. The overall score in KOFglob is calculated based on three sub-indices:

- KOFecon, which reflects openness to international flows of goods and services, capital and labor (KOFflows), as well as tariff and non-tariff restrictions on these flows (KOFrestrictions)
- KOFsoc, which accounts for social manifestations of globalization namely international information flows (KOFinfo), emerging multiculturalism, aka culture proximity (KOFcultpro), and intensity of foreign contacts (KOFcontact), and
- KOFpol, which stands for various political facets of globalization (e.g. policy emulation, integration and contracts).

The data on research and development (R&D) expenditures was extracted from Eurostat Science and Technology Database as GERD in purchasing power parity per capita in EUR 2000. TFP has been calculated following Dujava (2012).For proper distinction, data innatural logarithm formis denoted by lowercase letters.

Table 1.Correlation interference

	tfp	rd	impy	fdistock	hcm	kofsoc
tfp	1.0000					
rd	.7967	1.0000				
impy	-.1085	-.0994	1.0000			
fdistock	.1366	.2205	.6585	1.0000		
hcm	.3765	.1059	.3637	.2865	1.0000	
kofsoc	.6421	.7702	.0442	.3614	.1273	1.0000

As declared by the correlation matrix (Table 1), *tfp* correlates most closely with *rd* and *kofsoc*. The strong correlation between trade and FDI is also not surprising. As Anwar and Nguyen (2011) report, many small or middle-size economies open up in order to receive FDI and in such way, to foster growth. However, FDI are designed not to serve only the host (possibly small) demand, but are most usually export-oriented, aka producing solely intermediate products. In such circumstances, FDI and trade demonstrate high correlation.

4. Model estimations

4.1. Basic model

Results from first estimations yield impact of technology gains from globalization with elasticity higher than 1.

Table 2.Regression interference, basic model estimations

	tfp_model1	tfp_model2	tfp_model3	tfp_model4	tfp_model5	tfp_model6	tfp_model7
kofglob	1.016***						
	(15.91)						
rd	.117***	.213***	.171***	.221***	.163***	.192***	.137***
	(8.27)	(15.82)	(11.68)	(16.81)	(11.41)	(11.80)	(8.52)
fdistock			.0834***		.0295**		.0265**
			(10.86)		(3.28)		(2.97)
hcm				.110***	.0952***		.0884***
				(8.52)	(8.06)		(7.48)
impy		.278***			.212***		.210***
		(8.92)			(6.77)		(6.79)
kofsoc						.530***	.211***
						(7.34)	(3.36)
C	-3.054***	-2.001***	.800***	.750***	1.135***	-1.315***	.376
	(-13.14)	(-20.53)	(12.40)	(10.93)	(14.50)	(-5.03)	(1.57)
N	450	449	449	372	371	450	371
R^2	.7045	.6024	.6310	.5941	.6743	.5792	.6849
ρ-stat	.9604	.9469	.9473	.9354	.9684	.9280	.9698

Notes: the dependent variable is *tfp*; *, **, and *** indicate parameters that are significant at 10%, 5% and 1% level respectively; standard errors are reported in parentheses below the coefficients; all estimation models contain fixed effects.

Following up and decomposing the impact, all the explanatory variables remain positive and highly significant. The elasticity on import accounts for more than 0.2 what is comparable to the elasticity of R&D. FDI stock seems to lose its power when controlling for trade, but stays positive. The human capital mobility emerges as a highly significant conduit of technology explaining app. 10% of the TFP growth. These results are in accordance with the previous evidence (Krammer, 2013).

After controlling for KOFsoc, the magnitude of estimated elasticities does not change. However, the impact of KOFsoc deteriorates compared to its estimated value in Model 6 (Table 2) implying, thus, the overall impact of KOFsoc to be partially attributable to other channels of technology flows. The estimated elasticity of KOFsoc in Model 7 is the same as Ishise and Sawada (2009) report in their model of aggregate returns to social capital.

Nevertheless, the estimated magnitude of this proxy may still be considered surprisingly large. In the light of scarce evidence of social impact on TFP values, we suggest further research on this term.

4.2. Going further – transition countries vs. innovation leaders

In this section, we proceed to discrimination between the effects of globalization-induced societal changes captured here in KOFsoc in social regimes. We draw on their definition by Esping-Andersen (1990), but upgrade it with southern regime following Ferrera (1996). Furthermore, we pool all the other countries into one group calling it *transition* countries where their social regime is disregarded as insignificant. We decided to do so as throughout our time span 1995-2010, their social regimes underwent large restructuring phase.

Within a social regime, countries share certain social preferences, degree of social protection, and most commonly, yield certain level of social capital stock. Thus, we split the countries as follows:

- social-democratic regime (*socdem*): Denmark, Finland, Iceland, Norway, Sweden
- conservative regime (*cons*): Austria, Belgium, France, Germany, Italy, Luxembourg, Netherlands, Switzerland
- liberal regime (*lib*): Ireland, United Kingdom
- southern regime (*south*): Cyprus, Greece, Malta, Portugal, Spain
- regime in transition (*trans*): Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Macedonia, Poland, Romania**,** Slovakia, Slovenia, Turkey.

We expect to detect here two antagonistic innovation systems, one dependent on individualism spurred by commonly accepted economic liberalism (liberal one) and another one anchored in tradition of inequality-adverse (inequality-fighting) social system nurtured by common trust, tax discipline and efficiency (social-democratic one). The both differ considerably in the social capital accumulation (Ishise and Sawada, 2009; Lundvall, 2010).

First, we run the regressions for the overall impact on social regimes (Table 3). Estimated elasticities report high impact of globalization on technology flows into the liberal and transition countries and relatively small into other countries. Impact on transition countries can be decomposed using the variables in Table 4.

However, impact of globalization on liberal countries is difficult to decompose given our variables. KOFsoc proves to be significant, but also contradictory working what might be imputable to strong domestic production of technology that leak to other countries. In addition, the tradition of liberalism does not get along well with high degree of social capital what might stir the picture as well. However, the distortion might be alleviated by expanding the number of observations.

Table 3.Estimations for social regimes, KOFglob

	tfp_socdem	tfp_cons	tfp_lib	tfp_south	tfp_trans
rd	.235***	.155***	.190**	.00605	.155***
	(8.51)	(6.40)	(3.46)	(0.40)	(8.13)
kofglob	.273	.270*	1.232*	.265**	1.165***
	(1.18)	(2.01)	(2.26)	(3.25)	(15.22)
C	-.328	0.0363	-4.336	.865**	-3.991***
	(-.35)	(.07)	(-1.96)	(2.88)	(-14.60)
N	68	93	32	76	181
R^2	.6609	.5150	.6261	.3318	.8552

Notes: the dependent variable is *tfp*; *, **, and *** indicate parameters that are significant at 10%, 5% and 1% level respectively; standard errors are reported in parentheses below the coefficients; all estimation models contain fixed effects.

Table 4 and Table 5 yieldmore detailed interference results for social regimes and the pooled sample of transition countries. In case of innovation-leading regimes, we omitted human capital mobility and FDI stock as they both emerged insignificant in the regressions. That makes sense as both are considered to be more important in the transition phase or more generally, for relatively innovation-scarce countries. As country becomes more active in own innovation production, human capital (measured here as university student mobility) seems not to find much logic in moving abroad and obtain knowledge there. The nature of FDI differs also considerably conditional onif they flow into innovation-intensive or innovation-scarce countries.FDI into innovation-scarce countries bringforeign, already developed technologies while investments into innovation-intensive countries spur domestic development of technologies and thus, impact of foreign capital inflows on TFP is not visible under FDI, but rather under R&D and patent data.

Further toour results as demonstrated in Table 4 and Table 5, social capital stock captured in KOFsoc index is highly significant and large in magnitude in both social-democratic and conservative regime. The same applies to transition countries where the elasticity of KOFsoc accords with estimations of Ishise and Sawada (2009). The

elasticity of domestic R&D ranges from app. 0.04 (southern) through app. 0.1 (conservative) and app. 0.2 (transition, social-democratic) to 0.419 (liberal regime).

Table 4. Estimations for innovation-leading social regimes

	tfp_socdem	tfp_cons	tfp_lib	tfp_socdem	tfp_cons	tfp_lib
rd	.226***	.0982***	.419***	.130***	.0421	.417***
	(9.10)	(3.49)	(6.30)	(3.90)	(1.67)	(6.25)
kofsoc	.325*	.761***	-.776**	.402**	.694***	-.823**
	(2.45)	(4.03)	(-2.80)	(3.32)	(3.43)	(-2.91)
impy				.201***	.107**	.0899
				(3.92)	(2.99)	(0.91)
C	-.491	-1.770*	3.164**	0.00839	-1.040	3.454**
	(-.92)	(-2.48)	(3.38)	(.02)	(-1.18)	(3.49)
N	68	93	32	68	92	32
R^2	.6842	.5739	.6542	.7486	.7159	.6646

Notes: the dependent variable is *tfp*; *, **, and *** indicate parameters that are significant at 10%, 5% and 1% level respectively; standard errors are reported in parentheses below the coefficients; all estimation models contain fixed effects.

Table 5. Estimations for innovation-lagging social regimes

	tfp_south	tfp_trans	tfp_south	tfp_trans	tfp_south	tfp_trans
rd	.0400**	.245***	.0382*	.206***	.0202	.178***
	(2.69)	(10.18)	(2.44)	(9.97)	(0.79)	(10.40)
kofsoc	.0266	.746***	.0264	.546***	.195*	.232**
	(0.40)	(7.31)	(0.39)	(6.14)	(2.60)	(2.95)
impy			.0150	.379***	-.0155	.246***
			(0.40)	(8.44)	(-0.37)	(5.94)
?distock					.00243	.055***
					(0.12)	(3.89)
hcm					-.132***	.086***
					(-4.22)	(6.22)
C	1.737***	-2.543***	1.762***	-1.287***	1.218***	-.151
	(7.25)	(-6.94)	(7.07)	(-3.77)	(4.36)	(-.52)
N	76	181	76	181	57	154
R^2	.2298	.7382	.2316	.8168	.3467	.8757

Notes: the dependent variable is *tfp*; *, **, and *** indicate parameters that are significant at 10%, 5% and 1% level respectively; standard errors are reported in parentheses below the coefficients; all estimation models contain fixed effects.

5. Conclusion

This paper yields evidence of multiplication effect of technology flows spurred by globalization. Our approach suggests the technology conduits to be trade, foreign direct investments and human capital migration and to control for domestic R&D performance and social capital stock. We assume that impact of globalization takes also the form of social reaction to cultural collision, as well as form of increased access to international R&D funding. Nevertheless, proper isolation of these manifestations of globalization goes beyond the scope of this paper.

Analysis of panel data on selected EU and EFTA member and candidate countries employing the fixed effects estimator yields convincing results of positive and significant impact of globalization in overall, as well as in terms of particular conduits of technology transfer. The estimations justify the magnitude of the impact known from some earlier studies.

After confronting innovation leaders and transition countries, we find lower (still positive though) evidence of overall globalization impact on social-democratic, conservative and southern regimes. In case of all these regimes, FDI stock and human capital mobility do not emerge as significant. Nonetheless, the impact of social capital as estimated is significant, positive and large even when controlling for import and R&D.

Acknowledgements

The author gratefully acknowledges the support of the project VEGA No. 1/0340/11.

References

Abramovitz, M., 1986. Catching up, forging ahead, and falling behind. Journal of Economic History 46, 386-406.

Ahmed, E.M., 2012. Are the FDI inflow spillover effects on Malaysia's economic growth input driven? Economic Modelling 29(4), 1498-1504.

Akçomak, I.S., terWeel, B., 2009. Social capital, innovation and growth: Evidence from Europe. European Economics Review 53, 544-567.

Anwar, S., Nguyen, L.P., 2011. Foreign direct investment and trade: The case of Vietnam. Research in International Business and Finance 25, 39-52.

Barbosa, K.D., Eiriz T.W., 2009. Linking corporate productivity to foreign direct investment: An empirical assessment. International Business Review 18, 1-13.

Bénassy, J.-P., Brezis, E., S. 2013. Brain drain and development traps. Journal of Development Economics 102, 15-22.

Bottazzi, L., Peri, G., 2003. Innovation and spillovers in regions: Evidence from European patent data. European Economic Review 47 (4), 687-710.

Combes, P.-P., Miren, L., Mayer, T., 2005. The trade-creating effects of business and social networks: evidence from France. Journal of International Economics 66 (1), 1–29.

Cuaresma, J.C., Havettova, M., Labaj, M., 2013. Income convergence prospects in Europe: Assessing the role of human capital dynamics. Economic Systems (in press), http://dx.doi.org/10.1016/j.ecosys.2013.02.004.

Damijan, J., Knell, M., Majcen, B., Rojec, M., 2003. Technology transfer through FDI in top-10 transition countries: how important are direct effects, horizontal and vertical spillovers? William Davidson Institute Working Paper 549, Ann Arbor, MI.

Dreher, A., 2006. Does Globalization Affect Growth? Evidence from a new Index of Globalization. Applied Economics 38 (10), 1091-1110.

Dreher, A., Sturm, J., Ursprung, H. W., 2008a. The impact of globalization on the composition of government expenditures: Evidence from the panel data. Public Choice 134, 263-292.

Dreher, A., Gaston, N., Martens, P., 2008b. Measuring Globalisation, Gauging its Consequences. New York, Springer, 2008.

Dujava, D., 2012. Causes Of Lagging Behind Of New Member States Of EU: Empirical Analysis By Montgomery Decomposition, Politickáekonomie, University of Economics, Prague 2, 222-244.

Esping-Andersen, G., 1990. The Three Worlds of Welfare Capitalism. New Yersey : Princeton University Press.

Fagerberg, J., Srholec, M., 2008. National innovation systems, capabilities and economic development. Research Policy 37, 1417-1435.

Fagerberg, J., Srholec, M., Verspagen, B., 2010. Innovation and Economic Development, in "Handbook of the Economics of Innovation – Volume 2".In: Hall, B., Rosenberg, N. (Eds.). Elsevier, North Holland, pp. 793-829.

Ferrera, M. 1996. The southern model of welfare in social Europe. Journal of European Social Policy 6 (1), 17-37.

Ford, T. C., Rork, J. C., 2011. Why buy what you can get for free? The effect of foreign direct investment on state patent rates. Journal of Urban Economics 68, 72-81.

Gemmel, N., Kneller, R., Sanz, I., 2008. Foreign investment, international trade and the size and structure of public expenditures. European Journal of Political Economy 24, 151-171.

Gould, D.M., 1994. Immigrant links to the home country: empirical implications for U.S. bilateral trade flows. Review of Economics and Statistics 76, 302–316.

Hanousek, J., Kocenda, E., Maurel, M., 2011. Direct and indirect effects of FDI in emerging European markets: A survey and meta-analysis. Economic Systems 35(3), 301-322.

Heidenreich, M., 2003. Regional inequalities in the enlarged Europe. Journal of European Social Policy 13 (4), 313-333.

Irsova, Z., Havranek, T., 2013. Determinants of horizontal spillovers from FDI: evidence from a large meta-analysis. World Development 42, 1-15.

Ishise, H., Sawada, Y., 2009. Aggregate returns to social capital: Estimates based on the augmented augmented-Solow model. Journal of Macroeconomics 31, 376-393.

Javorcik, B., Ozden, C., Spatareanu, M., Neagu, C., 2011. Migrant networks and foreign direct investment. Journal of Development Economics 94, 231-241.

Javorcik, B., Spatareanu, M., 2008. To share or not to share: Does local participation matter for spillovers from foreign direct investment? Journal of Development Economics 85, 194-217.

Keller, W., 2010. International trade, foreign direct investment, and technology spillovers, in "Handbook of the Economics of Innovation – Volume 2". In: Hall, B., Rosenberg, N. (Eds.). Elsevier, North Holland, pp. 793-829.

Kemeny, T., 2010. Does Foreign Direct Investment Drive Technological Upgrading? World Development 38(11), 1543–1554.

Kose, M.A., Prasad, E.S., Terrones, M.E., 2009. Does openness to international financial flows raise productivity growth? Journal of International Money and Finance 28(4), 554-580.

Krammer, M. S. S., 2013. Assessing the relative importance of multiple channels for embodied and disembodied technological spillovers. Technological Forecasting & Social Change, http://dx.doi.org/10.1016/j.techfore.2013.02.006, in press

Lundvall, B.-A., 2010. National Systems of Innovation: Toward a Theory of Innovation and Interactive Learning. Anthem Press, New York.

Mendi, P., 2007. Trade in disembodied technology and total factor productivity in OECD countries. Research Policy 36, 121-133

Miller, S.M., Upadhyay, M.P., 2000. The effects of openness, trade orientation, and human capital on total factor productivity. Journal of Development Economics 63, 399–423.

Puskarova, P., 2012. Innovation performance of V4 countries, in "EDAMBA 2012: proceedings of international scientific conference for doctoral students and young researchers: 22nd November, 2012 Bratislava". In:Machová, M., Petianová, A. (Eds.). Publishing House EKONÓM, Bratislava, pp. 972-985.

Rodrik, D., Subramanian, A., Trebbi, F., 2004. Institutions rule: The primacy of institutions over geography and integration in economic development. Journal of Economic Growth 9, 131-165.

Simonen, J., McCann, P., 2008. Firm innovation: the influence of R&D cooperation and the geography of human capital inputs. Journal of Urban Economics 64, 146–154.

Soukiazis, E., Antunes, M., 2012. Foreign Trade, Human Capital and Economic Growth: An Empirical Approach for the EU Countries. The Journal of International Trade & Economic Development: An International and Comparative Review 21 (1), 3-24.

Teixeira, A., Fortuna, N., 2010. Human capital, R&D, trade, and long-run productivity.Testing the technological absorption hypothesis for the Portuguese economy, 1960-2001. Research Policy 39(3), 335-350.

Woo, J., 2009. Productivity growth and technological diffusion through foreign direct investment. Economic Inquiry 47(2), 226-248.