



Cooperation between FDI and the Domestic Innovation Systems

Evidence from East Germany
using a new FDI database

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The motivation of analysis

- Political assumption that FDI spurs employment, growth, and economic development
- In formally socialist economies, development depends foremost on technology catch-up. This is equally true for East Germany
- Hence, massive public investments were made in East Germany to make this region more attractive to foreign (including West German) investors
 - foreign investment subsidies
 - public investment into science and technology
 - public investment into infrastructure

The motivation of analysis

- Yet: technology transfer and spillovers may not always materialise, mixed experience at best

- Hence, we have to ask
 - Has this massive public investment paid off?
 - Do foreign investors locate any technological activities in East Germany?
 - Is the East German innovation system attractive enough?
 - Do incumbent East German firms benefit from FDI in terms of technology transfer and spillovers?
 - Are there replacement effects? Are there “monopoly-effects” with/or abuse of market power?

The research questions

Two overarching research questions

- What kind of subsidiaries cooperate most intensively with their local host economy innovation system?
- What are the locational framework conditions for intense cooperation?

The new FDI database

- To provide some answers to those questions, we use a new FDI database, generated in 2006/2007 by a European consortium, led by the IWH

- It provides firm-specific data on FDI subsidiaries
 - builds upon a database generated in 2002/2003
 - comparable across East Germany, Poland, Romania, Slovenia, Croatia
 - some correspondance to a survey in Estonia
 - builds upon the theoretical literature on
 - role of FDI in innovation systems
 - corporate governance in foreign invested firms
 - is representative (at least for the East German sample)

Theory and empirical experience

- Innovativeness of foreign subsidiaries depends not only on its own strengths, but also with the interfaces with firms, universities, research laboratories, suppliers, and customers (Powell et al. 1996, Chesbrough 2003, and others)
- Regional innovation systems are a valuable conceptualisation: evolutionary assumptions of cumulativeness of innovations that require collective efforts of actors and institutions from the private and public sectors for the generation, modification, and diffusion of new technologies (Cooke et al. 1997, Cantwell and Iammarino 2003, and others)

Theory and empirical experience

- Positive relationship between foreign subsidiaries' technological capability and the existence of local external innovation networks (Holm and Fratocchi 1998, Birkinshaw and Ridderstrale 1999, Pearce and Papanastassiou 1999; Yamin and Otto 2004, and others)
- FDI with exploitive vs. explorative strategy (Frost 2001): the former reinforces the existing knowledge base of the MNC, in the latter, existing search routines are opened to host economy knowledge base (see also Zander 1999, Cantwell and Piscitello 1999, Cantwell and Mudambi 2005, and other IBs)

Theory and empirical experience

- Empirical experience on FDI in East Germany
 - East German innovation system is seldomly considered able to satisfy foreign investors' requirements for the location of technological activities (Koschatzky et al. 2006)
 - FDIs have more R&D and innovation as compared to West German investors and East German owned enterprises
 - but: this is partially explained by sectoral specialisation (Günther and Gebhardt 2005, Belitz et al. 2007)
 - controlling for sectoral and firm specific effects, IPRs have negative effect on domestic firms' innovation activity (Günther and Peglow 2007)
 - Technology spillovers from FDI to East German firms is contradictory (Günther and Lehman 2004, Peri and Urban 2006)

Summary of results of empirical analysis

- We test the assumption that technological spillovers from FDI to East German firms is conditional on FDI's own technological activities (e.g. mandate) as well as the embeddedness of these activities into the East German innovation system

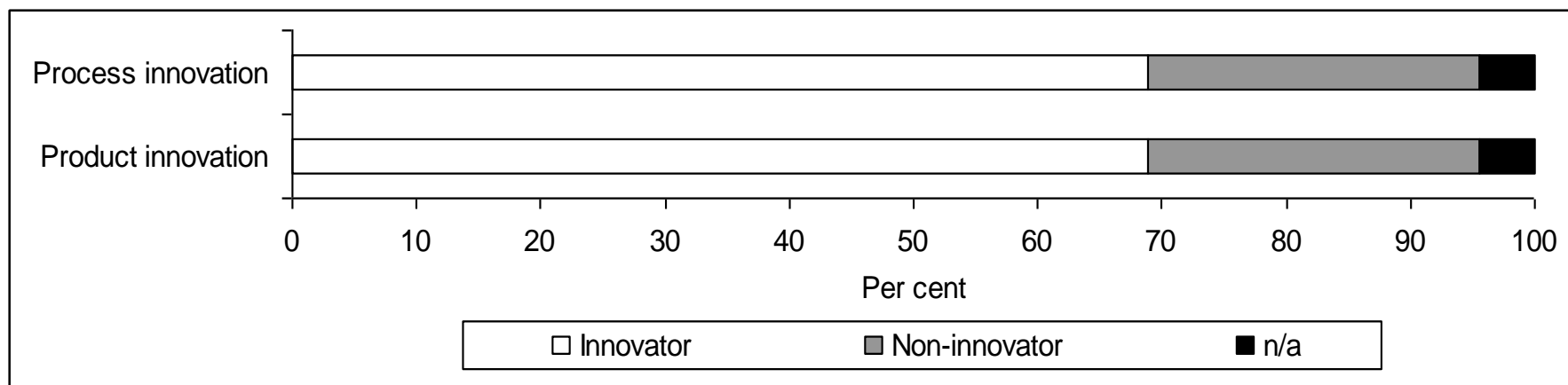
- We find that
 - particularly technology-active subsidiaries (R&D, innovation) grant their local networks of local suppliers, local customers, and local scientific institutions a more important role for their own innovation and R&D activities than less technology active subsidiaries (technology, knowledge seeking)

Summary of results of empirical analysis

- We find that
 - technologically active subsidiaries equally appear to play a more important role for technological activity within the East German regional innovation system than less technology active subsidiaries

- If these results were not statistically significant, then we would have to conclude that FDI subsidiaries in East Germany do not interact with the local innovation system even if they were technologically active, FDI would then solely service the MNCs own network. But this is not the case!

Summary of results of empirical analysis

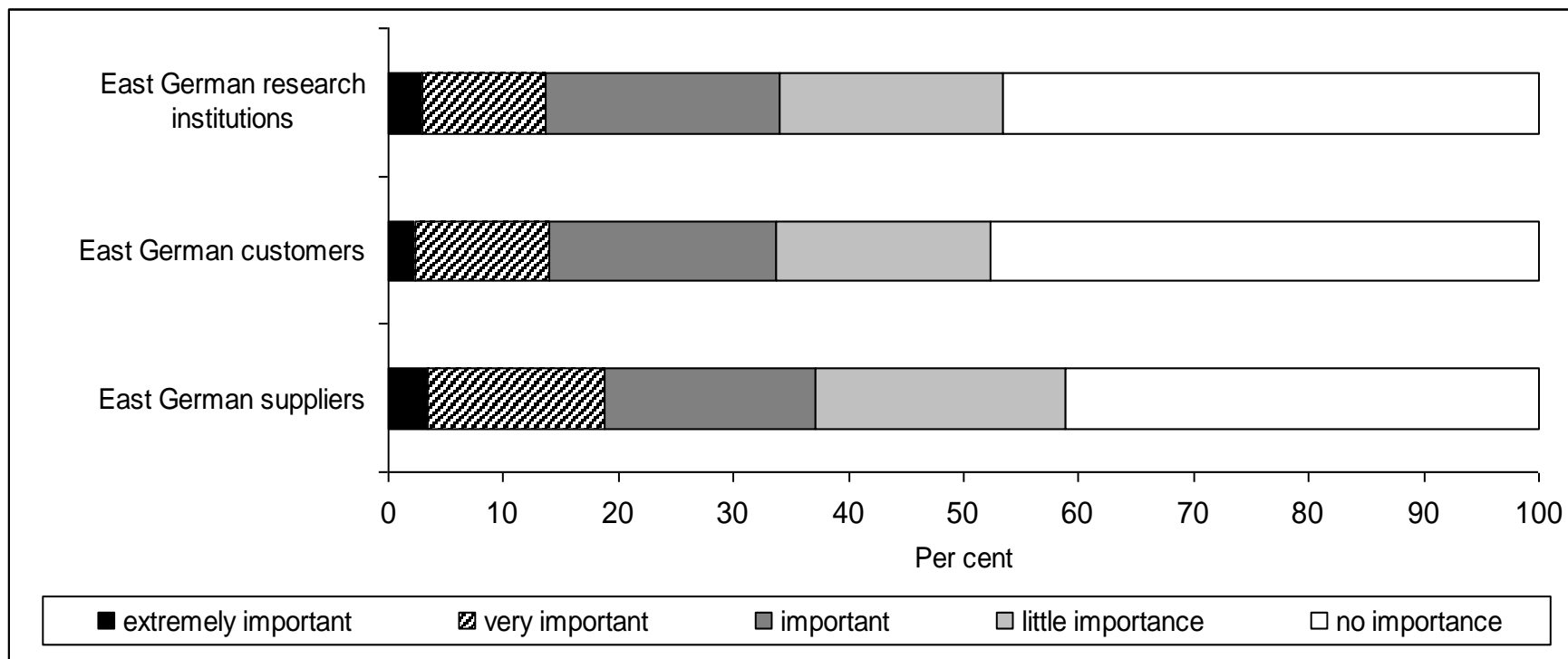


Note: An Innovator has produced at least one product (or one process) innovation between 2002 and 2005. Bars represent per cent shares of foreign subsidiaries in the IWH FDI database.

Source: IWH FDI-database, own calculations.

Figure 1: Innovators and non-innovators (product and process) amongst foreign subsidiaries in manufacturing industries in East Germany, 2005

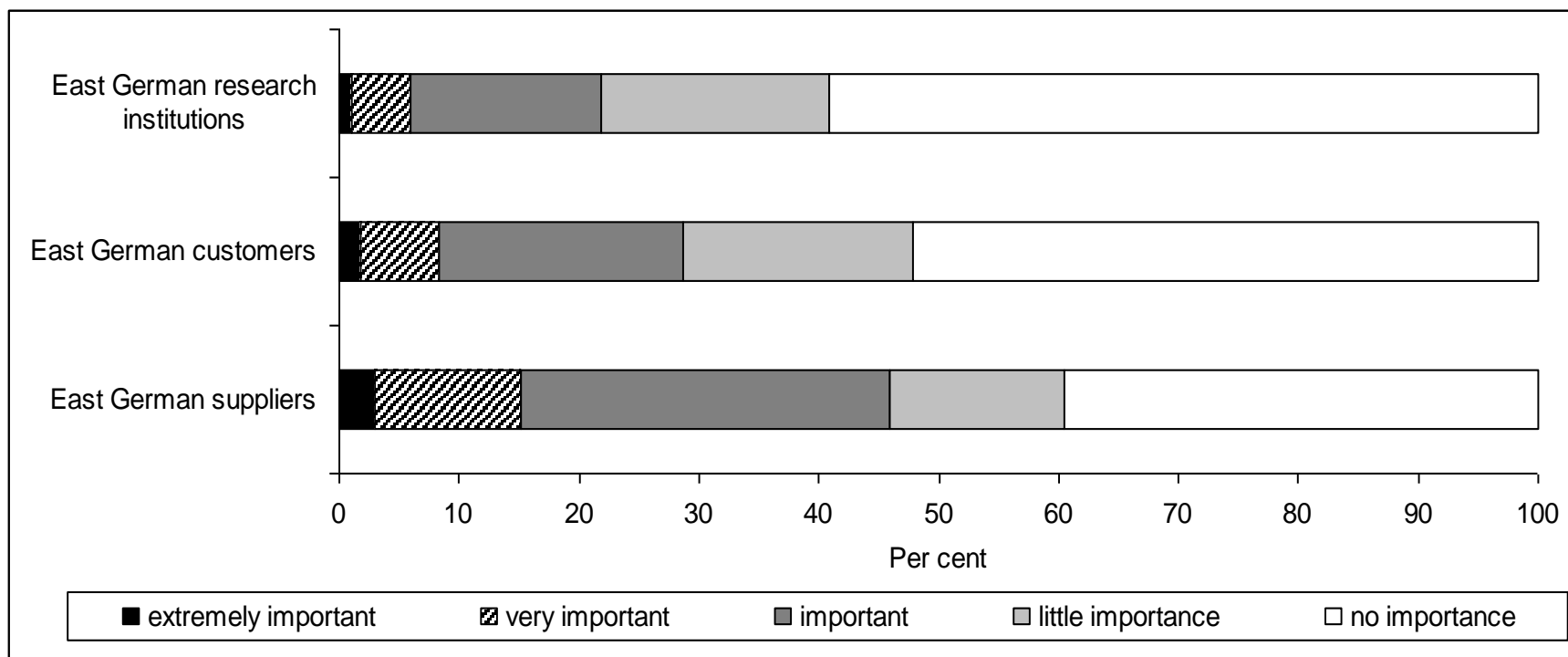
Summary of results of empirical analysis



Source: IWH FDI-database, own calculations.

Figure 2: Importance of actors of the East German innovation system for technological activities (R&D and innovation) of foreign investors (*technology seeking*), 2005

Summary of results of empirical analysis



Source: IWH FDI-database, own calculations.

Figure 3: Importance of foreign investors for technological activities (R&D and innovation) of actors of the East German innovation systems (*spillover potential*), 2005

Summary of results of empirical analysis

Table 1: Correlation between importance of actors of the East German innovation system for technological activities in foreign subsidiaries (*technology seeking*) and subsidiaries' R&D intensities, 2005

	East German customers	East German suppliers	East German research institutions
R&D employment share	0.159**	0.144*	0.387***
R&D expenditure share	0.186**	0.213**	0.155*

Notes: Correlation coefficients according to Spearman-Rho.

*significant on 10%-level, **significant on 5%-level, ***significant on 1%-level.

Source: IWH FDI-database, own calculations.

Summary of results of empirical analysis

Table 2: Mean comparisons between importance of actors of the East German innovation systems for technological activities in foreign subsidiaries (*technology seeking*) and subsidiaries' innovation activities, 2005

	East German customers			East German suppliers			East German research institutions		
	mean	σ	sign.	mean	σ	sign.	mean	σ	sign.
Product innovator	2.15	1.18	.018**	2.32	1.24	.012**	2.20	1.17	.001***
Non-innovator	1.71	1.09		1.86	1.14		1.61	1.07	
Process innovator	2.12	1.15	.070*	2.33	1.22	.009***	2.19	1.18	.002***
Non-innovator	1.82	1.19		1.83	1.17		1.65	1.07	

Notes: Mean-comparison with one-sided t-tests.

*significant on 10%-level, **significant on 5%-level, ***significant on 1%-level.

Source: IWH FDI-database, own calculations.

Summary of results of empirical analysis

Table 3: Correlations between importance of foreign investors for technological activities of actors of the East German innovation system (*spillover potential*) and subsidiaries' R&D intensities, 2005

	East German customers	East German suppliers	East German research institutions
R&D employment share	0.219***	0.137*	-0.012
R&D expenditure share	0.111	0.193**	0.029

Notes: Correlation coefficients according to Spearman-Rho.
 *significant on 10%-level, **significant on 5%-level, ***significant on 1%-level.

Source: IWH FDI-database, own calculations.

Summary of results of empirical analysis

Table 4: Mean comparisons between importance of foreign investors for technological activities of actors of the East German innovation system (*spillover potential*) and subsidiaries' innovation activities, 2005

	East German customers			East German suppliers			East German research institutions		
	mean	σ	sign.	mean	σ	sign.	mean	σ	sign.
Product innovator	1.88	1.07	.409	2.40	1.19	.007***	1.67	0.98	.240
Non-innovator	1.84	1.09		1.89	1.08		1.78	0.98	
Process innovator	1.88	1.04	.428	2.38	1.16	.015**	1.67	0.94	.248
Non-innovator	1,85	1,16		1,93	1,20		1,78	1,08	

Notes: Mean-comparison with one-sided t-tests.

*significant on 10%-level, **significant on 5%-level, ***significant on 1%-level.

Source: IWH FDI-database, own calculations.

Summary of results of empirical analysis

- What kind of subsidiaries cooperate most intensively with their local host economy innovation system?
 - technologically active subsidiaries cooperate most intensively with local host economy innovation system (see above)
 - those active in trade with local customers and suppliers also cooperate more in terms of R&D and innovation with the local innovation system
 - greenfield investments are less likely to cooperate with local innovation system
 - subsidiaries with a high level of absorptive capacity also cooperate more with the local innovation system
 - autonomy, strategic motives (state aid, local knowledge base) is inconclusive

Summary of results of empirical analysis

- What are the locational framework conditions for intense cooperation?
 - Density of local agglomeration in the relevant industry is important for interaction with local customers and research institutions
 - Intensity of R&D expenditure of local universities is important for interaction with local suppliers and research institutions
 - Local patent intensity in the relevant industry is detrimental for interaction with local research institutions: secrecy-issue
 - Share of local HRSTO in the relevant industry is NOT important for interaction with any of the actors of the local innovation system (not significant in regression analysis)

Summary of results of empirical analysis

Importance of ... for subsidiary technological activity	Local supplier		Local customers		Local research inst.	
	Coeff.	P> z	Coeff.	P> z	Coeff.	P> z
Share local HRSTO in industry	0.01	0.4680	0.03	0.1220	0.01	0.6280
Local patent intensity in industry	-2.17	0.8360	26.03	0.4410	-508.35	0.0530
Density local agglom. in industry	-0.04	0.3430	-0.08	0.0600	-0.07	0.0620
R&D local universities	0.00	0.0730	0.00	0.4410	0.00	0.0360
Autonomy subsidiary: R&D	-0.12	0.3000	0.26	0.0220	0.09	0.4010
Autonomy subsidiary: strategy	-0.19	0.1420	0.05	0.6700	0.09	0.4250
Strategic motive: state aid	-0.08	0.4610	-0.04	0.7030	0.12	0.2020
Strategic motive: local knowledge	0.08	0.4080	0.08	0.3860	0.11	0.2080
D (Greenfield investment)	-0.47	0.0800	0.20	0.4120	-0.22	0.3600
D (Multi National Company)	0.37	0.1330	0.34	0.1360	0.11	0.6270
Share of trade with suppliers	0.03	0.0000	-0.01	0.2070	0.00	0.9540
Share of trade with customers	-0.01	0.3580	0.04	0.0000	-0.00	0.8630
Subsidiary absorptive capacity	0.49	0.0000	0.28	0.0000	0.38	0.0000
Age subsidiary	0.03	0.2040	-0.01	0.7060	0.01	0.5890
Size subsidiary	-0.00	0.1740	0.00	0.3520	0.00	0.7520
Ds (industrial branches)	yes		yes		yes	
obs	140		142		139	
Prob > chi2	0.0000		0.0000		0.0001	
Pseudo R2	0.2524		0.2413		0.1565	

Conclusions

- Technological activity of FDIs positively correlates with the importance of external network partners from the East German innovation system
- The potential for external spillovers increases with high technological activity of FDIs only for East German suppliers
- The East German innovation system is attractive for technologically active FDIs
- This could be partially related to the substantial investment into the scientific infrastructure and favourable endowment in particular in respect to Max-Planck, Fraunhofer and Leibniz institutes in East Germany (Pasternak 2007, Roth 2006)

Implications for Economic Policy

- Innovation policy: it seems advisable to continue to use instruments that foster external network links between FDIs and the East German innovation system (e.g. InnoRegio, NEMO, ProInno)
- But, we would recommend that the role of external knowledge flows through FDI and trade is considered more prominently
- This applies to inward FDI, and also to domestic companies that internationalise through exports or outward FDI: exports of East German firms have been increasing (Zeddies 2007), outward FDI and the emergence of multinational headquarters within East Germany are still weak

Implications for Economic Policy

- Additionally, introduction of a tax allowance for R&D activities should be considered in Germany: the vast majority of OECD countries have this in place to attract FDI and to motivate their technology upgrading
- So far, East German industrial promotion programmes at the federal level (GA-promotion) emphasise employment, and (with the exception of Saxony and Brandenburg) they do not have a regional or sectoral focus in the project design (Titze 2007) – we suggest to tie such programmes on R&D and innovative capability, because they could strengthen absorptive capacity in the East German innovation system
- This means: not more funds, but more targeted at internationalisation and absorptive capacities