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**The significance of FDI for
innovation activities within domestic firms**
The case of Central East European transition economies
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Abstract

Foreign direct investment is expected to play a significant role as a multiplier of modern production- and management-know-how in Central East European transition economies. The so-called technology-spillovers are explained through externalities or extra-market-linkages. In practice they can take place via demonstration effects, labor mobility, supplier contacts, customer contacts or networking activities. However, the empirical study on the example of Hungarian industry shows that foreign owned and domestic firms – mainly due to their strong technological disparities – build virtually separate spheres within the industrial sector. Thus, technology-spillovers do hardly appear as an innovation-stimulating means for domestic companies.

Zusammenfassung

Ausländischen Direktinvestitionen wird in den mittelosteuropäischen Ländern eine wesentliche Rolle als Multiplikator modernen Produktions- und Management-Know-hows zugeschrieben. Die sogenannten Technologie-Spillovers werden in der Theorie auf Externalitäten bzw. Extra-market-linkages erklärt. In der Praxis kommen sie über Demonstrationseffekte, Arbeitskräftemobilität, Zuliefererkontakte, Kundenkontakte oder Netzwerkaktivitäten zustande. Die empirische Untersuchung am Beispiel der ungarischen Industrie zeigt jedoch, dass ausländische und einheimische Unternehmen vor allem aufgrund der hohen technologischen Entwicklungsunterschiede weitgehend getrennte Sphären innerhalb des Industriesektors bilden. Daher kommen Technologie-Spillover als innovationsförderndes Instrument einheimischer Unternehmen kaum zustande.

Keywords: Central Eastern Europe, FDI, innovation, technology-spillovers

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1 Introduction

Since the beginning of transition, Central East European countries (CEEC)¹ underwent substantial restructuring with the result that today the structure of economy in these countries is not very different from EU average (see appendix 1 and 2). However, with respect to productivity it becomes visible that the CEEC-5 still lack far behind Western Europe (see table 1 below). Therefore, the technological renewal process or rather the innovation activities of domestic firms need to go much further if these economies want to catch up with EU.

Table 1: Labor productivity (gross value added per employee) of the CEEC-5 in manufacturing industry 1998

	Labor productivity (EU-15 = 100)
Estonia	26
Poland	38
Slovenia	58
Czech Republic	53
Hungary	49

Data source: Eurostat (see: Stapel, 2001, 6)

The technological renewal process requires an international technology transfer which for most part takes place via foreign trade but can also be supported through foreign direct investment (FDI) (Klodt, 1990). For the host country FDI not only means the establishment of modern equipped foreign investment enterprises (FIE) but also a

¹ According to the geo-political definition suggested by Sundhausen (1998, 5), the region of Central Eastern Europe comprises Poland, Slovakia, Slovenia, Czech Republic, Hungary and the three Baltic states Estonia, Latvia, Lithuania. For reasons of data availability, the introduction of this paper focuses on Czech Republic (CZ), Estonia (EE), Hungary (HU), Poland (PL) and Slovenia (SL) – the originally first candidates for EU Eastern enlargement. They are referred to as CEEC-5.

“spread of knowledge from superior foreign to domestic companies” (Hunya, 2000, 4). In this context, spillover-, trickle-down-, learning-, synergy- or multiplier-effects are just different expressions of the same phenomenon: innovation activities within technologically backward domestic companies deriving from the presence of FIE.

Technology-spillovers are frequently mentioned in the literature and several authors state that the transfer of technology and know-how accompanying FDI is already more important for transition economies than the sole capital transfer (Hunya, 1998; McMillan, 1996, 139). However, there is no comprehensive theory of technology-spillovers itself and not much empirical research has been carried out that would allow a deeper insight in the practical mechanisms of technology-spillovers and their relevance to Central East European transition economies. Therefore, it is the intention of this paper to first create a theoretical framework that explains how technology is being transferred between FIE and domestic firms in the sense of spillovers and, second, to describe the practical significance of technology-spillovers on the example of Hungarian industry.

2 Foreign investment enterprises as a source of technology-spillovers – definitions and theoretical framework

2.1 Foreign direct investment

Different from portfolio-investment, FDI is a long-term oriented investment abroad with the main objective of the investor to gain a significant impact on the company’s decision making processes (Krugman/Obstfeld, 2000, 169f). According to the International Monetary Fund, a significant impact is possible when the foreign investor holds a share of at least 10% of the nominal capital (IMF, 1993, 86f). Lower shares count as portfolio investment with the main objective of the investor to realize short term gains in the stock exchange. These IMF-definitions have mainly been developed for statistical purposes in order to improve the international comparability of FDI statistics. Most

OECD countries and non-OECD transition economies have adopted the recommended IMF definitions within their national accounts.

In practice, FDI appears in the form of foreign subsidiaries. A foreign subsidiary is defined as a company of which more than 50% of the voting shares are owned by another corporation, termed the parent company (OECD, 1999, 72). Foreign subsidiaries are very often 100% foreign owned. They become real through the takeover of an existing company abroad (acquisition) or the foundation of a new company (greenfield-investment). Companies that establish operating units via FDI in at least two countries are called multinational companies. The term multinational company refers to the whole concern (Dunning, 1993, 3f).

2.2 Theory of multinational companies

There is no lack of theories explaining the existence of FDI or rather the existence of multinational companies. A whole spectrum of theoretical explanations has been developed since the 1960s when FDI became more and more important in practice (Caves, 1996; Dunning, 1993, 68ff). The different theoretical explanations that developed over time have been integrated by Dunning (1993, 75ff) in his so called **OLI-paradigm**. It has become the standard theoretical framework for studies on foreign subsidiaries.² The OLI-paradigm explains FDI by showing under what circumstances a parent company will establish a foreign subsidiary instead of entering the foreign market via export or licensing to a local producer. Three conditions (O, L, I) must be fulfilled before FDI takes place. First, the potential foreign investor – compared to the firms in the foreign market – must have **ownership-advantages** (e.g. firm specific production technology, marketing strategies). In order to regard production within the foreign market more efficient than export, a second condition must be given. That is, the aspired foreign country must offer **locational-advantages** (e.g. lower taxes, lower wages, cheap raw material). However, as it could still be more efficient to have a local company

² See e.g. Barz (1998), Autschbach (1997), Klagge (1997)

within the foreign market produce via license-agreement, a third condition must be given before a subsidiary will be established abroad. That is, the potential foreign investor must face **internalization-advantages**. This means that it must be more efficient for the foreign investor to make use of the firm specific technology within the multinational concern through a subsidiary because asymmetric information makes license-agreements impossible (failure of technology markets). Only if all three conditions, i.e. ownership-, locational-, and internalization-advantages, are given a firm will establish a foreign subsidiary instead of engaging in export or license-agreements.

Dunning's theoretical framework, as presented here, does not explain technology-spillovers. But it is reasonable to assume that the technology "packed" in a foreign subsidiary cannot be completely protected from trickling down to domestic firms (Blomström/Kokko, 1996; Burger, 1998, 48ff). Therefore, the OLI-paradigm lays the very foundation for a theoretical explanation of technology-spillovers. However, it must be further developed in order to understand why technology-spillovers exist and how they take place in practice.

2.3 Explaining technology-spillovers

In this paper technology-spillovers are defined as the transfer of hard technology (tangible assets) or soft technology (knowledge) from FIE to domestic companies outside market transactions. The non-market character of technology-spillovers is usually explained through positive externalities, which exist because technology at least partially is a public good (Grossman/Helpman, 1997, 15f). These so-called **externality-spillovers** appear anonymously and without any price to be paid by the technology-taking company. However, besides externality-spillovers, foreign investors can also consciously and intentionally transfer hard or soft technology to domestic companies without asking a price to be paid in direct return but expecting future advantages for themselves. These extra-market-linkages can e.g. derive from the foreign firm's interest to enable a domestic company to produce certain products and become a future supplier. This second type of technology-spillovers which requires a direct link between the two

sides, will be called **linkage-spillovers**. Externality- and linkage-spillovers build two main (theoretical) types of spillovers. However, some further considerations are necessary in order to explain how technology is finally being transferred from one company to another (here from FIE to domestic firms). The following table gives an overview of the practical spillover-mechanisms by type.

Table 2: Types and mechanisms of technology-spillovers

Externality-spillovers	Linkage-spillovers
Demonstration	Supplier contacts
Labor mobility	Customer contacts
	Networking

The **demonstration** of technology by foreign investment companies can lead to “learning-by-watching” (Burger, 1998, 56) or “reverse engineering” (Mohnen, 1996, 41). “Learning-by-watching” means that domestic firms observe foreign investor’s entrepreneurial actions, e.g. in the field of marketing or logistics, and legally copy certain practices which are new to them and result in innovation activities. “Reverse engineering” takes place when the domestic firm legally copies product technology after the inspection of a foreign company’s product. Technology-spillovers that derive from demonstration are a typical example of externality-spillovers.³

Labor mobility is another mechanism from which externality-spillovers can result. Foreign investment companies often invest in professional education and training of their local staff (Dunning, 1993, 372ff). So, employees acquire general and specific

³ It can be argued that reverse engineering and learning-by-watching can also take place without the presence of FIE, i.e. technology-spillovers appearing across national boundaries. However, transaction costs are much lower for domestic companies when FIE operate “next door”. Therefore, FIE do in deed have a multiplier function (Dunning, 1993, 470f; Mansfield/Romeo, 1980, 742).

qualifications through training programs or just by learning-on-the-job. If the qualified employees turn over to domestic companies or open their own business they automatically transfer technological knowledge that can be of use for the existing or newly founded domestic enterprise.

Supplier-contacts are another and very often mentioned mechanism for technology-spillovers (Dunning, 1993, 446ff). The underlying consideration is that foreign firms transfer hard or soft technology to domestic firms in order to circumvent transaction costs related to the otherwise costly search for adequate suppliers. If domestic suppliers receive such support through foreign investors and do not have to pay for it, a typical linkage-spillover appears.

On the other hand, linkage-spillovers can become real through **customer-contacts** between foreign investors as supplier and domestic firms as customers. The idea is that the foreign investor transfers technology to the domestic customer above the contractual obligation in order to gain a new or bind an existing customer, i.e. for marketing-strategic reasons. Compared to supplier-contacts, this spillover-mechanism plays a less important role in the empirical literature but Blomström (1991) and Blomström/Kokko (1996) provide evidence for the growing importance of that mechanism, e.g. with respect to computer-based production goods.

The fifth spillover-mechanism, the so called **networking**, covers all remaining forms of formal cooperation between independent foreign and domestic companies outside business contact. Such cooperation, aimed to realize common interests, can take place within business organizations, joint research and development projects etc. Linkage-spillovers within such networking-activities appear when a FIE regards it as useful to transfer technology to the domestic cooperation partner who in turn has not to pay for it.

The distinction between these five observable mechanisms of technology-spillovers is an analytical approach and in practice they can often overlap. So it is highly probable that e.g. supplier- or customer-contacts are accompanied by “learning-by-watching”. However, the empirical study has been based on the distinction of these five

mechanisms. Before turning to empirical results the research concept will be briefly outlined in the following chapter.

3 Research concept

The intention of the empirical study was not to directly measure possible effects of technology-spillovers on the side of domestic industry (e.g. productivity growth) but to elaborate the real significance of spillover-mechanisms on the basis of an explorative empirical study. As the selection of such qualitative research subject requires a qualitative research approach, **expert interviews** have been chosen as the main method of investigation. Semi-structured interviews in the sense of Lamnek (1995, 36ff) have been carried out in Hungary in the second half of the year 2000 with experts from the following five expert groups:

- Foreign investment enterprises
- Domestic enterprises
- Policy-makers
- Business associations
- Science

At least five interviews have been carried out in each expert group with leading representatives from various companies and organizations (see appendix 3).⁴ The evaluation of the interview material (verbal data) took place according to the “reductive procedures” described by Lamnek (1995, 107ff) and Meuser/Nagel (1991). Summarized results of expert interviews are presented in chapter 4 of this paper. They are put in italic and quote marks. For reasons of data protection, only the relevant expert group is being indicated.

⁴ I thank all experts for their time, openness and willingness to give interviews in English or German.

In addition to expert interviews, **secondary analysis** of data from company surveys has been done. The search for secondary data took place in Hungary in the year 2000 and despite the high specialization of the research subject some research institutes were able to offer relevant secondary data that has been included in the empirical study. Details will be given in chapter 4 below.⁵

4 Technology-spillovers within Hungarian industry – empirical results

Hungary, at first glance, offers favorable preconditions for technology-spillovers to take place - regarding the quantity and quality of foreign direct investment and the overall absorptive capacity of the economy. Simplified, the absorptive capacity can be regarded as a function of the economy's human capital and research and development (R&D) (Cohen/Levinthal, 1990). Like in most other transition economies, the Hungarian educational system has a high standard. Accordingly, the economy is well equipped with a qualified work force (EBRD, 2000). Despite severe cut backs of the state budget for R&D, the Hungarian R&D potential is still characterized as advanced and comparable to EU average (OMFB, 1999; Inzelt, 1998). With respect to the qualitative composition of FDI in Hungary it can be stated, that it is no longer dominated by low-tech labor intensive activities but takes place mainly in high-technology-branches and since the mid 1990s also in R&D (Csáki, 1998; Farkas, 2000).

However, empirical research carried out through expert interviews and secondary analysis of survey material does not point to the fact that FIE serve as a source of technology-spillovers. Each of the above described mechanisms of technology-spillovers exist but rather occasionally than generally. The effects are by far not broad enough to induce significant innovation activities within domestic firms. The reasons for that are the following:

⁵ I thank all colleagues at the Hungarian research institutes for discussion, friendly support and access to survey material.

Technology-Spillovers via **demonstration** proved to be difficult to investigate empirically. As expected, most respondents stated that “learning-by-watching” often takes place without being noticed, neither through the learning company nor through the foreign firm demonstrating technology. If at all, demonstration-effects have been of importance in the early stage of transition “*when more and more foreign investors came and domestic firms copied one or another directly visible practice, especially in marketing and logistics. However, many observable techniques require investments which domestic companies are hardly able to finance*” (expert group: domestic companies). With respect to “reverse engineering”, no evidence could be found that it has been relevant at any time during transition. “*In the service sector companies adopted many new services which were unknown before and possibly copied from foreign companies but not necessarily from those within Hungary. In industry the copying of products is insignificant and often impossible from a legal perspective*” (expert group: domestic companies). A sophisticated intellectual property right scheme that meets the standards of the European Union’s patent office does limit the scope for copying new products in Hungarian industry (Hungarian Patent Office, 1999; Smid, 1998).

With respect to **labor mobility**, it becomes visible – from expert interviews and survey material (DUIHK, 1995 and 2000) – that the majority of FIE in Hungarian industry invests in professional education of their local work force. Even though, it can be concluded that it is strongly unattractive for employees to switch from FIE to domestic employers because they usually cannot pay an income or additional benefits as high as foreign investors. “*Sometimes labor turnover from a foreign subsidiary to domestic companies takes place but rather occasionally than generally. It is too expensive for Hungarian owned firms to attract employees from multinational companies, especially those with an academic degree and leading position*” (expert group: economic policy). The possibilities for qualified persons to open a small or medium sized company in Hungary are not very attractive neither due to credit market failure. “*Private banks hardly offer finance schemes for small and medium sized companies and there is only very limited support for company start ups by the state. Entrepreneurs have to have*

their own financial resources if they intend to open up or enlarge a business in Hungary” (expert group: science).

Considering **supplier-contacts**, an investigation carried out by the Hungarian Ministry of Economic Affairs among selected big FIE (>500 employees) shows that their domestic purchases vary extremely, i.e. from below 5% to more than 70% depending on the companies’ purchasing policy. The Hungarian Ministry of Economic Affairs estimates that foreign companies on average buy 10-20% of their supplier products from domestic firms (Hungarian Ministry of Economic Affairs, 2000, 39). A more comprehensive survey carried out by the Economic Research Institute of the Hungarian Chamber of Commerce and Industry (MKIK-GVI) in the year 2000 among all 100% foreign owned firms in Central Hungary points to the same direction.⁶ Foreign investment firms buy on average 43% of their industrial supplier products within Hungary, but one third of this in turn comes from other foreign investment firms settled within Hungary (MKIK, 2000). Especially the big foreign investment companies usually bring with them their suppliers from abroad that establish subsidiaries close to their customers in Hungary. That contributes to the domestic value added but does not help existing Hungarian suppliers to technologically modernize. Supplier-contacts are a necessary but not sufficient condition for technology- or rather linkage-spillovers to take place in the above described way. However, it is reasonable to assume that the scope for spillovers via supplier-contact is higher the more domestic suppliers are involved. But so far the proportion of domestic suppliers is low. According to expert interviews, supplier support through FIE is offered very rarely and only to the already advanced and competitive domestic suppliers. *“Supplier support is not the main task of foreign investors in Hungary. It can be efficient but the domestic supplier must fulfill minimum quality standards and production capacities. This is often not the case with Hungarian suppliers. The technological backwardness of domestic suppliers is usually too large”* (expert group: foreign investment companies).

⁶ The region of Central Hungary comprises the city of Budapest and the surrounding district „Pest“. This region accounts for 60% of all FIE and 66% of the total FDI within Hungary (CSO, 2000, 68). 170 companies have gone into the evaluation of the survey. 87% were SME (MKIK, 2000).

Customer-contacts play an insignificant role because foreign investors in Hungary do mainly produce for export or for other foreign investment enterprises within Hungary. FIE account for 86% of Hungarian exports in manufacturing industry in 1998 (Hunya, 2000, 13). *“The Hungarian market is too small for foreign investment companies. They rely on export, especially to the EU. Customer-support in order to gain customers in Hungary or in order to compete with other firms is of no importance”* (expert group: business associations). No survey material could be found on customer contacts as a spillover-mechanism – probably another indication for its insignificance in transition economies.

Last but not least, **networking** as another potential spillover-mechanism has been investigated focusing on relevant business associations established in Hungary and joint R&D-activities. It was found that business associations are either dominated by foreign investment companies (e.g. foreign chambers of commerce and industry, Joint-Venture-Association) or do not engage in activities that are suitable to increase cooperative links between foreign owned and domestic companies (e.g. Hungarian Chambers of Commerce and Industry, industry associations). Joint R&D-projects of foreign and domestic companies do hardly exist in Hungary because of the technological backwardness of domestic firms and the embeddedness of foreign subsidiaries in the global R&D strategy of the multinational concern.

5 Conclusions

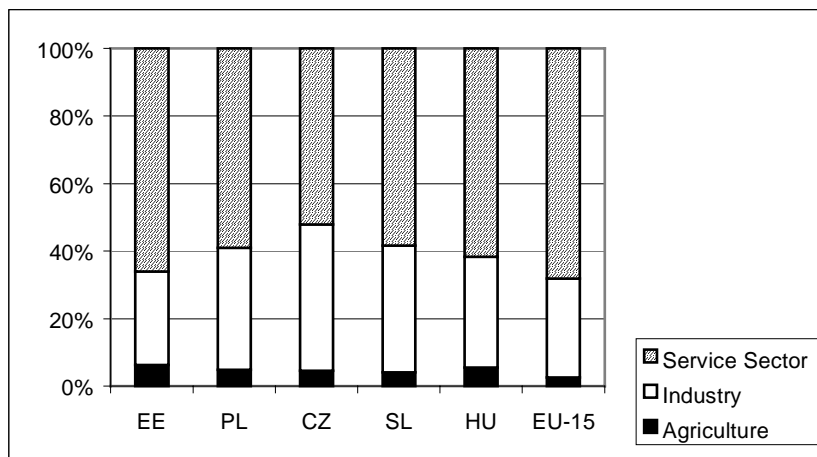
It can be concluded that on the one hand FIE clearly contribute to the overall modernization process of Hungarian industry by establishing modern production plants including investments in R&D. However, on the other hand at this time they still build “modern islands” cooperating mainly among themselves – if at all. The empirical study shows that FIE and domestic companies have no significant contact and build virtually separate spheres within Hungarian industry. Not much different effects are expected for other CEEC that are struggling with the same difficulties (low productivity) and have

attracted FDI in similar quantity and quality (e.g. Poland, Czech Republic, Slovenia, Estonia).

Multinational companies are of course no developmental agencies for economies in the process of catching-up. However, CEECs have to take into account that an increasing gap between modern equipped foreign owned companies and technological backward domestic firms leads to the already visible dual structure of the economy. If that process goes further, innovation-stimulating spillovers between the two sides become more and more difficult. From the author's perspective, a first step against the increasing duality of industry should be a much stronger support for small and medium sized enterprises so that they can become equal partners to all Hungarian based companies. Furthermore, the capability to carry out innovation activities – a prerequisite for competitiveness within the world market – requires a development strategy that in the long run supports the establishment of domestic firms in the sense of parent companies.

Appendix

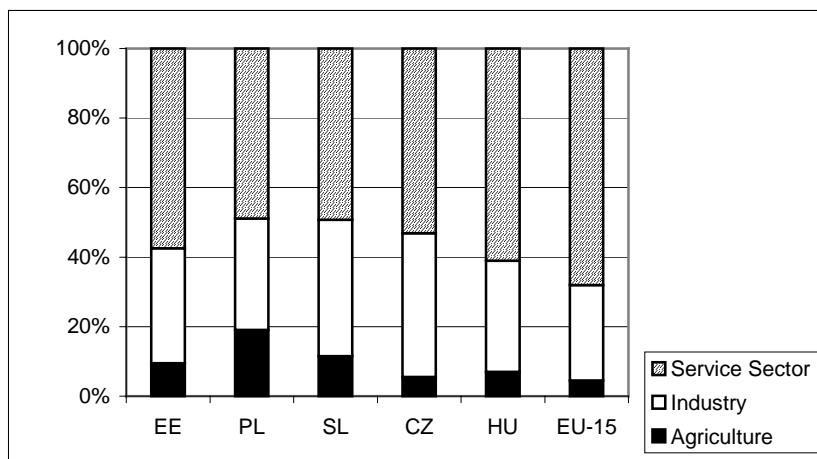
Appendix 1: Sectoral structure of the economy (gross value added in %) 1999*



Data source: Eurostat (see: Stapel, 2001, 3)

*Service Sector = NACE: G-O, Industry = NACE: C-F, Agriculture = NACE: A-B

Appendix 2: Sectoral structure of the economy (employment %) 1999*



Data source: Eurostat (see: Stapel, 2001, 3)

*Service Sector = NACE: G-O, Industry = NACE: C-F, Agriculture = NACE: A-B

Appendix 3: List of expert interviews

	Number of interviews
Expert group 1: Foreign investment enterprises	
AUDI Hungaria Motor Kft.	2
General Electric Lighting Tungsram Rt.	1
Henkel Magyarország Kft.	1
TEMIC Telefunken microelectronic Hungary Kft.	1
Reemtsma Debrecen Tobacco Factory Kft.	1
Zeuna Stärker Magyarországi Kft.	1
Expert group 2: Policy-makers	
Economic policy	
Hungarian Ministry of Economic Affairs, Department: supplier program	2
Hungarian Ministry of Economic Affairs, Department: regional development	1
Hungarian Foundation for Enterprise Development (MVA)	2
Investment and Trade Development Agency (ITD)	1
Technology policy	
Hungarian Ministry of Education and Technology, Department: R&D-strategy	1
Hungarian Ministry of Education and Technology, Department: Technology Foresight Program	1
Institute for International Technology (NETI), Department: International Technology-transfer	1
Expert group 3: Business associations	
Industry associations	
Association of Hungarian Automobile Industry (MGSZ)	1
Association of Hungarian Automobile Supplier Industry (MAJOSZ)	1
Association of the Hungarian Chemical Industry	1
Association of the Hungarian Electrical Industry	1

Chambers of Commerce and Industry	
Hungarian Chamber of Commerce and Industry (MKIK)	1
Budapest Chamber of Commerce and Industry (BKIK)	1
Further interest associations	
German-Hungarian Chamber of Commerce and Industry (DUIHK)	1
American Chamber of Commerce and Industry (AmCham)	1
Austrian Chamber of Commerce	1
Joint-Venture-Association (JVA)	2
Hungarian Association of International Companies (HAIC)	1
Association of Hungarian Employers and Industrialists (MGYOSZ)	1
Expert group 4: Representatives of domestic companies	
Videoton Holding Rt.	2
Videoton Precíziós Kft.	1
Hungarian Foundation for Enterprise Development (MVA), Department: Domestic supplier industry	1
Budapest Agency for Enterprise Support	2
Expert group 5: Science	
Hungarian Academy of Sciences, Institute for World Economics	1
Economic Research Institute of the Hungarian Chamber of Commerce and Industry (MKIK-GVI)	1
GKI Economic Research Co.	1
Kopint Datorg - Economic Research Institute	1
Eco Stat (Research Institute of the Central Statistical Office)	1

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