

# IWH-FDI-Micro-Database

## Methodological Note

### Survey 2008

**In East Germany (including Berlin)**

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## 1. Motivation and research questions

With the integration of post-communist countries into the European and global economy after 1990, there was strong research interest into the role of multinational enterprises (MNEs) for economic restructuring and technological catching-up. Most of the existing empirical studies on locational determinants of FDI and host country effects did not take account of East Germany. This might be for different reasons: Firstly, theoretical and empirical difficulties derive from the fact that East Germany followed a distinct transition pattern as it became a region subsumed in a larger and more mature economy. Secondly, East Germany received private investment from foreign as well as West German firms. Only the first can be considered as a foreign direct investment (FDI). Finally, there had long been a lack of micro data to adequately analyse the activities of corresponding firms from a production as well as technological perspective.

So far, the existing empirical research on locational determinants of FDI in transition economies of Central East Europe (CEE) indicates that labour costs, market size, geographical proximity, as well as institutional factors do explain MNE investment in the region (see for example Bevan and Estrin 2004, Bevan et al. 2004). Existing studies are implemented at the country rather than regional level and, therefore, neglect the role of agglomeration economies in choice of location (*ibid.*). However, the new economic geography argues that the presence of increasing returns, local externalities and economic integration leads to the spatial concentration of economic activities (see for example Fujita and Thisse 2002). Therefore, other recent studies switched to analysing at a regional level and suggest that various forms of intra and inter industry agglomeration effects have to be taken into consideration when analysing the relevance of locational determinants of MNEs (Basile 2004, Basile et al. 2008, Barrios et al. 2006, Chung and Alcácer 2002, Crozet et al. 2004, Guimarães et al. 2000).

The empirical research on host country effects in transition economies by and large focused on FDI induced productivity spillovers to domestic firms. This literature assumes there is a unidirectional technology transfer from the foreign investor in the West to domestic firms in East without an active role of the local foreign affiliate. The resulting evidence is rather mixed which is mainly explained by the lack of absorptive capacity of domestic firms (see Jindra 2005 or Meyer and Sinani 2009 for an overview). Recent contributions in the field shifted the emphasis from a technology transfer perspective to viewing the MNE as an international network for the generation and diffusion of technology. This view would suggest that centrally and locally driven technological heterogeneity of MNEs is an important factor in explaining the incidence of spillovers to the host country (Castellani and Zanfei 2006, Marin and Bell 2006).

The theory of technological accumulation and firm internationalisation (Cantwell 1989) proposes a dynamic relationship between spatially bounded technological externalities, the internationalisation of firms' R&D and innovation, as well as the potential for technological spillovers from MNEs to the domestic economy. This type of theorising was crucial for the design of a research project at the Halle Institute of Economic Research (IWH) which looks at the role of MNEs in selected transition economies as well as East Germany from a comparative perspective. The project currently addresses three inter-related research

questions: What is the role of various agglomeration economies in the location of the MNEs? What is the nature of the technological activities of the multinational affiliates? Does the technological heterogeneity of the MNEs explain the incidence of technological spillovers to other firms? With the emerging internationalisation of domestic firms, another set of research questions became relevant that deals with the motives for and home country effects of outward FDI from transition economies as well as East Germany.

## **2. Micro data availability**

Traditionally research on FDI location by MNEs uses bi-lateral country level aggregate data on FDI flows. Empirical studies on FDI spillover effects based on a production function approach by and large employ aggregate industry-level data on FDI stocks in combination with inter-sectoral linkage coefficients derived from national-level input-output tables. However, recent theoretical advances require micro data sets at the enterprise level in order to take account of firm heterogeneity.

In the case of Germany, the Microdatabase Direct Investment (Mikrodatenbank Direktinvestitionen, MiDi) maintained by the Bundesbank could serve as a potential initial choice. Companies with direct investment report their international capital links if their balance sheet total exceeds €3 million (see Lipponer 2009). Shares and voting rights held by affiliated investors from foreign economic territories are consolidated. Reports are submitted by German enterprises if a non-resident or several economically-linked non-residents hold a total of 10 per cent or more of the shares or voting rights in the enterprise on the date the balance sheet is issued. Indirect participating interests must be reported if a dependent investment enterprise has a stake of 10 per cent or more in another enterprise. The database also includes German branches and permanent establishments of non-residents having operating assets totalling more than €3 million. Two or more resident branches and permanent establishments of any one non-resident are to be regarded as a unit (ibid). Thus, the MiDi is a full census of obligatory administrative information. The MiDi has been used for a regional analysis of MNE choice of location in Germany at NUTS-1 level ('Bundesländer') (Arndt et al. 2009, Spies 2010). However, the registration of companies only above a certain threshold (total balance sheet/operating assets) introduces a bias towards large enterprises (Pflüger et al. 2010). In addition, the consolidation procedure of different units at the level of the German regional headquarter creates an unknown degree of distortion in terms of regional disaggregation (Arndt et al. 2009, Becker et al. 2009). As a result of size bias as well as the distorted regional disaggregation, the number and volume of foreign investment is underestimated for regions in East Germany (Günther 2005, Votteler 2001). By nature, the MiDi only contains information on foreign participation. However, West German investment played a crucial role in the transition process in East Germany (Belitz et al. 2000, Haas 1996, Günther 2005). Thus, the MiDi is only suitable to a limited extent as a micro data source for our research purposes.

An alternative choice for micro data is the Establishment Panel of the Institute for Employment Research (IAB). It is an annual survey of establishments that is representative of industries and firm size for all of Germany and can also be analysed on a longitudinal basis (see for an overview Fischer et al. 2009). The panel currently contains information on about 16,000 establishments. The net sample has a stratification in which large

establishments, small federal states, small industries and the manufacturing industry in East Germany are overrepresented. For descriptive analysis these are checked by cross-sectional weighting factors for each establishment in the sample. The panel also provides information on majority ownership (foreign, West German, East German, public). Therefore, Arndt et al. (2009), for example, use the IAB Establishment Panel for their study on the impact of foreign entry on employment, turnover, exports, and productivity. Lehmann and Günther (2007) use it to analyse the incidence of vertical productivity spillovers from foreign and West German affiliates. From our point of view, the IAB Establishment Panel is a possible micro data source for any research that looks at host country effects of foreign and West German owned affiliates that requires a control group of East German owned firms. However, ownership is not a criterion for survey stratification. Thus, we cannot tell whether the survey data is representative for the sub-group of foreign-owned or West German-owned establishments in East Germany. In addition, caution is required with regard to regional disaggregation of the survey data, which in the best case would be possible at the NUTS-1 level ('Bundesländer'). Thus, more regionally fine grained analysis on the effects of location choice requires an alternative micro data set that could serve as a source of information that draws from total population enterprises.

Peri and Urban (2002, 2006) use an unbalanced panel of manufacturing firms based in reunified Germany with ultimate foreign (or West German ownership in the case of East Germany) drawn from the Amadeus database. They estimate productivity spillovers at the NUTS-1 level ('Bundesländer'). The data shows representativeness deficiencies with regard to East Germany as such, and several industries, which are partially corrected by weighting observation according to statistics drawn from the 'Bundesbank' (Peri and Urban 2002). As described above, the Bundesbank data is only a limited guide for regional disaggregation of FDI. As a result, their regionalised dataset suffers from insufficient coverage of foreign-owned firms in East Germany. For example, they do not find any foreign firms in the East German federal state of Saxony (Peri and Urban 2002).

The micro data availability is similarly limited for most other transition economies in CEE. The Vienna Institute for International Economic Studies (wiiw) publishes the *wiiw Database on Foreign Direct Investment in Central, East and Southeast Europe*. However, this database contains only aggregate data on FDI flows for 18 CEE countries. Damijan et al. (2003, 2008) provide by far the most comprehensive firm level studies on FDI productivity spillovers. They use balance sheets/financial statements as well as ownership information from about 91,000 firms in 10 transition economies from 1995 to 2005 taken from the Amadeus database (Bureau von Dijk). The country coverage and presumably also quality of the collected data differs considerably across countries.

### 3. IWH FDI Micro Database

Given the constraints described above on the availability of enterprise-level data for East Germany and other selected transition economies, the IWH opted for a novel collection of primary data. The IWH FDI Micro Database provides a total population drawn from the MARKUS data base, in the case of East Germany, and from the AMADEUS database in the case of the selected transition economies. Both commercial datasets are compatible and allow for a uniform identification of the population through complex ownership information. This serves as a basis for an annual survey in East Germany and a bi-annual survey in selected transition economies. After a pilot survey<sup>1</sup> in 2002, the project was fully launched in 2007 as part of a Strategic Targeted Research Project (*“Understanding the relationship between knowledge and competitiveness within the enlarging EU” – Uknow 2006-2009*) financed by the 6<sup>th</sup> EU Framework Programme (see Table 1 for an overview).

Table 1: Overview of IWH FDI Micro Database

|                       | 2002   | 2007   | 2008   | 2009   | 2010   |
|-----------------------|--|--|--|--|--|
| <b>Countries</b>      | Estonia<br>Hungary<br>Poland<br>Slovakia<br>Slovenia | East Germany<br>Romania<br>Croatia<br>Poland<br>Slovenia | East Germany                                 | East Germany<br>Romania<br>Slovakia<br>Czech Republic<br>Hungary | East Germany                                 |
| <b>Industries</b>     | Manufacturing  | Manufacturing  | Manufacturing,<br>Other selected<br>Services | Manufacturing,<br>Other selected<br>Services                     | Manufacturing,<br>Other selected<br>Services |
| <b>Type of FDI</b>    | Inward FDI   | Inward FDI   | Inward FDI<br>Outward FDI                    | Inward FDI<br>Outward FDI  | Inward FDI<br>Outward FDI                    |
| <b>Sample*</b>        | 434  | CEE: 514<br>EG: 295                                      | 638 Inward<br>43 Outward                     | Inward:<br>632 EG, 616<br>CEE<br>Outward:<br>46 EG, 48 CEE       | 614 Inward<br>94 Outward                     |
| <b>Population</b>     | CEE: n.a.  | CEE: 5.421<br>EG: 1.412                                  | EG: 3.669                                    | CEE: 7.894<br>EG: 3.905  | EG: 3.672                                    |
| <b>Method**</b>       | Locally  | Locally  | Locally                                      | Centrally  | Locally                                      |
| <b>Thematic Focus</b> | Pilot Survey-<br>Technological<br>Upgrading          | Technology<br>Transfer and<br>spillovers                 | Performance<br>Expectations                  | Investment<br>motives and<br>location factors                    | Performance<br>Expectations                  |

Note: \*CEE = Central and East European countries; EG = East Germany, \*\* Locally implemented survey in each country; centrally implemented survey for all countries.

In 2007 the survey was implemented in Slovenia, Croatia, Poland, Romania and East Germany. In 2009 the countries selected were Hungary, Czech Republic, Poland, Romania, Slovakia, and East Germany. This country set-up will remain fixed for all subsequent bi-

<sup>1</sup> The pilot survey was of an EU 5th Framework Programme RTD research project on the “Determinants of the productivity gap between EU and CEECs (ProdGap)” coordinated by the IWH.

annual surveys. In 2007 the survey covered only manufacturing industries (NACE Rev.1: 15-37). Since 2008 this has been extended to include mining and quarrying (NACE Rev.1: 10-14), electricity, gas, steam and hot water supply (NACE Rev.1: 40-45), wholesale (NACE Rev.1: 51), transport and financial services (NACE Rev.1: 60-67), computer, R&D and other business related services (NACE Rev.1: 72-74), as well as sewage and waste disposal, media, and other services (NACE Rev.1: 90-93). This sectoral selection will remain fixed for all subsequent surveys. Until 2007 the survey covered only inward FDI. Since 2008, this survey has been extended to also include enterprises with outward FDI. Since 2009 the bi-annual survey has been implemented centrally by one provider for the CEE countries. Each survey has a standard set of questions on shareholder structure as well as technological capabilities. The survey implemented in even years (2008, 2010) only in East Germany has a set of questions on expectations for future employment, turnover, exports, and investment. Each bi-annual survey (2007, 2009, 2011) has a particular special thematic focus. The survey data can be used for cross-sectional analysis. Data from the population has a longitudinal dimension. The information provided below on basic population, survey implementation, and representativeness relates to the 2008 survey of the IWH FDI Micro Database.

### *3.1 The basic population 2008*

The population for East Germany is drawn from the MARKUS database provided by Verband der Vereine Creditreform e.V.<sup>2</sup> The information in the MARKUS database is drawn from public indexes, balance sheets, annual reports, the daily press and surveys. MARKUS contains about 1.1 million German enterprises. According to Verband der Vereine Creditreform e.V., 97% of all commercially registered and economically active German companies are listed in the database. For Germany, these figures seem to be reliable, since any commercial entity is obligated to register with its local chamber of commerce. The MARKUS database contains enterprise-level information such as name, legal form, date of registration, sector, address, ownership, balance sheet and financial information. The MARKUS database also forms the basis for the population underlying other established micro datasets such as the Mannheimer Innovation Panel (see Harhoff and Licht 1993) or the KfW/ZEW Start-up Panel (Fryges et al. 2010) are both operated by Centre of European Economic Research (ZEW).

For the CEE countries the firm population is drawn from the AMADEUS database provided by Bureau von Dijk (BvD). In total AMADEUS contains data on 14 million European enterprises and covers 10 transition economies. Of those, we selected the data for Hungary, Czech Republic, Poland, Romania and Slovakia. This data is fully compatible with the information drawn from the MARKUS database. In fact the latter forms the basis (in a slightly reduced form) for the German part of the AMADEUS database. BvD describes its AMADEUS data set as robust against a coverage bias since '35 expert and local information providers assure' the quality of the data (ibid.). Given the compatibility of the MARKUS and AMADEUS databases, we are able to draw upon the population underlying the IWH FDI

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<sup>2</sup> Until 2009 in case of East Germany data from the MARKUS database was supplemented by information from the European Investment Monitor, the EU-R&D Scoreboard and a list generated by the former Industrial Investment Council. In order to assure a uniform information format between the East German and the CEE firms this addition was given up in 2010.

Micro Database using the following uniform selection criteria for inward and outward FDI in all countries:

*A) Enterprises with one or more foreign investor – INWARD FDI*

The population of enterprises with one or more foreign investor is defined as all enterprises belonging to the selected sectors and countries in 2007, in which at least one foreign investor holds either a minimum of 10% direct shares/voting rights or a minimum of 25% indirect shares/voting rights. These enterprises are independent affiliates with their own legal or they are branches without a legal entity but with their own commercial register entry. Shareholders or ultimate owners are not limited to foreign enterprises headquartered abroad but also include natural persons, donors, foundations and financial investors with headquarters outside their respective country.

In the case of East Germany, the basic population of enterprises with foreign participation has been supplemented by enterprises belonging to the selected sectors and countries in 2007, in which at least one West German multinational investor holds either a minimum of 10% direct shares or voting rights or a minimum of 25% indirect shares or voting rights. A West German multinational investor is defined as an entity that is headquartered in West Germany and has either a minimum of 10% direct shares/voting rights or at least 25% indirect shares/voting rights in one or more entities located abroad. The federal state of Berlin is considered a part of East Germany in line with other established micro datasets and official statistics.

*B) Enterprises investing in an enterprise abroad – OUTWARD FDI*

The population of enterprises holding shares in an entity abroad is defined as enterprises belonging to the selected sectors and countries in 2007, which hold either a minimum of 10% direct shares/voting rights or a minimum of 25% indirect shares/voting rights in one enterprise located abroad. The enterprises could be independent affiliates (de jure independent person) or an independent branch (no de jure independent person) with their own commercial register entry.

### *3.2 Survey sampling and implementation 2008*

The sample stratification for the survey in East Germany was proportionally differentiated for ownership (FDI inward, WG MNE inward<sup>3</sup>, FDI outward). For FDI inward and WG MNE inward the sample was further stratified by differentiating between producing industries (NACE REV.1: 10 to 37) and all other industries (NACE Rev.1: 40-45; 51; 60-67; 72-74; 90-93). Subsequently each of the two sectors was further stratified according to enterprise size in terms of number of employees (up to 9, 10-49, 50-249, more than 250). FDI outward was only divided by sector into producing industries (NACE REV.1: 10 to 37) and all other industries (NACE Rev.1: 40-45; 51; 60-67; 72-74; 90-93). The sample stratification for the survey in the CEE countries based on the AMADEUS data was broken down by country and by ownership (FDI inward, FDI outward). Both ownership groups were further broken down

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<sup>3</sup> WG MNE inward stands for East German affiliates that have a participation of West German multinational investors



by differentiating between producing industries (NACE REV.1: 10 to 37) and all other industries (NACE Rev.1: 40-45; 51; 60-67; 72-74; 90-93). Subsequently only the FDI inward group was further broken down by enterprise size in terms of number of employees (up to 9, 10-49, 50-249, more than 250). Thus, each country sample has a total of 19 segments for stratification.

The contact addresses and the sample stratification were transferred to the *Zentrum für Sozialforschung Halle* (zsh). The survey was implemented by means of computer assisted telephone interviews (CATI). CATI was chosen as the appropriate method because the survey of the IWH FDI Micro Database requires a special design for highly standardised surveys, involves complex target groups, and has substantial filtering in the questionnaire. CATI are fast, relatively inexpensive and generate high response rates. In order to further increase the response rate, the enterprise received information about the IWH, the IWH FDI Micro Database, survey and data confidentiality per e-mail in advance upon request. The questionnaire was first programmed and internally tested for coherency before being submitted to at least five pre-tests per country between 14 October and 15 October 2008. The pre-test necessitated minor changes and resulted in a questionnaire which required eight minutes on average for completion. The interviewers at both providers received intensive training by researchers from the IWH. The interviews only were conducted by native speakers from each country under observation. Between 16 October and 10 December 2008 *Zentrum für Sozialforschung Halle* completed the required interviews in line with the respective sample stratification.

In 2008, the total population (inward and outward FDI) of the IWH FDI Micro Database for East Germany included 3,669. Altogether 2,566 East German companies could be contacted during the survey. About 30% of East German enterprises could not be contacted due to reasons such as wrong contact numbers, insolvency or incorrect information (see Annex Table 1 for a complete list). A total sample of 656 interviews could be conducted, which corresponds to a response rate of 25.6% (see Annex Table 2).

### *3.3 Survey representativeness 2008*

The following section summarises the results of various tests on the representativeness of the samples for East Germany in comparison with the respective basic population. For a more detailed description, please see the corresponding notes on representativeness (IWH 2008). For the sample of multinational investors in East Germany (FDI inward and WG MNE inward), we find a distribution that does not differ significantly from the underlying population with regard to sectors (producing industries and all other industries), ownership structure (full, majority or minority multinational-owned), and firm size (up to 9, 10-49, 50-249, more than 250 employees). (see Table 2). The sample of East German firms with outward FDI does not show significant differences in its regional, sectoral, size or ownership distribution in comparison to the underlying population.

In contrast, we find significant differences for the regional distribution (at the level of the federal states as well as at the level of 'Raumordnungsregionen'), and industries (NACE 2 digit level). These significant differences are mostly caused by the sample of foreign-owned firms in East Germany while the sample of West German owned firms is representative with respect to all dimensions tested except for the industries (NACE 1.1). Among East German

enterprises with a foreign investor, the regional sample deviation is mostly driven by the strong underrepresentation of enterprises located in Berlin. It is worthwhile pointing out that the regional distribution was not part of the sample stratification.

*Table 2: Significant differences in the distribution between the basic population and sample in East Germany*

|   | Response Rate* | Federal States | Regional Level – ROR | Sectors | Industries (NACE) | Size of Employment | Ownership Structure** |
|---|----------------|----------------|----------------------|---------|-------------------|--------------------|-----------------------|
| East German enterprises with a multinational investor |                |                |                      |         |                   |                    |                       |
| Total   | 18.3%          | yes            | yes                  | no      | yes               | No                 | no                    |
| Foreign   | 18.4%          | yes            | yes                  | no      | yes               | No                 | no                    |
| West German   | 17.2%          | no             | no                   | no      | yes               | No                 | no                    |
| East German enterprises investing abroad              |                |                |                      |         |                   |                    |                       |
|   | 17.3%          | no             | no                   | no      | no                | No                 | no                    |

\*Ratio between the number of enterprises in the population and sample; \*\*Ownership structure in the case of inward FDI refers to full, majority, or minority. In the case of outward FDI it refers to a differentiation between East German ownership or Foreign/West German ownership of the enterprise.

### 3.4 Survey questionnaire 2008

In 2008 the thematic focus of the survey was technology transfer and spill-over. The corresponding 2008 questionnaire includes 18 questions and is divided into four sections.

The first section (questions 1-4) focuses includes questions on employment, turnover, intermediate inputs, exports as well as changes to selected performance indicators through the internationalisation processes. The second part (questions 5-12) deals with the investment behaviour of the enterprise with a particular focus on foreign direct investments. The third part comprises questions about research and development activities (questions 13-17). All R&D indicators are in line with the international standards as codified in the Frascati Manual (OECD 2002). The questionnaire ends with questions about product innovation (question 18). All innovation-related indicators are in line with the international standards as codified in the Oslo Manual (OECD 2005).

## 4. Data Access

The Halle Institute for Economic Research (IWH) has been offering on-site access to the IWH FDI Micro Database as part of research co-operation between external and IWH researchers. So far, this mode of access has been chosen by foreign research teams in particular. In addition, the IWH welcomes external users and visiting researchers such as doctoral and other graduate students. In any case external users only have access to the IWH FDI Micro Database in a safe-room working environment. In the near future, the IWH is going to also provide external online access to the survey data of the IWH FDI Micro Database in the form of a Scientific-Use-File kept at the Archive of Social Sciences at the Leibniz Institute for Social Sciences. In order to secure anonymity of survey respondents, the IWH can only provide a limited version of the full data set.



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## Annex

*Annex Table 1: Distribution of the total population, IWH FDI Micro Database*

|  | <b>East German</b> | <b>In %</b> |
|--|--------------------|-------------|
| <b>Total population</b>                            | <b>3,669</b>       | 100         |
| Number not available                               | -270               | 7.36        |
| Called enterprise not relevant to the survey       | -57                | 1.55        |
| Enterprise in insolvency                           | -36                | 0.98        |
| Contact person could not be contacted              | -257               | 7.00        |
| Busy signal  | -59                | 1.61        |
| Contact persons wanted to be contacted later       | -353               | 9.62        |
| Incorrect information in the population            | -69                | 1.88        |
| Difficulties with understanding (foreign language) | -2                 | 0.05        |
| <b>Addresses used for the survey</b>               | <b>2,566</b>       | 69.94       |

Source: IWH 2008

*Annex Table 2: Distribution of enterprises in the random sample, IWH FDI Micro Database*

|  | <b>East German</b> | <b>In %</b> |
|--|--------------------|-------------|
| <b>Addresses used for the survey</b>                     | <b>2,566</b>       | 100         |
| No response  | -1,890             | 76.51       |
| Interview prematurely finished                           | -20                | 0.42        |
| <b>Sample (realized interviews)</b>                      | <b>656</b>         | 23.07       |
| Enterprises with a foreign/West German investor (INWARD) | 638                |             |
| Enterprises investing abroad (OUTWARD)                   | 43                 |             |
| Only INWARD  | 613                |             |
| Only OUTWARD   | 18                 |             |
| OUTWARD <u>and</u> INWARD                                | 25                 |             |

Source: IWH 2008