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Productivity in Foreign-owned Firms in Eastern Germany

1. Introduction

More than 10 years after re-unification, there still is an obvious need for competitive jobs in East Germany. Experience shows that such jobs do, above all, come into existence in firms that achieve high productivity, serve supra-regional markets, and are highly innovative. In view of the well-known internal deficits of the East German economy, the need to obtain external resources seems to be more than obvious. Besides West German sources, foreign-owned firms could be an alternative. During the past 10 years, the potential role of foreign-owned firms (FoFs) for restructuring has impressively been demonstrated in China and CEE countries which experienced a massive inflow of FDI having opened up for foreign investors (UNCTAD 2001).

If and to what extent East German locations and labour force can profit from increasing inflow of FDI does not only depend on the FDI volume, but it is also of decisive importance

- whether foreign-owned firms systematically offer better income opportunities than indigenous firms, and
- to what extent a better performance of FoFs spills over into the domestic economy.

In the following, we focus on the first aspect and ask whether there are performance differences between domestic and foreign companies. The core variable in this respect is productivity being an important determinant of employment level and wages. We start with a short presentation of foreign-owned firms' engagement in East Germany, compared to their engagement in West Germany (part 2). In part 3, we develop our basic hypothesis that FoFs achieve a better performance compared with indigenous firms. Within the group of German-owned firms, we differentiate between three groups of firms: East German "multinationals", subsidiaries of West German firms, and indigenous companies with without any foreign operations. After the description of the data base (part 4), we carry out empirical tests of our hypotheses (part 5). Part 6 concludes.

2 FoFs in East Germany

With the accession to the Federal Republic of Germany, East Germany opened up for foreign investors. The privatisation policy was directed to foreign as well to German investors. Especially foreign firms already engaged in West Germany had no worse chances in this process. This holds particularly for foreign firms that had taken over long-established West German firms and could, of course, benefit from their familiarity with the German business environment.

The order of magnitude of the engagement of foreign investors in East Germany can be assessed on the basis of a special compilation of the Bundesbank statistics. The indicators used

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here are not FDI flows or stocks, but sales and employment data of foreign-owned firms which are much less biased.¹ According to these data, FoFs in East Germany (excl. East Berlin) had sales of almost € 18 bn in 1999 and they had about 74.000 employees (table 1). That means, about 5% of all foreign engagements in Germany are in the Eastern part of the country. This is only about half the economic weight of East Germany in the entire country. Even if taking into account that the data is incomplete because of the exclusion of East Berlin, it can be assumed that East Germany is still lagging behind West Germany in terms of inward FDI.² Despite massive investment promotion this is not really surprising since general conditions and business environment in particular (bureaucracy!) have been less transparent than in the West. Moreover, there have to be allowed a lot of resources for restructuring of the acquired East German firms.

(Table 1 about here)

The operations of FoFs in East Germany are borne largely by Western European firms. They account for 70% of employment and 74% of sales - 13% percentage points more than in West Germany. This could indicate that European investors are better able (or willing) to adjust to prevailing uncertainties in the business environment.³ Another significant East-West difference lies in the sectoral structure: Engagements in East Germany are much more focused on manufacturing than in West Germany: About 70% of sales and employment vs. less than 50% (sales) and 60% (employment) respectively.) Nevertheless, the weight of FoFs in manufacturing is still more than one third lower in the East than in the West (10% of employees and 17,5% of sales compared with 16% and 26% for total Germany). However, Table 1 shows that the weight of FoFs has increased substantially in East Germany in the late 1990s whereas it has stagnated in West Germany during the last decade (Borrmann/Jungnickel/Keller 2001).

In view of the differences in level and sectoral structure, the catching-up process of East German locations seems to have been relatively successful in manufacturing while a substantial backlog has persisted in services.

3. Hypothesis: productivity advantages of foreign-owned firms

Starting point for the development of our hypotheses are established theories of FDI.⁴ Although the various theoretical approaches differ in terms of naming and weighting (of) the

¹ FDI statistics are biased because of indirect ownership. The regional allocation of FDI is generally determined by the location of the first owner which is very often based in West Germany. Regional FDI data is, therefore, biased in favour of West Germany while East German FDI is underestimated. However, sales and employment data of foreign-owned affiliates in East Germany are allocated to East German locations even if these affiliates are in turn subsidiaries or plants of FoFs in West Germany (there are some exceptions to this rule, the respective discussion goes beyond this contribution). Even sales and employment data for East Germany are, however, declared incompletely since East Berlin is allotted to West Berlin. Data used in the following were supplied by the Bundesbank.

² For further details see for example Belitz et al. 1999.

³ In both East and West Germany, the share of American investors probably is underestimated since they often operate holding companies in the Netherlands or in other European countries which then are shown as home countries of the subsidiaries in Germany.

⁴ Dunning (1980) often considered to have developed the basic explanation of FDI, refers to the interplay of ownership specific factors (O-factors), internalisation factors (I-factors) and location specific factors (L-factors) as a condition for FDI to come about. Later, other authors further differentiated this supposition and partly inte-

explanatory variables included, they generally consider the exploitation or development of company-specific competitiveness, or advantage, as a core determinant for FDI. FDI comes about if this advantage can be more fully Utilised, or developed, by expansion abroad compared with domestic production and exports only. "Ownership-advantage" in Dunning's terminology is equivalent to Markusen's (1998) „Knowledge-capital“.

Competitive strength can result from technological or organisational advantages or from realisation of scale economies in intra-company services such as research & development. FDI can, therefore, not (only) be interpreted as a transfer of financial capital from a parent company to the foreign subsidiary (not even being a necessary component of FDI). It is rather a transfer of those factors that make up the competitive strength of the investing company.⁵ Since these factors are of a public goods character in a multinational firm (Caves 1996), their use in foreign subsidiaries does not impair the domestic use. On the contrary, the additional use in foreign countries broadens the basis for the development and strengthening of such advantages.

tTaking the existence and the transfer of O-factors as a constitutive element of FDI, it follows that the companies investing abroad are among the most competitive and productive ones. Furthermore, it can be assumed that also the foreign subsidiaries show an above-average productivity since they can profit from the competitive strength transferred by the investing firm.⁶

This consideration leads to the conclusion that, first, FoFs can be assumed to achieve a productivity advantage over the average of domestic firms in the host country. Second, it follows that an advantage cannot be expected (or only to a smaller degree) compared with those host country firms which are multinationals themselves. The more internationalised the host economy is, the smaller should be the productivity advantage of FoFs. For Germany, this would mean that the productivity advantage over average domestic firms should be larger in the East than in the West. It can be assumed that FoFs are particularly able to overcome the well-known deficits in East German business environment –such as a general lack of management resources, less developed infrastructure and narrow industrial basis - by mobilising own resources. This relation could, however, be compensated by the high weight of highly-productive plants of West German investors often multinationally oriented.

Therefore, our hypotheses are

- H1 FoFs in East Germany enjoy a productivity advantage over purely nationally operating firms but not - or less so - over multinationals headquartered in the host region.
- H2 The productivity advantage of FoFs in East Germany is larger than in West Germany.
- H3 The productivity advantage is smaller or even not existent over subsidiaries of West German investors.

Some factors could be opposed to our expectations:

grated the OLI factors into general equilibrium models. Examples are Helpman/Krugman (1990), Ethier (1986), and Markusen (1998).

⁵ "It took little staring at available statistics to realize that viewing direct investment as a capital flow was largely a mistake" (Markusen 2001:5)

⁶ This interrelation even holds generally. Empirical investigations have found that the productivity of a plant is positively related to the productivity of the parent company (Bartelsman/Doms 2000). Highly competitive firms will be best in the position to impart their knowledge to the various plants (Baily et al. 1993).

- It is not certain that "high productivity" operations mean the same in the context of the investing firm and compared to the standards of the host country (Doms/Jensen 1998b), in our case in East Germany.
- Since foreign (i.e. East German) operations aim at improving the performance of the entire multinational, production transferred to East Germany is not necessarily of the high-productivity type. Firms can also transfer low-productivity assembly operations which improve productivity in other parts of the multinational.
- Much of FDI is realised by way of mergers and acquisitions (M&A). True, this cannot simply be regarded as a change of ownership with no influence on the performance of the firm acquired -- on the contrary, the foreign investor should aim at improving the performance in order to pay a premium to the former owner. However, experience shows that a large share of M&A turns out to be a failure (Bartelsman/Doms 2000:587), therefore, it is not self-evident that FoFs in East Germany achieve superior productivity.

These factors do not seem to cast fundamental doubt on our basic hypotheses since there have been obvious deficits in terms of efficiency on the part of East German firms. However, it has to be considered an empirical question if FoFs in East Germany operate at high productivity. Furthermore, the dominance of M&A leads to the question whether a productivity advantage on the part of FoFs can, in fact, be traced back to the change of ownership to a foreign investor. If the investors follow "picking-the-winner" strategies, the causality may as well be the other way round: German firms are not highly productive because of foreign ownership, they rather get into foreign ownership because of their high productivity from which the investor aims to profit at other locations.

Our thesis that FoFs enjoy a productivity advantage has been tested and largely confirmed in a number of studies.⁷ East Germany seems to be a particularly good case for a further investigation since it seems that FDI has not yet reached its "normal" level there. Of particular interest is a comparison of foreign- and West German-owned firms, which can, to some extent, be considered external investors, too. Our main aim is to identify the causes of any productivity differences. In particular, we try to find out whether foreign ownership "as such" (as compared with the general integration into an international business network) has an influence of its own and to what extent there are indirect effects of foreign ownership via other variables, such as the input of production factors.

4. Database and methodology

In the following, we largely rely on the establishment panel of the Nuremberg Institute for Employment Research (IAB). The panel is made up of almost 14.000 establishments 5500 of which are located in East Germany (Bellmann 2002). Using this rather broad and unique micro foundation, we can take into account the heterogeneity of the firms with regard to a number of characteristics not available in the aggregate data of the Deutsche Bundesbank. Furthermore, the number of cases is sufficiently high to compare the situation in East Germany with the one in the West.

⁷An overview of the literature can be found in: Pfaffermayr/Bellak (2002). See also Borrmann/Jungnickel/Keller (2002) and Jungnickel (ed. 2002) for detailed discussions of FoFs on the West German labour market and some international comparisons.

The test of our hypotheses requires a definition of both FoFs and adequate groups of establishments for comparison. The definition of FoFs poses no severe problem since ownership was regularly asked for in the East German survey.⁸ Also, the delimitation of affiliates owned by West German investors can be directly taken from the panel data. The biggest problem arises from the definition of German-owned multinationals since information on outward FDI is not available. Hence, we use a concept of multinationality based on export business instead. Export data are available for all years. We define "Multinationals" as establishments with at least 30 % sales in foreign countries. Therefore, establishments with less exports or no export at all are called "nationally oriented". This concept seems to be justifiable since export oriented firms should be under pressure of international competition to a similar extent as firms which are internationalised by way of FDI. These two ways of doing business internationally are often complements. Furthermore, exporting firms can, in principle, realise scale economies in headquarter services and production to a similar extent as "real" multinationals.

Certain problems arise with the operationalisation of productivity. In principle, it can be calculated as value added per employee. In view of a high percentage of no-responses to the value added question, we have to restrain to the gross output/employee ratio as a proxy. This enables us to include 50 % more cases than would have been possible on a value added basis.

The explanatory power of the output/employee ratio is, of course, restricted to the extent to which sourcing ratio and importance of trade business differ between the groups of firms. The output-based productivity increases with the importance of inputs and trading goods. Comparisons with "real" manufacturing firms would then lead to false conclusions. Some empirical studies (Oulton 1998a:10; Griffith/Simpson 2001:15) show that FoFs indeed have higher sourcing ratios than national firms. This problem is reduced as far as possible by twofold selection:

- We confine our analysis to manufacturing. Trading companies are not included. Thereby, the very common distribution outlets with no manufacturing activities are excluded.
- We employ a threshold of 50 employees. Smaller establishments are likely to focus on distributing products of other plants or companies, rather than manufacturing on their own. This should hold for FoFs in particular.

Large establishments are clearly over-represented in the IAB panel. This can lead to misconception if the indicators in question are sensitive to size. We, therefore, mostly display un-weighted averages and median values. The results are not extrapolated to the universe of East German firms.

The special features of FoFs are first analysed in comparison with German-owned firms. Beyond that, multiple regressions are run in order to assess the role of foreign ownership for productivity when other factors of influence are controlled for. Furthermore, the relationship between the independent variables has to be taken into account. For example, not only can foreign ownership influence productivity directly but also in an indirect way via structural characteristics (such as sectoral affiliation and size) and via increased input of qualified labour or capital. To the extent to which these factors are influenced by foreign ownership, they can no longer be considered as exogen. We, therefore, proceed in two steps. First, we assess the influence of foreign ownership "as such" compared with other factors. Beyond that, we ex-

⁸ There may result some uncertainties from the self-assessment of the participants in the panel. In particular, firms in East Germany that are owned by FoFs in West Germany may sometimes assess themselves as German-owned instead of foreign-owned.

plore the relationship between foreign ownership and further determinants of productivity in order to include these more indirect modes of influence.⁹

To what extent a possible productivity advantage can be traced back to "Picking-the-winner" strategies, cannot be decided only on the basis of cross-sectional data, since such data do not allow statements as to the direction of the established relationship. Conclusions concerning causality should be based on time series data. Such data are available for East Germany for 1995-1999, although the number of FoFs which are included in both years (22) is drastically lower than the sample in 1999 (265).

5. Productivity advantages of foreign-owned firms -- evidence

A first processing of the panel data largely yields the expected results for all hypotheses developed above (table 2):

- FoFs in East Germany achieve a productivity advantage of about 60 % over German firms; compared with subsidiaries of West German investors, the advantage is significantly lower since these firms can benefit from the competitive strength of the parent company.
- In West Germany, the FoFs' advantage is only roughly half as high as in the East; this conforms to our expectation that the advantage decreases with the multinationality of the host economy.
- German multinationals (defined by their export quota) in both East and West Germany achieve a higher productivity than firms operating on a national scale only.

(Table 2 about here)

Level and distribution of productivity among the German and foreign firms in East and West Germany reveals some interesting information:

- There is a strong heterogeneity of both the German-owned and the foreign-owned groups of firms in East and West Germany (fig. 1 and 2). In both groups, there are establishments with very low as well as with extraordinarily high productivity. This leads to the supposition that productivity differences are to a large extent a matter of sector and firm specific characteristics.
- While the level is generally lower in East Germany compared with that in the West, the gap between foreign-owned and domestic firms in East Germany is widening with increasing productivity. Thus, much of the advantage of FoFs derives from higher weight of high-productivity firms.

(Fig. 1 and 2 about here)

6. The role of foreign ownership

⁹ An alternative method would be to use interactive variables.

If fofs enjoy a productivity advantage over East German firms, the reason is not necessarily (or not only) foreign ownership as such. On the one hand, other possible factors of influence have to be controlled for. On the other hand, it is necessary to explore whether there are indirect effects of foreign ownership via other determinants of productivity. If indirect effects are not taken into account, the role of foreign ownership will be underestimated. Furthermore, we have to address the "Picking-the-winner" question: Do fofs enjoy higher productivity because they are foreign-owned, or are they foreign-owned because they were particularly competitive and were acquired for that reason?

6.1 Foreign ownership vs. other influencing factors

In order to clarify the question to what extent foreign ownership exerts an influence of its own, we first estimate some multiple regressions which include further factors of influence beyond foreign ownership. The additional factors are selected on the basis of theoretical considerations (production theory and approaches to explain FDI) and the results of other empirical studies available.

Variables included are

- sector;
- size of establishment;
- input of human capital;
- input of real capital;
- input of technological knowledge;
- integration into the international division of labour.

A definition of the variables is shown in the box.

According to our hypotheses, the regressions are done separately for the three groups of firms, as they were defined above (part 3). In the first model, we include all establishments with 50+ employees in order to test our hypothesis H1. In the second model, we restrict the German-owned firms to what we call "multinationals", i.e. to those with an export quota of 30+ per cent of sales. This is done in order to discriminate between the influence of "foreign ownership as such" and the "integration into an international business network in general" (hypothesis H2). In both models, we compare the East and West German situation. The results are not always as expected.

- In our first model, productivity significantly correlates with all independent variables included in the case of West Germany, whereas in East Germany, size and input of capital are not significant. The foreign ownership dummy, however, is highly significant in both cases. As expected, the strength of influence is a little higher in East Germany.
- The explanatory power is reduced only by a little if we include, in our second model, out of the group of German-owned firms only those which are strongly export oriented. In East Germany, only wages per employee and the technology factor remain significant, while the influence of foreign ownership disappears. This seems to contradict the results of table 1 which revealed the particularly strong productivity advantage of FoFs in East Germany. The reason for this unexpected result is largely the exclusion of low-productivity East German firms, whereas the share of high-productivity affiliates of

- West German investors increased substantially. They account for over half of all observations compared with 30 % East German-owned and 17 % foreign owned firms most of which are export-oriented, too.
- In West Germany, the foreign ownership factor remains significant in the second model. This indicates that it is not only the integration into an international business network what increases productivity. Apparently, ownership matters as well. This is a bit unexpected since the big West German multinationals should have good potential to produce at high productivity not least by increasing the internationalisation of sales.

(Table 3 about here)

Definition of variables

- Size of establishments is measured by the number of employed persons. The expected direction of influence is positive.
- Input of real capital: Since there is no information on the capital stock or fixed assets, annual investment is taken as a proxy. In view of the volatility of annual investment this is a problem which cannot even be reduced by averaging several years since a large number of firms only entered the panel in 1999.
- Input of human capital is measured by average wages per employee. It is thus assumed that payment reflects qualification of employees. The use of direct qualification levels is not possible because of too raw classification in the panel.
- Integration into the international division of labour is defined by the ratio of export to sales.
- The technological level of machinery is given in the panel by a self-assessed classification along a scale from 1 (latest technology) to 5 (outdated). This variable is operationalised in the regressions by a dummy (1 for the two best categories, else 0).
- Sector specific circumstances are taken into account by 15 dummies.
- The size and wages variables are used in log form.

6.2 Structural differences and indirect effects

Regarding the causes of productivity advantages, indications can be deducted from structural differences of "purely German" and foreign-owned firms. Main structural characteristics are sectoral distribution and size of the establishments. According to various studies, FoFs are concentrated on above-average productivity sectors and (they are) bigger than national firms (Davies/Lyons 1991; Doms/Jensen 1998; Pfaffermayr/Bellak 2002). The German evidence largely corresponds to the evidence established in other studies, although there are some particularities (Borrmann/Jungnickel/Keller 2001; Jungnickel, ed. 2002).

Structural factors: Sector and size

The sectoral composition of FoFs contributes to their productivity advantage since they are concentrated on high-productivity sectors. The exact role of this factor could be determined by a comparison of the actual productivity with a hypothetical one resulting from a sectoral composition matching the average one in East Germany. For Germany as a whole, respective calculations showed that the sectoral structure explains about one third of the FoFs' advantage

(Borrmann/Jungnickel/Keller 2001). Due to insufficient sectoral disaggregation in the FDI statistics, such calculations are not possible for East Germany. It can be assumed, however, that the situation there is not too different from the West German one.

(Fig. 3 and 4 about here)

Concerning size factor, our assumption, based on the former studies mentioned above, is that productivity increases with size, at least up to a certain degree. This view is confirmed in table 3 for Germany as a whole and for West Germany but not for East Germany. The distinctiveness of East Germany lies, however, largely in the structure of German-owned firms, not in the structure of FoFs (fig. 3 and 4). The German firms' level of productivity hardly differs between the two size groups. FoFs, however, show the expected relation. Their advantage increases with size.¹⁰ In West Germany, on the other hand, the productivity of German-owned firms slightly increases with size, whereas this does not hold for FoFs. Their overall advantage results basically from the wide difference in the lower size class.

Factor input and integration into the international division of labour

Foreign ownership can also influence productivity in an indirect way if it leads, for example, to employment of more qualified labour or the use of more modern technology. The resulting productivity-enhancing effects would then be statistically assigned to these two factors instead of foreign ownership. We explore such indirect influence by some regressions. They serve the analysis of the determinants of those factors that go along with both, higher productivity and foreign ownership.

In PROBIT regressions, the income per head (i.e. the input of human capital), the investment quota and the export ratio turned out to be positively correlated with foreign ownership (Borrmann; Jungnickel; Keller 2001). When further determinants of these variables are controlled for, there still is a significant positive relation with human capital and exports but not with the investment quota (which can only be explained to a very small degree by the independent variables included). We can, therefore, conclude that the influence of foreign ownership on productivity does not only take place by foreign ownership "as such" (as shown in table 3) but beyond that, there is an indirect influence via employment of qualified labour and a more intense integration into the international division of labour.

(Table 4 about here)

6.3 Picking-the-winner-strategies?

If we can determine a significant (direct or indirect) relationship of foreign ownership and productivity level even when other possible determinants are controlled for, we can assume an underlying causal relation. However, the direction of such relationship is open, as was dis-

¹⁰ Another factor that contributes to the difference between German- and foreign-owned firms is that FoFs concentrate on larger firms. In East Germany, one in eight firms of the lower size class (50-299 employees) is foreign-owned, roughly half are West German and little more than one third are in East German ownership. In the upper size class, one in five establishments is foreign-owned and ca. 70 % are in West German ownership.

cussed above (part 4). It cannot unambiguously be established on the basis of cross-sectional data. The assessment of causality requires information on the development of the establishments before and after acquisition.

Such information is seldom available. Great Britain is one of the few examples where a respective data base exists. On that basis, Griffith and Simpson (2001) show that establishments owned by foreign investors during the whole period covered, exhibit higher productivity growth than those only acquired in this period or having stayed British for the whole time. This leads to the conclusion that foreign ownership exerts a positive rather than a negative influence on performance.

For East Germany, information concerning ownership was collected from the beginning of the IAB survey. Therefore, we can compare the development of firms foreign-owned throughout the time with German firms. However, the number of identical FoFs included decreases over time because of "panel mortality". For the period 1996-1999 there are only 22 FoFs left. Our results, therefore, need further verification on a wider data base. They do, nonetheless, provide very clear results.

The comparison of the aforementioned groups of firms over the years 1996-1999 displays (table 5)

- not the FoFs, but the West German-owned firms operated at the highest productivity in 1996;
- during the following years, however, FoFs showed clearly higher growth rates and took the lead;
- "purely" East German firms have remained at the end of the productivity hierarchy.

This could, on the one hand, lead to the conclusion that foreign ownership helps to increase productivity. On the other hand, we could not prove a significant influence of foreign ownership in multiple regressions which aimed at identifying the determinants of productivity growth. There, only size was significant.¹¹ This result may be influenced by the small number of observations and, therefore, needs further empirical tests on a broader data base.

(Table 5 about here)

6.4 Reduction of employment - the price of productivity gains?

Even if we arrive at a positive assessment of the role of foreign ownership as a productivity-enhancing factor, we have to ask what is behind this result?. Productivity growth can be achieved by expanding production as well as by cutting down the workforce. While the first case would be welcomed from an economic policy point of view, the second case could be a problem. The growth of productivity and hence of income would be traded in for employment losses. The judgement of the second case is not unambiguous from an economic policy perspective. It depends on the capacity for structural adjustment, i.e. on the situation on the labour market. If structural change is functioning well and the dismissed employees instantaneously find new jobs elsewhere, there is no problem since nobody's situation will aggravate. Normally, there will, however, be an adjustment process which goes along with unemploy-

¹¹ Other variables included were: Income and investment per employee; export orientation; input of technology and sectoral affiliation. The regressions are not shown in this contribution.

ment, at least temporarily. The longer it takes, the more of a problem will there be for economic policy.

The calculations in table 6 show the level and change of employment from 1996 - 2000 in the various groups of firms, both weighted and unweighted data. Included are firms with unchanged ownership attribute in both years. While there was a general reduction of employment, the data clearly show that FoFs laid off employees more than the other groups did. This holds particularly for bigger firms. However, employment losses can only explain about one fourth of the productivity gains which can, therefore, not generally be regarded critically in general.

For affiliates of West German firms, the judgement is different. There, substantial reduction of personnel can explain the larger part of productivity increases (which were, however, much smaller compared with FoFs). "Purely" East German firms are in each respect at the other extreme. They maintained, as aggregate, a rather stable work force, but also had the by far lowest productivity gains. The long-term implications of this combination of wages, employment and competitiveness deserve further analysis.

(Table 6 about here)

7. Summary and conclusions

Foreign-owned investors could play an important role in upgrading the East German economy and supplying jobs that offer high income opportunities. Their employment and income potential largely depends on the existence of differences in structure and performance compared with German-owned firms.

In this paper, we analysed such differences and empirically tested three hypotheses:

- H1 FoFs in East Germany enjoy a productivity advantage over purely nationally operating firms but not - or less so - over multinationals headquartered in the host region.
- H2 The productivity advantage of FoFs in East Germany is larger than in West Germany.
- H3 The productivity advantage is smaller or even not existent over subsidiaries of West German investors.

Our work is largely based on the establishment panel of the German Institute for Employment Research (IAB). It largely yields the expected results although some particularities exist.

- FoFs, on average, achieve a higher productivity by about 60 % than German firms. However, compared to affiliates of West German firms, the advantage shrinks since these can benefit from the competitiveness of the parent companies.
- Similarly, the advantage over multinationally operating domestic firms is significantly smaller.
- The level of productivity seems to be largely determined by company-specific factors. German as well as foreign-owned firms display a wide variation of productivity. The advantage of FoFs results primarily from a higher share of high-productivity firms.
- Foreign ownership remains a significant determinant of productivity even when other factors are controlled for. If the comparison is restricted to German multinationals, foreign ownership will lose significance.

- Superior productivity not only results directly from foreign ownership, but also in an indirect way via employment of qualified work force and the integration into the international division of labour. Superior size does not play a crucial role.
- FoFs have extended their advantage over time. This is contrary to the "Picking-the-winner" thesis. This thesis argues that FoFs are competitive not because of foreign ownership, but they were acquired by foreign investors because of their existing competitiveness.
- FoFs have cut their work force significantly above average. However, this contributes to the increasing polarisation of firms in East Germany only to a minor extent. East German-owned firms display a more stable development of the work force. To what extent they can maintain this in the long run, remains an open question in view of their low level and sluggish growth of productivity.

Therefore, FoFs contribute to the growth of income, while the employment effects can be questioned, at least in the short and medium run. In view of the narrow data base concerning former years, these issues require further research. For example, one could think of matched pair analysis which is less sensitive to a limited number of observations.

Tables and Figures

Table 1 Foreign-owned firms in East Germany ^a 1995 und 1999

Sector	No. Employees				Sales			
	1000		% ^b		Mrd. DM		% ^b	
	1995	1999	1995	1999	1995	1999	1995	1999
Manufacturing	34	51	6,7	10,0	11,5	24,8	10,7	17,5
Food, beverages, tobacco	2	1	X	1,2	0,9	0,8	X	3,0
Paper	2	1	24,5	12,0	0,8	0,6	32,9	24,0
Chemical ind.	4	X	X	X	1,5	X	X	X
Rubber&plastic products	2	X	X	X	0,4	X	X	X
Non-metallic min.products	X	3	X	8,5	X	1,0	X	10,7
Metal, metal products	3	6	13,4	30,3	1,0	2,9	18,1	45,4
Mech. machinery	5	6	7,0	9,6	0,8	1,6	7,5	11,7
Electrical machinery	1	3	3,5	12,3	0,2	0,8	4,3	14,3
Medical&optical instruments,etc.	1	2	7,2	12,8	0,1	0,4	4,8	14,7
Motor vehicles&parts	2	3	9,2	11,0	2,1	2,7	27,3	18,9
Trade, repair business	4	5	k.A.	k.A.	3,0	4,3	k.A.	k.A.
Transport, communication	0	2	k.A.	k.A.	0,1	0,6	k.A.	k.A.
Real estate, business services.	3	3	k.A.	k.A.	1,0	0,8	k.A.	k.A.
Real estate	X	0	k.A.	k.A.	X	0,2	k.A.	k.A.
business services	2	2	k.A.	k.A.	0,4	0,4	k.A.	k.A.
Holding companies	0	0	k.A.	k.A.	0,0	0,0	k.A.	k.A.
All enterprises	59	74			19,6	34,6		

^a Excl. Berlin; ^b Share of the resp. Sector in East German economy (incl. East Berlin) - slightly underestimated, see text.

X No information in order to protect individual response.

k.A. No information because of lacking reference base.

Quelle: Deutsche Bundesbank; Statistisches Bundesamt; own calculations.

Table 2 Productivity^a in East and West German manufacturing, 1999

Establishments...	Establishments ^b			
	50+ employees		50+ employees and Exportquota ≥ 30 % ^c	
in East Germany				
German-owned	179	(59)	208	(69)
....affiliate of West German firm	210	(69)	253	(83)
Foreign-owned	303	(100)	303	(100)
Total ^d	188	(62)	230	(70)
in West Germany				
German-owned	258	(77)	276	(82)
Foreign-owned	337	(100)	337	(100)
Total	274	(81)	282	(84)

^a Sales per employee in DM 1000, calculated as median value. In brackets: Index, FoFs=100.

^b No. of observations: total: n=1601, foreign-owned: n= 265; Export quota ≥30%: n=606 German-owned firms. ^c Export criterion for German-owned firms only. ^d including three cases with public ownership or no majority owner.

Quelle: IAB Betriebspanel; own calculations.

Fig.. 1: Sales per employee and foreign ownership in West German manufacturing 1999 (establishments with 50+ employees)

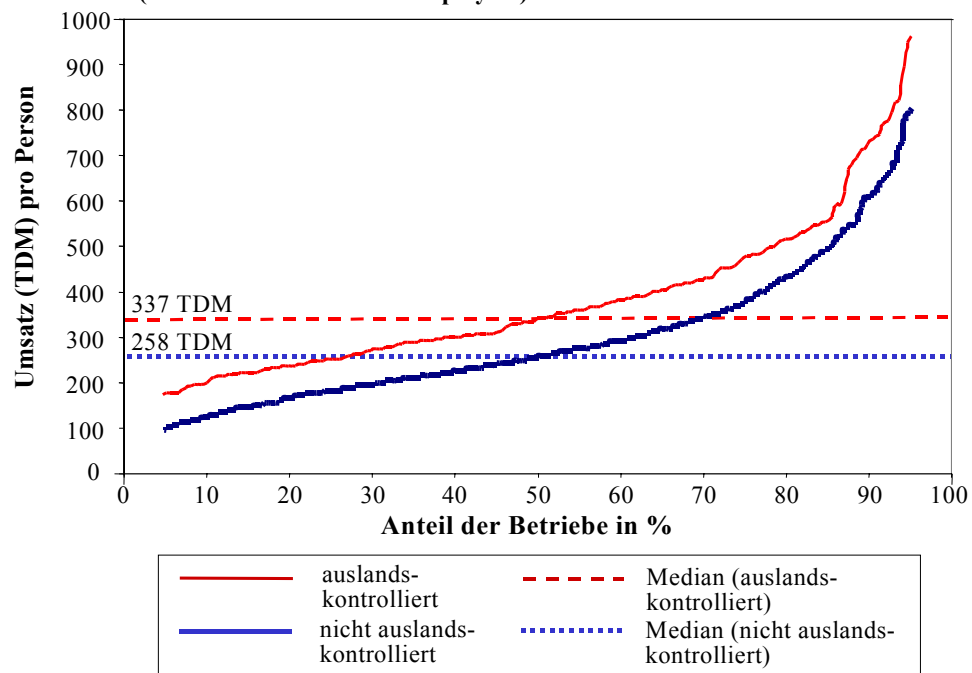


Fig.. 2 Sales per employee and foreign ownership in East German manufacturing 1999 (establishments with 50+ employees)

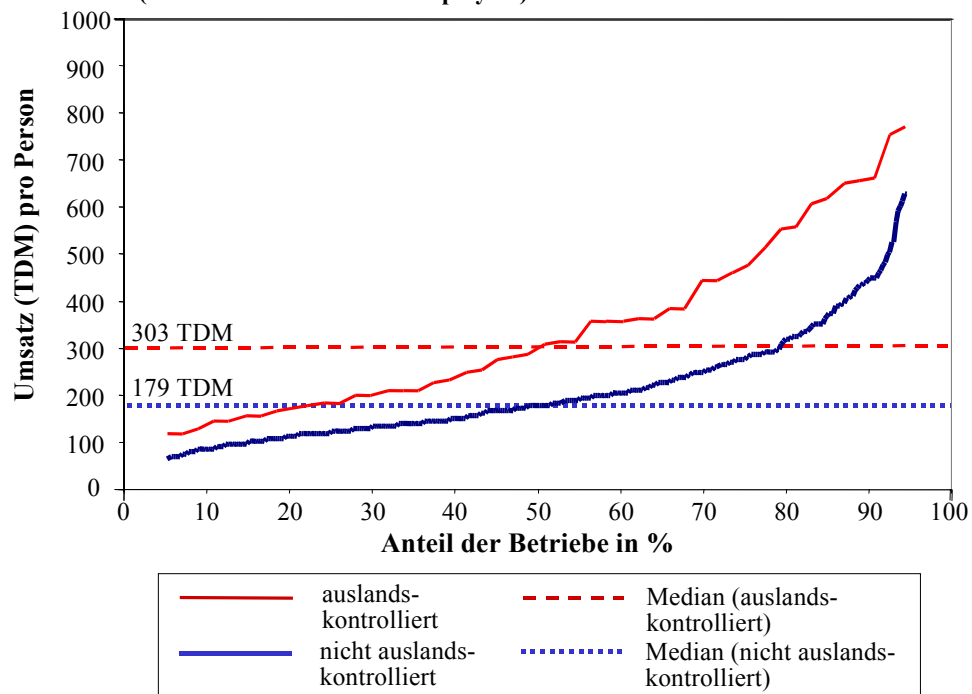


Tabelle 3 Regression estimates: Determinants of productivity in East German manufacturing, 1999^a

Independent variable	50+ employees			50+ employees and German-owned firms: Exports ≥ 30% of sales	
	Germany	East	West	East	West
Foreign ownership (yes= 1, no= 0)	0.176** (4.36)	0.212** (2.21)	0.168** (3.75)	0.130 (0.94)	0.175** (3.74)
(ln) no. employees	0.054** (3.47)	0.037 (0.847)	0.057** (3.43)	0.093 (1.12)	0.035 (1.71)
(ln) investment per employee	0.025** (4.07)	0.023 (1.72)	0.026** (3.81)	0.039 (1.13)	0.028** (3.08)
(ln) wages per employee	0.791** (17.75)	0.807** (7.79)	0.780** (15.73)	0.607** (2.78)	0.487** (7.22)
Export quota	0.334** (5.21)	0.387** (2.61)	0.316** (4.42)	-0.206 (0.69)	0.308** (3.09)
Technol. level of machinery (latest tech.=1, else 0)	0.104** (3.18)	0.166* 2.38	0.078* (2.11)	0.292* (1.99)	0.082 (1.77)
East/West Germany (West=1, East= 0)	0.030 (0.82)				
15 dummies for sectors	yes	yes	jays	jays	yes
Constant	4.919** (13.43)	4.760** (5.62)	5.063** (12.01)	6.194** (3.24)	7.699** (13.14)
R ²	0.355	0.318	0.337	0.260	0.298
Adjusted R ²	0.345	0.279	0.324	0.132	0.272
No. of observations	1476	397	1079	136	572

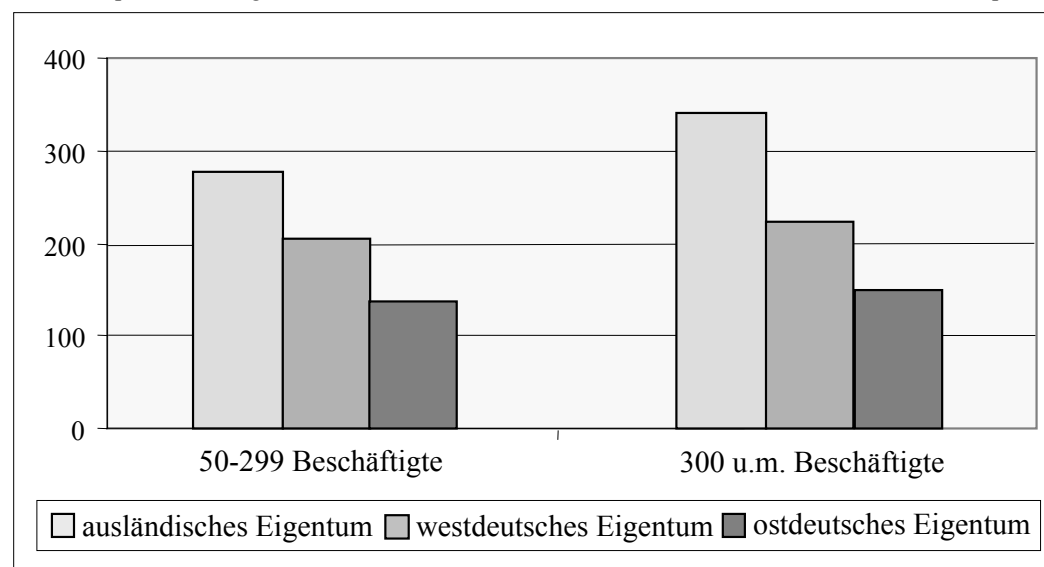
a t-values in brackets; * (**) Signifikanz $\alpha = 0.05$ (0.01)

Source: IAB Betriebspanel

Figure 3 Productivity ^a of foreign-owned and German establishments in East German manufacturing by size of establishment, 1999 (in 1000 DM)

^a Umsatz pro Beschäftigten

Quelle: IAB Betriebspanel



^a Umsatz pro Beschäftigten

Quelle: IAB Betriebspanel

Tabelle 4 Foreign ownership and various characteristics of manufacturing firms in East Germany, regression estimates^a (establishments 50+ employees)

Dependent variable	Income per employee	Investment per employee	Export quota
Independent variable			
Foreign ownership (yes= 1, no= 0)	0,09*(2,2)	0,57 (1,6)	0,09**(2,7)
No. employees (log)	0,07**(3,5)	0,20 (1,2)	0,04**(3,1)
Export quota	0,22**(3,1)	1,79** (3,2)	
Investment per employee (log)	0,00 (0,5)		0,01**(3,2)
Income per employee (log)		0,32 (0,8)	0,12**(3,5)
Technological level of machinery	-0,01 (0,3)	0,74** (2,7)	-2,34 (1,0)
Part time employees (share)	-0,01**(5,7)		
15 sectoral dummies	ja	ja	ja
Adjusted R ²	0,23	0,05	0,20
No. of cases	411	411	411

^a Standardised regression coefficients, t-values in brackets* (**) Significance $\alpha = 0,05$ (0,01)

Source: IAB-Betriebspanel

Table 5: Change of productivity^a in East German manufacturing by ownership of establishment, 1995 – 1999^b

ownership ...	All establishments			
	Productivity 1995		Productivity 1999	
German-owned	131	(77)	141	(48)
Affiliates of West German firms	194	(114)	235	(80)
East German-owned	112	(66)	125	(43)
Foreign ownership	170	(100)	293	(100)
Total ^c	140	(82)	150	(51)

^a Sales per employee in DM 1000, calculated as median in the respective group. In brackets: Index, FoFs=100;^b Basis: Panel participants with unchanged ownership attributes in both years. No. of observations: total n=304, foreign ownership: 22; ^c Including three cases with public or other ownership.

Quelle: IAB Betriebspanel, 1. and 4. wave East Germany

Table 6: Average size of establishments in East German manufacturing 1996 and changes of work force till 2000.
(Basis: Panel participants in both years)

Ownership 1996 und 2000:	Average no of employees					
	Median (1996)	arithmet. mean (1996)	Average change 1996-1999 (%)	Median (1996)	arithmet. mean (1996)	Average change 1996-1999 (%)

		unweighted			weighted		
German	31	112	-4,3	8	22	-1,4	
Affiliate of West German investor	125	223	-14,6	32	84	-9,3	
East German	15	34	+2,2	7	12	-0,5	
Foreign ownership	261	374	-17,6	76	170	-25,4	
Total ^a	35	130	-5,7	8	24	-2,0	

^a Including three cases with public or other ownership.

Source: IAB Betriebspanel, waves 1. and 4. East Germany

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