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**by**

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## **Why more West than East German firms export**

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### **Abstract**

Using unique new data and a recently introduced non-linear decomposition technique this paper shows that the huge difference in the propensity to export between West and East German plants is to a large part due to differences in firm size and human capital intensity.

JEL-classification: F14

Keywords: Exports, micro data, West Germany, East Germany

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## **1. Motivation**

While Germany is one of the most important exporters of manufacturing goods in the world, by far not all manufacturing firms in Germany are exporters, and there is a remarkable gap between the share of exporters in all manufacturing firms between West Germany and East Germany. While in West Germany in 2004 64.4 percent of manufacturing plants were exporters, fourteen years after re-unification this share was only 45.5 percent in the former communist East Germany. The reasons for this difference are not yet well understood, not least due to a lack of comprehensive micro data. Using a unique new data set and a recently introduced non-linear decomposition technique this paper contributes to the literature by investigating the share of this gap that is due to observed plant characteristics.

The rest of the paper is organised as follows: Section 2 introduces the newly available data. Section 3 reports descriptive evidence. Section 4 outlines the non-linear decomposition technique and presents results from its application. Section 5 concludes.

## **2. Data**

The empirical investigation uses data for plants taken from regular surveys by the Statistical Offices of the German federal states covering all plants from manufacturing industries that employ at least twenty persons in the local production unit or in the company that owns the unit. Participation of plants in the survey is mandated. Late in 2006 these data were matched over all federal states to form a data set that covers Germany as a whole. In this paper the most recent available data for 2004 are used.

Note that the micro level data are strictly confidential and for use inside the Statistical Office only, but not exclusive. Further information how to access the data is given in Zühlke et al. (2004).

### 3. Descriptive evidence

As shown in table 1 the share of exporters in all manufacturing firms<sup>1</sup> was much lower in East Germany (45.5 percent) than in West Germany (64.4 percent) in 2004. Participation of firms in export markets is linked to firm size and factor inputs. Firms from one of the most highly developed industrial countries of the world can be expected to have a comparative advantage in technology intensive products made by highly qualified workers; furthermore, firm size is expected to be positively correlated with export activities for various reasons including scale effects, a higher capacity for taking risks in larger firms, and the fixed costs character of various export related costs like retooling and redesigning products for foreign markets (see Wagner 2001).

Table 1 documents that in both parts of Germany exporters were larger, more human capital intensive, and more often from technology intensive industries than their non-exporting counterparts.<sup>2</sup> Results for probit models show that these links, which are in line with our theoretical priors for export participation, are statistically highly significant *ceteris paribus*, too.

[Table 1 near here]

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<sup>1</sup> In this paper the term firm is used to mean a local production unit, or plant.

<sup>2</sup> Human capital intensity is measured by wage per employee. Firms are classified as high-tech or medium-tech firms according to their industry affiliation, using the standard list of technology intensive industries of Germany; details are available from the author on request. All differences are statistically significant at an error level of less than one percent.

### **3. A decomposition of the difference in the propensity to export in West and East German firms**

The figures reported in table 1 reveal a number of differences between West and East German plants regarding the size of the estimated coefficients of the probit models, and in the composition of the samples with regard to these characteristics. Therefore, the question arises to what extent the differences of export participation across space can be explained by differences in characteristics of the firms on the one hand, and by differences in the coefficients on the other hand.

To tackle this kind of question, Fairlie (2006) introduced a decomposition method based on estimates from a non-linear probit model. While a discussion of the details of this method is beyond the scope of this paper, two aspects should be mentioned: First, while the characteristics effect identified in the decomposition represents the part of the difference in export participation that is due to observed differences over the two regions in the characteristics of the firms, the residual effect not only represents the part due to different regression coefficients but captures also the proportion of the difference due to group differences in unmeasured or unobservable factors. Second, each sub-sample can be used as the reference group, and the results usually differ according to the choice of the reference group. Therefore, both variants are computed, and the results are compared.

The type of question answered here is “How high would the share of exporting firms among all manufacturing firms in East Germany have been in 2004 if the firms from the West German sample were located in East Germany, and if the characteristics of these West German firms were linked to the probability of exporting according to the coefficients estimated using the East German sample from 2004?” Results are reported in table 2.<sup>3</sup>

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<sup>3</sup> Stata 9.2 and the program fairlie.ado were used for computations.

[Table 4 near here]

When West German firms are used as the reference group, 45 percent of the difference in the export participation rate is allocated to observed firm characteristics included in the probit regression. This part is slightly lower (about 40 percent) when the reference group is formed by East German firms. The detailed decomposition shows that the lion's share of this characteristics effect is due to the much lower human capital intensity of East German plants, and that the larger average size of West German plants matters, too. The point estimates for the two technology group dummy variables are tiny (and not always statistically significant at a usual level), and for each reference group one of the coefficients has the "wrong" sign; differences in technology intensity – at least when (due to a lack of better information) measured by average R&D intensities at the industry level – between East and West Germany do not contribute to the explanation of the huge difference in the export participation rate.

#### **4. Conclusions**

According to the results from a new unique data set and a recently introduced non-linear decomposition technique, between 40 and 45 percent of the large difference in the share of exporting firms in West and East Germany can be explained by the higher human capital intensity and – to a less degree – by the larger average size of West German firms. On the one hand, this is an important result that helps to understand why this difference is still that large one decade and a half after reunification. On the other hand, the residual effect – which is at least in part a measure of our ignorance – is more than 50 percent, and this points to the need of

further research based on more informative plant level data that will hopefully allow the inclusion of more plant characteristics in the decomposition.

## References

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Table 1: Export participation of manufacturing firms in West and East Germany, 2004

| Variable            | West Germany                                          |                            | East Germany                                          |                            |
|---------------------|-------------------------------------------------------|----------------------------|-------------------------------------------------------|----------------------------|
|                     | (Share of exporters: 64.44%)                          |                            | (Share of exporters: 45.49 %)                         |                            |
|                     | Results for probit estimation of export participation | Sample mean                | Results for probit estimation of export participation | Sample mean                |
|                     | Estimated coefficient (p-value)                       | Exporters<br>Non-exporters | Estimated coefficient (p-value)                       | Exporters<br>Non-exporters |
| Number of employees | 0.001408<br>(0.000)                                   | 176.56<br>58.72            | 0.00175<br>(0.000)                                    | 111.85<br>53.23            |
| Human capital       | 0.000024<br>(0.000)                                   | 31,798.70<br>26,274.75     | 0.000019<br>(0.000)                                   | 23,415.12<br>20,255.12     |
| High-tech (dummy)   | 0.308<br>(0.000)                                      | 0.059<br>0.029             | 0.416<br>(0.000)                                      | 0.074<br>0.035             |
| Medium-tech (dummy) | 0.431<br>(0.000)                                      | 0.214<br>0.104             | 0.399<br>(0.000)                                      | 0.215<br>0.120             |
| Constant            | -0.556<br>(0.000)                                     |                            | - 0.738<br>(0.000)                                    |                            |
| Number of firms     | 38,147                                                |                            | 9,071                                                 |                            |

Table 2: Decomposition analysis of differences in export participation of manufacturing firms in West and East Germany, 2004

| Reference group<br>(percent exporters<br>in sample) | Comparison group<br>(percent exporters<br>in sample) | Difference in participation<br>(percentage points) | Characterisitics effect<br>(percentage points) | Residual effect<br>(percentage points) |
|-----------------------------------------------------|------------------------------------------------------|----------------------------------------------------|------------------------------------------------|----------------------------------------|
| West<br>(64.44)                                     | East<br>(45.49)                                      | 18.96                                              | 8.51                                           | 10.45                                  |
| East<br>(45.49)                                     | West<br>(64.44)                                      | -18.96                                             | -7.71                                          | -11.25                                 |

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Detailed decomposition

| Variable | Characteristic effect<br>(percentage points) | Significance level<br>(p-value) |
|----------|----------------------------------------------|---------------------------------|
|----------|----------------------------------------------|---------------------------------|

## Reference group: West Germany

|                     |        |       |
|---------------------|--------|-------|
| Number of employees | 1.413  | 0.000 |
| Human capital       | 7.106  | 0.000 |
| High-tech (dummy)   | 0.012  | 0.005 |
| Medium-tech (dummy) | -0.034 | 0.000 |

## Reference group: East Germany

|                     |        |       |
|---------------------|--------|-------|
| Number of employees | -1.678 | 0.000 |
| Human capital       | -5.633 | 0.000 |
| High-tech (dummy)   | 0.013  | 0.218 |
| Medium-tech (dummy) | -0.405 | 0.000 |