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by  
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**The post-entry performance of cohorts of export starters  
in German manufacturing industries\***

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Abstract:

This paper investigates four cohorts of firms from German manufacturing industries that started to export in the years between 1998 and 2002 and follows them over the five years after the start. Export starters are a rare species and they are small on average compared to incumbent exporters. Between 30 percent and 40 percent of the starters became continuous exporters; some starters stepped out and back into exporting, many of them more than once. The share of total exports contributed by export starters of a cohort is tiny in the start year, and it remains so over the years to follow, although those starters that were exporters in year  $t+5$  had a share of exports in total sales that was more than twice as high as the average share of exports in total sales among the export starters of the same cohort in year  $t$ . Contrary to the market selection hypothesis there is no evidence that productivity in the start year is systematically related to survival in the export market. There is no evidence for a negative impact of a smaller firm size in the start year on the chance to survive on the export market. Starting with a higher share of exports in total sales, however, tends to increase the probability to stay on the export market.

*Keywords:* Export starters, post-entry performance, Germany, enterprise panel data

JEL Classification: F14

\* Acknowledgement: All computations were carried out inside the research data centre of the Statistical Office in Berlin. I thank staff members of the centre for running the Stata do-files and checking the output for violation of privacy. The data used are confidential but not exclusive; see Zühlke et al. (2004) for the rules to access the data inside the research data centre. To facilitate replication and extensions the Stata do-files used are available from the author on request.

## 1. Motivation

Every year firms that did sell their products on the national market only in the past start to export - they make the transition from the status of a non-exporter to an exporter. Numerous studies document the number of status switchers<sup>1</sup> and investigate the determinants of starting to export, pointing to, among others, self-selection of more productive firms into exporting.<sup>2</sup> The post-entry performance of export starters, however, is much less comprehensively documented and only incompletely understood. Snips of empirical evidence are available from different strands of the literature on international firm activities:

- Studies that decompose the change in total exports between two years into changes attributable to firms that exported in the second year but not in the first year, that increased (decreased) exports between the two years, and that exported in the first year but not in the second year document the impact effect of export starters on the net change in total exports in the first year of exporting. This impact effect varies widely between countries and over time.<sup>3</sup>

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<sup>1</sup> Germany, one of the leading actors in the world market for goods and services, is a case in point. Based on a comprehensive panel for all enterprises liable to turnover taxes (described in detail in Vogel (2008)) that covers the years 2001 to 2006 Vogel et al. (2010) document that in West Germany 9.848 firms from manufacturing industries switched from non-exporter to exporter status between 2001 and 2006. The share of new exporters in all manufacturing firms that were active in both years is 9.15 percent. The corresponding figures for East Germany are 1.733 new exporters and 7.65 percent of all firms. For the US, Bernard, Redding and Schott (2009) find that 49,035 firms, or 1.9 percent of the 2.6 million continuing firms that did not trade in 1993, become exporters until 2000. Empirical studies documenting export entry in other countries include Alvarez and López (2008) for Chile, Buono, Fadinger and Berger (2008) for France, Eaton et al. (2008) for Columbia and Esteve-Pérez, Pallardo and Requena (2009) for Spain.

<sup>2</sup> See Wagner (2007a) for a survey, Bernard and Jensen (2004a) for the US, and International Study Group on Exports and Productivity (2008) for comparable evidence for 14 countries.

<sup>3</sup> Wagner (2004) provides evidence on one German federal state, Lower Saxony, where this effect was 0.7 percent only in 1997/98 when total exports grew by 20 percent, and it was of the same order of magnitude in all other periods investigated with the exception of 1998/99 when export starters

- The emerging literature on the consequences of starting to export tests the so-called learning-by-exporting hypothesis and looks for the presence or not of positive effects of exporting for export starters compared to firms that continue to sell only on the national market. The bulk of the evidence shows no such learning effects.<sup>4</sup>
- Empirical investigations on export exits test the so-called market selection hypothesis that argues that firms from a cohort of export starters that still export after a couple of years were more productive in the start year than firms from the same cohort that stopped exporting in between. Empirical results so far are mixed and not in favour of the market-selection hypothesis for each cohort of starters.<sup>5</sup> In a different approach data on firms that start exporting are used and the duration of export activity until exit from the export market is modelled with duration analysis methods. These studies demonstrate how the duration of survival on the export market is related to firm characteristics.<sup>6</sup>

The bottom line, then, is that we have no comprehensive empirical evidence on the fate of cohorts of export starters over the years after the start and their

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contributed 2.13 percent to a net change in exports of 8.17 percent. Gleeson and Ruane (2007) show that in Ireland this effect was much larger – export starters contributed 12.82 percent to a net change in exports of 34.66 percent in 1999/2000, and a positive impact of 3.11 percent when total exports decreased by 26.18 percent. For the US, Bernard and Jensen (2004b) show that in the export boom of 1987 – 1992 most of the increase in exports came from increasing export intensity at existing exporters rather than from new entry into exporting; similar results are reported by Bernard et al. (2009) for 1995 – 2003. For Columbia, Eaton et al. (2008) report that newly exporting firms by and large do not add much to export growth.

<sup>4</sup> For productivity, see Wagner (2007a) for a survey and International Study Group on Exports and Productivity (2008) for comparable evidence for 14 countries; for wages, see Schank, Schnabel and Wagner (2010).

<sup>5</sup> See Wagner (2007b, 2008a) for evidence on entry cohorts of establishments from German manufacturing industries.

<sup>6</sup> Ilmakunnas and Nurmi (2010) find that in Finland plants that are large, young, highly productive, and with high capital-intensity are likely to survive in the export market longer. Similar findings are reported for Spain in Esteve-Pérez et al. (2007).

contribution to total exports over time.<sup>7</sup> There are only two exceptions I am aware of. Eaton et al. (2008) is a study of cohorts of export starters in Columbia. Using data that cover all export transactions by Columbian firms between 1996 and 2005 the authors find that new exporters by and large do not add much to export growth because most of them export for one year only and their sales are very small. Those new exporters that do survive their first year on the foreign market, however, grow especially rapidly for several years thereafter, and together account for about half of the total expansion in merchandise trade over the course of a decade. Freund and Pierola (2010) investigate firm entry and survival in exporting for the non-traditional agriculture sector in Peru in the period 1994 to 2007. They find tremendous entry and exit, with exits more likely after one year and among firms that start small. Firms that enter during the period under analysis and that survived make up nearly three quarters of exports by 2007; in traditional agriculture products entries are important, too, but to a lesser degree, making up just over 50 percent of exports by the end of the period.

Both studies mentioned that look on the fate of cohorts of export starters over the years after the start and their contribution to total exports over time are for developing countries. This paper contributes to the literature by investigating four

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<sup>7</sup> While there is no comprehensive empirical evidence on the post-entry performance of cohorts of export starters the fate of cohorts of newly founded firms over the years after market entry and their contribution to total employment is documented in a large number empirical studies (see the survey by Caves (1998, section 2.3) and the papers in the special issue of the International Journal of Industrial Organization edited by Audretsch and Mata (1995). For a study of cohorts of entrants in German manufacturing industries see Wagner (1994). Recent research includes papers in a special issue of Small Business Economics edited by Stam (2010)).

cohorts of firms from German manufacturing industries that started to export between 1998 and 2002 and follows them over the five years after the start.

To preview the most important results, it turns out that export starters are small on average compared to incumbent exporters and a rare species in West Germany, where about one percent of all enterprises started to export in each year between 1998 and 2001. This share is somewhat higher though still small in East Germany. Between 30 percent and 40 percent of the starters became continuous exporters that were selling on the international market in all five years after starting to export. Some stepped out and back into exporting in between, many of them more than once. The share of total exports contributed by export starters of a cohort is tiny in the start year, and it remains so over the years to follow, although those starters that were exporters in year  $t+5$  had a share of exports in total sales that was more than twice as high as the average share of exports in total sales among the export starters of the same cohort in year  $t$ . Contrary to the market selection hypothesis there is no evidence that productivity in the start year is systematically related to survival in the export market. There is no evidence for a negative impact of a smaller firm size in the start year on the chance to survive on the export market. Starting with a higher share of exports in total sales, however, tends to increase the probability to stay on the export market.

The rest of the paper is organized as follows. Section 2 informs about the data used and the way export starters are identified. Section 3 looks at the cohorts of export starters in the start year. Section 4 documents the post-entry performance of the cohorts of export starters over five years after the start. Section 5 discusses the role of productivity in the start year for post-entry performance on the export market. Section 6 investigates the role of firm size and of the share of exports in total sales in the start year for surviving on the export market. Section 7 concludes.

## 2. Data and identification of export starters

The empirical investigation uses data from an unbalanced panel of enterprises that is built from cross section data collected in regular surveys of establishments by the Statistical Offices of the German federal states. Establishment data were aggregated to the enterprise level. The surveys cover all establishments from manufacturing industries that employ at least twenty persons in the local production unit or in the company that owns the unit. Participation of firms in the survey is mandated in official statistics law.<sup>8</sup>

In this data set, *export* refers to the amount of sales to a customer in a foreign country plus sales to a German export trading company; indirect exports (for example, tires produced in a plant in Germany that are delivered to a German manufacturer of cars who exports some of his products) are not covered by this definition.

An export starter is defined as an enterprise that produced and sold goods in Germany but that did not export during three years from year  $t-3$  to year  $t-1$  and that exported in year  $t$ . These export starters were followed over the next five years until year  $t+5$ . In each year between year  $t+1$  and  $t+5$  a firm from a starter cohort could either be an exporter, or a non-exporter selling its products in Germany only, or no longer in the panel of manufacturing enterprises.

Note that a firm that is no longer in this panel might have been closed down, but that this is not the only reason for not being in the panel in a year – the number of employees in an enterprise might have decreased below the cut-off point of twenty and participation in the survey, therefore, was no longer mandatory for the firm; or the

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<sup>8</sup> For a description of the data see Malchin and Voshage (2009). Note that the micro level data are strictly confidential and for use inside the Statistical Office only, but not exclusive. Information how to access the data is given in Zühlke et al. (2004).



firm might have moved to the services sector or to agriculture due to a change in the share of its most important economic activity in its total sales from manufacturing to another industry; or the enterprise might have relocated across the German border. Information on the reason why a particular enterprise is no longer in the panel is, unfortunately, missing in the data at hand. Although this is a little bit sloppy, we will refer to firms that are no longer in the panel in a particular year as firms that are *no longer in the market*.

The panel covers the years from 1995 (when a new industry classification was introduced) to 2006. According to the definition of an export starter used in this paper we need a time-window of 9 years – three years before the year of the export start and five years after the start. Therefore, with the data at hand four cohorts of export starters can be identified for year  $t$  equal to 1998, 1999, 2000, and 2001. Each cohort covers all manufacturing enterprises that start to export in year  $t$ , provided that the enterprise has been covered by the survey in the start year and the three years before. Therefore, enterprises with less than twenty employees in one of the years from year  $t-3$  to year  $t$  and that started to export in year  $t$  are not included in the starter cohort from year  $t$ . This means that both very small export starters and firms that are “born globals” – enterprises that started to export during the first three year after entry in the market – are not covered in this study.

Given that the former communist East German economy still differs in many respects, and especially with regard to exporting, from the West German economy even many years after the re-unification in 1990, this study looks at West German and East German manufacturing enterprises separately.<sup>9</sup>

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<sup>9</sup> For a discussion of the differences in exporting between West German and East German manufacturing firms see Wagner (2008b).

### **3. A portrait of export starters in the start year**

As a first step in the empirical investigation of the four cohorts of export starters the starters are compared with incumbent exporters and non-exporting enterprises in the start year. Table 1 documents that export starters are a rare species in West Germany both in absolute numbers and relative to the number of incumbent exporters and non-exporting firms. In all four years about 250 or one percent of all enterprises start to export – some 1.4 percent of all exporting firms in this year. While the absolute number of export starters is considerably lower in East Germany, the relative shares are higher – between 1.6 percent and 2.1 percent of all firms started to export in the four years, and the share of export starters in all exporting firms was between 3.2 percent and 4.5 percent. Over time, starter cohorts were of about the same size in West Germany, and tend to decline in East-Germany. Note that the differences shown between West and East Germany, and the large difference between the shares of exporting firms in all firms in both parts of Germany that is reported in the last line of table 1, illustrate that it is appropriate to look at export starters from West and East Germany separately.

[Table 1 near here]

On average, export starters are small (measured by the number of employees in the firm) compared to incumbent exporters, but about the same size as non-exporting firms. Panel A.1 in table 2 shows that export starters from the 1998 cohort in West Germany had 82 employees on average, compared to 261 employees in incumbent exporters and 78 employees in non-exporting firms. Figures are about the same for the other three cohorts. According to a t-test for difference in mean values the large difference between export starters and incumbent exporters is statistically

highly significant, while there is no significant difference between export starters and non-exporters. As shown in panel B.1 of table 2 this is true for East-Germany, too. Given that export-starters, incumbent exporters and non-exporters might be concentrated in different industries with different size of firms, to control for these differences in the industry composition the number of employees in each firm was standardized by the mean number of employees in the 4digit-industry the firm was active in. Results reported in panel A.2 and B.2 in table 2 that are based on these standardized figures are in line with the results for the un-standardized figures for West Germany. For East Germany we find in three out of four cohorts more pronounced differences between the average size of export starters and non-exporters in favor of the export starters, although the difference is not statistically significant from zero at a usual error level of five percent.

[Table 2 near here]

Export starters tend to be less productive than incumbent exporters on average in the start year. As shown in panels A.3 and A.4 and in panels B.3 and B.4 of table 2 this holds both for West Germany and for East Germany, although not all of these differences are statistically significantly different from zero at an error level of five percent. In West Germany export starters from all cohorts were more productive than non-exporters on average; this difference, however, was only statistically significantly different from zero for the first two cohorts investigated here. In East Germany, the comparison of export starters and non-exporters leads to a somewhat different picture – the difference was not always in favor of the export starters, and never statistically significant. These results are in line with the findings reported in

Wagner (2007) that point to some empirical evidence for self-selection of more productive plants<sup>10</sup> into exporting in West Germany but not in East Germany.

A comparison of differences at the mean between export starters, incumbent exporters and non-exporters is a useful first step, but one should not stop there. A look at selected percentiles of the size distribution and the productivity distribution for export starters, incumbent exporters and non-exporters reveals that firms from all three groups were highly heterogeneous in each year. To illustrate this point, in 1998 and in West Germany the number of employees in export starters was 21 at the fifth percentile of the size distribution and 246 at the 95<sup>th</sup> percentile; the respective numbers for incumbent exporters were 24 and 738, and for non-exporters 21 and 234. For labour productivity, these numbers were 45,861 and 310,804 for export starters; 51,915 and 325,618 for incumbent exporters; and 28,659 and 278,623 for non-exporters. The degree of heterogeneity was similar for the other years in West Germany and in East Germany. An empirical study of heterogeneous firms should look at differences in the whole distribution of the variable under investigation between groups of firms, not only at differences at the mean. As Moshe Buchinsky (1994: 453) put it: “‘On the average’ has never been a satisfactory statement with which to conclude a study on heterogeneous populations.”

The hypothesis that the distributions of firm size and labour productivity differ between export starters, incumbent exporters and non-exporters, and the direction of the stochastic dominance of one distribution over the other, can be tested by the Kolmogorov-Smirnov test. This non-parametric test for first order stochastic dominance of one distribution over another was introduced into the empirical

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<sup>10</sup> Note that in Wagner (2007) data for plants (local production units) that started to export in the years between 1998 and 2004 were used, and productivity differentials between export starters and non-exporters were measured in t-3, t-2 and t-1, while this study uses enterprise level data and looks at productivity differentials in year t.

literature on international firm activities by Delgado, Farinas and Ruano (2002). Let  $F$  and  $G$  denote the cumulative distribution functions of firm size (or productivity) for two groups of firms (say, export starters and incumbent exporters). First order stochastic dominance of  $F$  relative to  $G$  is given if  $F(z) - G(z)$  is less or equal zero for all  $z$  with strict inequality for some  $z$ . Given two independent random samples of plants from each group, the hypothesis that  $F$  is to the right of  $G$  can be tested by the Kolmogorov-Smirnov test based on the empirical distribution functions for  $F$  and  $G$  in the samples (for details, see Conover 1999, p. 456ff.).

Results for Kolmogorov-Smirnov tests are reported in table 3. For firm size, results for West Germany (reported in panel A.1 and A.2) are broadly in line with the results from the comparison of average firm size. Export starters are smaller than incumbent exporters - the null hypothesis of equality of the two size distributions can be rejected at any error level, and the same holds for the null hypothesis that the difference is in favour of the export starters, while the null hypothesis that the difference is in favour of the incumbent exporters cannot be rejected - but starters do not differ in size from non-exporters if the industry affiliation of the enterprises is controlled for. For East Germany the picture is less clear. Results reported in panel B.2 show no difference in the size distribution between export starters and incumbent exporters for the cohorts 1998 and 1999, and differences between export starters and non-exporters that are favourable for non-exporters in these years. These results differ from the results based on a comparison of the mean number of employees in both groups.

[Table 3 near here]

A comparison of the distribution of labour productivity for export starters and incumbent exporters and for export starters and non-exporters reveals a clear pattern in West Germany. The difference between the two respective distributions is statistically significant at an error level of four percent or less; the difference is in favour of incumbent exporters compared to export starters, and in favour of export starters compared to non-exporters. Again, the picture for East Germany is different. While in most years the results of the Kolmogorov-Smirnov tests tend to indicate that incumbent exporters are more productive than export starters in the start year, the distributions of productivity between export starters and non-exporters do not differ.

Given that enterprises in all three groups – export starters, incumbent exporters and non-exporters – are heterogeneous to a large degree with regard to the number of employees and to labour productivity results from the Kolmogorov-Smirnov tests are more appropriate to draw conclusions on differences between the groups than results from the t-tests. The big picture for differences between export starters, incumbent exporters and non-exporters in the start year, therefore, can be summarized as follows:

In West Germany, export starters were smaller than incumbent exporters but did not differ in size compared to non-exporters; starters were less productive than incumbent exporters but more productive than non exporters. The picture is for East Germany. Export starters were smaller than incumbent exporters in two of four years only, and they were smaller than non-exporters in the two other years. While incumbent exporters tend to be more productive than export starters, there is no difference in productivity between export starters and non-exporters. To put it differently, in line with results from the literature we have evidence for self-selection of more productive enterprises into exporting in West Germany, but not in East Germany.

#### 4. Post-entry performance of cohorts of export starters

What happened to the export starters in the years following their step on the international markets for goods? Table 4 presents information on the fate of starters over the next five years. The post-entry performance documented there is remarkable similar over the cohorts<sup>11</sup> and for West Germany and East Germany. Between 30 percent and 40 percent of the starters became continuous exporters that were selling on the international market in all five years. Some stepped out and back into exporting in between, many of them more than once.<sup>12</sup> Between one in five and one in three firms from a cohort were no longer active in the market at all five years after the export start.<sup>13</sup>

[Table 4 near here]

The share of total exports contributed by export starters of a cohort is tiny in the start year,<sup>14</sup> and it remains so over the years to follow. The fact that this share does not decrease over time in general (with the exception of the starter cohorts

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<sup>11</sup> This similarity might be related to the fact that the macroeconomic conditions over the different five-year periods after the start year were quite similar for the four cohorts; the average rate of growth of real GDP over the post-entry period was 1.2 percent, 1.1 percent, 0.6 percent and 1.0 percent for the starter cohorts 1998, 1999, 2000 and 2001, respectively (Institut der deutschen Wirtschaft 2010, p.17).

<sup>12</sup> A table in the appendix lists the detailed patterns of firms from the starter cohort of 1998 in West Germany. There are 37 different pattern – 96 firms exported in every year; 27 exported only once in year t and sold their products in Germany only in the four other years; 15 exported in t+1 and t+2 and were no longer active in either the national market or the export market in the years between t+3 and t+5; many pattern indicate that firms stepped out and into the exporting over the years. The picture is similar for the other cohorts investigated in this study.

<sup>13</sup> As discussed in detail in section 2 above, “no longer active in the market” is a little bit sloppy because the enterprise might as well be too small to be covered by the survey in a year, or relocated to services, agriculture, or a foreign country.

<sup>14</sup> Note that this evidence for a tiny impact effect in the start year corresponds to the findings in Wagner (2004) for local production units from one German federal state, Lower Saxony.

1998 and 1999 in East Germany) indicates that the decline in exports due to enterprises that stop to export is at least compensated, and in some cases over-compensated, by an increase in the exports of enterprises that continue to sell products outside Germany.

A comparison of the share of exports in total sales for export starters and incumbent exporters in the start year and five years after the start shows that this share is considerably larger for incumbent exporters in both years in West Germany and in East Germany (see table 5). This difference is statistically significant at the mean according to a t-test, and the Kolmogorov-Smirnov test indicates that this holds over the whole distribution of export shares between the two groups.

[Table 5 near here]

Over time, the difference in the share of exports in total sales between old and new exporters declined. Those starters that were exporters in year  $t+5$  had a share of exports in total sales that was more than twice as high as the average share of exports in total sales among the export starters of the same cohort in year  $t$ , while the share of exports in total sales of the old exporters increased to a much lesser degree. This sharp increase in the share of exports in total sales among the former starters that survive on the world market, however, does not lead to a corresponding increase in the share of exports by enterprises from a starter cohort in total exports. The overall impact of export starters from an entry cohort on total exports in German manufacturing is tiny not only in the start year but over the next five years (at least), too.



## **5. The role of productivity in the start year for post-entry performance on the export market**

The descriptive analysis of cohorts of export starters over the five years after the export start reveals that between 30 percent and 40 percent of the starters became continuous exporters that were selling on the international market in all five years and that about 50 percent were exporting in  $t+5$ , the last year under investigation. What makes a difference between those export starters that continue to export and those that do not? A starting point to organize an empirical analysis of these questions is a model by Hopenhayn (1992) that shows how firms with different levels of productivity make different decisions to enter, exit, or stay in a product market.

Hopenhayn (1992) considers a long-run equilibrium in an industry with many price-taking firms producing a homogeneous good. Output is a function of inputs and a random variable that models a firm specific productivity shock. These shocks are independent between firms, and are the reason for the heterogeneity of firms. There are sunk costs to be paid at entry, and entrants do not know their specific shock in advance. Incumbents can choose between exiting or staying in the market. When firms realized their productivity shock they decide about the profit maximizing volume of production. The model assumes that a higher shock in  $t+1$  has a higher probability the higher the shock is in  $t$ . In equilibrium firms will exit if for given prices of output and inputs the productivity shock is smaller than a critical value, and production is no longer profitable.

Following Aw, Chung and Roberts (2000), although not specific to the export market, the Hopenhayn-model can be used to formulate a testable hypothesis on the role of productivity levels at time  $t$  for survival in the export market that can be viewed as another market besides the national market for the goods produced by the firm. Our formulation of this hypothesis, and the empirical strategy applied to test it, closely

follows Farinas und Ruano (2005) in their study of market entry and exit in Spain (that does not consider the export market). The hypothesis under test is

*H1: Firms from a cohort of export starters that still export in the last year of a panel were more productive in the start year than firms from the same cohort that stopped to export in between.*

In the model there is persistence with regard to the productivity shock. Therefore, a firm that starts with a low productivity will have a greater chance to experience a low productivity in the future, and a higher chance of failure. Contrary to that, a firm starting with a high productivity will tend to continue to have a high productivity, and a high chance to survive. “More productive” means that, measured at time  $t$  when the firms started to export, the productivity distribution of surviving exporters from a cohort stochastically dominates the productivity distribution of firms from the same cohort that stopped exporting later on.<sup>15</sup> Results are reported in table 6.

[Table 6 near here]

For East Germany the hypothesis that there is a market driven selection process in which those export starters that have a low productivity at starting time fail as a successful exporter in the year after the start, and only those that were more productive continue to export, can be rejected for all four cohorts and both for labour productivity measured as sales per employee in the start year and labour productivity in percent of the 4digit–industry mean value in the start year (see panel B.1 and panel B.2. in table 6). The same holds for the starter cohorts 2000 and 2001 in West

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<sup>15</sup> See Wagner (2007b, 2008a) for evidence on entry cohorts of establishments (not enterprises) from German manufacturing industries; empirical results for the validity of this hypothesis are mixed and tend to be in favour of it for cohorts of starters from West Germany but not from East Germany.

Germany, and for one of the two productivity measures for the cohorts from 1998 and 1999. The bottom line, then, is that *Born under a bad sign*<sup>16</sup> is not the blues export starters that failed on the international market should sing to pity their fate.

## **6. The role of firm size and share of export in total sales in the start year for post-entry performance on the export market**

A second starting point to organize an empirical analysis of the question what makes a difference between those export starters that continue to export and those that do not is the hypothesis of “liability of smallness” from organizational ecology. The majority of empirical studies on firm survival show that the likelihood of survival depends on the start-up size of a new firm at the time of market entry. A small start-up size can be interpreted as a proxy variable for a number of unobserved firm characteristics, including disadvantages of scale, higher restrictions on the capital markets leading to a higher risk of insolvency and illiquidity, disadvantages of small firms in the competition for highly qualified employees, and lower talent of management (Strotmann 2007).

Entry into the export market is a start-up. Is there a “liability of smallness” in this context, too? “Smallness” here can have two interpretations – a small firm size, measured by the number of employees, and a small amount of exports, measured by the share of exports in total sales of the firm. The two hypotheses under test, therefore, are

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<sup>16</sup> *Born under a bad sign* is a blues written by Booker T. Jones and William Bell that was originally recorded by Albert King in 1967 and that was covered by, among others, Eric Clapton and Jimi Hendrix (see <Born Under a Bad Sign (song)> in Wikipedia, the free encyclopedia; accessed August 2, 2010, 7:49).

*H2: Firms from a cohort of export starters that still export in the last year of a panel were larger in the start year than firms from the same cohort that stopped to export in between.*

*H3: Firms from a cohort of export starters that still export in the last year of a panel had a larger export to sales ratio in the start year than firms from the same cohort that stopped to export in between.*

The empirical approach applied to test these hypotheses is identical to the approach used to test the market selection hypothesis in section 5. Results are reported in table 7 (for H2) and table 8 (for H3).

As regards the role of firm size in the start year for survival on the export market table 7 reveals that export starters that export in year t+5 were on average larger than export starters from the same starter cohort that sell on the national market only in year t+5. This holds for both West Germany and East Germany. This difference in the average size, however, is only statistically significant for one cohort in each part of Germany (for 1999 in West Germany, and for 2000 in East Germany), and only for these cohorts does the Kolmogorov-Smirnov test indicate that the distributions of firm size for survivors and non-survivors on the export market differ, too. If firm size is measured as the number of employees in percent of the 4digit-industry mean value in the start year only the results for the East German starter cohort of 2000 point to liability of smallness.

[Table 7 near here]

Evidence on H3 is reported in table 8. The share of exports in total sales is higher on average among export survivors than among export stoppers in each cohort in West Germany and East Germany. This difference tends to be rather large,

and it is statistically significant at an error level of five percent in all four cohorts in West Germany and in one cohort on East Germany. For three cohorts in West Germany and two cohorts in East Germany the Kolmogorov-Smirnov test indicate that the distributions of the share of exports in total sales in the start year differ for survivors and non-survivors on the export market, too. The same holds when the share of exports in total sales is measured in percent of the 4digit-industry mean value in the start year.

[Table 8 near here]

To summarize, on the one hand we have no empirical evidence for a negative impact of a smaller firm size in the start year on the chance to survive on the export market. Starting with a higher share of exports in total sales, on the other hand, tends to increase the probability to stay on the export market. A higher share of exports in total sales from the outset seems to indicate that a firm and its products are better suited for the foreign market, and such firms can be found among the smaller and the larger firms from a cohort of export starters.

## **7. Conclusions**

This study documents that the overall impact of export starters from an entry cohort on total exports in German manufacturing is tiny not only in the start year but over the next five years, too. This is due to the rare events nature of entry into export markets, the small size of enterprises that start to export, the small fraction of exports in total sales at start time, the shrinking of cohorts of starters over time, and the absence of a massive growth rate in the exports of surviving export starters. This big picture for Germany, one of the most important actors on the world market for goods, then, is

very different from the evidence reported for developing countries by Eaton et al. (2008) for Colombia and by Freund and Pierola (2010) for Peru.<sup>17</sup>

Does this mean that export starters are unimportant for German exports, and for the development of the German economy as a whole, and that economic policy should not care about obstacles to export entry? I doubt. As has been pointed out in section 3 above export starters are a very heterogeneous group. While many of them are very small, some are rather large; while many of them export a small share of their products only, others have a rather large ratio of exports to sales from the beginning; and while many members of a starter cohort leave the export market after a short visit, others stay over the years and grow. Low barriers to entry into export market may help to increase the number of firms that successfully act on the world market in the future, and that contribute to economic growth more than marginally over the years.

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<sup>17</sup> Comparable evidence from empirical studies using data on cohorts of export starters from other countries would be very helpful in shaping a more complete picture that can be used both to inspire theoretical models that are based on “realistic” assumptions and to inform policy debates in an evidence-based way.

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Table 1: Export starters, incumbent exporters and non-exporters in German manufacturing industries

Year (t)	West Germany				East Germany			
	1998	1999	2000	2001	1998	2000	2001	2002
Number of export starters in t	248	253	256	259	104	98	76	82
Number of incumbent exporters in t	17,937	18,180	18,015	17,916	2,165	2,249	2,310	2,350
Number of non-exporters in t	7,871	7,940	7,684	7,365	2,552	2,549	2,454	2,315
Total number of firms in t	26,056	26,373	25,955	25,540	4,820	4,895	4,840	4,734
Share of export starters in all firms in t (percent)	0.95%	0.96%	0.99%	1.01%	2.14%	1.97%	1.57%	1.65%
Share of export starters in all exporters in t (percent)	1.36%	1.37%	1.40%	1.43%	4.54%	4.13%	3.19%	3.21%
Share of exporting firms in all firms in t (percent)	69.79%	69.89%	70.39%	71.16%	47.05%	47.93%	49.30%	51.29%

Note: Export starters are firms that sold products on the national market only in year t-3 to t-1 and exported in year t; incumbent exporters are all exporting firms in year t that are not classified as export starters.

Table 2: Comparison of export starters, incumbent exporters and non-exporters in German manufacturing industries – Part 1:  
Mean number of employees and labour productivity

A:	West Germany	Year (t)	1998	1999	2000	2001
1	Number of employees					
	Export starters	mean	81.1	74.5	75.3	86.5
		(sd)	(131.7)	(83.2)	(87.7)	(121.8)
	Incumbent exporters	mean	260.7	251.7	257.5	259.6
		(sd)	(2,104.7)	(1,942.2)	(1,962.2)	(1,971.1)
	Non-exporters	mean	77.7	79.3	80.5	81.8
		(sd)	(127.8)	(144.7)	(147.7)	(150.8)
	t-test for difference in mean values					
	Export starters vs. incumbent exporters (p-value)		0.000	0.000	0.000	0.000
	Export starters vs. non-exporters (p-value)		0.695	0.385	0.365	0.549
	Incumbent exporters vs. non-exporters (p-value)		0.000	0.000	0.000	0.000
2	Number of employees in percent of the 4digit-industry mean value					
	Export starters	mean	62.4	60.0	56.2	65.1
		(sd)	(73.0)	(66.5)	(58.0)	(97.4)
	Incumbent exporters	mean	117.4	116.6	116.3	115.6
		(sd)	(321.2)	(242.6)	(240.5)	(240.9)
	Non-exporters	mean	61.6	63.3	63.3	63.4
		(sd)	(82.6)	(85.3)	(86.3)	(85.9)
	t-test for difference in mean values					
	Export starters vs. incumbent exporters (p-value)		0.000	0.000	0.000	0.000
	Export starters vs. non-exporters (p-value)		0.871	0.447	0.061	0.781
	Incumbent exporters vs. non-exporters (p-value)		0.000	0.000	0.000	0.000

3 Labour productivity (Sales per employee; Euro in current prices)

Export starters	mean	130,417	136,582	124,742	127,927
	(sd)	(93,277)	(119,637)	(115,281)	(101,169)
Incumbent exporters	mean	148,877	149,725	161,865	163,149
	(sd)	(182,436)	(190,793)	(288,509)	(365,097)
Non-exporters	mean	113,771	115,763	119,778	121,435
	(sd)	(125,678)	(132,227)	(147,672)	(162,842)
t-test for difference in mean values					
Export starters vs. incumbent exporters (p-value)		0.003	0.087	0.000	0.000
Export starters vs. non-exporters (p-value)		0.007	0.007	0.503	0.324
Incumbent exporters vs. non-exporters (p-value)		0.000	0.000	0.000	0.000

4 Labour productivity (Sales per employee; Euro in current prices)  
in percent of the 4digit-industry mean value

Export starters	mean	100.0	94.9	92.7	91.9
	(sd)	(60.6)	(56.4)	(77.6)	(51.7)
Incumbent exporters	mean	106.3	105.9	105.9	105.7
	(sd)	(67.2)	(69.8)	(108.0)	(71.9)
Non-exporters	mean	85.7	86.6	86.3	86.3
	(sd)	(56.4)	(60.9)	(63.3)	(64.4)
t-test for difference in mean values					
Export starters vs. incumbent exporters (p-value)		0.108	0.002	0.008	0.000
Export starters vs. non-exporters (p-value)		0.000	0.023	0.192	0.094
Incumbent exporters vs. non-exporters (p-value)		0.000	0.000	0.000	0.000

B:	East Germany	Year (t)	1999	2000	2001	2002
1	Number of employees					
	Export starters	mean	88.6	81.9	72.5	67.5
		(sd)	(89.1)	(68.2)	(58.5)	(47.2)
	Incumbent exporters	mean	143.8	141.0	138.0	139.1
		(sd)	(381.6)	(371.4)	(358.9)	(361.7)
	Non-exporters	mean	76.8	76.8	79.0	79.7
		(sd)	(159.3)	(157.2)	(160.4)	(163.4)
	t-test for difference in mean values					
	Export starters vs. incumbent exporters (p-value)		0.000	0.000	0.000	0.000
	Export starters vs. non-exporters (p-value)		0.209	0.503	0.385	0.058
	Incumbent exporters vs. non-exporters (p-value)		0.000	0.000	0.000	0.000
2	Number of employees in percent of the 4digit-industry mean value					
	Export starters	mean	99.4	97.8	89.8	72.5
		(sd)	(82.4)	(76.5)	(76.9)	(49.7)
	Incumbent exporters	mean	119.2	119.3	117.1	116.6
		(sd)	(147.9)	(151.1)	(142.4)	(138.5)
	Non-exporters	mean	83.7	83.1	84.2	84.1
		(sd)	(96.2)	(92.7)	(93.7)	(92.6)
	t-test for difference in mean values					
	Export starters vs. incumbent exporters (p-value)		0.025	0.012	0.004	0.000
	Export starters vs. non-exporters (p-value)		0.063	0.067	0.532	0.054
	Incumbent exporters vs. non-exporters (p-value)		0.000	0.000	0.000	0.000

3	Labour productivity (Sales per employee; Euro in current prices)							
	Export starters	mean	95,305	104,145	107,092	110,594		
		(sd)	(71,969)	(101,035)	(111,741)	(116,306)		
	Incumbent exporters	mean	123,530	124,932	137,063	141,570		
		(sd)	(145,355)	(146,659)	(177,642)	(177,790)		
	Non-exporters	mean	97,028	98,918	100,594	100,823		
		(sd)	(130,836)	(127,676)	(135,771)	(128,409)		
	t-test for difference in mean values							
	Export starters vs. incumbent exporters (p-value)		0.000	0.055	0.027	0.026		
	Export starters vs. non-exporters (p-value)		0.820	0.622	0.621	0.469		
	Incumbent exporters vs. non-exporters (p-value)		0.000	0.000	0.000	0.000		
4	Labour productivity (Sales per employee; Euro in current prices) in percent of the 4digit-industry mean value							
	Export starters	mean	89.3	95.8	101.8	94.7		
		(sd)	(42.4)	(48.7)	(82.1)	(80.6)		
	Incumbent exporters	mean	111.6	110.7	111.5	111.8		
		(sd)	(71.2)	(71.9)	(71.9)	(76.8)		
	Non-exporters	mean	90.6	90.8	89.2	88.2		
		(sd)	(59.5)	(60.4)	(57.9)	(59.7)		
	t-test for difference in mean values							
	Export starters vs. incumbent exporters (p-value)		0.000	0.005	0.314	0.070		
	Export starters vs. non-exporters (p-value)		0.760	0.322	0.187	0.482		
	Incumbent exporters vs. non-exporters (p-value)		0.000	0.000	0.000	0.000		

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Note: All figures are for year t, the start year of the export starters from cohort t; the t-test is a two-sample test with unequal variances

Table 3: Comparison of export starters , incumbent exporters and non-exporters in German manufacturing industries – Part 2:  
Distribution of number of employees and labour productivity – Kolmogorov-Smirnov Tests for first-order stochastic dominance

A:	West Germany	Year (t)	1998	1999	2000	2001
1	Number of employees					
	Export starters vs. incumbent exporters					
	H0: equality of distributions (p-value)		0.000	0.000	0.000	0.000
	H0: differences favourable for export starters (p-value)		0.000	0.000	0.000	0.000
	H0: differences favourable for incumbent exporters (p-value)		1.000	0.999	0.939	0.999
	Export starters vs. non-exporters					
	H0: equality of distributions (p-value)		0.189	0.569	0.002	0.019
	H0: differences favourable for export starters (p-value)		0.959	0.807	0.657	0.937
	H0: differences favourable for non- exporters (p-value)		0.094	0.292	0.001	0.009
	Incumbent exporters vs. non-exporters					
	H0: equality of distributions (p-value)		0.000	0.000	0.000	0.000
	H0: differences favourable for incumbent exports (p-value)		1.000	1.000	1.000	1.000
	H0: differences favourable for non- exporters (p-value)		0.000	0.000	0.000	0.000
2	Number of employees in percent of the 4digit-industry mean value					
	Export starters vs. incumbent exporters					
	H0: equality of distributions (p-value)		0.000	0.000	0.000	0.000
	H0: differences favourable for export starters (p-value)		0.000	0.000	0.000	0.000
	H0: differences favourable for incumbent exporters (p-value)		0.979	0.842	0.863	0.997
	Export starters vs. non-exporters					
	H0: equality of distributions (p-value)		0.281	0.993	0.798	0.144
	H0: differences favourable for export starters (p-value)		0.141	0.691	0.434	0.532
	H0: differences favourable for non- exporters (p-value)		0.367	0.713	0.517	0.072
	Incumbent exporters vs. non-exporters					
	H0: equality of distributions (p-value)		0.000	0.000	0.000	0.000
	H0: differences favourable for incumbent exports (p-value)		0.996	0.877	0.942	1.000
	H0: differences favourable for non- exporters (p-value)		0.000	0.000	0.000	0.000



3	Labour productivity (Sales per employee; Euro in current prices)				
	Export starters vs. incumbent exporters	0.000	0.000	0.000	0.000
	H0: equality of distributions (p-value)	0.000	0.000	0.000	0.000
	H0: differences favourable for export starters (p-value)	0.935	0.588	0.997	0.999
	H0: differences favourable for incumbent exporters (p-value)				
	Export starters vs. non-exporters				
	H0: equality of distributions (p-value)	0.000	0.000	0.000	0.001
	H0: differences favourable for export starters (p-value)	0.970	0.985	0.895	0.923
	H0: differences favourable for non- exporters (p-value)	0.000	0.000	0.000	0.000
	Incumbent exporters vs. non-exporters				
	H0: equality of distributions (p-value)	0.000	0.000	0.000	0.000
	H0: differences favourable for incumbent exports (p-value)	1.000	0.997	1.000	1.000
	H0: differences favourable for non- exporters (p-value)	0.000	0.000	0.000	0.000
4	Labour productivity (Sales per employee; Euro in current prices)				
	in percent of the 4digit-industry mean value				
	Export starters vs. incumbent exporters				
	H0: equality of distributions (p-value)	0.006	0.001	0.000	0.000
	H0: differences favourable for export starters (p-value)	0.003	0.000	0.000	0.000
	H0: differences favourable for incumbent exporters (p-value)	0.942	0.988	0.994	0.999
	Export starters vs. non-exporters				
	H0: equality of distributions (p-value)	0.000	0.004	0.040	0.020
	H0: differences favourable for export starters (p-value)	0.999	0.989	0.947	0.937
	H0: differences favourable for non- exporters (p-value)	0.000	0.002	0.020	0.010
	Incumbent exporters vs. non-exporters				
	H0: equality of distributions (p-value)	0.000	0.000	0.000	0.000
	H0: differences favourable for incumbent exports (p-value)	1.000	1.000	1.000	1.000
	H0: differences favourable for non- exporters (p-value)	0.000	0.000	0.000	0.000

B:	East Germany	Year (t)	1998	1999	2000	2001
1	Number of employees					
	Export starters vs. incumbent exporters					
	H0: equality of distributions (p-value)		0.064	0.047	0.004	0.001
	H0: differences favourable for export starters (p-value)		0.032	0.024	0.002	0.000
	H0: differences favourable for incumbent exporters (p-value)		0.536	0.942	0.376	0.898
	Export starters vs. non-exporters					
	H0: equality of distributions (p-value)		0.000	0.000	0.003	0.123
	H0: differences favourable for export starters (p-value)		0.987	0.917	0.867	0.710
	H0: differences favourable for non- exporters (p-value)		0.000	0.000	0.001	0.062
	Incumbent exporters vs. non-exporters					
	H0: equality of distributions (p-value)		0.000	0.000	0.000	0.000
	H0: differences favourable for incumbent exports (p-value)		1.000	1.000	1.000	1.000
	H0: differences favourable for non- exporters (p-value)		0.000	0.000	0.000	0.000
2	Number of employees in percent of the 4digit-industry mean value					
	Export starters vs. incumbent exporters					
	H0: equality of distributions (p-value)		0.361	0.210	0.021	0.004
	H0: differences favourable for export starters (p-value)		0.182	0.105	0.010	0.002
	H0: differences favourable for incumbent exporters (p-value)		0.384	0.542	0.773	0.932
	Export starters vs. non-exporters					
	H0: equality of distributions (p-value)		0.007	0.003	0.288	0.851
	H0: differences favourable for export starters (p-value)		0.988	0.961	0.922	0.475
	H0: differences favourable for non- exporters (p-value)		0.003	0.001	0.144	0.725
	Incumbent exporters vs. non-exporters					
	H0: equality of distributions (p-value)		0.000	0.000	0.000	0.000
	H0: differences favourable for incumbent exports (p-value)		0.997	0.951	0.981	0.959
	H0: differences favourable for non- exporters (p-value)		0.000	0.000	0.000	0.000

3	Labour productivity (Sales per employee; Euro in current prices)				
	Export starters vs. incumbent exporters				
	H0: equality of distributions (p-value)	0.011	0.061	0.035	0.016
	H0: differences favourable for export starters (p-value)	0.005	0.031	0.018	0.008
	H0: differences favourable for incumbent exporters (p-value)	0.908	0.739	0.958	0.984
	Export starters vs. non-exporters				
	H0: equality of distributions (p-value)	0.089	0.089	0.109	0.112
	H0: differences favourable for export starters (p-value)	0.810	0.882	0.867	0.910
	H0: differences favourable for non- exporters (p-value)	0.044	0.045	0.054	0.056
	Incumbent exporters vs. non-exporters				
	H0: equality of distributions (p-value)	0.000	0.000	0.000	0.000
	H0: differences favourable for incumbent exports (p-value)	0.999	1.000	1.000	1.000
	H0: differences favourable for non- exporters (p-value)	0.000	0.000	0.000	0.000
4	Labour productivity (Sales per employee; Euro in current prices)				
	in percent of the 4digit-industry mean value				
	Export starters vs. incumbent exporters				
	H0: equality of distributions (p-value)	0.001	0.014	0.192	0.032
	H0: differences favourable for export starters (p-value)	0.001	0.007	0.096	0.016
	H0: differences favourable for incumbent exporters (p-value)	0.974	0.787	0.976	0.964
	Export starters vs. non-exporters				
	H0: equality of distributions (p-value)	0.226	0.147	0.348	0.767
	H0: differences favourable for export starters (p-value)	0.697	0.961	0.996	0.845
	H0: differences favourable for non- exporters (p-value)	0.113	0.073	0.175	0.412
	Incumbent exporters vs. non-exporters				
	H0: equality of distributions (p-value)	0.000	0.000	0.000	0.000
	H0: differences favourable for incumbent exports (p-value)	1.000	0.997	1.000	1.000
	H0: differences favourable for non- exporters (p-value)	0.000	0.000	0.000	0.000

Table 4: Post-entry performance of cohorts of export starters in German manufacturing industries

	West Germany				East Germany			
	1998	1999	2000	2001	1998	2000	2001	2002
Year of export market entry (t)	1998	1999	2000	2001	1998	2000	2001	2002
Number of export starters	248	253	256	259	104	98	76	82
Share of export starters exporting in each year between t +1 and t+5	38.7%	34.4%	37.1%	32.8%	31.7%	38.8%	31.6%	30.5%
Share of export starters exporting in year t+5	51.2%	49.4%	45.3%	47.1%	49.0%	48.0%	47.4%	46.3%
Share of export starters selling on the national market only in year t+5	21.8%	27.3%	26.6%	21.6%	20.2%	25.5%	31.6%	20.7%
Share of export starters no longer in the market in year t+5	27.0%	23.3%	28.1%	31.3%	30.8%	26.5%	21.0%	32.9%
Share of exports by export starters in total exports in year t	0.03%	0.08%	0.04%	0.05%	0.57%	0.29%	0.09%	0.13%
in year t+1	0.04%	0.08%	0.07%	0.07%	0.35%	0.32%	0.09%	0.16%
in year t+2	0.06%	0.08%	0.05%	0.08%	0.22%	0.26%	0.10%	0.31%
in year t+3	0.04%	0.10%	0.05%	0.15%	0.25%	0.27%	0.12%	0.26%
in year t+4	0.03%	0.10%	0.05%	0.09%	0.27%	0.41%	0.12%	0.25%
in year t+5	0.06%	0.09%	0.05%	0.09%	0.28%	0.24%	0.18%	0.24%

Note: Export starters are firms that sold products on the national market only in year t-3 to t-1 and exported in year t

Table 5: Share of exports in total sales – A comparison of export starters and incumbent exporters in German manufacturing industries

A:	West Germany	Year (t)	1998	1999	2000	2001
1 Share of export in total sales in year t						
	Export starters	mean	4.27	6.39	5.00	5.25
		(sd)	(7.67)	(12.57)	(8.72)	(10.58)
	Incumbent exporters	mean	25.49	25.96	27.33	28.08
		(sd)	(22.66)	(22.79)	(23.43)	(23.76)
	t-test for difference in mean values (p-values)		0.000	0.000	0.000	0.000
	K-S-Test H0: equality of distributions (p-value)		0.000	0.000	0.000	0.000
	K-S-Test H0: differences favourable for export starters (p-value)		0.000	0.000	0.000	0.000
	K-S-Test H0: differences favourable for incumbent exporters (p-value)		1.000	0.996	1.000	1.000
2 Share of exports in total sales in percent of the 4digit-industry mean value in year t						
	Export starters	mean	24.86	33.80	23.21	25.82
		(sd)	(40.34)	(55.56)	(39.70)	(49.77)
	Incumbent exporters	mean	101.04	100.92	101.09	101.07
		(sd)	(89.91)	(88.91)	(86.84)	(85.84)
	t-test for difference in mean values (p-values)		0.000	0.000	0.000	0.000
	K-S-Test H0: equality of distributions (p-value)		0.000	0.000	0.000	0.000
	K-S-Test H0: differences favourable for export starters (p-value)		0.000	0.000	0.000	0.000
	K-S-Test H0: differences favourable for incumbent exporters (p-value)		1.000	1.000	1.000	1.000

3 Share of export in total sales in year t+5 (exporting firms only)

Export starters	mean	12.86	15.44	12.97	12.53
	(sd)	(18.64)	(21.93)	(17.49)	(15.80)
Incumbent exporters	mean	30.77	31.66	32.57	33.14
	(sd)	(24.11)	(24.35)	(24.69)	(24.77)
t-test for difference in mean values (p-values)		0.000	0.000	0.000	0.000
K-S-Test H0: equality of distributions (p-value)		0.000	0.000	0.000	0.000
K-S-Test H0: differences favourable for export starters (p-value)		0.000	0.000	0.000	0.000
K-S-Test H0: differences favourable for incumbent exporters (p-value)		0.988	0.951	1.000	1.000

4 Share of exports in total sales in percent of the 4digit-industry mean value in year t+5 (exporting firms only)

Export starters	mean	56.19	58.09	42.93	44.33
	(sd)	(76.22)	(73.84)	(55.48)	(50.81)
Incumbent exporters	mean	100.41	100.38	100.49	100.51
	(sd)	(77.21)	(75.04)	(74.77)	(73.91)
t-test for difference in mean values (p-values)		0.000	0.000	0.000	0.000
K-S-Test H0: equality of distributions (p-value)		0.000	0.000	0.000	0.000
K-S-Test H0: differences favourable for export starters (p-value)		0.000	0.000	0.000	0.000
K-S-Test H0: differences favourable for incumbent exporters (p-value)		0.958	0.992	1.000	1.000

B:	East Germany	Year (t)	1998	1999	2000	2001
1 Share of export in total sales in year t						
	Export starters	mean	4.38	5.74	4.43	5.51
		(sd)	(6.61)	(11.22)	(7.81)	(8.30)
	Incumbent exporters	mean	19.92	20.24	21.52	22.22
		(sd)	(21.43)	(21.84)	(22.62)	(22.72)
	t-test for difference in mean values (p-values)		0.000	0.000	0.000	0.000
	K-S-Test H0: equality of distributions (p-value)		0.000	0.000	0.000	0.000
	K-S-Test H0: differences favourable for export starters (p-value)		0.000	0.000	0.000	0.000
	K-S-Test H0: differences favourable for incumbent exporters (p-value)		0.996	0.998	1.000	0.998
2 Share of exports in total sales in percent of the 4digit-industry mean value in year t						
	Export starters	mean	38.55	36.85	31.38	39.94
		(sd)	(50.90)	(55.53)	(47.26)	(59.92)
	Incumbent exporters	mean	102.92	102.72	102.26	101.99
		(sd)	(102.56)	(106.91)	(103.24)	(100.22)
	t-test for difference in mean values (p-values)		0.000	0.000	0.000	0.000
	K-S-Test H0: equality of distributions (p-value)		0.000	0.000	0.000	0.000
	K-S-Test H0: differences favourable for export starters (p-value)		0.000	0.000	0.000	0.000
	K-S-Test H0: differences favourable for incumbent exporters (p-value)		0.998	0.998	1.000	0.999

3 Share of export in total sales in year t+5 (exporting firms only)

Export starters	mean	9.48	14.39	13.24	11.81
	(sd)	(12.48)	(19.91)	(15.92)	(15.50)
Incumbent exporters	mean	25.58	26.20	27.21	27.87
	(sd)	(23.52)	(23.55)	(24.00)	(24.72)
t-test for difference in mean values (p-values)		0.000	0.000	0.000	0.000
K-S-Test H0: equality of distributions (p-value)		0.000	0.000	0.000	0.000
K-S-Test H0: differences favourable for export starters (p-value)		0.000	0.000	0.000	0.000
K-S-Test H0: differences favourable for incumbent exporters (p-value)		0.999	0.989	0.992	0.997

4 Share of exports in total sales in percent of the 4digit-industry mean value in year t+5 (exporting firms only)

Export starters	mean	56.47	62.52	62.00	60.70
	(sd)	(71.33)	(69.22)	(72.50)	(66.81)
Incumbent exporters	mean	101.54	101.16	100.88	100.87
	(sd)	(83.97)	(85.08)	(82.94)	(83.12)
t-test for difference in mean values (p-values)		0.000	0.001	0.003	0.001
K-S-Test H0: equality of distributions (p-value)		0.000	0.001	0.001	0.009
K-S-Test H0: differences favourable for export starters (p-value)		0.000	0.001	0.001	0.004
K-S-Test H0: differences favourable for incumbent exporters (p-value)		0.981	1.000	0.991	0.997

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Note: The t-test is a two-sample test with unequal variances; K-S-Test is the Kolmogorov-Smirnov test for first-order stochastic dominance.



Table 6: The role of labour productivity in the start year for survival on the export market in German manufacturing industries

A:	West Germany	Year (t)	1998	1999	2000	2001
1	Labour productivity in year t (sales per employee; Euro in current prices)					
	Export starters that export in year t+5	mean	134,893	156,109	137,861	135,425
		(sd)	(85,603)	(120,577)	(146,989)	(110,568)
	Export starters that sell on the national market only in year t+5 (export stoppers)	mean	131,250	115,987	122,507	135,814
		(sd)	(96,387)	(93,454)	(84,245)	(114,849)
	t-test for difference in mean values	p-value	0.811	0.011	0.369	0.983
	K-S-Test H0: equality of distributions	p-value	0.063	0.009	0.905	0.395
	K-S-Test H0: differences favourable for export survivors	p-value	0.825	1.000	0.914	0.538
	K-S-Test H0: differences favourable for export stoppers	p-value	0.038	0.006	0.561	0.222
2	Labour productivity in percent of the 4digit-industry mean value in year t					
	Export starters that export in year t+5	mean	109.07	103.14	98.30	93.97
		(sd)	(66.53)	(57.01)	(101.38)	(47.84)
	Export starters that sell on the national market only in year t+5 (export stoppers)	mean	91.01	89.82	90.44	100.19
		(sd)	(41.95)	(56.20)	(44.64)	(61.90)
	t-test for difference in mean values	p-value	0.029	0.118	0.469	0.507
	K-S-Test H0: equality of distributions	p-value	0.057	0.107	0.933	0.822
	K-S-Test H0: differences favourable for export survivors	p-value	0.903	0.981	0.593	0.489
	K-S-Test H0: differences favourable for export stoppers	p-value	0.034	0.062	0.758	0.516

B: East Germany	Year (t)	1998	1999	2000	2001
1 Labour productivity in year t (sales per employee; Euro in current prices)					
Export starters that export in year t+5	mean	95,751	103,141	112,597	119,650
	(sd)	(72,496)	(79,188)	(146,176)	(130,712)
Export starters that sell on the national market only in year t+5 (export stoppers)	mean	90,826	115,935	115,374	97,147
	(sd)	(48,505)	(152,800)	(75,060)	(89,125)
t-test for difference in mean values	p-value	0.738	0.698	0.924	0.474
K-S-Test H0: equality of distributions	p-value	0.299	0.970	0.077	0.728
K-S-Test H0: differences favourable for export survivors	p-value	0.178	0.905	0.053	0.934
K-S-Test H0: differences favourable for export stoppers	p-value	0.420	0.674	0.978	0.433
2 Labour productivity in percent of the 4digit-industry mean value in year t					
Export starters that export in year t+5	mean	93.69	99.52	113.92	103.80
	(sd)	(42.84)	(56.57)	(104.69)	(108.00)
Export starters that sell on the national market only in year t+5 (export stoppers)	mean	98.08	96.95	105.60	82.12
	(sd)	(50.04)	(36.89)	(59.83)	(37.33)
t-test for difference in mean values	p-value	0.617	0.818	0.698	0.290
K-S-Test H0: equality of distributions	p-value	0.654	0.553	0.922	0.952
K-S-Test H0: differences favourable for export survivors	p-value	0.396	0.333	0.574	0.857
K-S-Test H0: differences favourable for export stoppers	p-value	0.558	0.665	0.819	0.652

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Note: The t-test is a two-sample test with unequal variances; K-S-Test is the Kolmogorov-Smirnov test for first-order stochastic dominance.

Table 7: The role of firm size in the start year for survival on the export market in German manufacturing industries

A: West Germany	Year (t)	1998	1999	2000	2001
1 Firm size in year t (number of employees)					
Export starters that export in year t+5	mean	84.82	93.64	79.55	87.10
	(sd)	(160.07)	(103.98)	(93.75)	(98.59)
Export starters that sell on the national market only in year t+5 (export stoppers)	mean	76.34	60.29	76.69	95.05
	(sd)	(73.89)	(50.87)	(84.11)	(157.16)
t-test for difference in mean values	p-value	0.627	0.003	0.832	0.728
K-S-Test H0: equality of distributions	p-value	0.555	0.069	0.600	0.406
K-S-Test H0: differences favourable for export survivors	p-value	0.780	0.804	0.712	0.845
K-S-Test H0: differences favourable for export stoppers	p-value	0.315	0.041	0.341	0.230
2 Firm size in percent of the 4digit-industry mean value in year t					
Export starters that export in year t+5	mean	56.70	68.89	51.67	61.73
	(sd)	(56.61)	(82.30)	(44.31)	(61.55)
Export starters that sell on the national market only in year t+5 (export stoppers)	mean	69.05	55.51	65.17	70.75
	(sd)	(82.58)	(44.97)	(76.10)	(104.98)
t-test for difference in mean values	p-value	0.319	0.145	0.185	0.552
K-S-Test H0: equality of distributions	p-value	0.909	0.648	0.149	0.535
K-S-Test H0: differences favourable for export survivors	p-value	0.598	0.831	0.087	0.761
K-S-Test H0: differences favourable for export stoppers	p-value	0.569	0.368	0.983	0.301

B: East Germany	Year (t)	1998	1999	2000	2001
1 Firm size in year t (number of employees)					
Export starters that export in year t+5	mean	90.84	87.23	90.16	76.69
	(sd)	(96.12)	(70.96)	(73.55)	(55.17)
Export starters that sell on the national market only in year t+5 (export stoppers)	mean	72.46	74.14	50.84	72.30
	(sd)	(53.95)	(71.36)	(19.62)	(43.53)
t-test for difference in mean values	p-value	0.308	0.463	0.004	0.760
K-S-Test H0: equality of distributions	p-value	0.762	0.312	0.052	0.572
K-S-Test H0: differences favourable for export survivors	p-value	0.833	0.871	0.870	0.335
K-S-Test H0: differences favourable for export stoppers	p-value	0.468	0.189	0.041	0.734
2 Firm size in percent of the 4digit-industry mean value in year t					
Export starters that export in year t+5	mean	102.43	107.68	111.92	77.96
	(sd)	(87.27)	(83.62)	(97.76)	(50.07)
Export starters that sell on the national market only in year t+5 (export stoppers)	mean	105.85	81.18	61.28	81.00
	(sd)	(93.73)	(62.71)	(32.69)	(61.26)
t-test for difference in mean values	p-value	0.887	0.137	0.006	0.863
K-S-Test H0: equality of distributions	p-value	0.898	0.047	0.077	1.000
K-S-Test H0: differences favourable for export survivors	p-value	0.571	0.980	0.951	0.811
K-S-Test H0: differences favourable for export stoppers	p-value	0.776	0.033	0.053	0.786

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Note: The t-test is a two-sample test with unequal variances; K-S-Test is the Kolmogorov-Smirnov test for first-order stochastic dominance.

Table 8: The role of share of exports in total sales in the start year for survival on the export market in German manufacturing industries

A: West Germany	Year (t)	1998	1999	2000	2001
1 Share of exports in total sales in year t (percent)					
Export starters that export in year t+5	mean	4.87	8.63	5.92	5.87
	(sd)	(8.80)	(16.29)	(8.75)	(11.57)
Export starters that sell on the national market only in year t+5 (export stoppers)	mean	1.57	4.05	2.37	3.29
	(sd)	(2.79)	(6.80)	(5.15)	(6.94)
t-test for difference in mean values	p-value	0.000	0.007	0.001	0.013
K-S-Test H0: equality of distributions	p-value	0.001	0.250	0.000	0.021
K-S-Test H0: differences favourable for export survivors	p-value	1.000	0.959	0.995	1.000
K-S-Test H0: differences favourable for export stoppers	p-value	0.001	0.142	0.000	0.013
2 Share of exports in total sales in percent of the 4digit-industry mean value in year t					
Export starters that export in year t+5	mean	26.12	41.13	25.94	29.21
	(sd)	(39.02)	(65.83)	(39.44)	(44.20)
Export starters that sell on the national market only in year t+5 (export stoppers)	mean	16.94	26.29	13.79	27.33
	(sd)	(42.61)	(42.03)	(33.44)	(73.17)
t-test for difference in mean values	p-value	0.178	0.057	0.028	0.860
K-S-Test H0: equality of distributions	p-value	0.001	0.356	0.000	0.006
K-S-Test H0: differences favourable for export survivors	p-value	0.966	0.947	0.982	0.892
K-S-Test H0: differences favourable for export stoppers	p-value	0.000	0.200	0.000	0.004

B: East Germany	Year (t)	1998	1999	2000	2001
1 Share of exports in total sales in year t (percent)					
Export starters that export in year t+5	mean	3.90	7.93	6.18	5.51
	(sd)	(5.92)	(13.59)	(10.13)	(8.60)
Export starters that sell on the national market only in year t+5 (export stoppers)	mean	2.47	3.12	2.61	3.28
	(sd)	(2.94)	(5.65)	(5.17)	(5.65)
t-test for difference in mean values	p-value	0.176	0.040	0.079	0.275
K-S-Test H0: equality of distributions	p-value	0.562	0.039	0.039	0.728
K-S-Test H0: differences favourable for export survivors	p-value	0.688	1.000	1.000	0.934
K-S-Test H0: differences favourable for export stoppers	p-value	0.329	0.026	0.031	0.433
2 Share of exports in total sales in percent of the 4digit-industry mean value in year t					
Export starters that export in year t+5	mean	29.09	47.98	37.03	45.06
	(sd)	(36.43)	(63.44)	(53.50)	(63.99)
Export starters that sell on the national market only in year t+5 (export stoppers)	mean	47.68	21.83	18.12	30.68
	(sd)	(65.42)	(38.47)	(39.49)	(72.27)
t-test for difference in mean values	p-value	0.232	0.034	0.121	0.499
K-S-Test H0: equality of distributions	p-value	0.566	0.007	0.015	0.424
K-S-Test H0: differences favourable for export survivors	p-value	0.340	1.000	1.000	0.540
K-S-Test H0: differences favourable for export stoppers	p-value	0.787	0.005	0.009	0.270

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Note: The t-test is a two-sample test with unequal variances; K-S-Test is the Kolmogorov-Smirnov test for first-order stochastic dominance.

Appendix: Market participation patterns of export starters from the cohort 1998<sup>1</sup>

Pattern	Frequency
00000	9
00001	x
00022	x
02020	x
02222	x
10000	8
11000	3
11100	9
11110	x
11111	27
11112	10
11120	x
11122	4
11200	x
11221	x
11222	3
12111	3
12112	x
12121	x
12221	x
12222	6
20000	4
21000	x
21100	x
21111	10
21112	x
21120	x
21122	x
21211	x
22000	15
22111	5
22112	x
22200	3
22211	x
22220	8
22221	3
22222	96
Total	248

<sup>1</sup> The patterns cover the five years from 1999 to 2004; the first number refers to 1999, the second number refers to 2000, etc. 2 indicates that the firm was an exporter, 1 indicates that the firm sold products on the national market only, 0 indicates that the firm sold neither on the national market nor on the export market. Only patterns that were observed are listed; x indicates that one or two firms show the respective pattern – the exact number is not reported due to data protection rules. Help for interpretation: The pattern 22222 stands for firms that exported in each of the five years after export market entry, 11111 stands for firms that exported only in year t and sold products on the national market only in the years t+1 to t+5, 00000 stands for firms that exited the market completely in the year after the export start and did not return during the next five years.





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