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Working Paper
Exports and Productivity: A survey of the evidence from firm level data

HWWA Discussion Paper, No. 319

Provided in Cooperation with:
Hamburgisches Welt-Wirtschafts-Archiv (HWWA)

Suggested Citation: Wagner, Joachim (2005) : Exports and Productivity: A survey of the evidence from firm level data, HWWA Discussion Paper, No. 319, Hamburg Institute of International Economics (HWWA), Hamburg

This Version is available at:
http://hdl.handle.net/10419/19291

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HWWA DISCUSSION PAPER

319

Hamburgisches Welt-Wirtschafts-Archiv (HWWA)
Hamburg Institute of International Economics
2005
ISSN 1616-4814
Hamburgisches Welt-Wirtschafts-Archiv (HWWA)
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Exports and Productivity: 
A survey of the evidence from firm level data

Joachim Wagner *

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This paper is prepared for a special issue of The World Economy on Exports and Growth.

This version: March 2, 2005

Edited by the Department European Integration
Head: Dr. Konrad Lammers
Exports and Productivity:  
A survey of the evidence from firm level data

ABSTRACT

While the role of exports in promoting growth in general, and productivity in particular, has been investigated empirically using aggregate data for countries and industries for a long time, only recently have comprehensive longitudinal data at the firm level been used to look at the extent and causes of productivity differentials between exporters and their counterparts which sell on the domestic market only. This paper surveys the empirical strategies applied, and the results produced, in 45 microeconometric studies with data from 33 countries that were published between 1995 and 2004. Details aside, exporters are found to be more productive than non-exporters, and the more productive firms self-select into export markets, while exporting does not necessarily improve productivity.

Keywords:   Exports, productivity, literature survey, micro data
JEL classification:   F14, D21

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1 MOTIVATION

Discussions of the role of exports in promoting growth in general, and productivity in particular, have been ongoing for many years. Until some ten years ago, empirical studies in this field used data at the country or industry level to test whether exports promote productivity growth or vice versa (see the surveys by Baldwin (2000) and Giles and Williams (2000a, 2000b)). In 1995 Bernard and Jensen published the first of series of papers that changed this research perspective (see Bernard and Jensen 1995, 1999, 2004a). They used large comprehensive longitudinal data from surveys performed regularly by official statistics in the U. S. to look at differences between exporters and non-exporters in various dimensions of firm performance, including productivity. These papers started a literature. During the ten years following the publication of Bernard and Jensen’s Brookings paper researchers all over the world discovered the rich data sets collected by their statistical offices as a source to investigate the export activity of firms, and its causes and consequences.\(^1\) The extent and cause of productivity differentials between exporters and their counterparts which sell on the domestic market only is one of the core topics in this literature.

There are two alternative but not mutually exclusive hypotheses why exporters can be expected to be more productive than non-exporting firms (see Bernard and Jensen 1999; Bernard and Wagner 1997):

The first hypothesis points to self-selection of the more productive firms into export markets. The reason for this is that there exist additional costs of selling goods in foreign countries. The range of extra costs include transportation costs, distribution or marketing costs, personnel with skill to manage foreign networks, or production costs in modifying current domestic products for foreign consumption. These costs provide an entry barrier that less successful firms cannot overcome. Furthermore, the behaviour of firms might be forward-looking in the sense that the desire to export tomorrow leads a firm to improve performance today to be competitive on the foreign market, too. Cross-section differences between exporters and non-exporters, therefore, may in part be explained by ex ante differences between firms: The more productive firms become exporters.

The second hypothesis points to the role of learning-by-exporting. Knowledge flows from international buyers and competitors help to improve the post-entry performance of export starters. Furthermore, firms participating in international markets are exposed to more intense

\(^1\) Earlier research using longitudinal micro data from official statistics in Germany to investigate causes and consequences of exporting is summarised in Wagner (1995).
competition and must improve faster than firms who sell their products domestically only. Exporting makes firms more productive.

These two hypotheses are by no means mutually exclusive. This paper reviews the findings of studies that use micro data at the level of firms (i.e. plants, establishments, local production units) to investigate the relationship between export activities and productivity empirically. The rest of the paper is organised as follows: Section 2 describes the various empirical approaches used in the post-1995 literature to identify the extent and direction of the relationship between exports and productivity using micro data at the firm level. Section 3 reviews 45 studies with data from 33 countries and summarises the core results. Section 4 concludes.

2 INVESTIGATING THE EXPORTS / PRODUCTIVITY RELATIONSHIP: EMPIRICAL STRATEGIES

2.1 A standard approach

A common approach to investigate differences in productivity between exporters and non-exporters is to follow (sometimes only in part, and sometimes with modifications and extensions) the methodology introduced by Bernard and Jensen (1995, 1999). Studies of this type use longitudinal data for plants (usually from the regular surveys conducted by official statistics) to document differences in levels and growth rates of productivity between exporters and non-exporters in a first step. Here one starts by looking at differences in average labour productivity (total value of shipments per worker, or value added per worker) or average total factor productivity\(^2\) between exporters and non-exporters. The result is an unconditional productivity differential.

The next step is the computation of so-called exporter premia, defined as the ceteris paribus percentage difference of labour productivity between exporters and non-exporters. These premia are computed from a regression of log labour productivity on the current export status dummy and a set of control variables (usually including industry, region, firm size measured by the number of employees, and year):

\[
(1) \ln L_{P_{it}} = a + \beta \text{Export}_{it} + c \text{Control}_{it} + e_{it}
\]

where \(i\) is the index of the firm, \(t\) is the index of the year, \(LP\) is labour productivity, \(Export\) is a dummy variable for current export status (1 if the firm exports in year \(t\), 0 else), \(Control\) is a

\(^2\) To simplify the exposition we will refer to labour productivity only from now on.
vector of control variables (like four-digit industry dummies, dummies for regions, firm size, and year dummies), and e is an error term. The export premium, computed from the estimated coefficient $\beta$ as $100(\exp(\beta)-1)$, shows the average percentage difference between exporters and non-exporters controlling for the characteristics included in the vector Control. To control for unobserved plant heterogeneity due to time-invariant firm characteristics which might be correlated with the variables included in the empirical model and which might lead to a biased estimate of the exporter premia, a variant of (1) is often estimated with fixed plant effects, too.

Next, differences in productivity growth between exporters and non-exporters are investigated based on an empirical model that can be written as

\[
(2) \ln \text{LP}_{it} - \ln \text{LP}_{i0} = a + \beta_1 \text{Start}_{it} + \beta_2 \text{Both}_{it} + \beta_3 \text{Stop}_{it} + \text{Control}_{i0} + e_{it}
\]

where Control is a vector of plant characteristics in year 0, and the dummies for export status are defined as follows:

$\text{Start}_{it} = 1$ if $(\text{Export}_{i0} = 0)$ and $(\text{Export}_{it} = 1)$

$\text{Both}_{it} = 1$ if $(\text{Export}_{i0} = 1)$ and $(\text{Export}_{it} = 1)$

$\text{Stop}_{it} = 1$ if $(\text{Export}_{i0} = 1)$ and $(\text{Export}_{it} = 0)$

where non-exporting in both years is the reference category. The regression coefficients $\beta_1$, $\beta_2$ and $\beta_3$ are estimates for the increase in growth rates of labour productivity for export starters, exporters in both years, and export stoppers relative to non-exporters in both years, controlling for firm characteristics included in the vector Control. Here we look at $\beta_2$ to compare exporters and non-exporters.

To shed light on the empirical validity of the first hypothesis mentioned – namely, that the more productive firms go abroad – the pre-entry differences in productivity between export starters and non-exporters are investigated next. If good firms become exporters then we should expect to find significant differences in performance measures between future export starters and future non-starters several years before some of them begin to export. To test whether today’s export starters were more productive than today’s non-exporters several years back when all of them did not export, select all firms that did not export between year $t-3$ and $t-1$, and compute the average difference in labour productivity in year $t-3$ between those firms who did export in year $t$ and those who did not. More formally, estimate the empirical model
(3) \( \ln \text{LP}_{it-3} = a + \beta \text{Export}_{it} + c \text{Control}_{it-3} + e_{it} \)

where \( i \) is the index of the firm, \( t \) is the index of the year, \( \text{LP} \) is labour productivity in year \( t-3 \), \( \text{Export} \) is a dummy variable for current export status (1 if the firm exports in year \( t \), 0 else), \( \text{Control} \) is a vector of control variables (like four-digit industry dummies, dummies for regions, firm size, and year dummies), and \( e \) is an error term. The pre-entry premium, computed from the estimated coefficient \( \beta \) as 100(\text{exp}(\beta)-1), shows the average percentage difference between today’s exporters and today’s non-exporters three years before starting to export, controlling for the characteristics included in the vector \( \text{Control} \). To investigate the related question whether productivity increased more in export starters in the years before the start than in firms that continue not to export, the empirical model

(4) \( \ln \text{LP}_{it-1} - \ln \text{LP}_{it-3} = a + \beta \text{Export}_{it} + c \text{Control}_{i0} + e_{it} \)

is used. The estimated regression coefficient \( \beta \) shows the extent in which future exporters outperformed the non-exporting firms in the years prior to entry.

To test for the second hypothesis mentioned – namely, that exporting fosters productivity - the post-entry differences in productivity growth between export starters and non-exporters are investigated. This is done by looking at \( b_1 \) from (2) to compare the productivity growth performance of export starters and non-exporters.

Finally, to find out whether stopping to export is negatively related with productivity performance, post-exit differences in productivity growth between export stoppers and non-exporters are investigated by looking at \( b_3 \) from (2) to compare the productivity growth performance of export stoppers and non-exporters.

While most of the empirical studies that use (variants of) the now standard approach outlined in this section compare exporters and non-exporters across all (manufacturing) industries, some focus on firms from selected industries only and document interesting similarities and differences (see e.g. Alvarez and López (2004), Blalock and Gertler (2004), De Loecker (2004), and Greenaway and Kneller (2004b)). Furthermore, Damijan, Polanec and Prasnikar (2004) recently looked at differences by foreign markets served and found that it matters whether firms exported to advanced countries or developing countries.

### 2.2 Extensions

The standard approach outlined in the last section has been augmented by extensions and alternative approaches that deal with some of its weaknesses and problems. Here we will dis-
cuss two of these recent developments that are used more and more in empirical investigations, namely the comparison of productivity between matched firms, and differences in the distribution of productivity as a whole between exporters and non-exporters.

To motivate the first approach mentioned, consider the following situation: Assume that a study reports that plants entering the export market have substantially faster productivity growth in the following years than firms that keep selling their products on the domestic market only. Does this point to a causal effect of starting to export on productivity? The answer is, obviously, no: If better firms self-select into export-starting, and if, therefore, todays export starters are 'better' than today's non-exporters (and have been so in the recent past), we would expect that they should, on average, perform better in the future even if they do not start to export today. However, we cannot observe whether they would really do so because they do start to export today; we simply have no data for the counterfactual situation. So how can we be sure that the better performance of starters compared to non-exporters is caused by exporting (or not)? This closely resembles a situation familiar from the evaluation of active labor market programs (or any other form of treatment of units): If participants, or treated units, are not selected randomly from a population but are selected or self-select according to certain criteria, the effect of a treatment cannot be evaluated by comparing the average performance of the treated and the non-treated. However, given that each unit (plant, or person, etc.) either participated or not, we have no information about its performance in the counterfactual situation. A way out is to construct a control group in such a way that every treated unit is matched to an untreated unit that has been as similar as possible (ideally, identical) at the time before the treatment. Differences between the two groups (the treated, and the matched non-treated) after the treatment can then be attributed to the treatment (for a comprehensive discussion, see Heckman, LaLonde and Smith 1999).

The use of a matching approach to search for causal effects of starting or stopping to export on productivity (and other dimensions of firm performance) has been pioneered by Wagner (2002) and Girma, Greenaway and Kneller (2003, 2004), and it has been used in a growing number of empirical studies ever since (including De Loecker (2004), Arnold and Hussinger (2004), and Alvarez and López (2004)).

As regards the second recent methodological innovation in this literature, consider the comparison of productivity (or productivity growth) between exporters and non-exporters. If one looks at differences in the mean value for both groups only, one focuses on just one moment of the productivity distribution. A stricter test that considers all moments is a test for stochastic dominance of the productivity distribution for exporters over the productivity distribution for non-exporters. More formally, let F and G denote the cumulative distribution functions of productivity for exporters and non-exporters. Then first order stochastic dominance of F rela-
tive to $G$ means that $F(z) - G(z)$ must be less or equal zero for all values of $z$, with strict inequality for some $z$. Whether this holds or not is tested non-parametrically by adopting the Kolmogorov-Smirnov test. This method has been used to discuss the issue of exports and productivity for the first time by Delgado, Farinas and Ruano (2002); recent applications comparing firms that produce for the local market only, that export, and that are foreign direct investors are Girma, Kneller and Pisú (2003) and Girma, Görg and Strobl (2004).

A related extension of the standard approach used in the investigation of the relationship between exports and productivity is the application of quantile regression, introduced to this field of analysis by Yasar, Nelson and Rejesus (2003). By construction this method examines the productivity effect of exporting at different points of the conditional output distribution. To state it differently, quantile regression allows to test for differences in the effects of exporting on plant productivity as one moves from the lower to the upper tail of the conditional productivity distribution, and to identify the regions where these effects are especially weak, or strong, or not significantly different from zero at all.

3 A SURVEY OF THE EVIDENCE, 1995 – 2004

During the ten years following the publication of the path-breaking Brookings paper by Bernard and Jensen (1995) researchers all over the world used firm level data to investigate the relationship between exporting and productivity in microeconometric studies. Table 1 gives a synopsis of findings from 45 empirical studies covering 33 countries. Among the countries covered are highly industrialised countries (e.g., U.S., UK, Canada, Germany); countries from Latin America (Chile, Colombia, Mexico); Asian countries (China, Korea, Indonesia, Taiwan); transition countries (Estonia, Slovenia); and least developed countries from sub-Saharan Africa.

Given this wide range of countries the big picture emerging from column two of table 1 that summarises findings on differences in levels and growth rates between exporters and non-exporters is amazingly clear-cut: With only a few exceptions exporters are found to have higher productivity, and often higher productivity growth, and this tends to hold after controlling for observed plant characteristics (like industry and size), too. Exporters are better.

The findings for pre-entry differences surveyed in column three often present evidence in favour of the self-selection hypothesis: Future export starters tend to be more productive than future non-exporters years before they enter the export market, and often have higher ex-ante growth rates of productivity. The good firms go abroad.
Evidence regarding the learning-by-exporting hypothesis is somewhat more mixed: Results for post-entry differences in performance between export starters and non-exporters collected in column four point to faster productivity growth for the former group in some studies only. If matched firms are compared, often no statistically significant exporter premia are found. Exporting does not necessarily improve firms.

Finally, a look at the results for post-exit differences collected in the last column reveals that stopping to export tends to be accompanied by a decrease in productivity in the most cases. Girma, Greenaway and Kneller (2003) in the only study using matched firms, however, find only weak negative effects in the year of exit, and no effect for later years.

Obviously the big picture sketched here – exporters are more productive than non-exporters, and the more productive firms self-select into export markets, while exporting does not necessarily improve productivity - hides a lot of cross-country heterogeneity which is documented in some detail in table 1, and in even more detail in the studies surveyed. Cross-country comparisons, and even cross-study comparisons for one country, are difficult because the studies differ in details of the approach used. Therefore, the jury is still out on many of the issues regarding the relationship between exporting and productivity. One promising approach to generate stylised facts in a more convincing way is to co-ordinate microeconometric studies for many countries ex-ante, and to agree on a common approach and on the specification of the empirical models estimated. The outcome of such a joint effort would be a set of results that could be compared not only qualitatively (i.e. with regard to the signs and the statistical significance of the estimated coefficients) but with a view on the magnitude of the estimated effects, too.3

4 CONCLUDING REMARKS

Details aside the big picture that emerges after ten years of microeconometric research in the relationship between exporting and productivity is that exporters are more productive than non-exporters, and that the more productive firms self-select into export markets, while exporting does not necessarily improve productivity. However, given all the difficulties (mentioned above) to compare the results from the vast numbers of studies in detail, it still seems to be too early to speak of these findings as stylised facts, and to discuss any policy conclusions to be based thereon. Furthermore, there are a number of important issues that have only

3 See Bernard, Jensen and Wagner (1997) for this type of study using data for the U.S. and Germany. Volunteers willing to participate in an international study of this kind are asked to contact me!
been touched upon recently in some studies, and that deserve future research efforts that cover more countries:

- If high-productivity firms self-select into export markets, is their high productivity due to an exogeneous random shock, or is it the results of a planned strategy to prepare for entering export markets? Hallward-Driemeier, Iarossi and Sokoloff (2002), López (2003), and Alvarez and López (2004) present evidence for the latter view based on data from five East Asian countries and Chile.

- If exporting improves productivity via technology transfer from international buyers, what are the mechanisms by which this learning from exporting occurs? Blalock and Gertler (2004) report some anecdotal evidence from interviews with Indonesian exporting factory managers on this.

- Which role is played by different target countries of exports for higher productivity as a precondition or result of exporting? Damijan, Polanec and Prasnihar (2004) report that in Slovenia the productivity difference between future export starters and non-exporters is higher for firms that start to export to more advanced markets.

To answer these questions, microeconometric research based on large sets of longitudinal plant level data has to be supplemented by field research in firms, following Susan Helper’s (2000) credo that “you can observe a lot just by watching”. Case studies of this kind can not only produce the anecdotal evidence that helps us to understand what is behind the estimated coefficients that we produce with our PCs, they can point to the tailor-made questions to be included in future surveys that are aimed to collect data for a new generation of microeconometric studies, too.

Furthermore, there is a different area of future research that is driven by an emerging theoretical literature. While at the dawn of the empirical literature surveyed here Leamer and Levinson (1994, p.1) stated that “(i)nternational microeconomics is primarily a theoretical enterprise that seems little affected by empirical results”, this is no longer true for some years now. A number of theoretical papers, including Bernard, Eaton, Jensen and Kortum (2003), Melitz (2003), Helpman, Melitz and Yeaple (2004), and Yeaple (2005), take the results from the empirical literature on firms and exports as a starting point and develop models of international trade with heterogeneous firms which focus on the relationship between productivity and exports. These theoretical models in turn generate testable hypotheses, and serve as catalysts for future microeconometric studies.
REFERENCES


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<td><strong>Core findings</strong></td>
<td><strong>Pre-entry</strong></td>
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<td>Baldwin and Gu</td>
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<td>(2003) Canada</td>
<td>Pre-entry differences</td>
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<td>(1974-1996) Canada</td>
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<tr>
<td>Meller Chile (1995)</td>
<td>LP significantly higher in small and large export firms than in non-export</td>
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<td>Alvarez and López Chile</td>
<td>EP positive and significant for LP and TFP. Productivity differentials differ considerably by industry.</td>
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<td>(1986-1989) Chile</td>
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Kraay (2002) China (1988-1992) LP and TFP significantly higher in exporters than in non-exporters. EP positive and significant for LP and TFP. For established exporters, past exports are positively related to LP and TFP today, controlling for past firm performance and unobserved firm characteristics. For new entrants to export markets learning effects are insignificant and occasionally negative.

<table>
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<th>Study</th>
<th>Result</th>
<th>Notes</th>
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<tr>
<td>Clerides, Lach and Tybout (1998) Colombia (1981-1991)</td>
<td>LP higher for exporting firms than for non-exporters.</td>
<td>Pre-entry premia 20% to 24%. Pre-entry growth 3% - 4%. Pre-entry growth 3% - 4% for plants up to 100 employees and 27% - 32% for larger plants. EP ca. 45%. Growth of LP not significantly different for exporters and non-exporters over five year horizon.</td>
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<td>LP higher for export starters than for other groups of firms export.</td>
<td>LP growth rate differences between export starters and non-exporters not significant for one year horizon; LP grows 1.5% faster for starters over horizon five years after entry.</td>
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<td>(ongoing exporters, non-exporters and export stoppers).</td>
<td>Growth of LP not significantly lower for starters over horizon five year horizon.</td>
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<td>Isgut (2001) Colombia (1981-1991)</td>
<td>LP higher for exporting firms than for non-exporters, 80% - 100% for plants up to 100 employees and 27% - 32% for larger plants. EP ca. 45%.</td>
<td>For plants up to 100 employees and 27% - 32% for larger plants. EP ca. 45%.</td>
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<td>Higher in future starters.</td>
<td>LP shows worst performance compared to other groups, particularly around time of exit.</td>
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<td>Bernard / Wagner (1997) Germany (1978-1992)</td>
<td>LP 3-4 % lower in smaller export firms, but 30-50 percent higher in larger export firms. EP about 20 % on average, increasing with share of exports in total sales. Growth of LP slower in exporting than in non-exporting firms.</td>
<td>Growth of LP significantly higher for export starters than for non-exporters in the year after exporting starts (4.8-6.7 %).</td>
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<td>Pre-entry premia 2-5 % but insign.</td>
<td>Growth of LP significantly lower for export stoppers than for non-exporters in the year after exporting stops (3.6-8.4 %).</td>
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<td>Pre-entry growth 1.0–1.6 % higher in future starters, but difference insignificant.</td>
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<td>Source</td>
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<td>Wagner</td>
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<td>Arnold and Hussinger</td>
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<td>Hahn (2004)</td>
<td>Korea</td>
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Bernard
(1995)
Mexico
(1986-1990)
LP almost 30% (shipments)
more than 50% (value added)
greater for exporters.
EP 34% (value added).
Growth of LP not significantly
different for exporters and non-
exporters.
Growth of LP not significantly
different for export-starters and
non-exporters.
Growth of LP not significantly
different for export stoppers and-
non-exporters.

Clerides, Lach and
Tybout (1998)
Mexico
(1986-1990)
LP higher for exporting firms than
for non-exporters, export
starters and export stoppers.
LP higher for exporting firms than
for non-exporters, export
starters and export stoppers.
LP not higher for export starters
than for non-exporters and
lower than for exporters.
No suggestion of a learning
effect from exporting.
LP shows worst performance compared
to other groups.

Clerides, Lach and
Tybout (1998)
Morocco
(1984-1991)
LP higher for exporting firms than
for non-exporters.
LP higher for exporting firms than
for non-exporters.
LP higher for exporting firms than
for non-exporters.
LP improves after starting to
export.
LP sinks after stopping to export

Damijan, Polanec and
Prasnikar (2004)
Slovenia
(1994-2002)
Productivity of exporters higher
than of non-exporters; firms that
export to more markets are on
average more labor productive.
Productivity in starters higher than
in non-starters in years before
starting. Productivity difference
higher for firms that start to export
to more advanced markets.
No continuous productivity
improvement from exporting but
short run gains, only from serving
advanced, high-wage foreign
markets.
Firms ceasing exporting exhibit lower
productivity levels than old exporters
up to 20%.

De Loecker
(2004)
Slovenia
(1994-2000)
EP about 30% for value added
per worker.
For matched firms starting to export
raises productivity instantly and also
in the years following. Analyses by
industry find positive effects for most
sectors, but these are significant in
about half of them only.
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<tr>
<td>Delgado, Farinas and Ruano (2002) Spain</td>
<td>TFP distribution for exporters; TFP distribution for export starters stochastically dominates the distribution for non-exporters the distribution for non-exporters prior to entry. No evidence of divergence of distribution of TFP growth between new exporters and non-exporters; but post-entry growth greater for young entering exporters compared to young non-exporters.</td>
</tr>
<tr>
<td>Farinas and Martin-Marcos (2003) Spain</td>
<td>LP and TFP higher for exporters than for non-exporters. EP 17%. LP ex-ante higher for entering exporters than for continuing non-exporters. LP of entering exporters significantly higher than LP of non-exporters. Growth of LP and TFP not different between entering exporters and continuing non-exporters.</td>
</tr>
<tr>
<td>Greenaway, Gullstrand and Kneller (2003) Sweden</td>
<td>LP higher for exporters than for non-exporters; TFP lower for exporters, but around 10% higher after controlling for industry fixed effects. TFP lower for starters in the year of entry than for never-exporters. For matched firms first time entry into export markets is not associated with faster TFP growth compared to non-exporters.</td>
</tr>
<tr>
<td>Hansson and Lundin (2004) Sweden</td>
<td>Productivity higher for exporters than for non-exporters: EP 6.3% for TFP. LP and TFP higher for future starters two years before entry, but lower (not significant) three years before. Differences in growth of TFP and LP not significant. No significant differences in TFP growth between various export groups and non-exporters. Starters’ LP growth higher than non-exporters’.</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Country and Period</td>
</tr>
<tr>
<td>-----------</td>
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</tr>
<tr>
<td>Aw / Hwang (1995)</td>
<td>Taiwan</td>
</tr>
<tr>
<td>Aw, Chen and Roberts (1997)</td>
<td>Taiwan (1981 – 1991)</td>
</tr>
<tr>
<td>Liu, Tsou and Hammitt (1999)</td>
<td>Taiwan (1989-1993)</td>
</tr>
<tr>
<td>Aw, Chung and Roberts (2000)</td>
<td>Taiwan (1981 – 1991)</td>
</tr>
<tr>
<td>Tsou, Liu and Hammitt (2002)</td>
<td>Taiwan (1986 – 1996)</td>
</tr>
<tr>
<td>Study</td>
<td>Results</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Yasar, Nelson and Rejesus (2003) Turkey</td>
<td>EP around 19% (OLS regression). EP vary significantly from 9% to 21% from lower quantile to higher quantile (quantile regression). Productivity about 23% higher for entrants compared to non-exporters (OLS). Difference varies from 11% to 21% between lowest and highest quantile (quantile regression).</td>
</tr>
<tr>
<td>Girma, Greenaway and Kneller (2003) UK</td>
<td>Productivity higher for exporters than for non-exporters. Entrants more productive before entry than non-entrants. For matched firm exit has negative albeit weak effect on TFP in the year of exit; no effect detected for later years.</td>
</tr>
<tr>
<td>Girma, Greenaway and Kneller (2004) UK</td>
<td>Productivity of exporters 5.4% above industry mean, of non-exporters 4.6% below the mean. For matched firms entry is associated with significant increase in LP. No robust evidence of productivity effects beyond the first few years for all firms, but for firms more exposed to export markets.</td>
</tr>
<tr>
<td>Greenaway and Kneller (2003) UK</td>
<td>LP 2.2%, TFP 9.7% higher for exporters compared to non-exporters; EP 11.4% for LP and 8.3% for TFP. Past TFP positive effect on entry. Past productivity growth of future entrants higher compared to non-entrants. For unmatched firms, TFP growth faster in years of and after entry than for continuing non-exporters. For matched firms differences are lower and only significant in entry year.</td>
</tr>
<tr>
<td>Study</td>
<td>Findings</td>
</tr>
<tr>
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</tr>
<tr>
<td>Greenaway and Kneller (2004b)</td>
<td>Ceteris paribus the probability of export entry is increasing in the level of FTP. For matched firms productivity growth in new export firms is on average 2.9% faster than in non-export firms. Effect is consistently lower in industries in which existing exposure to foreign firms is greater.</td>
</tr>
<tr>
<td>UK (1990-1998)</td>
<td></td>
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<tr>
<td>Greenaway and Yu (2004)</td>
<td>Exporters more productive than non-exporters; EP 10.4% (output per worker) and 9.1% (TFP). Higher TFP leads to higher exporting probability. Learning-by-exporting effect strongest among new entrants, weaker for firms with more past export experience and negative for established exporters.</td>
</tr>
<tr>
<td>UK (Chemical Industry) (1989-1999)</td>
<td></td>
</tr>
<tr>
<td>Bernard / Jensen (1995)</td>
<td>LP approx. a third greater for exporters across all plant sizes. EP about 15%.</td>
</tr>
<tr>
<td>Bernard / Jensen (2004a)</td>
<td>Plants that always export 8%-9% more productive than plants that never export. Exporters have 0.72% lower productivity growth rates per year than similar plants producing solely for domestic market. Two years before starting entrants have productivity levels significantly above continuing non-exporters, but significantly below continuing exporters. In the year that they enter starters have significantly faster productivity growth rates 0.2%-0.9% growth rates than other firms, lower than continuing non-exporters.</td>
</tr>
<tr>
<td>U. S. (1983-1992)</td>
<td>Plants that exit the export market have productivity growth rates 0.2%-0.9% lower than continuing non-exporters.</td>
</tr>
<tr>
<td>Source</td>
<td>Finding</td>
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<td>--------------------------------</td>
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</tr>
<tr>
<td>Bernard and Jensen (2004b)</td>
<td>More productive plants have higher probability of starting to export, but controlling for plant fixed effects soaks the effect. Productivity effect is even negative (though insignificant) in GMM-first difference specification.</td>
</tr>
<tr>
<td>Bigsten et al. (2000)</td>
<td>Exporters exhibit higher average efficiency levels than non-exporters. Initial exporters tend to exhibit significantly higher levels of efficiency than other firms. Exporting in one period raises efficiency in the next period; the first year of exporting raises efficiency by 14%.</td>
</tr>
<tr>
<td>Cameroon (1992-1995)</td>
<td></td>
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<tr>
<td>Hallward-Driemeier, Iarossi and Sokoloff (2002)</td>
<td>TFP larger for exporters than non-exporters; gap is larger the less developed is the local market. Firms that export from the beginning have higher levels of TFP years later, due to different firm policy (investment in fixed and human capital etc.).</td>
</tr>
<tr>
<td>Indonesia, Korea, Malaysia, Phillipines, Thailand (1996-1998)</td>
<td></td>
</tr>
<tr>
<td>Mengistae and Pattillo (2004)</td>
<td>LP not different between newly entered and continuous exporters, but higher compared to non-exporting firms.</td>
</tr>
<tr>
<td>Three sub-Saharan African countries (1992-1995)</td>
<td>LP lower in export-stoppers than in continuous exporters, but higher than in non-exporting firms.</td>
</tr>
</tbody>
</table>
Note: Studies are listed in alphabetical order for the countries covered and chronologically for each country (using the most recent version of the study). Studies covering up to three countries are listed separately for each country (if information on each country is available); multi-country studies covering more than three countries are listed at the end of the table.

LP  =  labour productivity (total value of shipments per worker or value-added per worker).

TFP = Total factor productivity, usually calculated as the residual from an estimated Cobb-Douglas-type production function.

EP  =  exporter premia: cet. par. percentage difference of LP between exporters and non-exporters, usually based on OLS regressions controlling for industries, regions, firm size (no. of employees) and year.