research paper series

Globalisation, Productivity and Technology

Research Paper 2003/26

Exporting May Not Always Boost Firm Level Productivity

By

D. Greenaway, J. Gullstrand and R. Kneller

The Centre acknowledges financial support from The Leverhulme Trust under Programme Grant F114/BF

Leverhulme Centre
for Research on Globalisation and Economic Policy

The Authors

David Greenaway is Professor of Economics and Director of the Leverhulme Centre for Research on Globalisation and Economic Policy (GEP), University of Nottingham. Joakim Gullstrand is a Research Fellow at Lund University and a GEP External Research Fellow. Richard Kneller is a Research Fellow in GEP, University of Nottingham.

Acknowledgements

The authors are grateful to The Leverhulme Trust for financial support under Programme Grant F114/BF.

Exporting May Not Always Boost Firm Level Productivity

by

David Greenaway, Joakim Gullstrand and Richard Kneller

Abstract

A growing empirical literature suggests that the performance characteristics of firms that export are different from firms that do not. Specifically, exporters tend to be larger, more productive and pay higher wages than non-exporters. This paper reports on an econometric analysis of the characteristics of exporters and non-exporters in Swedish manufacturing industry. We use matching and differences in differences analysis to investigate a large panel dataset spanning almost 20 years. In contrast to the findings for every other country analysed so far, we find that the performance characteristics of exporters and non-exporters are remarkably similar.

JEL classification: F14

Keywords: Exporting, firm level productivity

Outline

Non-Technical Summary *(500 words)*

Over the last few years considerable research time has been spent analysing the characteristics of firms that enter export markets and whether export market entry changes these characteristics. Initially this literature was empirically led. From this literature it was consistently found that exporting firms were generally different from non-exporting firms. Specifically they tended to be larger, more productive and paid higher wages. This suggests that *self-selection* occurs, with potential exporters becoming more productive *before* they actually export. In addition, some studies go further, identifying that firms may become even more productive after they start exporting. More recently a theoretical literature has emerged to underpin these findings

In this paper we report on an extensive investigation of exporters in Swedish manufacturing. Sweden is an interesting case to take, given the openness of the economy to international trade and the remarkably high proportion of firms that export. Our sample is a large one. We have data for almost 20 years for in excess of 3,500 firms. Moreover, it is also a rich sample in that we have a lot of movement by firms into and out of export markets.

In searching for causal links between exporting and firm performance we use *matching* and *difference in differences* techniques, an approach which has been used rarely in this context and never on Swedish data. This methodology enables us to isolate the effects of export market entry on firm performance with greater confidence than alternative methodologies, including many used in the existing literature.

What we find is that a remarkably large proportion of Swedish firms export, much higher than in any other industrialised economy on which comparable research has been completed, including the US, Italy, Germany and the UK. Other aspects of our findings echo those for other countries: for example, exporting firms are on average bigger than otherwise comparable non-exporters and initially grow faster. In addition, labour appears to benefit from entry with average wages initially growing more quickly. However, in one crucial respect our results are in stark contrast to the findings of the rest of the literature – in Sweden the productivity growth of exporters on entry does **not** appear to differ significantly from non-exporters. Moreover, this result is robust to changes in specification, estimation procedure and industry disaggregation.

Why are the Swedish results so different? The likeliest explanation rests with the their already high degree of international exposure, they already compete with firms engaged in export activity and through import penetration. As a consequence of this there may be far smaller differences in firm characteristics than in economies where a smaller proportion of the population of firms export. Whatever the explanation, our findings challenge the consensus that exporting firms are always more productive than non-exporting firms.

1. INTRODUCTION

A range of aspects of firm level adjustment to international trade have attracted considerable attention in recent years. The fastest growing literature has focused on the characteristics of firms that enter export markets and whether export entry changes these characteristics. Initially this literature was empirically led, with important early contributions from Bernard and Jensen (1996), Bernard and Wagner (1998) and Clerides, Lach and Tybout (1998). This and subsequent work (to which we refer in greater detail below) finds that exporting firms were generally different from non-exporting firms. Specifically they tended to be larger, more productive and paid higher wages. All of this work suggests that *self-selection* occurs, with potential exporters becoming more productive *before* they actually export. In addition, some studies go further, identifying that firms may become even more productive after they start exporting.

More recently a theoretical literature has emerged, enquiring into why it is that, out of a given population, some firms export and some do not. As well as providing general equilibrium explanations of why productivity and exporting might be linked at the firm level, this literature has also offered a theoretical underpinning to a causal link between openness and aggregate productivity growth. Important contributions include Melitz (2002), Bernard, Jenson, Eaton and Kortum (2003), Medin (2003) and Helpman, Melitz and Yeaple (2003). As well as providing important insights into export market entry, these papers are also generating new testable propositions.

In this paper we report on an extensive investigation of exporters in Swedish manufacturing. Sweden is an interesting case to take, given the openness of the economy to international trade and the remarkably high proportion of firms which export. Our sample is a large one. We have data for almost 20 years for in excess of 3,500 firms. Moreover, it is also a rich sample in that we have a lot of movement by firms into and out of export markets.

In searching for causal links between exporting and firm performance we use *matching* and *difference in differences* techniques, an approach which has been used rarely in this context and never on Swedish data. Yet it is a powerful tool for dealing

with potential endogeneity and isolating productivity effects. In general, it controls more effectively for unobserved firm level heterogeneity than alternative methodologies.

What we find is that a remarkably large proportion of Swedish firms export, much higher than in any other industrialised economy on which comparable research has been completed, including the US, Italy, Germany and the UK. As in other studies we find that on average it is bigger firms that export. In Sweden, it appears to be the case that the performance characteristics of firms which export look similar to those that do not. Given the remarkably high participation rates of firms in export markets, this may not be too surprising and might explain why the productivity of exporters on entry does not appear to differ significantly from that of non-exporters.

The remainder of the paper is organised as follows. Section 2 reviews the literature on exporting and productivity. Section 3 outlines the key characteristics of Swedish manufacturing exporters. Section 4 describes our econometric methodology. Section 5 reports the results of our difference in difference analysis and Section 6 concludes.

2. WHY DO SOME FIRMS EXPORT?

Exporting is generally regarded as a 'good thing' by policymakers on the grounds that it is good for economic growth. This is perhaps most readily evident in developing countries, where the well established link between the growth of real exports and real GDP has been influential in promoting outward looking trade strategies. Indeed Krueger (1997) goes so far as to argue that this was *the* key driver behind the support of the Bretton Woods institutions in general and the World Bank in particular in promoting outward orientation as vigorously as they did. But the export - growth link has also been important in OECD countries where 'export led growth' is often seen as the most desirable form of growth to promote.

What is interesting about this literature is that it is fundamentally macroeconomic in orientation. The underlying models are aggregate growth models; the empirical literature is on aggregate data. Some of the policy literature is also essentially macro -

changing trade policy for example to alter relative prices and reduce anti-export bias. But it is firms that actually export and many policy interventions are microeconomic. Until recently we knew very little about the characteristics of exporters and why it is that some firms export and others do not. From the perspective of informing policy making, that was a crucial missing link. That situation is changing rapidly however and a substantial literature that is microeconomic and microeconometric is now developing.

Theory

As noted earlier the 'new' exporting literature has been empirically led. Recently however a number of important theoretical contributions have been made including Clerides, Lach and Tybout (1998), Melitz (2002), Jean (2002), Medin (2003) and Helpman, Melitz and Yeaple (2003). The first of these is essentially an empirical analysis motivated by a simple partial equilibrium model. What Clerides, Lach and Tybout (1998) show is that if there are sunk costs associated with export market entry, firms have to become more efficient prior to entry and self select into export markets. They also show that firms can be expected to show increasing costs prior to exit from export markets. Thirdly they not only demonstrate the potential for learning effects but go on to show how productivity dispersion will be higher among exporters when learning effects are present.

In an important paper, Melitz (2002) adapts Hopenhayn's (1992) dynamic industry model to a monopolistic competition setting. The key contribution is that this is a general equilibrium model with productivity heterogeneity across firms. Export entry is again costly. As a result the firms with higher *ex ante* productivity self-select into export markets, whilst those with lower productivity produce only for the domestic market. Globalisation promoting forces such as falling trade costs lead to an increase in aggregate productivity because they trigger firm level reallocations – more productive (exporting) firms expand whilst less productive (non-exporting) firms contract or exit. Hence the model not only pins down a causal link between exporting and productivity at the firm level, but also between openness and productivity in the aggregate. This is taken a stage further by Helpman, Melitz and Yeaple (2003), where firms also have the opportunity, subject to incurring a fixed cost, of setting up an

overseas affiliate. The model is again general equilibrium and yields the intuitively appealing result that the most productive firms engage in FDI, the next most productive export, whilst less productive firms produce only for the domestic market, with the least productive ceasing production altogether.

By contrast, Medin (2003) and Jean (2002) are representative firm models. They do incorporate fixed costs and trade costs so that exporters and non-exporters can co-exist in equilibrium. Fixed costs ensure that only a share of firms export and that share will vary with trade costs. Interestingly, in the Medin (2002) model, small countries have a higher share of exporting firms when there are increasing returns to scale, a reversal of the standard home market effect which is common to increasing returns/monopolistic competition trade models.

Microeconometric Evidence

Table 1 summarises the sample frame, methodology and key results from twelve microeconometric studies of exporting, firm performance and productivity. Although comparatively small, this is a rich literature in that it encompasses a number of developing and developed countries; a range of methodologies and a range of hypotheses.

The proportion of exporting firms in each sample ranges from 28% in Chile (Alvarez 2002) to over 80% in Sweden, and sample sizes vary from 353 firms in Germany (Wagner 2002) to 50-60,000 plants in the US (Bernard and Jensen 1999). Methodologically some studies rely on standard cross-section techniques, others use panel techniques of one form or another, or non-parametric techniques.

Despite diversity in terms of methodology and sample these are some striking empirical regularities. First, all studies report that exporters are typically larger, they tend to be more capital intensive and tend to pay higher wages. Second, all studies report that exporters are more productive and higher productivity is manifest before entry to exports markets takes place. This is certainly consistent with the prediction from theory that there are sunk costs associated with exporting, so firms have to be more productive before they can enter export markets. Third, a few studies

(Castellani 2002, Kraay 1999, Girma, Greenaway and Kneller 2003a) report that export intensity makes a difference. Specifically, the export premium increases as the share of output exported increases, but at a decreasing rate. Fourth, most studies fail to find evidence of exporting leading to a further increase in productivity, the exceptions being Kraay (1999), Castellani (2002) and Girma, Greenaway and Kneller (2003a). These report second order productivity effects, which could be due to learning, as in the Clerides, Lach and Tybout (1998) model or scale effects as in Medin (2003). Finally, some studies focus on the characteristics of quitters and the most common finding here is that's it is typically less productive firms that exit from export markets.

Table 1 Microeconometric Studies of Exporting and Productivity

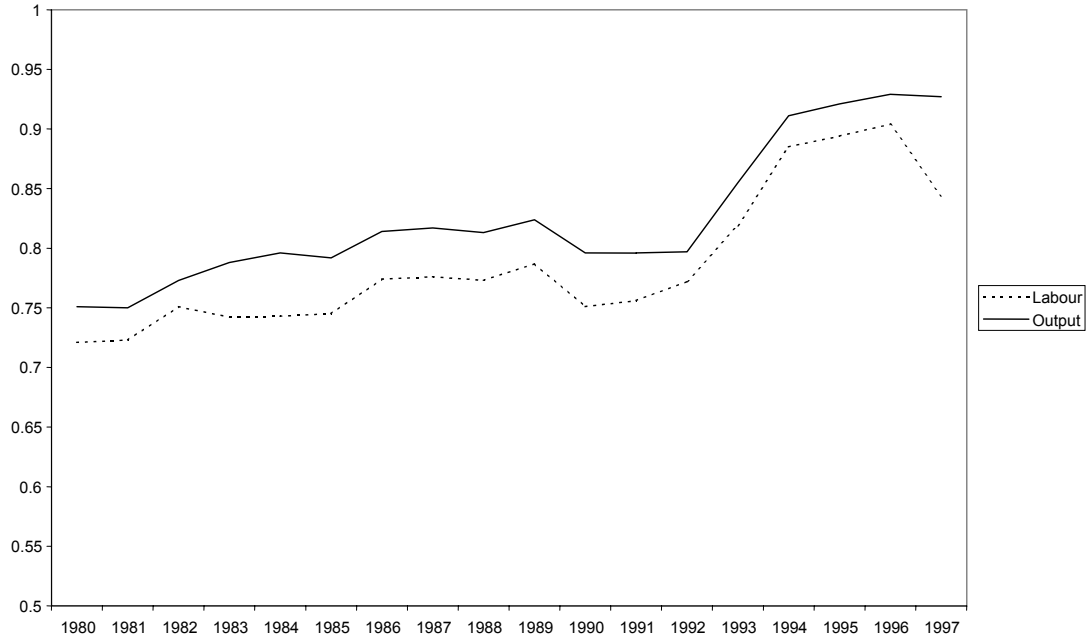
Study	Country	Sample	Methodology	Results
Bernard and Jensen (1999)	US	50-60,000 plants 1984-92	Linear probability with fixed effects	Self selection of exporters Absence of learning from exporting Higher productivity of exporters
Delgado, Farinos and Ruano (2001)	Spain	1,766 firms 1991-96	Non-parametric analysis of productivity distributions	Higher productivity of exporters Self selection of exporting firms Inconclusive evidence on learning
Aw and Hwang (1995)	Taiwan	2,832 firms 1986	Translog production function Cross section	Higher productivity of exporters Self selection Absence of learning from exporting
Castellani (2002)	Italy	2,898 firms 1989-94	Cross section	Higher productivity of exporters Learning associated with export intensity
Kraay (1999)	China	2,105 firms 1988-92	Dynamic panel	Higher productivity of exporters Learning from exporting
Clerides, Lach and Tybout (1998)	Colombia Mexico Morocco	All plants 2,800 firms All firms 1981-91 1986-90 1984-91	FIML of cost functions Panel data	Exporting firms more efficient than non-exporting firms Quitters less productive No learning from exporting in Colombia and Mexico Some learning from exporting in Morocco Spillovers from exporters to non-exporters
Bernard and Wagner (1997)	Germany	7,624 firms 1978-92	Panel data	Higher productivity of exporting firmd Self selection of exporters
Wagner (2002)	Germany	353 firms 1978-89	Panel data; matching	Higher productivity of exporting firms Absence of learning from exporting
Alvarez (2002)	Chile	5,000 plants 1990-96	Ordered probit; Pooled data	Higher productivity of exporting self selection of exporters
Girma, Greenaway and Kneller (2003a)	UK	8,992 firms 1988-99	Panel data; matching differences in differences	Higher productivity of exporting firms Self selection of exports Learning from exporting
Girma, Greenaway and Kneller (2003b)	UK	658 firms 1988-99	Panel data; matching differences in differences	Lower productivity of quitters

3. DATA CHARACTERISTICS AND THE PROBABILITY OF EXPORTING IN SWEDEN

This is one of the first investigations of exporting and firm characteristics for Sweden[1], which is an interesting case to take for several reasons. First, it is a very open economy, trade as a share of GDP being around 60% in the early 1980s and over 80% in 2000. Second, it is a highly export orientated economy with a very high proportion of firms engaged in exporting. On average over our sample period, 85% of firms export: much higher than one finds in larger OECD economies such as Germany, the UK and US. For example, Bernard and Jensen (1999) report that 54% of US firms export in their sample, whilst the comparable figure reported by Girma, Greenaway and Kneller (2003a) for the UK is 46%. Third, there is considerable movement by firms into and out of export markets.

Our data set contains information on 3,570 firms over the period 1980 to 1997, yielding a maximum of 36,903 observations. The average export intensity of these firms has been rising over time. This is evident both in the share of firms that export and in the share of exports to sales. Figure 1 reports the weighted ratio of export firms to non-export firms, where each firm is weighted according to its size, and output and employment provide the weights. In 1980 firms that exported accounted for close to 75% of total output rising to over 90% by the end of the sample period.

Figure 1: Number of firms in sample that export, weighted by the size of the firm



In line with previous studies there are noticeable differences in the characteristics of firms that export and those that do not as Table 2 shows.[2] On average, export firms are larger in terms of both output and employment: 1.7 times the size of non-export firms in terms of output and around 20% larger in terms of employment. While this suggests higher labour productivity, it is not reflected in higher TFP. The average level of TFP in export firms appears to be 0.3 below the (industry) mean while it is 0.06 above in non-export firms. However once we control for differences in the average level of productivity across industries the TFP premium to export firms returns. After controlling for fixed industry effects we find that TFP is around 10 percentage points higher compared to non-export firms. (On a smaller sample and shorter timeframe, Hansson and Lundin (2003) report a productivity advantage in favour of exporting firms of 6.8%). Finally the average wage paid in export firms is higher, again a finding echoed in the broader literature and reported by Hansson and Lundin (2003), though in the latter the wage premium amounts to less than 1%.

We are interested in the effect of first time export entry on firm performance. In Table 2 therefore we also report on the general characteristics of first time entrants in the year in which they started to export and firms that do not export. There are 610 new entrants during the sample period and 484 firms that do not export in any period. The low number of non-export firms in part reflects the high export intensity of Swedish manufacturing but also the relatively long sample period available. To mitigate the effects of the lengthy time frame, we add into the control group firms that have had no export experience within a seven year window.[3] This increases the number of firms within the control group to 920.[4] Finally for comparison we also report the characteristics of the matched sample of first time export and non-export firms used to generate the results (reported as regression 1 in Table 3).

---

[1] At the time of writing one further piece of work by Lundin and Hansson (2003) was underway. We report on this later.

[2] The sum of export firms and non-export firms exceeds the total number of firms within the dataset because this table counts the number of firms that have ever exported and ever not-exported. This table therefore double counts firms that switch in and out of export markets. It will not affect the other variables within the Table.

[3] This number is decreased to 5 years if the firm did not exist for the other 2 years.

Table 2: Sample Characteristics

Full Sample	***Exporters***		***Non- exporters***	
	Mean	*St. Dev.*	*Mean*	*St. Dev.*
No. of firms	3040		2146	
Observations	23979		12924	
Output	553.95	2144.97	210.16	1191.58
Employment	314.85	1052.95	163.48	1035.53
TFP	-0.296	3.78	0.088	2.80
Wages	264.49	868.04	118.46	721.06
Un-matched Sample	***First time exporters***		***Never Exporters***	
	Mean	*St. Dev.*	*Mean*	*St. Dev.*
No. of firms	610		920	
Observations	610		5838	
Output	151.05	360.16	253.92	1495.20
Employment	100.09	197.30	206.39	1312.45
TFP	-0.041	2.55	0.065	1.72
Wages	76.07	164.18	147.36	916.74
Matched Sample	***First time exporters***		***Never Exporters***	
	Mean	*St. Dev.*	*Mean*	*St. Dev.*
No. of firms	321		247	
Observations	1185		1117	
Output	130.08	244.22	293.51	1780.69
Employment	86.45	97.40	230.99	1527.01
TFP	-0.091	0.98	-0.026	1.06
Wages	62.03	96.90	163.58	1050.99

4. ECONOMETRIC METHODOLOGY

As stated above, one of our aims is to evaluate the causal effect of first time export market entry on firm level TFP growth. To do this we employ the matched difference-in-difference approach described and implemented on UK data in Girma, Greenaway and Kneller (2003a and 2003b)[5]. This is formulated as follows:

Let $EXP_{it} \in \{0,1\}$ be an indicator (dummy variable) of whether firm *i* entered export markets for the first time at period t, and g^1_{it+s} the outcome. In this analysis the

[4] The use just of firms that never export as the control group does not change the results reported in the matched difference-in-difference regressions of Table 3.
[5] Further details of this methodology can also be found in Blundell and Costa Dias (2000).

outcome is the growth rate of TFP, at time $t+s$,[6] following entry. The term Δg^{1}_{it+s} measures the change in TFP growth over the treatment period for the treatment group and the term Δg^{0}_{it+s} defines the change in the rate of TFP growth in firm *i had it not* entered export markets. The causal effect of export market entry for firm *i* at time period $t + s$ is therefore defined as: the change in TFP growth over period $t+s$ if export market entry occurred, less the change in TFP growth rate in period $t+s$ if export market entry had not occurred. We can write the average expected effect as:

$$E\left\{\Delta g^{1}_{t+s} - \Delta g^{0}_{t+s} \mid EXP_{it} = 1\right\} = E\left\{\Delta g^{1}_{t+s} \mid EXP_{it} = 1\right\} - E\left\{\Delta g^{0}_{t+s} \mid EXP_{it} = 1\right\} \qquad (1)$$

It is of course the case that the change in TFP growth experienced by firm *i had it not chosen to enter export markets*, Δg^{0}_{it+s}, is unobservable. Causal inference in this case relies on the construction of this counterfactual, using firms that had similar observable firm level characteristics in period *t* but which did not enter export markets. The average rate of growth $E\left\{\Delta g^{0}_{t+s} \mid EXP_{it} = 1\right\}$ in equation (1) is measured instead using $E\left\{\Delta g^{0}_{t+s} \mid EXP_{it} = 0\right\}$.

An important feature is the selection of a valid control group. This is where matching techniques come in. Since matching involves comparing first time exporting and non-exporting firms across a number of observable pre-entry characteristics (productivity, size, skill and fixed industry and time effects) it is often difficult to determine along which dimension to match the firms or what type of weighting scheme to use. We employ *propensity score matching* (Rosenbaum and Rubin, 1983), which uses the probability of receiving a given treatment, conditional on the pre-entry characteristics of firms, to reduce the dimensionality problem.

Matching is therefore performed on the basis of a single index that captures all the information from the (observable) characteristics of the firm pre-entry. In order to identify the probability of export market entry (or 'propensity score') we exploit the findings of the literature by estimating a probit model of export market entry (see, for example, Girma, Greenaway and Kneller 2003a; Bernard and Jenson 1999). The results are reported in Table A1 of the Appendix. We find that the probability of

[6] Where $s \geq 0$.

export market entry is found to depend upon firm level characteristics such as the level of TFP, size of the firm, level of wages as well as fixed industry and time effects. Within this literature size has typically been measured by the level of employment, and average skill levels by the average wage. Accordingly we estimate a panel random effects equation that includes the following set of variables,

$$P(EXP_{it} = 1) = F(TFP_{it-1}, size_{it-1}, ownweship_{it-1}, wages_{it-1}) \quad (4)$$

Let P_{it} denote the predicted probability of entry at time *t* for firm *i* (the firm that enters the export market). A non-exporter *j*, which is 'closest' in terms of its 'propensity score' to firm *i*, is then selected as a match for the latter using the 'caliper' matching method[7]. More formally, *at each point in time*[8] and for each new entrant firm *i*, a non exporter firm *j* is selected such that[9]

$$\lambda > \left| P_{it} - P_{jt} \right| = \min_{k \in \{EXP=0\}} \{ | P_i - P_j | \} \quad (5)$$

where λ is a pre-specified scalar (the caliper). If there is no untreated firm that lies below λ for a given treated firm then the treated firm is excluded from the subsequent analysis, it is left un-matched.[10] This type of matching procedure is preferable to randomly or indiscriminately choosing a comparison group, because it is less likely to induce estimation bias by picking firms with markedly different characteristics.

Having constructed the control group of firms we follow Blundell and Costa Dias (2000) and compare the average rate of growth of the two sets of firms using a difference-in-differences estimator. The advantage of using this in conjunction with matching is in accounting for additional covariates that may determine performance over the period *t*+*s*. The difference-in-difference equation estimated takes the form:

[7] The matching is performed in Stata Version 7 using the software provided by Sianesi (2001).
[8] Note that the matching strategy is only appropriate on a cross-section by cross-section basis. Once the matched firms are identified, we pool all observations on them to form a panel data of matched firms. This panel is used in subsequent analyses.
[9] A non-exporter can be matched to more than one entering firm.
[10] The chosen caliper value cannot be judged according to any statistical criteria. For this reason we set it a value such that it excludes approximately half of all first time exporters from the sample. We test the robustness to the relaxation of this assumption in later analysis.

$$g_{kt}^{EXP} = \beta_{ik} + \beta_{2t} + \sum_{l=-1}^{3} \beta_3 D_{t+l} + \sum_{l=-1}^{3} \beta_4^{EXP} D_{t+l}^{EXP} + \sum \beta_5 X_{kt} + + \varepsilon_{it}^{L}$$

where *k* denotes firms (firms *i* and *j* in equation 5), the vector of coefficients β_2 captures the effect of events that occur in calendar time *t* but are common to all firms, β_3 for events that occur to all firms in event time *t*, while the vector of coefficients β_4 the change in the rate of growth of TFP specific only to those firms that entered export markets for the first time at event time *t*. It is the significance or otherwise of β_4 that is of primary interest in this paper. Firm performance is compared across a number of time periods, the pre-entry period, the year in which entry takes place and the three years after entry. These are expressed such that they measure growth relative to the time period before entry, the increase in growth caused by the change in export status. We also control for unobserved firm level fixed effects as well as the lagged level of TFP (to control for possible convergence effects) and lagged size and skill effects (measured by the lagged level of employment and wages respectively). We therefore control for as much of the variation in TFP growth rates for the firm that cannot be attributed to the change in export status.

5. MATCHED DIFFERENCE-IN-DIFFERENCE ANALYSIS

Table 3 reports the results from our matched difference-in-difference regressions. In generating these results 247 non-export firms are matched to 321 first time exporters. It is clear that while the rate of TFP growth in firms that enter export markets is greater than that in the period before entry these differences are not statistically significant. First time entry into export markets is *not* associated with faster TFP growth among Swedish manufacturing firms during the 1980 to 1997 period as a whole. This is consistent with evidence reported by Hansson and Lundin (2003) for Swedish manufacturing over the 1990-99 period, but contrasts with Girma, Greenaway and Kneller, (2003a) for the UK, who also use a matched difference-in-difference approach, and Wagner (2002) who uses a matched sample of German manufacturing firms.

This particular result is robust to both changes in the sample frame, the measure of TFP used, as well as the matching equation. In regressions 2-4 of Table 3 we report

results from regressions constrained over shorter sample periods. Regression 2 considers the 1981 to 1991 time period; regression 3, 1988 to 1994; and regression 4, 1990 to 1997.

Table 3: Difference-in-difference results

Regression No.	**1** *1981-97 period*	**2** *1981-91 period*	**3** *1988-94 period*	**4** *1990-97 period*	**5** *SNI 15-23*	**6** *SNI 29-35*
Export dummy	0.482 (0.89)	0.768 (0.56)	-0.320 (0.13)	-0.061 (0.07)	-0.033 (0.05)	1.068 (0.15)
Event time *t*	-0.217 (1.06)	-0.031 (0.03)	-2.191 (1.27)	-0.131 (0.32)	0.100 (0.50)	-1.659 (0.42)
Event time *t+1*	-0.109 (0.47)	-0.654 (0.52)	-3.795 (1.12)	0.444 (0.86)	-0.002 (0.01)	-12.625 (0.98)
Event time *t+2*	-0.588 (1.40)	0.099 (0.06)	-7.331 (1.35)	0.588 (0.73)	0.131 (0.63)	-3.635 (0.66)
Event time *t+3*	-0.222 (0.56)	-8.266 (1.15)	-7.830 (1.14)		0.207 (1.06)	-0.260 (0.04)
Export Entry Effect Time *t*	**0.011** **(0.03)**	**-0.038** **(0.03)**	**1.054** **(1.17)**	**0.219** **(0.48)**	**-0.220** **(0.70)**	**-2.747** **(0.87)**
Export Entry Effect Time *t+1*	**0.148** **(0.32)**	**1.106** **(0.77)**	**0.224** **(0.21)**	**-0.191** **(0.39)**	**-0.183** **(0.57)**	**7.228** **(0.79)**
Export Entry Effect Time *t+2*	**0.383** **(0.60)**	**-0.290** **(0.17)**	**0.973** **(0.84)**	**-0.367** **(0.68)**	**-0.228** **(0.70)**	**-3.129** **(0.94)**
Export Entry Effect Time *t+3*	**-1.083** **(0.97)**	**7.201** **(1.00)**	**-1.044** **(0.82)**		**-0.487** **(1.63)**	**-8.216** **(1.19)**
TFP_{t-1}	-2.608 (4.28)**	-0.909 (1.32)	-1.570 (0.73)	-3.958 (2.84)**	-1.772 (3.75)**	-11.058 (1.26)
$Ln(LAB)_{t-1}$	0.920 (0.64)	1.641 (0.72)	-2.478 (0.60)	-0.530 (0.70)	-0.872 (0.99)	13.454 (1.24)
$ln(Wage)_{t-1}$	-1.023 (0.74)	-0.604 (0.27)	2.642 (0.72)	0.250 (0.33)	1.348 (1.19)	-19.748 (1.28)
Constant	-0.461 (0.30)	-4.381 (0.69)	-1.483 (0.33)	1.539 (1.11)	-1.718 (1.03)	12.873 (0.62)
Observations	2302	1100	466	1016	525	380
R-squared	0.26	0.25	0.27	0.46	0.41	0.22

These sub-periods do not reflect arbitrary choices. 1981-91 coincides with a period of decline in the value of the Krona relative to the currencies of Sweden's major trading partners, in particular the German DM and the French Fr. Interestingly however this did not appear to be associated with large increases in the number of exporters. By contrast, 1988-94 concentrates on a period in which an increase in the rate of export market entry took place. The final sub-period (1990-97) is similar to that considered

by Hansson and Lundin (2003) and facilitates more direct comparisons with their results.

As can be seen even when we split our sample in this way, our results are not sensitive to the choice of sample period, export market entry is still not associated with faster rates of TFP growth.

In regressions 5 and 6 we test whether the results are sensitive to the choice of industries included within the sample. In regression 5 we include only firms from industries with SNI codes 15-23, in regression 6 industries with codes 29-35. (A list of industry codes and industries are included in the Appendix). Broadly speaking, codes 15-23 capture firms that operate within industries that are relatively low skill intensive and in which technology is more likely to be homogeneous across countries. The second set of industries represent technology intensive industries. Again however our results are insensitive to this disaggregation. Thus our finding that Swedish manufacturing firms that enter export markets for the first time do not benefit relative to non-export firms is unchanged.

Other Indicators of Firm Performance and Alternative Measures of TFP

TFP, whilst important, is only one of a number of measures of firm performance, albeit the one that has attracted most attention. In Table 4 we report matched difference-in-difference results for the size of the firm (measured both by employment levels and output), average wages and labour productivity. We also report results from a regression in which TFP is measured using fixed effects. The difference-in-difference regressions control for unobserved fixed effects and lagged performance variables (although these are not reported to conserve space).

Perhaps unsurprisingly export market entry is associated with increases in firm size in the contemporaneous period. This effect is significant in the case of employment, although there is no significant effect on labour productivity. Following this initial effect the differences in firm growth are not significant however and there is some evidence of relative decline. Export market entry also appears to be associated with an increase in the average wage in the contemporaneous period, although again no other significant post-entry effects are found.

These results echo those previously found by Bernard and Jensen (1995), Girma, Greenaway and Kneller (2003a) but contrast with Hansson and Lundin (2003). The latter find employment growth of new Swedish exporters is not significantly different from firms that never export, whereas output growth is faster for first time exporters.

Table 4: Additional measures of firm performance

	7 *Fixed Effects TFP*	**8** *Employ -ment*	**9** *Output*	**10** *Labour Product -ivity*	**11** *Wages*
Export dummy	0.257 (0.97)	0.038 (1.37)	-0.002 (0.04)	-0.064 (1.64)	0.039 (1.20)
Event time *t*	0.071 (0.25)	-0.002 (0.14)	0.046 (2.02)*	0.017 (1.03)	-0.001 (0.04)
Event time *t+1*	0.076 (0.29)	-0.022 (1.24)	0.028 (1.04)	0.023 (1.16)	-0.012 (0.69)
Event time *t+2*	-0.355 (0.94)	-0.001 (0.05)	0.025 (0.88)	0.005 (0.22)	0.011 (0.54)
Event time *t+3*	-0.043 (0.14)	-0.004 (0.20)	0.040 (1.33)	0.027 (1.10)	0.001 (0.07)
Export Entry Effect Time *t*	**0.103 (0.36)**	**0.068 (3.11)****	**0.044 (1.33)**	**-0.003 (0.11)**	**0.078 (3.46)****
Export Entry Effect Time *t+1*	**-0.197 (0.67)**	**0.013 (0.57)**	**-0.027 (0.76)**	**-0.036 (1.43)**	**0.015 (0.64)**
Export Entry Effect Time *t+2*	**0.109 (0.39)**	**-0.020 (0.80)**	**0.010 (0.27)**	**-0.001 (0.05)**	**-0.017 (0.66)**
Export Entry Effect Time *t+3*	**0.131 (0.39)**	**-0.035 (1.31)**	**-0.015 (0.40)**	**-0.006 (0.21)**	**-0.014 (0.49)**
Constant	-1.857 (0.72)	2.002 (10.33)**	1.981 (9.05)**	0.674 (4.42)**	1.815 (9.33)**
Observations	2614	2325	2317	2323	2325
R-squared	0.25	0.49	0.35	0.50	0.52

In addition Hansson and Lundin (2003) find reasonably strong effects from export market entry and labour productivity. One explanation for this contrast is that we use a rather longer period than Hansson and Lundin. To check this we restricted ourselves to 1990-97 and find that the labour productivity and growth results are robust to this change. Thus differences in the results are likely to be due to differences in methodology, with our matching / differences in differences approach possibly controlling more effectively for unobserved heterogeneity.

Further Sensitivity Tests

We also test the sensitivity of our results to other changes in estimation procedure. In regressions 12-14 reported in Table 5, we consider whether changes in the probit regression used in the matching process alters the results, while regression 15 changes the value of the calliper used in the matching process.

Table 5: Further Sensitivity Tests

	12 *Coeffs differ across years*	**13** *Pooled probit*	**14** *Population average Probit*	**15** *Caliper*
Export dummy	0.731 (0.73)	0.630 (1.22)	0.609 (0.67)	1.046 (1.90)+
Event time *t*	1.089 (0.75)	-0.098 (0.45)	0.339 (1.05)	-0.252 (1.41)
Event time *t+1*	1.084 (0.64)	-0.372 (1.73)+	-0.005 (0.01)	0.045 (0.22)
Event time *t+2*	1.822 (0.91)	-0.426 (1.59)	0.152 (0.37)	-0.236 (0.78)
Event time *t+3*	2.224 (0.98)	-0.116 (0.43)	0.391 (0.68)	-0.424 (1.12)
Export Entry Effect Time *t*	**-1.118** **(0.79)**	**-0.243** **(0.54)**	**-0.304** **(0.67)**	**-0.030** **(0.08)**
Export Entry Effect Time *t+1*	**-1.124** **(0.69)**	**0.234** **(0.46)**	**0.322** **(0.67)**	**-0.252** **(0.60)**
Export Entry Effect Time *t+2*	**-2.260** **(1.20)**	**-0.282** **(0.50)**	**-0.525** **(1.02)**	**-0.314** **(0.62)**
Export Entry Effect Time *t+3*	**-4.077** **(1.64)**	**-1.886** **(1.87)+**	**-2.398** **(2.25)***	**-1.328** **(1.52)**
TFP_{t-1}	-7.300 (1.59)	-3.043 (4.85)**	-0.130 (1.13)	0.093 (0.72)
$Ln(LAB)_{t-1}$	0.592 (0.29)	0.796 (0.73)	-0.157 (0.11)	0.539 (0.59)
$ln(Wage)_{t-1}$	-1.222 (0.77)	-1.695 (1.21)	-0.616 (0.39)	-0.919 (0.91)
Constant	2.003 (0.43)	2.816 (0.91)	2.412 (0.70)	0.663 (0.30)
Observations	2204	2921	2807	3795
R-squared	0.25	0.25	0.25	0.25

We make a number of changes to the underlying probit. Thus far we have assumed that the coefficients used to generate the probability of export market entry do not change over time. In regression 12 we report the results from a difference-in-difference regression in which the coefficients from the probit regression used in

matching treatment and control firms differ according to the year in which they entered export markets. In regression 13 we report the results from a pooled rather than a random effects probit, while in regression 14 we report the results when using a population averaged panel probit. The main parameters of interest are reported in Table A1 of the Appendix. Whilst the parameters from the probit regressions are sensitive to the choice of estimator, the results from the difference-in-difference analysis are not. Indeed from these alternative estimators there is some evidence that the growth rate of TFP in the third period after entry into export markets is slower than that of non-export firms.

Finally we test the robustness of difference-in-differences to a change in the value of the caliper. This sets a maximum limit for the difference in probabilities in the matching process. In generating the results thus far the caliper has been set at a level sufficient to exclude close to half of the first time exporters from the sample. Here we test whether increasing the sample size by increasing the value of calliper affects the results. In regression 15 we report the results from a difference-in-difference regression in which 360 non-export firms are matched to 578 first time exporters. Again we find there is no significant change in the rate of TFP growth of first time exporters when compared to non-export firms.

6. CONCLUSIONS

This paper reports on research from one of the first investigations of the performance characteristics of Swedish exporters of manufactures. As noted at the outset, the openness of the Swedish economy and the remarkably high participation rate of firms in export markets makes this an interesting case to research.

We have had the benefit of a large firm level dataset. Moreover the data extends over almost two decades. We have used matching and differences in differences methods, a methodological approach that is particularly well suited to isolating the effects of export market entry and an approach which has so far been used sparingly in this context. Some of our results echo those for other countries: for example, exporting firms are on average bigger than otherwise comparable non-exporters and initially grow faster. In addition, labour appears to benefit from entry with average wages initially growing more quickly. However, in one crucial respect our results are in stark

contrast to the findings of the rest of the literature – in Sweden the productivity growth of exporters on entry does **not** appear to differ significantly from non-exporters. Moreover, this result is robust to changes in specification, estimation procedure and (modest) industry disaggregation.

Why are the Swedish results so different? The likeliest explanation rests with the their already high degree of international exposure, they already compete with firms engaged in export activity and through import penetration. As a consequence of this there may be far smaller differences in firm characteristics than in economies where a smaller proportion of the population of firms export. In the heterogeneous firm framework of the Melitz (2003) model this might be explained through a combination of uncertainty surrounding the fixed costs of exporting (or the returns to entry) and a relatively small difference between the productivity level required to enter the industry and that required to enter export markets. Increased export opportunities in that model encourage entry of new firms into the market (through profit opportunities), raising the minimum productivity requirement below which firms exit the industry. Thus new firms, which have productivity levels sufficiently high that they can serve both domestic and foreign markets, replace firms that before had productivity sufficient to serve only the domestic market. Whatever the explanation, our findings challenge the consensus that exporting firms are always more productive than non-exporting firms.

Appendix

Table A1: Probit regressions of first time export market entry

	(A1)	(A2)	(A3)
	Random Effects Probit	*Pooled Probit*	*Population Averaged Probit*
$Ln(LAB)_{t-1}$	0.615 (1.95)+	-0.033 (0.23)	0.028 (0.19)
$Ln(Wage)_{t-1}$	0.162 (0.56)	0.122 (0.90)	0.085 (0.61)
TFP_{t-1}	0.091 (3.17)**	0.023 (2.04)*	0.021 (2.06)*
Age	-0.137 (10.32)**	-0.049 (9.73)**	-0.044 (7.69)**
Constant	-15.313 (2.01)**	-0.307 (1.04)	-3.468 (6.53)**
Observations	5969	5959	5969
Number of id	1279		1279

Table A2: Industries

SNI92 code	Industry
15	Manufacture of food products and beverages
16	- tobacco products (excl. from this study)
17	- textiles
18	- wearing apparel
19	- luggage, handbags and footwear
20	- wood and products of wood and cork
21	- pulp, paper and paper products
22	Publishing, printing and reproduction
23	Manufacture of coke and refined petroleum
24	- chemicals, chemical products and man-made fibres
25	- rubber and plastic products
26	- non-metallic mineral products
27	- basic metals
28	- fabricated metal products
29	- machinery and equipment n.e.c.
30	- electrical and optical equipment
31	- electrical machinery and apparatus n.e.c.
32	- radio, television and communication equipment and apparatus
33	- medical, precision and optical instruments, watches and clocks
34	- motor vehicles, trailers and semi-trailers
35	- other transport equipment
36	- furniture, manufacturing n.e.c.

References

Aw, B.Y. and Hwang, A.R. (1995), Productivity in the Export Market: A Firm Level Analysis, *Journal of Development Economics*, Vol. 47, pp.131-332.

Bernard, A. and Jensen, J.B. (1995), Exporters, jobs and wages in US manufacturing: 1976-1987, *Brookings Papers on Economic Activity, Microeconomics 1995*, pp.67-119.

Bernard, A. and Jensen, J.B. (1999), Exceptional exporters performance: cause, effect or both?, *Journal of International Economics, Vol. 47, pp. 1-25.*

Bernard, A. and Jensen, J. (2001a), Exporting and Productivity: The Importance of Reallocation (mimeo).

Bernard, A. and Jensen, J. (2001b), Why Some Firms Export, *NBER Working Paper No. 8349.*

Bernard, A. and Wagner, J. (1997), Exports and success in German manufacturing, *Weltwirtschaftliches Archiv*, Vol. 133, 134-157.

Blundell, R. and Costa Dias, M (2000), Evaluation methods for non-experimental data, *Fiscal Studies,* Vol. 21, pp. 427-468.

Castellani, D. (2002), Export Behaviour and Productivity Growth: Evidence from Italian Manufacturing Firms, *Weltwirtschaftliches Archiv*, Vol. 138, pp. 605-628

Clerides, S., Lach,S. and Tybout, J. (1998), Is learning by exporting important? Micro-dynamic evidence from Columbia, Mexico and Morocco, *Quarterly Journal of Economics*, Vol. 113, pp.903-948.

Delgado, M., Fariñas, J. and Ruano, S. (2002) Firm Productivity and Export Markets: A Non-Parametric Approach, *Journal of International Economics*, Vol. 57, pp. 397-422

Girma, S., Greenaway, D. and Kneller, R. (2003a) Does Exporting Increase Productivity? A Microeconomic Analysis of Matched Firms. *Review of International Economics* (forthcoming)

Girma, S., Greenaway, D., and Kneller, R. (2003b) Export Market Exit and Performance Dynamics, *Economics Letters*, Vol. 80, pp. 181-187

Greenaway, D., Sousa, N. and Wakelin, K.(2003), Do domestic firms learn to export from multinationals? *European Journal of Political Economy* (Forthcoming)

Hansson, P. and Lundin, N. (2003) Exports as an Indicator or Promoter of Successful Swedish Manufacturing Firms in the 1990s (mimeo, FIEF)

Heckman, J., Ichimura, H., Smith, J. and Todd, P. (1997), Matching as an Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Programme, *Review of Economic Studies* Vol. 64, pp.605-654.

Kraay, A. (1999), Exports and Economic Performance: Evidence from a Panel of Chinese Enterprises, mimeo World Bank.

Rosenbaum, P. and Rubin, D.B (1983), The central role of the propensity score in observational studies for causal effects. *Biometrika,* Vol. 70, pp.41-55.

Sianesi, Barbara (2001), Implementing propensity score matching estimators with Stata, available at http://fmwww.bc.edu/RePEc/usug2001/psmatch.pdf

Wagner, J. (2002), The Causal Effects of Exports on Firm Size and Productivity : First Evidence From a Matching Approach. *Economics Letters*, Vol. 77, pp. 287-292

Wagner, J. (2003), Unobserved Firm Heterogeneity and the Size Export Nexus : Evidence From German Panel Data. *Weltwirtshaftliches Archiv*, Vol. 139, pp. 161-172