research paper series

Globalisation, Productivity and Technology

Research Paper 2003/07

Export Market Exit and Performance Dynamics: A Causality Analysis of Matched Firms

By S. *Girma, D. Greenaway 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

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Acknowledgements

The authors acknowledge the support of Trade Partners UK in initiating this work. Greenaway and Kneller also gratefully acknowledge financial support from the Leverhulme Trust under Programme Grant F114/BF.

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Abstract

As a result of the rapid growth of microeconometric studies of exporting firms, we now know quite a lot about the performance dynamics of firms that enter export markets. We know much less about what happens to performance when firms exit. We apply a difference-in-differences methodology based on matched firms to analyse the performance dynamics firms in UK manufacturing that exited export markets during the period 1991-1997. We find that, on average, exit from foreign markets has a negative albeit weak effect on total factor productivity. But this is confined to the year of exit as we fail to detect any discernible productivity effect due to exit in subsequent years. By contrast exit is found to have a deleterious effect on both employment and output dynamics. The effect on output is sizeable and quite persistent, suggesting that domestic demand was not able to make up for the loss in foreign market shares.

JEL: F14

Keywords: exporting and productivity

Outline:

1. Introduction
2. Empirical methodology
3. The data
4. Empirical estimates
5. Conclusion

Non-technical summary:

A rich literature focusing on the performance dynamics of firms that enter export markets has developed in recent years. A recurrent finding in this literature is that typically it is more productive firms that enter export markets and this finding is robust across quite a number of developed and developing countries.

But what about firms that leave export markets? Are there particular performance characteristics associated with them? Are there any deleterious impacts on the firm from exit and, if there are, are they temporary or permanent? This paper focuses on the performance consequences of exit for UK firms during the period 1991-97. The methodology we use is designed to compare these firms with a group of closely matched firms that did not exit. This allows us to compare over 300 quitters with a similar number of close matches. What we find is that the performance dynamics of firms that exit are significantly different from firms that had an equivalent probability of exiting export markets but did not. Specifically, we observe slower output, employment and productivity growth in the period in which exit occurred: total factor productivity decreases by over 2 per cent, employment by almost 3 per cent and output by almost 6 per cent. Moreover, the decline in output and employment persists over subsequent years, although that in productivity does not. This contrast in the persistence of effects between productivity on the one hand and employment and output on the other, suggests that any productivity gains associated with entry might be driven by exposure to best practice technology rather than scale economies or competition effects.

1. Introduction

In the recent literature on firm-level characteristics, the relationship between exporting and firm performance has received considerable attention for a number of developing and industrialised countries (see, for example, Bernard and Jensen, 1995, 1999; Clerides, Lach and Tybout, 1998; Bernard and Wagner, 1997; Delgado, Fariñas and Ruano, 2002; Wagner, 2002; Girma, Greenaway and Kneller, 2002). A neglected aspect of this relationship has been the effect of export market exit on the firm. Yet if, as some of the recent literature claims (Kraay, 1999; Castellani, 2002; Wagner, 2002; Girma, Greenaway and Kneller, 2002), there are benefits to the firm from entry, then understanding what happens to the firm upon leaving export markets is equally important. Interesting questions include: do firms that exit have different characteristics from those that remain?; are any deleterious impacts on the firm from export market exit temporary or permanent?; can the performance of firms after they exit help explain the reasons for improved performance upon entry?

This paper considers the performance consequences of exit from export markets by UK firms during the period 1991-1997 using propensity score-matching techniques (see Rosenbaum and Rubin, 1983). Such techniques have commonly been applied in microeconometric evaluation problems and have recently been applied to the analysis of exporting and firm performance by Wagner (2002) and Girma, Greenaway and Kneller (2002)[1]. Apart from expanding this literature to consider the performance implications of exit, this paper extends Wagner's (2002) methodology by combining matching techniques with difference-in-difference analysis. This is motivated by recent studies which argue that standard matching estimators are usually unsatisfactory, but in combination with difference-in-differences methodology can have the potential to "*...improve the quality of non-experimental evaluation results significantly*" (Blundell and Costa Mias, 2000, p. 438).

[1] For a comprehensive review on the microeconometric evaluation literature see Blundell and Costa Dias (2000). Matching techniques are especially popular in applied labour economics, where, for example, the aim of the study is the evaluation of training programmes on earnings.

The rest of the paper is organised as follows. Section 2 outlines the empirical modelling strategy. Section 3 describes the data. Section 4 reports the main empirical results. Finally Section 5 concludes.

2. Empirical methodology

The modelling problem considered is the evaluation of the causal effect of export market exit on *y*, where *y* represents total factor productivity, employment or output. Let $EXIT_{it} \in \{0,1\}$ be an indicator of whether firm *i* made an exit from the export market at time period *t*, and let y^1_{it+s} be the value of *y* at time *t+s*, where $s \geq 0$, following exit. Also, let y^0_{it+s} denote the performance indicator of the firm *had it stayed in the export market*. The effect of exit for firm *i* at time period *t+s* is therefore defined as:

$$y^1_{it+s} - y^0_{it+s} \ . \qquad (2)$$

The fundamental problem of causal inference is that y^0_{it+s} is unobservable. Thus the analysis can be viewed as confronting a missing-data problem. Following the microeconometric evaluation literature (e.g. Heckman et al, 1997), we define the *average* effect of exit as

$$E\left\{y^1_{t+s} - y^0_{t+s} \mid EXIT_{it} = 1\right\} = E\left\{y^1_{t+s} \mid EXIT_{it} = 1\right\} - E\left\{y^0_{t+s} \mid EXIT_{it} = 1\right\} \qquad (3)$$

Causal inference relies on the construction of the counterfactual, the last term in equation (3), which is the outcome export market quittors would have experienced, on average, had they *not* quit the market. This is estimated by the average performance of the firms that remained exporters: $E\left\{y^0_{it+s} \mid EXIT_{it} = 0\right\}$.

An important feature in the accurate construction of the counterfactual is the selection of a valid control group. One approach is to employ matching techniques. The purpose of matching in this context is to pair each exiting firm with a firm that continues to export on the basis of some observable variables. Since matching involves comparing exiting and non-exiting firms across a number of observable pre-exit characteristics (productivity, size, export intensity and exporting history) it is difficult to determine along which dimension to match the firms, what type of weighting scheme to use. In this paper we employ propensity score-matching (Rosenbaum and Rubin, 1983), which uses the probability of exit from export markets conditional on the pre-exit 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-exit. Accordingly, we first identify the probability of exit (or 'propensity score') using the following probit model

$$P(EXIT_{it}=1)=F(TFP_{it-1}, size_{it-1}, \exp share_{it-1}, history_{it-1}, industry\ dummies) \qquad (4)$$

In this model, size is measured by the level of employment, export share by the proportion of total output directed to foreign markets and exporting history by the number of years in the sample period that the firm has been exporting. The TFP values are obtained as residuals from unrestricted production function regressions conducted on an industry by industry basis. The choice of covariates is fashioned by the predictors of export market participation in the UK.

Let P_{it} denote the predicted probability of exit at time *t* for firm *i* (the firm that exits the export market). A continuous 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[2]. More formally, *at each point in time*[3] and for each newly exiting firm *i*, an exporter firm *j* is selected such that[4]

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

where λ is a pre-specified scalar. This type of matching procedure is preferable to randomly or indiscriminately choosing the comparison group, because it is less likely to induce estimation bias by picking firms with markedly different characteristics.

Having constructed the comparison group (C) of firms that are similar to the exiting firms (E), a standard matching estimator of the causal effect of foreign acquisition can be written as

$$\delta = \sum_{i\in E}\left(y_i - \sum_{j\in C} w_{ij}\, y_i\right) \qquad (6)$$

[2] The matching is performed in Stata Version 7 using the software provided by Sianesi (2001).
[3] 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.
[4] A continuous exporter can be match to more than one exiting firms. By the same token it can happen that an exitor may not have a suitable match.

where w_{ij} are the weights generated by the matching algorithm and placed on the comparison firm j. In this paper we employ the more general difference-in-differences estimator on the matched firms to isolate the causal effect of exits on the performance dynamics of firms. Firstly, the difference between the average productivity before and after exit $\Delta^a y$ is calculated. This difference is then further differenced with respect to the before and after difference of the comparison control group, Δy^c, to obtain the difference-in-differences estimator $\delta = \Delta^a y - \Delta^c y$. Defining PEXIT as a vector of dummy variables for the post-exit period (contemporaneous and lagged dummies) equal to 1 for the exiting firm and 0 for continuous exporters, the final estimated regression can be written as:

$$y_{it} = \phi + \delta PEXIT_{it} + u_{it} \qquad (7)$$

The coefficient δ in equation (7) can be interpreted as the average change in the firm performance characteristic y attributable to the firm exiting foreign markets. To control for possible unobservable factors that may be correlated with changes in performance we extend this basic framework by including firm-specific fixed effects (f_i). By so doing, we are able to identify the impact of quitting export markets through within firm performance changes. A full set of time dummies (D_t) are also included to capture economy-wide productivity shocks. The final estimating equation is:

$$y_{it} = \delta PEXIT_{it} + f_i + D_t + \varepsilon_{it} \qquad (8)$$

3. The data

Information on the firms used in this study is taken from the *OneSource* database of private and public companies.[5] All public limited companies, all companies with more than 50 employees, and the top companies based on turnover, net worth, total assets, or shareholders funds (whichever is largest) up to a maximum of 110,000 companies are included. There is clearly a bias towards larger firms in the sample and exporting firms tend to be larger than the average firm (see, for example, Bernard & Jensen, 1995). However, our use of matching techniques should ensure that this does not affect the conclusions we reach about the effect of exiting foreign markets.

[5] This database is derived from the accounts that companies are legally required to deposit at Companies House in the UK.

The data-period available spans 1989 to 1999. However since we are interested in the post-exit trajectory of previously exporting firms, which requires information at least two years into the post exit period, and the matching process requires data on the pre-exit period, we restrict our attention to firms that exit export markets between 1991 and 1997. To avoid conflating the effects of export market entry and exit we exclude firms that resume exporting after quitting foreign markets in some earlier period. Table 1 gives the frequency distribution of the permanent exits by year. The population of the potential comparison firms consists of domestically-owned manufacturing subsidiaries[6] of continuous exporters with a least three years data. Of this population of 2989 firms, 301 were found to be good matches for 357 quitters.[7] Thus, only about one in ten continuous exporters are deemed to display (observable) characteristics that are similar to those of firms that subsequently exited the export market.

The characteristics of the matched and un-matched sample of continuous exporters and exiters are shown in Table 2. For the un-matched sample the firms that exit are on average smaller both in terms of employment and output, and have lower productivity levels, than firms that continue to export through the sample period. This confirms results found in Bernard & Jensen (1999). Unsurprisingly, the average firm in the matched sample displays less heterogeneity across exiting firms and continuous exporters.

4. Empirical estimates

Table 3 reports the effect of exit on TFP, output and employment for the period in which exit occurs and two years after. Overall, the results suggest that the performance dynamics of firms that exit are significantly different from firms that had an equivalent probability of exiting export markets but did not. Moreover these dynamics differ noticeably across the indicators of firm performance.

[6] Parent companies were omitted if they have consolidated accounts as this leads to double counting. We also exclude firms with annual employment or output growth exceeding 100% , given doubts about the reliability of these extreme data points

[7] Notice the propensity score-matching method can pair a comparison firm with more than one exitor. It is also possible that an exitor may not have a good enough matching firms and we left the 5 such firms in our original sample from subsequent analyses.

Perhaps the most notable result is the slower output, employment and productivity growth displayed in the period in which exit occurred. TFP decreases by about 2.3%, employment falls by some 2.9%, while output falls by 5.9%. The change in TFP is perhaps not surprising, though it is contrary to the conjecture in Clerides, Lach and Tybout (1998) that firms do not react immediately to a fall in productivity but attempt to remain in export markets to avoid re-entry costs. The output falls suggests that on average exiting firms do not generate sufficient demand from the domestic sector to compensate for the loss of foreign market share. It would also appear that employment adjusts quickly to these output falls.

One interesting pattern in Table 3 is that, while output and employment continues to fall in firms that exit, with additional negative effects persisting over the next two years, productivity does not fall further. Firms that exit have on average slower productivity growth than continuous exporters in the periods *t-1* and *t-2*, but these differences are small and far from statistically significant. It would appear that the productivity gains reported in Girma, Greenaway and Kneller (2002) for entry into export markets are not entirely lost upon exit. Given the falls in output and employment this might suggest that the benefits from exporting are due to exposure to best practice technology, rather than scale economies or competition effects.

5. Conclusion

This paper combines for the first time propensity score-matching techniques with difference-in-differences analysis to investigate the performance effect of exit from export markets using recent micro data from UK manufacturing. Matching was found to be successful in identifying an appropriate sample for a comparator group. Our empirical estimates identify a temporary negative contemporaneous impact of exit on TFP but more persistent and sizeable negative effects on output and employment trajectories. The contrast in the persistence of effects between productivity on the one hand, and employment and output on the other, suggests that any productivity gains associated with entry might be driven by exposure to best practice technology, rather than scale economies or competition effects.

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Table 1
Frequency of exit by year

Year	Unmatched sample	Matched sample
1991	33	33
1992	33	33
1993	38	38
1994	58	57
1995	60	59
1996	48	48
1997	92	89
Total	362	357

Table 2
Summary statistics for the matched and unmatched sample, mean (standard deviation)

	Unmatched Sample		Matched Sample	
	Exitors	**Control group**	**Exitors**	**Control group**
Log TFP	.046 (.463)	.064 (.421)	.045 (.459)	.051 (.424)
Log employment	4.667 (1.107)	4.726 (1.068)	4.668 (1.109)	4.648 (1.039)
Log output	8.873 (1.157)	8.957 (1.109)	8.874 (1.164)	8.877 (1.102)
Number of firms	362	2989	357	301
Total observations	3024	25499	2969	2716

Table 3
The effect of export market exit on firm performance dynamics

	TFP	Employment	Output
$EXIT_{it}$	-0.023	-0.029	-0.059
	(1.96)**	(2.03)**	(3.65)***
$EXIT_{it-1}$	-0.003	-0.035	-0.041
	(0.28)	(2.52)**	(2.54)**
$EXIT_{it-2}$	-0.006	-0.025	-0.035
	(0.48)	(1.72)*	(2.08)**
Observations	4241	4254	4254
Number of id	653	654	654

Note:
(i) Time dummies are included in all specifications
(ii) Absolute value of t-statistics in parentheses
(iii) * significant at 10%; ** significant at 5%; *** significant at 1%