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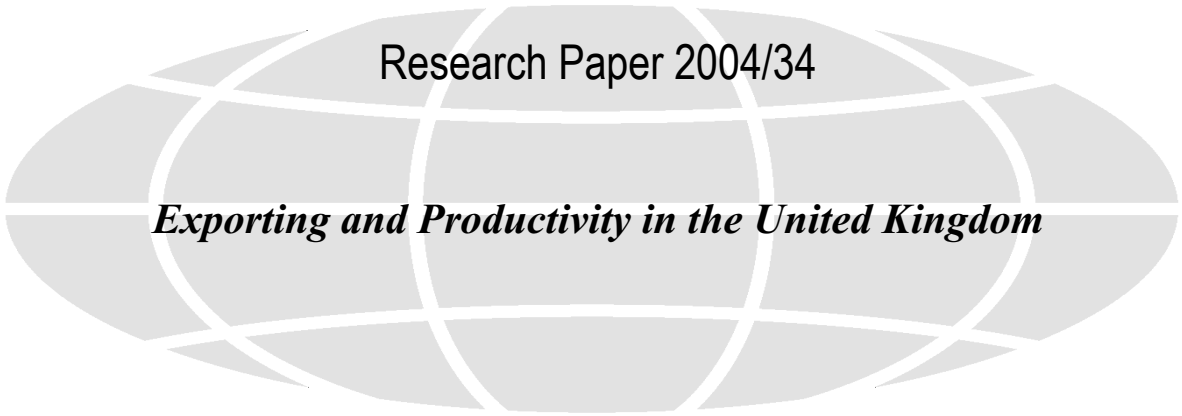

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Exporting and Productivity in the United Kingdom

by

David Greenaway and Richard Kneller

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The Authors

David Greenaway is Professor of Economics and Director of the Leverhulme Research Centre for Research on Globalisation and Economic Policy; Richard Kneller is a Senior Research Fellow in the Leverhulme Research Centre for Research on Globalisation and Economic Policy.

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Abstract

This paper investigates various aspects of the links between exporting and productivity for a large sample of firms in the United Kingdom. We find evidence to support the proposition that sunk costs are important. Self selection takes place, with larger and more productive firms entering export markets, and firms have to become more productive in order to enter. Industry characteristics also affect the likelihood of entry—both industrial and spatial agglomeration are important. When we rely on an unmatched sample of firms we can find some evidence of further productivity improvement after entry, but this disappears when we use a matched sample. Our results suggest that policy should avoid simply subsidizing firms that may self select into export promotion policies and focus instead on reducing information asymmetries and supporting development of clusters.

Key words: exporting, productivity

JEL Codes: F12, F14

Outline

Non-Technical Summary

Government intervention to promote exports is pervasive, not as pervasive as import protection, but pervasive nonetheless. These export promotion activities range from financing trade fairs, through providing free information about foreign markets and financing market researches, to export credit insurance and export subsidies. This kind of intervention occurs because policy makers see promoting export as a good thing. They connect it with exploiting comparative advantage (probably unconsciously) and linked to export led growth (almost certainly consciously). But what is the evidence base for this? For the most part it is macroeconomic and macroeconometric. In the main it derives from time series and cross-country correlations between growth in real exports and growth in real output or total factor productivity growth. It also derives from a perception that export promoting developing countries outperformed inward orientated developing countries in the second half of the twentieth century.

In this paper we reconsider the motivation for government intervention by drawing on the recent explosion in work focusing on exporting at the microeconomic level, the firm, and specifically on the evidence for the UK. We draw a number of conclusions from this evidence. Firstly, not all firms have the 'right' characteristics to become exporters. Entry into export markets is costly and not all firms within an industry are large enough or productive enough to meet these costs. Firms are therefore likely to self-select into any export-promotion policies.

Secondly, there is a pool of firms that do not export, but which have similar characteristics to firms that do. Whether intervention to encourage the entry of these potential exporters is worthwhile depends upon the explanation of why, given their positive underlying characteristics, these firms choose not to export. The existing evidence base provides no unequivocal answer to this question, but does suggest some interpretations.

Finally, with reference to the entry effects found in studies of UK exporters. Evidence of post export market entry effects might be thought of as the area in which the case for policy intervention is most persuasive. As discussed above the existing empirical evidence does not lead us to this conclusion. Firms self-select into export markets. It is therefore likely that the evidence of entry effects found in the data represent the effects of export market entry on that group of self-selecting firms and not what the effect of entry might be on other non-exporting. Further research into the question of post-entry improvements in firm performance offers potentially high returns.

I. Introduction

One important, but almost invisible outcome of the Uruguay Round of multilateral trade negotiations was the creation of the *Trade Policy Review Mechanism* (TPRM). What this established was a regular audit of Members trade policies, with its frequency depending upon country size – from every two years for the US, Japan and EU through to every seven years for countries like Vanuatu and Barbados. One of the key purposes of the TPRM is to bring greater transparency to border and non-border protectionist measures. But, interestingly, **every** Trade Policy Review includes a chapter on 'Measures directly affecting exports'. Moreover, this is always a substantive chapter and always reports on export promotion measures.

Export promotion is pervasive, not as pervasive as import protection, but pervasive nonetheless. Putting to one side high profile but rare 'strategic trade policy' cases such as wide bodied jets, it is also less controversial and all governments provide some kind of support. For example, as in other industrialised countries, the UK has an inter-Departmental agency, namely *UK Trade and Investment*. This "……..*offers support to companies based in the UK to achieve their export potential*……..(by helping)……..*develop export capabilities and provide expert advice, reliable data and professional research*"[1]. UKTI does not provide direct export subsidies but does offer a range of information and facilitation services designed to reduce the sunk costs of export market entry.

This kind of intervention, as well as the provision of direct export subsidies which are such a common feature of Export Processing Zones in developing countries, occurs because policy makers see promoting export as a good thing. They connect it with exploiting comparative advantage (probably unconsciously) and linked to export led growth (almost certainly consciously). But what is the evidence base for this? For the most part it is macroeconomic and macroeconometric. In the main it derives from time series and cross-country correlations between growth in real exports and growth in real output or total factor productivity growth. It also derives from a perception that export promoting developing countries outperformed inward orientated developing countries in the second half of the twentieth century.

The 'macro' evidence is controversial with some arguing that links between exporting and growth are clear and causal (for example Edwards 1998) and others arguing that the reality is rather more complicated and the role of export promotion overstated (for example Rodrik and Rodriguez 2000).

[1] www.uktradeinvest.gov.uk

Be that as it may, what is interesting is the absence of any substantive microeconomic or microeconometric evidence base to support intervention. This is interesting because it is firms rather than countries, or industries that export and most active export promotion policies tend to be targeted at firms. But that is changing and quite rapidly. Over the last seven or eight years there has been enormous interest in links between entry to export markets and firm level performance. Initially this was empirically driven, in particular by the work of Bernard and Jensen (1995) on US data, quickly followed by a range of studies on other countries. This work seems to point to several regularities in the data. For example, firms which export tend to be larger than those which do not. They also tend to be more productive, exhibiting higher productivity before they enter export markets. In turn these regularities have stimulated the development of models of firm level adjustment by Melitz (2003), Helpman, Yeaple and Melitz (2004) and Bernard Eaton, Jensen and Kortum (2003) to provide some theoretical underpinning to what we seem to be seeing in the data.

In this paper we focus on the UK, on which a number of studies have now been completed. We review that evidence, but also report on new evidence relating to factors which are related to export market entry and firm level performance once entry has taken place. We begin in Section II with an analysis of how exporters differ from non-exporters and focus in Section III on the determinants of entry. Section IV evaluates the consequences of entry. In Section V we discuss the implications of our results for economic policy and conclude.

II How exporters differ

In Table 1 we compare UK export firms and non-exporters across a range of performance characteristics.[2] The first column reports how much larger exporters are than non-exporters (measured at the mean). This evidence is consistent with the stylised facts from other countries. At the mean, employment and output levels in export firms are 12.6% and 20.8% greater than those in non-export firms. Exporters also pay on average higher wages, although the difference here is small at just 0.5%. Given these output and employment figures it is no surprise that they have higher labour productivity (a premium of 2.2%). This is not just confined to a difference in capital intensity, exporters also have higher total factor productivity (TFP). The TFP of non-exporters lies on average 4.3% below the industry mean and that for exporters 5.4% above, a net difference of 9.7%. The second column reports test statistics from a t-test of whether these differences are significant or not. They suggest that all of the differences reported in column one are significant at standard levels; exporters and non-exporters do appear to have different characteristics.

[2] We briefly outline the data sources used in the Appendix, although further detail can be found in Girma et al. (2004) and Greenaway and Kneller (2004).

In the final columns of Table 1 we condition the export premium reported in column one on other covariates that might affect firm performance and may bias the result from a simple comparison of means. For example the export premium may be biased upwards if exporters are concentrated in industries where economies of scale are important, and therefore output of the average firm is greater than in industries where economies of scale are less important and exporting less likely. To control for additional covariates we estimate the regression,

$$\ln Y_{it} = \alpha_0 + \alpha_1 EXPDUM_{it} + \alpha_2 \ln Z_{it-1} + \sum_{j=1}^{101} \alpha_j IND_j + \sum_{t=1}^{13} \alpha_t T_t + \varepsilon_{it} \quad (1)$$

Where, *Y* is the firm characteristic under test, *EXPDUM* is a dummy variable indicating the export status of the firm, the matrix *Z* controls for other firm level characteristics (chosen from amongst measures of total employment, average wages, capital stock and TFP), *IND* controls for fixed industry effects (measured at the 3-digit SIC level) and *T* fixed time effects. The subscript *i* indexes firms, *t* time and *j* industries. We report only the estimated parameter value on the export dummy and its t-statistic (4th column) to conserve space.

Conditional on these the premium in performance characteristics between export and non-export firms remains, although in some cases the differences are noticeably smaller than in column 1. Export firms are larger, pay higher wages and have higher productivity and these differences are all significantly different from zero. In terms of the size of the firm, the premium is between 3.9% and 6.2%, when measured by either output or employment, wages are 2.3% higher and productivity is between 8.3% and 11.4% higher (measured by TFP or labour productivity respectively).

Table 1:
Percentage difference between Exporters and Non-exporters and their statistical significance.

Exporters vs. Non-exporters	*Export premium (%)*	*t-test of difference in means*	*Conditional Export premium (%)*	*t-statistic*
Employment	12.6	43.25*	6.2	9.17*
Output	20.8	50.11*	3.9	9.21*
Wages	0.5	8.55*	2.3	7.16*
Labour Productivity	2.2	15.72*	11.4	20.17*
TFP	9.7	20.81*	8.3	15.56*

Notes: * denotes significance at 5% level.

While the differences between exporters and non-exporters are large they do not provide us with information about causality; do good firms become exporters or does exporting make firms good? Which characteristics fashion the probability that a firm will export? Roberts and Tybout (1997) find that firm level characteristics such as plant size and age are important for entry in Colombian plants, while Bernard and Jensen (2004) report that in addition productivity and average wage levels are important for US firms. We estimate a probit regression, where export status is regressed on a series of firm level and industry characteristics,

$$P(EXPDUM_{it}\ 0/1) = f(EXPDUM_{it-1}, TFP_{it-1}, size_{it-1}, wages_{it-1}, T_t, REG_k, IND_{jt}) \qquad (2)$$

The fixed time and industry effects are included as in equation (1) above. In addition we add a measure of industry agglomeration at the 5-digit level from Duranton and Overmans (2002). The firm level variables are all lagged one period; we are interested whether ex-ante success helps predict export status (Bernard and Jenson, 1999). To provide some interpretation of the estimated coefficients we report the marginal effect calculated at the mean of each right hand side variable, except where the determinant of exporting is a dummy, where the reported marginal effect is the effect of the change from zero to one.

From this it seems that the most important determinant of exporting is experience. Exporting yesterday is a good predictor of exporting today. Export experience in the previous period raises the probability of exporting in this period by 0.83, in line with the marginal effects of experience reported in Bugamelli and Infante (2002). This matches evidence of persistence noted below, where entry and exit rates from export markets were relatively low. The importance of past behaviour is usually interpreted as evidence of sunk-costs.

All of the other determinants have a positive effect on the probability of exporting, but only size and wages are statistically significant.[3] These characteristics also appear to be quantitatively far less important than experience. Increasing TFP, size or wages by one unit raises the probability of exporting by 0.7, 2.0 and 2.5 percentage points respectively. Even when one allows for the sample variation in these measures the effect is small. At the mean an increase by one standard deviation for each of these variables raises the probability of exporting by 2.6 percentage points for size, 0.4 percentage points for TFP and 1 percentage point for wages.

Table 2:
Probability Model of Exporting

Variable	*Estimated Coefficient (z-stat)*	*Variable*	*Estimated Coefficient (z-stat)*	*Variable*	*Estimated Coefficient (z-stat)*
$EXPDUM_{t-1}$	0.830	*Central*	-0.006	*Northern*	-0.071
	(146.52)**	*Southern*	(0.56)	*Ireland*	(0.90)
$Log(EMP)_{t-1}$	0.020	*East Anglia*	-0.001	*Outer*	-0.069
	(9.69)**		(0.10)	*London*	(5.45)**
$Log(Wage)_{t-1}$	0.025	*East*	-0.013	*South East*	-0.006
	(3.28)**	*Midlands*	(1.00)		(0.47)
TFP_{t-1}	0.007	*Home*	0.018	*South West*	-0.005
	(1.45)	*Counties*	(1.18)		(0.39)
Industry	0.650	*North*	-0.008	*Southern*	-0.032

[3] The TFP variable is significant when the wage variable is removed from the regression. This would suggest that differences in TFP within 2-digit industries are less important for explaining the export status than across regions.

Agglomeration	(11.09)**	*East*	(0.78)	*Scotland*	(2.21)*
		North	-0.041	*Wales*	-0.033
		Scotland	(1.84)+		(2.09)*
		North	-0.015	*West*	0.009
		West	(1.34)	*Midlands*	(0.83)
Obs	54731	*Pseudo* R^2	0.699		
Observed P	0.683	*Predicted P*	0.833		

Notes: + denotes significance at the 10% level; * significance at the 5% level; and ** significant at the 1% level.
In a probit model the marginal effect of a regressor x_i on the probability y is given by $\frac{\delta P(y=1)}{\delta x_i} = \frac{\delta F(x'\beta)}{\delta x_i} = f(x'\beta) * \beta_i$

where the normal density function f(.) is conventionally evaluated at the predicted probability $\bar{x}'\beta$ where $\bar{x}$ stands for the sample average of the regressor and β the estimated coefficient.

The results from Table 2 suggest agglomeration is important. To explore this further two types of regional variables are included. The first measures fixed regional effects, whereas the second is a measure of agglomeration of industries. We might expect that because of higher transaction costs the costs of exporting rise the greater the distance from continental Europe. There is some evidence for this. Relative to Central London the probability of a firm located in Northern Scotland, Southern Scotland and Wales exporting is significantly lower. The probability is also lower for Outer London, suggesting that these dummies in part capture the industrial mix of regions.

More important is the agglomeration of industries, where there is strong evidence that industrial agglomeration is significantly correlated with the probability a firm will export. Whilst consistent with evidence of spillover effects from the co-location of firms within the same industry, caution should be applied before interpreting this as evidence of a causal relationship from industrial agglomeration to exporting. Industrial agglomeration and exporting may both be determined by some third omitted variable. We consider this further below. According to the estimated marginal effects, at the mean an increase in industry agglomeration by one standard deviation increases the probability of exporting by close to 3.5 percentage points. This industry specific factor therefore has a similar effect on the probability of exporting to firm characteristics such as size and TFP.

III New Entrants – Determinants of Entry

The preceding results show that firms operating in the same industry can differ substantially in their performance, and these differences help explain why some become exporters and others do not. *Ex-ante* success is an important determinant of participation in export markets (Bernard and Jensen, 1999). Simply put, the best firms self-select into becoming export firms. Yet within the data we also find firms that transit between the two states of exporting and not. Over the sample period 15 per cent of firms that were not exporting in t-1 start to export in t, while 2 per cent of firms that were exporting stop (Table 3). Since past experience is such an important factor in predicting

participation we might ask what enables a firm to overcome the barriers to entry into export markets? Is it the result of endogenous improvements in firm performance in the periods leading up to entry? Does the experience gained by other new and existing exporters spill over, effectively reducing sunk-costs of entry? And what happens to the firm in the years following entry?

Table 3:

Transitions in and out of exporting

	Not-exporting$_t$	*Exporting$_t$*
Not-exporting$_{t-1}$	19,605 (85%)	3,461 (15%)
Exporting$_{t-1}$	884 (2%)	43,311 (98%)

The basic characteristics of new relative to 'old' exporters and non-exporters are set out in Table 4. On average the productivity of firms that become exporters during the sample period lies between that of exporters and non-exporters. TFP in new export firms is 6.6% above that of firms that do not export and 3.2% below that of firms that do. Using a t-test of differences in mean we find that the difference with respect to non-exporters is statistically significant, whereas it is not with respect to established exporters. Bernard and Jensen (1999) suggest that in the US new export firms have faster TFP growth than both non-exporters and established exporters. Similar evidence can be found for the UK. Average TFP growth is 1.9 percentage points per annum faster in new exporters than non-exporters and 2.4 percentage points faster than established export firms (both statistically significant).

The remaining variables in Table 4 confirm that new export firms are closer in their characteristics to established exporters than non-exporters. Evidence suggests a significant difference in the size of new exporters relative to non-exporters, but not between new and established exporters.

Table 4:
Characteristics of New Exporters versus Established Exporters and Non-Exporters

	New Exporters vs. Non-Exporters	*New Exporters vs. Exporters*
TFP	6.6%	-3.2%
(t-test)	(7.94)*	(1.41)
TFP growth	1.9%	2.8%
(t-test)	(2.52)*	(4.18)*
Average firm sales	18%	-1%
(t-test)	(22.90)*	(0.26)
Average number of employees	26.3%	17.0%
(t-test)	(22.48)*	(0.85)

Notes: + denotes significance at the 5% level.

Given the differences that exist between new exporters and non-exporters it is perhaps no surprise that these result in some leaving the pool of non-export firms. In Table 5 we report the results from a probit regression of export market entry on the level of TFP and size of the firm and a series of

industry level characteristics. Again the reported coefficients are estimated marginal effects, calculated at the mean. Comparing the marginal effects between Tables 5 and 2 shows little heterogeneity in the effect of the determinants of entry versus exporting more generally. The marginal effect of an increase in firm size is identical in the two models, whereas the marginal effect of TFP is not identical.[4] However as the average predicted value serves as the guide through which to interpret the reported marginal effects, and the average predicted value in Table 5 is considerably lower than in Table 2 we can conclude that firm level changes play an important role in determining entry.

In Section IV below we examine the productivity performance of firms that enter export markets in the sample period across time. As in Bernard and Jensen (1999) one characteristic of these firms is their noticeable improvement in productivity in the periods leading up to entry. Using the productivity growth that occurs in the 5-year period before entry, one might ask how much does additional productivity growth increase the probability of entry. Applying regression analysis on the unmatched sample of exporters and non-exporters we find that productivity growth of new exporters was 2% per annum faster than non-export firms 5-years before entry (but not statistically significant), 2.4% the next year (significant), 3% the next (significant), then 1% (not significant) and 1.7% (significant) faster in the period before entry. Cumulatively this raises the probability of entry of these firms relative to non-exporters from 0.2 of a percentage point 5 years before entry, to 0.8 of a percentage point three years before entry and 1.1 percentage points in the year before entry. This is about 10 per cent of the predicted probability of export market entry.

The fixed regional factors also have a similar effects to those reported in Table 2, although the North West and West Midlands are now significant and North Scotland insignificant. We return to the effect of agglomeration below.

Table 5:
Probit Model of Export Market Entry.

Variable	*Estimated Coefficient (z-stat)*	*Variable*	*Estimated Coefficient (z-stat)*	*Variable*	*Estimated Coefficient (z-stat)*
Log(EMP) $_{t-1}$	0.020	*East*	-0.008	*Outer*	-0.057
	(9.34)**	*Midlands*	(0.72)	*London*	(5.68)**
TFP $_{t-1}$	0.011	*Home*	0.035	*South East*	-0.003
	(2.62)**	*Counties*	(2.11)*		(0.24)
Industry	0.785	*North*	-0.005	*South West*	0.021
Agglomeration	(10.30)**	*East*	(0.47)		(1.43)
Central	-0.017	*North*	-0.024	*Southern*	-0.024

[4] When the wage variable is removed from the regression used to generate the results in Table 2 is also identical to that found in Table 5, the marginal effect of TFP is 0.011 and statistically significant.

Southern	(1.59)	*Scotland*	(1.23)	*Scotland*	(1.97)*
East Anglia	0.006	*North*	-0.019	*Wales*	-0.035
	(0.48)	*West*	(1.88)+		(2.62)**
		Northern	-0.008	*West*	0.023
		Ireland	(0.16)	*Midlands*	(2.01)*
Obs	16646	*Pseudo* R^2	0.232		
Observed P	0.144	*Predicted P*	0.099		

Notes: + denotes significance at the 10% level; * significance at the 5% level; and ** significant at the 1% level.

The specification of the above regression allows export market entry to be determined solely from changes in firm level characteristics (and fixed time effects). Greenaway and Kneller (2004 a and b) explore whether industry level determinants also matter. Agglomeration may encourage entry through a number of different channels. If information about export market opportunities and costs are an important barrier then we might expect that the co-location of firms within the same industry and region leads to sharing of information across potential entrants, reducing these costs. Or the concentration of exporters may lead to improvement in the infrastructure necessary to provide access to foreign markets, or improve information about the 'tastes' of foreign consumers (Aitken et al, 1997). Whatever their source, we might expect that entry by non-export firms is more likely the greater the concentration of export activity. In Table 6 we report results from Greenaway and Kneller (2004b) from a similar specification to that used to generate the results in Table 5, except where additional measures of agglomeration of export firms are included.[5]

Agglomeration of exporters is measured by counting the number of export firms within various industry/regional combinations. Industries are measured at the 3 digit division of the Standard Industrial Classification (SIC), which gives 101 industries, whereas regional categorisation relies on the NUTS classification at the 3-digit level (yielding 65 identifiable regions). Of course, the possibility exists that the gains from information or demonstration spillovers decay through time. The experiences of more recent entrants may be of more value than older entrants. One way of investigating this is to distinguish between the presence of existing exporters in a given region or industry and other contemporaneous entrants. The reported regression includes information from both. To control for possible correlation of the agglomeration of new exporters with macroeconomic shocks that have an industry and regional dimension the regression includes fixed time effects that vary across regions and industries.

Finally we also control for fixed regional and industry effects and the industrial agglomeration variable included in Table 5. Of these additional covariates it is worth noting the potential importance of including the measure of industrial agglomeration. If the concentration of export activity is a consequence of agglomeration of economic activity more generally, and there are no

spillover effects from agglomeration of exporters, we would expect that the addition of information about industrial agglomeration will remove the significance of the export agglomeration variables. The regression therefore controls as much as possible for other factors that might lead us to spuriously conclude in favour of agglomeration amongst export firms. We recalculate the estimations made in Greenaway and Kneller (2004b) and report instead estimated marginal effects.

Table 6:
Probit model of export market entry: Agglomeration effects.

Same region *Same industry*	*Diff. region* *Same industry*	*Same region* *Diff. industry*	*Diff. region* *Diff. industry*
0.003	0.001	0.000	-0.000
(6.29)**	(4.53)**	(2.78)**	(2.68)**
New Same region *New Same industry*	*New Diff. region* *New Same industry*	*New Same region* *New Diff. industry*	*New Diff. region* *New Diff. industry*
0.014	0.005	0.003	0.000
(8.56)**	(6.59)**	(5.54)**	(3.23)**

Notes: + denotes significance at the 10% level; * significance at the 5% level; and ** significant at the 1% level.

Two patterns emerge: firstly, the effects of agglomeration decline as physical and industrial distance between firms increases. The effect of being in the same region and industry has the greatest impact on the probability of entry by non-export firms. The industrial dimension of agglomeration would appear to be more important, the effect of being in the same industry but a different region is greater than being in the same region but a different industry. Secondly, there is evidence of decay in the usefulness of this information across time. Contemporaneous entry of other export firms in the same period has a larger impact on the estimated probability of entry than established export firms.

At the sample mean the estimated marginal effect of an additional export firm has a strict ordering according to when the firm became an exporter, where it is located and in which industry it operates. The effect of an additional firm in the current period located in the same region and industry raises the probability of exporting by 1.4 percentage points, whereas if the same firm were located in a different industry the effect is just 0.5 of a percentage point. The effect of an additional established export firm located in the same region and industry has a smaller marginal effect, estimated to be just 0.3 of a percentage point. This is the same as the effect of an additional export firm located in the same region but a different industry and which begins to export in the current period.

The beneficial impact of co-location of firms on the export decision has also been explored by Greenaway, Sousa and Wakelin (2004) for the UK, Aitken, Hanson and Harrison (1997) for Mexico

[5] The regression used to generate the results reported in Table 5 differs in that both average wages and TFP are included

and Bernard and Jensen (2004) for the US. The first two studies explore the role played by multinationals in encouraging entry amongst domestic firms, finding that their presence has a statistically positive and significant effect. Bernard and Jensen (2004) as well as Aitken et al. (1997) also explore agglomeration effects from the concentration of export firms more generally. The evidence presented there is mixed on this point, the results depending upon the inclusion of particular industries. Using somewhat more aggregated measures of agglomeration of industries and regions (regions are measured by States and industries at the 2-digit level) than Greenaway and Kneller (2004a and b) and Aitken et al. (1997), Bernard and Jensen (2004) find no effect from agglomeration on the export entry decision.

IV New Entrants – Consequences of Entry

While there would appear to be general agreement of a causal relationship from productivity to exporting, there is less agreement whether exporting brings any additional benefit to the firm. Bernard and Jensen (1999) for example find that exporting has a significant effect on the survival of firms. Even conditioning on plant level characteristics, they have higher employment growth but not faster productivity growth. Girma et al. (2004) in contrast find a significant effect from export market entry to productivity growth. In part this disagreement reflects a difference in methodology, or more specifically how new export firms are compared to non-export firms.

The effect of entry on firm performance is most commonly evaluated by comparing the performance of the firm in the time periods before with those after entry. *Ceteris paribus* this can be known from the information contained in the cross-time performance of a sample of new entrants. If as seems likely such an assumption does not hold, then this approach will tend to over/understate the effect of export market entry according to the direction of any shocks or firm specific changes. The effect of entry can then only be known relative to what would have happened to the firm had it not entered the export market. This counterfactual is of course unobservable. The question therefore arises as to what constitutes a 'valid' control group. The literature diverges on this point. Bernard and Jensen (1995) and others assume that all non-export firms (or a random sample of them) are capable of providing the counterfactual. One objection to this might be the heterogeneous nature of productivity levels between export and non-export firms suggested by recent contributions to the theoretical literature (see in particular Melitz, 2003; Helpman, Melitz and Yeaple, 2004; and Head and Reis, 2003). In support of this the differences between new export market entrants and non-exporters in Table 4 were found to be statistically significant across a number of dimensions of firm performance. If there are substantial differences in the distribution of the observed covariates between exporters and non-exporters, as the theory and Table 4 suggest, then a pooled regression

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and regions are measured at NUTS level 3 (not NUTS level 3 as in Table 5).

will yield unreliable results (Rubin, 2001). Given that new export market entrants appear to come from the upper end of the distribution of non-export firms we might expect that such an approach will tend to bias upward the observed cross-time performance between exporters and non-exporters. Wagner (2002), Girma et al. (2004), Greenaway and Kneller (2003) and Greenaway et al. (2003) chose instead to generate a control group of non-export firms using information on observable firm characteristics. [6] That is, to select from the reservoir of non-exporters those firms in which the distribution of the right hand side variables is as similar as possible to that for exporting firms in the period before the latter become exporters. There are several alternative methods of generating this comparison group. For brevity we describe the propensity score matching method used in Girma et al. (2004) and refer the reader to Blundell and Costa Dias (2000) for others.

Using information from a probit regression each firm is assigned a probability score (or propensity score) that they will become an export firm. Using this, actual export market entrants are then matched to a non-export firm so as to minimise the difference in the propensity scores. This is then combined with difference-in-difference analysis to control for changes in other observable determinants of firm performance in the post-entry period.

While this method of generating the comparison group on the basis of observable firm level characteristics appears preferable on a-priori grounds, there are a number of questions that might reasonably be asked about its effectiveness and the conclusions drawn from its application. Firstly, does it have an important effect on the results? That is, should we be concerned more by heterogeneity of the right hand side variables in the difference-in-difference regression (as the matching methodology suggests we should) or by the loss of efficiency that comes from removing information from the sample (if we implement matching). Secondly, how sensitive are the results to changes in the matching process? This might operate either across changes to the probit regression or the closeness of the 'match' allowed in the matching procedure. Finally, do unobservable firm characteristics, such as managerial ability, determine both the selection into export markets and the effect on firm performance once it does? We deal with the last of these first; consider what impact matching has relative to not matching; and refer the reader to Greenaway and Kneller (2004b) for the second. In that study the effect of export market entry was not found to depend on the choice of matching procedure or on the probit regression.

The procedure typically adopted matches firms based on their observable characteristics. Yet, it would seem likely that unobservable characteristics, such as managerial ability or product characteristics, play an important role in the participation decision, despite predictions from recent theoretical innovations such as Melitz (2003). In the heterogeneous firm model entry into export

[6] For a comprehensive review on the microeconometric evaluation literature see Blundell and Costa Dias (2000).

markets within an industry is determined strictly on the basis of the productivity of the firm. The marginal exporter should have higher productivity than the marginal non-exporter. In practice there are some firms that, based on their observable characteristics, could export but do not. In the data controlling for productivity, as well as a range of other firm and industry characteristics, we find that at the mean of the sample the model (presented in Table 2) predicts that 83 per cent of firms will export, against an observed incidence of 69 per cent. Another way at looking at the same point is to generate a measure of the degree of uncertainty in the choice that firms make. Conditional on the industry and time period we find that of 1064 observations on (101) 3-digit industries over the sample period, there are just 24 observations (across 18 industries) in which the marginal exporter strictly has greater TFP than the marginal non-exporter. Of these, 17 observations fall either in the first or the last three years of the sample where the number of observations is somewhat less. In parlance of the evaluation literature the conditional independence assumption is violated.

While we might expect that the effect of some unobservables, such as managerial ability, on the selection process might be lessened, because they are also likely to affect observable characteristics such as productivity, the importance of unobservables in the decision to become an exporter should not be seen as an argument against matching. Matching on observables is still preferable to using the entire sample of non-export firms as the counterfactual if it brings the comparison group closer to the treatment (Blundell and Costa-Dias, 2000).

In addition to their effect on the decision to become an exporter we might think of two other effects of managerial ability on the estimated impact of exporting. Firstly, managerial ability or product attributes are likely to affect firm performance independent of the export entry decision. Firms with high managerial ability for example are likely to consistently outperform those with low ability. This persistence can be removed by combining matching with difference in differences and is unlikely to bias the estimated effect of export market entry. The error term is assumed to comprise a firm specific, time invariant component and a random component. Firm fixed effects can therefore appropriately control for the persistent element of firm performance in the estimated regression. Secondly, the unobservable factor may induce heterogeneity in the outcome. Some firms may benefit more from export market entry than others because they are high managerial ability firms. These time-varying effects of unobserved characteristics are not possible to eliminate through either matching or difference in differences. In this case we observe in our results not the effect of export market entry on performance where any firm randomly becomes an exporter, but the effect of export market entry on those who chose to become exporters. In the parlance of the literature, we observe the treatment effect on the treated not the treatment effect on the population. Knowing the effect of the treatment on the treated is a valid research question however, and its impact is not on the plausibility of the results but on interpretation and policy conclusions. In terms of policy, it

limits our ability to say from our results that encouraging additional export market participation amongst the pool of non-export firms will yield the same returns to productivity as we observe in the data.

In order to generate our propensity scores we apply the probit model in Table 5 above. In Table 7 we report the characteristics of the matched and un-matched samples of new exporters and non-export firms. Matching has the expected effect of reducing the export premium of new exporters found in Table 4. Using either a t-test of difference in means or estimating a regression that additionally controls for fixed time and industry effects we find that the export premium in the level of TFP between new exporters and non-exporters is statistically insignificant. In the matched sample the TFP premium of new export firms is between 1.6% and 1.7% percent depending on the method of estimation and statistically insignificant. This contrasts with the evidence presented in Table 4.

Table 7:
Sample characteristics of Exporters and No-exporters in a Matched Sample of Firms

	Obs.	*Mean*	*Standard deviation*
Matched New Exporters			
TFP	1271	0.010	0.61
TFP growth		0.011	0.31
Log(Emp)		4.64	1.43
Log(Output)		8.92	1.48
Matched Non-exporters			
TFP	1154	-0.006	0.60
TFP growth		0.020	0.30
Log(Emp)		4.54	1.35
Log(Output)		8.77	1.39

The results for the effect of entry on performance are reported for the matched and un-matched samples in Table 8. Obviously it is not possible to generate periods before and after entry for the un-matched sample. For this reason we estimate regressions separately for each period and test for the difference in the growth of TFP for the two sets of firms, controlling for fixed firm, time and industry effects as well as the lagged level of TFP, employment and wages. We report results for the matched sample in the same way, but add a regression that compares TFP growth across all periods.[7]

In the unmatched sample TFP growth was 2.9% faster before entry, 4.4% faster in the year of entry and still significantly faster two years after entry. As reported by Bernard and Jensen (1999) and

Clarides, Lach and Tybout (1998) firms deciding to export for the first time improve their performance in the periods leading up to entry (relative to non-export firms). Whether this is a consequence of the decision to enter export markets at some future point, or the decision to export is a consequence of this productivity improvement is not evident. Firms could for example, improve their productivity in the periods leading up to entry in anticipation of tougher competition in international markets than domestically. Nevertheless, as found in Table 5 *ex-ante* productivity improvements have been found to be an important determinant of export market entry across studies for a large number of countries. Comparing these results to the matched sample it is clear that matching has two principal effects. Firstly, the estimated TFP growth premium accorded to new entrants relative to the unmatched sample is in every period lower. For example, in the entry period the growth premium to new exporters is 4.4% in the unmatched sample and 3.6% in the matched sample. The second effect is to remove the significance of the premium variable for all except the entry period, although the entry t+1 effect is reasonably close to significance.

Bernard and Jensen (1999) argue against a causal effect from exporting to productivity on the basis of the type of pre-entry effects found in Table 8. The results from the matched sample however are consistent with a causal effect from export market entry, albeit one that is relatively small and short-lived. Comparing non-export firms with similar productivity trajectories to new entrants in the period leading up to the decision of one group to enter export markets shows no difference in their performance in the pre-entry period and some difference in the post-entry period. Firms that were on similar growth paths diverge in their performance only when one group becomes exporters. To answer the first question, matching has both an important effect on the results achieved and the conclusions that can be drawn.

Table 8:
Effect of Export Market Entry on Firm Performance for a Matched and Unmatched Sample of Firms.

	All time periods	*Pre-Entry*	*Entry Period*	*Entry t+1*	*Entry t+2*
			Unmatched		
Export Premium		0.029 (4.56)**	0.044 (5.02)**	0.036 (5.21)**	0.018 (2.36)*
Observations		18106	19266	18047	15423
R-squared		0.12	0.14	0.12	0.09
			Matched		
Export Premium	0.024 (3.95)**	-0.002 (0.16)	0.036 (5.16)**	0.015 (1.41)	-0.001 (0.07)
Observations	11580	2417	3470	3074	2619
R-squared	0.13	0.17	0.23	0.07	0.09

[7] This approach modifies the presentation but not the conclusions for the matched sample compared to those found in Girma et al. (2004) and Greenaway & Kneller (2004).

Although we do not report the results it is also worth noting that a positive effect of entry can be found for a range of different indicators of firm performance in the matched sample. Finally, the co-presence of exporters in the same region and industry was found to increase the probability of entry. As argued above, this is consistent with demonstration effects between potential entrants and existing exporters. To investigate whether similar information spillovers between existing exporting firms and new entrants maximises productivity benefits after entry, Greenaway and Kneller (2004b) interact the entry variables with industry and regional agglomerations. This does not appear to have any statistically significant impact on the effect of entry.

V Conclusions

What are the policy conclusions that might be drawn from the evidence base on exporting at the firm level? Firstly, not all firms have the 'right' characteristics to become exporters. Entry into export markets is costly and not all firms within an industry are large enough or productive enough to meet these costs. Firms are therefore likely to self-select into any export-promotion policies.

Secondly, there are is a pool of firms that do not export, but which have similar characteristics to firms that do. Whether intervention to encourage the entry of these potential exporters is worthwhile depends upon the explanation of why, given their positive underlying characteristics, these firms choose not to export. The existing evidence base provides no unequivocal answer to this question, but does suggest some interpretations. If the explanation lies in unfavourable unobservable characteristics such as low managerial ability or product attributes then policy intervention to encourage entry may be seen as a waste of resources. If the failure to become exporters is due to information asymmetries, for example because the costs of entry are perceived to be too high or too uncertain or the profitable opportunities perceived to be too low or uncertain then intervention may be of some benefit. The evidence found in favour of spillover effects from the co-location of export firms (either generally or from multinationals) may be used to suggest that information asymmetries form at least part of the problem.

Finally, with reference to the entry effects found in studies of UK exporters. Evidence of post export market entry effects might be thought of as the area in which the case for policy intervention is most persuasive. As discussed above the existing empirical evidence does not lead us to this conclusion. Firms self-select into export markets. It is therefore likely that the evidence of entry effects found in the data represent the effects of export market entry on that group of self-selecting firms (the effect of treatment on the treated) and not what the effect of entry might be on other non-exporting firms (the effect of treatment on the population). Further research into the question of

post-entry improvements in firm performance offers potentially high returns. There are for example, methodologies that might be applied that allow an understanding of the effect of export market entry on the population of firms.

Given that the current Government is interested in raising average rates of productivity growth in the economy the question might be raised how much does exporting contribute to this. We might think of two effects here. Firstly, the evidence of a positive effect on productivity growth from export market entry, which would appear to be relatively small and short-lived. A second effect is from the reallocation of resources from low productivity firms to firms with higher productivity. Unfortunately it is not possible to assess the contribution of exporters to this for the UK owing to data limitations but Disney, Haskel and Heden (2003) show that reallocation of the latter type is the major source of productivity growth in the UK manufacturing industry.[8]

[8] See also Bernard & Jensen (2001) (the importance of reallocation) for an analysis of US firms.

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Appendix: Data Sources

The United Kingdom is a relatively large industrialised economy and an important exporter of manufactures; in fact the fifth largest globally. Unfortunately its production census (the Annual Respondents Database) does not collect information on firms' exporting activity. However, two other firms level surveys do, namely OneSource and FAME.[9]

Our sample frame does not encompass the full dataset from either source however, for three reasons. First, we are only interested in manufactures since, in general, export data on service providers is not available. Second, we exclude foreign owned companies since they will have different motives for exporting than indigenous firms and face different costs. Third we exclude firms for which there is incomplete information on output and factor inputs. Our final data set therefore contains comprehensive information on 11,225 firms for the period 1989-2002 yielding a total of 78,606 observations. On average there are six years of data on each firm.

[9] Both *Onesource* and *FAME* are non-stratified samples with an oversampling of large firms. This in part provides a motivation for the matching analysis of later sections, although throughout we consider the robustness of the results to the use of a sample of small firms (employment less than 50).