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Price cost margins and exporting behaviour: Evidence from firm level data*

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Abstract

This paper examines whether exporting activity matters for firm's price cost margins. The recent literature on exporting and productivity shows that exporters on average are more efficient than non-exporters. If that is the case we may also expect them to have different mark-ups. We investigate this issue using company level data for UK manufacturing industries. The measurement of mark-ups follows the recent approach presented by Roeger (1995). Our results show that, on average, exporters have higher mark-ups than non-exporters. We also distinguish sectors into homogeneous and differentiated goods producing. This distinction shows that we only find higher mark-ups for exporters in differentiated goods sectors, not in homogeneous sectors.

JEL Classifications: F1, L1, L6

Keywords: exports, mark-ups, price cost margins, productivity

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1 Introduction

The issue of whether firms that export have productivity advantages over non-exporters has been the subject of much research and debate recently. Evidence showing such a productivity advantage is plentiful, see, for example, the papers by Clerides et al. (1998) for Colombia, Mexico and Morocco, Bernard and Jensen (1999) for the US, Girma et al. (2003) for the UK and Hallward-Driemeier et al. (2002) for a number of East Asian countries.[1] A related question that comes to mind is whether this apparent productivity advantage also has an effect on the competitiveness of exporters compared to non-exporters. To be more precise, are exporters that have an apparent productivity advantage also able to sustain higher price cost margins than non-exporters? This question, which does not appear to have been addressed in the existing literature, is the topic of this paper.

If markets are less than perfectly competitive firms are able to charge prices higher than marginal cost, i.e., their mark-up defined as the ratio of price over marginal cost (p/mc) will be greater than one. The evidence that mark-ups exist is widespread (e.g., Hall, 1988, Roeger, 1995, Konings et al., 2001) and is taken as evidence that competition is less than perfect. Much has been written about the effect of import competition on mark-ups and this literature has recently been reviewed by Tybout (2001). Trade theoretic models (e.g., Krugman, 1979, Brander, 1981) show that a move from autarky to free trade will lead to increases in output through imports, resulting in stronger competition and hence reductions in the mark-up. Empirical studies that look at the link between import competition and mark-ups are provided by, for example, Levinsohn (1993), Harrison (1994), Katics and Petersen (1994), Krishna and Mitra (1998) and Co (2001). These studies generally find that increases in imports, or reductions in trade protection, are related with decreasing mark-ups.

This paper examines the trade - competition link from a slightly different point of view. We investigate empirically whether exporting activity is related to firms' price cost margins.

Bernard et al. (2003) have recently provided a model based on imperfect competition that links firm level efficiency, firm specific mark-ups and exporting activity of a firm in a consistent way. In imperfectly competi-

[1]Much of the recent debate focusses on whether firms learn through exporting (e.g., Girma et al. 2003a) or whether more productive firms self select into exporting (e.g., Bernard and Jensen, 1999 and Clerides et al. 1998).

tive markets, firms charge a price equal to a mark-up over marginal cost, $p_i = m_i(c/z_i)$, where m_i is the firm specific mark-up, c is the cost of inputs and z_i is a measure of efficiency of firm i. Then, measured productivity of firm i is $p_i z_i = m_i w$ which varies if m_i varies across firms.

Their simple model yields two testable predictions. First, since more efficient producers are also likely to have more efficient rivals, they are likely to charge lower prices, sell more on the domestic market and also beat rivals on export markets, i.e., they are more likely to become exporters.[2] As pointed out above, a large literature analyses this issue, mostly confirming the theory. Second, in a model with Bertrand competition, more efficient producers have a cost advantage over their competitors, set higher mark-ups and have higher levels of measured productivity. Hence, more efficient producers set higher mark-ups and are also more likely to become exporters.

Our paper tests the implication that there is a relationship between firms price cost margins and export intensity empirically, using a large sample of firms from UK manufacturing sector. We contribute to the literature in a number of other ways. As pointed out above, while there is a large literature studying the effect of import competition on PCMs and the link between exporting and productivity, this is, to the best of our knowledge, the first paper that looks at the implications of exporting for mark-ups of exporters compared to non-exporters. Furthermore, our paper is the first that we are aware of that calculates price-cost margins using the approach developed by Hall (1988) and Roeger (1995) for the UK using firm level panel data.[3]

The remainder of the paper is structured as follows. Section 2 briefly introduces the methodology used to estimate PCMs, following the approach proposed by Hall (1988) and Roeger (1995). Section 3 describes our firm level dataset. The results are divided in two sub-sections: Section 4.1 provides estimates of average PCMs, in manufacturing industry as a whole and in mode disaggregated subsets, while Section 4.2 analyses more precisely the effect of exporting. Section 5 concludes.

[2] The theoretical result that more efficient firms are more likely to become exporters is similar to Melitz (2003). However, Melitz's paper assumes constant mark-ups which makes it less relevant for our analysis.

[3] Small (1997) calculates PCMs for UK manufacturing using industry level data. As we discuss in more detail below, firm level data can be considered to be more appropriate to study this issue. Griffith (2001) attempts to measure PCMs using observed data on total output divided by total costs (assuming that AC = MC).

2 Methodology

The calculation of price cost margins is not straightforward as it is difficult to observe marginal costs. In the past, many studies used accounting data on profitability, or sales minus expenditures on labour and materials for the calculation (see Tybout, 2001). However, Bresnahan (1987) argues forcefully against the use of such accounting data on profits as "there is no stable time-series relationship between accounting profit and price-cost margins in the economic sense" (p. 460) due to the way in which different accounting practices deal with fixed costs.

In order to avoid such issues, our methodology to calculate price cost margins (PCMs) is based on Hall (1988) and Roeger (1995). These papers attempt to estimate Solow residuals under imperfect competition which, almost as a by-product, allows the estimation of PCMs.

To implement such an approach we start from a standard production function

$$Q_{it} = \Theta_{it} F(K_{it}, N_{it}, M_{it})$$

where i is a firm index, t a time index, K_{it} is capital stock (selected in advance of the realisation of demand), N_{it} is labour input, M_{it} is material input and Θ_{it} is the Hicks neutral technical progress. Assuming imperfect competition in the final goods market where firms set prices higher than marginal costs, Hall (1988) and Domowitz et al. (1988) show that under constant returns to scale the Solow residual (i.e., total factor productivity (TFP)) can be written as

$$\begin{aligned} SR &= \Delta q_{it} - \alpha_{Nit}\Delta n_{it} - \alpha_{Mit}\Delta m_{it} - (1 - \alpha_{Nit} - \alpha_{Mit})\Delta k_{it} \\ &= \beta_{it}(\Delta q_{it} - \Delta k_{it}) + (1 - \beta_{it})\,\vartheta_{it} \end{aligned} \tag{1}$$

where Δx_{it} are the growth rates (in log differences) of output (q), labour (n), materials (m) and capital (k), the α_{it} are the shares of inputs in total turnover ($\alpha_{Jit} = p_{Jit}J_{it}/p_{it}Q_{it} \forall J = N, M$) and $\vartheta_{it} = \Delta \log(\Theta_{it})$ is the unobserved productivity term.

The coefficient β_{it} is of special interest as it is equal to the price cot margin, or Lerner index

$$\beta_{it} = \frac{p_{it} - mc_{it}}{p_{it}} = 1 - \frac{1}{\mu_{it}}$$

which in turn allows one to retrieve the markup $\mu_{it} = p_{it}/mc_{it}$.

Hall (1988) and Domowitz et al. (1988) suggest that μ can be retrieved from estimating specifications of equation (1) and this approach has been followed in a number of empirical studies (for example, Levinsohn, 1993, Harrison, Konings et al., 2001). However, the problem with such an estimation is that the explanatory variables are potentially correlated with the unobserved productivity term ϑ_{it}. Hence, consistent estimation of equation (1) relies on the use of suitable instruments for the right-hand-side variables, which are potentially endogenous. The selection of proper instruments has, however, turned out to be rather difficult in practice.

Roeger (1995) discusses this problem in some detail and suggests an alternative approach that does not rely on "the use of instruments that are very hard to select" (p. 318). His proposed technique for estimating price-cost-margins stems from his idea that the difference between the primal Solow residual as described in equation (1) and its price-based dual (derived from a cost function) is due to imperfect competition.

Hence, starting off with the primal Solow residual derived from the production function as in equation (1) we can write a similar expression for the price-based Solow residual (SRP_{it})

$$\begin{aligned} SRP_{it} &= \alpha_{Nit}\Delta w_{it} + \alpha_{Mit}\Delta p_{Mit} + (1-\alpha_{Nit}-\alpha_{Mit})\,\Delta r_{it} - \Delta p_{it} \\ &= -\beta_{it}\,(\Delta p_{it} - \Delta r_{it}) + (1-\beta_{it})\,\vartheta_{it} \end{aligned} \quad (2)$$

where Δw_{it}, Δp_{Mit}, Δr_{it}, Δp_{it} are the growth rates of the price for labour (i.e., wage), materials, capital (i.e., rental rate for capital) and output. Subtracting SRP from SR yields

$$\begin{aligned} SR_{it} - SRP_{it} &= \Delta q_{it} + \Delta p_{it} - \alpha_{Nit}(\Delta n_{it} + \Delta w_{it}) - \alpha_{Mit}(\Delta m_{it} + \Delta p_{Mit}) \\ &\quad -(1-\alpha_{Nit}-\alpha_{Mit})(\Delta k_{it} + \Delta r_{it}) \\ &= \beta_{it}\left[(\Delta q_{it} + \Delta p_{it}) - (\Delta k_{it} + \Delta r_{it})\right] \end{aligned}$$

which cancels out the unobserved productivity term $(1-\beta_{it})\,\vartheta_{it}$. Rewriting the left hand side as Δy and the right hand side as Δx and adding a random error term u_{it} yields:

$$\Delta y_{it} = \beta_{it}\Delta x_{it} + u_{it} \quad (3)$$

Roeger (1995) argues that this expression can be estimated using OLS because the error term in this case is not correlated with the regressor, i.e., there is no endogeneity problem. Hence, there is no need to use instrumental variables. Equation (3) is the key equation to be estimated.

As discussed extensively by Roeger (1995) pp. 321-324, there are a variety of reasons why the error term should not be identical to zero for all i and all t. In particular, in the case of excess capacity and labor hoarding, the difference between the primal and the dual Solow residual is cyclical, which would be captured by the error term. We use year dummies to capture potential demand effects. However, Roeger finds that the goodness of fit is relatively high, and that adding conjectural factors does not add much explanatory power.

To make our analysis econometrically feasible, we need to impose some identifying restrictions. It is not possible to estimate price-cost margins for each firm separately using this approach. We have at our disposal a firm level panel dataset. Therefore, we can estimate β for a given time period (β_t) assuming that price-cost margins are the same for all firms in a given year, for a given industry $\left(\beta_j\right)$ assuming PCMs to be identical for all firms within the same sector, or for a given period and a given industry $\left(\beta_{jt}\right)$. This technique allows much more flexibility than what has been used in the literature thus far as we can estimate the evolution of mark-ups over time by sector and therefore capture more of the heterogeneity present in our sample.

A number of issues arise when estimating price-cost-margins using this approach. First, there is the question of whether to use firm or industry level data to estimate the above equations. Clearly, the empirical methodology is based on a model of firm behaviour and, therefore, firm level data should be most appropriate to estimate the model. However, the literature has mostly used industry level data (see Hall, 1988, Roeger, 1998). As is well known, industry level data may lead to biased results as they aggregate over potentially heterogenous units. Our dataset provides us with firm level data for UK manufacturing industries which are arguably more appropriate for such an analysis.[4]

Second, it is difficult to believe that the degree of market power has remained constant over time. Nevertheless, most studies estimate the average markup over a period. Exceptions are studies using firm level data with a smaller time span and/or trying to capture structural adjustments (Levin-

[4] See also Konings and Vandenbussche (2002) for a recent application of this method using firm level data. They analyse the effect of antidumping protection on price cost margins of European firms.

sohn, 1993; Konings et al., 2001) and sector studies trying to control for changes in some exogenous parameters like trade (Hakura, 1998) or the nature of antitrust control (Warzynski, 2001). We allow for changes in mark-ups over time in the estimations of equation (3).

Third, we can also look more closely at some firm level characteristics that might be associated with higher price cost margins. As pointed out above, the main aim of the paper is to analyse whether exporting activity impacts on price cost margins. To do this, reconsider equation (3) and assume that the coefficient β_{it} is made up of two components, capturing the average mark-up for non-exporters plus a term allowing for a difference in mark-ups between exporters and non-exporters, i.e.,

$$\beta_{it} = (\beta_1 + \beta_2 * ED_{it})$$

where ED_{it} is a dummy variable equal to 1 if the firm is an exporter. We can estimate these two components of the mark-up by substituting this expression back into equation (3) and re-arranging, which yields

$$\Delta y_{it} = \beta_1 \Delta x_{it} + \beta_2 ED_{it} * \Delta x_{it} + u_{it} \tag{4}$$

If exporters indeed have different price-cost margins we would expect β_2 to be statistically significantly different from zero.

Similarly, we investigate whether export intensity affects price cost margins by estimating the following equation

$$\Delta y_{it} = \beta_3 \Delta x_{it} + \beta_4 EI_{it} * \Delta x_{it} + v_{it} \tag{5}$$

for all firms as well as for exporting firms only, where EI_{it} is a firm's export intensity defined as exports over total turnover. Again, if exporting activity matters we would expect β_4 to be statistically significantly different from zero.

It is worth noting that, while the derivations of the dual Solow residual assumes constant markup, it is straightforward to relax this assumption, adding necessary controls, as shown by Oliveira Martins and Scarpetta (2002).

Finally, what we are testing is the joint hypothesis of perfect competition and constant returns to scale (see also Basu and Fernald, 1997 p. 253). While the Hall approach allows the joint estimation of both parameters, this estimation is more complicated with the Roeger approach.

3 Dataset

The analysis is based on company level data taken from the *OneSource* database which is compiled by OneSource Information Services Ltd.[5] The OneSource database is a subset of all actively trading companies which are legally required to deposit company accounts data at Companies House. It includes information on the top 110,000 private and public companies in all industries (not just manufacturing) in the United Kingdom. Specifically, the data include (i) all plcs, (ii) all companies with employment greater than 50, (iii) the top companies based on turnover, net worth, total assets, or shareholders' funds (whichever is the largest), up to a maximum of 110,000 companies (Hart and Oulton, 1995).

This dataset is particularly suitable for our purposes as it is one of the few datasets to contain recent firm level data on exports.[6] Also, it provides recent firm level data on, *inter alia*, output, employment, physical capital, wages and accounting data in a consistent way across firms in the UK. Furthermore, it has a time series element allowing investigation of the development of price cost margins over time. The data available to us cover the period 1990 to 1996.

Since the purpose of this study is to look at the relationship between exporting and price-cost margins we focus on private manufacturing firms only, dropping all public or non-manufacturing firms from the sample. We also drop firms that were ultimate holding companies or subsidiaries under joint ownership,[7] firms that have average employment or turnover levels of zero, or growth rates for wages or turnover of more than 200 percent or less than -200 percent in the data, and firms for which the ownership indicator (which indicates whether the firm is private/public owned, whether it is independent etc) is missing. Furthermore, in order to mitigate the impact of outliers in the regressions we excluded the top and bottom 5 percentile observations in terms of Δy_{it} and Δx_{it}.

[5]We used the OneSource CD-ROM entitled "UK Companies, Vol. 1" for May 1998. See, for example, Girma et al. (2003) and Hart and Oulton (1996) for other papers using other vintages of the same database. Hart and Oulton (1995) provide a thorough description and discussion of the dataset.

[6]Note that micro level data on exporting are not available in the ARD database, the micro-level database provided by the Office for National Statistics (ONS) in the UK.

[7]These were dropped as it may lead to double counting if firms have consolidated accounts.

After these operations our dataset contains information on 5,834 firms. The median number of observations per firm is 4. The mean employment in these firms over the total period is 329, with the median being 97 employees. 2,644 firms enter and there are 2,395 exits from the sample over the period analysed. Of the firms included in the sample, 2,410 are exporters throughout the sample period, 2,659 never export and the remaining 765 exported in at least one year during the sample period.

For the discussion of the variables included in the empirical estimation it is useful to rewrite equation (3) as follows

$$\begin{aligned} & \Delta \log OR_{it} - \alpha_{Nit} \Delta \log CE_{it} - \alpha_{Mit} \Delta \log CM_{it} \\ & -\alpha_{Kit} \left(\Delta \log NK_{it} + \Delta \log R_{it} \right) \\ = \; & \beta_{it} \left[\Delta \log OR_{it} - \left(\Delta \log NK_{it} + \Delta \log R_{it} \right) \right] \end{aligned} \tag{6}$$

OR is operating revenue, CE is total cost of employees, CM is total cost of materials and NK is tangible fixed assets net of depreciation. All of these variables are available at the firm level from our dataset. Note that all variables are specified in nominal terms which is a further advantage of the Roeger method compared to others. R_{it} is the user cost of capital, defined as (see, for example, Hsieh, 2002)

$$R_{it} = P_I \left(r + \delta_{it} \right)$$

where δ_{it} is the firm-specific rate of depreciation on capital assets, available from the dataset. P_I is the index of investment goods prices and r is the real interest rate. P_I and r are at the country level and time varying.

Table 1 presents some summary statistics on the growth rates of operating profits, capital stock, total cost of employees and cost of materials for 1996. Note that, in all cases, the growth rates are higher for non-exporters than for exporters, although this difference is only statistically significant at the five percent level in the case of the growth of operating revenue and cost of employees.

[**Table 1 here**]

4 Econometric Results

As pointed out above, our analysis is based on firm level panel data for UK manufacturing industries. Since equations (3) to (6) are essentially twice differenced equations any possible firm specific unobservable effects that may impact on a firm's production function are cancelled out. Hence we can use simple pooled regression techniques for the estimation.[8] We allow for heteroskedasticity of the error term, as well as an unspecified correlation between error terms within establishments, but not across establishments. This allows for the likely possibility that error terms within firms are correlated over time.

4.1 Average price cost margins

We start with estimating equation (3) for the entire sample in order to provide a baseline of the average PCM in UK manufacturing firms. The results are reported in column (1) of Table 2. We report the coefficients of β_{it} estimated from the regressions and the implied value of the mark-up μ_{it}. The estimates of the Lerner index β_{it} are statistically significantly different from zero, suggesting the existence of market power and, hence, deviations from perfect competition in UK manufacturing industries. The average mark-up is 1.12 which is well within the range of estimates provided by Small (1997) for a number of UK manufacturing industries.

This estimation imposes the constraint that the average PCM is constant over time. In order to relax this assumption we constructed interaction terms of year dummies with Δx_{it} which are included in equation (3). Inclusion of the time interaction terms, i.e., allowing for changes in PCM over time in column (2) indicates a reduction in the average PCM for all years relative to 1990. While the focus of our paper is not on explaining the evolution of mark-ups over time, we note that this finding is in line with Griffith (2001) who argues that the European Single Market Programme, which became effective in 1992, led to an increase in product market competition in the UK. Note that, in all specifications, we can reject the hypothesis that the interaction terms are jointly equal to zero. Hence the specification in column (2) should be preferred to column (1).

[8] We also replicated all estimations using a fixed effects estimator. In the majority of cases, a simple F test of the significance of the firm fixed effect rejects the specification, hence we prefer the pooled estimations as used here.

These estimations, of course, average over a number of heterogeneous sub-sectors. In order to find more homogeneous comparison groups we estimated equation (3) separately for firms in differentiated and homogeneous good producing industries.[9] As is well known, a firm's mark-up is affected by the degree of product differentiation. Hence, grouping firms together according to the level of product differentiation appears a reasonable empirical strategy.

The results of the estimations for the two groups of firms separately are reported in columns (3) to (6). We find differences in the average PCM between differentiated and homogeneous good producing industries. In order to check whether these differences are statistically significant we estimated the model on the whole sample including interaction terms of all variables with a dummy equal to one if the firm is in a differentiated good industry. Without including the year interaction terms, the interaction term for Δx_{it} with the dummy is individually statistically significant (at the six percent level) suggesting a significant difference in PCMs between differentiated and homogeneous goods producing industries. When including the time interaction terms, the coefficient is no longer statistically significant, however.[10] This suggests that PCMs in the two different subsets of firms have followed different evolutions.

[**Table 2 here**]

4.2 The effect of exporting behaviour

We now turn to the issue of whether exporting affects price-cost margins for those firms who do export. The first step is to estimate the simple premia to exporting, as described in equation (4). Note that with our approach all we can establish is whether or not there is a correlation between exporting and price-cost margins, we are agnostic about the causality of such possible effects.[11]

The result of this estimation for the whole manufacturing sector is presented in columns (1) and (2) of Table 3. Note that the average Lerner

[9] This distinction is based on a classification of industries used by Rauch (1999); details can be found in the appendix.

[10] The t- and F- values for these tests are not reported here but can be obtained from the authors. We also carried out similar tests for the results on exporting reported below.

[11] Bernard et al. (2003) also do not establish a causal link between exporting and price cost margins in their theoretical model.

index is still positive and statistically significant. The inclusion of the export dummy only leads to a marginal change in comparison to the estimates presented in the preferred specification in column (2) of Table 2. The positive and statistically significant coefficient on the export interaction term $(ED_{it} * \Delta x_{it})$ suggests that exporters have, on average, higher price cost margins than non-exporters. This is consistent with the theory discussed above, where more efficient firms are more likely to export and have higher mark-ups. Based on the preferred specification in column (2), we find that exporters have an average mark-up that is about 1.2 percent higher than that for non-exporters.

In order to investigate differences across broad industries we again break up the total sample into the differentiated and homogeneous goods groups. For differentiated goods industries we find a positive export premium. Taking the point estimates at face value, we find that the mark-up for exporters in these industries is about 2.5 percent higher than that for non-exporters. For homogeneous good industries, however, we find no statistically significant difference between exporters and non-exporters in terms of their PCMs. Again we checked whether the export premia are statistically significantly different between homogenous and differentiated goods sectors by estimating the model on the whole sample and including interaction terms of all variables with a differentiated good industry dummy. The coefficient on the export dummy interaction term is individually statistically significant, and all interaction terms are jointly statistically significant also.

This difference is probably what one would expect. In differentiated goods industries, firms can add a further dimension to product differentiation by exporting (i.e., differentiate geographically). This may then lead to exporters being able to increase their price cost margins through this further differentiation. This is not possible for exporters which sell homogeneous goods abroad as these are homogeneous on both domestic and foreign markets.

[**Table 3 here**]

A further question to ask is whether the extent of exporting activity is also related with the mark-ups firms charge. When we use the export intensity instead of the export dummy and interact with Δx, we find results similar to those found in the specification with the export dummy, as reported in Table 4.

[**Table 4 here**]

However, it may be more interesting to ask what the impact of the exporting intensity is *conditional on the firm being an exporter*. In order to address this point we estimate equation (5) using data on only firms that are exporters at any given time during the sample period.[12] The results are reported in Table (5). The coefficients on the interaction terms $EI_{it} * \Delta x_{it}$ are positive and statistically significant only for the case of homogeneous goods industries. However, performing a test as above by interacting all variables with a dummy for differentiated goods industries, we find that we cannot reject the hypothesis that the interaction term of $EI_{it} * \Delta x_{it}$ with the dummy is equal to zero. Furthermore, we find that these interaction terms are not jointly statistically significant in either of the two specifications. Hence, we cannot conclude that there are any significant differences in the impact of exporting intensity on PCMs across these two sectoral groupings.

[**Table 5 here**]

Taken together, these results indicate that there is a difference between homogeneous and differentiated goods industries in terms of exporting only as far as the distinction between exporter - non-exporter is concerned. For firms in the differentiated goods industries it is important whether or not they are exporters in terms of their price cost margin, while there is no such effect apparent for firms in homogeneous goods industries.

We also carried on our analysis using more disaggregated subsets of firms (2-digit NACE Rev.1) and our main results held on. We observed more heterogeneity by sector but we also noticed a difference depending on whether the sector was producing differentiated or homogeneous goods. The effects of exporting activity and exporting intensity were also in line with the results shown in this section.

[12]This sub-sample thus includes firms that enter and exit over the sample period. While we do not deal with the issue of entry and exit explicitly we also experimented using data for cohorts of entrants into exporting only. However, no clear-cut results were obtained and we therefore report the results for all exporters here.

5 Summary and conclusions

There exists a sizeable literature analysing the effect of import competition on domestic mark-ups. Our paper examines the trade - competition link from a different point of view by investigating whether exporting activity is related to firms' price cost margins. Our paper is related to the recent literature on exporting and productivity, which shows that exporters on average are more efficient than non-exporters. Based on a model by Bernard et al. (2003) one may expect firms that are more efficient to charge higher mark-ups and to be more likely to become exporters. We investigate this issue using company level data for UK manufacturing industries. The measurement of mark-ups follows the recent approach presented by Hall (1988) and Roeger (1995). Our econometric results show that, on average, exporters have higher mark-ups than non-exporters. Based on the classification by Rauch (1999) we also distinguish sectors into homogeneous and differentiated goods producing. This distinction shows that we only find higher mark-ups for exporters in differentiated goods sectors, not in homogeneous sectors.

6 Appendix

The distinction of industries into differentiated and homogeneous goods producing industries is based on Rauch (1999). The details of his classification which is based on the SITC Rev. 2 sectoral definition are described at http://weber.ucsd.edu/~jrauch/intltrad/. Rauch distinguishes commodities into three groups: those trade on organised exchanges, those which are reference priced, and others, which are differentiated goods. For our purposes we amalgamate the first two categories into a group "homogeneous goods". We use the "conservative" aggregation used by Rauch.[13] We used the three to four digit sectoral classification used by Rauch and matched this to three to four digit UK SIC 1992 sectors.

[13]It turned out that the "conservative" and "liberal" classifications used by Rauch did not appear to be very different once we amalgamated referenced priced and organised exchange goods into one group.

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Tables

Table 1: Summary statistics for 1996

	Non-exporters		Exporters		t-stat
	mean	Std. Dev.	mean	Std. Dev.	
ΔlogPQ	0.089	0.192	0.077	0.201	2.019
ΔlogK	0.039	0.333	0.037	0.300	0.180
ΔlogWN	0.086	0.183	0.067	0.169	3.644
$\Delta \log P_M M$	0.093	0.219	0.080	0.227	1.891

Table 2: Average price cost margins

	(1)	(2)	(3)	(4)	(5)	(6)
	all	all	differentiated	differentiated	homogeneous	homogeneous
x_{it}	0.104	0.127	0.102	0.129	0.108	0.126
	(0.001)**	(0.005)**	(0.002)**	(0.006)**	(0.002)**	(0.007)**
Implied μ	*1.116*	*1.145*	*1.114*	*1.148*	*1.121*	*1.144*
x_{it} * D91		-0.021		-0.027		-0.013
		(0.006)**		(0.008)**		(0.009)
x_{it} * D92		-0.030		-0.033		-0.026
		(0.006)**		(0.007)**		(0.008)**
x_{it} * D93		-0.028		-0.028		-0.028
		(0.006)**		(0.008)**		(0.009)**
x_{it} * D94		-0.024		-0.027		-0.019
		(0.005)**		(0.007)**		(0.008)*
x_{it} * D95		-0.021		-0.027		-0.012
		(0.006)**		(0.007)**		(0.008)
x_{it} * D96		-0.028		-0.033		-0.019
		(0.006)**		(0.007)**		(0.008)*
Observations	23238	23238	13656	13656	9582	9582
R-squared	0.25	0.25	0.24	0.24	0.27	0.27
F (interaction)		5.88**		4.08**		2.44*

Heteroskedasticity – autocorrelation consistent standard errors in parentheses
* significant at 5%; ** significant at 1%
F-test for joint significance of time interaction terms
Regression includes constant term

Table 3: Exporting premium

	(1)	(2)	(3)	(4)	(5)	(6)
	all	all	differentiated	differentiated	homogeneous	homogeneous
x_{it}	0.095	0.119	0.083	0.109	0.106	0.129
	(0.004)**	(0.007)**	(0.006)**	(0.009)**	(0.005)**	(0.010)**
x_{it} * ED	0.009	0.009	0.021	0.021	-0.001	-0.002
	(0.004)*	(0.004)*	(0.006)**	(0.006)**	(0.006)	(0.006)
Implied μ						
For non-exporters	*1.105*	*1.135*	*1.091*	*1.122*	*1.119*	*1.148*
For exporters	*1.116*	*1.147*	*1.116*	*1.149*	*1.117*	*1.145*
x_{it} * D91		-0.022		-0.023		-0.022
		(0.008)**		(0.010)*		(0.012)
x_{it} * D92		-0.027		-0.025		-0.031
		(0.007)**		(0.009)**		(0.011)**
x_{it} * D93		-0.033		-0.034		-0.035
		(0.007)**		(0.009)**		(0.011)**
x_{it} * D94		-0.021		-0.024		-0.018
		(0.007)**		(0.009)**		(0.010)
x_{it} * D95		-0.021		-0.024		-0.016
		(0.007)**		(0.009)**		(0.010)
x_{it} * D96		-0.030		-0.034		-0.024
		(0.007)**		(0.009)**		(0.011)*
Observations	15207	15207	9322	9322	5885	5885
R-squared	0.24	0.24	0.24	0.24	0.25	0.25
F (interaction)		4.47**		3.00**		2.08*

Heteroskedasticity – autocorrelation consistent standard errors in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%
F-test for joint significance of time interaction terms
Regression includes constant term

Table 4: Effect of exporting intensity

	(1)	(2)	(3)	(4)	(5)	(6)
	all	all	diff	diff	hom	hom
x_{it}	0.098	0.121	0.094	0.120	0.101	0.123
	(0.002)**	(0.006)**	(0.003)**	(0.007)**	(0.004)**	(0.009)**
x_{it} * EI	0.023	0.022	0.026	0.025	0.024	0.025
	(0.008)**	(0.008)**	(0.009)**	(0.009)**	(0.014)	(0.014)
x_{it} * D91		-0.022		-0.022		-0.022
		(0.008)**		(0.010)*		(0.012)
x_{it} * D92		-0.028		-0.025		-0.032
		(0.007)**		(0.009)**		(0.011)**
x_{it} * D93		-0.034		-0.033		-0.035
		(0.007)**		(0.010)**		(0.011)**
x_{it} * D94		-0.021		-0.024		-0.017
		(0.007)**		(0.009)**		(0.010)
x_{it} * D95		-0.021		-0.025		-0.016
		(0.007)**		(0.009)**		(0.010)
x_{it} * D96		-0.030		-0.035		-0.024
		(0.007)**		(0.009)**		(0.011)*
Observations	15207	15207	9322	9322	5885	5885
R-squared	0.24	0.24	0.24	0.24	0.25	0.25
F (interaction)		4.50**		2.96**		2.09*

Heteroskedasticity – autocorrelation consistent standard errors in parentheses
* significant at 5%; ** significant at 1%
F-test for joint significance of time interaction terms
Regression includes constant term

Table 5: Effect of exporting intensity (only exporters)

	(1)	(2)	(3)	(4)	(5)	(6)
	all	all	diff	diff	hom	hom
x_{it}	0.099	0.122	0.100	0.123	0.097	0.120
	(0.003)**	(0.006)**	(0.004)**	(0.008)**	(0.005)**	(0.010)**
x_{it} * EI	0.020	0.020	0.015	0.014	0.033	0.037
	(0.008)*	(0.008)*	(0.010)	(0.010)	(0.016)*	(0.016)*
x_{it} * D91		-0.018		-0.020		-0.013
		(0.008)*		(0.010)		(0.014)
x_{it} * D92		-0.027		-0.021		-0.040
		(0.008)**		(0.010)*		(0.013)**
x_{it} * D93		-0.034		-0.036		-0.030
		(0.008)**		(0.010)**		(0.013)*
x_{it} * D94		-0.021		-0.020		-0.023
		(0.007)**		(0.009)*		(0.012)
x_{it} * D95		-0.021		-0.019		-0.025
		(0.008)**		(0.010)*		(0.012)*
x_{it} * D96		-0.030		-0.033		-0.025
		(0.008)**		(0.009)**		(0.012)*
Observations	11781	11781	7693	7693	4088	4088
R-squared	0.25	0.25	0.25	0.25	0.25	0.25
F (interaction)		3.82**		2.76**		2.01

Heteroskedasticity – autocorrelation consistent standard errors in parentheses
* significant at 5%; ** significant at 1%
F-test for joint significance of time interaction terms
Regression includes constant term