Small Business Economics (2005) 25: 237-253
DOI 10.1007/s11187-003-6460-x

The Decision to Enter and Exit Foreign Markets: Evidence from U.K. SMEs

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ABSTRACT. This paper studies the dynamics of the export behaviour of small and medium sized enterprises (SMEs) in the U.K. between 1994 and 1998. I use a dynamic empirical model to disentangle three distinct dimensions of a firms' participation in foreign markets: sunk cost induced hysteresis, firm heterogeneity and macroeconomic instability. The results show that SMEs view exporting as an irreversible investment, with state dependence being the largest explanatory factor. Moreover, observable firm characteristics, such as size and ownership, play a significant role in distinguishing exporters from non-exporters. Finally, there is no evidence that the 1992–1993 recession influenced firms' export decisions in subsequent years implying that the results provide a valid indication of SMEs "typical" export behaviour.

KEY WORDS:
entry-exit decision, markets, probit, panel techniques.

1. Introduction

The dramatic expansion of international trade flow in the last two decades has led policy makers in all major trading nations to acknowledge that successful business performance in overseas markets is vital to enhancing competitiveness.[1] In their desire to encourage firms to export, many governments have placed an increased emphasis on promoting regional information conduits and expenditure sources through the development of private, local and central government collaborative programs.[2]

Export assistance programs target, and are predominantly utilised by, small and medium sized enterprises (SMEs).[3] While export promotion programs vary between countries three traditional rationales for targeting SMEs are common to all. First, SMEs numerically dominate the firm population, many have export potential and some already do some exporting. Second, unlike large firms, SMEs have less internal resources to use for exporting and typically cannot afford the high cost of privately provided export services that match their potential export capabilities. Third, the resources available to support assistance programs are too modest to be of much use to anything other than a small number of large firms, and large firms typically have well developed export systems of their own.

The findings of recent research add two further rationales for focusing export support on SMEs. First, a growing body of empirical research indicates that SMEs are superior innovators and so overseas markets offer considerable potential to expand sales of their new products embodying these product and process innovations (Arcs et al., 1997). Second, SMEs are likely to benefit disproportionately from the pro-competitive effects of exporting as, in the U.K. at least, only about one fifth of SMEs face foreign competition in the domestic market while exporters typically confront considerable competitive pressures in overseas markets (Cosh and Hughes, 1997).

While there is a clear consensus, and strong rationales, for expanding the role of SMEs in overseas markets, it is less clear what determines their entry and ongoing participation in the increasingly global market. The purpose of this paper is to derive a greater understanding of the determinants of the internationalisation of SMEs within a dynamic framework.[4] To accomplish that task I use information from a large panel of 1,679

Final version accepted on October 17, 2003

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U.K. SMEs (defined as firms with less than 250 employees) between 1992–98. The dynamic nature of my analysis allows me to disentangle the importance of *state dependence*, whereby a firm's export status is unaltered over time due to the large irreversible entry costs inherent to obtaining and nurturing overseas markets, from *industry and firm specific differences* that distinguish those firms that become exporters from those that do not. As far as I am aware, there has been no work to date on SMEs that has taken into account the dynamics of export participation, nor more generally, on the decision of U.K. firms to export.

To briefly anticipate the results, I show that the observed persistence in export behaviour is explained by a mixed of genuine state dependence and firm heterogeneity. After controlling for observable and unobservable firm heterogeneity, up to 75 percent of export persistence in the data is explained by state dependence, and this dependence is affected by a learning process. Some observable firm-specific characteristics are also important determinants of export status. In particular, I find that older (established before 1980) and medium-sized firms, and firms that are foreign-owned subsidiaries, are more likely to be exporters, while younger, small-sized, domestic-owned firms are less likely to do so. There is no evidence that labour productivity, managerial remuneration or short run profitability influence the export participation of U.K. SMEs. Interestingly, I do not find that the major shift in the external environment affecting U.K exporters during the period examined, the strong appreciation of the pound, had any impact on export participation. Finally, I find evidence that industry-level "initial condition" characteristics affect a firms decision to export, as is reflected in the positive impacts of regional spillovers and exchange rate volatility.

The remainder of the paper is set out as follows. Section 2 sets up the explanatory framework adopted in this study. Section 3 develops the dynamic econometric model of the export participation decision, and details methodological issues. Section 4 describes the data and variables used in the empirical analysis that is presented in Section 5. Section 6 addresses robustness issues. Finally, Section 7 provides a concluding discussion of the findings of the paper.

2. The explanatory framework

While empirical literature examining export participation is extensive, the vast majority of research has employed static models that only include observable firm-specific characteristics and factors influencing the economic environment that firms inhabit (Glejser et al., 1980; Wagner, 1995; Braunerhjielm, 1999; Lautanen, 2000). However, dynamic models are needed to fully understand the nature of firm behaviour that follows entry and exit from overseas markets (Robert and Tybout, 1997; Campa, 2000; Bernard and Jensen, 2001).

This paper encompasses three distinct dimensions of the entry and exit behaviour of SMEs. First, changes in the economic environment facing firms may influence firms' export participation. The U.K. economy was affected by two shocks over the period: a rise in labour productivity, and a sharp appreciation of pound. The first two rows of Table I provide time-series data depicting trends in the (trade weighted) real exchange rate and comparative labour productivity (measured by output per hour relative to the G7). The data suggests that exchange rate conditions were quite favourable for exporters before 1997 when the pound witnessed a severe appreciation. Productivity gains followed a cyclical pattern. Prior to 1994 productivity growth fell, reflecting dampened demand conditions following the 1991 recession, before recovering in the following three years, and stagnated from 1996 onwards. Taken together movements in the real exchange rate and labour productivity were generally quite favourable to exporters between 1994 and 1996, however conditions were not conducive for exporting in the last two years of the sample period. As a first pass at ascertaining the effect of these changes on SME export participation the transition rates into and out of export markets are presented in the third and fourth rows of Table I respectively. Over the full period, there was a net expansion in the stock of exporters with entry rates uniformly exceeding exit rates. The average rate of probability of taking up exporting, conditional on being an exporter the previous year, over the full period was about 6 percent, while the probability of ceasing exporting at time $t + 1$, conditional on not exporting at time t, was only 2

TABLE I
Firm raw transition rates in the export market (1992–1998)

	Year t Year $t+1$	1992 1993	1993 1994	1994 1995	1995 1996	1996 1997	1997 1998	Average 1992–1998
Year on year percentage change	Output per hour in manufacturing	–2.69%	0.51%	17.3%	1.70%	0.00%	–0.10%	1.09%
	Real effective exchange rate	–8.16%	0.76%	–5.21%	2.10%	20.27%	6.92%	15.18%
Status	Status							
Export	No export	0.013	0.025	0.017	0.023	0.023	0.020	0.020
No export	Export	0.048	0.064	0.066	0.051	0.064	0.059	0.059
Export	Export	0.987	0.975	0.983	0.977	0.977	0.980	0.980
No export	No export	0.952	0.936	0.934	0.949	0.936	0.941	0.941

Source: Firm sample (1,679) from FAME; Output per hour in manufacturing (relative to G-7) from <http://www.statistics.gov.uk/productivity>; Real effective exchange rate from International Financial Statistics (IMF).

percent. A visual comparison of the transition rates with the exchange rates and productivity growth patterns does not suggest that the effects are closely linked. It is possible, however, that other factors are clouding the impact of the changing macro-conditions facing U.K. firms, which is an issue that will be addressed in the subsequent analysis.

Second, firms that want to export have to incur relevant "sunk" costs so the experience of exporting one year alters the future likelihood of exporting thereafter. Sunk costs include the cost of information about demand conditions overseas, the cost of establishing distribution networks, and other outlays necessary to enable firms to overcome complications in selling their products under the typically higher degree of uncertainty intrinsic to overseas markets. Roberts and Tybout (1997), in their study of the export decision of Colombian manufacturing plants, showed that the learning from exporting is completely depreciated two years after exiting export markets. As noted earlier, it is natural to consider that these costs are relatively greater to SMEs due to the more binding financial and time constraints place on managers and employees. The greater costs facing SMEs, taken together with the high depreciation associated with such costs, provides a potentially strong incentive to postpone entry into foreign markets. To the extent that export activity involves learning behaviour where SME's commitment to the process of internationalisation partially determines its benefit, it will be more profitable to start exporting earlier than later. Indicative evidence of considerable persistence in export status is illustrated in the fourth and fifth rows of Table I which shows that, based on raw data, the conditional probability of maintain export status throughout the observation period is high, above 97 percent.[5]

Third, previous research on export persistence has indicated that there are a certain set of observable and unobservable characteristics associated to exporting firms suggesting that some, and only some, firms self-select into export activity (Bernard and Jensen, 1999; Clerides et al., 1998). Besides an extensive array of observable firm characteristics and industry control variables, I have included a firm-specific random effect in the empirical model to capture unobservable firm characteristics.

The next section deals with the empirical model and methodological issues.

3. An empirical model of export decision

I begin with an extended version of the reduced form representation of the export market partici-

pation decision, the theoretical counterpart of which can be referenced in Appendix I. The export participation decision for firm i at year t is expressed by

$$y_{it}^{*} = x_{it}'\beta + \gamma y_{t-1} + \alpha_i + u_{it} \quad \text{where} \quad t = 2, \ldots, T \quad \text{and} \quad i = 1, \ldots, N$$
$$y_{i1}^{*} = \lambda' z_i + \eta_i \quad \text{where} \quad t = 1 \quad \text{and} \quad i = 1, \ldots, N \qquad (1)$$

In the first equation y_{it}^{*} denotes the unobservable firm propensity to export. A firm is observed to be an exporter when the profitability of its action crosses a threshold (zero in this case), that is, if $y_{it}^{*} > 0$. The variable x_{it} is vector of observable characteristics affecting y_{it}^{*}, y_{t-1} is a dummy variable that takes value of 1 if the firm exported the previous period (capturing the *structural dependence*), α_i is a firm-specific time-invariant component in the error term (capturing the *unobservable firm heterogeneity*), and u_{it} is the unobservable error term. By assuming that u_{it} is independent normal distributed with mean zero and variance σ_u^2, the first equation is the random effects probit model. An extended version of this model includes as an additional vector of regressors, $\bar{x}_i$, the means of all the time-varying covariates, which allows for relaxing the assumption of independence between the firm specific unobservable effect and the time-varying characteristics (Chamberlain, 1984).

The second equation accounts for the initial condition problem. The initial condition problem arises when the start of the observation period does not coincide with the start of the stochastic process generating individuals' "first" exporting experience. Technically the problem occurs if y_{i1} is correlated with the unobservable term, α_i (Heckman, 1981a), that is, $\text{corr}(\alpha_i, \eta_i) = \rho$.

To estimate the two-equation model I use a two-step method suggested by Orme (1997) and Arulampalam et al. (2000), in the spirit of Heckman's standard sample selection correction method. The random effect probit model, under the specification of $\alpha_i = \delta\eta_i + w_i$, is given by

$$y_{it}^{*} = x_{it}'\beta + \gamma y_{it-1} + \delta\eta_i + w_i + u_{it} \quad \text{where} \quad t = 2, \ldots, T \quad \text{and} \quad i = 1, \ldots, N \qquad (2)$$

Now this equation has two firm-specific random error components η_i and w_i. Assuming a bivariate distribution of (η_i, α_i), $E[w_i|y_{i1}] = 0$ but $E[\eta_i|y_{i1}] = e_i$, where $e_i = \dfrac{(2y_{i1} - 1)\phi(\lambda' z_i)}{\Phi[(2y_{i1} - 1)\lambda' z_i]}$. If u_{it} is assumed to be orthogonal to the regressors x_{it}, w_i can be treated as the usual time-invariant error component in the random effects probit model provided the unobservable error component, η_i, can be corrected for. Since that e_i is a generalised error in the "initial condition" probit equation, η_i can be replaced by its conditional expectation in (2) so we can estimate the random effect probit model equation with an additional regressor, e_i, and so under the assumption of normality I obtain the following reduced form model

$$y_{it}^{*} = x_{it}\beta + \gamma y_{it-1} + \delta\hat{e}_i + w_i + u_{it} \quad \text{where} \quad t = 2, \ldots, T \quad \text{and} \quad i = 1, \ldots, N \qquad (3)$$

A test of the null hypothesis that $\text{corr}(\alpha_i, \eta_i) = \rho = 0$ is given by the t-statistic of the coefficient of the additional regressor $\hat{e}_i$.[6]

Finally, the structure of the error term u_{it} in equation (1) is important in interpreting of the nature of export persistence. For example, if shocks are purely transitory, $\text{cov}(u_{it}, u_{it-1}) = 0$, then relatively large entry costs will lead to persistence in exporting (or non-exporting) while small entry costs will allow firms to enter and exit the market more often. Persistent shocks, $u_{it} = \varpi u_{it-1} + \mu_{it}$ with ϖ near one, can therefore overcome the effects of large entry costs where firms perceiving a positive shock today will lead to persistent good fortune and that the value of entry is large. If persistence in the error term structure fails to be modelled adequately, then it will be picked up by the lagged endogenous variable and thus will be incorrectly interpreted as high entry costs. A dynamic probit model with an autoregressive error term is also estimated using simulated smooth maximum likelihood with the GHK simulator (Borsh-Supan and Hajivassiliou, 1993) to test for persistent shocks, ϖ.

4. Data and variables description

The data used in this work are based on firm-level information from U.K. manufacturers. Firm-level data was obtained from balance sheets and annual reports in the FAME database (Financial Analysis

Made Easy). An explicit explanation of the construction of the sample is provided in Appendix 2 for the interested reader. The variables include total sales, destination of sales (domestic and exports), year of registration in Company House, ownership, geographic location, employment, wages, profits, fixed assets, operating costs and four digit industry codes associated to each firm. The data set contains seven annual observations per firm, covering the years 1992–98, for each of the 1,679 firms analysed, giving a total of 11,753 observations. The observation $t = 1$, is treated as the pre-sample transition year and is used to determine the transition rates in $t = 2$, while the observation for $t = 2$ is used to control for initial conditions (the probit equation in year 1993). This leaves five annual observations, amounting to 8,395 observations, over the 1994–98 period.

4.1. *Description of variables*

Table II defines the variables that are used in the analysis of the export participation decision. The explanatory variables are the firm's export status in the previous year, the firm's characteristics and a set of regional, industry and control variables as well as a series of pre-sample characteristics used to estimate the initial condition equation.

4.1.1. *Sunk cost estimate*

Sunk costs are captured through the lagged dependent variable. A wide body of literature argues that exporting can be viewed as a learning process within a firm (Clerides et al., 1998).[7] To evaluate the importance of learning effects through their influence on past export status, the variable y_{t-1} enters in interacted form with firm age to account for differences in the perceived sunk investment in exporting depending on firm experience. To the extent that age embodies experience, older companies may conceive start-up entry costs as being much lower than young companies so their past exporting history may be a stronger determinant of their actual export propensity.

4.1.2. *Firm characteristics*

The data contains a large set of firm characteristics, which allows me to evaluate a number of hypotheses concerning the particular impact of each characteristic on the export decision.

The *size* of the firm, measured as total tangible assets, is expected to have a positive impact on the probability to export. Size can be viewed as a proxy for past success, lower average costs, better information acquisition capacity and easier access to internal and external financial resources.[8] Where fixed costs to exporting are important, the likelihood of exporting should increase with firm size. Medium sized firms may also benefit from economies of scale in production and marketing.

Labour quality is measured by firm productivity and provides a means to capture the impact of shifts in labour quality. I use directors' wages to proxy for heterogeneity in *managerial skills* since it would be expected that more productive firms will have with better managerial teams, and so will exhibit a higher propensity to export. Finally, the return on sales is included to reflect the current *financial situation* of the firm. A good, or a bad, cash-flow situation could encourage, or deter, a firm's export plan.[9]

To complement my strategy of examining learning affects I include two time invariant dummy variables distinguishing firms set up between 1970 and 1980 and firms set up after 1980, leaving the firms set up before 1970 as the benchmark group. The *age* dummies would be expected to capture whether older firms are more likely to become exporters since they have survived longer and their accumulated resources and knowledge have given them more opportunities to start exporting.

Control over the decision to export in SMEs depends critically on *ownership* structure. I include dummy variables for domestic and foreign-owned subsidiaries, leaving domestic-owned independent firms as a reference category. Decision makers in subsidiaries are likely to benefit from interactions with other decision markers of the company group. Foreign-owned subsidiaries are also likely to benefit from the greater access to the resources that the parental firm has abroad (Aitken et al., 1997). Therefore, a positive impact of subsidiary ownership on export propensity, particularly among foreign-owned firms, is expected.

Recent evidence has found firms use product diversification as a market diversification strategy to stimulate exports (Aw and Batra, 1998). To capture product *diversification* effects a dummy variable is introduced that takes the value of one

TABLE II
Definitions and statistical summary of variables

		Mean	Std. dev.	Min.	Max.
Firm level time varying characteristics[a, b]					
Exported last year*age (≥ 15 years)	Lagged dependent variable interacted with firm age	0.274	0.446	0	1
Exported last year*age (< 15 years)	Lagged dependent variable interacted with firm age	0.414	0.492	0	1
Size	Book value of tangible assets	6.240	1.281	2.302	10.612
Labour quality	Output per employee	4.229	0.733	2.542	8.045
Managerial skills	Directors' wage	4.696	0.734	2.771	7.425
Financial situation	Return on sales (profits before tax divided by turnover	0.034	0.103	–0.581	0.484
Firm level time invariant characteristics					
Set up between 1970 and 1980	1 if set up between 1970 and 1980; 0 otherwise	0.281	0.449	0	1
Set up after 1980	1 if set up after 1980; 0 otherwise	0.415	0.493	0	1
Subsidiary/foreign owned	1 if foreign owned subsidiary; 0 otherwise	0.190	0.392	0	1
Subsidiary/domestically owned	1 if domestically owned subsidiary; 0 otherwise	0.510	0.501	0	1
Diversification	1 if firm operates in more than one industry; 0 otherwise	0.719	0.433	0	1
Industry and control variable					
Relative export price[c]	Ratio of foreign to domestic manufacturing prices (unit value index of exports/producer price index)	0.814	13.05	44.3	140.93
Regional dummies	Dummy variables for Scotland, Northern England, Midlands and Wales, Southern England				
Industry dummies	Dummy variables for food and drink; textiles and confection; paper and print; chemicals; metallic and non-metallic minerals; mechanical and electric machinery; electronic machinery; transport material; wood, furniture and others				
Year dummies	1 if year = 19XX; 0 otherwise. XX = 95, 96, 97, 98				
Initial conditions (1990–1992)					
Regional spillovers[d]	Regional-industry production concentration, 1992	1.197	1.005	0.001	12.2
Growth rate of exports[e]	Annual export growth rate, 1990–1992	12.960	25.71	–48.52	55.29
Country-destination instability[f]	Percentage of firms considering export market instability affects their export decision (1992)	0.301	0.146	0.045	0.731
Exchange rate volatility[g]	The trade-weighted nominal value of the pound, 1990–92	2.975	0.312	2.147	3.688

[a] Time varying characteristics are lagged one period.
[b] Firm level data was derived from the *FAME* database.
[c] Export unit values over the period 1993–1998 are from *U.K. Markets* and *Products Sales and Trade* both published by ONS (both calculated at the 4 digit SITC).
[d] Source: Annual Manufacturing Survey, 1992.
[e] Source: Business Monitor Publication MQ12, HMSO.
[f] Source: *CBI Industrial Trends Survey*.
[g] 21 OECD average monthly nominal exchange rates (*International Financial Statistics*); trade weights are 1992 share of 3-digit NACE industry exports in total U.K. exports for each destination country (EUROSTAT).

if the firm operates in more than one industry and zero otherwise.

4.1.3. *Industry and control variables*

The effects of the exchange rate appreciation on the firms should reflect the reduced attractiveness of foreign markets relative shifts of producer prices in domestic markets. These effects are likely to differ by industry and so to capture these impacts I calculate the ratio of *foreign to domestic prices*. The index of export price competitiveness is defined by the ratio of the unit value index of manufactured exports and the producer price index in U.K. manufacturing at the four digit Standard Industrial Classification (SIC92).

In addition, ten industry dummies based on the two-digit SIC92 classification are included in the analysis. Furthermore, a series of regional dummies are used to capture regional differences and economy-wide annual macroeconomic shocks are captured through a series year dummies.

4.1.4. *Initial conditions*

Our pre-sample information contains industry-level variables that measure export spillovers, exchange rate shocks, foreign demand shocks and destination market uncertainty. These extra variables are included in the "initial condition" equation to identify additional factors that may influence the firms decision to be an exporter or non-exporter in years prior to the 1994–1998 "observation window". All the variables refer to the period between 1990 and 1992. Previous research on export participation has found a significant correlation between the decision to export and geographic spillovers (Aitken et al., 1997). Motivated by this finding I constructed an employment-based measure of geographic concentration variable with region-industry concentration of employment being defined as the region-industry share of national employment divided by the regional share of national employment. Specifically, $E_{jk} = \frac{E_{jk}}{\sum_j E_{jk}} \Big/ \frac{E_{jk}}{\sum_j \sum_k E_{jk}}$ where E is employment, j is a region and k is a three-digit SIC80 in 1992.[10]

Two industry-specific indicators of foreign demand conditions were derived to capture shocks that may induce some firms to enter into foreign markets: the industry growth rate of exports, and the degree of foreign market instability. Industry export growth rates were calculated using data from the Business Monitor Publication MQ12 (HMSO). My proxy for the extent of economic and political uncertainty of the destination markets uses information from the *CBI Industrial Trends Survey*. One of the questions in the survey for manufacturing exports concerns the factors that firms perceive will limit their ability to export.[11]

Finally, the export hedging literature has shown that greater exchange rate volatility raises the expected profitability of exporting and stimulates exports (Ungern-Sternberg and Weizsacker, 1990; Gagnon, 1993). The volatility of the exchange rate was measured as the standard deviation of the industry level monthly growth rate of exchange rate between 1990 and 1992.

5. Results

The estimates of the dynamic probit model, using the two-step estimation procedure detailed in Section 3, are contained in Table III. The first column reports the estimates of the "initial condition" equation, which is a static probit model of export decisions including pre-sample information from 1990–1992. Model 1 reports the estimates for the period 1994–1998 under the assumption that there is no correlation between the time-varying firm level covariates and the error term. Next, Model 2 column 3 reports the results of the specification allowing for correlation between time-varying covariates and the error term.

Given the purpose of the initial conditions equation is to account for endogeneity due to left censoring in the sample I first test whether such effects are apparent and significant. To do so I test the null hypothesis that δ, the coefficient attached to the probit generalised error variable $\hat{e}_i$, is equal to zero. The null hypothesis was easily rejected by the data indicating that there is endogeneity in the initial conditions.[12] Further evidence against the appropriateness of the pooled probit model is suggested by the variance of the unobservable heterogeneity as a proportion of total unexplained variance, r, lying between zero and one and it is statistically significant in both estimated models. Therefore, the pooled probit is rejected in favour of the random effects probit models.

One means to gauge the relative merit of

Models 1 and 2 is via their ability to "fit" the data. As is evident from the log likelihood Model 2 is a better "fit" of the data. However, a far more serious problem of misspecification exists when the covariates are correlated with the error term since this that would render the coefficients in Model 1 biased and inconsistent. Both Models are identically parameterised, with the exception of the correlation between the covariates and the error term. Comparing the results of the two models there are a number of marked differences in the parameter values between the two models, which strongly suggests that Model I is not well specified. I therefore take Model 2 to be the preferred specification and concentrate the discussion on the resulting estimates of that model.

5.1. *State dependence*

The results in Table III show a positive and significant coefficient on the lagged export status variables, suggesting that there is state dependence in export activity for both young (aged less than 15 years) and mature firms (aged more than 15 years). In all the models there is little difference between the magnitude of the coefficients for young and more mature firms. Although the difference is small, the state dependence coefficient for firms set up after 1980 is slightly larger than that for companies set up before 1980.[13]

5.2. *Observed firm heterogeneity*

Several observable time-varying firm characteristics have a positive impact on the propensity to export. In Model 1, firm size, labour productivity and directors' wage (as proxy for managerial quality) have a positive and statistically significant impact on the decision to export. The indicator of financial performance, the rate of return on sales, had no effect on the decision to export. When the correlation between the covariates and the error term (Model 2) is incorporated only firm size remains significant.

The negative sign on the coefficient of age (set up) variables suggests that young companies are less likely to export than mature companies. The positive coefficient of subsidiary ownership reveals that foreign-owned subsidiaries are more likely to export than domestically owned subsidiaries and independent companies. Industry diversification has a positive effect on the decision to export, but the coefficient is not statistically significant.

The insignificant coefficient on the proxy variable for managerial quality should *not* be interpreted to mean that the quality of management is an unimportant determinant of export behaviour. It is plausible that factors such as the size and learning capabilities of the firm, represented by the *age* and *size* variables, are picking up managerial quality. A second explanation is that directors' wages are not a sharp indicator of the management capabilities of U.K. firms as indicated by considerable previous research.[14]

Time, regional and industry dummies were found to be inconsequential contributors with joint significance tests being rejected for all three groups of dummies.

Interestingly, neither export prices relative to domestic output prices nor labour productivity are significant. Due to the inclusion of year dummies, the firm-specific labour productivity and industry-specific relative export prices can be interpreted as reflecting across-firm and across-industry deviations from average trends. However, the exclusion of the time dummies in my regression did not change the sign and significance of either of these variables. These findings allow me to reject the hypothesis that significant macroeconomic instability associated to the post-1996 exchange rate appreciation and enhanced labour productivity, impacted on export participation in favour of export status inertia.

The initial conditions equation (Column 1) provides an additional list of industry-level explanatory variables on the propensity to export in 1993. In accordance with expectations, both geographic concentration of the manufacturing activity and exchange rate volatility are positively correlated with export participation, although the coefficient of the spillover variable was only significant at a 10 percent level. The two additional pre-sample variables, the growth rate of industry exports and an indicator of country-destination perceived instability by exporters, showed no effect on the decision to export in the sample. The rest of variables in the initial condition equation coincide in sign and significance

TABLE III
Dynamic probit model of export participation

Variable	Initial conditions Year: 1993		Random effect probit model							
			MODEL 1 Period: 1994–1998 (No correlation between covariates and error term)		MODEL 2 Period: 1994–1998 (With correlation between covariates and error term)		MODEL 3 1994 and 1998 only (No correlation between covariates and error term)		MODEL 4 1994 and 1998 only (With correlation between covariates and error term)	
Constant	–2.771**	(0.384)	–5.734**	(0.913)	–6.968**	(1.112)	–4.533**	(0.990)	–4.663**	(1.089)
Lagged dependent variable										
Exported last year* (age ≥ 15)			1.390**	(0.172)	1.315**	(0.178)	2.786**	(0.263)	2.781**	(0.272)
Exported last year* (age < 15)			1.643**	(0.140)	1.588**	(0.144)	2.907**	(0.241)	2.910**	(0.244)
Time-varying firm level variables										
ln(Capital Stock) ($t-1$)	0.144**	(0.013)	0.439**	(0.009)	0.309*	(0.139)	0.275**	(0.069)	0.292**	(0.065)
ln(Productivity) ($t-1$)	0.102**	(0.027)	0.394**	(0.107)	0.121	(0.253)	0.212**	(0.105)	0.252	(0.317)
ln(Directors' Wage) ($t-1$)	0.182**	(0.025)	0.324**	(0.095)	0.063	(0.162)	0.183*	(0.105)	0.080	(0.252)
Return on sales ($t-1$)	–0.003	(0.065)	0.054	(0.574)	0.243	(0.776)	0.177	(0.667)	0.116	(0.987)
Time-variant firm variables										
Subsidiary/domestic owned	0.317**	(0.042)	0.249**	(0.146)	0.503**	(0.201)	0.132	(0.203)	0.141	(0.208)
Subsidiary/foreign owned	0.488**	(0.068)	0.687**	(0.242)	0.723**	(0.267)	0.293	(0.234)	0.304*	(0.182)
Set up between 1970 and 1980	–0.182**	(0.052)	–0.342**	(0.179)	–0.376*	(0.195)	–0.170	(0.183)	–0.159	(0.189)
Set up after 1980	–0.214**	(0.042)	–0.324*	(0.196)	–0.345*	(0.201)	–0.132	(0.197)	–0.137	(0.209)
Diversification	0.026	(0.044)	0.249	(0.183)	0.273*	(0.169)	0.022	(0.180)	0.024	(0.186)
Relative export price	0.033	(0.040)	0.002	(0.090)	0.034	(0.239)	0.242	(0.647)	0.232	(0.238)
Industry dummies	No		Yes	0.836	Yes	0.783	Yes	0.889	Yes	0.818
Regional dummies	No		Yes	0.612	Yes	0.577	Yes	0.802	Yes	0.810
Year dummies	No		Yes	0.213	Yes	0.129	Yes	0.225	Yes	0.193
Pre-sample information										
Region-industry concentration 1992	0.025*	(0.014)								
Growth rate of exports 1990–92	–0.001	(0.118)								
Country-destination instability 1992	–0.046	(0.225)								
Exchange rate volatility (1990–92)	0.242**	(0.102)								
Residual from initial condition probit			0.689**	(0.058)	0.835**	(0.041)	0.804**	(0.041)	0.810**	(0.178)
Variance unobservable heterogeneity as % of total unexplained variance (r)			0.602**	(0.101)	0.602**	(0.102)	0.310*	(0.164)	0.313*	(0.168)
Log likelihood	–2,987.15		–930.32		–899.47		–407.58		–407.32	
Log likelihood with $r = 0$			–1,152.89		–928.98		–411.54		–411.77	
Constant only log-likelihood	–3,456.89									
Number of firms	1,679		1,679		1,679		1,679		1,679	
Number observations	1,679		8,395		8,395		3,358		3,358	

** (*) = Significant at a level of 5 (10) percent.
[a] For industry, region and year dummies we report the P-values of the F-test for joint significance of all the estimated coefficients.

with those contained in the random effect model.

5.3. *Export probabilities*

5.3.1. *State dependence effects on export probabilities*

In order to see how much of the estimated export persistence probabilities are attributed to "genuine" state dependence I estimate raw aggregate probabilities from the data, and compare these to probabilities derived using my preferred ML estimates (Model 2) using a methodology devised by Chamberlain (1984). I take each firm and calculate the predicted probabilities of being an exporter conditional, firstly on being an exporter in the previous period, and second, on being a non-exporter in the previous period, and then average over the sample members keeping firm characteristics constant. The resulting calculations indicate (for a random chosen firm from a particular age group, conditional on previous exporting status) the probability of observing this individual exporting in the current time period. Since each calculation is carried out for each individual by changing their previous export status the difference between probabilities gives the contribution due to "genuine" state dependence.

The results are presented in Table IV. The first panel records raw aggregate probabilities, while the other two panels document the predicted probabilities for the pooled probit model and the model with unobservable heterogeneity and endogenous initial conditions (Model 2). There are two central points to note about the predicted probabilities. First, the raw data shows that young firms exhibit greater state dependence, although the difference is quite small. However, these raw calculations do not take into account changes in observed and unobserved characteristics that may influence the probability of exporting at a particular point in time. Treating the initial observation as exogenous attributes a very large percentage of the persistence effect to genuine state dependence (97 percent), while the accounting for endogeneity and incorporating unobservable heterogeneity into the analysis leads to a considerably smaller percentage of the observed persistence being determined by state dependence (about 75 percent).

5.3.2. *Unobserved firm heterogeneity effects on export probabilities*

Next I investigate the impact of unobservable firm heterogeneity on the probability of becoming an exporter. Table V reports the predicted probabilities for two "representative" SMEs. The first column describes the two types of firms. The first has attributes that *are not* associated with being an exporter – independence, youth, single industry operation, small size, poor labour productivity, and low directors' remuneration. The second is a firm has an antithetical set of attributes that *are* associated to exporters.

The second column in Table V indicates the distance to the population mean of those unobservable firm attributes distributed randomly across firms. The benchmark is a zero deviation with, (un)favourable unobservable attributes being measured as one or two positive standard normal deviations. The last two columns indicate whether the firm has previous export experience.

After controlling for observable firm characteristics and past export experience, the marginal impact of unobservable heterogeneity across firms can be identified. Suppose that firm effects capture the distribution of a manager's attributes towards the internationalisation of the firm. The results suggest that a firm with negative "attributes", no previous export experience and has the worst possible unobserved characteristics (minus two standard deviations) will not export. However, a firm with no past experience of exporting and negative observable "attributes" that has very positive unobserved characteristics (plus two standard deviations) has an 11 percent probability of exporting. Indeed the rate of exporting amongst these firms exhibiting highly favourable unobserved characteristics is higher than amongst those firms with "good" observable characteristics but poor unobservable capabilities.

6. Robustness

I examine three robustness issues in turn: (1) effects of changes in panel structure; (2) the importance of autocorrelated random shocks, and (3) the predictive capacity of the model.

TABLE IV
State dependence: raw and predicted probabilities

		Firm with age > 15 years [1]	Firm with age < 15 years [2]
Status t – 1	*Status t – 1*	*Raw data probabilities*	
1 Exporting at $t-1$	Exporting at t	0.9776	0.9791
2 Non-exporting at $t-1$	Exporting at t	0.0612	0.0573
3 Non-exporting at $t-1$	Non-exporting at t	0.9388	0.9427
4 Exporting at $t-1$	Non-exporting at t	0.0224	0.0209
Predicted probabilities holding characteristics constant		*Pooled probit model*	
5 Keep same export status in $t-1$ and t		0.9617	0.9693
6 Change export status between $t-1$ and t		0.0721	0.0834
9 State dependence		0.8896	0.8859
10 As percentage of raw probability	[9/(3–4)]	*0.9797*	*0.9610*
		Random effect probit model	
11 Keep same export status in $t-1$ and t		0.8953	0.8791
12 Change export status between $t-1$ and t		0.1166	0.1093
13 State dependence		0.7787	0.7698
14 As percentage of raw probability	[13/(3–4)]	*0.7497*	*0.7428*

TABLE V
Predicted probability of exporting

List of observable firm characteristics	Firm effect (unobservable heterogeneity)[a]	No previous export experience	With past export experience
"bad" SMEs			
(Independent +	–2	0.000	0.829
Set up after 1980+	–1	0.001	0.866
No-diversified +	0	0.041	0.902
25th percentile of each	1	0.093	0.946
time-variant characterisics)	2	0.110	0.989
"good" SMEs			
(Foreign subsidiary+	–2	0.042	0.984
Set up before 1970+	–1	0.083	0.991
Diversified +	0	0.139	0.996
75th percentile of each	1	0.179	0.999
time-variant characterisics)	2	0.215	0.999

[a] The firm effect is one-time the standard deviation with respect to the mean.

6.1. *Periodisation*

First I check whether the results are sensitive to the sample period. The last two columns of Table III report the results for the two models using the two years at the extremes of the sample period (1994 and 1998). Compared to Model 1 and 2, the results do not change for the variables capturing past experience, unobservable heterogeneity and endogenous initial conditions on the participation decision. However, time-invariant characteristics become statistically insignificant when the assumption that no correlation between the covariates and the error term is relaxed (Model 3). Only the coefficients of firm size and foreign-ownership are robustly significant in the model with corre-

lation between covariates and error term (Model 4).

6.2. *Autocorrelation*

Another important issue is whether the inclusion of autocorrelated shocks modifies my previous findings concerning export persistence. For that purpose a multi-period dynamic probit model is estimated that allows for serial correlation in the error term. To simplify the estimation I have assumed that the initial conditions are exogenous and have used a more parsimonious selection of explanatory variables than in earlier estimations.[15] Table VI reports the results of the preferred model using 50 draws from the GHK simulator. The estimated coefficient for the autoregressive parameter in the error term is not statistically different from zero, thereby rejecting the hypothesis of permanent shocks as explanation for export persistence. The robustness of the results also indicates that the estimated coefficients in Table II are consistent after allowing for the presence of serial autocorrelation in the error term.

TABLE VI
SML estimation of dynamic probit model of export participation[a]

Variables	Coefficient	S.E.
Constant	–2.448**	(0.079)
Lagged export status	3.583**	(0.062)
Log (capital stock)	0.119**	(0.022)
Return on sales	0.079	(0.128)
Set up after 1980	0.032	(0.058)
Diversification	0.055	(0.066)
Foreign-owned subsidiary	0.125*	(0.067)
Export price	–0.001	(0.094)
RHO	0.239*	(0.022)
AR1	–0.052	(0.043)
Industry dummies	Yes	
Year dummies	Yes	
Log-likelihood	944.86	
Number of firms	1,679	
Number of observations	8,395	

[a] The specification of the model is more parsimonious than the one estimated using the random probit model without autocorrelated error term and without mean values of the explanatory variables (Model 2). The excluded variables are directors' wage, labour productivity, dummy for set up before 1970 and a dummy for domestic subsidiaries.

6.3. *Goodness of fit*

To evaluate the goodness of fit of the preferred model I compare the actual and predicted patterns of export market participation in Table VII.[16] Each path comprises a sequence of {0, 1} where 1 indicates positive exports in a given year. For example {1, 1, 1, 1, 1} represents the sequence of a stable exporter while {0, 1, 0, 1, 0} is a sequence for a firm that enters and exits the foreign market in alternative years. The number of firms that are predicted to change their export status more than once is, 2.5 percent, compared with 9.3 percent of actual changes.[17] In addition, the model over predicts the number of regular exporters and under predicts the number of non-exporters however the deviations are not substantial. Comparing the

TABLE VII
Goodness of fit. Actual and predicted export trajectories

Export sequence	Actual probability	Predicted probabilities
00000	28.36%	31.15%
00001	0.98%	0.30%
00010	0.17%	0.15%
00100	0.12%	0.00%
01000	0.12%	0.07%
10000	0.35%	0.00%
00011	0.92%	0.45%
00101	0.00%	0.00%
00110	0.12%	0.07%
01001	0.00%	0.00%
01010	0.06%	0.00%
01100	0.12%	0.00%
10001	0.00%	0.00%
10010	0.12%	0.00%
10100	0.12%	0.00%
11000	0.58%	0.07%
00111	0.81%	0.15%
01011	0.12%	0.07%
01101	0.06%	0.00%
01110	0.17%	0.07%
10011	0.12%	0.00%
10101	0.00%	0.00%
10110	0.00%	0.00%
11001	0.12%	0.00%
11010	0.29%	0.00%
11100	0.40%	0.07%
01111	1.61%	0.30%
10111	0.29%	0.00%
11011	0.00%	0.00%
11101	0.52%	0.00%
11110	1.10%	0.45%
11111	62.31%	66.54%

absolute state-weighted deviation between the predictions of the model and the actual trajectories, the model explains 86 percent of the export state trajectories in the sample.

7. Concluding discussion

This paper provides the first empirical evidence on the dynamics of export decision by SMEs in the U.K between 1994 and 1998. The results suggest that both state dependence and firm heterogeneity are important elements. The probability of exporting one year conditional on exporting the previous year, holding firm characteristics constant, is about 75 percent. I also find that the importance of sunk costs falls with the age of the company, although the difference is small. In addition, export participation remained unaffected by the most significant macroeconomic shock during the period analysed, a substantive appreciation of the pound in 1997 that was coupled with stagnating labour productivity, and to the explicit inclusion of permanent auto-correlated shocks. Taken together these findings provide strong evidence that devising programs that *successfully* induce *non-exporters with unutilised export capability* will provide an ongoing payoff beyond the initial inducement. The stability of the results to environmental factors also suggests that I am capturing "typical" exporter behaviour.

In addition, I established which of the observable determinants of exporters contained in the dataset, that are hypothesised to affect export participation, matter. In doing so I am able to identify *non-exporters with unutilised export capability*. My results suggest that SMEs that are, "medium" rather then "small" sized, are mature rather then young, and that are the subsidiaries foreign firms, are more likely to internationalise. In addition, I tested hypotheses related to spillovers, exchange rate shocks, foreign demand shocks and perception of uncertainty about export destinations highlighted in the recent literature. I find a positive but weak role of geographic spillovers on the export decision by SMEs. In line with the exporting hedging literature, greater exchange rate volatility stimulates export participation.

The ability of the model to quantify and predict the importance of factors determining the entry and ongoing participation of SMEs provides a guide to policy makers. An interesting extension of this paper would entail a direct assessment of whether firms aided by promotional activities become exporters. A second promising area for future research, that is the most cited reason for SME export promotion in the government discourse, concerns whether or not there are pro-competitive dimensions associated with U.K. small and medium sized exporters. Anecdotal evidence suggests that this is the case. However no systematic work examining the relative efficiency of U.K. SMEs has been undertaken to date as far as I am aware. Both of these topics are the subjects of my on going research.

Acknowledgements

This paper is part of Chapter 1 of my thesis at the London School of Economics. I thank an anonymous referee, James Walker, Anthony Venables, John Van Reenen, Chris Milner and the participants of the seminar at LSE (U.K., 2000) and Frontier Economics (U.K., 2001) and the conferences at Simposio de Análisis Económico (Spain, 1999) and Royal Economic Society (U.K., 2000) for comments and suggestions. I also thank Chris Alexander at the Department of Trade and Industry for helpful discussions on U.K. trade promotional activities. Funding from Generalitat Valenciana (GV99.135.1.88) is gratefully acknowledged.

Appendix I: An empirical model of exporting decision with sunk cost

This appendix summarises the empirical model of exporting decision, derived by Roberts and Tybout (1998) and used to motivate my research.

Consider an industry in a monopolistically competitive environment so there is no strategic competition and each firm faces a downward-sloping marginal revenue function in each market. The current period gross operating profits of a firm can be written as

$$\tilde{\pi}_{it}(x, Z, F, Y_{it}) = R_{it}(\bullet, X, Y_{it}) - c^{v}(\bullet, Z) - F(1 - Y_{it}) \quad \text{(A1)}$$

where R_{it} is the total revenue function, c^{v} is the variable cost of producing total output and F captures the sunk start-up costs to initiate exports. Y_{it} is an indicator function such that is equal to one if the decision to

export in period t is positive, and zero otherwise. The demand shifters, X, affect firm profitability through revenues, while industry and firm-specific factors, Z, affect firm profitability through changing variable costs. For simplicity of exposition we maintain that the expression for the variable costs function is independent of the export decision.

If firms can price discriminate between foreign and domestic markets, producers would simply participate in foreign markets – choosing the profit-maximising level of exports – whenever the marginal revenue is equal to marginal cost condition is satisfied. In the absence of firm-specific sunk costs ($F = 0$), there exists a threshold such that, given demand conditions, all firms with a marginal variable costs below that threshold self-select into export activities.

The presence of sunk start-up costs to initiate exports explains the dynamics of a firm's reaction to exchange rate or trade policy changes. For simplicity we will assume that entry costs recur in full if the firm exits the export market for any amount of time so firms will export if expected profit net of entry costs are positive, $Y_{it} = 1$ if $\tilde{\pi}_{it}(\bullet) > 0$. In a multi-period framework, the profit function can be written as $V_{it} = \max_{q^A,\, q^B,\, Y_{it}} E_t(\sum_{s=t}\delta^{s-t}[\tilde{\pi}_{is}Y_{is}])$ where $\{q_{it}^A, q_{it}^B, Y_{it}\}$ is the optimal sequence of decisions about volume and entry in each market. E_t is an expectations operator conditioned on the set of information available at time t, and δ is the one-period discount rate. The Bellman's optimality principle states that the firm's program solution is the period-by-period solutions to the sequence of Bellman's Equations

$$V_{it} = \max_{q^A,\, q^B,\, Y_{it}}\{\tilde{\pi}_{it}Y_{it} + \delta E_{t+1}[V_{t+1}Y_{t+1}]\} \qquad \text{(A2)}$$

A firm that did not export in period $t-1$ will choose to export in period t (i.e. $Y_{it} = 1$) if

$$\pi_{it}(Y_{it} = 1) - \pi_{it}(Y_{it} = 0) + \delta E_{t+1}[V_{t+1}(Y_{t+1} = 1)] - \delta E_{t+1}[V_{t+1}(Y_{t+1} = 0)] > F(1 - Y_{it+1}) \qquad \text{(A3)}$$

The term on the left-hand side of equation A3 represents the current net operating profits from total sales in the domestic and foreign market plus the expected discounted future payoff from remaining an exporter. The right-hand side term contains the sunk-cost fee associated to new entry or re-entry. Incumbent exporters continue exporting, and non-exporters begin exporting, whenever the first term is larger than the second term. Note that the first term must be larger for non-exporters than for incumbent exporters due to start-up costs.

Define the latent variable Y_{it}^* is defined as current net operating profits plus the expected future return from being an exporter in period t [i.e. the left part of equation (A3)]. The condition to start exporting can be written as a dynamic discrete choice process

$$Y_{it} = \begin{cases} Y_{it}^* - F > -FY_{it-1} \\ 0 \quad \text{otherwise} \end{cases} \qquad \text{(A4)}$$

The export participation equation (A4) is equivalent to equation (1) in the main text if we express the latent variable $Y_{it}^* - F$ as a reduced form determined by an exogenous set of observable factors that affect the expected future profitability of the firm $x_{it} = (X_{it}, Z_{it}, \varphi_t)$ and an individual error, ε_{it}. Moreover we define the parameter $\gamma = -F$ so all the relevant information about the past export history of a firm is captured by $y_{it} - 1$.

Appendix II: Construction of the data

The empirical data used in the present study are mainly taken from FAME (Financial Analysis Made Easy). It is a financial database containing major public and private companies from Jordan Watch and Jordan Survey database and is collected by Jordans and Bureau Van Dyck for commercial use. The database includes balance sheet data, profit and loss statements and some complementary information on all U.K. firms that satisfy one or more of these criteria: Turnover greater than £700,000; Shareholder Funds greater than £700,000; Profits before tax greater than £40,000. This accounts for about 110,000 firms. It also contains a sample of 100,000 small-medium sized firms that satisfy one or more of these criteria: Turnover greater than £250,000; Current Assets or Liabilities greater than £250,000; profits before tax greater than £25,000.

We use the filters provided by FAME to select companies operating primarily in the manufacturing industry (SIC92 codes 1511 to 3663). FAME provided information for 25,240 over the period 1992–1998, but some firms are repeated due to consolidated accounts (group accounts, holding accounts). In these cases we keep the individual and not the group. We have also eliminated repeated companies that changed legal status from limited company to public limited company during the period. The number of firms is reduced to 24,115.

The final sample of firms is obtained after the following filters:

(i) companies with complete information for seven consecutive years (4,759);
(ii) companies without measurement errors. The data was trimmed to eliminate possible outliers. Observations with total sales, employment, wages or tangible assets changing more than 150 percent in one year were excluded (4,312);
(iii) companies classified in manufacturing activity before 1992 according to the 3-digit SIC80 classification (4,168);
(iv) companies with less than 250 workers in 1992 (3,023);

(v) firms that were set up after 1955 (2,510);
(vi) firms operating in industries with export intensity above 10 percent in 1992 (1,679).

The justification for the sample selection procedures (iv)–(vi) is that the sample is valid to represent the population of firms that are more likely to suffer a change in their export status, that is, young small and medium sized companies competing in exporting industries. The final data set contains 7 annual observations for 1,679 companies amounting to a total of 11,753 observations.

Notes

[1] The desire to raise the number of exporters has been a central pillar of U.K. government policy since the mid-1990s with the *1995 Competitiveness White Paper* setting a target of 30,000 new exporters by the year 2000.

[2] The key example of a central, local government and private sector partnership is the U.K. *Business Links* program established in 1993. *Business Links* explicitly targets SME development through the provision of experienced personal (Export Development Councillors) and Government department representatives (Export Directors) [Department of Industry and Trade, U.K. (2001)]. In addition, the emphasis on regional trade promotion activities is been mirrored across the Atlantic with all 50 U.S. states providing assistance to export promotion. Expenditure for the 34 states that consistently reported trade promotional spending rose by 35 percent between 1990 and 1998 to $80 m [National Association State Development Agencies (2002)].

[3] Firms with less then 250 employees accounted for 86 percent of the users of export promotion services in 2000 [Department of Industry and Trade, U.K. (2001)].

[4] For the purposes of my analysis "exporters" are defined as firms that report a positive share of their turnover sold abroad and "non-exporters" are defined as firms that report zero exports. This definition allows to me capture both "regular" (firms that export continuously through the sample period) and "irregular" exporters (firms that only export for some periods within the sample period). Using the above definitions the proportion of firms who export irregularly in the sample is low. I do not have information on whether firms who are censored at the end of the period continue to remain "regular" or change states to become "irregular" exporters. However, an upper bound to the proportion of irregular exporters can be gauged using the actual state trajectories located in Table VI (i.e. summing the 00001, 00011, 00111, 01111 sequences) by assuming that exporters, which have a positive and continuing export sequence at the end of the period, are regular exports. Only a minority of exports are irregular, about 5 percent, while if all the censored firms where to become "irregular" exporters the proportion is still only amounts to 9 percent.

[5] The empirical evidence using plant and firm level data show that the transition rates into and out of export markets are relatively high in both developed and developing countries. A large number of studies find that there is considerable variation in the transition rates of firms between countries over differing time frames. Based on sample of unrepresentatively larger U.S. manufacturers between 1976 and 1987 Bernard and Jensen (1999) find that 18 percent of exporting plants left the export market and 9 percent of non-exporters began foreign shipments in an average year. Campa (2000) reports that 4 percent of Spanish exporting plants left the export market and 8 percent of non-exporters began foreign shipments in an average year between 1990–1997. Bernard and Wagner (2001) report that 8 percent of German exporting plants left the export market and 14 percent of non-exporters began foreign shipments in an average year between 1978–1989. Aitken et al. (1997) report a striking 47 percent entry rate into foreign markets for large Mexican companies in the four-year period after trade liberalisation [1986–1989]. Roberts and Tybout (1997) observe that 10 percent of exporting plants left the export sector and 5 percent of non-exporters began foreign shipments in an average year in Colombia [1981-1989]. Clerides et al. (1998) combined the data used by Aiken et al. (1997) and Roberts and Tybout (1998) to include Morocco that had an entry rate of 5 percent and an exit rate of 4 percent between 1984 and 1991. Liu et al. (1999) noted that 10 percent of firms in the Taiwanese electronic industry that exported in 1990 did not export in 1992 and 12 percent of firms did not export in 1990 but enter by 1992. Aw et al. (1997) also provided evidence of high turnover rates in foreign markets for other Taiwanese industries.

[6] Unfortunately, the assumption of a bivariate distribution for (η_i, α_i) implies that the variance of w_i (the new error component that enters the random effects probit model specification) is not constant. Orme (1997) shows, using Monte-carlo simulations, that heteroskedasticity produces inconsistent parameter estimates that disappear for small values of ρ. Moreover, the condition of "small ρ" is also required for $\text{var}(w_i) \cong \sigma_a^2$. By imposing a factor analytical structure in the error term, that is, the correlation between successive errors for the same individual is a constant, $r = \text{corr}(w_i + u_{it}, w_i + u_{it-1}) = \sigma_a^2/(\sigma_a^2 + \sigma_u^2)$, $t = 2, \ldots, T$, so r is the proportion of the variance attributed to the unobserved individual heterogeneity in the total variance of the error term. By normalising $\sigma_u^2 = 1$, then an estimate of ρ is approximated by $\delta\sqrt{(1 - r)/r}$ where δ is the coefficient associated to the probit generalised error variable $\hat{e}_i$.

[7] It should be noted that the notion that experience conditions export participation over time is not equivalent to the traditional approach to exporting behaviour by SMEs, which views export participation as a slow process where the firm gradually increases its commitment to international operations in a series of "stages" (Bilkey and Tesar, 1978), since no structured staging process of exporter behaviour is imposed.

[8] Evidence of the extent to which U.K SMEs are financially constrained is limited. Hughes (1996) finds little support for "gaps" in debt and equity financing of small firms.

[9] Several empirical papers include these three variables in their empirical specifications. See, among others, Robert and Tybout (1997) or Bechetti and Santoro (2001).

[10] Note that I use an index of geographic concentration of activity to capture concentration in export activity. To the

extent that both indices are correlated, and export spillovers matters, the export participation decision will be enhanced among small and medium sized companies in highly geographically concentrated industries.

[11] The explanatory variable is constructed as the percentage of responses claiming from question 15 of *CBI Industrial Trends Survey* that political and economic problems abroad are important factor constraining export decision making. The CBI Survey data is available for 50 manufacturing industries. I use previous research by Temple and Urga (1997) for a correspondence with 81 three-digit SIC80 industries.

[12] The estimate of $\delta\sqrt{(1-r)/r} =$ is 0.560, which is sufficiently small to ensure consistent estimated parameters, in line with the results of Arulampalam et al. (2000).

[13] Various interactions of age with lagged export status were tried, including firms aged 10 and 20. Age 15 was chosen in the preferred specification based on the likelihood value. Since the models are estimated as probabilities, there is no restriction on the values of the coefficients on lagged export status. This is in contrast to time-series analysis, where the absolute value of the coefficient needs to be less than unity for stationarity.

[14] The effects of firm performance on executive compensation has generated considerable literature in the U.K. some of which has been directed specifically at SMEs. The evidence to date is quite fragile (see Conyon and Nicolitsas, 1997).

[15] A more parsimonious specification is used due to difficulties computing the standard errors in the full model. I expect that the estimation is still valid to test for autocorrelation in the error term.

[16] An alternative approach is to carry out some simple test of my preferred model, such as the standard goodness of fit chi-squared tests (Chamberlain, 1984). The approximate distribution of the test statistic is chi-squared only if the expected frequencies that enter the denominator of the test statistic are at least 5. Unfortunately any combination of cells is arbitrary, so I decided not to carry on with the calculations.

[17] Roberts and Tybout (1997) find that only 5 percent of firms switch their export status more than once among all Colombian plants in a six-year period examined. Bernard and Jensen (1999) observe switching rates above 12 percent for U.S. plants over the seven-year period studied.

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