Export Market Participation

The Importance of Sunk Costs and Spillovers

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Export market participation: The importance of sunk costs and spillovers[1].

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Abstract

This paper investigates the importance of sunk costs, firm characteristics and spillovers from nearby exporters on a firm's export participation decision. The empirical analysis involves the estimation of a non-structural, discrete choice, dynamic model with firm heterogeneity. The results suggest that both sunk costs and observable firm characteristics are important determinants of export market participation. In addition, previous history matters, in that, if a firm has been exporting the last period or the period before that it significantly increases the likelihood of the firm exporting in the current period. This conclusion is robust across all specifications. Also, larger firms with high capital intensity and foreign owned are more likely be exporters. Finally, while there is no clear evidence on export spillovers, if a firm operates in an export-oriented industry increases the likelihood of exporting.

Keywords: Dynamic Panel, sunk costs, export decision.
JEL classification: L10, F10, C23, C25.

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1. Introduction

The last decade has produced a stream of micro-econometric studies on the relationship between firm's exports and its productivity. A major conclusion emerging from this literature is that exporters have higher productivity, and, often, higher productivity growth, even after controlling for observed plant characteristics. This conclusion, however, seems not to be affected by previous exporting experience, as some studies show that exporting does not necessarily improve productivity. Alternatively, a series of papers, such as Roberts and Tybout (1997), Bernard and Wagner (1998), Bernard and Jensen (1999, 2001) and Campa (2004), model firm's exporting decision as a function of sunk cost hysteresis, i.e. previous exporting history subject to sunk entry cost as well as firm and industry characteristics. They find that sunk entry costs are important for the current exporting decision. Yet, Roberts and Tybout (1997) find that their effect depreciates fairly quickly, namely, if the firm has been out from the export market for two years its probability of exporting again is no different from that of a plant that has never exported.

This study investigates the relevance of sunk entry costs, firm characteristics and spillovers from nearby exporters on a firm's exporting decision. The empirical analysis involves the estimation of a non-structural, discrete choice, dynamic model with firm heterogeneity. Differently from the existing research we explicitly model unobserved firm heterogeneity, permanent over time, as well as initial conditions in the estimation of a random dynamic probit. Another important distinction of our study is that, we employ a large and representative panel of Estonian firms over the period 1994 through 1999, which allows us to model a firm's current exporting decision as a function of its last two years exporting history and observed firm characteristics, given the economic environment changes over this time period. For instance, soon after becoming an independent country, Estonia started a trade liberalization policy reform. The result of

this reform was the abolishment of all tariff and non-tariff barriers to trade, opening the door fully to FDIs, as well as the equal treatment of foreign and domestic investors under the national law. This led to a reorientation of Estonia's trade from Russia, as the main trade partner, to the West European countries. Although the main trade and investment reforms were undertaken unilaterally, bilateral free trade agreements with the major trading partners were signed to secure access to export markets. For a small economy, within a short time period Estonia managed to establish a high degree of trade openness, which resulted in continuous increase in exports. For instance, between 1996 and 1999, exports to Finland and Sweden (now the main trade partners) increased by 8.37% and 40%, respectively.

A very important factor of the macro-economic stability, which Estonia achieved very fast, was the currency board system the Estonian Central Bank adopted since the early transition. In 1992, the new Estonian currency, the kroon, was fixed to the D-mark, and became automatically fixed to the Euro when it became common currency in 1999. However, in advance of the expected adoption of the monetary union, the mark (and, consequently, the Estonian kroon) depreciated against the US dollar by 17% during the period 1995-1998. Furthermore, the Russian crisis of 1998 had an overall severe impact on the Estonian economy and trade. For instance, in 1998 Estonian exports to Russia fell by almost 64%. Russian crisis aside, such large fluctuations in exchange rates are likely to have a strong impact on a country's trade flows. In a series of papers, Dixit (1989) and Baldwin and Krugman (1989) argued that fluctuations in exchange rates have significant effects on the entry and exit decisions of firms in the export market. Yet, once the firm has incurred a sunk cost to enter the export market, it might prefer to stay in even though there is an exchange rate shock of a moderate magnitude, in order not to re-incur the sunk entry cost. Hence, the existence of sunk entry costs may cause hysteresis in trade. Accordingly, there may be persistency of

the Estonian firms in the export market even though they might experience negative exchange rate shocks.

The rest of the paper is organized as follows. In Section 2 we introduce theoretical arguments on sunk costs hysteresis and briefly review the empirical literature on firm exporting decision with sunk entry costs. In Section 3 we lay out the determinants of a firm's exporting decision, while in Section 4 introduce a model of export decision with sunk entry costs and discuss the econometric issues and the estimation strategy. In Section 5 we describe the data used in the empirical analysis, in Section 6 introduce the estimation results, and, finally, in Section 7 we conclude.

2. Theoretical and empirical evidence on firm entry and exit under sunk cost hysteresis

An important determinant of the decision to undertake an action, such as the decision to export, to participate in labor force, in a union or to remain in welfare programs, is state dependency. It implies that current participation in any of these activities directly affects the propensity of individuals/firms to participate in future activities. For instance, if a person has been in a welfare program for a long spell, the probability that he/she remains in welfare even in the next period is high[2]. This state dependency is referred to as "hysteresis" in international trade[3], which is defined as the failure of an effect to reverse itself when its underlying cause is reversed (Dixit, 1989). In this paper we focus on sunk cost hysteresis[4], where sunk costs, typically, represent the costs of setting up a distribution and service network, of establishing a brand name through advertising, or of bringing the product in conformity with health and safety regulations of the foreign country.

[2] This is differently known as the welfare trap in labor economics literature.
[3] For more on this issue read Becker, Grossman and Murphy (1994) or Moffit (1992).
[4] See the seminal papers of Baldwin (1988, 1989), Dixit (1989), Baldwin and Krugman (1989).

Under the sunk cost hysteresis, a firm will find it advantageous to enter a foreign market once there is, for instance, a temporary exchange rate shock that leads to an appreciation of the foreign currency, which results in profits greater than zero. After the shock reverses itself the firms' profits will start dropping, but as long as profits are non-negative the firm finds it cheaper to stay in the market because of the already incurred sunk cost. If the firm were to exit and re-enter in good times, it would have to re-incur the sunk entry cost. Hence, the existence of sunk costs implies that it is cheaper to stay "in" than to get "in" a market (Baldwin, 1989). Baldwin (1989) refers to the interval between a firm's critical entry level (when profits exceed at least the sunk costs) and the critical exit level (when profits become negative) as the hysteresis band or, differently, as the no exit no entry band. In the hysteresis band, history matters. If the firm was "in" in the last period, it remains "in" and if the firm was "out" it remains "out", unless a large enough shock reverses the situation. In addition, Baldwin (1989) analytically shows that the hysteresis band tends to widen with sunk costs and that persistence in shocks has the effect of making entrenched firms more likely to exit, narrowing the band for the marginal firm. Further, Dixit (1989) finds that incorporating uncertainty in the analysis implies that the firm can do better by waiting, especially when there are large sunk entry costs and that hysteresis emerges very rapidly even for very small entry sunk costs. Hence, the hysteresis band increases with both sunk costs and uncertainty.

A very important implication emerging from these theoretical considerations is that, in the case of no sunk costs there would be no hysteresis, and, accordingly, firms would easily enter the export markets in good times and exit in bad times, at no cost. However, due to asymmetric entry and exit condition created by the sunk entry costs there is hysteresis. None of these implications, however, is captured in the standard static empirical analysis of export decision-making. Empirically ignoring their

importance when working with models that can easily accommodate longitudinal data may result in misspecification if the model is subject to hysteresis.

The empirical literature of firms' exporting decisions is closely linked to the development of theoretical models. Studies to date that include the role of sunk costs in the export decision are Roberts and Tybout (1997), Bernard and Wagner (1998), Campas (2004), and Bernard and Jensen (2001). In each of these papers the authors develop a theoretical model of entry and exit with sunk costs, from which a non-structural dynamic discrete-choice model is developed for estimation. The results of the these papers reject the hypothesis that sunk costs are significantly different from zero, implying that prior export market experience is important for the current decision to export. However, previous exporting experience seems to depreciate fairly quick, namely, if the firm has been out from the export market for two years its probability of exporting again is no different from that of a plant that has never exported. In contrast, Campa (2004) is not just interested on the importance of sunk cost hysteresis, but also on the possibility of hysteresis on the quantity of exports. He estimates a dynamic export market participation to test the importance of hysteresis in trade and an export supply function to test for the possibility of hysteresis on the quantity of exports. The author finds sunk cost hysteresis in entry and exit to be an important determinant of export market participation, however, its effect on the volume of trade is quantitatively small. A 10 % depreciation of the currency, changes the export volume due to increases in the number of exporting firms by only 1.5%. This suggests that trade adjustment due to changes in the exchange rates, occurred mainly through the adjustment of export quantities of existing exporters, rather than through changes in the number of exporting firms.

3. The Determinants of Export Market Participation.

There is ample empirical evidence that shows that exporting firms are larger, more productive, pay higher wages and survive longer than non-exporting firms. The literature has proposed two main reasons that could explain the positive correlation between firm productivity and exporting. First, exporters can acquire knowledge and expertise on new production methods, product design, etc., from international contacts. In turn, learning-by exporting results in higher productivity of exporters versus non-exporters. Second, the positive correlation between productivity and exporting, could simply suggest that only the most productive firms can survive in a highly competitive international environment. Hence, the most efficient firms self-select into the export market. The empirical evidence of Bernard and Jensen (1999), Clerides et al. (1998), and Aw et al. (2000), clearly supports this self-selection hypothesis. In light of such information, current values of variables of firm characteristics would be endogenous to the current export decision.

The existing empirical evidence shows that firm characteristics such as firm size, age, labor quality, firm productivity and/or firm ownership structure are important determinants of export market participation. For instance, Clerides et al. (1998) and Bernard and Wagner (2001), find that plant characteristics, such as large capital stock and low average cost as well as firm size and productivity increase the probability of exporting. Furthermore, Bernard and Jensen (2001) argue that plant characteristics, especially those indicative to the past success such as firm size and labor quality, strongly increase the probability of exporting. Likewise, Roberts and Tybout (1997), find that plant size, its age and corporate ownership increase the probability of exporting[5].

Drawing from the results of previous research, we consider several firm characteristics, such as firm size, productivity, labor quality, capital intensity and

[5] For additional evidence on the importance of firm characteristics see Aitken et al. (1997), Barrios et al. (2003), Sjöholm (1999) and Girma et al. (2002). They all confirm on the importance of firm characteristics as determinants of export market participation.

ownership structure, as important determinants of a firm's exporting decision. As pointed out in most of the studies that focus on export market participation, exporting firms are larger than non-exporting firms. Accordingly, firm size, may reflect economies of scale in exporting (Krugman, 1984). In other words, size may be associated with lower average costs of production, providing a way through which size affects the probability of exporting. In addition, Caves (1989) has argued that if sunk costs represent costs of setting up a distribution and service network, of establishing a brand name through advertising etc, then they should come in almost fixed amount no matter the size of the firm. This implies that small firms would face higher costs to entry in foreign markets, than large firms. Consequently, we include firm size in our specification as the logarithm of the average number of employees.

Another important determinant of decision to export is firm level productivity, which we proxy with the ratio of sales per employee. We expect firm level productivity to be positively correlated with a firms' probability to export, in that more productive firms are more likely to export (Clerides et al., 1998; Bernard and Wagner, 2001). Another firm characteristic, which we employ to proxy for firm's labor quality, is average labor cost. A firm that possesses qualified workers is more likely to produce high quality goods and therefore has a higher probability to become exporter (Bernard and Jensen, 2001). In addition, firm's capital intensity, is expected to account for differences in technology between exporting and non-exporting firms. Capital-intensive firms are expected to be more productive and to produce high quality goods, and, therefore, are more likely to export. Recently, empirical research is also investigating the importance of ownership in export decision (Bernard and Jensen, 2001; Buck et. al., 2000; Roberts and Tybout, 1997). For instance, Buck et al. (2000) find that managerial ownership increases the probability of exporting versus the other ownership forms.

Therefore, we control for firm ownership status by including ownership dummies in the estimation.

Other than individual firm characteristics, economy wide and industry variables, such as changes in the domestic demand conditions and exchange rates, as well as export spillovers and inherent industry differences, can affect the probability of exporting. For instance, a drop in domestic demand for the firm's product can cause a firm to shift its sales effort to the foreign markets. We account for changes in the overall domestic demand conditions by including domestic private consumption as a right hand side variable. In addition, favorable or unfavorable changes in exchange rates are expected to affect the decision to export. As in Roberts and Tybout (1997), we rely on the time dummies to account for the impact of (un)favorable changes in exchange rates on the export market participation. Moreover, to control for permanent unobserved industry effects industry dummies are also included in the specification. Regarding export spillovers, if MNEs' information on foreign markets could spill over to local firms, then potential exporting firms would face lower sunk costs of entering a foreign market[6]. Hence, more local firms could become exporters. For instance, direct contacts with foreign firms can provide local firms with necessary information on foreign tastes, market structure, competitors, distribution networks and transport infrastructures. This, in turn, contributes to the decrease of local firms' cost for collecting information on foreign markets. Hence, foreign exporters located nearby can improve the likelihood of exporting. We use three alternative measures to proxy for export spillovers: the total number of firms that export in an industry, the number of foreign firms that export in the industry and the share of foreign firms' exports in total industry's exports. All measures reflect the prevalence of knowledge about foreign market and technology. We expect the coefficient in front of the spillover variables to be positive and significant.

[6] For more on export spillovers see Blomstrom, Tasini and Kokko (2001), Aitken et al. (1997), Clerides et al. (1998), Sjöholm (1999), Bernard and Jensen (2001), Greenaway et al. (2002) and Barrios et al. (2003).

However, the number of exporters in the industry approximates also the degree of competition in the export market. A negative coefficient of this variable indicates that exporting firms crowd out each other in the export market.

There are, however, two further problems that one has to account for in the estimation procedure: the identification of export spillovers and endogeneity of the spillover variables. The former problem relates to the fact that in an export-oriented industry, firms may have a higher probability of becoming exporters independently of the export activity of other firms in the same industry. To account for this problem we include in the regression the share of industry's exports in the total economy's export, as a right hand side variable. The endogeneity problem relates to the fact that foreign firms may locate in industries that offer more favorable conditions for exporting. Hence, there is a simultaneity problem in between the individual firms export decision, spillover variables and the share of industry's exports in the total economy's export. We address this problem by including industry dummies and the lagged values of spillover variables and of the share of industry's exports in the total economy's export as instruments.

Finally, to avoid the endogeneity problem stemming from the self-selection of more productive firms into the export market, we employ lagged values of all firm characteristics.

4. A Model of Export Decision with Sunk Costs.

In a static model without sunk costs a firm will enter the export market only if the profit from exporting is positive. In a multi-period case the firm will decide to export only when the expected current and discounted future profits are positive. If firm's revenues and profits do not depend on previous choices, then the multi-period solution would be a sequence of static optimal decision-makings.

In introducing sunk costs into the model we assume that the firm incurs F_i^0 in costs in the first year of entry in the export market. The corresponding earnings from export activity become π_{it} - F_i^0. If the firm exits the export market, in re-entry it will face the sunk cost, F_i^j and consequently it will earn π_{it} - F_i^j. Given that the sunk costs are start up costs of setting up a distribution and service network or of establishing a brand name through advertising, then it is common sense to assume that the re-entry cost, F_i^j, is lower than the sunk cost the firm incurs when it enters the market for the first time. Finally, if the firm exits the market it will suffer the exit cost N_i and if it stays in it will earn the profit π_{it}. This information can be collapsed together in a single expression, where the firm's current profits given its previous exporting history, and net of entry and exit sunk costs are:

$$\tilde{\pi}_{i,t} = y_{i,t}[\pi_{i,t} - F_i^0(1 - y_{i,t-1}) - \sum_{j=2}^{J_i}(F_i^j - F_i^0)y_{i,t-j}] - N_i(1 - y_{i,t}) * y_{i,t-1} \quad (1)$$

where j=2….J_i and $y_{i,t-j}$ summarizes a firm's most recent exporting experience. For instance, $y_{i,t-2}$=1 if the firm was last seen exporting two years ago.

The Bellman equation for equation (1) is the following:

$$V_{i,t}(y_{it-j}) = \max_{y_{it} \in \{0,1\}}[\tilde{\pi}_{i,t}(y_{i,t-j}) + \delta E_t(V_{i,t+1}(y_{it})] \quad (2)$$

According to equation (2), a firm will export if the current and discounted future stream of profits from exporting is greater than the discounted future stream of profits from non-exporting. That is, $y_{i,t}$=1 if:

$$\pi_{i,t} + \delta[E_t(V_{i,t+1}(y_{i,t} = 1)) - E_t(V_{i,t+1}(y_{i,t} = 0))] \geq F_i^0 - (F_i^0 + N_i) * y_{i,t-1} + \sum_{j=2}^{J_{ii}}(F_i^0 - F_i^j)y_{i,t-j} \quad (3)$$

As in Dixit (1989), the sum of entry and exit sunk costs for current exporters, -($F_i^0 + N_i$), is differently known as the band of hysteresis.

The estimable equation of export market participation is based on condition (3). We first denote the sum of current profits and the discounted increment in exporting activity, with:

$$\pi_{i,t} + \delta [E_t(V_{i,t+1}(y_{i,t} = 1)) - E_t(V_{i,t+1}(y_{i,t} = 0))] = R_{i,t} \quad (4)$$

Then we rewrite (3) as follows:

$$y_{i,t} = \begin{cases} = 1 \quad if \quad R_{i,t} - F_i^0 + (F_i^0 + N_i) * y_{i,t-1} + \sum_{j=2}^{J_{ii}} (F_i^0 - F_i^j) y_{i,t-j} \geq 0 \\ = 0 \quad otherwise \end{cases} \quad (5)$$

Equation (5) is a dynamic, discrete choice export participation model, where current exporting decision is a function of previous exporting history. In case sunk costs do not apply, (5) is reduced to the case of the firm deciding to export if $R_{i,t} \geq 0$. Accordingly, we can test the sunk costs hypothesis by investigating the importance of export history captured by the coefficients in front of the dummy variables, $y_{i,t-1}$ and $y_{i,t-j}$, in equation (5).

We estimate the binary equation (5) employing a non-structural equation approach. For a lag structure j=2, we assume that fluctuations in profits after entering the export market, $R_{i,t} - F_i^0$, are a function of previous market participation ($y_{i,t-1}, y_{i,t-2}$), exogenous industry and economy wide variables X_t, and firm characteristics, Z_{it}. The empirical model we estimate is the following:

$$y_{i,t} = c + \gamma_1 y_{i,t-1} + \gamma_2 y_{i,t-2} + \beta X_t + \theta_1 Z_{i,t} + \varepsilon_{i,t} \quad (6)$$

$$\varepsilon_{i,t} = \alpha_i + u_{i,t} \quad (7)$$

Where, α_i are unobserved, time invariant firm specific components, such as managerial expertise, output quality or foreign contacts, while $u_{i,t}$ is a standard random error.

The empirical analysis involves the estimation of the non-structural dynamic model (8), where the error term is decomposed into an unobserved, time invariant firm specific component, α_i, such as managerial expertise, output quality or foreign contacts, and a standard random error $u_{i,t}$.

$$y_{i,t} = c + \gamma_1 y_{i,t-1} + \gamma_2 y_{i,t-2} + \beta X_t + \theta_1 Z_{i,t} + \alpha_i + u_{i,t} \quad (8)$$

The estimation of this dynamic binary model faces two main problems: accounting for the unobserved firm characteristics, α_i and the initial conditions problem.

In a dynamic framework, persistency in export market participation could be either the result of sunk costs, the true state dependency, or the result of time invariant unobserved firm characteristics, the heterogeneity across firms. Time-invariant firm characteristics are usually unobserved and their persistence will induce serial correlation in the error term $u_{i,t}$. If not controlled for, this persistency will be captured by the state dependency variables, causing the problem of "spurious state dependency" (Heckman 1981a). That is, we will conclude that all the persistency in export status is due to sunk costs, when in fact this is not true. Indeed, there might not be any "state dependency", which is caused by sunk costs hysteresis. Furthermore, the unobserved invariant firm characteristics are correlated with other firm characteristics included as regressors, for instance firm performance, hence, causing their coefficients to be inconsistently estimated[7].

[7]We cannot control for unobserved heterogeneity (α_i) using firm specific dummy variables, differently known as fixed effects because of the "incidental parameters" problem (Chamberlain, 1980; Heckman, 1981b). With time fixed, as $n \to \infty$ the number of parameters to be estimated grows and the estimation becomes infeasible. However, Bernard and Jensen (…) have opted for a linear probability model to fully account for firm unobserved heterogeneity by first differencing the data, eliminating both the unobserved firm heterogeneity and initial conditions, because of the eliminated fixed effects. This approach, however, attributes too much of the serial dependence to unobserved heterogeneity. In general, any approach that understates (overstates) the importance of unobserved heterogeneity will overstate (understate) the importance of state dependency. Hence, when using linear probability models, we expect the coefficient in front of the lagged binary variable to provide us with a lower bound of the sunk costs coefficients compared to the coefficients in the nonlinear models. However, the problem with the linear probability models is that predicted probabilities are not constrained to the unit interval, making nonlinear models more likely to provide a better fit.

To account for the firm unobserved heterogeneity, fixed over time, we follow Mundlak (1978), who models the dependency between the permanent firm characteristics, α_i, and other firm characteristics regressors, $Z_{i,t}$, by assuming that α_i is linear in the means of all time-varying covariates.

$$\alpha_i = \theta_2 \bar{z}_{i,j} + \nu_i \qquad (9)$$

Where, ν_i is identically and normally distributed as ν_i ~N(0, σ_ν^2) and is independent of $Z_{i,t}$ and $u_{i,t}$ for all *i* and *t*, and $\bar{z}_{i,j}$ is a vector of means of the time-varying covariates of a firm over time.

The initial conditions problem, on the other hand, refers to the fact that we observe a firm's export status from year 1 to T, but the estimation of equation (8) does not allow modelling the first year of export decision. However, $y_{i,0}$, the export decision of the first year cannot be treated as exogenous because it depends on α_0 which in itself is correlated with $u_{i,t}$ (Heckman, 1981b). If not accounted for, this will lead to inconsistent estimates.

Based on the work of Blundell and Smith (1991) and Orme (1997), a two-stage approach estimator can be adopted, that yields more reliable estimates than models that ignore the initial conditions. In *the first stage* a random effects probit for the *j* initial observations is estimated as follows:

$$y_{i,j} = \lambda' \Gamma_i + \mu_i \qquad t=j \text{ and } j=1, 2 \qquad (10)$$

where Γ_i is a vector of exogenous regressors that include firm characteristics $Z_{i0, \ldots\ldots} Z_{iT}$ as recommended in Blundell and Bond (1995). In addition, α_i *and* μ_i are assumed to be bivariate normal, i.e., (α_i, μ_i)~BVN(0,0,1,1, ρ), where ρ is the correlation between α_i and the initial observations *j*. From the first stage, the probit generalized residuals are calculated as follows:

$$\hat{e}_{i,j} = (2y_{i,j} - 1)\phi(\hat{\lambda}'\Gamma_i) / \Phi((2y_{i,j} - 1)\hat{\lambda}'\Gamma_i) \quad (11)$$

where $\phi(.)$ *and* $\Phi(.)$ are the standard normal density and distribution function, respectively. Then, in *the second stage*, the probit generalized residuals are included as right hand regressors.

The final equation to be estimated, which accounts for both the initial conditions and firm unobserved heterogeneity is:

$$y_{i,t} = c + \gamma_1 y_{i,t-1} + \gamma_2 \tilde{y}_{i,t-2} + \beta X_t + \theta_1 Z_{i,t} + \delta \hat{e}_{i,j} + \theta_2 \bar{z}_{i,j} + \eta_i + u_{i,t} \quad (12)$$

where η_i are the random permanent firm characteristics. Equation (12) is estimated as a conventional random effects probit.

5. The Data

Before independence, Estonia's trade was heavily oriented towards the Soviet Union, which in 1991 accounted for 94.7% of Estonian exports. Estonia's independence from the Soviet Union in 1991 triggered a wave of reforms such as price liberalization, a DM-backed currency board, full currency convertibility, large-scale privatization with special targeting of foreign investors, a flat 26% income tax, a zero corporate tax and strong bankruptcy laws. The economy grew fast, prices were stable and inflation was under control. Some of the main economic indicators are presented in Table 1. Impressive was also Estonia's speed of integration into the world economy. It reoriented its trade westwards and Finland quickly replaced Russia as its major trading partner (see Table 2). Nevertheless, Russia sill remained among the first five trade partners. In August 1998, Russia experienced a financial crisis as the Central Bank floated the currency and declared inability to pay off the debts. The fact that Estonia had the most open economy compared to the other Baltic countries, with exports amounting to 60% of GDP in 1998, made it vulnerable to international economic developments such as the

Russian crisis. More specifically, the Russian crisis had a strong impact on the Estonian economy and trade. The depreciation of the ruble caused a reduction in domestic private consumption, which, in turn, caused a drop in Estonian exports to Russia from 12.3% in 1998 to 5.2% in 1999, as reported in Table 2. Consecutively, in 1998, Estonia experienced a current account deficit of 8.6% of GDP, which narrowed to 7% in 1999. Hence, the crisis substantially reduced the export growth[8].

This event makes Estonia a very good conduit for testing the effect of the sunk cost hysteresis on export market participation. To this end we employ a rich data panel, which contains detailed information on firm exports, ownership structure and financial situation and it consist of annual firm-level observations for 1994 through 1999. The data are derived from a large and representative sample of 666 firms that cover all the economic sectors and are assembled from diverse sources including company records and a series of ownership surveys that were undertaken by the authors. Prior to using the data, a series of consistency checks is performed and inconsistent data is left out[9]. The sample used in estimation includes firms with at least 10 employees and consists of 2335 firm observations of which 420 in 1994, 454 in 1995, 430 in 1996, 394 in 1997, 334 in 1998 and 303 firms in 1999[10]. Variable definitions, their means and standard deviations as well as a matrix of correlations of our main variables are presented in Tables 3, 4, and 5 in the appendix.

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[8] However, the Russian crisis had no significant impact on the FDI flows. In 1998, Estonia received almost twice the amount of FDI than in 1997. This was mainly the result of heavy investments of Swedish investors in the two biggest Estonian banks. Furthermore, in the first quarter of 1999, FDI flows to Estonia amounted to 1.95 billion USD, an amount 21% higher than in the previous year. This makes Estonia the second leading recipient of FDI per capita among CEEC countries after Hungary.

[9] We check for inconsistencies using different criteria. For instance, a firm's capital at the beginning and end of each year should be positive; sales should be positive; labor cost in a given year should be positive; average employment per year should be positive and equal or greater than 10; investment in new machines and equipment should be non-negative; and the ownership shares should add up to 100.

[10] The different number of firms over years is the result of firms entering and exiting the sample. The reason may be bankruptcy, merger or firms choosing not to report in a given year.

Table 3 & 4 & 5 approximately here

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A common problem with data over time is that for a given year, data are expressed in current prices. This makes it important to control for inflation by expressing all data in real terms. Hence, all variables are deflated to 1993 prices with the two digit PPI deflator. Furthermore, we define five ownership groups using the dominant owner classification: employee owned, manager owned, foreign owned, state owned, and outsider owned firms. We classify a firm in one of the dominant ownership groups if the share in equity owned by a specific group for that year is greater than that owned by any other group.

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Table 6 approximately here

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Table 6 describes the distribution of exporters according to industry classification and over time. We observe that in 1994, the beginning of the sample, exporters are located mainly in food products, textile products, wood products, furniture and wholesale trade sectors. The number of exporters in these sectors seems to slightly decrease over time, however, their share (the ratio of exporters to the total number of firms in these sectors) remains quite high.

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Table 7 approximately here

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Table 7 shows the means of selected variables for exporting and non-exporting firms at the beginning and the end of the sample period. Clearly, this table shows that

exporting firms are larger in size, pay higher wages and are more than non-exporting firms. In addition, although exporting firms start as less capital intensive in 1994, in 1999 they become almost twice as capital intensive as non-exporting firms.

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Table 8 approximately here

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Table 8 shows the distribution of exporting and non-exporting firms over time. The ratio between them is relatively constant over the whole sample period, with the share of exporting firms being no less than 60% of each year's sample. Due to the unbalanced nature of our sample the results in Table 8 are affected by the entry and exit of firms in the sample. Consequently, the decrease in the number of exporting firms over time cannot be interpreted as the decision of firms to exit the export market. In order to look at persistence of firms in the export market, one has to focus on those firms that are present over the whole period. In our sample there are 176 firms that are present over the period 1994 through 1999.

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Table 9 approximately here

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Table 9 illustrates export persistency, entry and exits in and from the export market over time, for the balanced panel. The results of Table 9 show that there is strong persistence of firms in the export market, with more than 90% of firms that export in a period being still exporters in the next period. Similarly, around 80% of non-exporters in each period remain non-exporters in the next period. Regarding entry in the export market we see that the number of entrants is highest in 1995-1996 and 1998-

1999, with around 6% of non-exporters becoming exporters, and it slightly decreases in between. In contrast, the exit rates are much higher than the entry rates and the percentage of firms exiting the export market gradually increases over time. The exit rates can reflect either lingering benefits from exporting or the fact that sunk costs are not very significant. However, there is one more explanation. The Russian crisis of 1998 is expected to have affected export behavior of Estonian firms in two ways: first, through changes in the volume of exports and second through changes in the decision to enter/exit the export market. However, Table 9 shows that, although exit rates increase during 1997-1998 and 1998-1999, they are still not much higher than those of the previous years. These facts suggest that the effect of the Russian crisis on Estonian firms has mainly been through the change in the volume of exports rather than on their decision to leave the market at all. This result is in line with that of Campa (2004), who finds that in Spain trade adjustment against exchange rate fluctuations occurred through the adjustment of the volume of exports rather than through changes in the number of exporting firms.

The persistence in the exporting behavior that we see in Table 9 might be caused by sunk costs, as the hysteresis models suggest, or it may be caused by the unobserved firm characteristics. For instance, persistent differences in firm characteristics might explain why some firms export and others don't.

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Table 10 approximately here

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Attempting to discriminate between these two explanations, we turn to Table 10, which displays the firms' export sequence over time for the balanced sample. Each sequence represents the total number of times a firm is observed to participate in the

export market during the sample period[11]. From this table we see that there is substantial serial persistency over time. That is, the majority of firms either export in all of the sample periods or never export. For example, 51 % of firms export the whole period, while 15.9% do not export at all. The rest of the firms display entry in and exit from the export market over time. The frequency of these entry and exits depends to a large extend on the existence of sunk costs. If these costs are important for persistency, we expect to observe sequences in which export and non-export participation are clumped together. For instance, 8.53% of firms in the sample export five consecutive years with non-exporting year being either at the beginning or the end of the sample. Similarly, 3.4 % of firms export four consecutive years, and 4.5 % export three consecutive years. This information suggests that, while there is firm heterogeneity that affects export participation, persistency in the export market is also consistent with the sunk cost hypothesis.

6. The Estimation Results.

Following the discussion in Section 5, the final equation to be estimated includes lags of firm characteristics and the lagged spillover variable, as follows:

$$y_{i,t} = c + \gamma_1 y_{i,t-1} + \gamma_2 y_{i,t-2} + \alpha X_t + \theta Z_{i,t-1} + \delta \hat{e}_{i,j} + \beta \bar{z}_{i,j} + \eta_i + u_{i,t} \qquad (12)$$

We have carried out the estimation first applying the linear probability approach and then the nonlinear probit estimation. The estimation results are reported in Tables 11 and 12 respectively. In both estimation strategies, the firm's current export decision is modeled as a function of the last year's export status, the export status of two years ago, domestic private consumption as a measure of demand conditions in the country,

[11] Number one indicates the case when the firm participates in the export market and zero when firms do not participate in the export market.

firm characteristics such as firm size, labor productivity, capital intensity, labor quality and ownership structure, and export spillover variables. In the linear probit estimation, we estimate three different specifications according to the three spillover variables defined earlier, while in the random effects probit estimation we consider two additional models, namely, with and without the initial conditions.

The results of Table 12 show that across all models the coefficients of the sunk costs are positive and significant, providing thus strong support for the sunk cost hypothesis. That is, having exported last a year ago or two years ago increases the probability of exporting in the current period. This is largely consistent with the sunk costs hypothesis. Model 1 estimates equation (12) forgoing the initial conditions. Not accounting for the initial conditions results in upward biased coefficient estimates of the sunk costs variables $y_{i,t-1}$ and $y_{i,t-2}$. Indeed, the sunk costs coefficients are much larger in Model 1 than in all other estimations, i.e., Model 2 through Model 5. The coefficient estimates of sunk costs through the five different models run between 2.48-1.05 if the firm exported last a year ago and between 0.95-1.44 if the firm exported last two years ago. Furthermore, as predicted, these coefficients are larger in comparison to the sunk cost coefficients of the linear probit estimation (Table 11). The reason is that by first differencing the data we eliminate the unobserved heterogeneity, fixed over time, as well as the problem of initial conditions. As such, the sunk costs coefficients of the linear estimation provide a lower bound of the importance of sunk costs. These sunk cost coefficient estimates range between 0.17-0.19 if the firm has exported last a year ago and between 0.146-0.147 if it has exported last two yeas ago. These coefficient estimates are comparable with those of Bernard and Jensen (2001) and Bernard and Wagner (1998) who find coefficient estimates between 0.52 -0.36 when the firm exported last a year ago and 0.18-0.105 when the firm exported last two years ago.

Regarding the domestic private consumption variable, both the linear probability and random effects estimation show that it significantly affects the decision to export. Its coefficient is negative and significant across the three specifications of the linear probability estimation, but significant only for Models 1 and Model 3 of the random effects estimation. These results imply that, as expected, a decrease in domestic demand for the firms' product pushes the firm to shift output to foreign markets.

With respect to firm characteristics, we find that they are mostly significant at the random effects probit estimation. Among firm characteristics, we see that the larger and the more capital intensive a firm is, the higher its probability of exporting. These results are supported from the argument that large firms can spread their fixed costs of entering a foreign market over more units of production. In addition, as capital intensity is expected to account for differences in technology between exporting and non-exporting firms, capital-intensive firms are expected to have high quality goods, therefore, higher probability of export market participation. Furthermore, ownership structure is important in the firm's decision to export. We find that a firm dominantly owned by foreigners, managers and employees is significantly more likely to export than a state owned firm. Similarly, Bernard and Jensen (2001), Buck et al. (2000) and Roberts and Tybout (1997) find that firm characteristics such as firm size, its age and average labor cost as well as its ownership type increase the probability of exporting for the U.S and Colombian firms.

To account for the possibility of export spillovers, we have included in the regression three spillover variables as well as a control variable for the industry's export activity in the economy. We find that the control variable, the share of industry's export activity to the overall exports of the economy, is significant across all specifications in Table 11, and only in Models 4 and 5 in Table12. The implication of such finding is that firms belonging to export-oriented industries have a higher probability of becoming

exporters, while firms that intend to become exporters should consider locating in export oriented industries. Between the three spillover variables spillovers from MNEs are significant only in the linear probit estimation. That is, the presence of foreign exporting firms in the industry increases the probability of local firms to export. Hence, firms that intend to become exporters will tend to locate near multinational firms. This finding is similar to Aitken, Hanson and Harrison (1997) who also find that export spillovers are associated to multinational activity. Furthermore, the impact of MNEs spillovers on other foreign firms (the interaction of the spillover variables with the foreign dummy) is insignificant. An explanation for this finding is that foreign firms are already export oriented, hence, they have the knowledge about foreign markets and foreign tastes and as such their export decision is not influenced by the exporting activity of the other foreign exporting firms. Indeed, 91.34% of the foreign firms in our sample export the whole period. In the nonlinear probit estimation, out of the three spillover measures only one, the number of exporters in the industry, is significant, however, negative. This indicates that there may be tough competition in the export market, with exporting firms crowding out domestic firms from the export market. In contrast, we find no significant effect of the interaction variables, which suggests that foreign firms do not benefit from export spillovers.

In conclusion, we find strong support for the sunk costs hypothesis, in that, if a firm exported last year, or exported last two years ago is an important determinant of today's export market participation. That is, a firm that was exporting a year ago is more likely to keep exporting the current year and although this effect depreciates for the firm that was last seen exporting two years ago, it still remains significant and positive. Furthermore, firm characteristics such as labor productivity, capital intensity, firm size and ownership structure also increase a firm's probability to be exporter. In addition, we find evidence that operating in an export-oriented industry increases the

probability of becoming exporter. Finally, there is some evidence on export spillovers as spillovers from MNEs significantly increase local firms' probability to become exporter, while the number of other exporters in the industry negatively affects export market participation, indicating some crowding out of domestic firms from the export market.

The non-linearity of the probit specification makes the economic interpretation of the coefficients difficult. Therefore, we also compute the marginal effects of a change in the independent variables on the probability of exporting. The marginal effects of a regressor on the probability of the dependent variable are calculated as follows:

$$\frac{\partial P(y=1)}{\partial x_i} = \frac{\partial F(x'\beta)}{\partial x_i} = f(x'\beta) * \beta$$

where f(.) is the normal density function calculated at the regressors' sample mean ($\bar{x}$).

Marginal effects, which are reported in Table 13, are calculated for five different groups of firms: a) for all the firms (exporting and non-exporting), b) for firms with past exporting experience, c) for firms with no past exporting experience, d) for firms with exporting experience last two years ago and finally e) for firms with no exporting experience in the last two. The last row of Table 13 shows that the average predicted probability of exporting for the whole sample is 98.6%, it increases to 99.9% for firms with past exporting experience and drops to 5,6% for firms with no past exporting experience. Furthermore, the estimated probability of exporting is 55.4 % for firms that have exported last two years ago and drops to 2.45% for firms that haven't been exporting in the last two years. Hence, the probability to export for a firm that hasn't been in the export market during the last two years is very low.

The marginal effect of capital intensity shows that if capital intensity increases by 10%, the probability of exporting increases by 0.13% for all the firms, by 0.0018%

for firms with past exporting experience, by 0.0058% for firms with past exporting experience and by 1.7% for firms that have been exporting last two years ago. Similarly, if firm size increases by 10 employees then the probability of exporting for all the sample increases by 0.16% and by 0.0022% for firms with past exporting experience and by 2.11% for firms that have been exporting last two years ago. The marginal effects of firm ownership structure reveal that, for instance, if foreign ownership increases by 10%, the probability of exporting increases by 0.19% for all the sample of firms, by 0.0029% for firms with past exporting experience and by 3.84 % for firms that have exported last two years ago. The same change in probabilities of exporting for firms owned by managers and employees are 0.16% and 0.17% for all firms, 0.002% and 0.0018% for those with past exporting experience and 3.15% and 3.67% for those that exported last two years ago. Hence, the longer the firm has been in the exporting market, the higher the marginal effect/elasticity of its firm characteristics on its probability to export. In other words, the firm becomes very responsive to changes in its characteristics such as firm size or capital intensity.

Finally, an increase in the number of other exporters in the industry reduces the probability of exporting by 0.09% for all the firms, by 0.0056% for firms with past exporting experience and by 0.46% for firms that have been exporting last two years ago. Obviously, the impact is stronger for firms that have been exporting longer. This supports our argument that as new exporters enter the export market they may steal away market shares from existing exporters.

7. Conclusions

In this paper we investigate the importance of sunk costs, firm characteristics and spillovers on a firm's decision to export. Empirical analysis involves the estimation of a non-structural, discrete choice, dynamic model with firm heterogeneity. To this end

we use a panel of data of Estonian firms over the period 1994-1999. Our findings provide strong evidence of the importance of sunk costs in the export market participation. That is, a firm's exporting history significantly affects the likelihood of remaining in the export market. This conclusion, in our analysis, is robust across all specifications. In addition, the average predicted probability of exporting is highest for firms with past exporting experience and is more than 50% for firms that have been observed exporting last two years ago. In contrast, the probability of exporting for firms that haven't been in the export market during the last two years is very low.

While there is strong evidence that sunk costs are a significant source of export market persistence, observable firm characteristics also contribute to a firm's exporting decision. For instance, larger firms and with higher capital intensity are more likely to export. Furthermore, a firm dominantly owned by foreigners, managers and employees is more likely to export than a state owned firm.

We find some evidence of spillovers in the linear estimations, while there is no evidence of spillovers in the nonlinear estimations. In the later estimation, we even find that one of the spillover variables measured as the number of exporters in the industry, is negative and significant. However, both estimations reveal that operating in an export-oriented industry increases the likelihood of exporting.

The results of this paper also suggest that export-promoting policies undertaken by the government in Estonia should distinguish between policies that aim at expanding the export volume of existing exporters and those policies that promote entry of new firms into the export market. The entry of new firms into the export market can be promoted by reducing the sunk costs and uncertainty in accessing the export market. This would be possible if the government divulges information about potential export markets and developing the export infrastructure. Furthermore, if when entering the export market firms find it possible to expand their export volume, then promoting the

entry of new firms in the export market is a more effective policy than the one aiming at expanding the export volume through subsidies. Finally, given that operating in the export-oriented industries increases the likelihood for exporting then the government should promote these industries as possible supporters of economic growth.

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Appendix

Table 1: Estonian economic indicators

Economic Indicators	1994	1995	1996	1997	1998	1999
GDP growth, %	-2	4.3	3.9	10.6	4.7	-1.1
Inflation, % end of year	41.7	28.9	14.8	12.5	6.5	3.9
Unemployment, end of period	5.1	5	5.5	4.6	5.1	6.5
Exports, USD million	1211	1660	1764	2275	2674	2439
Imports, USD million	1557	2398	2876	3516	3928	3430
Current account balance, % of GDP	-7.2	-4.4	-9.2	-12.1	-9.2	-5.8

Source: Estonian Statistical Office, Bank of Estonia.

Table 2: The main trade partners in Estonian exports (% of total)

Country	1995	1996	1997	1998	1999
Exports to:					
Finland	23.5	20.8	18.9	22.1	22.7
Sweden	11.8	13.2	17	19.5	22
Germany	7.3	7.3	6.5	6.1	8.3
Latvia	7.5	8.2	8.3	8.3	8
Russia	16.3	14.1	16.3	12.3	5.2

Source: Bank of Estonia

Table 3: Variable Definition

Variables	Definition
Export market participation	The dependant variable is a dummy equal 1 for all firms with positive exports, and 0 otherwise.
Exported last period	Is the first lag of the dependent variable.
Exported last two periods ago	Is a dummy variable equal to 1 if the firm was seen exporting last two periods ago, and zero otherwise.
Employment	Firm's average number of employees per year. Available at firm level.
Firm size	Is constructed as the logarithm of firm's average number of employees per year. Available at firm level.
Capital	Capital is calculated as the average of fixed assets at the beginning and end of year. Expressed in thousands of kroons. Available at firm level.
Capital/Labor	The ratio of Capital to Employment, measures firms' capital intensity. Available at firm level.
Dominant Ownership	This is a dummy equal to 1 if the share in equity owned by a group for that year is greater than the share in equity owned by any other group.
Average Labor Cost	Used to proxy labor quality. Expressed in thousands of kroons. Available at firm level.
Sales	Net sales are expressed in thousands of koorun. Available at firm level.
Sales/L	The ratio of net sales is used to proxy for labor productivity. Available at firm level.
Exports	Are the value of exports. Expressed in thousands of kroons Available at firm level.
Spillover Variables (a, b, c)	
a) Nr. of exporters in the industry	The overall number of exporters in each industry. This variable is constructed at the *Industry Level*, and is a proxy for export spillovers from nearby exporters in the sector.
b) The nr. of foreign exporters in the industry.	The number of foreign exporters in each industry. This variable is constructed at the *Industry Level*, and is a proxy for export spillovers from nearby exporters in the sector.
c) MNE Export Spillovers	The share of foreign firms' exports to the industries' exports. This variable is constructed at the *Industry Level*, and, again, proxies for export spillovers from nearby exporters in the sector. It is calculated as below: $MNE\ Export\ spillover_{j,t} = \sum_j E_{f,t-1} / (\sum_j E_{d,t-1} + \sum_j E_{f,t-1})$
Private Consumption	Is the consumers consumption after subtracting the government consumption, net value of export and import and fixed investment from the gross domestic product.
d_t	Time dummies: Included to account for economy wide shocks.
d_j	Industry dummy, constructed on a two-digit level ISIC/NACE industry classification

Note: Except for a), b), c) and d) all other variables are available at the firm level.

Table 4: Mean and standard deviation of main variables.

Variable	Nr. Obs	Mean	St. Dev
Employment	2332	153.5858	415.281
Net Sales	2335	25595.41	65418.32
Value Added	2335	5174.043	15160.65
Exports	2335	7922.083	25204.57
Capital/Labor	2332	56.34414	185.8232
Avg. Labor Cost	2332	26.58465	26.83318
Nr. Of Foreign Exporters	2335	4.59743	3.448208
Foreign Firms' share in Exports	2311	0.233603	0.279102

Note: All variables are deflated to the 1993 prices.

Table 5: Matrix of correlation of main variables.

	MNE Spillover	Share of Industry Exports in Economic Activity	Nr. Exporters	Labor Productivity	Capital Intensity	Firm Size	Avg. Labor Cost
MNE Spillover	1						
Share of Industry Exports in Economic Activity	0.249	1					
Nr. Exporters	-0.0045	0.2705	1				
Labor Productivity	0.2022	0.0414	0.2542	1			
Capital Intensity	0.2803	0.1838	0.0575	0.5173	1		
Firm Size	0.0427	0.2501	0.0024	0.0417	0.2	1	
Avg. Labor Cost	0.3024	0.1398	0.0561	0.5784	0.4957	0.0467	1

Table 6: Sample distribution of Exporters and overall firms according to industry classification.

Year	**94**		**95**		**96**		**97**		**98**		**99**	
Industry	**Export**	**Total**	**Export**	**Total**	**Export**	**Total**	**Export**	**Total**	**Export**	**Total**	**Export**	**Total**
Agriculture, Forestry, Fishing	13	38	12	29	7	23	11	24	9	21	6	16
Mining&Quarrying	10	14	12	17	8	13	10	15	8	13	8	13
Manufacturing												
food products	24	38	38	55	37	55	33	50	31	44	25	39
textile products	17	21	26	30	24	27	23	26	19	20	17	19
leather products	6	7	6	8	7	7	5	6	6	6	6	6
wood products	18	24	23	25	18	21	15	17	14	16	11	13
pulp & paper	13	24	9	18	10	19	9	16	6	13	9	14
coke, petroleum products & nuclear fuel	0	1	1	2	1	2	0	2	0	1		
chemical products	11	11	10	10	10	10	10	11	8	8	8	8
rubber and plastic products	9	11	8	8	7	7	7	7	6	6	4	6
other non-metallic products	13	15	16	19	16	18	16	18	14	17	13	15
basic metal products	12	15	15	19	18	21	13	18	13	16	11	14
machinery & equipment	12	21	15	22	15	21	14	18	11	15	13	16
electrical and optical equipment	16	19	16	17	19	22	18	20	14	16	13	14
transport equipment	11	11	10	10	10	11	9	10	7	9	4	6
furniture	28	31	18	23	16	19	15	17	12	14	13	13
Electricity, Gas and Water supply	1	15	1	17	0	15	1	9	0	5	1	3
Construction	15	37	18	44	19	45	17	45	17	40	15	35
Wholesale Trade	34	42	29	47	28	44	24	39	22	33	19	30
Retail Trade	5	25	10	34	9	30	8	26	5	21	6	23
Total	268	**420**	293	**454**	279	**430**	258	**394**	222	**334**	202	**303**

Table 7. Means of Selected Variables for Exporters and Non-exporters at the Beginning and the End of the Period

Year	1994		1999	
Variables	Exporters	Non-exporters	Exporters	Non-exporters
Employment	225	54	150	61
Wage Salary	4113.876	908.3865	4333.934	1373.988
Productivity (Sales/L)	219.364	85.39755	273.1146	146.8218
VA/L	36.59811	10.70839	55.06947	7.834387
K/L	46.7814	54.05512	93.79471	46.97879
Maximum Number of Observations	268	152	202	101

Table 8. Number of Exporting and Non-exporting Firms Over Time

Year	Exporting	Non-exporting	Total
1994	268	152	420
1995	293	161	454
1996	279	151	430
1997	258	136	394
1998	222	112	334
1999	202	101	303

Table 9: Export Persistence, Entrants and Exits from the Export market.

(Balanced panel)

T	**t+1**	**94-95**	**95-96**	**96-97**	**97-98**	**98-99**
Non-Exp	Non-Exp	84.78	82.61	82.98	80.77	80
	Export (Entrants)	3.85	6.15	5.43	4.03	6.61
Exporters	Non-Exp (Exits)	15.22	17.39	17.02	19.23	20
	Export	96.15	93.85	94.57	95.97	93.39

Table 10: Export Transitions over Time.

Sequences	Freq.	Percentage
000000	28	15.90909
000001	1	0.568182
000010	2	1.136364
000100	1	0.568182
001000	2	1.136364
010000	3	1.704545
100000	1	0.568182
000011	2	1.136364
000110	1	0.568182
011000	1	0.568182
110000	2	1.136364
100001	1	0.568182
000111	4	2.272727
001101	1	0.568182
101100	1	0.568182
111000	4	2.272727
111010	1	0.568182
101011	1	0.568182
101101	1	0.568182
101110	1	0.568182
110101	2	1.136364
111001	1	0.568182
111100	6	3.409091
011111	7	3.977273
101111	1	0.568182
110111	1	0.568182
111101	1	0.568182
111110	8	4.545455
111111	90	51.13636
Total	176	100

Table 11: A Linear Probability Estimation with Instrumental Variables. The Decision to Export With Sunk Costs and Firm Characteristics.

Variables	**Model 1**	**Model 2**	**Model 3**
Exported Last period	0.18**	0.17**	0.19**
	(2.53)	(2.43)	(2.56)
Exported Last two periods ago	0.147*	0.146*	0.146*
	(4.57)	(4.61)	(4.74)
Private Consumption $_t$	-0.69**	-0.62**	-0.6**
	(-2.54)	(-2.38)	(-2.37)
Average Labor cost$_{t-1}$	0.048	0.053	0.049
	(1.26)	(1.37)	(1.29)
Labor Productivity$_{t-1}$	0.044	0.042	0.04
	(1.36)	(1.31)	(1.21)
Capital Intensity$_{t-1}$	0.0074	0.0067	0.0094
	(0.34)	(0.32)	(0.44)
Firm Size$_{t-1}$	0.084***	0.084***	0.083***
	(1.65)	(1.66)	(1.67)
Dummy D. Foreign$_{t-1}$	0.072	0.15***	0.14***
	(0.73)	(1.78)	(1.68)
Dummy D. Manager$_{t-1}$	0.0061	-0.0024	0.0029
	(0.11)	(-0.04)	(0.05)
Dummy D. Employee$_{t-1}$	0.074	0.065	0.066
	(1.43)	(1.31)	(1.34)
Dummy D. Domestic$_{t-1}$	0.0066	-0.00061	-0.0041
	(0.16)	(-0.02)	(-0.11)
Nr. of Exporters$_{t-1}$	0.0022		
	(0.69)		
Nr. Of Exporters *	-0.00105		
Dummy Foreign	(-0.21)		
Nr. of Foreign Exporters$_{t-1}$		0.0037	
		(0.56)	
Nr. Of Foreign Exporters *		0.017	
Dummy Foreign		(1.38)	
MNE Spillover$_{t-1}$			0.12***
			(1.91)
MNE Spillover$_{t-1}$*			0.086
Dummy Foreign			(0.51)
Share of Export Activity $_{t-1}$	1.86**	1.72**	1.36***
	(2.26)	(2.09)	(1.65)
Time Dummies	Yes	Yes	Yes
Number of Observations	704	704	704
F-Test	1.78**	1.69**	2.2*
(joint significance of coefficients)	(0.031)	(0.045)	(0.0048)

Note: * is significant at 1%, ** is significant at 5% and *** significant at 10% significance level

Table 12: A Random Effects Probit Estimation of the Export Market Participation Accounting for Firm Heterogeneity and Initial Conditions.

Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Exported Last period	2.48*	1.22*	1.99*	1.055**	1.05**
	(12.09)	(2.57)	(7.5)	(2.07)	(2.11)
Exported Last two periods ago	1.44*	0.97**	1.23*	0.95**	0.96**
	(4.68)	(2.41)	(3.8)	(2.2)	(2.2)
Private Consumption $_{t}$	-6.97**	-7.15	-10.34**	-8.81	-9.01
	(-1.6)	(-1.32)	(-2.17)	(-1.53)	(-1.56)
Average Labor cost$_{t-1}$	-0.25	-0.24	-0.35	-0.36	-0.35
	(-1.01)	(-0.7)	(-1.35)	(-0.93)	(-0.91)
Sales per Employee$_{t-1}$	-0.026	-0.0086	-0.017	0.03	0.025
	(-0.14)	(-0.03)	(-0.08)	(0.1)	(0.08)
Capital Intensity$_{t-1}$	0.27***	0.43**	0.30**	0.44**	0.438**
	(1.91)	(2.24)	(2.08)	(2.16)	(2.13)
Firm Size$_{t-1}$	0.32***	0.53***	0.28	0.56***	0.55***
	(1.77)	(1.77)	(1.5)	(1.74)	(1.71)
Dummy D. Foreign$_{t-1}$	0.82**	1.11***	1.048**	1.05	1.16***
	(2.07)	(1.82)	(2.14)	(1.4)	(1.68)
Dummy D. Manager$_{t-1}$	0.57***	0.86***	0.63***	0.95***	1.01***
	(1.81)	(1.8)	(1.89)	(1.78)	(1.87)
Dummy D. Employee$_{t-1}$	0.77**	1.14**	0.92**	1.25**	1.29**
	(2.19)	(2.14)	(2.41)	(2.11)	(2.18)
Dummy D. Domestic$_{t-1}$	0.22	0.16	0.15	0.16	0.19
	(0.74)	(0.37)	(0.5)	(0.36)	(0.41)
Nr. of Exporters$_{t-1}$			-0.12*		
			(-2.65)		
(Nr. Of Exporters * Dummy Foreign) $_{t-1}$			-0.0058		
			(-0.33)		
Nr. of Foreign Exporters$_{t-1}$				-0.023	
				(-0.27)	
(Nr. Of Foreign Exporters * Dummy Foreign) $_{t-1}$				0.041	
				(0.34)	
MNE Spillover$_{t-1}$					0.063
					(0.12)
(MNE Spillover * Dummy Foreign) $_{t-1}$					0.17
					(0.25)
Share of Export Activity $_{t-1}$			17.16	27.1***	26.7***
			(1.4)	(1.67)	(1.65)
Initial Condition (η_0)		1.32*	0.58*	1.58*	1.59*
	-	(2.6)	(3.74)	(2.62)	(2.66)
Industry Dummies	Yes	Yes	Yes	Yes	Yes
Time Dummies	Yes	Yes	Yes	Yes	Yes
Number of Observations	704	704	704	704	704
χ^2 **-test**	222.63	89.71	82.6	73.13	71.84
(joint significance of coefficients)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Note: A constant and mean –firm level characteristics are included in all estimations.
*, **, *** significant at 1%, 5% and 10%, respectively.
z-statistics in parenthesis

Table 13: The Marginal Effects.

Variables	All Firms	With Past Export Experience ($y_{i,t-1}$=1)	With No Past Export Experience ($y_{i,t-1}$=0)	With Exporting Experience of last, two years ago ($\tilde{y}_{i,t-2}$=1/ $y_{i,t-1}$=0)	Have Not Exported in the last two years ($\tilde{y}_{i,t-2}$=0/ $y_{i,t-1}$=0)
Private Consumption $_t$	-0.2170	-0.00295	-0.8037	-2.828	-0.4239
Average Labor cost$_{t-1}$	-0.0075	-0.00010	-0.0276	-0.097	-0.0146
Labor Productivity$_{t-1}$	-0.0003	0.00000	-0.0010	-0.003	-0.0005
Capital Intensity$_{t-1}$	0.0131	0.00018	0.0484	0.170	0.0255
Firm Size$_{t-1}$	0.0162	0.00022	0.0600	0.211	0.0316
Dummy D. Foreign$_{t-1}$	0.019	0.00029	0.2441	0.384	0.168
Dummy D. Manager$_{t-1}$	0.0168	0.0002	0.144	0.3151	0.084
Dummy D. Employee$_{t-1}$	0.0176	0.00018	0.2	0.367	0.1165
Dummy D. Domestic$_{t-1}$	0.0045	0.00006	0.0186	0.0622	0.0099
The Spillover Variables[12]					
Nr. of Exporters$_{t-1}$	-0.0099	-0.00056	-0.014	-0.046	-0.0088
Nr. Of Exporters * Dummy Foreign	-0.0005	-0.000028	-0.00073	-0.00231	-0.00044
Share of Export Activity $_{t-1}$	1.470	0.08222	2.145	6.813	1.3035
Nr. of Foreign Exporters$_{t-1}$	-0.00031	-1.37E-06	-0.0023	-0.009	-0.0011
Nr. Of Foreign Exporters * Dummy Foreign	0.00055	2.43E-06	0.004	0.0159	0.00194
Share of Export Activity $_{t-1}$	0.3624	0.00161	2.698	10.562	1.2876
MNE Spillover$_{t-1}$	0.00098	5.24E-06	0.006	0.0243	0.0029
MNE Spillover$_{t-1}$* Dummy Foreign	0.0028	0.000015	0.0171	0.068	0.00812
Share of Export Activity $_{t-1}$	0.42	0.0022	2.61	10.41	1.2387
The Predicted probability of Exporting ($\bar{x}'\beta$)	0.986	0.999	0.056	0.554	0.0245

[12] The marginal effects for the spillover variables are estimated from the respective estimated equations of Table 12, Models 3-4-5.