Does Exporting Increase Productivity? Firm Level Evidence from Slovenia*

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Abstract

This paper adds a new dimension to the recent literature on relationship beween firm's heterogeneity, exporting and productivity gains form exporting, namely the importance of the heterogeneity of foreign markets. Exploiting a rich and complete dataset for Slovenian exporting firms in the period 1994 - 2002, we demonstrate that, on average, exporting firms are not always more productive than firms supplying only domestic market. When controlling for the heterogeneity of export markets, we are able to confirm a conjecture that higher productivity level is required for firms starting to export to advanced countries as opposed to starting to export to developing countries. Furthermore, we show that for firms in a small open country exporting *per se* does not warranty productivity gains. Significant productivity gains occur only when serving advanced, high-wage foreign markets. This demonstrates that learning from exporting may well depend on the extent of competitive pressures firms are faced with in heterogenous export markets.

JEL Classifications: D24, F14

Key Words: Exports, Productivity, Firm Heterogeneity, Export Market Heterogeneity

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1 Introduction

Pioneering papers by Bernard and Jensen (1999a, 1999b), Bernard, Eaton, Jensen and Kortum (2003) and Pavčnik (2002) have brought into focus exceptional performance of exporting firms in terms of labor productivity, wages and size, demonstrating heterogeneity of firms within sectors. Recent theoretical work (Montagna, 2001) and evidence (Clerides, Lach and Tybout, 1998; Pavcnik, 2002; Tybout, 2003) introduce heterogeneity of firms into standard monopolistic competition models with increasing returns. Melitz (2003) provides a general equilibrium model showing that firms self-select into export markets, i.e. only more efficient firms can bear fixed entry costs in the export markets. Helpman, Melitz and Yeaple (HMY, 2004) extend the model in order to demonstrate that - given equal trade and investment opportunities within sectors - the least productive firms serve only the domestic markets, more efficient firms export, and most efficient serve foreign markets both through exports and FDI. Head and Ries (HR, 2003) generalize the model allowing for differences in size and factor costs (i.e. wages) between countries. They show that allowing for low-cost foreign production can reverse the HMY prediction, i.e. also low productivity firms may engage in FDI in low-wage countries but not in high-wage countries. That is, only high productivity firms may export and engage in FDI in a wide range of countries. A study by Eaton, Kortum and Kramarz (2004) confirms this finding indirectly by showing that number of firms that serve markets is a declining monotonic function of number of export markets. In this paper, we provide direct evidence that number of export markets that firms serve increases with firms' productivity levels and, in addition, show that heterogeneity of export markets matters, i.e. low productivity firms may enter only less competitive foreign markets.

A related issue that has recently been studied less extensively is the importance of productivity improvements related to penetration of foreign markets either through exports or outward FDI. Melitz (2003) builds a model based on motivating evidence that productivity growth is generated by shifts in market shares between firms in the same sector (compare Foster, Haltiwanger and Krizan, 1998, and Bernard and Jensen, 1999b). Melitz (2003) assumes explicitly that productivity improvements occur through within-sector market shifts of shares (triggered by trade) towards more productive exporting firms "...without necessarily affecting intra-firm efficiency". This is a very strong assumption and we are aimed at challenging it by providing evidence that intra-firm productivity improvements from starting exporting can be enormous, while within-sector market share redistribution is less or not important at all.

This paper has an advantage of using a rich and complete firm-level dataset for Slovenia for the period 1994-2002 that allows us to differentiate between firms' operations in different foreign markets. We confirm some of the above theoretical considerations and evidence, but at the same time, we offer several new insights.

First, we reaffirm the importance of fixed entry costs in foreign markets. Heterogenous fixed entry costs generate a positive relationship between number of foreign markets served by firms and their productivity levels. In addition, we show that a firm starting to export does this only gradually - on average firms penetrate one market every two years. Second, we demonstrate that exporting firms are not necessarily more productive than domestic firms. While it is obvious that higher productivity level is required to start exporting to advanced countries, this is not the case for firms that start exporting to less-developed countries. Finally, we demonstrate that firms can gain significant productivity improvements from serving foreign markets, although this finding again depends on the type of foreign market served. We find no continuous productivity improvements from exporting but a rather limited upward shift in productivity that accrues only to those firms serving more competitive, advanced foreign markets. This result is in line with findings of Greenaway, Gullstrand and Kneller (2003) who show remarkable similarity of performance characteristics between Swedish exporters and non-exporters.

In the next section, we shortly review related empirical literature and present the theoretical framework underlying our empirical exercise. In the third section, we describe the basic features of dataset used in empirical exercise and provide the evidence on relative productivity of exporting and non-exporting firms. In the fourth section we examine the self-selection of heterogenous firms into heterogenous export markets. In the fifth section, we provide some empirical tests of productivity improvements related to exporting. The final section concludes.

2 Related empirical studies

Bernard and Jensen (BJ, 1999a), Bernard, Eaton, Jensen and Kortum (BEJK, 2003) and Pavčnik (2002) provide evidence on superior performance of exporting firms relative to non-exporting firms in terms of productivity, average wages and size. Clerides, Lach and Tybout (CLT, 1998) demonstrate that when firms' bear the burden of sunk costs when starting to export, only more productive firms decide to do so. Using the data for Colombia, Mexico and Morocco, they show that causality runs from productivity to export status: more productive firms, in fact, self-select into export markets. In a similar vein, these conclusions are also valid for U.S. (BJ, 1999) and for Taiwan (Aw, Chung and Roberts, 2000).

Roberts and Tybout (1997) and BJ (1999a, 2001) develop a dynamic model of export decision for a profit maximizing firm that faces significant sunk cost when penetrating foreign markets. Let us consider the version of export decision model provided by BJ (2001). A firm decides to export ($X_{it} = 1$) only if it expects positive future profits from entering foreign markets, i.e.:

$$X_{it} = \left\{ \begin{array}{l} 1 \text{ if } \; p_t q_{it}^* + M_{it} - [c_{it}(E_t, Z_{it}|q_{it}^*) - N \cdot (1 - X_{it-1})] > 0 \\ 0 \text{ otherwise} \end{array} \right\}, \qquad (1)$$

where p_t is a market price of exporting good, q_{it}^* is output sold abroad, c_{it} is associated variable cost of production which depends on external factors E_t and firm-specific factors Z_{it}. N is entry cost into export markets. The entry cost is modelled as a sunk cost since a firm does not have to pay this entry cost again in the period t if it already exported in the previous period, i.e. if $X_{it-1} = 1$. BJ (2001) allow also for potential productivity improvements generated by exporting, i.e. learning-by-doing in producing the export goods.[1] Total profits from exporting perceived by the firm, hence, depend on the sum of current profits and potential productivity improvements from exporting $(p_t q_{it}^* + M_{it})$, where M_{it} denotes these additional profits.

Previous studies find that firm heterogeneity (i.e. firm-specific factors concentrated in Z_{it}) plays a crucial role in the firm's decision to enter foreign market through exporting. Aitken, Hanson, and Harrison (1997) find that plant size, wages, and foreign ownership are positively related to the decision to export. Roberts and Tybout (1997) also find that the plant size, the plant age, and the extent of foreign ownership positively affect firm's decision to export. BJ (2001), in addition, find evidence of positive impact of firm size, wages and introduction of a new product on firm exporter status, but past export success is probably the best plant level indicator of future exporting. Among external factors E_t, BJ (2001) find that favorable exchange rate shocks increase firm's propensity to export, but they find no impact of geographic or industry spillovers, and no effect of state export promotion on exporting.

Another stream of research has recently started to examine firm's decision to serve foreign markets through either exports or outward FDI. Helpman, Melitz and Yeaple (HMY, 2003) develop a model of firm's choice between exports and horizontal FDI. They are the first to consider the heterogeneity in productivity (after controlling for capital intensity) as a key factor in firm's decision whether to supply only domestic market or to supply also foreign market either through exports or FDI. Firms decide between these three options depending on their productivity. Least productive firms that do not exit serve only domestic market, more productive firms serve both domestic market and foreign market through exports, and the most efficient firms serve foreign markets only through foreign affiliates.

They provide a simple evidence of this pattern, regressing labor productivity y (value added per employee) on industry dummies S_k, capital intensity k (capital per employee), total capital K and its square K^2, and on dummy variables

[1] The expected gains from future productivity improvements are given by: $M_{it} > 0$ if $\delta E_t[V_{it+1}(\cdot)|q_{it}^* > 0] > \delta E_t[V_{it+1}(\cdot)|q_{it}^* = 0]$, where $V_{it}(\cdot)$ is the corresponding value function.

D_{EXP} and D_{OFDI} that assume 1 if a firm is exporter and has a foreign affiliate, respectively, and 0 otherwise

$$\ln y_i = \alpha_0 + \alpha_1 \ln k_i + \sum_k \alpha_{2k} S_k + \alpha_3 \ln K + \alpha_4 \ln K^2 + \alpha_5 D_{EXP} + \alpha_6 D_{OFDI}. \quad (2)$$

Their results confirm predicted ranking of firms' productivity, that is $0 < \alpha_5 < \alpha_6$. In particular, they find that firms with FDI have 15% higher productivity than firms that serve foreign markets through exports. However, upon their estimates, we cannot infer about the direction of causality. In fact, the causality may run in the reverse direction: firms with FDI may have additional productivity improvements.

Next important contribution in this strand of literature is a paper by Head and Ries (HR, 2003), who generalize the results of HMY by introducing in their model also heterogeneity of factor costs in different countries. An important case that works against HMY is when we are dealing with countries with low costs. According to their model, we can expect that in low-cost foreign countries also low productivity firms may engage in FDI causing that average productivity level of firms with FDI is lower than that of firms with FDI to high cost countries. HR also test the hypotheses stemming from their model using a sample of Japanese firms surveyed in 1989 and find that when host country offers no cost advantage firms with outward FDI are more productive than exporters. They also find that median and third quartile host country incomes tend to rise in step with investing firm's productivity, i.e. low productivity firms are most attracted to relocate production to low-cost foreign country and vice versa.

Another recent important contribution to the field is a study by Eaton, Kortum and Kramarz (EKK, 2004). They demonstrate the importance of fragmented export markets with different fixed entry costs which causes a monotonically declining frequency with which firms serve different number of export markets. While EKK do not put this finding in a context of firm heterogeneity in terms of productivity, it is straightforward to show that only the most efficient firms can afford to serve a large number of export markets.

The latter may be of special importance for firms in developing countries that are due to smaller home markets and weaker competition on average less efficient comparative to their counterparts in advanced countries. An average firm based in a more developed country is more likely to serve foreign markets either through exports or through FDI and can afford to serve more foreign markets than an average firm based in a developing country. Our aim is to show that the decision of firms, based in developing countries, to export crucially hinges (aside to firms' productivity level) on heterogeneity of target foreign markets.[2]

[2]In a separate paper Damijan, Glažar, Polanec and Prašnikar (2004) find a very similar pattern also for foreign direct investments. They show that FDI by Slovenian firms are more likely in less developed countries where lower productivity level is required to enter the market.

It is also our aim to show that required productivity level to enter the markets of developing countries is lower. Hence, only most productive firms decide to start exporting to more developed countries, while at the same time serve more foreign markets. On the other hand, less productive firms, although still above the average, start exporting to less developed countries first and then proceed to serve a more narrow range of countries than their more productive counterparts. Finally, we also aim to demonstrate that productivity improvements are higher from supplying developed countries than from serving less developed countries. In other words, productivity improvements from learning-by-doing are higher from exporting to countries with stronger market competition and more extensive product differentiation.

3 The data

3.1 Description of the dataset

In our work, we use firm-level panel data for all Slovene manufacturing firms active in the period from 1994 to 2002. The dataset contains detailed accounting information as well as detailed information on firms' external trade and capital flows, i.e. exports, imports and foreign direct investment. To the best of our knowledge, such detailed data have not yet been used so far in international trade empirics. Specifically, detailed information on timing of exporting and investments allows us to test directly what are the characteristics of firms as well as the motives driving firms into outward foreign direct investments.

Existing studies use either cross-section data (e.g., HMY, HR) or panel data (e.g. BJ, BEJK) without information on specific export markets or cross-section data with information on specific export markets (e.g. EKK). Naturally, the data limitations also narrow the scope of their analysis. Contrary to these studies, we are able to exploit the panel structure of the firm level data with specific information on direction of trade and capital flows, which enables us to merge it with additional information on export markets. Using these data, we are able to account for differences in entry costs related to either exports or outward FDI and test whether different productivity levels are required to start exporting to different markets. In addition, the panel structure of the data enables us to tackle the omnipresent issue of simultaneity between exporting and investing abroad and firm productivity.

The dataset we use contains complete information on trade and investment flows for all Slovene firms with all countries for the period from 1994 to 2002. While the original database provided by Bank of Slovenia contains 32,021 firms from different sectors, a large fraction of these firms had neither exports nor FDI and 11,155 exported in at least one year. Besides exports 811 firms in our sample had also at least one outward FDI. The database contains around 850,000 entries

as many firms have many observations, depending on number of countries with which firms' have either trading or investment relations. For the purpose of our analysis, we have selected only manufacturing firms (NACE Rev.1 industries 15 - 37) with 10 or more employees in all years of available data. The reason for that is the poor quality of accounting data for extremely small firms. Thus, the database used in estimations contains information on 995 firms (in 1994) and 1,382 (in 2002). In total our dataset contains 352,000 entries, from 23,642 in 1994 to 40,840 in 2002. Note, however, that missing values can reduce the database substantially.

3.2 Some motivating evidence

HMY model predicts that the least productive firms serve only domestic market, firms with intermediate and high productivity levels serve both domestic and foreign market. While firms with intermediate productivity level serve foreign markets through exports, firms with high productivity level serve foreign markets through FDI. Table 1 shows productivity differences in absolute terms (Slovene tolars, constant 1994 prices) between manufacturing firms and mainly confirms the pattern predicted by HMY model also for Slovene firms. Firms with FDI are more productive in terms of value added per employee than just exporters, while exporters became more productive than firms serving domestic market only after 1999. These numbers, are however, not adjusted for productivity differences in different sectors. Therefore we show in Figure 1 productivity figures of the three groups of firms after controlling for sectoral differences in value added per employee. The HMY pattern is here even stronger - productivity advantage of exporting firms with FDI ranges between 8% and 15%, productivity level of just exporters is always close to the sectoral average, while the productivity gap of firms serving only domestic market monotonically increases after 1995 and reaches 20% in 2002.

[Insert Table 1]

[Insert Figure 1]

The only exception from the general pattern predicted by HMY is the feature of productivity advantage of firms serving only domestic markets over firms serving foreign markets through exports in 1995. Since this seems to be a temporary phenomenon related to a large inflow of small, less productive newly exporting firms.

Important insights can be gained also from a regional breakdown of exports. As shown in Table 2, only about 5%, 4% and 1% of exports is directed to Central and Eastern European countries (new EU members), non-European OECD countries and to countries of former Soviet Union, respectively. More than 50%

of exports is directed to EU-15 countries and about one third is being directed to four succeeding countries of former Yugoslavia, demonstrating a strong preference of Slovene firms for members of former common market. Interestingly, though, after 1999 the share of exports to former Yugoslav countries has gained 4 percentage points at the expense of diminished share of exports to EU-15. This can be explained by stabilization of the region of former Yugoslavia and by the fact that Slovenia has signed free trade agreements with three of the four successor states of former Yugoslavia.

[Insert Table 2]

Additional factor in explaining shifts in exports structure can be found in the evidence provided by Damijan (2001) who demonstrates that Slovene exporters can charge up to 100 per cent higher prices for the same product when exporting to countries of former Yugoslavia relative to EU-15 countries. Relatively isolated markets of former Yugoslavia result in less intensive product differentiation, weaker market competition and thus relatively inelastic demand curves which allowed Slovene firms to earn the price premia. Due to weaker market competition and less demanding consumers in the region of former Yugoslavia, exporters to this region may have lower productivity level to that required to start exporting to more advanced markets of EU-15. Hence, many Slovene firms with initially no "exceptional performance" become exporters. This may be important in terms of employing excessive production capacities while it may not lead to significant future efficiency improvements due lower scope for learning-by-exporting. In particular, in the fifth section we show that exports to less developed countries, such as those of former Yugoslavia, does not lead to productivity improvements. We do, however, observe productivity improvements stemming from exporting to advanced countries.[3]

4 The decision to export

In this section we analyze characteristics of exporting firms. After providing some descriptive statistics, we estimate an export decision model. First we replicate the BJ (2001) type of model on a sample of all exporting firms. Since the former exercise is most likely biased due to the simultaneity between productivity and exporting, we then proceed to estimate a model of export decision for first-time-exporters only. In the last part of this section we analyze characteristics of exporting firms deciding to add a new export market.

[3]This finding is confirmed both for the "old" exporters as well as for the "new" exporters (see Section 5 for more details).

4.1 Descriptive statistics

An important contribution of the present work to the literature is the opportunity to study the time, productivity and spatial patterns of the decision to export, which enables us to gain many useful insights before proceeding to empirical estimations. As opposed to the evidence for US firms, exports seems to be a common and persistent phenomenon for firms in a small open economy like Slovenia. Its location in Central Europe implies low trade costs (due to low transport costs) and exports seems to be a natural extension of domestic sales.[4] As shown in Table 3 participation rate in exporting is very high in Slovenia. Around 80 per cent of manufacturing firms with ten or more employees participated in exports in the period 1994-2002.[5] Furthermore, in the early years of our sample there was a large share of firms that started to export. Namely, in 1994 entry rate amounted to 17% of all exporting firms but it reduced significantly to only 4% by the end of the period. On the other hand, the exit rate from exports remained stable at some 4% indicating persistency of export status,[6] while the net gain in number of exporters is getting thinner and thinner.

[Insert Table 3]

Table 1 revealed that exporters differ significantly from non-exporters in terms of labor productivity, even more so after correcting for sectoral differences. It is interesting to take a closer look at these differences in productivity for different types of exporters. Table 4 demonstrates that new exporters have higher productivity levels than established exporters from 1998 onwards by some 4-9%. It is also evident that firms ceasing exporting exhibit lower productivity levels than old exporters up to 20%! As the latter might well be dominated by the scale effect one should check for past productivity levels of firms exiting in the current year. Table A1 in Appendix demonstrates clearly that scale effect is not dominating. Instead, firms that cease to export exhibit significantly lower productivity levels already 2 to 3 years before exit. Furthermore, these firms served on average only one market in the year before exiting exports, while persistent exporters served as many as 9-10 export markets.

[Insert Table 4]

[4]Note that Slovenian firms had preferential treatment in the markets of European Union already after 1992 and completely free of duty from 1997 onwards (with the exception of some "sensitive" goods, such as textiles, steel and agriculture products). In the period 1993-1999 Slovenia signed 32 free trade agreements mostly with European countries with which it conducted 85% of total trade flows by 2000 (see Damijan and Majcen (2003) for further details).

[5]Note that export participation rate among U.S. manufacturers was only 17% in 1987 for firms with more than 200 employees (BJ, 2001).

[6]Average entry rate for US firms in the period 1986-1992 amounted to 14% and exit rate to 10% per year (BJ, 2001) In Columbia these rates amounted to 2.7% and 11%, respectively (Roberts and Tybout, 1997).

New exporters, instead, start exporting on average between 3 and 4 foreign markets in the year of entry. In subsequent years they extend their geographic activities only slowly. On average they gain one additional export market in two years (see Table 5). For example, a firm that started exporting in 1994 by serving 3-4 export markets ended up in 2002 by serving some 6-7 export markets only. This demonstrates the importance of significant fixed entry costs into each single export market.

[Insert Table 5]

If there are significant fixed entry costs in all foreign markets, productivity should play an important role in determining the range of export markets a firm can serve. EKK (2004) indicate a negative relationship between number of exporting markets and number of firms that export, but do not relate the number of markets to which firms export to productivity. Table 6 does this in a very informative way by showing differences in average characteristics of firms that serve differing numbers of foreign markets. Firms that export to more markets are on average more labor productive, more capital intensive and larger in terms of employment. This holds both in absolute as well as in relative terms, i.e. after eliminating sectoral differences. Firms serving only one foreign market have below average labor productivity and capital intensity, and are very small in terms of number of employees. Firms serving 6 to 10 foreign markets have average labor productivity and capital intensity, although slightly smaller in terms of employment. On the other end, firms serving more than 50 foreign markets have labor productivity and capital intensity that is 36% and 25%, respectively, above the sectoral average. At the same time, these firms are on average 9-times larger in terms of employment than respective sectoral averages.

[Insert Table 6]

Descriptive statistics presented above reveal the importance of unobserved heterogeneity of firms, entry costs and heterogeneity of foreign markets for individual firm's decision to export. In what follows, we confront all these factors in an empirical model of decision to export and provide estimates. We first explore the importance of sunk entry costs and then consider the importance of unobserved heterogeneity of firms and export markets.

4.2 Sunk entry costs

The decision to enter foreign markets through exports is inevitably related to the size of entry cost. Dixit (1989) provides a thorough theoretical discussion on its importance, while Roberts and Tybout (1997) and BJ (2001) address this question in an empirical model of decision to export. They model export entry cost as sunk since firms pay these costs only ones. This assumption is empirically

valid as long as we observe export markets as an aggregate and we will maintain it in the first part of our analysis. In the subsequent analysis we also allow for differences in entry costs between different export markets. Naturally, firms pay these sunk costs when entering each of these foreign markets.

First we replicate the BJ (2001) exercise by estimating the theoretical model (1) in a non-structural form:

$$\begin{aligned} X_{it}[1,0] &= \alpha_0 + \alpha_1 X_{it-s} + \alpha_2 ry_{it-1} + \alpha_3 rl_{it-1} + \alpha_4 IFDI_{it-1} \\ &\quad + \alpha_5 OFDI_{it-1} + \alpha_6 n\sec_{jt-1} + \sum_k \alpha_{7,k} T_k + \sum_j \alpha_{8,j} D_j + \mu_i + \varepsilon_{it}, \\ &\quad \varepsilon_{it} \sim N(0, \sigma^2), \end{aligned} \tag{3}$$

where ry_{it-1}, rl_{it-1}, $IFDI_{it-1}$ and $OFDI_{it-1}$ capture firm-specific factors (elements of Z_{it} in (1)), whereby they stand for relative value added per employee (indicating firm productivity), relative firm size in terms of employment,[7] foreign ownership and multinational status of the exporting firm, respectively. More specifically, $OFDI_{it-1}$ is a dummy variable with value 1 if firm has a foreign affiliate in period $t-1$ in any country, and zero otherwise, and $OFDI_{it-1}$ denotes the same whether a firm is foreign owned in a previous year. Variable $n\sec_{jt-1}$ stands for number of exporters in the sector, which aims to capture within-sector spillovers from other exporters. We also include sectoral dummies D_j to control for remaining sectoral effects, and year dummies T_k to control for time-specific economic policy shocks common to all firms. We also include lagged dependent variable in order to get an estimate of the entry costs. BJ (2001) suggest that high value of coefficient for the lagged dependent variable indicates substantial sunk entry cost, while still significant and high coefficient of lagged dependent variable by two years indicates whether the entry sunk costs act like a slowly depreciating investment.

There are several empirical problems associated with the specification of (3) which may result in incorrectly measured lagged dependent variable. First problem refers to unobserved firm-specific effects such as technology, product characteristics, product changes, etc. which are not captured by included firm-specific factors. These effects are most likely highly serially correlated inducing persistency in export behavior and thus leading to overestimated coefficients of entry sunk costs. We control for this by decomposing the error term into a permanent firm-specific effects μ_i and a usual transitory component ε_{it} which is i.i.d distributed with zero mean and variance σ^2.

By doing this we face the problem of choice of an appropriate estimation approach and estimator. Clearly, the specification in (3) contains unobserved firm-specific effects μ_i which are correlated with the observed firm-specific effects.

[7] We use transformed variables (ratio of firm i to sector j) in order to control for sectoral differences.

If this was the only problem, fixed effects estimator would be an appropriate one. The latter, however, has a drawback of producing downward biased and inconsistent estimates for the coefficient on the lagged dependent variable. On the other hand, using OLS or random effects estimator is not appropriate since the assumption of no correlation between the observed firm-specific effects and the error term μ_i is violated, which induces upward biased estimates for the coefficient on the lagged dependent variable (see Wooldridge, 2002, for more details). Having this in mind, we decide to estimate (3) applying both OLS as well as fixed effects estimator in order to get the upper and the lower bound of the estimates for coefficient on sunk entry cost. Most of previous studies used probit or conditional logit estimation approach to estimate this kind of empirical issues. Instead, we decide to follow the BJ (2001) approach of applying a linear probability model which gives us more flexibility in using both the fixed effects estimator as well as different possible instrumental variables approaches.

Third problem related to the choice of estimator is possible simultaneity between lagged export status and unobserved firm heterogeneity. In the above specification of the model we deal with a perfect simultaneity as not only present and lagged export status variables are correlated, but also lagged dependent variable (export status) are assumed to be correlated with present independent variables, and vice versa. Applying OLS estimator to (3) inevitably leads to inconsistent and biased coefficients. OLS estimator will be seriously biased due to correlation of the lagged dependent variable with the individual specific effects as well as with the independent variables. This is due to the fact that X_{it} is a function of η_i in (3), and then X_{it-1} is also a function of η_i. As a consequence, X_{it-1} is correlated with the error term, which renders the OLS estimator biased and inconsistent, even if ε_{it} in (3) is not serially correlated. This holds also whether the individual effects are considered fixed or random (see Hsiao 1986, Baltagi 1995, Wooldridge 2002). There are several ways of controlling for this unobserved heterogeneity and simultaneity. One way is to include exogenous variables into the first-order autoregressive process, i.e. lagged by one year. This, in turn, reduces the bias in the OLS estimator, but its magnitude still remains positive. Namely, the simultaneity problem enters this model at much higher lags when individual exporter is observed over a number of time periods. Another way of controlling for the simultaneity is to apply the Anderson-Hsiao instrumental variables approach. This approach requires transformation of first-differencing (3) in order to eliminate η_i, a source of bias in the OLS estimator. Then we may take the second lag of dependent variable X_{it-2} and first difference of this second lag, ΔX_{it-2}, as a possible set of instruments for ΔX_{it-1}. That is both are correlated with it ($\Delta X_{it-1} = X_{it-1} - X_{it-2}$) but uncorrelated with the error term. This approach, though consistent, is not efficient since it does not take into account all the available moment conditions (i.e. restrictions on the covariances between regressors and the error term). Hence, a natural choice of approach that allows for controlling for the unobserved heterogeneity and simultaneity in (3) is the application of

GMM (general method of moments) estimators. There are two possible choices of application of the GMM approach to dynamic panel data. Difference GMM (diff-GMM) method uses lagged levels as instruments for first-differenced equation. However, as shown by Arellano and Bover (1995), lagged level instruments used in diff-GMM approach are weak instruments for first-differenced equation, especially for variables with near unit-root behavior. Arellano and Bond (1998), and Blundell and Bond (1998, 1999) suggest application of the system GMM (sys-GMM) estimators. If a model is estimated in first differences, corresponding instruments for Δx_{i3} are x_{i1} and Δx_{i1} (where x stands generally for all included variables), and so on for higher time periods. This approach allows for a larger set of lagged levels' and first-differences' instruments and therefore to exploit fully all of the available moment conditions. Hence, the system GMM approach maximizes both the consistency as well as the efficiency of the applied estimator. The only drawback of the sys-GMM approach to dynamic panel data is that either balanced panel data or longer time series are required since the first two years of observations are used up as instruments.

[Insert Table 7]

Now we turn to the estimation results presented in Table 7. We first estimate model (3) in levels using OLS and fixed effects (FE) estimator in order to obtain upper and lower bounds of the estimates for coefficient on sunk entry cost. Then we estimate the model in first-differences and apply instrumental variable approach by using the sys-GMM method. This estimate of the coefficient on sunk entry cost should lie in the range between the OLS and FE estimates. Indeed, OLS gives an upward biased estimate of sunk entry costs of 0.497, suggesting that exporting last year raises the probability of exporting in the present year by 50%. The OLS estimate of the sunk entry costs lagged by two years is also very high (0.286) suggesting that entry costs are important and depreciate very slowly. OLS results also indicate importance of firm specific variables such as productivity, size, foreign ownership and firm's multinational status. Spillovers from other exporters in the sector are also positive but less important than firm-specific effects. Of course, these estimates are unreliable due to the described simultaneity problems, which shows up in the autocorrelation of the second order.

Fixed effects estimates, which difference out the unobserved firm-specific effects, reduce the impact of sunk entry costs significantly to only 17%, while returning insignificant estimate of the impact of firm productivity on its exporter status. This specification again suffers when autocorrelation is present in the data, indicating a problem of simultaneity. Instrumental variables approach, in turn, seems to solve this problem as we get rid of the second-order autocorrelation. Sargan test of overidentifying restrictions also does not reject used instruments indicating correct specification of the empirical model. Sys-GMM estimation suggest that sunk entry cost are important: exporting last year (two years ago)

raises the probability of exporting today year by 28% (9%).[8] All the firm-specific variables as well as within sector spillover, with the exception of firm's multinational status, seem to be unimportant for firm exporting status. Instead, some unsobserved heterogeneity seem to determine firm exporter status.

Upon these results we conclude that sunk entry costs are large and as a consequence there is a high persistency in a decision to export. We are, however, interested in finding key factors that trigger firms to start exporting not only to preserve the exporter status. We address this issue by introduction of heterogeneity of firms in terms of productivity and heterogeneity of markets below.

4.3 Firm heterogeneity and self-selection

Let us first present some additional descriptive statistics in order to get more insights on relationship between observed initial heterogeneity and decision to export. Table 8 demonstrates that firms that started to export in year t, on average, exhibited above average productivity levels at least one year before they decided to start exporting. In most cases this favorable past performance in terms of productivity is observed up to three years earlier. In other words, firms seem to self-select into exports by their exceptional heterogenous past productivity. However, these results are not yet conclusive as they may be biased due to exceptional performance of few firms and more detailed analysis is necessary.

Table 8 also points at importance of export market heterogeneity. While preceding evidence shows that an average exporter sells about 33% of its total exports to countries of former Yugoslavia, Table 8 demonstrates a slight export bias of new exporters towards countries of former Yugoslavia. Newly established exporter starts selling overproportionally (up to 45% of total exports) to the countries of former Yugoslavia. Why is this so? Are these markets easier to serve in terms of product quality? If this is the case, then it should be reflected also in a lower initial productivity level of firms that start exporting mainly to less demanding markets. Certainly, this is in line with a prediction of general equilibrium trade model with monopolistic competition that larger markets allow for more products leading to higher elasticity of substitution, while the size of market should be interpreted in terms of income. Therefore, in equilibrium product prices must be lower in larger countries and less productive foreign firms have hard time penetrating the market. On the other hand, in the context of vertically differentiated goods, models predict that consumers in high wage countries demand higher share of more sophisticated goods, which can be supplied only by high productive firms. In any case, product differentiation and market competition are stronger and consumer requirements are more pronounced in more

[8] Note that BJ (2001) find similarly high estimates of sunk entry costs for U.S. manufacturing firms. Their estimates of corresponding coefficient using OLS, FE and diff-GMM approaches are equal to 0.655, 0.203 and 0.362, respectively.

advanced markets which implies that higher productivity levels are needed to enter these markets.

[Insert Table 8]

We address this issue by estimating a slightly modified empirical model (3):

$$\begin{aligned} X_{it}[1,0] &= \alpha_0 + \alpha_1 ry_{it-1}[D_{OECD}, D_{YU}] + \alpha_2 rl_{it-1} + \alpha_3 IFDI_{it-1} \\ &\quad + \alpha_4 n\sec_{jt-1} + \sum_k \alpha_{5,k} T_k + \sum_j \alpha_{6,j} D_j + \alpha_7 D_{OECD} + \alpha_8 D_{YU} \\ &\quad + \mu_i + \varepsilon_{it}, \qquad \varepsilon_{it} \tilde{} N(0, \sigma^2) \end{aligned} \tag{4}$$

The dependent variable captures export decisions of first-time-exporters only, i.e. X_{it} is equal to 1 if a firm starts exporting in year t, and equals 0 for all previous and subsequent time periods. Logically, we drop the lagged dependent variables (as it is by definition always equal to 0) and the variable on firm's multinational status.[9] A novelty of this model is to include variables of export shares to particular regional market, where D_{OECD} stands for EU-15 and other OECD countries and D_{YU} stands for countries of former Yugoslavia. This is to reveal regional preferences of the first-time-exporters. In addition, we interact these export shares with the productivity variable, which enables us to address the issue whether different productivity levels are required to start exporting to heterogenous markets in terms of product competition.

Note that specification of (4) suffers from similar specification problems as (3), therefore we apply similar econometric approaches as used in Table 7 above. We first estimate the model by OLS in levels in order to get an upper bond estimate of the impact of productivity on firm's export decision. In the second specification we then interact the productivity variable with the first year's export shares to OECD countries and to countries of former Yugoslavia, respectively. In the third specification we apply fixed effects approach to wipe out unobserved firm specific effects μ_i and to get the lower bound estimate of the impact of productivity on firm's export decision. In the final specification we use first-differenced data and apply the sys-GMM instrumental variable approach.

[Insert Table 9]

Results presented in Table 9 confirm the bias of first-time-exporters in favor of countries of former Yugoslavia. This finding is robust to all estimation methods with the exception of sys-GMM estimates. The first OLS specification without interaction terms shows that first-time-exporters are mainly small firms,

[9] There are only 4 such cases, where a non-exporting manufacturing firm has establishments abroad.

which are not foreign owned (most of foreign owned firms are large and already exporters) and which are not necessarily more productive. Interacting productivity levels with export destination in the second OLS specification, however, gives interesting results: firms that started exporting to OECD countries are more productive than firms that started exporting to the countries of former Yugoslavia or to any other country group. This result is robust also to fixed effects and the sys-GMM specification of the model. The latter specification is efficient in solving the problem of persistent autocorrelation while not substantially altering the results obtained by OLS and FE specifications.

Hence, we conclude that firms do self-select into exports, but different productivity levels are required to serve different export markets. This suggests that both firm heterogeneity as well as export market heterogeneity do substantially determine firm's choice of regional export market. Only high productivity firms can afford to export advanced markets. Thus, high productivity levels of first-time exporters observed in Table 8 are obviously due to few high productivity firms that started exporting to OECD countries and is not a general feature of all firms that started exporting.

4.4 Export markets heterogeneity

Preceding results suggest that heterogeneity of markets in terms of product differentiation and market competition is important. To explore this point further, hereafter we use more disaggregated data, i.e. unit of observation is a flow made by firm to one of export markets.[10] Hence, we can observe productivity levels for each firm entering whatever single export market. Table 10, showing data on average productivity levels of firms that start exporting to different country groups, confirms that higher productivity is required to enter more advanced markets. Past productivity of entering firms has the expected ranking: $ry_{it-1}^{OECD} > ry_{it-1}^{CEEC} > ry_{it-1}^{exYU}$. On average, firms that start exporting to OECD markets are about 10% more productive than firms that start exporting to CEEC countries and about 20% more productive than firms that start exporting to countries of former Yugoslavia.

[Insert Table 10]

Using these rich three dimensional panel data, we re-estimate the model (4). Note that due to higher dimensionality of the data set the instrumental variable estimation approach becomes computationally very expensive, so we skip sys-GMM estimations. This may leave us with somehow biased coefficient estimates, but the estimates of previous subsection suggest that it is not substantial.

[10] Above we use standard firm level data with one observation per firm and year (2-dimensional panel data). In this subsection we use 3-dimension panel data where each observation is a triplet of firm, export market and year.

[Insert Table 11]

Note that results presented in Table 11 differ from results using the 2-dimension panel. In contrast to Table 9, here we observe firms that may already be exporters but then decide to enter an additional export market. Results in Table 11 therefore show that large firms and firms that are either foreign owned or have own affiliates abroad are more likely to decide to enter a new export market. This additional new market will less likely be one of the markets of former Yugoslavia. In addition, firms that do decide to enter advanced markets of OECD countries are initially more productive than firms entering other markets. These results are robust also to the fixed effects specification. Results in Table 11, hence, formally confirm previous findings contained in Tables 9 and 10 that firms penetration of markets in advanced countries requires higher productivity levels.

5 Exports and productivity improvements

We now turn to analysis of reverse causality between exports and productivity, running from exports to productivity improvements. The problem of simultaneity rarely allows researchers to make statements about the direction of causality, especially when using cross-section data. Hence, it is no surprise that neither theory nor empirical evidence are conclusive on this thorny issue. Standard models of monopolistic competition, starting with Krugman (1979, 1980), assume that due to firm symmetry exporting affects all firms in similar ways through learning effects, increased scale of production, increased innovation, higher diversity of intermediate inputs, etc. Melitz (2003), instead, assumes explicitly that productivity improvements occur through within-sector market share reallocations (triggered by trade) towards more productive exporting firms "...without necessarily affecting intra-firm efficiency". On the other side, empirical studies failed to find such productivity improvements related to exports. CLT (1998) and BJ (1999) find that causality runs from productivity to self-selection into export markets. Greenaway, Gullstrand and Kneller (GGK, 2003) find no significant differences in performance characteristics between Swedish exporters and non-exporters, while Greenaway and Kneller (GK, 2003) find some productivity benefits for U.K. exporters that are most exposed to export markets.

Below we examine post-exporting performance of Slovene manufacturing firms. We first compare productivity growth performance between all exporters and non-exporters and then proceed with comparison of productivity growth of new exporters and firms that remained non-exporters.

5.1 Empirical model

Our main focus are differences in total factor productivity (TFP) growth between exporters and non-exporters. In empirical approach we start from standard pro-

duction function and follow Griliches and Mairesse (1990) approach in estimating "approximate total factor productivity" (ATFP) as: $ATFP = \ln Y/L - s \ln K/L$, i.e. $ATFP = \ln y - s \ln k$ (where Y, K, L and s are value added, capital, labor and capital share). Major advantage of this specification where labor productivity y is regressed on capital intensity k is in its simplicity and in the fact that obtained regression coefficients can be interpreted as measures of TFP.

To capture the impact of exporting and of observed firm-specific factors on firm performance we estimate a modified production function discussed above:

$$\begin{aligned} \Delta ry_{it} &= \alpha_0 + \alpha_1 ry_{t_0} + \alpha_2 \Delta rk_{it} + \alpha_3 X_{it-s} \cdot ExSh_{ij} \left[D_{YU}, D_{Oecd}, D_{Ceec}\right] \quad (5) \\ &\quad + \alpha_4 X\_period_i + \alpha_5 OFDI_{it-1} + \alpha_6 IFDI_{it-1} + \alpha_7 nX_{it-1} \\ &\quad + \alpha_8 n\sec_{jt-1} + \sum_k \alpha_{9,k} T_k + \sum_j \alpha_{10,j} D_j + \mu_i + \varepsilon_{it}, \\ &\quad \varepsilon_{it} \tilde{} N(0, \sigma^2). \qquad (6) \end{aligned}$$

where Δry_{it} and Δrk_{it} are rates of growth of relative labor productivity and capital intensity, and ry_{t_0} is initial (first year) relative labor productivity. Note again that these relative categories are ratios of firms' values and corresponding sectoral averages. Initial relative labor productivity is included to control for a process of technological and capital intensity convergence (less productive firms grow faster). X_{it-s} is a lagged exporter dummy variable indicating the year firm started exporting. We interact it with the $ExSh_{ij}$, which is firm's export share to different regional groups. X_period_i is length of the exporting period. $OFDI_{it-1}$ is a dummy variable that assumes value 1 if a firm has a foreign affiliate in a period $t-1$ in any country, and zero otherwise. $IFDI_{it-1}$ has the same definition, only that it applies to foreign ownership of domestic firms. T_k and D_j denote time and sectoral dummies, respectively. μ_i captures potential remaining unobserved firm specific heterogeneity apart from heterogenous productivity already captured by ry_{it}, while ε_{it} denotes i.i.d. distributed residuals with zero mean and variance σ^2.

Note that our main measures of observed firm heterogeneity enter the model in relative terms, i.e. measuring individual firm's growth differential relative to the sector average. Recent studies (GGK, 2003; GK, 2003) apply a kind of difference-in-difference (DID) approach, where individual firm's performance is compared with performance of selected control group. Control groups are natural counterparts to the analyzed firms, which can be selected arbitrarily or using one of the matching methods.[11] Though more sophisticated, these methods do not add much to the efficiency of estimations, since qualitatively the same results can be obtained by using more natural and intuitive method of relative firm performance where the control group is the average sectoral performance.

[11] GGK (2003) and GK (2003) apply propensity score method.

We estimate (5) in first-differences and in cumulative-differences where appropriate. This enables us to estimate the post-exporting TFP growth, while at the same time fixed firm-specific effects μ_i are wiped out.

5.2 Results

Let us first present some evidence on growth performance of different groups of firms over the period 1994-2002. Table 12 presents three-year differences in relative labor productivity, averages for different groups of firms. It is obvious from these figures, that on average non-exporters exhibit negative growth implying that they loose their market shares within industries. These, however, are not redistributed uniformly to all exporters (see slight negative growth pattern of the exporters' group) but mainly to new exporters. Among them, exporters that start exporting to OECD countries exhibit fastest growth in terms of labor productivity. The evidence for new exporters to former Yugoslav markets is less conclusive and productivity growth seems to depend on random productivity shocks to different firms.

[Insert Table 12]

Obviously, these results, although indicative, are biased since labor productivity grows also due to capital intensity increases. In order to control for these, we estimate (5) using two different groups. In Table 13 we compare productivity growth between all exporters and non-exporters, while Table 14 compares productivity growth of new exporters only and firms that remained non-exporters.

[Insert Table 13]

We estimate (5) using non-exporters as a comparison group for performance of exporting firms by applying first-difference and cumulative-difference estimator. The former returns short run productivity effects of exporting, and the latter gives estimates of long run productivity effects. Second column of Table 13 shows that exporting does not have short run effects. Firms that exported previously do not exhibit faster TFP growth than non-exporters. Instead, time span of exporting is crucial - higher TFP growth is gained from persistent exports. Of the other variables, spillovers form serving a large number of export markets or spillovers form other exporters within sector do not seem to be important. The most important effect on growth seems to stem from foreign ownership as TFP of these firms grows faster by as much as 5%.[12] In the third column we include export shares to different country groups, where again productivity improvements are encountered for firms that rely more heavily on exports to advanced OECD

[12] As shown by Damijan, Knell, Majcen and Rojec (2003) this result is robust to selection bias as well as to different econometric methods.

countries. Positive productivity effects are found also for exporting to CEEC countries, while there are no productivity improvements from exporting to former Yugoslav markets.

In the last column we do a long run analysis. Here, the impact of exporting is picked up by the length of exporting period. We find that exporting persistency positively affects firm's TFP growth - persistent exporting firm increased on average their TFP level relative to non-exporters by modest 2% in the period 1994-2002. However, exporting majority of sales to OECD countries increase long run TFP level by additional 7%. No such long run productivity effects are detected from exporting to less developed CEEC and former Yugoslav markets.

While Table 13 provides results on productivity growth of all exporting firms versus non-exporters, we now turn to a more appropriate comparison; i.e. we compare productivity differential between firms that started exporting recently and firms that remained non-exporters. The advantage of this approach is, first, to avoid the problem of simultaneity, and second, to track the productivity pattern of exporters after the point they started exporting. We use similar approach as GK (2003), where they look for productivity effects of exporting for up to four years after entry. They show that new exporters do grow faster in terms of TFP but only if they are more heavily exposed to competition in export markets.

[Insert Table 14]

Table 14 demonstrates that there are no continuous productivity improvements from exporting (as found by GK, 2003), but one can merely speak of short run productivity shocks after firms start exporting. First column shows that no pre-entry (X_{it-1}) or entry (X_{it}) productivity effects for new exporters can be observed, but there is present a huge productivity shock in a year after entry (X_{it+1}). As shown in the second column of Table 14, this productivity shock, however, can be accrued only by those new exporters that export majority of their sales to OECD countries. For them, the productivity shock spans over two years after starting exporting and is quite enormous: 16% TFP growth in the first year and 11% in the second year after starting exporting. No productivity improvements can be accounted by firms depending heavily on less developed markets of former Yugoslavia.

By finding some post-exporting productivity shocks for firms exposed to competition in advanced OECD markets, this section, thus, confirms findings of the previous section that heterogeneity of markets matters. Exporters can benefit from exporting through learning and competition effects only when serving more demanding advanced markets. Exporting *per se* does not warranty such effects.

6 Conclusions

This paper builds on recent theoretical and empirical work on firm-level heterogeneity and self-selection into exports. We complement the evidence by studying the impact of export market heterogeneity for firm export decision and post-exporting productivity improvements. By exploiting a rich and complete firm-level dataset for Slovenia for the period 1994-2002 that allows us to differentiate between firms' operations in different foreign markets, we offer several new insights. First, we demonstrate the importance of fixed entry costs in foreign markets causing that the number of foreign markets served by individual firm increases with firm's productivity level. We show that a firm entering exports gains additional export markets only slowly - on average one market by year. Second, we demonstrate that higher productivity of exporting (investing) firms relative to domestic (exporting) firms is not necessarily uniform. Instead, higher productivity level is required for firms to start exporting (FDI) to advanced countries as opposed to developing countries. Finally, we demonstrate that firm can exhibit significant productivity improvements from serving foreign markets, although this also depends on the type of foreign markets. We find no continuous productivity improvements from exporting but rather limited short run productivity gains that can be accrued only from serving advanced, high-wage foreign markets. We explain this by the fact that firms in a small open country are more inclined to serve foreign markets in whichever way notwithstanding their relative productivity. Therefore, one cannot expect to observe uniform positive productivity spillovers from serving foreign markets in general. This is in line with the recent findings by Greenaway, Gullstrand and Kneller (2003) showing that the performance characteristics of Swedish exporters and non-exporters are remarkably similar. Exporters can benefit from exporting through learning and competition effects only when serving more demanding advanced markets. Exporting *per se* does not warranty such effects.

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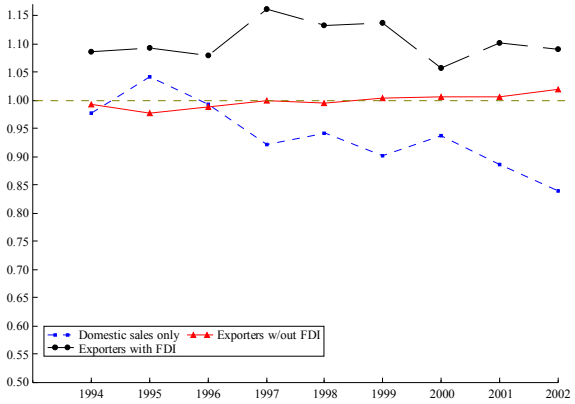
Tables and figures[13]

Table 1: Average productivity, size and number of manufacturing firms [by year and type]

Type	Domestic sales only			Exporters w/out OFDI			Exporters w/ OFDI		
Year	y^*	$l^\#$	N	y^*	$l^\#$	N	y^*	$l^\#$	N
1994	2157	50	159	1868	141	721	2300	654	115
1995	2562	39	197	2042	126	819	2570	657	120
1996	2821	36	241	2505	114	855	3051	562	138
1997	2910	38	275	2913	104	899	3733	544	142
1998	3232	37	276	3190	106	931	3920	467	164
1999	3531	35	266	3683	98	973	4815	433	169
2000	3903	35	243	4078	94	970	4600	404	182
2001	3944	34	230	4399	93	927	5083	360	211
2002	4096	31	234	5004	87	940	5593	372	208

Notes: * value added per employee, in thousands of Slovenian tolars (SIT), 1994 prices. # number of employees

Figure 1: Average relative productivity of different types of firms*



* Note: value added per employee of firm i relative to sector j

[13]Note: Source of all data is Bank of Slovenia; all calculations and estimations made by authors.

Table 2: Average export shares of manufacturing firms, in % [by year and region]

Year	$EU-15$	$exYU^1$	$Ceec^2$	$ex-SU^3$	$rOecd^4$
1994	53.3	27.2	3.7	3.7	4.4
1995	52.5	27.0	3.9	3.4	4.3
1996	53.7	31.5	4.2	2.3	3.9
1997	55.2	30.2	4.5	2.4	3.7
1998	56.2	29.8	4.4	2.1	3.6
1999	58.2	29.5	4.8	1.2	4.2
2000	57.8	30.3	4.4	1.1	4.1
2001	55.6	32.2	4.6	1.3	4.1
2002	54.2	33.9	4.7	1.4	3.8

Notes: [1] 4 countries of former Yugoslavia; [2] 9 Central and Eastern European countries; [3] countries of former Soviet Union; [4] Rest OECD countries.

Table 3: Number of firms, exporters, entrants and exiters from exporting [by year]

Year	All	Exporters	%Exp	Enter	Exit	Net	%Enter	%Exit	%Net
1994	995	836	84.0	-	-	-	-	-	-
1995	1,136	939	82.7	162	38	124	17.3	4.0	13.3
1996	1,234	993	80.5	133	55	78	13.4	5.5	7.9
1997	1,316	1,041	79.1	93	41	52	8.9	3.9	5.0
1998	1,372	1,095	79.8	88	41	47	8.0	3.7	4.3
1999	1,410	1,142	81.0	77	46	31	6.7	4.0	2.7
2000	1,396	1,152	82.5	58	34	24	5.0	3.0	2.0
2001	1,369	1,138	83.1	59	34	25	5.3	3.0	2.3
2002	1,382	1,148	83.1	50	42	8	4.4	3.7	0.7

Table 4: Average relative productivity of exporters and number of export markets [by type and year]

	Productivity (ry^*)			No. of exp. markets		
Year	Old	Enter	Exit	Old	Enter	Exit(-1)
1994	1.005	-	-	9.4	-	-
1995	0.995	0.973	1.053	10.1	3.6	1.2
1996	1.000	1.012	0.900	9.5	3.5	2.1
1997	1.027	0.995	0.942	9.3	3.7	1.8
1998	1.010	1.099	0.941	9.4	4.3	1.2
1999	1.020	1.094	0.803	9.9	3.2	1.4
2000	1.012	1.050	0.944	10.1	2.3	1.6
2001	1.022	1.096	0.924	10.3	3.6	1.5
2002	1.034	1.053	0.830	10.5	2.7	1.3

Notes: * ry is value added per employee of firm i relative to sector j

Table 5: Average number of export markets of entering firms [by year]

Year	t	$t+1$	$t+2$	$t+3$	$t+4$	$t+5$	$t+6$	$t+7$
1995	3.6	3.9	4.4	4.7	5.0	5.5	5.9	6.2
1996	3.5	4.1	4.4	4.6	5.0	5.1	5.3	
1997	3.7	4.0	4.5	4.7	5.6	6.2		
1998	4.3	5.3	5.9	6.0	6.1			
1999	3.2	3.6	4.3	4.7				
2000	2.3	3.1	3.3					
2001	3.6	3.5						
2002	2.7							

Table 6: Firms' characteristics and number of export markets in 2002

# Markets (n)	ry	rk	rl	l	N
n $= 0$	0.839	0.654	0.304	31	234
n $= 1$	0.980	0.906	0.362	38	163
$1 <$ n < 6	1.045	1.044	0.546	58	388
$5 <$ n < 11	0.996	0.997	0.809	90	245
$10 <$ n < 31	1.056	1.243	1.787	218	284
$30 <$ n < 51	1.062	1.158	3.806	564	54
n > 50	1.365	1.253	9.179	1163	14
Total	1.000	1.000	1.000	121	1,382

Notes: ry, rk and rl are value added per employee, capital to labor ratio and number of employees in relative terms, i.e ratio of firm i relative to sector j.

Table 7: Export decision of manufacturing firms, all exporters, 1995-2002 [firm level analysis]

Model	OLS	FE	sys-GMM
X_{t-1}	***0.497 (25.5)	***0.171 (5.2)	***0.275 (4.8)
X_{t-2}	***0.286 (14.3)	***0.130 (3.7)	**0.089 (2.4)
ry_{t-1}	**0.009 (2.4)	0.042 (1.0)	0.006 (0.4)
rl_{t-1}	***0.005 (4.4)	**0.069 (2.1)	0.0001 (0.0)
$IFDI_{t-1}$	**0.012 (2.3)	***0.043 (3.6)	0.027 (0.3)
$OFDI_{t-1}$	***0.018 (4.3)	***0.049 (4.7)	***0.085 (1.2)
$n\_\sec_{t-1}$	***0.0006 (4.3)		0.0005 (0.0)
$Sec.\,Dum.$	Yes	Yes	Yes
$Time\,Dum.$	Yes	Yes	Yes
N	8,160	8,052	8,052
adj.R^2	0.608	0.642	
Sargan χ^2[p]			65.0 [0.871]
AR(1)	-0.3	***-9.2	***-8.5
AR(2)	***-3.6	***-11.6	0.2

Notes: Dependent variable is X_{it} [1 if a firm is a exporter in period t and 0 if not]. t-statistics in parentheses; ***, **, and * indicate significance of coeffcients at 1, 5, and 10 per cent, respectively.

Table 8: Past relative productivity and regional export shares of entering firms [by year]

	No.	Productivity (ry^*)				Export shares (t)			
Year	t	t	$t-1$	$t-2$	$t-3$	$EU15^1$	$exYu^1$	$Oecd^2$	$Ceec^3$
1995	162	0.973	0.869			53.7	29.8	2.5	4.3
1996	133	1.012	1.121	0.902		50.7	36.8	5.4	2.2
1997	93	0.995	1.001	0.871	0.920	55.5	26.3	2.0	4.3
1998	88	1.099	1.010	1.211	0.910	51.3	38.2	2.8	3.4
1999	77	1.094	0.890	0.862	0.853	51.7	34.4	5.2	6.9
2000	58	1.050	1.217	1.243	1.209	51.2	45.6	0.1	0.8
2001	59	1.096	0.921	1.270	1.053	48.5	42.9	0.7	4.0
2002	50	1.053	1.096	1.176	1.189	54.2	41.6	0.1	3.4

Note: * value added per employee of firm i relative to sector j; [1] 4 countries of former Yugoslavia; [2] non-Europe OECD countries; [3] 9 Central and Eastern European countries.

Table 9: Export entry decision of first-time exporters, 1995-2002 [firm level analysis]

Model	OLS	OLS	FE	sys-GMM
ry_{t-1}	-0.001 (-0.6)	-0.004 (-1.3)	-0.007 (-1.6)	0.013 (0.8)
$ry_{t-1}.D_{Oecd}$		**0.077 (4.5)	**0.068 (3.2)	**0.077 (2.0)
$ry_{t-1}.D_{YU}$		0.003 (0.7)	*0.016 (1.9)	***-0.057 (-3.4)
rl_{t-1}	***-0.003 (-4.5)	***-0.003 (-4.3)	-0.0002 (-0.1)	*-0.010 (-1.9)
$IFDI_{t-1}$	*-0.008 (-1.7)	*-0.008 (-1.8)	0.011 (1.1)	**0.032 (2.4)
D_{Oecd}	0.011 (1.4)	***-0.061 (-3.5)	-0.021 (-0.8)	*-0.057 (-1.6)
D_{YU}	***0.019 (6.2)	***0.016 (2.7)	***0.053 (5.5)	0.031 (1.4)
$n\_\,\mathrm{sec}_{t-1}$	*0.0001 (1.7)	0.0001 (1.5)		-0.014 (-0.6)
$Sec.\,Dum.$	Yes	Yes	Yes	Yes
$Time\,Dum.$	Yes	Yes	Yes	Yes
N	9,813	9,813	9,813	9,709
adj.R^2	0.013	0.015	0.029	
Sargan χ^2[p]				178 [0.650]
AR(1)	***-3.23	**-2.37	***-10.48	***-9.23
AR(2)	**-2.50	***-2.81	***-9.79	-0.67

Notes: Dependent variable is X_{it} [1 if a firm starts exporting in period t and 0 if not]. t-statistics in parentheses; ***, **, and * indicate significance of coeffcients at 1, 5, and 10 per cent, respectively.

Table 10: Average past productivity ($t-1$) of firms entering export market [by region and year] (switchers excluded)

Year	N	Oecd	ex-Yu	Ceec
1995	678	1.091	0.993	0.873
1996	383	1.149	0.960	1.066
1997	432	1.155	0.821	1.059
1998	450	1.117	0.958	1.078
1999	479	1.184	1.043	1.095
2000	501	1.159	1.145	1.140
2001	445	1.285	0.784	1.194
2002	501	1.249	1.116	1.721
Avg.	-	1.174	0.978	1.072

Table 11: Decision to enter a new export market, 1995-2002 [firm -market level analysis]

Model	OLS	FE
ry_{t-1}	**0.003 (2.0)	-0.002 (-0.9)
$ry_{t-1}.D_{Oecd}$	**0.004 (2.1)	***0.005 (2.7)
$ry_{t-1}.D_{YU}$	-0.003 (-1.2)	-0.002 (-0.8)
$ry_{t-1}.D_{Ceec}$	0.0003 (0.1)	0.003 (1.2)
rl_{t-1}	***0.001 (7.2)	***0.001 (3.7)
$IFDI_{t-1}$	***0.008 (4.6)	***0.016 (4.4)
$OFDI_{t-1}$	**0.003 (2.5)	**0.012 (3.7)
D_{Oecd}	0.0001 (0.1)	-0.001 (-0.5)
D_{YU}	***-0.023 (-6.7)	***-0.023 (-6.5)
D_{Ceec}	-0.002 (-0.5)	-0.004 (-0.1)
$Sec.\,Dum.$	Yes	Yes
$Time\,Dum.$	Yes	Yes
N	138,320	138,320
adj.R^2	0.012	0.008

Notes: Dependent variable is X_{it} [1 if a firm enters a new export market in period t and 0 if not]. t-statistics in parentheses; ***, **, and * indicate significance of coeffcients at 1, 5, and 10 per cent, respectively.

Table 12: Three-year labor productivity differential $(\Delta ry_{it+3})^*$, in % [average over firms' groups]

			New exporters		
Period	Non-export.	Exporters	All	OECD	ex-YU
1998-1995	-5.0	-0.3	9.4	34.8	-4.3
1999-1996	-9.1	0.0	7.3	7.4	10.5
2000-1997	3.4	-3.4	0.6	5.7	-7.0
2001-1998	-4.9	-0.7	-0.6	3.6	-3.9
2002-1999	-1.2	0.1	15.3	1.5	31.7

Note: * $\Delta ry_{it+3} = y_{it+3} - y_{it}$

Table 13: Productivity spillovers from exporting [firm level analysis, 1995 - 2002]

Model	FD	FD	CD
ry_{it_0}	***-0.087 (-14)	***-0.087 (-14)	***-0.451 (-25)
Δrk_{it}	***0.267 (52.3)	***0.267 (52.3)	***0.126 (15.8)
X_{it-1}	-0.025 (-1.5)	**-0.058 (-2.4)	
T_X	***0.006 (2.7)	***0.006 (2.7)	***0.017 (3.2)
$IFDI_{t-1}$	***0.048 (3.5)	***0.044 (3.1)	***0.166 (3.4)
$OFDI_{t-1}$	-0.013 (-0.9)	-0.012 (-0.8)	-0.043 (-0.8)
n_X_{t-1}	-0.0002 (-0.5)	-0.0002 (-0.4)	***0.009 (4.7)
$n\_\sec_{jt-1}$	-0.00001 (-0.8)	-0.00002 (-0.8)	*-0.0001 (-1.9)
$ExSh_{Oecd}$		*0.040 (1.9)	*0.067 (1.7)
$ExSh_{YU}$		0.031 (1.4)	-0.020 (-0.5)
$ExSh_{Ceec}$		*0.082 (1.9)	-0.028 (-0.2)
Sec. Dum.	Yes	Yes	Yes
Time Dum.	Yes	Yes	Yes
N	9,811	9,811	1,797
adj.R^2	0.233	0.233	0.376

Notes: Dependent variable is Δry_{it}. t-statistics in parentheses; ***, **, and * indicate significance of coeffcients at 1, 5, and 10 per cent, respectively.

Table 14: Productivity spillovers from starting exporting [firm level analysis, 1995 - 2002]

Model	FD	FD
ry_{it_0}	***-0.100 (-12.6)	***-0.096 (-10.7)
Δrk_{it}	***0.273 (21.4)	***0.266 (18.7)
X_{it-1}	-0.042 (-1.1)	-0.029 (-0.7)
X_{it}	-0.001 (-0.1)	0.085 (1.0)
X_{it+1}	***0.081 (4.3)	0.016 (0.4)
X_{it+2}	0.010 (0.4)	-0.023 (-0.5)
X_{it+3}	0.030 (1.4)	0.048 (1.0)
X_{it+4}	0.001 (0.1)	0.025 (0.4)
$X_{it} * ExSh_{Oecd}$		0.054 (0.54)
$X_{it+1} * ExSh_{Oecd}$		***0.159 (2.6)
$X_{it+2} * ExSh_{Oecd}$		*0.110 (1.7)
$X_{it+3} * ExSh_{Oecd}$		-0.002 (-0.1)
$X_{it+4} * ExSh_{Oecd}$		0.053 (0.7)
$X_{it} * ExSh_{YU}$		*-0.200 (-1.9)
$X_{it+1} * ExSh_{YU}$		-0.0002 (-0.0)
$X_{it+2} * ExSh_{YU}$		0.028 (0.4)
$X_{it+3} * ExSh_{YU}$		-0.036 (-0.5)
$X_{it+4} * ExSh_{YU}$		-0.051 (-0.6)
$IFDI_{it-1}$	**0.046 (2.1)	**0.073 (2.9)
$OFDI_{it-1}$	-0.052 (-1.4)	-0.060 (-1.4)
n_X_{it-1}	0.001 (0.9)	0.001 (0.6)
$n\_\sec_{jt-1}$	-0.00002 (-0.7)	-0.00001 (-0.4)
$ExSh_{EU}$		-0.053 (-1.5)
$ExSh_{YU}$		0.031 (0.8)
Sec. Dum.	Yes	Yes
Time Dum.	Yes	Yes
N	4,264	4,169
adj.R^2	0.133	0.113

Notes: Dependent variable is Δry_{it}. t-statistics in parentheses; ***, **, and * indicate significance of coeffcients at 1, 5, and 10 per cent, respectively.

Appendix

Table X5: Productivity and number of export markets of exiting firms [by year]

	No.	Productivity (ry^*)				No. of exp. markets		
Year	t	t	$t-1$	$t-2$	$t-3$	$t-1$	$t-2$	$t-3$
1995	38	1.053	1.145			1.2		
1996	55	0.900	0.958	0.834		2.1	1.8	
1997	41	0.942	0.927	0.974	0.939	1.8	2.3	2.2
1998	41	0.941	0.944	0.960	0.913	1.2	1.8	2.7
1999	46	0.803	0.847	0.960	0.991	1.4	1.1	1.1
2000	34	0.944	1.033	1.068	1.125	1.6	1.3	1.1
2001	34	0.924	1.014	1.020	1.006	1.5	1.2	2.3
2002	42	0.830	0.770	0.788	1.032	1.3	1.1	0.8

Notes: * ry is VA/L of firm i relative to sector j