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FROM TECHNICAL AND COST EFFICIENCY TO EXPORTING: FIRM LEVEL DATA FROM SLOVENIA

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ABSTRACT: The paper investigates the influence of technical and allocative efficiency on export performance of Slovenian individual firms. The main contribution of the paper to the literature is the test on whether technical and allocative efficiencies, measured by data envelopment analysis (DEA) and stochastic frontier function (SFA), significantly influence the export orientation of individual firms. Our evidence suggests that firms which are more efficient than their competitors in industry are more export oriented and that technical efficiency is more significant for firms' export orientation than allocative efficiency. The evidence also suggests that along efficiency export activity of individual firms is significantly influenced by size, capital intensity, profitability, wages and export orientation of the firms a year prior to investigation.

KEYWORDS: *export, firm, technical efficiency, cost efficiency, Slovenia*
JEL-KLASIFIKACIJA: D24, F14

1. INTRODUCTION

The importance of export as an economic activity and a driver of growth have long been established in various research endeavors. Issues addressed in these studies include quantifying the contribution of export to economic growth, designing appropriate trade and industrial policies, and identifying macroeconomic factors that affect trade performance. As international competition became more innovation and knowledge based, understanding trade performance went-beyond the parameters of the comparative advantage paradigm and stressed the role of technology in affecting international competitiveness. Focusing on the role of entrepreneurs in shaping international competition, a critical observation made is that all firms face the same macroeconomic condition but respond and perform differently in their export activities. This suggests that there must be firm-

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specific characteristics that significantly influence a firm's capability to perform in the world market. Hence, research direction has shifted toward understanding the different forces that influence firm level performance.

This paper aims to contribute to the literature on firm level export performance by investigating the influence of technical and allocative efficiency on export performance of individual firms. The relationship between a firm's export activity and its technical efficiency has not been of much interest in literature in comparison to other determinants of firm's export performance, while the relationship between a firm's export activity and its allocative or cost efficiency has, to our knowledge, not been investigated so far. We find only one study (Djankov and Hoekmyn, 1996) that investigates impact of firm's export activity on its cost efficiency. The main body of empirical research use longitudinal data at the firm level to look at the extent and causes of productivity differentials (in terms of average labour productivity - total value of shipments per worker, or value added per worker – or average total factor productivity2) between exporters and non-exporters and have only recently been on the agenda (Wagner, 2005).

The process in this research area has been hampered by lack of firm level data. Earlier studies showed that exporting firms are more efficient than non exporting firms (Handoussa et al., 1986, Bernard and Jensen, 1995), while recent studies emphasise that relatively efficient firms self-select into exporting activities because the returns on doing so are relatively high for them (Roberts and Tybout, 1997). In his survey, Wagner (2005) finds that exporters more productive than non-exporters, and the more productive firms self-select into export markets, while exporting does not necessarily improve productivity. However, there is no consensus on the causality between efficiency and export participation in literature as there is yet little systematic empirical evidence that exporting causes efficiency gains (e.g. Haishun, Hone and Doucouliago 1980, Haddad 1993, Hill and Kalirajan 1993, Harrison 1999, Aggarwal 1994, Aw and Hwang 1995, Clerides et al., 1998, Bigsten et al. 2000, 2002, Hossain and Karunaratne 2004), and that efficient firms may self-select into the export market (e.g. Bigsten et al. 2000).

This paper is motivated by the existing empirical research gap on the relationship between a firm's technical allocative efficiency and its export activity, in particularly in Slovenia. Our aim is to answer the question, to what extend the use of technical and allocative efficiency could enhance the understanding of export orientation of individual firms. We measure technical and allocative efficiencies by two alternative methods, i.e. data envelopment analysis (DEA) and stochastic frontier function (SFA), as proxies of the quality of management and include them in the model of Slovenian firms' export activity as one of firm-specific determinants when firms' export activity is modelled in firm specific dimensions. Authors also hypothesize that export activity of individual firms is additionally influenced by size, capital intensity, profitability, wages and previous export orientation of a particular firm.

The marginal contribution of this paper to the literature on determinants of export orientation of individual firm goes in three directions: i) a use of technical and allocative

efficiency as factors potentially affecting export orientation of individual firm in order to test whether remoteness from the "best practice" has some influence on export orientation of a firm; ii) adoption of alternative measure of firms efficiency, based on DEA or SFA, in order to test whether the choice of efficiency measurement method matters in analyzing export orientation of firms; ii) the analysis of export determinants on firm level in Slovenia. Furthermore, by considering firms size authors' draw attention also to determinants of export activity of small firms. The presented paper is important from both the managerial and government interests' point of view.

The paper is structured as follows. Section two looks shortly at the determinants of a firm's export performance, as put forward by the relevant empirical literature. We are interested in a firm's characteristics as determinants of its export performance with the aim of identifying relevant determinants and showing at the empirical research gap on the relationship between a firm's efficiency and its export performance. In section three, we construct eight econometric models in order to account for the contribution of efficiency, measured by alternative methods (DEA and SFA) to export performance, as well as to consider different control variables. The selection of control variables is based on recent empirical literature and availability of data. Section four provides the methodology with special attention on the methods for measuring firm's efficiency. After description of the basic features of dataset used in empirical exercise, we presents the results of the analysis in section six. The final section concludes with the discussion and conclusions.

2. RELATED EMPIRICAL STUDIES

The international trade theory was originated in the David Ricardo's (1817) model of comparative advantages of nations, which is based on the difference of labour productivity as determinant of trade. Heckacher (1991) and Ohlin (1991) developed his trade theory in a way that it takes into account also the difference in the location of labour, capital and natural resources as determinants of trade. According to so-called neoclassical Heckschert-Ohlin (H-O) model, countries export goods whose production is intensive in factors with which they are abundantly endowed. However, H-O model, different from the Ricardo's mode, disregards the difference in labour productivity among countries, meaning that even if labour productivity were identical among two countries, there would be a possibility for competitive advantages due to the differences in the production factors endowment. The difference in factors supply is a reason for the difference in relative prices between countries. For example, capital abundant countries would, therefore, export capital-intensive goods, while countries with abundant labour would export labour-intensive goods. Just described and other models of international trade aim to explain, how international trade emerge and why some industries are more export oriented than other, i.e. the intensity of intra-industry trade among countries.

However, regarding international trade another research question is of a special relevance: the involvement of individual firms in international trade, i.e. export behaviour of individual firms. In this perspective, export activity is influenced not only by the charac-

teristics of industries but also by firm's characteristics.

There has been much research interest in the export activity of individual firms (e.g. Cavusgil and Nevin, 1981, Aaby and Slater, 1989, Leonidou and Katsikeas, 1996, Aitken et al., 1997, Bernard and Wagner, 1997, Roberts and Tybout, 1997, Clerides et al. 1998, Bernard and Jensen 1999, Katsikeas, Leonidou and Morgan 2000, Wagner 2001, Sterlacchini, 2001). Following Bleaney and Wakelin (1999), authors of this paper classify determinants of export performance into firm-specific and industry-specific determinants. They presume the export activity of an individual firm to be influenced by a combination of comparative advantage factors, acting at the level of the industry, and the characteristics of the individual firms. Firm-specific influences on export activity are considered as deviations from industry average. A series of empirical research has revealed productivity, profitability, patterns of innovation, size of a firm, capital intensity and wages as important variables of firm-specific influence and industry- specific influence on export activity. Entrepreneurship researchers have additionally investigated ownership structure, education, age of a manager, foreign language skills of a manager in etc. as determinants of export activity.

Previous studies find that firm heterogeneity plays a crucial role in the firm's decision to enter foreign market through exporting. A consistent finding is that better-performing firms in an industry are more likely to be exporters (e.g. Aw and Hwang 1995, Bernard and Jensen 1999, Bernard and Wagner 1997, Bleaney and Wakelin 1999). Early research in this area investigated firm's competitive advantages that facilitate its involvement in exporting activities and was limited to highly industrialized countries. 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. Bleaney and Wakelin (1999), for example, analyzed firm-specific factors affecting the trade performance of British manufacturing firms. Using share of export to total sales, they concluded that higher export shares were evident in firms that engaged in technologically innovative activities, as measured by their R&D expenditures. Sterlacchini (2001) conducted similar study for Italian manufacturing firms and found that firm size, as measured by total sales, seems to be the most significant factor affecting the export behaviour of local firms. Lefebvre and Lefebvre (2001) tested firm characteristics, technological capabilities, and commercial capabilities as possible determinants for small and medium enterprises (SMEs) in Canada. The study empirically supported the hypothesis that import activities, R&D expenditures, distribution access, knowledge intensity, and size significantly affect export performance.

Studies analyzing firm-level export performance in developing countries were conducted for Chile (Alvarez 2002), Mauritius (Wignaraja 2002), Indonesia (van Dijk 2002) and Ghana (Sarpong and Wolf 2004), In the Chilean firms, productivity, firm size, and human capital were found to increase the sustainability of export while foreign technical licenses and foreign capital participation positively improved export performance. The study of van Dijk (2002) attempted to determine the factors affecting export performance

of Indonesian manufacturing firms. It highlighted the importance of industry variation in determining export activities and concluded that relative size, foreign ownership, and age were significant factors across all sectors while skilled labour differed according to the industry where the firm belonged. In Ghana, the study of Sarpong and Wolf (2004) did not find any positive or significant relationship between export performance and investment behaviour of private firms. On the other hand, results indicate that younger and larger firms were likely to invest in export compared to older and smaller firms.

Although there has been much research interest in the determinants of export activity of individual firms, there is a research gap on the relationship between a firm's technical and cost efficiency and its export performance. Earlier studies showed that exporting firms are more efficient than non-exporting firms (Handoussa et al., 1986, Bernard and Jensen, 1995). These studies tend to emphasize the conclusion that export participation leads to increased efficiency through so-called learning effects. Learning effects may arise when, for instance, foreign customers offer exporters technical assistance, market information or guidance in quality control. Learning could also be acquired more indirectly by, for instance, a firm's monitoring feedback from its own activities or through informal discussions with foreign contacts (Webb and Fackler, 1993) and the existence of arduous international competition (Granér and Isaksson, 2007).

However, recent studies focus on alternative explanation, namely, the notion that relatively efficient firms self-select into export activity because returns on doing so are relatively high for them (Clerides et al., 1998, Roberts and Tybout, 1997). Only the most efficient firms from the outset have a sufficient cost advantage to overcome transportation costs and compete internationally. If this is true, then it is not export participation, per se, that makes a firm more efficient, but rather efficiency that causes export participation. First authors, which have asked the questions of whether exporting causes efficiency gains and presented a model for testing self-selection hypotheses, were Bernard and Jensen (1995) and Clerides et al. (1998). To explain self-selection hypothesis, Clerides et al. (1998) present a model in which incumbent exporters would choose to export whenever gross operating profit plus expected future payoff from remaining an exporter is higher than the per-period fixed cost of being an exporter, Similarily, non-exporters begin exporting whenever this sum is higher than the per-period cost plus the sunk entry cost for entering foreign markets. Since gross profit is positively related to productive efficiency the probability that a firm exports should increase with its efficiency level.

Melitz's (2003) work may be interpreted as another argument against the notion of learning effects, but lends further support to the self-selection hypothesis. He 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. In a dynamic industry model based on heterogeneous agents, as opposed to the standard representative-agent model, Melitz (2003) shows that trade may generate productivity gains at the aggregate level, however, without necessarily improving the productivity of individual firms. This can happen because costs associated with export entry alter the distribution of trade gains across firms. The most efficient firms reap trade gains by increasing their market

share and profit, while less efficient firms lose in terms of both, and the firms worst off are forced to exit. Thus, although export participation is driven by productivity, increased trade exposure tends to strengthen this self-selection effect by selecting only the most productive firms. This leads to additional intra-industry reallocations towards more productive firms. Helpman, Melitz and Yeaple (2004) extend the model in order to demonstrate that the least productive firms serve only the domestic markets, more efficient firms export, and most efficient serve foreign markets both through exports and FDI, given equal trade and investment opportunities within sectors.

Empirical evidence on the causality of a firm's export activity and its technical efficiency is mixed. Bernard and Jensen (1995, 1999), who first analyze the causal relationship between exporting and productivity at the firm level in the recent literature on the U.S. economy, find little evidence of any learning-by-exporting effect. Their study shows a consistent positive correlation between a firm's export activities and its technical efficiency but the forces that generate this trend are less clear. The results are mixed also of few examining causality issues on countries other than the USA: that of Clerides et al. (1998) on Mexico, Colombia and Morocco and that of Kraay (1997) on China. A review of studies outside Africa by Bigsten et al. (2004), has found evidence that causation runs from technical efficiency to exporting, that is, there is self-selectivity into exporting rather than from exporting to efficiency. However, the few studies in Africa (e.g. Rankin et al., 2006) show mixed evidence that exporting causes technical efficiency gains or efficiency firms may self-select into the export market. Using SFA method for measuring technical efficiency of the manufacturing firms on panel data in four African countries (Cameroon, Ghana, Kenya and Zimbabwe) for the period 1992 to 1995, Bigsten et al. (2000) investigated the causal link between efficiency and export orientation, using firm-level panel data for the manufacturing sector in four African countries (Cameroon, Ghana, Kenya and Zimbabwe) and find evidence of self-selection of the most efficient firms into exporting as well as a learning-by-exporting effect. They find that there are large efficiency gains from exporting both in terms of levels and growth, and contrary to China, the gains are largest for the new entrants to exporting. In resent studies, Granér and Isaksson (2007) show that exporters of Kenyan manufacturing firms are more efficient than non-exporters, while Niringiye et al. (2010) find no evidence of self-selection by the relatively more technical efficient firms into exporting in East African manufacturing firms. They conclude that factors other than technical efficiency may be playing a more prominent role as determinants of the export decision in those firms.

This relationship has been a subject of much interest in developed countries, while there has been a relatively little research interest on this relationship in developing countries. Research on the relationship between a firm's cost efficiency and its export activities has been to our knowledge missing, as well as the research on the subject in Slovenia.

To sum up, although it is believed that trade liberalization and an export-oriented strategy increase firm-level efficiency (e.g. Krugman 1987, Rodrik 1988, Grossman and Helpman 1991), there is as yet little systematic empirical evidence that exporting causes technical efficiency gains (e.g. Haishun, Hone and Doucouliago 1980, Haddad 1993, Hill and

Kalirajan 1993, Harrison 1999, Aggarwal 1994, Aw and Hwang 1995, Clerides et al., 1998, Bigsten et al. 2000, 2002, Hossain and Karunaratne 2004). There is even less evidence of the opposite causality: technical efficient firms may self-select into the export market (e.g. Bigsten et al. 2000). Djankov and Hoekmyn (1996) find that international competition led to substantial cost efficiency improvements of Bulgarian firms.

In Slovenia, there has been research on the relationship between productivity (in term of value added per employee) and export decision of individual firms, yet there has been no research interest into impact of a firm's technical and cost efficiency on its export activity. For example, investigating self-selection into exporting on a dataset for Slovenian exporting manufacturing firms in the period 1994 - 2002, Damijan, Polanec and Prašnikar (2004) demonstrate that, on average, exporting firms are not always more productive than firms supplying only domestic market and that that higher productivity level is required for firms starting to export to advanced countries as opposed to starting to export to developing countries. They observe that firms can gain significant productivity improvements only when serving advanced, high-wage foreign markets, while in a small open country, exporting per se does not warranty such effects. More recently, by investigating bidirectional causal relationship between firm innovation and export activity of Slovenian firms in 1996-2002, Damijan, Kostevc and Polanec (2008) find no evidence for the hypothesis that either product or process innovations increase the probability of becoming a first-time exporter. However, they find evidence that exporting leads to productivity improvements.

Besides productivity, researchers (e.g. Damijan, 2001, Damijan et al., 2004, Damijan, Kostevc and Polanec, 2008) have investigated other determinants of Slovenian firms' export decision, namely, improved access to the EU market, changes in export structure, the role of FDI, and institutional changes etc. Rojec, Pavlič Damijan and Majcen (2004) tested mentioned five determinants of export performance in CEEC countries, including Slovenia and find that the CEEC with higher levels of accumulated FDI and changes in the institutional setup (measured by the EBRD trade index or the EBRD overall transition index) do exhibit much larger growth of exports. In their earlier study, Majcen in Rojec (2001), for example, show that differences in export propensity between foreign and domestic firms in Slovenia and Estonia are significant and that they are due to structural differences between foreign and domestic firms which reflect in (i) different efficiency of factors utilisation and productivity level, and (ii) in differences in other operational characteristics determining productivity and export propensity.

This paper builds on theoretical and empirical work on firm-level self-selection hypothesis. We complement the evidence by studying the impact of a firm's technical and cost efficiencies as determinants of its export performance. Slovenia makes for a particular interesting study because of two main reasons: its relatively strong export-orientation of firms and the absence of such empirical analysis.

3. HYPOTHESES, VARIABLE SPECIFICATION AND EMPIRICAL MODELS OF A FIRM'S EXPORT ORIENTATION

3.1 Hypothesis and variable specification

As we mentioned, this paper builds on theoretical and empirical work on firm-level self-selection hypothesis. Therefore, the main hypothesis of this paper is the following:

H: *More technically and cost efficient firms become exporters.*

Considering data availability, export involvement of a particular firm as dependent variable in the model of export activity of Slovenian individual firms is measured by the net revenues on foreign markets as a share in total firm's revenue. Technical, allocative and cost efficiency of a particular firm are independent variables, measured by data envelopment analysis (DEA), and stochastic frontier analysis (SFA).

As special attention of the paper is the analysis of efficiency as firm-specific determinant of export performance, we include two indicators of efficiency in the model of export orientation of Slovenian firms: technical and cost efficiency. We measure both technical and cost efficiency in two ways, namely, by adoption of data envelopment analysis (DEA), and by performing stochastic frontier analysis (SFA). We obtained a measure of technical efficiency by econometric estimation of Cobb-Douglas production function (Cobb and Douglas 1928). We estimated two specifications of a model assuming (technical) efficiency term follows half-normal distribution or exponential distribution (Aigner, Lovell and Ashmidt 1977, Meesuen and van den Broeck 1977). A stochastic frontier measure of cost efficiency was obtained by econometric estimation of stochastic frontier cost function in a normalized logarithmic form. Again, we estimated stochastic frontier cost function by assuming cost efficiency term follows half-normal distribution or exponential distribution. Presumably, all four measures of efficiencies have a positive influence on export orientation of individual firms. As cost efficiency explains not only efficiency in term of quantity, i.e. technical efficiency, but also the ability of the firm to use the inputs in optimal proportions, given their respective prices and the production technology, we hypothesize that cost efficiency explain export orientation of the firm to the larger extend than technical efficiency. There are no conceptual differences between the influences of DEA and SFA estimators of technical and cost efficiencies on export orientation. Differences between those two methods of measuring firm efficiency influences point only to the explanatory power of efficiency measured by DEA and/or SFA in the analysis of export orientation of individual firms.

To control for firm's heterogeneity, we include other control independent variables in the model of export activity of individual firm. The selection of these variables is based on overview of relevant empirical literature in section 2 and availability of data, namely, market power of individual firm, absolute firm size, price of labour, profitability, relative capital intensity and export orientation of individual firms in previous year. The presumption of correlation between control variables and firm's export activity is based on

relevant literature, presented in section 2 of this paper. We use relative measure of some control variables (i.e. relative to the average in industry) in order to capture heterogeneity of firms in industry.

The model of export orientation of Slovenian individual firms includes market power of individual firm, measured by the number of employees in a firm relative to the number of employees in industry. We presume linear relationship between market power of individual firm and its export orientation. However, since this relationship is hypothesized to be also non-linear, we additionally include square value of the number of employees in a firm relative to the number of employees in industry into the model of export orientation of individual firms.

Since it could be hypothesized that export involvement is influenced also by absolute and not only by relative size of a firm, the model also consist of the number of employees in a particular firm as indicator of absolute firm size. Firms with larger number of employees are presumed to have larger share of net revenues on foreign markets in total revenues and firms with smaller number of employees. At this point, we must emphasize that, according to theoretical and empirical research findings, one could not persist on the presumption that large firms in absolute sense and firms with dominant market position have higher share of net revenues on foreign markets in total revenues that firms with smaller absolute firm size and smaller number of employees relative to number of firms in industry. Proportional relationship between firm size and export involvement could be, particularly in small countries, explained by the hypothesis that large firms are able to create adequate revenue only if they derive the largest share of their annual total sales volume from exporting activities, since for them domestic markets are too small.

From supply-side point of view, we include price of labour in our model. Price of labour is measured as a price of labour in individual firm relative to average price of labour in industry and presents labour costs per employee. We made strong assumption that firms with higher relative labour prices create smaller share of net revenues on foreign markets in total revenue, since they are less competitive than other firms in industry.

Export orientation of individual firms is presumably also to be influenced by profitability, measured by rate of return on assets (ROA) of the firm in this paper. With regard to this determinant of export orientation of individual firms we did not form strong assumption. Namely, it could be assumed that higher export orientation of individual firm is correlated with higher ROA value, when firm creates higher profitability on foreign markets, and with smaller ROA value when higher profitability is a consequence of higher opportunity price of equity capital and consequently of lower competitiveness of a firm on foreign markets.

However, we do made strong assumption regarding the influence of relative capital intensity on export orientation of individual firms. We measure relative capital intensity as the ratio of capital intensity of a firm (i.e. capital of the firm relative to the number of employees in a firm) and capital intensity of the industry (i.e. total capital relative to

total number of employees in the industry). According to economic theory, we assumed that capital intensity of the industry does not influence significantly export orientation of firms in industry. However, we could assume that higher capital intensity of individual firm relative to capital intensity of the industry has at certain factor prices a negative impact on firm's export orientation, in particular when the capital price is relatively high. Therefore, we expected that higher capital intensity of a firm relative to average capital intensity in industry have a significantly negative influence on export orientation of a firm. We could also presume that negative impact of high relative labour prices of individual firms on their export orientation is not so significant for firms with relatively high ratio of capital and labour. Therefore, when the influence of relative labour prices on export orientation of individual firms is statistically significant and negative, we reasonable expect that the influence of capital intensity of the firm relative to capital intensity of the industry is statistically insignificant and even positive.

To estimate firm specific determinants of export orientation of individual firms in a particular year in Slovenia, we also include export orientation of individual firms in a previous year in the analysis. Namely, we presume that firm's export orientation in a particular year is to a large extent influenced also by its' previously export orientation. We presume not only linear relationship between this variable and export orientation of individual firma but also square relationship.

We measure dependent variable, i.e. firm's export activity, as net on foreign markets relative to total revenue of individual firms in this paper.

3.2 Model specification

In order to analyze determinants of export orientation of individual firms, we estimated eight models, which differ according to included determinants of firm's export orientation. Each model includes one of the following alternative measures of technical efficiencies as independent variables: i) technical efficiency, measured by DEA, ii) technical efficiency, estimated by SFA and assuming efficiency term of firm's production function follows half-normal distribution or iii) technical efficiency, estimated by SFA and assuming efficiency term of firm's production function follows exponential distribution. Similarly, each model of firm's export function includes one of the following alternative measures of cost efficiencies as independent variables: i) cost efficiency, measured by DEA model, ii) cost efficiency, estimated by SFA and assuming efficiency term of firm's cost function follows half-normal distribution or iii) cost efficiency, estimated by SFA and assuming efficiency term of firm's cost function follows exponential distribution.

Therefore, we estimated six specifications of each eight models of export orientation of Slovenian firm. The first model includes along with DEA and SFA indicators of technical and cost efficiencies the following variables presumably affecting export orientation of individual firm: relative firm size, relative labour price and export orientation of the firm in previous year. The second model differs from first one in an assumption about func-

tional relationship between relative firm size and export orientation of the firm. While first model presume both linear and square functional relationship, second model assume only linear relationship. The third model includes along with DEA and SFA indicators of technical and cost efficiencies again relative firm size, relative labour price and export orientation of the firm in previous year as variables affecting export orientation of the firms, and additionally relative capital intensity of the firm. The fourth model additionally includes rate of return on assets (ROA) as determinant of export orientation of the firm. The fifth model differs from the fourth model in a way it replaces relative firm size with absolute firm size as a variable affecting export orientation of the firm. This model has been upgraded in several ways. The sixth model additionally includes square form of absolute firm size, while the seventh model differ from fifth model by assuming both functional relationship and square relationship between export orientation of the firm in a previous year and export orientation of the firm in the year under investigation. The eighth model differs from the fifth one by assuming square relationship between absolute firm size and export orientation of the firm, as well as between square export orientation of the firm in a year prior to estimation and export orientation of the firm in the year under investigation.

4. METHODOLOGY

We adopted two step analysis in order to investigate the impact of technical and cost efficiency on export orientation of individual firm. First, we measure firm's technical and cost efficiency by two alternative methods for measuring (or assessing) firm's efficiency: econometric and parametric stochastic frontier analysis (SFA) and data envelopment analysis (DEA), which is nonparametric method of linear mathematical programming. Second, we estimated parameters of firm's export activity models, presented in section 3.2, with OLS regression analyses. The methodology use firm level cross-sectional data in Slovenia, which limits the choice of research method. We are aware that adopted regression analysis might not be appropriate method because of possible omitted variable bias and lagged dependent variables among the explanatory variables. Therefore, the results of the analysis should be interpreted with caution. However, to deal with the problem of firms' heterogeneity, we consider third level of NACE classification when we measure a firm's technical and cost efficiency. We also, as we mentioned in section 3, use relative measures of relevant control independent variables (i.e. relative to a particular industry) to capture firms heterogeneity in industries. We also test for the linearity of the influence of control determinants of export activity of individual firm.

As we already described, we measure technical and cost efficiencies with two alternative methods: econometric and parametric stochastic frontier analysis (SFA) and nonparametric method of linear mathematical programming, namely, data envelopment analysis (DEA). Both SFA and DEA are analytically rigorous benchmarking methods that exploit the distance functions to measure efficiency relative to a frontier. However, the two approaches use different techniques to envelop data more or less tightly in different ways. In doing so, they make different accommodations for statistical noise and for flexibility

in the structure of production technology (Fried, Lovell in Schmidt 2008, Coelli et al. 2005, Kumbhakar and Lovell (2000)[1]. SFA is stochastic method, which enables to distinguish the effects of statistical noise from those of inefficiency, thereby providing the basis for statistical inference. DEA is, on the other hand, a nonparametric method, which enables it to avoid confounding the effects of misspecification of the functional form (of both technology and efficiency) with those of inefficiency. Furthermore, DEA have as non-statistical approach the disadvantage of assuming no statistical noise, but have the advantage of having stringent data requirements (Farsi in Fillipini 2004, 2, Simar in Wilson 2000, 2006). SFA models on the other hand have the disadvantage of requiring strong assumptions as to the form of the frontier (Fried, Lovell in Schmidt 2008, 32).

It is these different accommodations of SFA and DEA methods that have generated the debate about the relative merits of the two approaches (Fried, Lovell in Schmidt 2008, 32). In literature, one stream of research has attempted to clarify the trade-off between SFA and DEA, so that the choice of a "correct" method would be rather a clear cut in particular applications. Banker, Gahd and Gorr (1993), for example, report findings from a Monte Carlo experiment to the effect that the relative precision of DEA and SFA is context specific. DEA is favoured where measurement error is unlikely to pose much of a threat and where the assumptions of neoclassical production theory are in question (Farsi in Filippini 2004, 2). Conversely, SFA should have the advantage in coping with severe measurement error and where simple functional forms provide a close match to the properties of the underlying production technology. Gong and Sickles (1993) and Mortimer (2002) report findings along similar. However, the literature lacks the consensus on which method is the most appropriate for the measurement of productivity and efficiency of individual firm in particular applications (Pušnik 2008).

In order to measure technical efficiency by SFA, we must first specify appropriate production function which estimation yield the measure of technical efficiency. We choose Cobb-Douglas production function (Cobb and Douglas 1928), where output is presumably measured as total revenues of firms, input labour as the number of employees in the firm and capital as capital stock. We choose a Cobb-Douglas production function in its normalized form, where output is proxies by the log of total revenue value per employee at certain time and production inputs are presented by the log of capital stock per employee. The choice of functional form was based on the popularity of Cobb-Douglas production function in empirical analysis because of its accordance with conditions for selecting a functional form of production function[2] and availability of data.

In order to measure cost efficiency by SFA, we presume that total costs represent the sum of labour costs and capital costs. We derive cost function from classical Cobb-Douglas

[1] For the detailed explanation of SFA methods see, for example, Greene (2003, 2008) and Kumbhakar and Lovell (2000). For the detailed explanation of DEA see, for example, Zhu (2003), Cooper, Sieford and Zhu (2004), Daraio and Simar (2007), Thanassoulis, Portela and Despić (2008).

[2] The conditions for selecting a functional form of production function refer to theoretical consistency and domain of applicability, flexibility vs. maintained hypotheses, statistical estimation and general conformity of data (Lau, 1986, Griffin, Montgomery and Rister, 1987).

production function. Total costs are presumably being a function of input, i.e., labour and capital, prices and the quantities of output produced. According to the characteristics of initial cost function, which satisfies the condition of homogeneity, i.e. cost function is homogenous of degree one in input prices, the cost function was derived from Cobb-Douglas production function in a normalized logarithmic (log-log) form.

Measures of technical and cost efficiency were then obtained by econometric estimation of production and cost function in a form of stochastic frontier function. As it is well known, in econometric estimation of stochastic frontier function the measurement error term consists of two parts (e.g. Fried, Lovell in Schmidt 2008, Kumbhakar and Lovell 2000). First one is a normally distributed random error with a zero mean and the second one is the inefficiency residual. A frontier production function thus indicates maximal output from a given set of inputs. Similarly, a frontier cost function identifies the minimum costs at a given output level, input prices and existing production technology. Considering frontier production function, inefficiency is indicated by the failure to attain the production frontier at given and set of inputs. On the other hand, inefficiency residual of frontier cost function is indicated by the failure to attain the cost frontier at given output level. Deviations from production and cost frontier for a particular firm are the sum a normally distributed random error with a zero mean and the inefficiency residual which is assumed to be positive in cost function and negative in production function. The inefficiency term can follow different distribution, yet it is generally assumed to follow a half-normal distribution.

We must point to the fact that the estimation of production frontier allows us to measure only technical efficiency, while the estimation of cost frontier allows us to measure both technical and allocative efficiency. Namely, cost efficiency is the composed technical and allocative efficiency.

In order to measure technical efficiency of individual firms, we estimated single-equation cross-section stochastic production frontier models suggested independently by Aigner et al. (1977) and Meeusen and van den Broeck (1977) of the form:

$$\ln q_i = \boldsymbol{x}'_i\boldsymbol{\beta} + v_i - u_i, \quad (1)$$

where q_i represents the output of the *i*-th firm, $\mathbf{x}_i$ is a Kx1 vector containing the logarithms of inputs, $\boldsymbol{\beta}$ is a vector of unknown parameters, v_i is a symmetric random error to account for statistical noise and u_i a non-negative random variable associated with technical inefficiency. Similarly, to measure cost efficiency of individual firms, we estimated single-equation cross-section stochastic cost frontier models, which are derived from stochastic production frontier models because of the duality between production and cost function. As we mentioned above, we estimated two specifications of a model assuming efficiency term follows half-normal distribution or exponential distribution. The choice is a matter of data characteristics and computational convenience (Coelli et all. 2005, 252). We use software package Stata 9.2, which allows estimating half-normal, exponential and truncated-normal models.

DEA is a non-parametric linear programming method, which examines the relationship between inputs to a production process and the outputs of that process in order to measure technical and cost efficiency of individual firms relative to other firms in industry. DEA first identifies production units (e.g. firms) that produce a maximal output level at given input levels (Zhu 2003). This approach therefore estimates a deterministic frontier based on observed data, deviations from the frontier are attributed as measured inefficiencies. This means that no random measurement error is assumed in the DEA framework, which is considered to be a shortcoming of DEA in comparison to SFA.

If we consider also relative input prices, DEA measures also deviations of production units' costs from minimal costs that are a consequence of the use of inputs in suboptimal proportions without considering their given relative prices. This is so-called allocative effects. This, allocative efficiency reflects the ability of the firm to use the inputs in optimal proportions, given their respective prices and the production technology. Technical and allocative efficiency are combined to provide a measure of total cost efficiency. Again, DEA measure of cost efficiency reflects technical as well as allocative efficiency. We use software packages DEAp (Coelli 1996) to adopt input oriented DEA model with variable returns on scale.

5. DATA

Econometric estimation of export orientation of individual firms was adopted on a sample of 1.411 Slovenian firms in 2003. We narrow sample from the population of 39.833 Slovenian firms by random sampling method. The data source is the database of firms' financial statements collected by the Agency of the Republic of Slovenia for Public Legal Records and Related Services (APLR). When dealing with such an extensive data base, founded on firms' accounting data, we must consider three important issues. The first is the deficiencies in the financial data reported to APLR. Those data often do not reflect the actual incomes and expenses underlying the production process because firms use this reporting mechanism to reduce the company's tax burden. Second, there are some inconsistencies in the accounting data, e.g., manufacturing firms from the database are classified into industries according to their primary activity, even though, according to the NACE classification of activities, the majority of these firms are engaged in several activities in different industries. Third, we must consider the heterogeneity of data, particularly when we measure efficiency by DEA method. As we mentioned, we consider third level of NACE classification. Therefore, we expect that the results of estimating models of a firm export activity, which include DEA efficiency, would explain the relationship between a firm's efficiency and its export activity to the smaller extent than models that incorporate SFA measures of firm's efficiency. Furthermore, we use relative measures of control independent variables, which capture firm's heterogeneity in its industry. In spite of its imperfections, the dataset presents a relatively good foundation for empirical investigation of the relationship of export orientation to firm specific determinants.
In order to ensure that the cleanest possible data entered the analysis, we narrowed the dataset by excluding firms for which an industry was not defined, firms with zero em-

ployees, firms with a negative value of equity or with zero sales revenues, and firms with zero assets or zero fixed assets. Furthermore, the sample was to the larges extend determined by the possibility to estimate DEA model. As a result, the database employed in the analysis contained a sample of 1.411 Slovenian firms with no missing values.

In our sample, mean value of net revenue on foreign markets relative to total revenue of the firm is 11.8%, while mean value of net revenue on foreign markets relative to total revenue of the firm in a population of total 39.833 firms in Slovenia is 8.6 %. Average value of net revenue on foreign markets relative to total revenue of the firm in a sample is 50.1%, while average value of net revenue on foreign relative to total revenue of the firm in a population of Slovenian firms is 28.2%.

In 2003, 23.4% of Slovenian firms were exporters, while 76.6% of firms were not involved in international trade. In this year, Slovenian firms created 91.5% of net revenues on foreign markets by exporting on European markets, 4% on markets of North and Central US and 3.4% on Asia markets. Therefore, the findings of this paper are predominantly findings on determinants of export orientation of individual Slovenian firms on European markets, in particularly on markets of Germany, Italy, Croatia, Austria and France, which are main export destinations of Slovenian firms.

6. RESULTS OF ECONOMETRIC ESTIMATION OF MODELS OF EXPORT ORIENTATION OF THE FIRMS

Results of econometric estimations of above specified models of firms' export orientation (Table 1 in Appendix 1) indicate that the influence of relative firm size on export orientation of individual firms is statistically not significant. However, regression coefficients have a positive sign in all specifications. The result is the same if we assuming square functional relationship between relative firm size and export orientation of the firm: regression coefficient of square relative firm size has a positive sign in all specifications of models that include this determinant of export orientation of the firm, while the influence is not statistically significant at p=0.05. Results are the same in models excluding square value of relative firm size. However, econometric estimation results are different for models that include absolute firm size. Signs of regression coefficients and p value indicate that absolute firm size has a positive and statistically significant influence on export orientation of the firm at p=0.05. Absolute firm size has also a statistically significant influence at p=0.05 in almost all models which include square value of absolute firm size, in particularly in those specifications that include cost efficiency as determinant of export orientation of the firms. In all models, regression coefficients of square absolute firm size have, as expected, a negative sign.

All specified models also include relative labour prices of individual firms as determinant of export orientation of individual firms. All regression coefficients of this variable have negative sings. However, the influence of relative labour price has proven to be statistically significant at p=0.05 only in one specification of one model. Similarly, regression

coefficients of the rate of return on assets are positive and statistically insignificant at p=0.05 in all specifications of model that include this determinant of export orientation of the firms. However, regression coefficients have an expected signs. Regression coefficients of relative capital intensity of the firms have positive signs in all specifications, although the influence of this determinant of firm's export orientation is statistically not significant at p=0.05.

On the other hand, the results indicate statistically significant and positive influence of export orientation of the firm in previous year on export orientation of the firm in analyzed year in all specifications of models that include this variable. The influence has proven to be statistically significant also in models that include squared value of this determinant of export orientation of the firms. Regression coefficients of this variable have, as expected, negative signs in all specifications. We are aware that the inclusion of lagged dependent variable among explanatory variables might make OLS estimator bias and inconsistent.

The value of adjusted R square in all specified models indicate that determinants of export orientation of individual firms, analyzed in this paper, are able to explain about 73% of overall variability of export orientation. The highest explanatory power has the model that includes stochastic frontier measure of cost efficiency assuming Half-Normal Distribution of inefficiency term, relative firm size, share of labour price in industry, export orientation of a firm a year prior to estimation, as well as square export orientation of the firm in previous year as variable affecting export orientation of individual firms. This model is able to explain 73,85% of overall variability of firms' export orientation

This study particularly focused on technical and cost efficiency. In general, it was established that the influences of technical and cost efficiencies are positive in all specifications of models, except in one, and in compliance with the expectations. However, we established a statistically significant influence at p=0.05 only in all those specifications which include stochastic frontier measure of technical efficiency.

However, the statistically significant influence of technical as well as cost efficiencies, measured by DEA model could not be fount in neither specification. Thus, an interesting finding of this paper is that one can explain a somewhat larger variability of firms' export orientation when the DEA model is applied for cost efficiency and when the stochastic frontier model is applied for technical efficiency. The results of the study clearly show that the firms' export orientation can be explained by their efficiency as measured relative to other firms in the industry. This fact is even more evident if the analysis does not include export orientation of the firm in a year prior to analysis. In those specifications, regression coefficients of technical as well as cost efficiencies are highly statistically significant, regardless of the method used for measuring efficiencies.

7. DISCUSSION OF RESULTS AND CONCLUSIONS

The analysis of export determinants of Slovenian firma points to some interesting implications for managers, as well as for economic and entrepreneurial activity.

1. The firms which are more efficient than their competitors within the relevant industry are more export oriented as they create the majority of their revenue in foreign markets. This finding is consistent with the theoretical assumptions (self-selection hypothesis) and, at the same time, points to a great significance of competition within a national economy's individual industries. Due to the industries' heterogeneity, the competition within an individual industry is the only factor that may accelerate higher efficiency through market rewards and, at the same time, encourages the creation for those firms that are capable to sell in foreign markets and to participate in international trade. This analysis presents a huge importance of the creation of efficient companies in individual sectors.

2. One of the interesting findings of this research is the fact that technical efficiency is more significant for firms' export orientation than cost efficiency. It is thus obvious that, as regards international trade, it is more important for firms to use a lower quantity of inputs per production unit than the ways in which these inputs are combined from the aspect of their prices. Considering the fact that the production factor prices are largely determined locally or within individual international economies and that there exist differences between them, these calculations advise that in terms of export it is more important for the firms to carry out their production with as small quantity of production factors as possible than to base their production on the lowest costs. The firms have slightly higher cost due to the fact that they do not combine production factors in compliance with their prices but rather use, in general, a lower quantity of production factors per production unit are more suitable for the involvement in international trade. These finding points to the fact that the export-oriented firms should take more into consideration the prices of production factors in their export markets than prices of production factors in their relevant domestic markets. This may be concluded from the finding that the influence of cost efficiency which takes into account national prices of production factors, on export orientation of individual firms is less significant. However, the signs of regression coefficients point to a clearly negative impact of the relative cost of labour on export orientation of firms.

3. Apart from efficiency other determinants are significant for a high export orientation of an economy, one of the key ones being the firm size. It should be noted here that the strength of individual firms in the market structure within an individual industry (i.e. relative size) is less important than the absolute size of firms. In general, it could be said that large firms (in terms of the average size of the industry) export more, but this influence is nevertheless statistically insignificant. On the other hand, the influence of the firm's absolute size is statistically significant and, consequently, more important. It can be claimed that large firms in general export a larger proportion of their production regardless of their industry and regardless of the average firm size in that particular industry.

Yet, it has to be noted that the increase in firm size results in a certain 'break-point' in the export orientation. Very large firm export a slightly lower proportion of their production, which signifies that there exists a certain optimal size of firms appropriate for export.

4. The firms with the above-average price of labour in comparison with industry average are involved in international trade to a lesser degree and create a smaller proportion of their revenue in foreign markets. A higher cost of labour than the industry average turns out to be a greater weakness as regards the competition in international markets than the one in domestic market.

5. The firms which are capital intensive within a particular industry (i.e. they need more capital per employee for production unit) create a large proportion of their revenue in foreign markets. High capital intensity is obviously linked to high labour productivity and technologically demanding production, which creates either the need for higher export orientation of firms or a higher comparative advantage in international trade.

6. The calculations clearly show that the firms' export orientation is largely defined by inertion, as their export orientation in a year prior to estimation statistically significantly influences their export orientation in a current year. It may thus be concluded that the firms which have created the majority of their revenue on foreign markets, should do the same in the future. However, at the same time the econometric results also warn that a high level of the firms' export orientation in a particular year may lead to the decrease of export orientation in the following year. There obviously exists an optimal export orientation of firms that can be maintained throughout a longer period of time. When a firm exceeds such optimal export orientation, there is a high probability that it will be unable to achieve the extremely high revenue share from foreign markets in the following year. These results point out that it is difficult to change firms' export orientation in a short time-period and that the foreign market penetration is a process which requires a longer time-period.

7. Slovenia's case shows that only the firms with the above-average efficiency in their industry participate in international trade. Here, it is important to point out that they achieve technical efficiency in particular, i.e. they use as few production factors as possible per production unit in comparison with their competitors. It is highly likely that they will achieve better results in international competition if they combine production factors in a way to consider their prices in international and not domestic markets. It appears that the firms which wish to be active in international markets must carry out international business operations even when they enter into the labour and capital markets. As the case of Slovenia demonstrates, a modern firm involved in international trade does not gain its involvement by merely selling the surplus production (i.e. the one which it cannot sell on the domestic market) in foreign market. The firm must act internationally also from the viewpoint of its organization and from the viewpoint of suppliers and sales market. It is thus sensible to presume that such a firm may be created only in the circumstances where there is a high level of capital and work-force mobility not only within the national economy but also in the international arena. The key factor here is

that the prices of production factors must not exceed the average industry prices. Apart from that, the firms with lower prices of labour than the industry average find it easier to enter international trade.

8. It is easier for large firms to enter foreign trade, but the firm size is not measured by its share in the relevant industry but from the viewpoint of an average firm in the economy in general. The larger the firms are, the easier it is for them to enter foreign trade, which is also reflected by the fact that modern trade is primarily governed by large firms. Nevertheless, the research clearly shows that the largest firms in an economy are not, at the same time, the ones with the largest proportion of export. Indeed, the research has been carried out in the economy where there are no large firms from the global perspective. Apart from that, it is important to consider the fact that Slovenian economy is small as regards the sales markets also when compared to other European and world economies. Taking into account both characteristics of Slovenian economy, it may be established that in order to achieve a high level of an economy's involvement in international trade, large firms are compulsory.

9. Here, the research points out that it is not possible to implement extensive shifts as regards the involvement of firms in international trade neither at the entrepreneurial not at the national level. The heavily exporting firms of yesterday will are likely to be significant exporters today. Thus, it is impossible to expect that a list of significant exporters can be changed rapidly ant that economic policy may quickly change the level of economy's export orientation. It is obvious that conquering foreign takes a certain amount of time; however, once these markets are won, the firms' orientation on those markets is quite stable. Temporary extremes in the export orientation of individual firms are obviously short-term and they cannot be sustained for longer periods of time. Therefore, the firms which achieve the highest levels of export orientation may sustain such orientation only for the period of one year.

10. The last findings are significant for small countries with a high level of orientation to individual markets. The reduction of conjunctures in individual markets is impossible to replace by a fast shift of the economy to other markets. For that reason, the high rate of attachment of a particular country's (e.g. Slovenia's) export to European market is risky as the firms are incapable to quickly shift their export to other markets if the conditions for management are unfavourable on the European market. This is particularly important considering the fact that the export orientation of individual economies is predominantly governed by the largest firms, which are even less flexible in this respect. At the same time, a high export orientation requires high-efficiency firms which take into consideration the prices of individual factors in the export markets. For that reason, the consideration of the prices of factors within the EU is inappropriate for those firms which would like to shift from the European to other world markets.

11. The economies which aim to become a significant player on the world markets and have the basic characteristics similar to Slovenian economy, should encourage the creation of such firms which are technically as efficient as possible and which employ pro-

duction activities with the consideration of their prices on the world markets and which are, at the same time, large from the viewpoint of the national economy and not only the individual industry. The monopoly in the domestic market is thus not a factor of a bigger export orientation of companies. However, one has to be aware that such firms can only gradually enter foreign markets and that the export orientation of an economy is highly dependent on the conditions on the markets in which the firms are selling in a particular time.

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Table 1: *Econometric estimation of Slovenian individual firms' export-orientation*

		Constant	Techical efficiency	Cost efficiency	Market power	Market power-squared	Absolute firm size	Absolute firm size-squared	Relative price of labour	Profitability of a fim	Relative capital intensity	Export in previous year (in t-1)	Export in previous year (in t-1) -squared	Adjusted R-squared
Model 1														
Model 1 TE DEA	DEA indicator of technical efficiency	0.012*	0.017	-	0.027	0.057	-	-	-0.075	-	-	0.990*	-0.196*	0.7319
Model 1 TE SFA N-H-N	SFA indicator of technical efficiency, assuming normal-half normal distribution of random error	-0.065*	0.128*	-	0.028	0.066	-	-	-0.086*	-	-	0.978*	-0.185*	0.7337
Model 1 TE SFA N-E	SFA indicator of technical efficiency, assuming normal-exponential distribution of random error	-0.55*	0.102*	-	0.024	0.066	-	-	-0.081	-	-	0.978*	-0.184*	0.7334
Model 1 CE DEA	DEA indicator of cost efficiency	0.011*	-	0.029	0.03	0.056	-	-	-0.079	-	-	0.990*	-0.197*	0.7321
Model 1 CE SFA N-H-N	SFA indicator of cost efficiency, assuming normal-half normal distribution of random error	-001	-	0.025	0.034	0.051	-	-	-0.076	-	-	0.991*	-0.194*	0.7317
Model 1 CE SFA N-E	SFA indicator of cost efficiency, assuming normal-exponential distribution of random error	-0.013*	-	0.038	0.036	0.053	-	-	-0.80	-	-	0.990*	-0.192*	0.732
Model 2														
Model 2 TE DEA	DEA indicator of technical efficiency	0.010*	-0.016	-	0,065		-	-	-0.066	-	-	0.988*	-0.194*	0,7319
Model 2 TE SFA N-H-N	SFA indicator of technical efficiency, assuming normal-half normal distribution of random error	-0.065*	0.125*	-	0,071		-	-	-0.075	-	-	0.975*	-0.183*	0,7337
Model 2 TE SFA N-E	SFA indicator of technical efficiency, assuming normal-exponential distribution of random error	-0.056*	0.100*	-	0,068		-	-	-0.071	-	-	0.976*	-0.183*	0,7334
Model 2 CE DEA	DEA indicator of cost efficiency	0,009	-	0,029	0,068		-	-	-0.068	-	-	0.988*	-0.196*	0,7332
Model 2 CE SFA N-H-N	SFA indicator of cost efficiency, assuming normal-half normal distribution of random error	-0.002	-	0,025	0,068		-	-	-0.068	-	-	0.989*	-0.193*	0,7385
Model 2 CE SFA N-E	SFA indicator of cost efficiency, assuming normal-exponential distribution of random error	-0.014	-	0,038	0.071*		-	-	-0.071	-	-	0.988*	-0.191*	0,732
Model 3														
Model 3 TE DEA	DEA indicator of technical efficiency	0.012*	0,015	-	0,024	0,54	-	-	-0,067	-	0,0001	0.995*	-0.201*	0,732
Model 3 TE SFA N-H-N	SFA indicator of technical efficiency, assuming normal-half normal distribution of random error	-0.064*	0.126*	-	0,025	0,064	-	-	-0.080	-	0,0001	0.983*	-0.190*	0,7338
Model 3 TE SFA N-E	SFA indicator of technical efficiency, assuming normal-exponential distribution of random error	-0.055*	0.101*	-	0,021	0,064	-	-	-0.075	-	0,0001	0.983*	-0.190*	0,7335
Model 3 CE DEA	DEA indicator of cost efficiency	0.011*	-	0,028	0,027	0,054	-	-	-0.073	-	0.0001	0.995*	-0.201*	0,7323
Model 3 CE SFA N-H-N	SFA indicator of cost efficiency, assuming normal-half normal distribution of random error	-0.000	-	0,023	0,03	0,049	-	-	-0.069	-	0.0001	0.996*	-0.199*	0,7319
Model 3 CE SFA N-E	SFA indicator of cost efficiency, assuming normal-exponential distribution of random error	-0.012	-	0,037	0,033	0,051	-	-	-0.073	-	0.0001	0.995*	-0.198*	0,7321

Table 1: *Econometric estimation of Slovenian individual firms' export-orientation (continued)*

		Constant	Techical efficiency	Cost efficiency	Market power	Market power-squared	Absolute firm size	Absolute firm size-squared	Relative price of labour	Profitability of a fim	Relative capital intensity	Export in previous year (in t-1)	Export in previous year (in t-1) -squared	Adjusted R-squared
Model 4														
Model 4 TE DEA	DEA indicator of technical efficiency	0.012*	0.015	-	0.022	0.057	-	-	-0.069	0.005	0.0001	0.995*	-0.200*	0.7319
Model 4 TE SFA N-H-N	SFA indicator of technical efficiency, assuming normal-half normal distribution of random error	-0.064*	0.126*	-	0.024	0.064	-	-	-0.08	0.001	0.0001	0.983*	-0.190*	0.7336
Model 4 TE SFA N-E	SFA indicator of technical efficiency, assuming normal-exponential distribution of random error	0.053*	0.100*	-	0,021	0,064	-	-	-0.076	0,001	0.0001	0.983*	-0.190*	0.7334
Model 4 CE DEA	DEA indicator of cost efficiency	0.011*	-	0,027	0,026	0,56	-	-	-0.073	0,004	0,0001	0.995*	-0.201*	0.7321
Model 4 CE SFA N-H-N	SFA indicator of cost efficiency, assuming normal-half normal distribution of random error	0,002	-	0,02	0,028	0,052	-	-	-0.070	0,005	0,0001	0.996*	-0.199*	0.7317
Model 4 CE SFA N-E	SFA indicator of cost efficiency, assuming normal-exponential distribution of random error	-0.011	-	0,035	0,031	0,053	-	-	-0.073	0,004	0,0001	0.995*	-0.193*	0.732
Model 5														
Model 5 TE DEA	DEA indicator of technical efficiency	0,008	0,012	-	-	-	0.001*	-	'-0.009	0,006	0.0001	0.822*	-	0.7311
Model 5 TE SFA N-H-N	SFA indicator of technical efficiency, assuming normal-half normal distribution of random error	-0.065*	0.120*	-	-	-	0.001*	-	'-0.012	0.001	0.0001	0.820*	-	0.7328
Model 5 TE SFA N-E	SFA indicator of technical efficiency. assuming normal-exponential distribution of random error	-0.055*	0.094*	-	-	-	0.001*	-	-0.011	0.002	0.0001	0.820*	-	0.7325
Model 5 CE DEA	DEA indicator of cost efficiency	0.007	-	0.022	-	-	0.001*	-	-0.010	0.004	0.0001	0.822*	-	0.7313
Model 5 CE SFA N-H-N	SFA indicator of cost efficiency, assuming normal-half normal distribution of random error	-0.05	-	0.022	-	-	0.001*	-	-0.008	0.005	0.0001	0.824*	-	0.7311
Model 5 CE SFA N-E	SFA indicator of cost efficiency, assuming normal-exponential distribution of random error	0.016	-	0.034	-	-	0.001*	-	-0.009	0.004	0.0001	0.822*	-	0.7313

Table 1: *Econometric estimation of Slovenian individual firms' export-orientation (continued)*

		Constant	Techical efficiency	Cost efficiency	Market power	Market power-squared	Absolute firm size	Absolute firm size-squared	Relative price of labour	Profitability of a fim	Relative capital intensity	Export in previous year (in t-1)	Export in previous year (in t-1) -squared	Adjusted R-squared
Model 6														
Model 6 TE DEA	DEA indicator of technical efficiency	0	0.014	-	-	-	0.003*	-0.00005*	-0.011	0.006	0.0001	0.821*	-	0.7318
Model 6 TE SFA N-H-N	SFA indicator of technical efficiency, assuming normal-half normal distribution of random error	-0.069*	0.116*	-	-	-	0.003*	-0.00005	-0.0126	0.001	0.0001	0.818*	-	0.7333
Model 6 TE SFA N-E	SFA indicator of technical efficiency, assuming normal-exponential distribution of random error	-0.056*	0.090*	-	-	-	0.003*	-0.00005	-0.011	0.002	0.0001	0.818*	-	0.733
Model 6 CE DEA	DEA indicator of cost efficiency	-0.001	-	0.025	-	-	0.003*	-0.0001*	-0.011	0.004	0.0001	0.820*	-	0.732
Model 6 CE SFA N-H-N	SFA indicator of cost efficiency, assuming normal-half normal distribution of random error	-0.015	-	0.027	-	-	0.003*	-0.0001*	-0.010	0.004	0.0001	0.823*	-	0.7317
Model 6 CE SFA N-E	SFA indicator of cost efficiency, assuming normal-exponential distribution of random error	-0.024	-	0.026	-	-	0.003*	-0.0001*	-0.010	0.004	0.0001	0.823*	-	0.7319
Model 7														
Model 7 TE DEA	DEA indicator of technical efficiency	0.005	0.013	-	-	-	0.001*	-	[1]-0.009	0.005	0.0001	0.972*	-0.182*	0.7328
Model 7 TE SFA N-H-N	SFA indicator of technical efficiency, assuming normal-half normal distribution of random error	-0.065*	0.115*	-	-	-	0.001*	-	[1]-0.011	0.001	0.0001	0.963*	-0.173*	0.7344
Model 7 TE SFA N-E	SFA indicator of technical efficiency, assuming normal-exponential distribution of random error	-0.055*	0.090*	-	-	-	0.001*	-	[1]-0.010	0.001	0.0001	0.964*	-0.174*	0.7341
Model 7 CE DEA	DEA indicator of cost efficiency	0.004	-	0.024	-	-	0.001*	-	-0.010	0.004	0.0001	0.973*	-0.183*	0.733
Model 7 CE SFA N-H-N	SFA indicator of cost efficiency, assuming normal-half normal distribution of random error	-0.009	-	0.023	-	-	0.001*	-	-0.008	0.005	0.0001	0.973*	-0.180*	0.7328
Model 7 CE SFA N-E	SFA indicator of cost efficiency, assuming normal-exponential distribution of random error	-0.017	-	0.033	-	-	0.001*	-	-0.008	0.004	0.0001	0.971*	-0.179*	0.733

Table 1: *Econometric estimation of Slovenian individual firms' export-orientation (continued)*

		Constant	Techical efficiency	Cost efficiency	Market power	Market power-squared	Absolute firm size	Absolute firm size-squared	Relative price of labour	Profitability of a fim	Relative capital intensity	Export in previous year (in t-1)	Export in previous year (in t-1) -squared	Adjusted R-squared
Model 8														
Model 8 TE DEA	DEA indicator of technical efficiency	-0.001	0.016	-	-	-	0.003*	-0.00005	-0.010	0.004	0.0001	0.963*	-0.172*	0.7333
Model 8 TE SFA N-H-N	SFA indicator of technical efficiency, assuming normal-half normal distribution of random error	-0.068*	0.113*	-	-	-	0.002*	-0.00004	-0.012	0.004	0.0001	0.954*	-0.164*	0.7347
Model 8 TE SFA N-E	SFA indicator of technical efficiency, assuming normal-exponential distribution of random error	-0.058*	0.087*	-	-	-	0.002*	-0.00004	-0.011	0.004	0.0001	0.956*	-0.165*	0.7359
Model 8 CE DEA	DEA indicator of cost efficiency	-0.002	-	0.026	-	-	0.003*	-0.00005*	-0.011	0.003	0.0001	0.963*	-0.173*	0.7335
Model 8 CE SFA N-H-N	SFA indicator of cost efficiency, assuming normal-half normal distribution of random error	-0.016	-	0.027	-	-	0.003*	-0.00005*	-0.010	0.004	0.0001	0.964*	-0.170*	0.7332
Model 8 CE SFA N-E	SFA indicator of cost efficiency, assuming normal-exponential distribution of random error	-0.024	-	0.033	-	-	0.003*	-0.00004*	-0.009	0.004	0.0001	0.962*	-0.169*	0.7334