Is there evidence of learning from exporting in different manufacturing industries?

by

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Abstract

In this thesis I analyze the relationship between the performance of firms and exporting activity in manufacturing industries. There are a number of researches demonstrating evidence of better performance of exporters than non-exporters, as well as pre-selection for exporting, but only a few demonstrate evidence of learning by exporting. Most of the previous research concentrates on the aggregate manufacturing sector, while firms in different industries might demonstrate different behavior. In this thesis I use a panel of Hungarian manufacturing firms and fixed effects OLS to estimate the export premium, pre-selection for exporting, and gains or losses caused by starting exporting. I differentiate learning from exporting and other non-permanent beneficial effects and I investigate the connection between different firm behavior and industry-specific technological and knowledge intensities. I find evidence that exporting firms in all industries perform better than non-exporters, but there is heterogeneity in exporting effect on performance within different industries. I also find evidence that industries demonstrating learning from exporting are technology and knowledge intensive, but there is no causal effect of technology and knowledge intensity on firm behavior.

Keywords: Export, Performance, Learning by Exporting, Manufacturing Industries, Hungary

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Introduction

Internationalization, particularly exporting, is a very rare activity, but very important for aggregate productivity. Firm-level exporting activity had a lack of attention in international trade literature before 1990-s. Generally, love of variety, increasing returns to scale and relative advantage among countries and industries received much more attention. But starting from 1990-s more and more research has been done about the firm characteristics in international trade.

The works of Bernard and Jensen (1996, 1999) became the basis for future investigations of export effect on firm performance. In the majority of research in this area, exporting firms have been found more productive, bigger, pay higher wages, more capital and skill-intensive etc. Another common conclusion of most of the works is the presence of self selection: firms that enter export markets perform better even before starting exporting. But relatively little proof has been found of the effect of export on firm performance. It is difficult to separate pre-selection for exporting from the effect of starting export on performance. Therefore it is very difficult to tell if trade causes productivity, productivity causes trade or both. In the latter case only the best performing firms start exporting and increase their productivity even more as a result. In my thesis I monitor the performance trends before and after starting exporting as well as before and after stopping exporting and disentangle the causal relations. There are various channels of exports affecting performance. Managers of firms might learn from exporting and adopt the beneficial knowledge and technology gained in other markets, they might hire better employees to be internationally competitive; sales might increase due to the economy of scale, risk diversification, seasonal optimization, etc. In order to disentangle different benefits I control for the economy of scale, better human resource and capital intensity by including the number of employees, the average wage and

year dummies in all my estimations. However I can not control for such factors as risk diversification, seasonal adjustment benefits etc. The dynamic analysis of firms which started and stopped exporting is used to separate learning from exporting from other non-permanent benefits. The latter can be done by analyzing export quitters and determining if on average firms lose performance level as a result of stopping exporting. My hypothesis is that firms who learn from exporting do not lose their knowledge after stopping exporting and their performance trend is non-decreasing. While firms that benefit from other factors, such as risk diversification or seasonal adjustment might loose these benefits after exiting foreign markets and their performance would decrease. I also disentangle worse performance after starting exporting from worse performance due to starting exporting. If a firm performs worse after starting but starts to perform better after stopping exporting then it performed worse due to exporting. Otherwise there might be other reasons for bad performance. One of the most interesting aspects of firm level trade is the dynamics of new exporters and export-quitters. There are examples where share of new exporters has been 10% and share of export-quitters 17% (Bernard and Jensen 1999). Such dynamics in new exporters and those who stop exporting is very important in determining the effect of learning by exporting as well as understanding the relationship between export and performance.

In this thesis I consider the manufacturing sector industries separately and run all the estimations for each industry. The manufacturing sector has been chosen because it has high share of exporters. Other sectors, such as services sector would, probably, not give such reliable results. Furthermore, a lot of research has been made on the manufacturing sector and this allows me to compare my results with other well-known analyses. Analyzing how the effects change from industry to industry allows describing the variation of dynamics. To my best knowledge the firm performance-exporting interrelation has not been analyzed at the industry level for Hungary. I have chosen Hungary because of its internationalization

dynamics; concentration of trade, and foreign ownership as well as role of foreign firms is higher then in most EU countries (Békés, Muraközy and Harasztosi, 2011).

My hypothesis is that industry specifics are very important in determining exporting effects. Industries might react differently for trade liberalization. A possible benefit from starting exporting might come from macro risk, supply, demand and seasonal diversification. Firms in almost all industries benefit from these factors. For example manufacturing of food products, beverages or dressing are exposed to seasonal demand and supply shocks. Macro risks can be very strong, for example for such industries as manufacturing of tobacco products when new trend in prohibition of smoking in public spaces causes strong decreases in sales. There also might be industries, where competition motivates to learn from exporting, adopt new technology (which might both increase sales, decrease number of workers or both), better management and marketing techniques, labor development processes etc. and therefore perform better. These might be such technology and knowledge intensive industries as manufacturing of radio, television and communication equipment as well as manufacturing of medical, precision and optical instruments, watches and clocks. Firms in these industries heavily rely on adopting new technology, innovation in marketing etc. There might also be industries in which firms decrease performance after entering the foreign market. Most of previous research shows substantially slower development of those firms who exit foreign markets. For these firms benefits do not cover drawbacks. The latter might include intense competition, management costs, labor and capital outflow, costs of meeting foreign standards unrelated to quality improvement and financial costs (e.g. extension of credit terms due to longer selling process). Implementing trade liberalization for these industries would decrease average performance. Therefore policies targeting labor performance and using trade liberalization would have to consider each industry separately in order to maximize their effects.

In the first chapter I describe previous studies and theory in the chosen area. Second chapter includes data analysis. In the third chapter I describe methods, estimations and analysis of the results. I start my analysis by showing the difference between exporters and non-exporters in terms of labor productivity, average wage and employment using descriptive statistics. Further I consider export premia for these characteristics and describe how export status is related to the chosen firm characteristics. Self selection and learning from exporting is estimated further and the same yearly performance dynamics is shown for firms which stop exporting during the considered period. This analysis gives separate coefficients for annual dynamics of before and after change of export status for the considered industries. Therefore it is possible to see non-aggregated coefficients, check industry by industry and determine if the firms in different industries react differently for exporting and, if yes, what are the general regularities. Further I follow with conclusions, appendices and reference list.

Literature review

The first studies describing differences between exporters and non-exporters in terms of a firm's performance were made by Bernard and Jensen (1995), Aw and Hwang (1995) and Tybout and Westbrook (1995). All the researches show that exporting firms outperform non-exporters. For example, Bernard and Jensen (1995) show that even though the share of exporters is small, exporting firms are larger, more capital-intensive, have higher average employment, investment per employee and labor productivity, measured by value added per employee and shipments per employee. The above mentioned characteristics were monitored for U.S. Manufacturing firm-level data in general and industries or regions of firms were not taken into account. The authors found a positive and significant export premium controlling for plant size, capital intensity, hours per worker, industry and location. The impact of export on productivity couldn't be identified. The authors found that better performing plants became exporters and plants that stopped exporting demonstrated the worst performance. The study shows that exporters were better-performing firms, but, because of self selection, it couldn't show the effect of being an exporter on future performance. Therefore export-oriented policy and trade liberalization results in survival of only the best performing firms and raises aggregate productivity.

The impact of entering export markets on productivity has been investigated by Bernard and Wagner (1996), Roberts and Tybout (1998) and Bernard and Jensen (1999). All the studies show significant exporting premium and self selection, but almost no sign of better performance as the result of starting exporting. For example the study by Bernard and Jensen (1999) considers performance of firms before entering export markets by comparing

the initial characteristics[1] and performance dynamics of future exporters and future non-exporters[2]. The authors find that future exporters show higher initial characteristics, such as size, number of shipments, labor productivity and wages 2-3 years before starting exporting. The average annual growth rate premia was analyzed and detected significant for shipments and employment and insignificant for productivity and wage. This showed clear evidence that future exporters have higher initial characteristics as well as higher annual growth rate for shipments and employment. The decision to export was analyzed by using linear probability model; results show that increase in firm characteristics increases probability of exporting, which is a sign of self selection. In order to check ex-ante performance the effect of initial export status was investigated controlling for initial employment and other plant characteristics.[3] While for shipments and employment the results were positive and significant, labor performance measure was not significant in the later periods, or significant, but negative in the early periods. Generally, the results didn't show any labor productivity performance increase due to starting exporting. Authors note substantial share of new exporters (10% on average) and export-stoppers (17% on average) each year. In order to investigate the effects of starting and stopping exporting on plant characteristics and to get results for gains from exporting dummies for future export start, future export stop and for

[1] Subsample of non-exporters has been created and as future exporters those firms have been categorized who exported in the period T(last period). The initial period firm characteristics differences have been considered by executing the following regression $LnX_{i0} = \alpha + \beta EXPORT_{iT} + \gamma \ln Size_{i0} + \delta Di + \varepsilon_i$, where X_{i0} is a firm characteristic in year t, $EXPORT_{iT}$ is an export dummy of the last period, $Size_{i0}$ is the employment in the first period, D is a vector of state and ε is an industry dummy. (Bernard, Jensen, 1999. p.9).

[2] The coefficient β in the regression $\frac{\ln X_{iT-1} - \ln X_{i0}}{T-1} = \alpha + \beta EXPORT_{iT} + \gamma \ln Size_{i0} + \delta Di + \varepsilon_i$ shows the dynamics of future exporting firms' performance throughout the chosen T-1 period (Bernard, Jensen, 1999. p9).

[3] The following regression has been constructed: $\frac{\ln X_{iT} - \ln X_{i0}}{T} = \alpha + \beta EXPORT_{i0} + \gamma \ln Size_{i0} + \delta Char.s_{i0} + \varepsilon_{iT}$. β shows the difference in performance increase of annual growth rate between exporters and non-exporters(Bernard, Jensen, 1999. p9).

exporting in both periods were included in their ex-ante performance regression[4]. The results show that in the long run stopping export is related to negative performance growth, starting exporting activity is associated with high growth, while exporters in initial and last periods demonstrate positive annual dynamics of employment and shipments, but not for productivity. The authors also noted that continuous exporters outperform firms that change their exporting status during the period under consideration in terms of employment, shipments and wages growth but not for productivity.

A comparative research of export effect on productivity involving the biggest number of countries has been done for 14 countries by the Trade Team of the World Bank (2007). Most of the conclusions were in line with the previously mentioned works: in general export status as well as the share of export in sales has been significant in estimating the labor productivity. While the results show self selection of better performing firms into the exporting, no evidence of better performance effect of starting exporting has been found. The paper also describes that better productivity has been found in the countries which had better-performing governments.

Bernard, Jensen, Redding and Schott, in their famous paper "Firms in International Trade" (2007) describe the main differences between exporting and non-exporting firms and theories that face these differences. The authors mention the shift of focus in theoretical and empirical research from countries or industries to firms and products. They use transaction-level US trade data in order to investigate new stylized facts. The authors mention that exporting is a very rare activity and in 2000 the top 10% of all exporters (4 % of total US

[4] Coefficients β_1, β_2 and β_3 show the difference between growth for export starters, exporters in both years and export stoppers comparing to the non-exporters as shown in the following regression(Bernard, Jensen, 1999. p14): $\frac{\ln X_{iT} - \ln X_{i0}}{T} = \alpha + \beta_1 Start_{iT} + \beta_2 Both_{iT} + \beta_3 Stop_{iT} + \gamma \ln Size_{i0} + \delta Char.s_{i0} + \varepsilon_{iT}$, where

$Start_{iT}$ =1 if $Export_{i0} = 0 and Export_{iT} = 1$;

$Both_{iT} = 1$ if $Export_{i0} = 1 and Export_{iT} = 1$;

$Stop_{iT} = 1$ if $Export_{i0} = 1 and Export_{iT} = 0$

firms), are accounted for 90% of total export. Their study shows that exporters' average size and wage is larger; they are more productive, capital- and skill-intensive. They concluded that initial productivity as well as rapid growth in employment and output (mentioned by all the previous researches) lead to increase of aggregate productivity in case of trade liberalization. The paper also describes that variety of products traded as well as the number of countries traded with are very important in understanding the effect of distance on trade.

There have also been cases when learning by exporting has been found significant. One of few researches that found evidence of productivity effects of exporting has been made by Van Biesebroeck and Johannes (2005), who analyze panel of African firms between 1992 and 1996 and show pre-export differences in wages, scale of operation, capital intensity and productivity. The post-entry productivity as well as its growth rate for export starters has shown to be higher then for non-exporters.

Another significant learning by exporting effect was investigated by De Loecker (2007). The author, using 6-year panel of Slovenian firms, demonstrates that exporting activity in Slovenia has been very dynamic. During the period exports doubled and the number of firms that started exporting significantly increased. The matched sampling technique was used to show the dynamics of difference between non-exporting control group and exporters. The author finds the exporters become on average 8.8% more productive after straining exporting.

Sabina Abduallayeva (2010), in her CEU Master's thesis, estimated self selection and the effect of exporting on labor performance using the sample of 1992-2005 Hungarian manufacturing firms' data. In the research the author controlled for ownership effects, and showed a substantial export premium as well as self selection in terms of productivity, sales, employment, capital and material costs. In contrast to researches made on different countries, learning by exporting effect has been found even when controlling for ownership effects.

Although there are cases of detecting learning by exporting to be statistically significant both in Europe and Africa, they are in the minority and therefore have to be further investigated. Moreover, most of the researches discussed are designed to capture aggregate effects, controlling for industry and time, but relatively few of them consider the effect between industries.

Hungarian trade is comparatively very intense and very important for the development of Hungarian business and the economy. Békés, Muraközy and Harasztosi (2011) describe Hungarian trade and main stylized facts at firm and product level. The authors point out that the concentration of trade, foreign ownership as well as the role of foreign firms is higher in Hungary then in most of the EU countries.

Békés and Muraközy (2012) describe trade volatility in the Hungarian manufacturing sector. They show the presence of temporary trade in all kinds of traded products and firms. Authors find evidence that productivity, destinations, capital cost and firm-product characteristics affect stability of trade. Halpern and Muraközy (2009) show that innovative firms in Hungary are more productive, likely to trade and they export in more countries.

Another important research on internationalization and firm performance in Hungary has been made by Halpern, Koren and Szeidl (2005), in which the authors suggest that total factor productivity depends on the share of imported inputs. The results show that imports can be accounted for 30% of the aggregate total factor productivity in Hungary. They also find that 50% of the productivity effect comes from imports advancing productivity and the rest is accounted for the reallocation of labor and capital to firms that import.

These results give clear evidence that Hungary is very involved in trade and the performance of firms in Hungary is strongly affected by their internationalization process. There is a lot of evidence that exporters perform better and they self select for exporting activity. Although learning by exporting has not been so clear, there are cases when it has

been detected as statistically significant. A lot of the research has been done for the whole manufacturing sector and there is lack of attention to these processes on the industry level. The aim of this research is to fill this gap by considering all the industries of the manufacturing sector separately.

Data description

The dataset includes unbalanced panel of firm-level annual data for Hungarian firms from 1992 to 2006[5]. The dataset is originally produced by the APEH, the Hungarian Tax Authority. I consider the following variables from the dataset in my analysis: export sales, total sales, employment, wages and the 2-digit NACE code.

The share of export sales in total sales is used as an export-intensity measure. Number of employees is used in order to account for the size of a firm. In order to control for labor quality I use average wage. In order to limit sample to the considered industries, a 2-digit industry code was used. Manufacturing sector accounts for the 15-37 NACE2 numbers.

In order to clean the data the number of restrictions was applied. All the variables are nonnegative, export sales are less then total sales; number of employees, wages and total sales are bigger then 0.

Export dummies are used as indicators of export status of a firm during a given year. This dummy is 1 if the share of export sales in total sales is higher than a certain threshold. Two thresholds were considered: 0% and 5%. The first alternative allows me to observe more exporters and therefore gives higher confidence in the estimations. But according to export premia calculations, these two thresholds give substantially different results. Using 5% threshold shows significantly lower export premia and therefore I choose to use it to make my results more robust.

I also use dummies for starting export, for stopping export and for always exporting. The dummy of change of export status is 1 if during the previous 3 lags there has been one type of exporting status and starting from current period and 3 leads on the status is different. For example, dummy indicating start of exporting is 1 in time t if in time t-3, t-2 and t-1 a

[5] The dataset was presented to me by Prof. Miklos Koren for the purpose of this research.

firm didn't export, at time t the firm started exporting and at times t+1, t+2 and t+3 the firm exported. Dummies for stopping exporting activity as well as always exporting are created in exactly the same was. Stopping exporting dummy is 1 if a firm did export in t-3, t-2, t-1, stopped exporting in t and didn't export in years t+1, t+2 and t+3. Always exporting dummy is 1 if a firm exports for 7 consecutive years. All the firms which start and stop exporting more frequently are in the control group together with firms which do not export during 7 consecutive years.

I start my analysis by considering the variables used in the estimations. The average numbers of employees per firm, average share of exports in total sales, average sales per employee in millions HUF deflated to 2006 prices as well as average wage per employee in millions HUF deflated to 2006 prices are given in Table A1. Total numbers of firms, share of export starters, share of firms that stop exporting, share of exporters as well as share of always exporters in total number of firms are presented in Table A2.

According to table A1, the highest average number of employees, level of productivity as wells as level of average wage is in industry 23 (manufacturing of coke, refined petroleum products etc.), which is an industry-outlier in terms of most characteristics. This can be explained by the specifics of the industry as well as small number of firms in it. Table 2 shows that there are only 8 firms in this industry. Average employment in other industries ranges from 349 in manufacturing of tobacco products to 19 employees in publishing; it gradually decreases without any visible division into blocks or any outliers. The average number of employees per industry increases with decrease of the number of firms in the industry. Average wage per employee in millions of HUF per year ranges from 3.97 millions in manufacturing of tobacco (8 firms) to 1.13 in manufacturing of wearing apparel, dressing etc. (2021 firms).Wage per employee seems to become higher with average sales.

Average sales per employee ranges form 55.75 million HUF in manufacturing of tobacco to 7.18 in manufacturing of wearing apparel.

Share of export in total sales gradually increases from Publishing, Food, paper, petroleum to 27: basic metals, 18: Wearing apparel, 19: Leather cloth and 34: Motor Vehicles. Visually there seem to be no relation between any of the previously considered variables and share of export in sales.

The share of exporters gradually decreases from 57% in manufacturing of motor vehicles to 9% in publishing. It seems to be not correlated with other variables shown in tables A1 and A2.

Graphs A1: A4 show the dynamics of share of net exporters per year for each industry. Share of net exporters is calculated as share of exporters minus share of importers. Most of the annual volatility in net export starters is within the range of +\- 1% of the total number of firms. However there are very volatile industries, for example tanning and dressing of leather, which includes 664 firms. Manufacturing of pulp, paper and paper products industry (471 firms) experienced a peak above 1% in 1996 and then a big drop until -30% in 2000. This might be explained by computerization, when only the strongest paper producer firms survived. The Manufacturing of machinery and equipment (3632 firms) had a high peak up to 1.5% in 1998 and again from up till 1.3% from 2000 until 2004, when the share of net export-starters normalized to 0%. Another industry outlier is manufacturing of motor vehicles, trailers and semi trailers. It experienced a huge peak in annual net number of export-starters up to 2.5% of total number of firms in 2000. Total production of cars in Hungary increased in 2000 to 107%, similarly to Slovakia and Czech Republic (OICA, 2007).

Generally, for Hungary the statement of Bernard and Jensen about exporting being a rare activity doesn't seem to work. Firms in Hungary export a lot and there are industries

where share of exporters in total number of firms reaches 50%, using 5% threshold of export share in sales to determine an exporter. There was noticed an industry outlier, particularly the manufacturing of coke, refined petroleum products etc. All the other industries visually can not be divided into blocks based on any characteristics. Only two relationships between average industry characteristics are noticeable. The average number of employees per industry increases with decrease of the number of firms in the industry and average wage per industry seems to become higher with average sales. Concerning the annual dynamics of share of net exporters, most of the variation is within +\- 1% of the share of total firms per industry.

Methodology and estimations

To show the percentage difference of performance between the exporters and non-exporters I started with computing the productivity premia for each industry separately. The equation was adopted from the comparative research of 14 countries of the World Bank Trade Team (2007).

$$\ln P_{it} = a + ß\ Export_{it} + c\ Control_{it} + e_{it} \qquad (1)$$

where *P* is labor productivity (sales/employment); *Export* is a dummy variable for export status (1 if the firm's export share in total sales in year t is higher then 5%); *Control* is a vector of control variables that includes the log of number of employees to measure firm size, the log of wages and salaries per employee to control for human capital, year dummies to control for capital intensity; and *e* is an error term. The exporter productivity premium shows the average percentage difference in firm characteristics between exporters and non-exporters. Omitted variables might create problems in my estimation. The problem is that there are many factors affecting performance and some of them might be correlated with explanatory variables. In order to control for unobserved plant heterogeneity and to compare the results with the pooled estimations, both pooled and firm fixed effects Ordinary Least Squares estimation methods were applied. Fixed effects estimation was used because firm specific factors are correlated with explanatory variables.

The results are given in the Table B1. All the variables were used in logarithmic form. The second column includes coefficients at the export status dummy in specification where the dependent variable is sales per person, while average wage and number of employees are used as controls. The third column includes the coefficient at the export status dummy in

specification where the dependent variable is the average wage while sales per person and the number of employees are used as controls. The fourth column includes the coefficients at the export status dummy in the specification where the number of employees is the dependent variable while the average wage and sales per person are used as controls. All the estimations are done for the industries listed in the first column. All the columns include pooled and fixed effects OLS estimation. P-values, R squared coefficients and numbers of observations are given only for the first column. The coefficients, demonstrating percentage difference between exporters and non-exporters in the above mentioned dependent variables are mostly statistically significant. Most of the industries on average have better performing exporters than non-exporters, even though the export premia are different for the most of them. There are negative values present, but these are not statistically significant, probably because of the low number of observations. There are big differences between fixed effects and pooled estimation. This can be explained by the role of unobserved firm heterogeneity in determining difference between exporters and non-exporters. Generally these results fit in the overall picture of previous research in the field.

In order to show how the premia change with export intensity, I included export share instead of export dummy in the regression used in comparative research of 14 countries of the World Bank Trade Team (2007) and run it for all industries separately.

$$\ln P_{it} = a + ß\ Exportshare_{it} + c\ Control_{it} + e_{it} \qquad (2)$$

where *P* is labor productivity (sales/employment); *Exporshare* is a measure of export share in total sales (export sales/total sales); *Control* is a vector of control variables that includes the log of number of employees to measure firm size, the log of wages per employee to control for human capital, year dummies to control for capital intensity; and *e* is an error term. The

export share variable coefficient shows the average linear relationship of labor performance, number of workers and average wage with share of export in total sales for a particular industry. Both pooled and fixed effects OLS was applied in order to check if the results depend on unobserved firm heterogeneity.

The results are presented in the Table B2. The structure of the table is the same as in Table 1, but share of export sales in total sales is used instead of export status dummy. For the number of observations see Table B1. I find that if share of export increases by 1 % the dependent variable increases by β/100%. The coefficients in Table B2 are statistically significant but quite low. Most of the previous studies, done for aggregate manufacturing sector, showed positive linear relationships, but now there are a lot of significant and negative coefficients in all three equations. Therefore different industries have different export-performance relationships. As in the case with exporter status premia, there is significant difference between pooled and fixed effects estimation; sometimes they even have different signs. Therefore there are firm specific characteristics which affect the linear relationship between export and performance indicators. Further on only fixed effects estimation is applied to all estimation procedures. The same estimations, solely for the sample of exporters controlling for heteroskedasticity, didn't show any significant coefficient.

In order to show the performance difference between export starters and other firms the model of Bernard and Jensen (1999) was modified and applied. Particularly,

$$\ln LP_{it} = a + ß_1\, Exportstart_{it-3} + ß_2\, Exportstart_{it-2} + ß_3\, Exportstart_{it-1} + ß_4\, Exportstart_{it} + \\ + ß_5\, Exportstart_{it+1} + ß_6\, Exportstart_{it+2} + ß_7\, Exportstart_{it+3} + c\, Control_{it} + e_{it,} \qquad (3)$$

$$\ln LP_{it} = a + ß_1\, Exportstop_{it-3} + ß_2\, Exportstop_{it-2} + ß_3\, Exportstop_{it-1} + ß_4\, Exportstop_{it} + \\ + ß_5\, Exportstop_{it+1} + ß_6\, Exportstop_{it+2} + ß_7\, Exportstop_{it+3} + c\, Control_{it} + e_{it} \qquad (4)$$

where *i* is the index of the firm, *t* is the index of the year; *LP* is labor productivity; *Exportstart* is a dummy variable for staring exporting (1 if the firm exports in year t, t+1, t+2 and t+3, but doesn't export in periods t-1, t-2 and t-3, 0 else). In the same way I construct *Exportstop* variable, a dummy indicating if the firm stopped exporting. *Control* is a vector of control variables that includes the log of the number of employees to control for firm size, the log of wages to control for human capital, year dummies to control for capital intensity; and *e* is an error term. The pre- and post-entry premium shows the average percentage difference between today's exporter starters and today's non-export starters (those firms that export or do not export or stop exporting during the chosen period) annually for 7 years starting t-3 (respective coefficient t+3) up until t+3 (respective coefficient t-3), controlling for the characteristics included in the Control vector.

This regressions help to describe the dynamics of performance of export starters in comparison to all the other firms. This analysis shows if firms pre-select for starting\stopping exporting and if learning by starting\stopping exporting is present. As already mentioned, due to the lack of robustness between pooled and fixed effects estimators, only the fixed effects OLS has been used in order to control for firm specific heterogeneity and avoid omitted variable bias.

The results are presented in Tables B3 and B4, where each column includes coefficient at the export start\stop dummies from specification 3 and 4 respectively. For example, coefficients in column 1 of Table B3 determine the difference between firms that start export in 3 years and all other firms in the current period. The coefficient in the last column of Table B3 shows the percentage difference in labor performance between firms which started to export 3 years ago and all the other firms in the current period. Most of the results are not statistically significant; however certain general conclusions can be made. First

of all the results are very different and no unique kind of trend is present. For export starters there are industries in which firms' performance is lower before and after starting exporting, e.g manufacturing of non-metallic products etc. This means that the export status premium is negative. There are industries which perform worth than others and start performing better after starting exporting. These are manufacturing of food products; manufacturing of paper, publishing and printing industries. The latter is the only industry for which the coefficients are statistically significant showing sign of learning by exporting. There are also industries which do not demonstrate learning by exporting, but the coefficients are positive and, sometimes, significant, e.g. manufacture of textiles. These results show positive export premium as well as self selection for exporting, but the dynamics of growth of the coefficient didn't change and therefore the firms preserve a positive trend, but do not learn more.

For firms that stop exporting after 3 years, the situation is rather similar. Most of the coefficients are insignificant. For the results that are significant, such as non-metallic products and basic metal industries, there appears to be pre selection for stopping exporting, when the first three coefficients are negative and significant. For the manufacturing of electrical machinery industry the coefficients after stopping exporting are significant, negative and continue to decrease. This is a sign against the hypothesis of learning by exporting, because firms which increase their labor productivity by learning from foreign markets should preserve their performance trend. Therefore the most probable explanation would be that firms in these industries benefit mostly from other non-permanent factors.

To show the difference between all 4 types of export statuses, particularly export starters, firms that stop exporting, always-exporters and non-exporters during the chosen period the model 3 was modified. In edition to the previous equation, dummies for export quitters (see equation 4) and always exporters were included. The following model was used:

$$\ln LP_{it} = a + ß\ Exportstart_i + \gamma Exportstop_i + \delta AlwExport_i + c\ Control_{it} + e_{it}, \quad (5)$$

where *i* is the index of the firm, *t* is the index of the year; *LP* is labor productivity in year t; *Exportstart, Exportstop and AlwExport* are vectors of 3 lags and 3 leads of the dummy variables (for periods t-3, t-2, t-1, t, t+1, t+2, t+3). $Exportstop_{it}$ is 1 if a firm didn't export in year t, t+1, t+2 and t+3, but exported in periods t-1, t-2 and t-3, and 0 otherwise. $AlwExport_{it}$ is 1 if a firm exported in periods from t-3 to t+3. *Control* is a vector of control variables that includes the log of the number of employees to control for firm size, the log of wages to control for human capital, year dummies to control for capital intensity and *e* is an error term. The pre- and post-entry premia show the average percentage difference today between: export starters and non-exporters; always exporters and non-exporters; and export-stoppers and non exporters per industry during 7 consecutive years, starting t-3 (respective coefficient t+3) up until t+3 (respective coefficient t-3) and controlling for the characteristics included in the Control vector. Generally, there is a clear sign of learning by exporting if performance increases as the firm starts exporting and non-negative dynamics after stopping exporting. As already mentioned, due to the significant difference between pooled and fixed effects estimators, only the fixed effects OLS was used. In the following paragraphs I explain the manipulations to determine in which industries firms on average learn from starting exporting, in which they benefit from non-permanent factors or perform worse due to exporting. I decide to consider the increase\decrease of performance as significant if the change between the first lag and the first lead is more than 10% relative to the control group. I also calculate the results for different thresholds in order to determine if they are robust to modifications.

The results for export starters are presented in Table B5.1. Each column is the coefficient at *Exportstart* dummies from the specification 5. For example, first column

includes coefficients at $Exportstart_{t+3}$ which shows the percentage difference between firms starting exporting in 3 years and firms from the Control group (non exporters and firms often changing exporting status). Industries for which coefficients are significant are referred by the following Nace codes: 17, 18, 22, 28 and 29. There is pre-selection for starting exporting for 17 (Manufacturing of textiles), 18 (Manufacture of wearing apparel; dressing and dyeing of fur), 24 (Manufacture of chemicals and chemical products), 25 (Manufacture of rubber and plastic products), 28 (Manufacture of fabricated metal products, except machinery and equipment), 29 (Manufacture of machinery and equipment n.e.c.) and 31 (Manufacture of electrical machinery and apparatus n.e.c). The results are also graphically demonstrated in Graphs B1-B3 for each considered industry. Each graph demonstrates the percentage difference of firms starting exporting in period t and the Control group. Industries, demonstrating sign of learning by exporting are the following: 21, 22, 29, 31 and 32 while 18, 25, 26 and 33 have negative dynamics after starting exporting. The results for firms stopping exporting are presented in Table B.5.2 and graphs B.4-B.6. Each column includes coefficients at *Exportsop* dummies in the specification 5. For example, the first column presents percentage difference between firms that will stop exporting in 3 years and the Control group (non-exporters and firms changing export status more often than once in 3 years). All the graphs show the annual difference between firms stopping exporting in year t and the control group. The same kind of heterogeneity within industries is present as in the case of export-starters. There is sign of pre-selection for stopping exporting, particularly 15, 18, 19, 21, 26, 29, 32, 33 and 36. Industries that demonstrate negative trend: 17, 18, 21, 22, 24, 25, 31; non-negative trend: 15, 19, 26, 29, 32, 33, and 36.

Those of the latter industries which intersect with industries that show positive productivity dynamics after starting exporting have a clear sign of learning by exporting. These are 29 (Manufacturing of machinery and equipment) and 32 (Manufacture of radio,

television and communication equipment and apparatus). Performance of firms in these industries heavily relies on adopting new technology, innovation and creativity in product development, marketing etc. Both of the industries are in the specialized supplier factor-intensity group according to the OECD classification (see Table B.6). According to the aggregations of manufacturing firms by technological intensity by the Eurostat these are medium-high and high technology industries (see Table B.7).

The knowledge gained from functioning in foreign markets can not simply vanish, therefore industries which show sign of better performance, but start to perform worse after stopping exporting, might benefit from other non-permanent factors. These are the following industries: 21 (Manufacture of pulp, paper and paper products), 22 (Publishing, printing and reproduction of recorded media) and 31 (Manufacturing of electrical machinery and apparatus). A possible benefit from starting exporting might come from macro risk, supply, demand and seasonal diversification. Firms in almost all industries benefit from these factors. Nowadays macro risks can be very strong, for example for such industries as manufacturing of tobacco products when new trend in prohibition of smoking in public spaces causes strong decreases in sales. Industries 21 and 22 are in the scale intensive group, industry 33 is in the specialized-supplier factor-intensity group according to the OECD classification of firms based on factor intensities (see Table B6.). Due to the fact that I control for scale intensity by using employment as a size measure, economy of scale benefit can not be used to explain the behavior of the firms. According to the classification of firms based on technological intensity by Eurostat (see Table B.7) these are low technology industries, except of 31, which is a medium-high technology-intense industry.

Those firms which perform worse after starting exporting, but start performing better after stopping exporting, are negatively affected by entering foreign markets. For 26: Manufacturing of other non-metallic mineral products and 33: Manufacturing of medical,

precision and optical instruments, watches and clocks benefits do not cover drawbacks. The latter include intense competition, management costs, labor and capital outflow, costs of meeting foreign standards unrelated to quality improvement and financial costs (e.g. extension of credit terms due to longer selling process) (Exporthelp, n.d.). The above-mentioned industries are in resource-intensive and science based factor intensity groups according to the OECD (see Table B.6). Based on technological intensity classification by Eurostat, these are in medium-low and high technology groups (see Table B.7).

I also calculate the results for different thresholds in order to determine if they are robust to change of threshold conditions. All the results are presented in Table B.5.4. Each column presents industries which demonstrate similar behavior due to exporting. The results slightly vary depending on the threshold, but considering other threshold values doesn't help explain the behavior of the firm. The considered threshold of 10% change in difference between exporters and non-exporters in periods between t-1 and t+1 is optimal and representative of the general picture.

The results for firms that always export during the considered period are given in Table 6.3. Most of the results are not statistically significant, but positive. These results match well with the estimations of export status premia and support the argument that exporters outperform non-exporters.

Generally the results are very different for each industry and it is more practical to analyze all the industries separately for presence of any effect of export on performance. Not all the industries react to starting exporting by increase of productivity; some of them experience a decrease. This decrease in productivity might be caused by intense competition, management costs, labor and capital outflow, costs of meeting foreign standards unrelated to quality improvement and financial costs. This was the case for 26 (manufacturing of other non-metallic mineral products) and 33 (manufacturing of medical, precision and optical

instruments, watches and clocks) benefits do not cover drawbacks s in 1994-2004 and it is hard to detect the exact reasons for such a decrease. Some industries have strong sign of learning by exporting, like 29 (Manufacturing of machinery and equipment) and 32 (Manufacture of radio, television and communication equipment and apparatus). These are specialized supplier and high technology industries. However there are high technology and medium-low technology-intensive industries which perform worse due to exporting and therefore technology-intensity doesn't explain the behavior of firms. Neither can it be explained by knowledge intensity based on aggregation of knowledge-intensive industries by the Eurostat (see Table B8) because two knowledge intensive industries, particularly 32 and 33 better and worse performance as the result of starting exporting. Other industries benefit from other factors not related to gaining permanent skills or knowledge. Firms might increase their performance due to supply, demand and macro-risk diversification. According to my analysis these are the following industries: 21 (Manufacture of pulp, paper and paper products), 22 (Publishing, printing and reproduction of recorded media) and 31 (Manufacturing of electrical machinery and apparatus). It is hard to describe the exact reasons of better performance of firms in these industries because it requires in-depth historical analysis of each industry and this might be a separate future research. Technology-intensity and knowledge-intensity can not explain why firms behave differently. Therefore policymakers who are concerned with aggregate productivity growth should consider industries separately, rather than making a policy for the whole manufacturing sector.

Conclusions

In this thesis I analyzed the relationships between exporting activity and labor performance for industries of manufacturing sector. I found a significant export premium for performance, average wage level and employment. The results for linear relationship between the share of export and labor performance vary substantially from industry to industry. There are a lot of negative values and most of the coefficients are rather small for all three variables. Most of the coefficients are significantly different for fixed effects and pooled OLS and therefore firm-specific heterogeneity is significant in these relations for all considered industries.

Analyzing dynamic performance I find heterogeneity of firm reactions on starting exporting. Signs of learning by exporting are present for a list of industries, but only few of them preserve the performance trend after stopping exporting. Even though these are specialized supplier industries, not all specialized supplier industries learn from exporting. For example electrical machinery and apparatus n.e.c. industry is a specialized supplier industry demonstrating evidence of benefiting from other, non-permanent factors. In some industries performance increases when firms start exporting, but decreases when they stop. This behavior doesn't support the hypothesis of learning by exporting for these industries and it is present in manufacture of pulp, paper and paper products, publishing and printing, as well as manufacturing of electrical machinery industries. Firms in these industries might benefit from other factors not related to obtaining permanent skills or knowledge. The benefits might include diversification of demand and supply risks caused by macro-economic, legal or social factors. There are industries performing worse when starting exporting and start performing better after stopping exporting. These industries are manufacturing of other non-metallic products and manufacturing of medical, precision and

optical instruments. Due to such significant differences among these industries and their low quantity it is very hard to find a common factor which might explain why they perform worse. The list of potential problems associated with exporting is very long and ranges from high foreign competition to labor and capital outflow.

Generally the hypothesis of industry heterogeneity has been proven, the results are very different for different industries and it is more practical to analyze all the industries for presence of effect of export on performance separately. Both of the industries, firms in which learn from exporting, are in the specialized supplier group according to the OECD factor intensity classification. Otherwise it is very hard to determine which firms' characteristics cause such different reactions on exporting because the industries demonstrating similar behavior are very different. Industries which demonstrate learning by exporting belong to the high technology group, but there are high technology industries which benefit from non-permanent factors or even perform worse due to exporting. Therefore technology intensity doesn't cause firm behavior, but might be an important factor in determining learning by exporting. Firms in machinery, radio, television and communication equipment and apparatus industries entering foreign markets might adopt new technology in order to meet standards or to increase compatibility and therefore improve labor performance. The behavior of industries can not be explained by knowledge intensity as well. Two of the industries which are considered as knowledge intensive by the Eurostat, the radio, television and communication apparatus as well as medical, precision and optical instruments industries, are in the group that learn from exporting and the group that perform worse due to exporting respectively. In order to determine why firms in certain industries behave in a certain way an in-depth analysis of historical firm performance might be necessary, but it could not be done in scope of this research. Therefore policymakers who are concerned with aggregate

productivity growth should consider industries separately, rather then make policy for the whole manufacturing sector.

Appendix A

Table A1. Descriptive statistics. Average sales and Average wage are deflated to 2006 HUF and presented in millions of HUF.

industry/variables	Average Number of Employees	Share of Export in Sales	Average Sales per Employee	Average Wage per Employee
15 : Manufacture of food products and beverages	70.70	0.09	22.03	1.56
16 : Manufacture of tobacco products	349.30	0.12	55.75	3.97
17: Manufacture of textiles	59.94	0.23	12.01	1.33
18 : Manufacture of wearing apparel; dressing and dyeing of fur	74.90	0.30	7.18	1.13
19 : Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	76.33	0.36	8.69	1.32
20 : Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	24.74	0.15	11.98	1.23
21 : Manufacture of pulp, paper and paper products	70.50	0.10	21.11	2.09
22 : Publishing, printing and reproduction of recorded media	18.71	0.03	23.29	2.36
23 : Manufacture of coke, refined petroleum products and nuclear fuel	2622.18	0.11	296.00	4.06
24 : Manufacture of chemicals and chemical products	104.46	0.16	32.70	2.83
25 : Manufacture of rubber and plastic products	39.48	0.16	19.15	1.80
26 : Manufacture of other non-metallic mineral products	60.91	0.12	16.95	1.83
27 : Manufacture of basic metals	143.76	0.25	19.73	2.12
28 : Manufacture of fabricated metal products, except machinery and equipment	28.78	0.18	15.09	1.82
29 : Manufacture of machinery and equipment n.e.c.	42.95	0.16	18.18	2.26
30 : Manufacture of office machinery and computers	83.84	0.12	37.07	2.26
31 : Manufacture of electrical machinery and apparatus n.e.c.	121.14	0.23	16.19	2.02

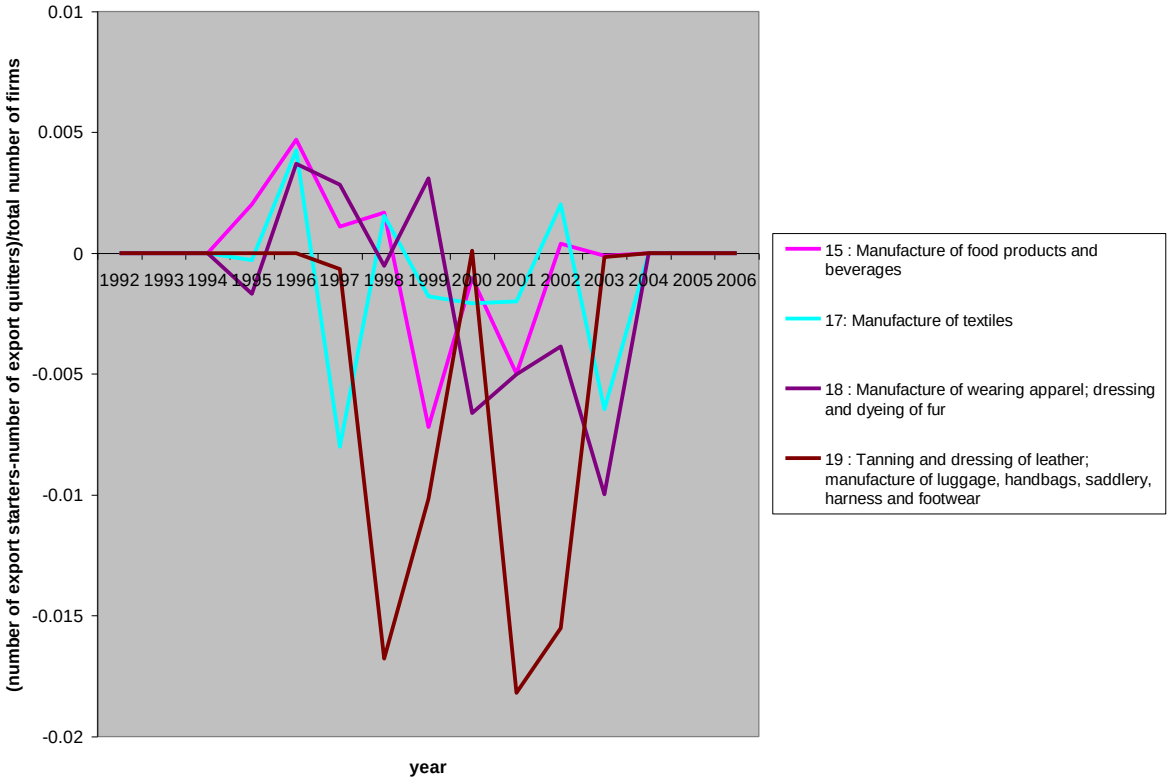
32 : Manufacture of radio, television and communication equipment and apparatus	96.89	0.22	23.82	2.37
33 : Manufacture of medical, precision and optical instruments, watches and clocks	28.56	0.13	17.24	2.17
34 : Manufacture of motor vehicles, trailers and semi-trailers	183.00	0.38	21.44	2.37
35 : Manufacture of other transport equipment	94.65	0.20	16.34	2.05
36 : Manufacture of furniture; manufacturing n.e.c.	32.12	0.16	10.18	1.32
37 : Recycling	22.14	0.17	34.73	1.81

Table A.2. Descriptive Statistics.

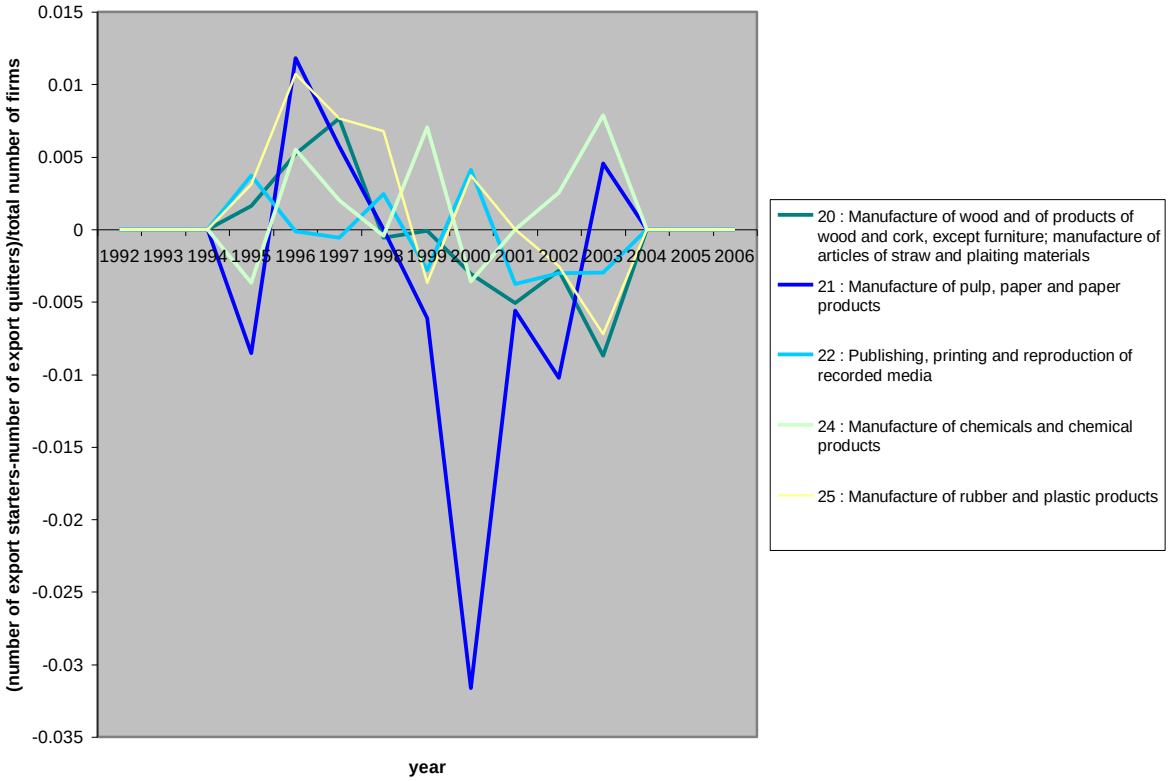
industry/variables	Share of Always Exporters	Share of Export Starters	Share of Export Quitters	Share of Exporters	Total number of firms
15 : Manufacture of food products and beverages	0.05	0.0025	0.0029	0.22	4643
16 : Manufacture of tobacco products	0.10	0.0000	0.0116	0.47	8
17: Manufacture of textiles	0.10	0.0026	0.0037	0.37	1426
18 : Manufacture of wearing apparel; dressing and dyeing of fur	0.14	0.0029	0.0041	0.43	2021
19 : Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	0.17	0.0019	0.0068	0.51	664
20 : Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	0.05	0.0026	0.0032	0.28	2317
21 : Manufacture of pulp, paper and paper products	0.06	0.0040	0.0071	0.27	471
22 : Publishing, printing and reproduction of recorded media	0.01	0.0015	0.0017	0.09	3963
23 : Manufacture of coke, refined petroleum products and nuclear fuel	0.23	0.0000	0.0000	0.52	16
24 : Manufacture of chemicals and chemical products	0.11	0.0048	0.0035	0.37	877
25 : Manufacture of rubber and plastic products	0.10	0.0049	0.0039	0.36	1842
26 : Manufacture of other non-metallic mineral products	0.06	0.0037	0.0026	0.25	1322
27 : Manufacture of basic metals	0.17	0.0049	0.0014	0.53	441
28 : Manufacture of fabricated metal products, except machinery and equipment	0.08	0.0041	0.0037	0.33	4743
29 : Manufacture of machinery and equipment n.e.c.	0.09	0.0033	0.0031	0.31	3632
30 : Manufacture of office machinery and computers	0.06	0.0016	0.0009	0.21	279
31 : Manufacture of electrical machinery and apparatus n.e.c.	0.11	0.0025	0.0036	0.35	1177

32 : Manufacture of radio, television and communication equipment and apparatus	0.09	0.0026	0.0034	0.36	923
33 : Manufacture of medical, precision and optical instruments, watches and clocks	0.06	0.0034	0.0029	0.26	1275
34 : Manufacture of motor vehicles, trailers and semi-trailers	0.24	0.0029	0.0016	0.57	450
35 : Manufacture of other transport equipment	0.07	0.0067	0.0017	0.38	248
36 : Manufacture of furniture; manufacturing n.e.c.	0.07	0.0029	0.0028	0.28	2014
37 : Recycling	0.05	0.0024	0.0013	0.32	204

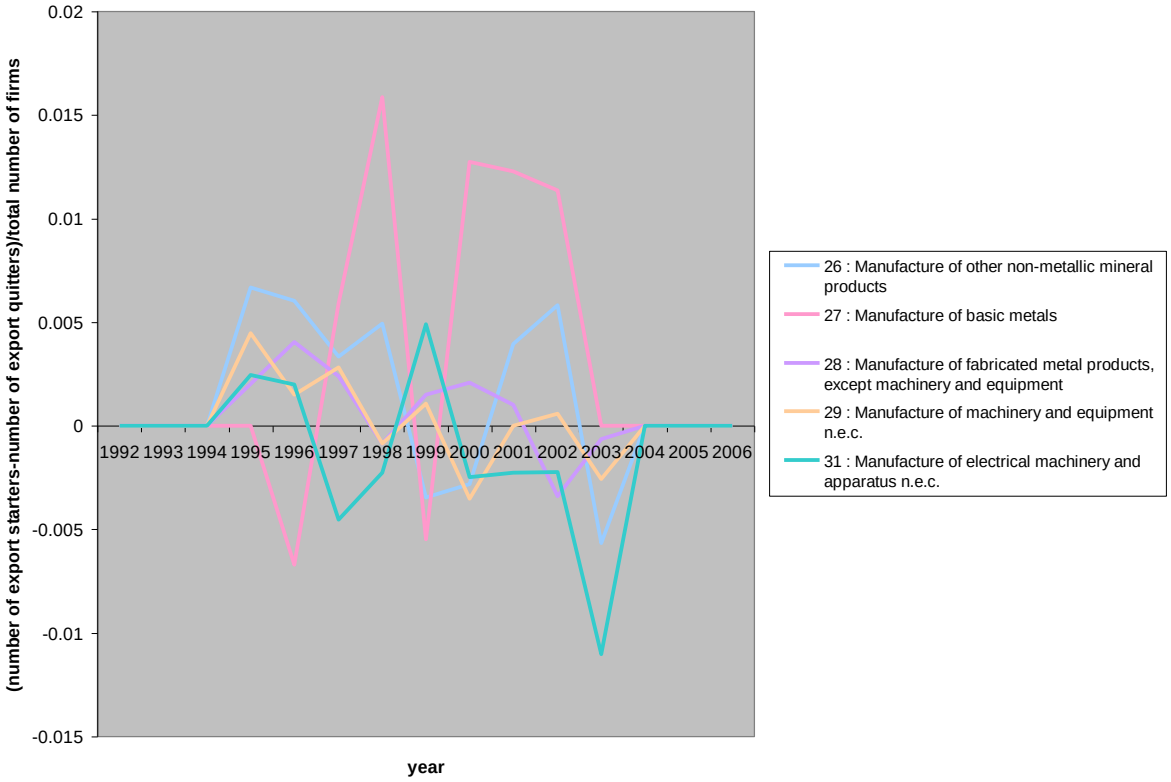
Graph A1. Dynamics of net export starters



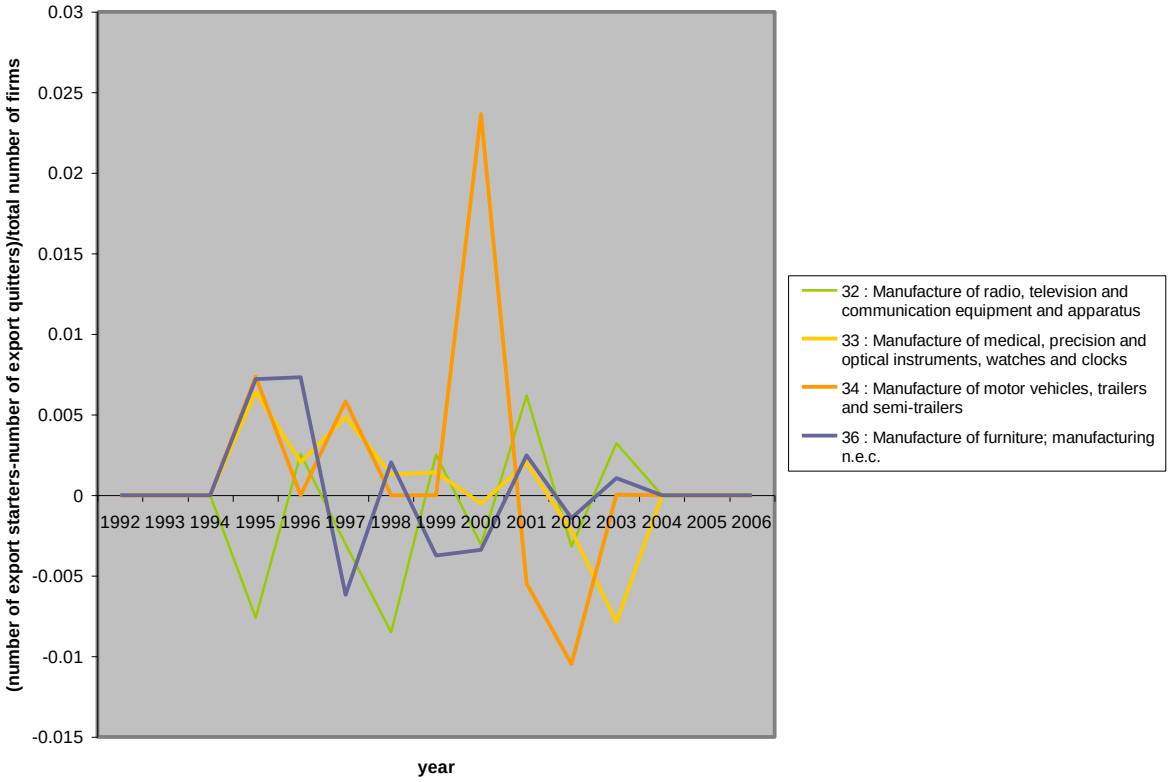
Graph A.2. Dynamics of net export starters



Graph A.3. Dynamics of net export starters



Graph A.4. Dynamics of net export starters



Appendix B

Table B.1 Export status premia per industry. For each industry first three rows present pooled estimation coefficients, p-vales and R-squared, next three rows fixed effects estimation coefficients, p-values and R-squared. R-squared are present only for Log(Sales/Employment). The last row presents number of observations.

EXPORT STATUS PREMIA PER INDUSTRY

industry\dep. variables		LogSales/Emp	Avg. Wage	Avg. Employ.
15 : Manufacture of food products and beverages	pooled	0.506	-0.019	1.189
	p	0.000	0.041	0.000
	r^2	0.381		
	fixed	0.321	0.145	0.421
	p	0.000	0.000	0.000
	r^2	0.827		
	observ.	25343		
16 : Manufacture of tobacco products	pooled	-0.315	0.272	0.736
	p	0.073	0.004	0.002
	r^2	0.87		
	fixed	-0.217	0.111	0.749
	p	0.302	0.278	0.000
	r^2	0.93		
	observ.	87		
17: Manufacture of textiles	pooled	0.515	0.006	1.570
	p	0.000	0.757	0.000
	r^2	0.38		
	fixed	0.346	0.097	0.431
	p	0.000	0.000	0.000
	r^2	0.83		
	observ.	7154		
18 : Manufacture of wearing apparel; dressing and dyeing of fur	pooled	0.344	0.007	1.487
	p	0.000	0.584	0.000
	r^2	0.41		
	fixed	0.187	0.090	0.439
	p	0.000	0.000	0.000
	r^2	0.85		
	observ.	11116		
19 : Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	pooled	0.502	-0.008	1.290
	p	0.000	0.680	0.000
	r^2	0.45		
	fixed	0.185	0.056	0.506
	p	0.000	0.002	0.000

	r^2	0.86		
	observ.	3787		
20 : Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	pooled	0.444	0.026	0.962
	p	0.000	0.061	0.000
	r^2	0.36		
	fixed	0.255	0.070	0.366
	p	0.000	0.000	0.000
	r^2	0.81		
	observ.	11202		
21 : Manufacture of pulp, paper and paper products	pooled	0.501	-0.045	1.436
	p	0.000	0.113	0.000
	r^2	0.39		
	fixed	0.171	0.061	0.299
	p	0.000	0.031	0.000
	r^2	0.86		
	observ.	2513		
22 : Publishing, printing and reproduction of recorded media	pooled	0.395	0.037	0.972
	p	0.000	0.004	0.000
	r^2	0.39		
	fixed	0.148	0.099	0.208
	p	0.000	0.000	0.000
	r^2	0.85		
	observ.	18900		
23 : Manufacture of coke, refined petroleum products and nuclear fuel	pooled	1.223	-0.011	2.657
	p	0.003	0.924	0.000
	r^2	0.51		
	fixed	-0.313	-0.101	-0.001
	p	0.097	0.546	0.997
	r^2	0.97		
	observ.	68		
24 : Manufacture of chemicals and chemical products	pooled	0.357	0.001	1.454
	p	0.000	0.966	0.000
	r^2	0.42		
	fixed	0.249	0.140	0.410
	p	0.000	0.000	0.000
	r^2	0.84		
	observ.	5301		
25 : Manufacture of rubber and plastic products	pooled	0.397	0.017	1.171
	p	0.000	0.151	0.000
	r^2	0.41		
	fixed	0.201	0.108	0.280
	p	0.000	0.000	0.000
	r^2	0.83		
	observ.	11053		
26 : Manufacture of other non-metallic mineral products	pooled	-0.106	-0.016	1.098
	p	0.000	0.350	0.000
	r^2	0.45		
	fixed	0.225	0.139	0.277

	p	0.000	0.000	0.000
	r^2	0.86		
	observ.	7278		
27 : Manufacture of basic metals	pooled	0.352	-0.020	1.655
	p	0.000	0.494	0.000
	r^2	0.46		
	fixed	0.212	0.137	0.576
	p	0.000	0.000	0.000
	r^2	0.86		
	observ.	2362		
28 : Manufacture of fabricated metal products, except machinery and equipment	pooled	0.279	0.033	0.923
	p	0.000	0.000	0.000
	r^2	0.41		
	fixed	0.164	0.135	0.305
	p	0.000	0.000	0.000
	r^2	0.83		
	observ.	26016		
29 : Manufacture of machinery and equipment n.e.c.	pooled	0.354	0.021	1.229
	p	0.000	0.048	0.000
	r^2	0.45		
	fixed	0.185	0.083	0.293
	p	0.000	0.000	0.000
	r^2	0.84		
	observ.	19640		
30 : Manufacture of office machinery and computers	pooled	-0.060	0.123	1.730
	p	0.472	0.022	0.000
	r^2	0.27		
	fixed	0.077	0.266	0.407
	p	0.301	0.000	0.000
	r^2	0.82		
	observ.	1252		
31 : Manufacture of electrical machinery and apparatus n.e.c.	pooled	0.292	0.000	1.821
	p	0.000	0.985	0.000
	r^2	0.38		
	fixed	0.135	0.076	0.286
	p	0.000	0.000	0.000
	r^2	0.86		
	observ.	6601		
32 : Manufacture of radio, television and communication equipment and apparatus	pooled	0.171	0.015	1.784
	p	0.000	0.563	0.000
	r^2	0.39		
	fixed	0.249	0.108	0.527
	p	0.000	0.000	0.000
	r^2	0.80		
	observ.	4745		
33 : Manufacture of medical, precision and optical instruments, watches and clocks	pooled	0.325	0.002	1.060
	p	0.000	0.919	0.000
	r^2	0.44		
	fixed	0.166	0.072	0.284

	p	0.000	0.000	0.000
	r^2	0.86		
	observ.	7492		
34 : Manufacture of motor vehicles, trailers and semi-trailers	pooled	0.213	0.003	1.780
	p	0.000	0.931	0.000
	r^2	0.46		
	fixed	0.205	0.174	0.330
	p	0.000	0.000	0.000
	r^2	0.85		
	observ.	2548		
35 : Manufacture of other transport equipment	pooled	0.456	0.001	1.242
	p	0.000	0.977	0.000
	r^2	0.34		
	fixed	0.243	0.021	0.259
	p	0.000	0.605	0.000
	r^2	0.81		
	observ.	1240		
36 : Manufacture of furniture; manufacturing n.e.c.	pooled	0.267	0.034	1.130
	p	0.000	0.017	0.000
	r^2	0.37		
	fixed	0.132	0.145	0.333
	p	0.000	0.000	0.000
	r^2	0.84		
	observ.	10349		
37 : Recycling	pooled	0.833	0.029	0.974
	p	0.000	0.574	0.000
	r^2	0.31		
	fixed	0.236	0.121	0.460
	p	0.015	0.030	0.000
	r^2	0.87		
	observ.	868.00		

Table B.2 Export share premia per industry. For each industry two rows present pooled estimation coefficients and p-vales, next two rows- fixed effects estimation coefficients and p-values. See notes to table B.1 for more details.

EXPORT SHARE PREMIA PER INDUSTRY

industry\dep. variables		LogSales/Emp	Avg. Wage	Avg. Employ.
15 : Manufacture of food products and beverages	pooled	0.531	0.215	0.818
	p	0.000	0.000	0.000
	fixed	0.774	-0.130	0.560
	p	0.000	0.000	0.000
16 : Manufacture of tobacco products	pooled	-1.487	0.047	1.585
	p	0.000	0.811	0.000
	fixed	-0.526	0.547	0.689
	p	0.170	0.002	0.105
17: Manufacture of textiles	pooled	0.233	0.126	1.539
	p	0.000	0.000	0.000
	fixed	0.567	0.002	0.650
	p	0.000	0.949	0.000
18 : Manufacture of wearing apparel; dressing and dyeing of fur	pooled	0.099	0.175	1.651
	p	0.000	0.000	0.000
	fixed	0.231	0.008	0.496
	p	0.000	0.641	0.000
19 : Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	pooled	0.265	0.141	1.269
	p	0.000	0.000	0.000
	fixed	0.280	-0.042	0.699
	p	0.000	0.151	0.000
20 : Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	pooled	0.389	0.137	0.920
	p	0.000	0.000	0.000
	fixed	0.430	0.005	0.525
	p	0.000	0.863	0.000
21 : Manufacture of pulp, paper and paper products	pooled	0.192	0.278	1.049
	p	0.032	0.000	0.000
	fixed	0.054	0.017	0.327
	p	0.572	0.805	0.002
22 : Publishing, printing and reproduction of recorded media	pooled	0.130	0.136	0.501
	p	0.043	0.004	0.000
	fixed	0.351	-0.016	0.186
	p	0.000	0.739	0.000

23 : Manufacture of coke, refined petroleum products and nuclear fuel	pooled	-1.255	0.504	-0.322
	p	0.189	0.150	0.841
	fixed	-0.848	0.261	-0.270
	p	0.004	0.225	0.287
24 : Manufacture of chemicals and chemical products	pooled	0.112	0.195	1.567
	p	0.024	0.000	0.000
	fixed	0.526	-0.040	0.431
	p	0.000	0.316	0.000
25 : Manufacture of rubber and plastic products	pooled	-0.072	0.262	1.368
	p	0.033	0.000	0.000
	fixed	0.113	0.022	0.387
	p	0.007	0.420	0.000
26 : Manufacture of other non-metallic mineral products	pooled	-0.496	0.175	1.203
	p	0.000	0.000	0.000
	fixed	0.281	-0.028	0.618
	p	0.000	0.471	0.000
27 : Manufacture of basic metals	pooled	0.201	0.304	1.518
	p	0.002	0.000	0.000
	fixed	0.381	0.047	0.637
	p	0.000	0.363	0.000
28 : Manufacture of fabricated metal products, except machinery and equipment	pooled	0.080	0.263	0.790
	p	0.000	0.000	0.000
	fixed	0.256	0.046	0.446
	p	0.000	0.007	0.000
29 : Manufacture of machinery and equipment n.e.c.	pooled	0.076	0.145	1.678
	p	0.001	0.000	0.000
	fixed	0.449	0.005	0.492
	p	0.000	0.842	0.000
30 : Manufacture of office machinery and computers	pooled	-0.277	0.369	2.352
	p	0.030	0.000	0.000
	fixed	0.817	-0.279	0.909
	p	0.000	0.026	0.000
31 : Manufacture of electrical machinery and apparatus n.e.c.	pooled	-0.117	-0.020	2.300
	p	0.002	0.389	0.000
	fixed	0.257	-0.094	0.383
	p	0.000	0.011	0.000
32 : Manufacture of radio, television and communication equipment and apparatus	pooled	-0.111	0.012	2.474
	p	0.031	0.707	0.000
	fixed	0.515	-0.089	0.872
	p	0.000	0.040	0.000
33 : Manufacture of medical, precision and optical instruments, watches and clocks	pooled	0.018	0.071	1.350
	p	0.661	0.008	0.000
	fixed	0.262	0.047	0.315
	p	0.000	0.235	0.000
34 : Manufacture of	pooled	0.063	0.230	1.935

motor vehicles, trailers and semi-trailers	p	0.251	0.000	0.000
	fixed	0.134	0.001	0.450
	p	0.054	0.988	0.000
35 : Manufacture of other transport equipment	pooled	0.118	0.185	0.727
	p	0.204	0.001	0.000
	fixed	0.226	0.187	0.323
	p	0.082	0.031	0.005
36 : Manufacture of furniture; manufacturing n.e.c.	pooled	0.014	0.232	1.194
	p	0.644	0.000	0.000
	fixed	0.283	0.062	0.601
	p	0.000	0.033	0.000
37 : Recycling	pooled	0.658	0.213	0.718
	p	0.000	0.014	0.000
	fixed	0.495	0.020	0.217
	p	0.008	0.841	0.141

Table B.3 Dynamics of export-start premium, p-values are underlined. Dependent Variable: Log(Sales/Employment)

Export Start Dummy. Control: all other firms

industry/period	t+3	t+2	t+1	t+0	t-1	t-2	t-3
15 : Manufacture of food products and beverages	-0.039	-0.084	-0.077	0.062	0.143	0.198	0.081
	0.590	0.212	0.225	0.271	0.012	0.001	0.179
17: Manufacture of textiles	0.342	0.371	0.588	0.639	0.711	0.585	0.642
	0.033	0.029	0.001	0.000	0.000	0.000	0.000
18 : Manufacture of wearing apparel; dressing of fur	0.079	0.174	0.133	0.271	0.255	0.090	0.128
	0.590	0.134	0.174	0.002	0.005	0.335	0.178
19 : Tanning and dressing of leather	-0.396	-0.262	-0.196	0.122	-0.017	-0.003	0.119
	0.109	0.148	0.276	0.408	0.911	0.981	0.395
20 : Manufacture of wood and of products of wood and cork, except furniture	-0.211	-0.089	0.067	0.011	0.122	0.131	0.031
	0.288	0.624	0.579	0.911	0.237	0.220	0.770
21 : Manufacture of pulp, paper and paper products	-0.019	-0.045	-0.013	0.001	0.062	-0.128	-0.011
	0.923	0.827	0.938	0.997	0.712	0.553	0.960
22 : Publishing, printing and reproduction of recorded media	-0.338	-0.291	-0.309	0.006	0.179	0.240	0.155
	0.001	0.003	0.001	0.937	0.027	0.007	0.082
24 : Manufacture of chemicals and chemical products	0.028	0.105	0.184	0.093	0.107	0.076	-0.011
	0.788	0.278	0.042	0.256	0.244	0.417	0.907
25 : Manufacture of rubber and plastic products	0.028	-0.026	-0.027	-0.022	0.028	-0.008	0.041
	0.770	0.758	0.709	0.734	0.681	0.906	0.572
26 : Manufacture of other non-metallic mineral products	-0.241	-0.451	-0.395	-0.315	-0.182	-0.215	-0.141
	0.071	0.000	0.000	0.000	0.032	0.023	0.142
27 : Manufacture of basic metals	0.139	-0.149	-0.059	-0.038	0.130	0.108	0.067
	0.439	0.337	0.688	0.791	0.377	0.551	0.734
28 : Manufacture of fabricated metal products, except machinery and equipment	-0.058	-0.032	-0.059	0.035	0.052	0.032	0.037
	0.329	0.580	0.232	0.434	0.254	0.491	0.463
29 : Manufacture of machinery and equipment	-0.116	0.043	0.037	0.127	0.206	0.208	0.084
	0.129	0.560	0.585	0.030	0.001	0.002	0.222
30 : Manufacture of office machinery and computers	0.982	0.561	0.036	0.224	0.201	0.055	0.172
	0.034	0.160	0.928	0.570	0.609	0.903	0.703
31 : Manufacture of electrical machinery and apparatus n.e.c.	0.193	0.277	0.079	0.149	0.011	0.112	0.102
	0.160	0.056	0.520	0.220	0.931	0.391	0.473
32 : Manufacture of radio, television and communication equipment and apparatus	-0.317	-0.328	-0.190	-0.138	0.002	-0.051	0.007
	0.213	0.196	0.411	0.545	0.994	0.847	0.980
33 : Manufacture of medical, precision and optical instruments	-0.107	-0.055	-0.133	-0.105	-0.021	-0.107	-0.036
	0.402	0.625	0.197	0.253	0.822	0.279	0.733
34 : Manufacture of motor vehicles, trailers and semi-trailers	-0.212	-0.104	-0.229	-0.206	-0.385	-0.336	-0.385
	0.312	0.619	0.293	0.220	0.022	0.045	0.031
35 : Manufacture of other transport equipment	-0.666	-0.185	0.088	0.056	0.081	0.020	-0.107
	0.077	0.548	0.709	0.764	0.671	0.917	0.574
36 : Manufacture of furniture; manufacturing n.e.c.	-0.017	-0.227	-0.182	-0.176	-0.106	-0.068	0.052
	0.884	0.041	0.064	0.035	0.225	0.438	0.587

Table B.4 Dynamics of Export-Stop Premium. Dependent Variable: Log(Sales/Employment).

P-values are underlined

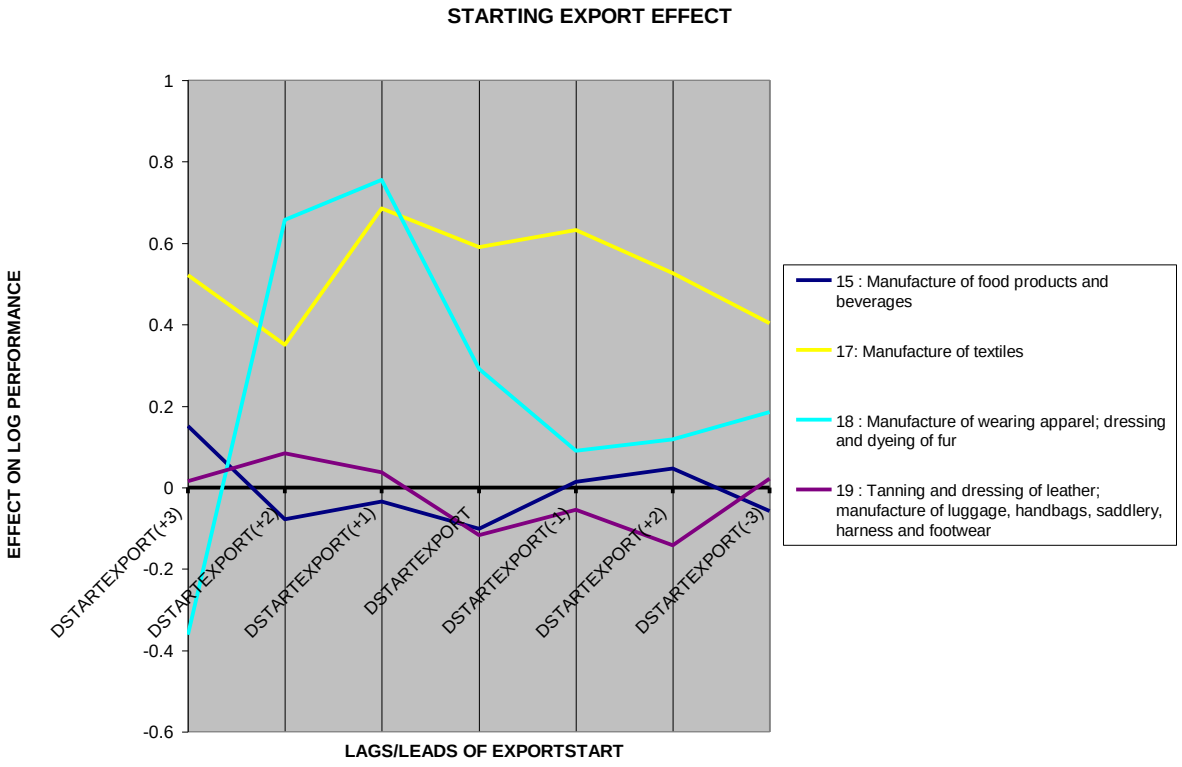
industry/period	t+3	t+2	t+1	t+0	t-1	t-2	t-3
15 : Manufacture of food products and beverages	0.092	0.286	0.007	-0.163	-0.028	-0.069	0.000
	0.144	0.000	0.908	0.003	0.631	0.267	0.994
16 : Manufacture of tobacco products	0.094	-0.106	-0.084	-0.273	0.517	0.245	0.050
	0.802	0.777	0.832	0.536	0.210	0.560	0.907
17: Manufacture of textiles	0.321	0.317	0.338	-0.218	0.038	0.118	0.146
	0.015	0.005	0.004	0.052	0.765	0.360	0.235
18 : Manufacture of wearing apparel; dressing of fur	-0.153	-0.149	-0.173	-0.405	-0.274	-0.220	-0.181
	0.053	0.046	0.016	0.000	0.002	0.022	0.065
19 : Tanning and dressing of leather; manufacture of luggage	-0.019	0.019	-0.094	0.063	0.081	0.091	0.139
	0.845	0.834	0.297	0.489	0.399	0.418	0.322
20 : Manufacture of wood and of products of wood and cork, except furniture	0.067	-0.001	-0.043	-0.063	-0.228	-0.253	-0.142
	0.491	0.991	0.654	0.509	0.033	0.036	0.149
21 : Manufacture of pulp, paper and paper products	0.140	0.173	-0.151	-0.210	-0.260	-0.064	0.031
	0.288	0.170	0.223	0.076	0.040	0.655	0.819
22 : Publishing, printing and reproduction of recorded media	0.010	-0.036	-0.103	-0.133	-0.098	-0.088	0.122
	0.893	0.611	0.123	0.059	0.196	0.279	0.061
24 : Manufacture of chemicals and chemical products	0.297	0.244	0.214	0.172	0.127	0.129	0.098
	0.024	0.053	0.080	0.145	0.282	0.287	0.451
25 : Manufacture of rubber and plastic products	0.142	0.154	0.111	-0.055	-0.063	0.010	0.013
	0.067	0.042	0.146	0.467	0.459	0.921	0.892
26 : Manufacture of other non-metallic mineral products	-0.186	-0.321	-0.276	-0.195	-0.194	-0.260	-0.088
	0.099	0.002	0.007	0.052	0.080	0.031	0.325
27 : Manufacture of basic metals	-1.043	-0.575	-0.082	-1.217	0.296	-0.146	-1.040
	0.000	0.043	0.762	0.000	0.272	0.611	0.000
28 : Manufacture of fabricated metal products, except machinery and equipment	0.094	0.059	-0.002	-0.058	-0.004	-0.030	-0.149
	0.064	0.228	0.968	0.202	0.929	0.588	0.005
29 : Manufacture of machinery and equipment n.e.c.	-0.067	0.008	-0.102	-0.101	-0.040	-0.041	0.011
	0.311	0.897	0.073	0.082	0.539	0.566	0.859
31 : Manufacture of electrical machinery and apparatus n.e.c.	-0.035	-0.009	0.003	-0.128	-0.233	-0.303	-0.194
	0.747	0.921	0.978	0.188	0.030	0.007	0.105
32 : Manufacture of radio, television and communication equipment and apparatus	-0.296	-0.570	-0.245	-0.334	-0.005	-0.205	-0.128
	0.118	0.002	0.183	0.047	0.974	0.263	0.419
33 : Manufacture of medical, precision and optical instruments,	-0.031	0.023	-0.106	-0.137	0.001	0.151	0.099
	0.776	0.837	0.302	0.189	0.995	0.219	0.398
36 : Manufacture of furniture; manufacturing n.e.c.	0.250	0.222	0.145	0.204	0.084	0.089	0.168
	0.005	0.013	0.081	0.014	0.346	0.388	0.069

Table B.5.1. Starting Exporting dummy including Lag\Leads controlled for export-stoppers and always exporters.. Fixed Effect Estimation. P-values are underlined.

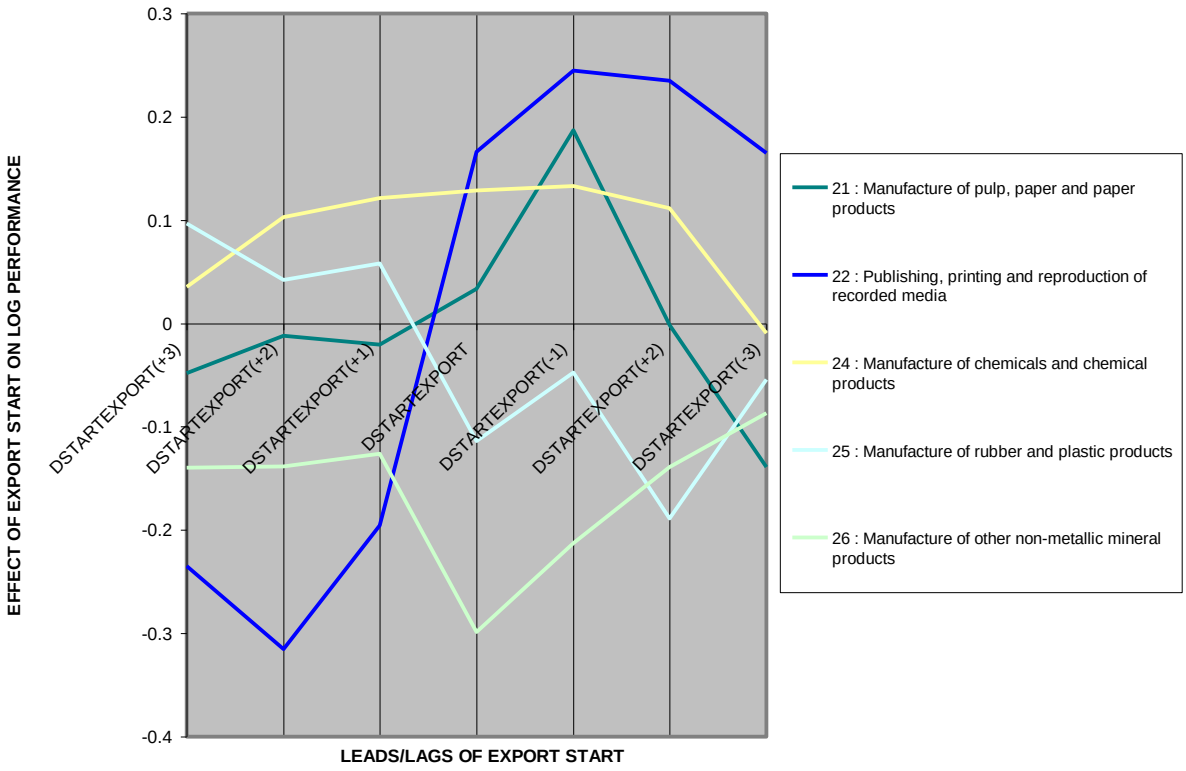
Export Start Dynamics. Dependent Variable: Log(Sales/Employment)

industry/period	t+3	t+2	t+1	t+0	t-1	t-2	t-3
15 : Manufacture of food products and beverages	0.151	-0.079	-0.034	-0.101	0.014	0.047	-0.058
	0.149	0.391	0.695	0.204	0.863	0.582	0.512
17: Manufacture of textiles	0.522	0.351	0.685	0.591	0.632	0.527	0.403
	0.050	0.131	0.007	0.034	0.025	0.146	0.376
18 : Manufacture of wearing apparel; dressing and dyeing of fur	-0.362	0.656	0.755	0.291	0.090	0.119	0.185
	0.138	0.003	0.000	0.030	0.499	0.388	0.204
19 : Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	0.016	0.084	0.037	-0.117	-0.054	-0.142	0.021
	0.962	0.773	0.869	0.569	0.797	0.499	0.921
21 : Manufacture of pulp, paper and paper products	-0.048	-0.012	-0.020	0.034	0.187	-0.002	-0.139
	0.830	0.958	0.928	0.953	0.727	0.997	0.795
22 : Publishing, printing and reproduction of recorded media	-0.235	-0.315	-0.196	0.166	0.245	0.235	0.165
	0.051	0.004	0.072	0.127	0.034	0.062	0.181
24 : Manufacture of chemicals and chemical products	0.035	0.103	0.121	0.128	0.133	0.111	-0.010
	0.802	0.427	0.347	0.355	0.347	0.485	0.952
25 : Manufacture of rubber and plastic products	0.097	0.042	0.058	-0.114	-0.048	-0.189	-0.055
	0.431	0.717	0.590	0.267	0.644	0.078	0.626
26 : Manufacture of other non-metallic mineral products	-0.140	-0.139	-0.126	-0.299	-0.213	-0.139	-0.087
	0.421	0.403	0.406	0.024	0.121	0.317	0.544
28 : Manufacture of fabricated metal products, except machinery and equipment	0.122	0.127	0.127	0.104	0.112	0.083	-0.007
	0.096	0.048	0.037	0.103	0.083	0.214	0.921
29 : Manufacture of machinery and equipment n.e.c.	0.133	0.157	0.174	0.305	0.310	0.305	0.135
	0.158	0.075	0.033	0.000	0.000	0.001	0.140
31 : Manufacture of electrical machinery and apparatus n.e.c.	0.123	0.153	0.013	0.159	0.131	0.310	0.088
	0.539	0.414	0.947	0.313	0.467	0.123	0.663
32 : Manufacture of radio, television and communication equipment and apparatus	-0.219	-0.352	-0.132	-0.049	-0.077	0.012	-0.071
	0.564	0.280	0.685	0.879	0.834	0.976	0.892
33 : Manufacture of medical, precision and optical instruments, watches and clocks	0.082	0.006	-0.101	-0.219	-0.205	-0.287	-0.050
	0.622	0.966	0.473	0.107	0.140	0.044	0.765
36 : Manufacture of furniture; manufacturing n.e.c.	0.222	-0.233	-0.137	-0.176	-0.144	0.061	0.027
	0.181	0.095	0.327	0.167	0.291	0.662	0.861

Graph B.1. Starting Exporting dummy including Lag\Leads. Fixed Effect Estimation.



Graph B2 Starting Exporting dummy including Lag\Leads. Fixed Effect Estimation



Graph B3. Starting Exporting dummy including Lag\Leads. Fixed Effect Estimation

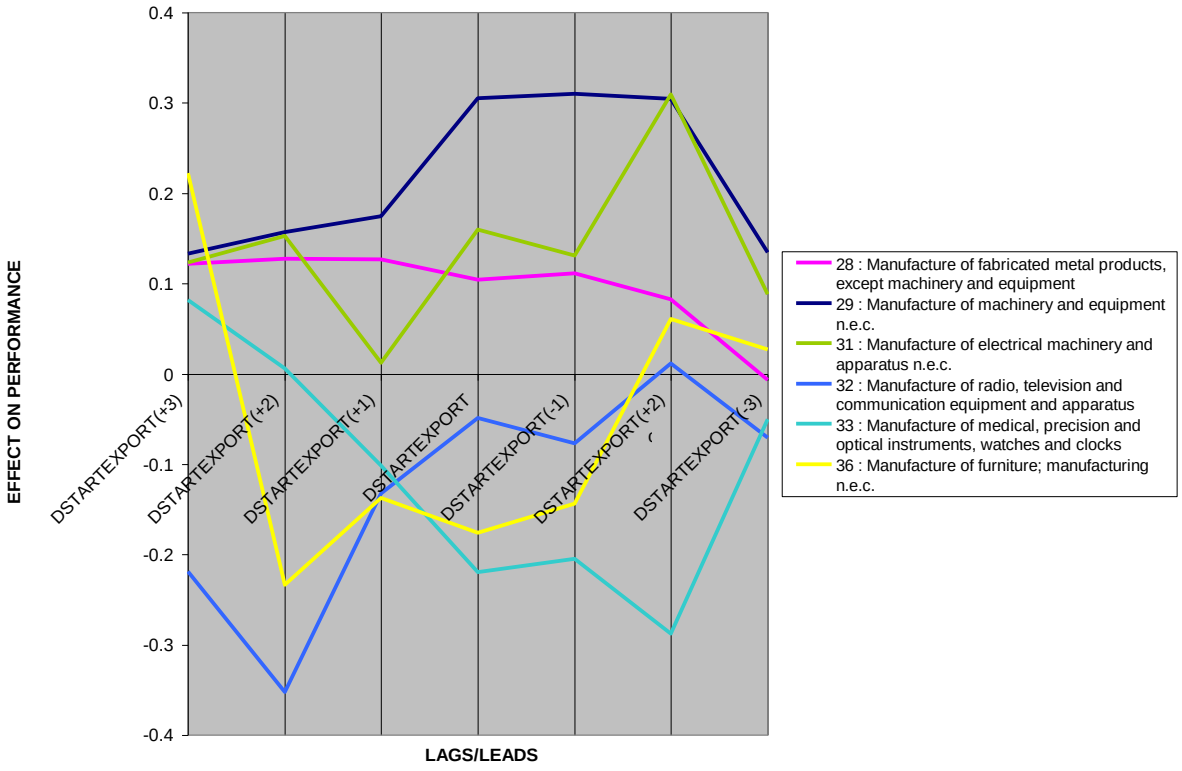
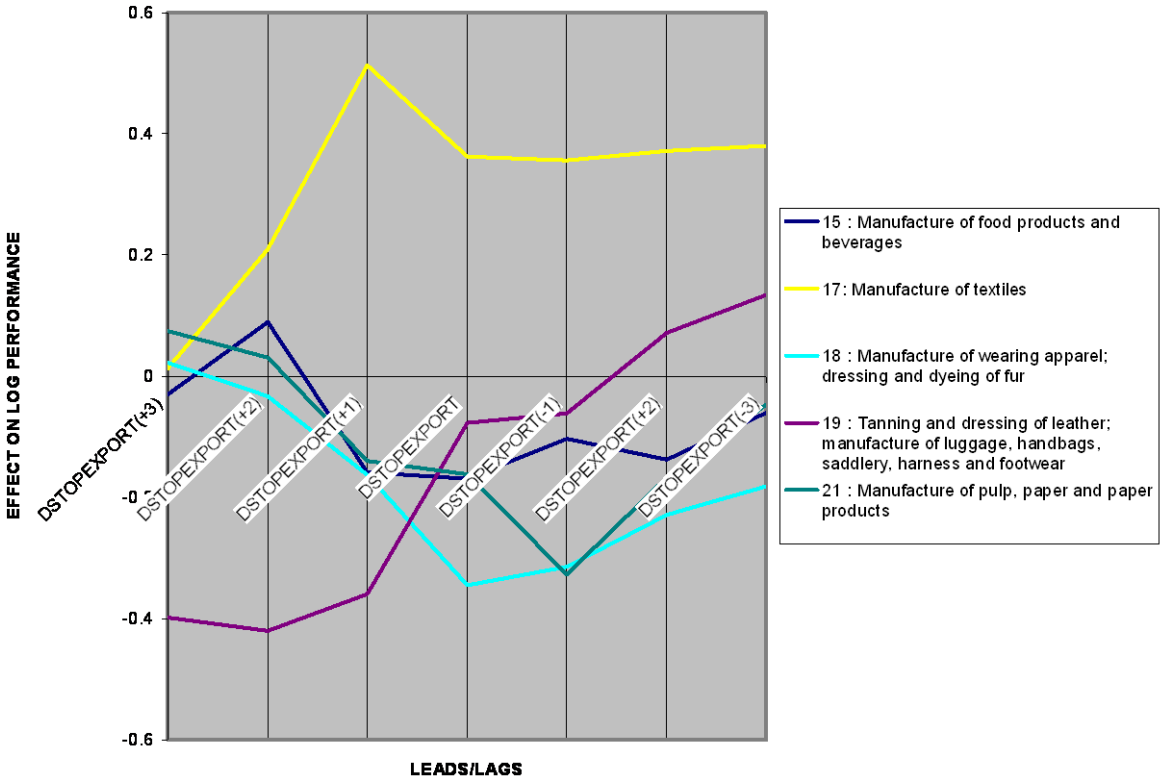


Table B.5.2 Stopping Exporting dummy including Lag\Leads controlled for export-starters and always exporters. Fixed Effect Estimation.. P-values are underlined.

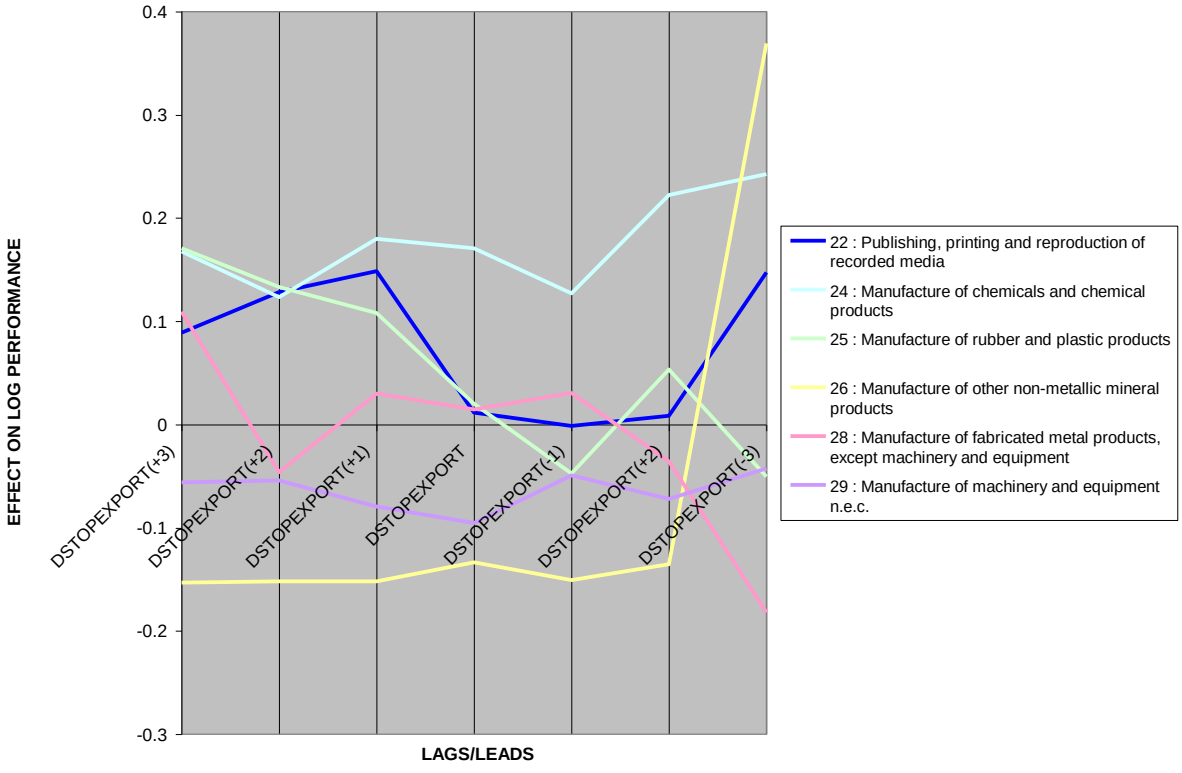
Stopping Export Dynamics, Dependent Variable: Log(Sales/Employment)

industry/period	t+3	t+2	t+1	t+0	t-1	t-2	t-3
15 : Manufacture of food products and beverages	-0.030 0.737	0.090 0.301	-0.159 0.061	-0.169 0.012	-0.103 0.141	-0.137 0.066	-0.060 0.474
17: Manufacture of textiles	0.013 0.956	0.210 0.342	0.514 0.017	0.363 0.029	0.357 0.036	0.372 0.035	0.380 0.038
18 : Manufacture of wearing apparel; dressing and dyeing of fur	0.023 0.842	-0.033 0.763	-0.163 0.151	-0.345 0.001	-0.314 0.007	-0.229 0.064	-0.181 0.238
19 : Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	-0.398 0.028	-0.420 0.023	-0.359 0.042	-0.077 0.582	-0.061 0.659	0.072 0.637	0.135 0.457
21 : Manufacture of pulp, paper and paper products	0.075 0.660	0.030 0.849	-0.139 0.376	-0.162 0.243	-0.327 0.028	-0.167 0.322	-0.047 0.775
22 : Publishing, printing and reproduction of recorded media	0.089 0.332	0.128 0.130	0.148 0.075	0.011 0.885	-0.001 0.987	0.009 0.919	0.147 0.149
24 : Manufacture of chemicals and chemical products	0.168 0.429	0.124 0.520	0.180 0.323	0.171 0.289	0.127 0.438	0.222 0.186	0.242 0.219
25 : Manufacture of rubber and plastic products	0.171 0.118	0.134 0.211	0.108 0.329	0.020 0.856	-0.047 0.707	0.053 0.733	-0.051 0.806
26 : Manufacture of other non-metallic mineral products	-0.153 0.303	-0.152 0.270	-0.152 0.269	-0.133 0.307	-0.151 0.299	-0.135 0.409	0.369 0.087
28 : Manufacture of fabricated metal products, except machinery and equipment	0.109 0.148	-0.046 0.540	0.030 0.668	0.015 0.800	0.031 0.630	-0.036 0.604	-0.182 0.017
29 : Manufacture of machinery and equipment n.e.c.	-0.056 0.563	-0.054 0.591	-0.079 0.394	-0.095 0.208	-0.049 0.545	-0.072 0.405	-0.042 0.643
31 : Manufacture of electrical machinery and apparatus n.e.c.	0.154 0.476	0.674 0.000	0.719 0.000	0.415 0.010	0.307 0.078	0.246 0.176	0.026 0.893
32 : Manufacture of radio, television and communication equipment and apparatus	-0.546 0.040	-0.468 0.065	-0.437 0.093	-0.262 0.230	0.127 0.556	-0.026 0.916	0.004 0.988
33 : Manufacture of medical, precision and optical instruments, watches and clocks	-0.090 0.561	0.105 0.485	-0.097 0.477	-0.104 0.436	-0.045 0.745	0.027 0.859	0.117 0.446
36 : Manufacture of furniture; manufacturing n.e.c.	0.056 0.700	-0.096 0.501	-0.062 0.665	-0.001 0.993	-0.039 0.741	-0.006 0.965	0.071 0.629

Graph B4. Stopping exporting dummy including Lag\Leads. Fixed Effect Estimation



Graph B5. Stopping exporting dummy including Lag\Leads. Fixed Effect Estimation



Graph B6 Stopping exporting dummy including Lag\Leads. Fixed Effect Estimation

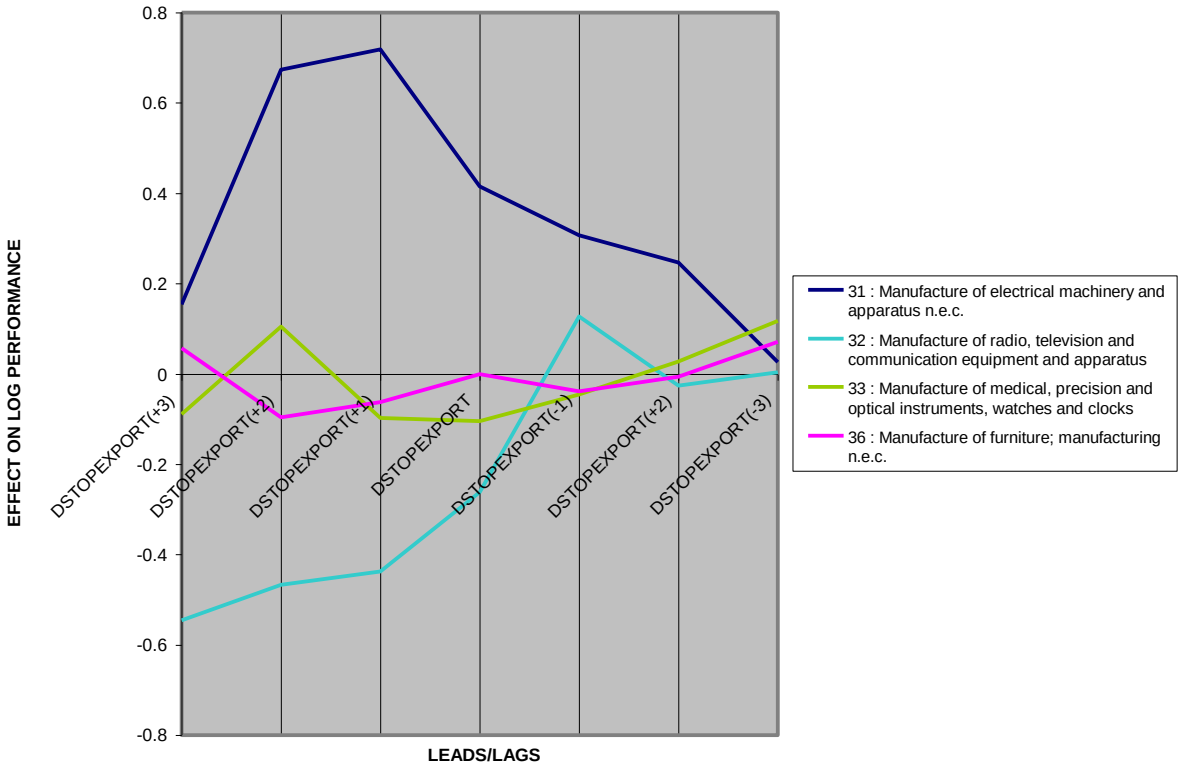


Table B.5.3 Always Exporting dummy including Lag\Leads controlled for export starters and export stoppers. P-values are underlined.

Always exporting dummy coefficients and p-values(underlined). Dependent Log(Sales/Employment)

industry/period	t+3	t+2	t+1	t+0	t-1	t-2	t-3
15 : Manufacture of food products and beverages	-0.021	0.003	-0.018	-0.024	0.003	0.020	-0.018
	0.752	0.960	0.786	0.763	0.972	0.752	0.789
17: Manufacture of textiles	0.062	-0.049	-0.025	-0.014	0.180	0.038	0.020
	0.655	0.687	0.836	0.926	0.216	0.782	0.886
18 : Manufacture of wearing apparel; dressing and dyeing of fur	0.183	0.087	0.025	0.086	0.002	-0.037	0.107
	0.018	0.222	0.711	0.331	0.984	0.628	0.156
19 : Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	0.196	-0.053	0.106	0.193	0.069	0.111	0.132
	0.162	0.649	0.295	0.100	0.675	0.449	0.347
21 : Manufacture of pulp, paper and paper products	0.067	-0.012	0.045	0.234	-0.091	0.163	-0.139
	0.626	0.942	0.801	0.329	0.804	0.679	0.687
22 : Publishing, printing and reproduction of recorded media	-0.172	-0.023	0.085	0.098	0.087	0.017	-0.099
	0.111	0.839	0.418	0.340	0.364	0.848	0.278
24 : Manufacture of chemicals and chemical products	0.041	0.019	0.098	0.172	0.086	-0.017	0.000
	0.709	0.845	0.339	0.114	0.495	0.863	0.999
25 : Manufacture of rubber and plastic products	0.124	0.067	0.147	0.008	0.020	0.031	-0.003
	0.149	0.388	0.059	0.927	0.832	0.705	0.974
26 : Manufacture of other non-metallic mineral products	0.071	0.166	0.008	-0.003	0.105	-0.009	0.087
	0.402	0.047	0.927	0.975	0.284	0.913	0.383
28 : Manufacture of fabricated metal products, except machinery and equipment	0.061	0.067	0.066	0.103	0.000	0.031	0.085
	0.236	0.181	0.169	0.072	0.995	0.508	0.089
29 : Manufacture of machinery and equipment n.e.c.	-0.080	0.162	-0.091	0.047	0.072	-0.029	-0.047
	0.210	0.008	0.122	0.476	0.280	0.623	0.447
31 : Manufacture of electrical machinery and apparatus n.e.c.	0.011	-0.029	-0.082	0.007	-0.099	-0.128	-0.235
	0.939	0.826	0.512	0.954	0.352	0.200	0.036
32 : Manufacture of radio, television and communication equipment and apparatus	-0.079	-0.077	-0.031	0.128	-0.126	0.343	0.129
	0.709	0.704	0.867	0.581	0.584	0.125	0.567
33 : Manufacture of medical, precision and optical instruments, watches and clocks	-0.041	0.008	0.079	-0.051	0.088	0.166	-0.024
	0.781	0.954	0.520	0.705	0.454	0.097	0.818
36 : Manufacture of furniture; manufacturing n.e.c.	0.152	0.081	0.097	0.219	-0.088	0.098	0.038
	0.078	0.362	0.318	0.123	0.601	0.480	0.749

Table B 5.4. The robustness of the results depending on threshold value.

criteria\results	learning by exporting	non-permanent benefit	performance worse due to exporting
5% change between t-1:t+1	15, 29, 32	21, 22, 31	19, 26, 33
10% change between t-1:t+1	29, 32	21, 22, 31	26, 33
10% change between t-1:t+2	29, 32, 36	22, 31	18, 19, 25, 33
15% change between t-1:t+2	19, 22, 29, 32, 36	31	18, 25, 33
15% change between t-1:t+3	22, 36	-	17, 18
20% change between t-1:t+3	22	-	17, 18, 21

1. column lists thresholds for determining the dynamics of performance. Columns 2:4 are groups of industries demonstrating similar behavior as a result of exporting. All the number are respective industries' Nace codes.

Table B6.Classification of NACE-2digit groups into factor intensity product groups

Description	NACE codes
Science-based	
Manufacture of office machinery and computers	30
Manufacture of medical, precision and optical instruments, watches and clocks	33
Specialised supplier	
Manufacture of machinery and equipment n.e.c.	29
Manufacture of electrical machinery and apparatus n.e.c.	31
Manufacture of radio, television and communication equipment and apparatus	32
Scale-intensive	
Manufacture of pulp, paper and paper products	21
Publishing, printing and reproduction of recorded media	22
Manufacture of chemicals and chemical products	24
Manufacture of rubber and plastic products	25
Manufacture of basic metals	27
Manufacture of motor vehicles, trailers and semi-trailers	34
Manufacture of other transport equipment	35
Labour-intensive	
Manufacture of textiles	17
Manufacture of wearing apparel; dressing and dyeing of fur	18
Manufacture of leather and leather products	19
Manufacture of fabricated metal products, except machinery and equipment	28
Manufacture n.e.c. (other manufacturing)	36
Recycling	37
Resource-intensive	
Manufacture of food products and beverages	15
Manufacture of tobacco products	16
Manufacture of wood and of products of wood and cork	20
Manufacture of coke, refined petroleum products and nuclear fuel	23
Manufacture of other non-metallic mineral products	26

Source: Ulff-Moller Nielsen, Jorgen and Konrad Pawlik, 2004

Table B.7. Classification of industries by technological intensity

Aggregations of manufacturing based on NACE Rev 1.1

Eurostat uses the following aggregation of the manufacturing industry according to technological intensity and based on NACE Rev. 1.1 at 3-digit level for compiling aggregates related to high-technology, medium high-technology, medium low-technology and low-technology. Please note that in a few cases (R&D, Employment in high-tech and HRST), due to restrictions of the data sources used, the aggregations are only made on a NACE 2-digit level. This means that High-technology includes the NACE codes 30, 32 and 33, Medium-high-technology 24, 29, 31, 34 and 35, Medium-low-technology 23 and 25 to 28 and Low-technology 15 to 22 and 36 to 37.

Manufacturing industries	NACE Rev 1.1 codes
High-technology	**24.4** Manufacture of pharmaceuticals, medicinal chemicals and botanical products; **30** Manufacture of office machinery and computers; **32** Manufacture of radio, television and communication equipment and apparatus; **33** Manufacture of medical, precision and optical instruments, watches and clocks; **35.3** Manufacture of aircraft and spacecraft
Medium-high-technology	**24** Manufacture of chemicals and chemical product, **excluding 24.4** Manufacture of pharmaceuticals, medicinal chemicals and botanical products; **29** Manufacture of machinery and equipment n.e.c.; **31** Manufacture of electrical machinery and apparatus n.e.c.; **34** Manufacture of motor vehicles, trailers and semi-trailers; **35** Manufacture of other transport equipment, **excluding 35.1** Building and repairing of ships and boats **and excluding 35.3** Manufacture of aircraft and spacecraft.
Medium-low-technology	**23** Manufacture of coke, refined petroleum products and nuclear fuel; **25 to 28** Manufacture of rubber and plastic products; basic metals and fabricated metal products; other non-metallic mineral products; **35.1** Building and repairing of ships and boats.
Low-technology	**15 to 22** Manufacture of food products, beverages and tobacco; textiles and textile products; leather and leather products; wood and wood products; pulp, paper and paper products, publishing and printing; **36 to 37** Manufacturing n.e.c.

Source: Eurostat High-Tech Aggregation, n.d.

Table B.8 Classification of industries by knowledge intensity

Aggregations of Knowledge Intensive Activities based on NACE Rev. 1.1

An activity is classified as knowledge intensive if tertiary educated persons employed (according ISCED'97, levels 5+6) represent more than 33% of the total employment in that activity. The definition is built based on average number of employed persons aged 25-64 at aggregated EU-27 level in 2006, 2007 and 2008 according to NACE Rev. 1.1 at 2-digit, using EU Labour Force Survey data. There are two aggregates in use based on this classification total Knowledge Intensive Activities (KIA) and Knowledge Intensive Activities – Business Industries (KIABI). The lists of activities included in each aggregate, according to NACE Rev.1.1 – 2 digit level are presented in the tables below:

Table 1: Total knowledge intensive activities (KIA)

NACE Rev. 1.1 codes	Description
23	Manufacture of coke, refined petroleum products and nuclear fuel
24	Manufacture of chemicals and chemical products
30	Manufacture of office machinery and computers
32	Manufacture of radio, television and communication equipment and apparatus
33	Manufacture of medical, precision and optical instruments, watches and clocks
62	Air transport
65	Financial intermediation, except insurance and pension funding
66	Insurance and pension funding, except compulsory social security
67	Activities auxiliary to financial intermediation
72	Computer and related activities
73	Research and development
74	Other business activities
75	Public administration and defence; compulsory social security
80	Education
85	Health and social work
91	Activities of membership organizations n.e.c.
92	Recreational, cultural and sporting activities
99	Extra-territorial organizations and bodies

Source: Eurostat. Knowledge-Intensive Aggregation, n.d.

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