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Impact of the European Union Cohesion Fund on the export performance of Estonian firms

Master's thesis

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Tartu 2021

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Allowed for defense on 13.01.2021

(date)

I have written this master's thesis independently. All viewpoints of other authors, literary sources and data from elsewhere used for writing this paper have been referenced.

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Abstract

This thesis analyses the effect of the European Cohesion Fund in Estonia on the export performance of supported firms. For the analysis, we used detailed microdata of companies' exports and treatment analysis, namely nearest neighbor matching and propensity score matching. Treatment indicator variables are the grants of two export and one R&D focused activities of the Cohesion Fund; outcome variables are various firm-level export indicators. The results show that treatments separately have mostly a positive and significant effect on companies' export indicators. Results have shown, that Cohesion fund grants are useful and fulfill their goal to enhance businesses. The most economically significant positive results are found in the model where treatment was from the non-financial export activity and R&D focused activity.

Keywords: Cohesion fund, treatment analysis, exports, Estonia, propensity score matching, nearest-neighbor matching

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1 Introduction

European Union is not only about politics, but also about economic cooperation. Thus, it is a vital part of the regional development and process of convergence (Ederveen et al. 2006), which is committing by the EU intervention policies (Mairate 2006). One of the benefits is the funding of firms of the less developed regions. This funding presumably shall improve the economic situation in that area, which may benefit the growth of the whole European Union market. The Structural Funds and the Cohesion Fund are financial instruments intended to enforce the European Union's regional strategy. They seek to reduce regional unemployment, wealth, and inequality of opportunities. Most of the funding is provided to the poorest regions of Europe, but all European regions are eligible for financing under the various policy funds and programs. The new framework for regional policy spans seven years between 2014 and 2020. The European Regional Development Fund (ERDF) and the European Social Fund (ESF) constitute the Structural Funds. The Structural Funds and the Cohesion Fund, together with the Common Agricultural Policy (CAP) constitute the vast bulk of EU funding and the majority of overall EU expenditure. The strategic importance of EU structural funds assistance was discussed by Florio and Vignetti (2004).

This thesis aims to analyze the impact of grants on enhancing the export of local businesses in Estonia. This analysis will use data from Cohesion Funds 2014-2020 implementation period. The contribution of this thesis will be to look at the issue by using sets of variable other than used in previous studies, namely export indicators, on the data from Estonia. The contribution of this thesis is empirical analysis. The unique component of the thesis is taking a look in particular at those grants, that mostly focused on the companies' export performance. It means, that the effect of one particular Activity, which is a grant, in this case, will be analyzed and the combined effect of different grants will not be analyzed. This can give an understanding, how efficient is one or the other activity in terms of export enhancement. The empirical part of the thesis is the treatment analysis of Cohesion fund performance in Estonia, where outcome variables are various firm-level export performance indicators; these will be discussed in the methodology part. Contribution to the literature of this thesis is showing the effect of European Cohesion fund grants on various export performance indicators of Estonian firms. This topic is vital to analyze because export is important for Baltic states (Saboniene 2009) and the efficiency of European Structural Funds is researched for the last two decades (Ruiz 2008, Wostner and Šlander 2009, Melecky 2018).

There is some ambiguity and lack of continuity in the topic of grants, according to Begg (2010), although the primary strategy of the fund has been stated explicitly. The deliberate aim has room for interpretation. Regional policy is to opt for helping specific types of regions, but it cannot be similarly applied to all regions. Structural policies are slow, and even if a country or region is making significant progress, further support may still be needed. This issue is acknowledged by the fact that cohesion policy is not abruptly switched off and is often continued even when a region does not require further assistance from the Fond.

The high performance of firms is vital for the growth of the economy (Storey, Fanelli, & Mendez 2013). For that to happen, the government may enhance companies in different ways, since companies sometimes cannot find sufficient investment base in their own country or they need some extra consulting support or other non-financial grants. This research will concentrate

on the export-focused grants, that are aiming at promoting companies' exports. It will look at how chosen grants will affect export indicators in the first, second, and third-year after treatment. In theory (Hansson and Henrekson 1994), government investment should increase the performance of the firm. Still, there is the question of how efficient the process is. For this thesis, it means, that firstly given measures or treatments might not have been sufficient to enhance export indicators and secondly, that firms chosen for treatment might not have been good candidates. Although the second point will not be analyzed in this thesis, still that fact can explain further results. Moreover, there is no golden rule of how funding should be handled, thus it is hard to evaluate policy. Therefore, the research of the thesis has been conducted to help identify the main drivers of successful funding instruments by researching the effect of selected activities on export.

A vital component of a company's development is export performance. Exports are especially vital for small economies (Casey and Hamilton, 2014). The moderately sized local market does set limits for company growth, in other words, there is a linear connection between country size and the size of the firms' that operate mainly or only in this country; therefore, to overcome this obstacle, companies search for new markets to increase the profitability. Essentially, it is very often unavoidable to be export-oriented for small-sized economies like Estonia, where the local market is smaller than in the case of for instance Germany or the USA. That point illustrates why export deserves to be the focal point of the study and why it should be looked at from different perspectives. It is also important to point out, that as argued in Konstantins et al. (2019) for example, in Latvia and Estonia there are high productivity companies that are not exporting. This argument fortifies the argument, that the connection between productivity and export is vital to analyze.

Therefore, the main focus of this research will be to understand the significance of the grants from the European Cohesion Fund on the export of the companies in Estonia and to understand how efficient they were. The thesis will be focused on evaluating treatment effects from the chosen activities on the firms' export indicators, like export values, but also other indicators like the number of export markets (countries). This thesis has an overview of the strategy and methodology of how effective these grants are and suggestions for improvements will be made.

The rest of the thesis will contain the following parts: literature review, which will look at the theoretical part of the thesis and discuss the intricacies of the topic; in the methodology part will be the overview of the data and the description of the approaches used namely the treatment analysis procedure; that will be followed by a discussion of results and conclusions.

2 Literature Review

2.1 Overview of Fund's goals and aims

The Cohesion Fund was established in 1993 for providing financial assistance to the less developed regions (those with GNI per capita below 90% of the EU average) for economic adjustment for a future embracing of the common currency. In the 2014-2020 period, the Cohesion Fund was active in the following countries: Bulgaria, Croatia, Cyprus, the Czech Republic, Estonia, Greece, Hungary, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia, and Slovenia. In the Estonian case, €9 billion out of the EU's cohesion and investment funds were to be received between 2004 and 2020, which is around one-third of Estonian GDP. Since 2014, 44 percent of all public sector grants were provided by EU funds, as per the EU Budget 2014-2020 Programs' Performance Overview. The CEE and Baltic states receive relatively more than regions in other countries (EU Budget for the future 2018).

European funds can be seen as instruments of interventionist policies. Economic interventionism is the approach of policymaking favoring governmental intervention to address market failures and enhance welfare. The most prominent example for Europe is the Marshall plan in 1948, whose aim was to overcome destruction during World war II. The goals of interventionism have been changed. Now they are more aligned with societal goals, such as a clean environment, better healthcare, or increased lifespan (OECD, 2015; Robinson and Mazzucato, 2019). The most critical breakthrough in perception that contributed to the first wave of innovation policies is that R&D has qualities similar to public goods. (Arrow, 1962; Nelson, 1959). Institutional efficiency is one of the most significant facets of economic development (Acemoglu and Robinson, 2012). The crux of the intervention's action is addressing the market or system failure, although in the context of the Cohesion policy it is more about the outcome of the failure, which is the lower GNI. Plausible failure or state is the transition to the free market economy, this was described by Radosevic (1997). He described how it is for Baltic countries to create reliable strategic policies, which imply intervention. Mairate (2006) specifically focused on the outcomes of the Cohesion Policy, “added value” by his words. Broadly speaking, the latter means the degree to which intervention of European Funds brings 'value' to the interventions of other administrations, organizations and institutions. The key goal is to focus interventions in the Member States and regions based on the strategic recommendations established at the local level and to bring Cohesion policy.

'The Structural Funds and the Cohesion Fund are financial tools set up to implement the regional policy of the European Union. They aim to make the European regions more homogeneous, by leveling up the performance of the economy and rise the welfare of less prosperous regions to Europe's average (The EU's main investment policy 2013). Although the aim is stated clearly, the actual state of the funding's approach is more ambiguous.

Cohesion policy was a topic for discussion for decades because of a political agenda. It has also been an object of many evaluations, most of them will be mentioned in this part, but most studies were concerned not with the Cohesion process itself, but with whether the EU support is growth-enhancing (Hagen and Mohl 2016). Bradley and Untiedt (2008) made a meta-analysis, which criticizes the limited effectiveness of cross-sectional regression analysis

approaches. They concluded that hitherto policy recommendations are not useful and have to be revisited. Moreover, regionality, namely distributing funding by regions of Europe, not countries, was not the most efficient approach, as the country difference can be more useful. In our case, Estonia plays hereby the role of the region. Thus, it means, that companies in Harjumaa should be also supported, even though that area is significantly wealthier than the rest of Estonia. Another critique from the institutional point of view was made by Garrett and Tsebelis (1996).

The main argument is that intergovernmentalism, a policy that concerns many countries, has not taken into account many factors. Moreover, the lack of directness is not the only issue of this concept. The main argument of this critique is the low theoretical base of the Cohesion Fund. Fratesi and Wishlade (2017) looked at the issue of different approaches to evaluate the impact of the Cohesion Fund by assessing the prime studies of the topic. Grants from the mentioned Fund have both economic and social direct impacts. On top of these direct effects, there are also hidden or indirect effects, which are hard to identify and measure. Moreover, while the direct effects can be relatively quickly evaluated, the indirect ones are harder to evaluate, because their effects reveal themselves only in the long term. Notwithstanding, even the economic effect purely from the EU funds is still hard to identify because there is also a signaling effect, which means in the given case, that other firms from the EU will cooperate more with the firm, which was chosen to be funded by EU's fund. This created the shift in the approach from finding of the 'total effect' to the seeking of the 'conditioning factors', which were analyzed by Surubaru (2016), Gagliardi, and Percoco (2016), Percoco (2016) andothers.

There are some issues with estimating the Cohesion Fund impact, namely: there are some other impacts that are affecting the companies, and it may be hard to identify the actual effect of the grant; heterogeneity both in the addressing of the 'initial conditions' and the targeted areas; the data quality issue is also present (Wostner and Slander 2009).

The funds have a well-structured system on the European scale, but as it has also been mentioned in earlier articles, there have been also some flaws. No studies have claimed that the funds are useless. Notwithstanding, there are some aims, which have to be relooked due to Garrett and Tsebelis (1996) and Bradley and Untiedt (2008). Following guidelines suggested by Marzinotto (2012), changes to geographical redistribution schemes; guaranteeing the small and medium-sized economies (SME's) access to local credits, and bolstering the presence in the R&D sector are in order. The mentioned authors presented valid critiques, arguably implementing their suggestions can improve the performance of the Cohesion Fund. Another question is to understand what are the vital indicators of profitable fund strategy, and what these indicators could be will be presented in the next sub-section.

2.2 Effect of grants on firm productivity

It is not so obvious what the main criteria are, which can show the effect of the treatment, as demonstrated by Becher et al. (2012). Some examples are the increase in employment and the efficiency of treated firms. De Zwaan and Merlevede (2013) analyzed the effect of EU regional policy on the performance of manufacturing firms. Authors did not achieve significance in their results, but implied, that timeframe, which they have chosen is not long enough and that deeper

analysis is needed, the means that every segment of the industry has to be analyzed individually for a better understanding of the treatments.

For this research, it is also vital to understand, if the source of the grant matters. Czarnitzki and Lopes-Bento (2014) looked at this issue in Germany's case. The study showed a complementary effect of the grant from the EU, as one of the investment sources on performance. Complementarity in this context means, that grant can work well as the additional source of funding, but not the main one. The finding is that public funding triggers the production of socially beneficial products, no matter if it was a German grant, European, or both.

Papers discussed above-set productivity as one of the primary dependent variables. In many pieces of research, productivity dropped instead of rising. One of the plausible reasons could be that another dependent variable, namely the number of employees, increased. That may lead to the point of the productivity curve, where more employees with the same capital mean less productivity. In other words, less capital per employee. Therefore, some other variable or set of variables shall be selected. There are many key performance indicators (KPIs) to choose from, but they may differ in importance from region to region. For Estonia and probably many other small European economies, it may be the export capabilities, like export value.

2.3 Effect of grants on exports

The previously discussed more standard measurers of grants' effects like productivity and employment have in addition to positive aspects also negative ones, and that has called to look for alternative metrics in the evaluation exercises. Moreover, more focused research on export demands is needed because of its intricacies and possible spillovers.

The effect of the export on a small country in the case of New Zealand, which was evaluated by Casey and Hamilton (2014) is a prominent example of how small economies can strive by exporting. Perceived export performance (PEP) is not a widely used dependent variable. Given the variables evaluated sales and profit contribution of their primary export market and then divided by their domestic market sales and profit. Also, a comparison was made to the Caribbean and Greek companies to estimate the singularities of New Zealand's case. The study suggests that although the distance to export markets from New Zeeland is larger than other tested small economies, R&D and Export intensities, as well as PEP, are better. It may be explained by the smaller number of employees in companies or the relative isolation of New Zealand from the big markets, like North America or Europe. Although this study does not have a connection to grants, it shows the small country peculiarities of companies' export activities. Latvian case, which is closer to the Estonian one, showed that the European Structural and Investment Fund increased the tendency to export (Viksna and Bekeris 2017).

Cardoso and Soukiazis (2008) looked at this topic carefully. Their study explains the differences in growth rates between the cohesion countries of the EU: Ireland, Spain, Portugal, and Greece. By using a growth decomposition approach, it is found that the main driver of growth differences lies in productivity. The export-led growth analysis suggested that competitiveness, as given by the income elasticities of exports and imports, is a crucial factor in explaining the varying economic performance of the four studied countries. Also, it is worth

noting, that not only the origin but also the industry and age of the firm play a role in how significant the rise in export can be (Greenaway and Kneller 2007).

One other way to look at this export influence is Krugman's new trade theory (1980), especially its' liberalization effect aspects. In some ways, the impact of funds may be described as the export promotion, which is essential for small economies like Estonia. Export promotion has a positive effect on a firm's productivity (Martincus and Carballo 2008) and adding new markets (Martincus and Carballo 2010). This impact was tested for the European environment and gave economically and statistically significant results (Brooks and Van Biesebroeck 2017). So, one of the issues of the studies in this field is the heterogeneity of the firms, and sometimes it is not easy to identify critical differences between exporting and non-exporting firms. One of them may be trade opportunity cost, type of industry, and different political barriers (Bernard et al. 2007). In competitive circumstances, there will be winners and losers, and resources will in most cases be relocated to the winners (Melitz and Treffler 2012), because it is more expedient, that efficient firms gain more market share. Findings from Görg et al. 2008 suggest that European funding schemes encourage incumbent exporters to export more, but there is no substantial evidence that non-exporting firms will start to export. Export has many possible hidden effects; one of them is the enhancement of productivity. The increase in productivity is most helpful for SME companies (Wilkinson and Brouthers 2006), which have an increase in value-added, productivity, and employment (Munch and Schaur 2018).

Learning by exporting is one of the effects, which comes with enhanced export. The effect is not so easy to identify (Loecker 2010). This effect extends naturally to cases where the firm-level impact is revealed on future productivity, via channels such as technology adoption, R&D, product quality upgrading, and investment more broadly defined. This fact extends another point is that learning by exporting may cause different effects in different countries. For instance, the significant increase in productivity in the Indonesian case (Blalock and Gertler 2004) is probably inapplicable for Estonia, although learning by exporting is present in the Estonian case (Konstantins et al. 2019). This effect can also be described as innovations, which can be quantitively measured (Salomon and Shaver 2005). The growth of productivity was increased for the export firms, and firms, which gather and process consumer feedback. That subsequently results in the tailoring of products to meet the needs of heterogeneous foreign consumers, which gives an upper hand in the exploration of new markets. Thus, export increases productivity, because of innovation. The evidence of this from Sweden (Lööf et al. 2015) shows that industries that are continuously innovating and actively exporting expand faster than exporting industries that do not implement innovations at such a high rate, while the latter expands at the same productivity as non-innovators. A meta-analysis from Martins and Young (2009) indicates that exports have a more significant impact on the productivity of developing economies and that finding was resilient to a wide variety of different criteria. Besides, the analysts further argue that this learning by export effect is more significant in the first year that businesses sell than in the following years. When it comes to the advantages of learning by exporting, which refers to productivity gains experienced by firms after they start exporting, Hosono et al. (2015) found that firms starting to export performed better than their non-exporting counterparts prior to export and the performance difference, in particular productivity, significantly increased after started exporting.

2.4 Case of Baltic countries

Cohesion Fund operates in different European countries, and as it was said before, these countries can be separated into three groups: Baltic, Central European, and South European. There are also regions in Western Europe, which are affected by the Cohesion fund, but not as broad as in previously mentioned countries (Manzella et. al. 2009). Estonia is one of the Baltic countries and has its own unique economic and political circumstances.

Many countries in these groups are tagged as new EU member states. Although, by the 2nd half of the 2000s they became more familiar with EU policies, that has happened only after a period of transformation (Rosenberg and Sierhej 2007). The process of getting familiar with policies was not simple, but Estonia turned out to be more efficient in this process compared to both CEE (Štreimikienė and Mikalauskienė 2016) and the other Baltic countries (Štreimikienė 2016).

A few studies have been conducted to evaluate the effects of grants on company performance in the Baltic States. A similar analysis was conducted on another Baltic country Latvia by Benkovskis et al. (2018) This paper takes into account the effect of other EU funds, namely the European Regional Development Fund (ERDF). Key investigated variables were productivity, employment and other indicators of Latvian firms. They found that the quantity of employment rose due to the grants, while productivity rose slowly if did at all. Moreover, ERDF did not prove to be a better source of funding compared to private investment. The authors also mentioned that this result of evaluation might be caused by the small size of firms that got the grant, because mentioned changes can affect small firms more significantly, than big ones. That effect was also studied by Benkovskis et al. (2019) using Estonian and Latvian data. This research was conducted to understand the effects of export entry on productivity. It was found that firms, which had lower productivity beforehand experienced productivity growth, whereas other firms did not get a positive effect on such scale.

The most common cause is the funding of startups because they are small or medium-sized businesses, which mostly are R&D intensive in one way or another. Lukason and Masso (2010) researched the situation in Estonia using data from the Estonian business register from 2005 till 2008. Estimated labor taxes rose after the influx of investment in the form of a grant. In the interpretation of these results, it needs to be considered that the Estonian case is quite specific, because of economic and historical circumstances.

Notwithstanding the experience of the country may be applied not only in the other Baltic States but also for European countries with a communist past. In that paper, researchers realized the main issues with grants for startups and made recommendations about future funding, which means, that enhancement of the R&D sector can give positive results. The earlier study about the same case was conducted by Vildo and Masso (2009). The main difference from the study by Lukason and Masso (2010) was that there were chosen slightly different variables. The result of the research was surprising - although the productivity did not increase, the number of employees and turnover increased. Lithuanian case was discussed in Dapkus and Streimikiene (2014). Although the positive effect was shown, still it was not enough to create significant positive change in the country and it was not as effective as it was in Poland.

There are government agencies in Estonia, which distribute funding and grants to the chosen firms. One of the most prominent of them is Enterprise Estonia (EAS). The study by Vicente (2014) was conducted to estimate the effects of this type of funding. It tested the statistical significance of the economic effect of getting at least one grant of any sort on the number of workers, sales income, labor costs, and gross profits. This evidence showed that EAS subsidies contribute to the growth and profit of the company. This result, namely an increase in the performance of the firm, was also proven by another paper (Hartšenko and Sauga 2013), which analyzed the effects of grants (treatment) from EAS. Another notable paper is a thesis from Promvalds (2020), which addressed issues related to the current thesis. In her thesis was concluded that the export adviser services have a positive impact on reaching some of the goals set in Estonia's strategic development plans. Notwithstanding, past studies about the Estonian case did not research many aspects of governmental funding or European economic interventionism. Mentioned articles show that although Estonian results bear some similarities with those found in the other European countries, still outcomes have their uniqueness. It follows that the Cohesion policy should be more tailored for each country or even a region at the sub-national level to be more efficient. The approach chosen for this thesis and its' data will be discussed in the next section.

From the analysis, which was focused on Estonia and other Baltic countries, the applied methodology for this thesis was deduced. It is treatment analysis, with 'greedy' and propensity score matching. The actual effects will be estimated with the average treatment effect on the treated approach. These calculations will give the estimated effect of activities on the export performance of firms. An elaborate description of the methodology will be presented in the following methodology part.

3 Methodology

3.1 Data description

For the analysis, firm-level panel data was used from 2014 to 2018 with treatments based on the activities funded by the Cohesion Fund. In the data, firms get funding from different activities in different periods. The data on final beneficiaries of financial and non-financial support was provided by the Ministry of Finance of the Republic of Estonia for a project "Ühtekuuluvuspoliitika fondide rakenduskava 2014–2020 ettevõtlus- ja innovatsioonitoetuste tulemuslikkuse hindamine" ("Performance evaluation of entrepreneurship and innovation grants of the Cohesion Fund for 2014-2020") undertaken from September 2019 till March 2020 where the author of the thesis participated. The data on chosen firms for treatment, which will be referred to as "treatment" data, consists of information on the number of unique projects for which different types of support were given in the 2015-2018 time period.

The treatment data was merged with Estonian Business Registry data, which contains different metrics and indicators about the firms' performance, and with export data from Statistics Estonia. Firm-level export data at the firm-product-market level is based on customs statistics. After the merging of these datasets, data cleaning procedures were undertaken using Stata, and R software packages. Every step of the analysis was made in the Statistics Estonia Server Terminal. The procedure was as follows. Firstly, there were dropped firms with a negative age and negative revenue. The next issue is outliers, which represent data, which significantly deviates from the majority of the sample. Outliers were eliminated for increasing the prediction capabilities. The outliers have been removed by using STATA's Weber (2010) "bacon" command, which quickly identifies outliers in the multivariate dataset. For the better consistency of the data and its' better accessibility, most of the variables were logged, excluding the percentages and number of export markets. For the matching some variables, mentioned below, were lagged by one period, to eliminate the influence of the treatment.

The number of treated companies is 571 for activity 5.1.3, 47 for 5.3.3, and 110 for 4.2.2. The current selection is caused by the fact, that into the analysis were selected only firms, which have received treatment only in the first time. The analysis was made to evaluate the treatment effect on the following dependent variables: logged export value in EUR (overall, only to EU countries, to non-EU countries); export intensity, which is export value divided by the turnover (overall, only to EU countries, to non-EU countries); the number of new markets, export per worker. The effect on every dependent variable was also analyzed both in t+1 and t+2 periods. Export value shows fundamental export quantities; it is an essential export variable. A number of new export countries (markets) shows if the market expansion is affected by the grant funding. It also shows that the firm has the needed infrastructure, knowledge and capabilities to satisfy the demand of new markets. Export intensity adds dimension to existing export value because it gives its' relation to the turnover, which is a crucial aspect of the firm's export performance.

Matching variables includes dummy 'North', which represents firms from Harjumaa (including Tallinn), being important because the capital region is different from the rest of the country in terms of purchasing power and population density; the age of the firm, linear and squared;

market share(local), since firms with higher market share are more likely to be innovative (Blundell et al., 1999). Also, it can be used as a measure of firm size; capital intensity; employment, where we consider the logarithm transformation of a number of employees; profits per worker; turnover per employee. Also, industry dummies are present, they are represented by the NACE 2-digit code. From the control group for particular grants are excluded companies that have received supports from other activities, e.g. in case of activity 5.1.3 from activities 5.3.3. and 4.2. 2.. Primary information about the variables is presented in Table 1. Information about the treated companies is presented in Table 2. Table 3 describes the controls.

Table 1 Main information about the variables

Variable Name	Units of Measurement	Years	Source
Number of export markets	Number	2014-2018	Exports data, Statistics of Estonia
Value of all services and goods exported	Logged form (EUR)	2014-2018	Estonian Business Registry, Statistics of Estonia
Export intensity(exports divided by turnover)	Units	2014-2018	Exports data, Statistics of Estonia
North Estonia	Dummy variable (0-1)	2014-2018	Estonian Business Registry, Statistics of Estonia
Age of firm	Number in years	2014-2018	Estonian Business Registry, Statistics of Estonia
Market share (in Estonia)	Percentage	2014-2018	Estonian Business Registry, Statistics of Estonia
Capital intensity (fixed assets divided by number of employees)	Euros	2014-2018	Estonian Business Registry, Statistics of Estonia
Number of employees	Units	2014-2018	Estonian Business Registry, Statistics of Estonia
Profits per worker (Operating profits divided by number of employees)	Euros	2014-2018	Estonian Business Registry, Statistics of Estonia
Turnover per employee	Euros	2014-2018	Estonian Business Registry, Statistics of Estonia
Export value per employee	Logged form (EUR)	2014-2018	Exports data, Statistics of Estonia

Table 2 Descriptive statistics on treated

Variable Name	Consulting support to enhance export performance (5.1.3)					Financial support for developing the export capacity of companies operating in the creative industries (5.3.3)					Financial grant to SMEs to support R&D (4.2.2)				
Statics indicators	Observa-tions	Mean	Standard Deviation	Min	Max	Observa-tions	Mean	Standard Deviation	Min	Max	Observa-tions	Mean	Standard Deviation	Min	Max
Number of exporting Markets	1,275	1.18	3.36	0	58	63	0.56	2.15	0	13	181	0.77	2.23	0	19
Export value per worker	1,275	0.67	2.08	0	15.98	63	0.69	2.10	0	11.45	181	0.67	2.25	0	15.49
Log(export value)	1,275	3.92	6.53	0	17.19	63	2.16	4.79	0	15.69	181	3.22	6.12	0	16.93
Log(export value) EU	1,275	2.53	5.74	0	17.14	63	0.24	1.87	0	14.86	181	2.03	5.23	0	16.93
Log(export value) non-EU	1,275	2.56	5.22	0	17.19	63	2.14	4.76	0	15	181	1.95	4.73	0	15.42
Export Intensity	1,275	0.22	0.40	0	1	63	0.09	0.25	0	1	181	0.19	0.38	0	1
Export Intensity EU	1,275	0.15	0.36	0	1	63	0.01	0.06	0	0.43	181	0.12	0.33	0	1
Export Intensity non-EU	1,275	0.11	0.29	0	1	63	0.08	0.23	0	1	181	0.08	0.26	0	1
North	1,275	0.62	0.48	0	1	63	0.79	0.41	0	1	181	0.46	0.50	0	1
Age	1,275	9.91	7.18	1	28	63	8.90	6.11	1	26	181	9.03	6.89	1	26
Log(Number of employees)$_{t-1}$	1,275	1.60	1.33	0	5.05	63	1.56	1.07	0	3.74	181	1.33	1.23	0	4.58
Log(Profits per worker)$_{t-1}$	1,275	3.73	4.33	0	12.48	63	6.99	3.68	0	10.81	181	5.37	4.22	0	11.68
Log(Turnover per employee)$_{t-1}$	1,275	6.31	5.48	0	14.20	63	10.94	0.87	8.23	12.79	181	8.59	4.51	0	14.15
Log (Capital intensity)$_{t-1}$	1,275	10.43	1.21	5.13	14.49	63	10.36	0.79	8.39	12.27	181	10.38	1.23	7.51	14.82
Market share$_{t-1}$	1,275	0.18	046	0	5.11	63	0.23	0.36	0	1.85	181	0.11	0.24	0	2.05

Table 3 Descriptive statistics on controls

Variable Name	Consulting support to enhance export performance (5.1.3)					Financial support for developing the export capacity of companies operating in the creative industries (5.3.3)					Financial grant to SMEs to support R&D (4.2.2)				
Statics indicators	Observa-tions	Mean	Standard Deviation	Min	Max	Observa-tions	Mean	Standard Deviation	Min	Max	Observa-tions	Mean	Standard Deviation	Min	Max
Number of exporting Markets	258,174	0.11	0.92	0	61	149,728	0.11	0.85	0	46	255,723	0.09	0.82	0	46
Export value per worker	258,174	0.23	1.54	0	17.24	149,728	0.18	1.28	0	17.02	255,723	0.22	1.52	0	17.17
Log(export value)	258,174	0.59	2.84	0	17.29	149,728	0.57	2.78	0	17.19	255,723	0.54	2.71	0	17.19
Log(export value) EU	258,174	0.31	2.16	0	17.28	149,728	0.30	2.12	0	17.14	255,723	0.28	2.03	0	17.18
Log(export value) non-EU	258,174	0.36	2.17	0	17.29	149,728	0.34	2.09	0	17.19	255,723	0.33	2.07	0	17.19
Export Intensity	258,174	0.03	0.18	0	1	149,728	0.03	0.17	0	1	255,723	0.03	0.17	0	1
Export Intensity EU	258,174	0.02	0.13	0	1	149,728	0.02	0.13	0	1	255,723	0.02	0.13	0	1
Export Intensity non-EU	258,174	0.02	0.13	0	1	149,728	0.02	0.12	0	1	255,723	0.02	0.12	0	1
North	258,174	0.58	0.49	0	1	149,728	0.55	0.49	0	1	255,723	0.58	0.49	0	1
Age	258,174	10.02	6.80	1	31	149,728	11.09	6.79	1	50	255,723	10.01	6.80	1	31
Log(Number of employees)$_{t-1}$	258,174	0.66	0.94	0	5.51	149,728	0.88	0.96	0	5.49	255,723	0.65	0.93	0	5.51
Log(Profits per worker)$_{t-1}$	258,174	2.98	4.05	-3.04	15.35	149,728	5.03	4.17	-3.04	15.51	255,723	2.96	4.04	-3.04	15.51
Log(Turnover per employee)$_{t-1}$	258,174	5.39	5.31	-3.38	18.01	149,728	10.37	1.21	-3.38	18.01	255,723	5.37	5.31	-3.38	18.01
Log(Capital intensity)$_{t-1}$	258,174	10.22	1.65	-0.69	17.29	149,728	10.04	1.56	-1.09	16.59	255,723	10.23	1.67	-0.69	17.29
Market share$_{t-1}$	258,174	0.05	0.40	0	73.04	149,728	0.05	0.27	0	27.17	255,723	0.5	0.40	0	73.04

The summary of the descriptive statistics shows that the samples of treated companies and those in the control group are similar in many aspects. However, there are a few points, where they are different. The treated companies are younger than in the control group. There is no treated firm older than 10 years. This fact can also explain why companies of the control group have on average higher turnover compared to the treated companies. In the control group also non-exporting firms are presented. Other variables do not have a significant difference between groups.

Table 4 shows the results of the probit model, equation 1, by the three analyzed activities (i.e. the probability of receiving a grant from the particular activity). Although the pseudo R^2 of the models is not high, the coefficients of the explanatory variables are both statistically and economically significant. The estimated coefficients of the probit regressions are used to calculate the propensity score of chosen of receiving grants from the analyzed activities.

$$(1)\ A_i = \Phi(Constant + Log(Profit\ per\ employee)_{t-1} + Log(Turnover\ per\ employee)_{t-1} + Market\ share_{t-1} + Capital\ Intensity_{t-1} + North + Log(noemp)^2_{t-1} + Age^2 + Log(noemp)_{t-1} + Age + I_1 + \ldots + I_{16}),$$

where A_i is the set of the activities.

Table 4 Probit estimation of the probability of getting funding from activities

Variable/Activity	Consulting support to enhance export performance (5.1.3)	Financial support for developing the export capacity of companies operating in the creative industries (5.3.3)	Financial grant to SMEs to support R&D (4.2.2)
$Log(noemp)^2_{t-1}$	-0.01	-0.09**	0.01
$Log(noemp)_{t-1}$	0.33***	0.48***	0.12*
Age^2	0***	0	0
Age	-0.04***	-0.03	-0.04***
$Log(Profits\ per\ worker)_{t-1}$	0	0.01	0.01
$Log(Turnover\ per\ employee)_{t-1}$	-0.01	0.10	0.02**
North	0.05***	0.18	-0.12
$Market\ share_{t-1}$	0.32***	0.99	0.37
$Market\ share^2_{t-1}$	-0.06**	-0.45	-0.16
$Capital\ Intensity_{t-1}$	0.07***	0.01	0.04
Constant	-3.54***	-4.79***	-3.66***
Number of observations	259,449	147,204	255,269
Pseudo R^2	0.12	0.17	0.09

Significance levels : ∗:5% ∗∗:1% ∗∗∗ : 0.1%

3.2 Matching procedure

Matching Procedures, which were used in this thesis are Mahalanobis distance matching (MDM) and propensity score matching (PSM). There are built on specific notions of distance between observations of pre-treatment covariates. MDM measures the distance between the two observations X_i and X_j with the Mahalanobis distance

$$(2)\ M(X_i, X_j) = \sqrt{(X_i - X_j)/S^{-1}(X_i - X_j)}$$

, where S is the sample covariance matrix of X. In PSM, we first collapse the vectors to a scalar "propensity score," which is the probability that an observation receives treatment given the covariates, estimated by a logistic regression

(3) $\pi_i \equiv \Pr(T_i = 1|X) = 1/(1 + e^{X_i\beta})$

then, the distance between observations with vectors X_i and X_j is the simple scalar difference between the two estimates $X_{i\beta} - X_{j\beta}$. The most common implementation of each approach is to apply one-to-one nearest neighbor greedy matching without replacement (Austin 2009, p. 173). This procedure matches each treated unit in some arbitrary sequence to the nearest control unit, using that method's chosen distance metric. Part of the procedure then entails removing treated units that are unreasonably distant from the control units to which they were matched. The most used procedure is calipers, which are chosen cutoffs for the maximum distance allowed (Stuart and Rubin, 2007; Rosenbaum and Rubin,1985).

Nearest neighbor matching can be done on most statistical software packages. In STATA it can be implemented with 'teffects nnmatch' command It can either use a "greedy" algorithm that runs through possible matches and chooses the nearest unknown alternative to match each time, or a more complex, more advanced "optimal matching" that minimizes global consistency for all matches through some of the equations involved. Often the nearest neighbor matching is also performed with a substitution, where each member of the target set will fit more than one data point, company in our case. For non-replacement sampling, each target component can only be used once. 'Greedy matching' could lead to the reduced overall quality of matches because instead of the entire system, one match is configured at a time. An alternative is an optimum synchronization, which takes the entire system into account before matching (Rosenbaum, 2002). If control is very 'competitive' for the closest treated match, greedy matching is not efficient, and optimal matching is needed.

With the propensity score matching we are trying to evaluate the average causal effect of treatment, namely calculate the difference of performance between treated and untreated units. $D_i=1$, for treated and $Di=0$ for untreated, where *i* denotes the company. The propensity score theorem says that if the conditional independence assumption is true, then potential values of the outcomes Y_{1i} and Y_{0i} (values of outcome variable *Y* firm *i* if treated and not treated respectively) are themselves conditionally independent of the treatment if we condition on the propensity score of an individual. In this thesis matching by propensity scores is used. These scores are used to curtail the selection bias, by balancing given covariates between groups. That helps to match units between groups on multiple variables.

Matching helps to eliminate treatment classification bias and imitate randomization by generating a sample of treatment-receiving units that is equal for all covariates found to a sample of treatment-receiving units. PSM has been shown to increase model dependency, bias, inefficiency, and power and is no longer recommended when opposed to other matching approaches (King and Nielsen 2019), but it is used because of high applicability, which other methods often do not possess. The ideas behind the use of matching remain, but should be extended to other matching methods; likelihood scores also have other productive uses in weighting and double-strong estimation. At the time of its implementation, the key advantages of PSM were that, by using a linear combination of covariates for a single score (Rosenbaum and Rubin 1983), it combines treatment and control classes with a large number of covariates with out losing a large number of observations. If treatment and control units were balanced on

a large number of covariates one at a time, a large number of observations would be needed to overcome the "dimensional problem" whereby the introduction of a new balancing covariate would increase the minimum number of observations in the sample geometrically. One downside of the PSM is that it only accounts for the covariates observed. Factors that influence treatment assignment and outcome but cannot be observed cannot be taken into consideration in the matching process. Since the method considers only the observable variables, any implicit bias due to latent variables can remain after matching. Another concern is that the PSM needs a large number of observations, with significant overlaps between treated and control classes. Judea Pearl (2010) has addressed general questions about matching, suggesting that latent bias can potentially increase, because matching observable variables can induce bias due to dormant unobserved confounders.

For propensity scores, first, we estimate the propensity score - and then matching is conducted based on the estimated probabilities of receiving the grant. In the STATA this approach is implemented by command ‘teffects psmatch‘ and will have name Baseline PSM, usage of ‘psmatch2‘ command will be called Alternative PSM. Whereas for nearest neighbor matching STATA User’s guide suggests, that likeness between subjects is based on a weighted function of the covariates for each observed unit.

Thus, we have the following probit estimation:

$$(4)\ p(X_i) \equiv E\{D_i = 1|X_i\} = \frac{e^{h(X_i)}}{1+e^{h(X_i)}},$$

for the propensity score, where D_i takes value 1 for those companies receiving a grant, and 0 otherwise, X_i is a set of variables (regressors or covariates) which determine grant receiving up to a random factor, and which include a constant, and $h(X_i)$ is a linear function of those variables. To address the issue of a small number of experimental control units, we assume that data can be obtained from a set of potential matches that are not specifically drawn from the same population as the treated, except with whom we are finding the same set of pretreatment covariates, *Xi*. The closeness between subjects is based on estimated probabilities of treatment, known as propensity scores. The treatment effect is calculated by taking the mean of the difference between the observed and potential outcomes for each subject.

$$(5)\ C(p_i) = min_j|p_i - p_j|, j \in I_0,$$

For the ‘greedy matching’, covariates p_j from the control group are selected for the subject (firm) from treatment. The nonparticipants with the value of P_j that are closest to P_i are selected as a match. The closeness between subjects is based on a weighted function of the covariates for each observation. The treatment effect is computed by taking the mean of the difference between the observed and the imputed potential outcomes for each subject.

So far, we have discussed ‘greedy matching’ and the PSM. Although PSM is better in many aspects, the 'greedy’ approach was used to understand when treatment analysis was feasible and when it was not. It is also easier to compute. The method can be used to double-check the PSM outcomes. A combination of the approaches can give a more detailed understanding of the topic.

In the calculation will be used average treatment effect on treated (ATT), that indicator was chosen because the main goal was to understand the effect of the selected Activity. To test the robustness of the results to alternative specifications there was additionally used nearest neighbor matching with four neighbors. The baseline was to conduct matching with the smallest number of matches, which can be more close to each other. ATT formula has the following form:

(6) $ATT = E[Y_{1i} - Y_{0i} | W_i = 1]$,

where 1 is treated, and 0 is untreated period

Another alternative approach, which will be used for robustness checking of the results will be implemented by the psmatch2 STATA command. The main difference compared to the previous data selection is the following: instead of focusing only on one activity, were included also companies, which were also treated by the other selected activities in the same year. Although the values can be different, the small difference is not crucial and the results are interpreted differently.

In the 4th part will be presented results from both methods, namely 'greedy matching' and PSM, their comparison could show trends, if the results are close to each other or some issues, if the results will be different. In the following Table, 5 will be presented a balance of the matching, which was made by command 'pstest' in STATA. Table 5 reports the results of the balancing property test for all activities, as an example. The t statistics and p-values after the propensity score matching indicate that the procedure eliminated statistically significant differences in the determinants of export indicators. It is worth mentioning that after balancing the number of observations dropped significantly for the controls, by half on average. For the treated, it was somewhere between a quarter and a half.

Table 5 Balance of the matching

Variable/Activity		Consulting support to enhance export performance (5.1.3)				Financial support for developing the export capacity of companies operating in the creative industries (5.3.3)				Financial grant to SMEs to support R&D (4.2.2)			
		Treated	Control	Bias	p-value	Treated	Control	Bias	p-value	Treated	Control	Bias	p-value
$Log(no.\ of\ emp.)^2_{t-1}$	Unmatched	5.06	1.49	81.0	0	3.38	1.88	46.1	0.001	3.89	1.45	62.9	0
	Matched	5.06	5.16	-.25	0.74	3.38	3.11	8.3	0.682	3.89	4.27	-9.6	0.583
$Log(no.\ of\ emp.)_{t-1}$	Unmatched	1.80	0.73	90.6	0	1.55	0.94	61.4	0	1.49	0.72	67.2	0
	Matched	1.80	1.82	-1.7	0.799	1.55	1.51	3.6	0.856	1.49	1.55	-5.2	0.740
Age^2	Unmatched	153.58	145.86	4.4	0.261	113.62	165.54	-32.5	0.035	139.44	145.83	-3.8	0.682
	Matched	153.58	155.11	-0.9	0.889	113.62	125.38	-7.4	0.707	139.44	158.8	-11.4	0.424
Age	Unmatched	10.13	10.12	0.2	0.964	8.77	11.01	-35.1	0.021	9.54	10.12	-8.5	0.360
	Matched	10.13	10.12	0.2	0.974	8.77	9.21	-7.0	0.731	9.54	10.46	-13.4	0.338
$Log(Profits\ per\ worker)_{t-1}$	Unmatched	5.60	4.24	32.4	0	6.85	5.42	36.9	0.016	5.25	4.21	24.4	0.01
	Matched	5.60	5.61	-1.6	0.78	6.85	6.31	13.8	0.505	5.25	5.27	-0.6	0.966
$Log(Turnover\ per\ employee)_{t-1}$	Unmatched	9.25	7.61	36.7	0	10.92	10.46	44.2	0.008	8.81	7.59	26.6	0.008
	Matched	9.25	9.48	-5.2	0.32	10.92	10.90	1.8	0.931	8.81	8.51	6.5	0.618
North	Unmatched	0.62	0.57	9.2	0.029	0.77	0.54	47.9	0.002	0.47	0.57	-19.7	0.038
	Matched	0.62	0.64	-5.4	0.358	0.77	0.70	13.7	0.489	0.47	0.41	10.9	0.418
Market share $_{t-1}$	Unmatched	0.24	0.05	37.9	0	0.22	0.06	52.9	0	0.11	0.05	16.4	0.182
	Matched	0.24	0.25	-3.0	0.65	0.22	0.20	5.4	0.792	0.11	0.11	-1.2	0.887
Market share^2 $_{t-1}$	Unmatched	0.35	0.19	1.3	0.029	0.17	0.07	6.1	0.759	0.05	0.19	-1.1	0.932
	Matched	0.35	0.39	-0.4	0.358	0.17	0.09	4.1	0.441	0.05	0.06	-0.1	0.751
Capital Intensity $_{t-1}$	Unmatched	10.41	10.27	10.0	0.036	10.26	10.14	9.6	0.607	10.44	10.27	11.7	0.279
	Matched	10.41	10.42	-1.2	0.820	10.26	10.39	-12.0	0.579	10.44	10.43	0.1	0.992
Number of observations	Controls	103,379				77,868				102,195			
	Treated	571				47				110			
Pseudo R^2	Unmatched	0.15				0.17				0.09			
	Matched	0.01				0.55				0.03			

Significance levels : ∗:5% ∗∗:1% ∗∗∗ : 0.1%

3.3 Treatments

For this analysis were chosen Activities, which totally or mostly have been dedicated to the increase of export capabilities. These activities were chosen because they oriented explicitly on business development and export capabilities. A number of companies, which were treated by the chosen activities, are given in Table 5. It should be noted that the numbers in Table 5 represent firms, that were uniquely treated by one of the activities. It means that for the particular company there was considered only the 1st time of the unique treatment.

- Activity 5.1.3 Consultancy Support to enhance Export Performance, under which non-financial supports are provided for the development of export activities (the main goal was to promote exports);
- Action 5.3.3 Aim to develop the creative industries, under which financial support is provided for developing the export capacity of companies operating in the creative industries;
- Activity 4.4.2 Financial grant to SMEs to support R&D, which gives financial support for business development and promotion of export activities, besides supporting the enhancement of management capacity (only exports);

Under a broader mandate of subsection 4.4 for facilitating companies' development, promotion of export activities, and improving their management capacities, a financial grant under activity 4.4.2 is given out to small and medium-sized enterprises (SME's) to support Research and Development activities. According to the European Commission, SMEs are enterprises that meet the following definition of staff headcount and either the turnover or balance sheet total definitions. Due to previously mentioned rules by size, firms can be divided into the next groups: Small enterprises have up to 50 employees, medium-sized enterprises have up to 250 employees. Thus, only SME's can utilize financial support under activity 4.4.2. Besides, firms in specific sectors such as those in the financial sector. The insurance sector is excluded from obtaining support under activity 4.4.2, thus, also the control group excludes these firms.

The age of the company is included in the study, as older firms that have survived over time have formed networks and are more able to form clusters and provide cluster training grants. Since one of all the aims of the priority axis 4.2 is to push international competitiveness through R&D, it is possible that firms that are active in foreign markets could also be more innovative and are more likely to apply for grants under this priority axis. Since firms with higher market share are more likely to be innovative (Blundell et al., 1999), lag of market share was included, defined as the ratio of firm's revenue to industry revenue, within the set of controls. The concept again is that firms with higher market share are more likely to apply for this grant. Since financial grants for supporting R&D activities under activity 4.4.2 are more likely to incline to firms with growth and smart specialization potential, a dummy variable for firms with growth and smart specialization potential was included.

Under activity 5.1.3 consultancy services are provided to SME's for export promotion. The consultancy support under activity 5.1.3 for export promotion was given in the years: 2015, 2016, 2017, and 2018. The help under the focal axis 5 is not directly aimed at industries with the modern type of businesses or R&D-intensive businesses but at small and medium-sized

enterprises for improving the productivity of firms in the different Estonian regions. Consequently, the factors that classify creative businesses or firms expected to take up R&D were not included.

All activities under measure 5.3 aim to develop Creative Industries. Under measure 5.3, the five activities can be distinguished – 5.3.1 consultancy supports for the incubation and development of creative industries (2015-2017), 5.3.2 consultancy supports for the development of support structures for the creative industries (2017 only), 5.3.3 financial support for developing the export capacity of companies operating in the creative industries (2015-2017), 5.3.5 consultancy supports for linking the creative industries with other sectors (2017 only). Chosen activity 5.3.3 provides financial support for developing the export capacity of companies operating in the creative industries, and consultancy supports are provided under the rest of the activities for the other purposes.

The eligibility criteria require that the applicants are small and medium-sized firms; consequently, firms with employees over 250 were removed. Also, firms within the following sectors are excluded from obtaining grants or supports under measure 5.3, because they did not qualify for the grants:

- Mining and quarrying
- Water, sewerage, waste management, and remediation activities
- Public administration, defense, and compulsory social security

4 Discussion of results

In this section, the results of the previously discussed model will be presented and interpreted. Precise outcomes will be discussed in the following sub-sections dedicated to the three analyzed Activities.

4.1 Results from the Activity for Financial grant to SMEs to support R&D

Results of treatment for activity 4.4.2 (financial support for business development and promotion of export activities, besides supporting the enhancement of management capacity) show in general positive results. The export value has increased both in the case of exports to EU countries and non-EU countries. Notably, in most cases effect is more significant in the second and third years after treatment. Although the size of the values is economically significant, there is no clear progression through the years, because the second year mostly shows a higher impact, than the third one. ‘Greedy matching’, mostly did not show statistically significant results (excluding the export values), but the size of the estimates are close to ones obtained by using 'PSM', which prove the robustness of the model. Positive outcomes, which were obtained by implementing treatment from this activity can say, that even non-export-oriented grants can have a positive and significant effect on the companies' export. Results from the alternative PSM are pretty close to the PSM results. The biggest difference between

them is in the number of export markets at the t+1 and t+2 period, where alternative PSM have smaller estimates than that from the PSM. Financial grants to SMEs to support R&D did not show the significant economical effect on expanding to the new markets, there is no value bigger than "1". Also, this activity showed a higher impact on Export per worker than the Export intensity. Worth noting, that in the current case EU and Non-EU values are not different.

Table 6 Results (ATT) for, activity 4.4.2

Values	'GREEDY'	Baseline PSM	Alternative PSM
Export Value, log points	1.04	1.30**	1.41**
Export Value, log points t+1	1.35**	1.77***	1.77**
Export Value, log points t+2	1.40	1.99	1.55
Export Value EU, log points	0.55	0.63	0.69
Export Value EU, log points t+1	1.12**	1.46***	1.21**
Export Value EU, log points t+2	0.68	0.99	0.74
Export Value non-EU, log points	0.88**	0.98**	1.13*
Export Value non-EU, log points t+1	1.00**	1.12***	1.17***
Export Value non-EU, log points t+2	0.99	1.08	0.92
Number of export markets	0.31	0.37	0.31
Number of export markets t+1	0.54*	0.68**	0.39**
Number of export markets t+2	0.51*	0.56**	0.37**
Export Intensity, points	0.05	0.08**	0.09**
Export Intensity, points t+1	0.07	0.10***	0.09***
Export Intensity, points t+2	0.07	0.11**	0.09*
Export Intensity EU, points	0.03	0.04	0.04
Export Intensity EU, points t+1	0.06*	0.09**	0.07*
Export Intensity EU, points t+2	0.03	0.07	0.04
Export Intensity non-EU, points	0.03	0.04*	0.05*
Export Intensity non-EU, points t+1	0.04	0.05*	0.04*
Export Intensity non-EU, points t+2	0.05*	0.05*	0.06*
Export per worker , log points	0.35	0.39*	0.27*
Export per worker, log points t+1	0.27	0.38*	0.26*
Export per worker, log points t+2	0.18	0.19	0.21*

Significance levels : ∗:5% ∗∗:1% ∗∗∗ : 0.1%

4.2 Results from the Financial support Activity for developing the export capacity

Activity, which concerns about financial support of the creative activities have shown mixed results. The alternative approach showed results, which are not every time close to the PSM results, thus there is some robustness mismatch. There is a significant difference between estimates of the first period in the export value, the number of export markets and the intensities. Similarly, to activity 4.4.2 alternative PSM shows not as high estimates for export markets. Also, the estimated effect on export to non-EU countries is bigger than the PSM. The logarithm of export value has increased, but the estimates are not statistically significant. On

the contrary EU, market values are negative. Export value from non-EU markets showed significant results both statistically and economically because the rise in the second year is approximately equal to the average value of non-EU market exports before treatment. A similar situation can be seen both in the case of the number of non-EU export markets and the number of total export markets. Perhaps the explanation could be that the chosen firms have focused primarily on the increase of export capacity to non-EU markets. Export per worker was increased significantly and positively, namely by 0.61 in the first year and 0.72 in the third year. Not very high statistical significance may be explained by the fact, that the current activity has a smaller number of supported firms than the two other analyzed Activities.

Table 7 Results (ATT) for activity 5.3.3

Values	'GREEDY'	Baseline PSM	Alternative PSM
Export Value, log points	1.04*	0.56	0.18
Export Value, log points t+1	1.94**	1.70*	1.32
Export Value, log points t+2	2.11**	2.22	1.26
Export Value EU, log points	-0.98	-1.03	-1.04*
Export Value EU, log points t+1	-0.33	-0.59	-0.94
Export Value EU, log points t+2	-0.25	-0.87	-1.14
Export Value non-EU, log points	1.45**	1.30**	0.75
Export Value non-EU, log points t+1	2.52***	2.54***	1.92*
Export Value non-EU, log points t+2	2.59***	1.96***	2.07*
Number of export markets	0.32	0.34*	-0.19
Number of export markets t+1	0.66	0.72	0.30
Number of export markets t+2	0.55	0.29	0.11
Export Intensity, points	0.03	-0.1	-0.03
Export Intensity, points t+1	0.10*	0.09*	0.04
Export Intensity, points t+2	0.09	0.02	0.03
Export Intensity EU, points	-0.04	-0.01	-0.06
Export Intensity EU, points t+1	-0.01	-0.03	-0.06
Export Intensity EU, points t+2	0.00	-0.05***	-0.07
Export Intensity non-EU, points	0.06*	0.06*	0
Export Intensity non-EU, points t+1	0.12**	0.13***	0.09
Export Intensity non-EU, points t+2	0.11**	0.06*	0.09
Export per worker , log points	0.46	0.61**	0.59
Export per worker, log points t+1	0.43	0.82**	0.82*
Export per worker, log points t+2	0.53*	0.72**	0.94*

Significance levels : ∗:5% ∗∗:1% ∗∗∗ : 0.1%

4.3 Results from the Non-financial support under Activity for Consultancy Support to enhance Export Performance

Non-financial support activity 5.1.3. showed a positive effect on export values. Moreover, a given activity has shown economically and statistically significant results. Treatment from Activity 5.1.3 enhances expansion into new markets in all years. There can be seen positive effects on export per worker, although the effect drops over the years, and already in the 1st

year, there was 0.38 growth, which is around half from the mean value. The export intensity did not increase drastically, the size of the effect varies from 5 to 11 percent, depending on the year and market group (EU and non-EU). The current activity showed a significant effect on the growth of the export value. Current Activity showed a significant effect on the growth of the export value. The alternative approach has high statistical significance and shows a bit smaller, but still close results to the PSM approach. It means the estimated results of the efficiency of the activity are robust to the three involved specifications.

Table 8 Results (ATT) for activity 5.1.3

Values	'GREEDY'	Baseline PSM	Alternative PSM
Export Value, log points	1.56***	2.00***	1.72***
Export Value, log points t+1	1.76***	1.99***	1.92***
Export Value, log points t+2	1.93***	2.43***	2.13***
Export Value EU, log points	0.85***	1.02***	1.18***
Export Value EU, log points t+1	0.96***	1.15***	1.35***
Export Value EU, log points t+2	1.17***	1.59***	1.45***
Export Value non-EU, log points	1.25***	1.47***	1.31***
Export Value non-EU, log points t+1	1.59***	1.71***	1.38***
Export Value non-EU, log points t+2	1.37***	1.65***	1.42***
Number of export markets	0.59***	0.69***	0.77***
Number of export markets t+1	0.79***	0.89***	0.88***
Number of export markets t+2	0.82***	1.02***	0.94***
Export Intensity, points	0.08***	0.11***	0.10***
Export Intensity, points t+1	0.09***	0.12***	0.10***
Export Intensity, points t+2	0.11***	0.14***	0.11***
Export Intensity EU, points	0.09***	0.11***	0.11***
Export Intensity EU, points t+1	0.09***	0.11***	0.07***
Export Intensity EU, points t+2	0.10***	0.13***	0.09***
Export Intensity non-EU, points	0.05***	0.08***	0.05***
Export Intensity non-EU, points t+1	0.06***	0.07***	0.05***
Export Intensity non-EU, points t+2	0.07***	0.09***	0.05***
Export per worker, log points	0.39***	0.38***	0.32***
Export per worker, log points t+1	0.32***	0.33***	0.27***
Export per worker, log points t+2	0.29***	0.35***	0.27***

Significance levels: ∗:5% ∗∗:1% ∗∗∗: 0.1%

4.4 Robustness check

For a more profound understanding of the issue of the effect of grants on companies' export performance, some further robustness checks have to be conducted. The main idea is to add the regressors, which show the export capabilities in the previous year, before treatment. These variables are lags of a number of foreign markets and export value. This is specifically performed on Activity 5.1.3 because it has the biggest sample (the largest number of treated companies). For other activities, it was a concern that adding extra explanatory variables could have hindered the matching procedure. The results of the estimation of the probit model can be found in table 9. As we can see, both export indicators seem to matter for the probability of the company receiving the grants. It is worth noting that a number of observation dropped by two times compared to the base model and "North" variable do not have a previous level of

statistical significance. The parameters of the other variables of the Robustness check probit estimation are pretty close to the estimates of the baseline probit estimation.

Table 9 Robustness check Probit estimation of the probability of getting funding from activity 5.1.3

Variable	Consulting support to enhance export performance (5.1.3)
Number of foreign markets$_{t-1}$	0.02**
Log(Export value)$_{t-1}$	0.03***
Log(noemp)$^2_{t-1}$	-0.02
Log(noemp)$_{t-1}$	0.35***
Age^2	0***
Age	-0.06***
Log(Profits per worker)$_{t-1}$	0
Log(Turnover per employee)$_{t-1}$	-0
North	0.03
Market share $_{t-1}$	0.36***
Market share^2 $_{t-1}$	-0.06*
Capital Intensity $_{t-1}$	0.06***
Constant	-3.48***
Number of observations	103,949
Pseudo R^2	0.16

Significance levels : ∗:5% ∗∗:1% ∗∗∗ : 0.1%

In the essence, the results of the balancing property test presented in Table 10 do not have striking differences with the main model. As we can see, for the added export indicators, the differences between the treatment and control group are statistically significant before the matching, but not after the matching.

Table 10 Robustness check: balance of the matching

Variable/Activity		Consulting support to enhance export performance (5.1.3)			
		Treated	Control	Bias	p-value
Number of foreign markets$_{t-1}$	Unmatched	0.99	0.13	34.1	0
	Matched	0.99	0.72	10.6	0.12
Number of foreign markets$_{t-1}$	Unmatched	3.41	0.65	56.8	0
	Matched	3.41	3.33	1.7	0.826
Log(noemp)$^2_{t-1}$	Unmatched	5.05	1.49	81	0
	Matched	5.05	5.17	-2.54	0.74
Log(noemp)$_{t-1}$	Unmatched	1.80	0.74	90.6	0
	Matched	1.80	1.83	-2.4	0.72
Age^2	Unmatched	153.58	145.86	4.4	0.26
	Matched	153.58	153.71	-0.1	0.99
Age	Unmatched	10.13	10.12	0.2	0.96
	Matched	10.13	10.03	1.5	0.82
Log(Profits per worker)$_{t-1}$	Unmatched	5.60	4.23	32.4	0
	Matched	5.60	5.66	-1.5	0.98

Log(Turnover per employee)$_{t-1}$	Unmatched	9.25	7.61	36.7	0
	Matched	9.25	9.37	-2.7	0.61
North	Unmatched	0.61	0.57	9.2	0.03
	Matched	0.61	0.64	-5	0.39
Market share $_{t-1}$	Unmatched	0.24	0.05	37.9	0
	Matched	0.24	0.24	-0.2	0.98
Market share^2 $_{t-1}$	Unmatched	0.36	0.19	1.3	0.83
	Matched	0.36	0.35	0	0.96
Capital Intensity $_{t-1}$	Unmatched	10.41	10.27	10	0
	Matched	10.41	10.27	9.5	0.723
Number of observations	Controls	103,378			
	Treated	571			
Pseudo R^2	Unmatched	0.16			
	Matched	0.01			

Significance levels : ∗:5% ∗∗:1% ∗∗∗ : 0.1%

The treatment effect was calculated in the same way as "Alternative PSM" in the main model, by using psmatch2 command via STATA. Compared to baseline results the estimated effects after including the lagged values of the two export indicators in probit model are now much higher, see Table 11. It seems that the control group if unmatched included companies with much lower values of the export indicators. Thus, perhaps that would explain the lower effects previously, as the baseline results may have been affected by the companies increasing their export performance from a relatively low initial level even without the grants. While in the revised estimates the firms in the control group have a higher level of internationalization from where increasing the exports further without the grants is more complicated. Another explanation of the difference of ATET results is that in the robustness test model firms in the treatment and control groups are better matched in terms of profits per worker and market share are than in the baseline model. Overall, it can be summarized, that on average robustness test model shows higher values if the effects of the grants than the main model by approximately two times for all of the studied export performance indicators.

Table 11 Robustness results (ATT) for activity 5.1.3

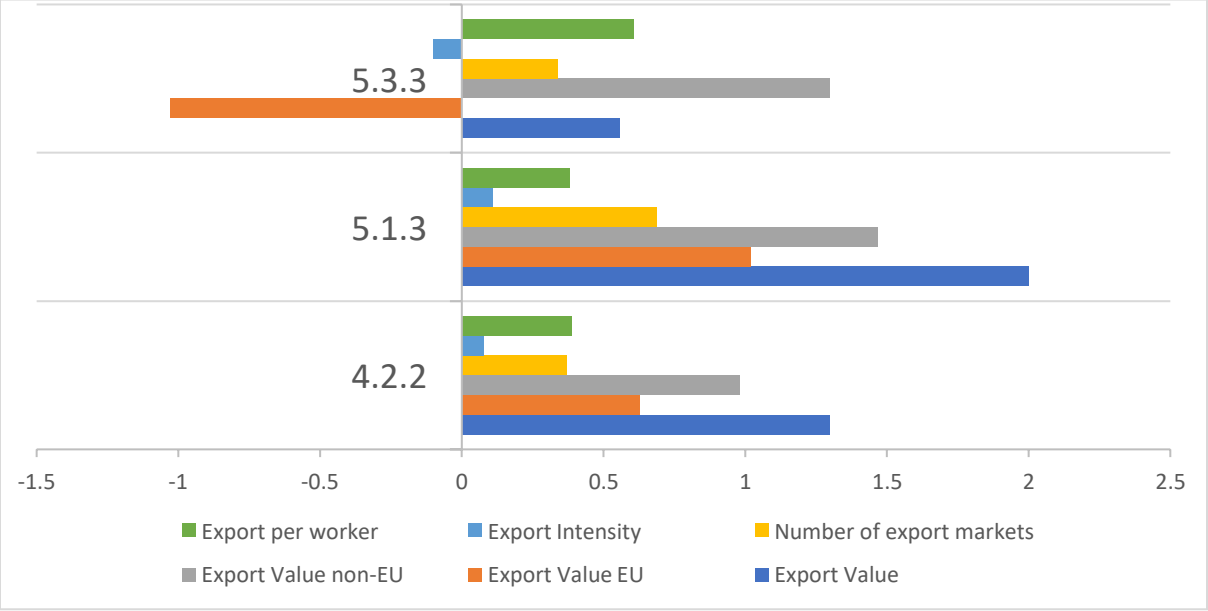
Values	Alternative PSM
Export Value, log points	4.27***
Export Value, log points t+1	4.59***
Export Value, log points t+2	4.87***
Export Value EU, log points	2.89***
Export Value EU, log points t+1	3.14***
Export Value EU, log points t+2	3.38***
Export Value non-EU, log points	2.71***
Export Value non-EU, log points t+1	2.99***
Export Value non-EU, log points t+2	2.89***
Number of export markets	1.36***
Number of export markets t+1	1.51***
Number of export markets t+2	1.61***
Export Intensity, points	0.25***
Export Intensity, points t+1	0.26***
Export Intensity, points t+2	0.27***

Export Intensity EU, points	0.18***
Export Intensity EU, points t+1	0.19***
Export Intensity EU, points t+2	0.20***
Export Intensity non-EU, points	0.12***
Export Intensity non-EU, points t+1	0.12***
Export Intensity non-EU, points t+2	0.12***
Export per worker , log points	0.64***
Export per worker, log points t+1	0.59***
Export per worker, log points t+2	0.61***

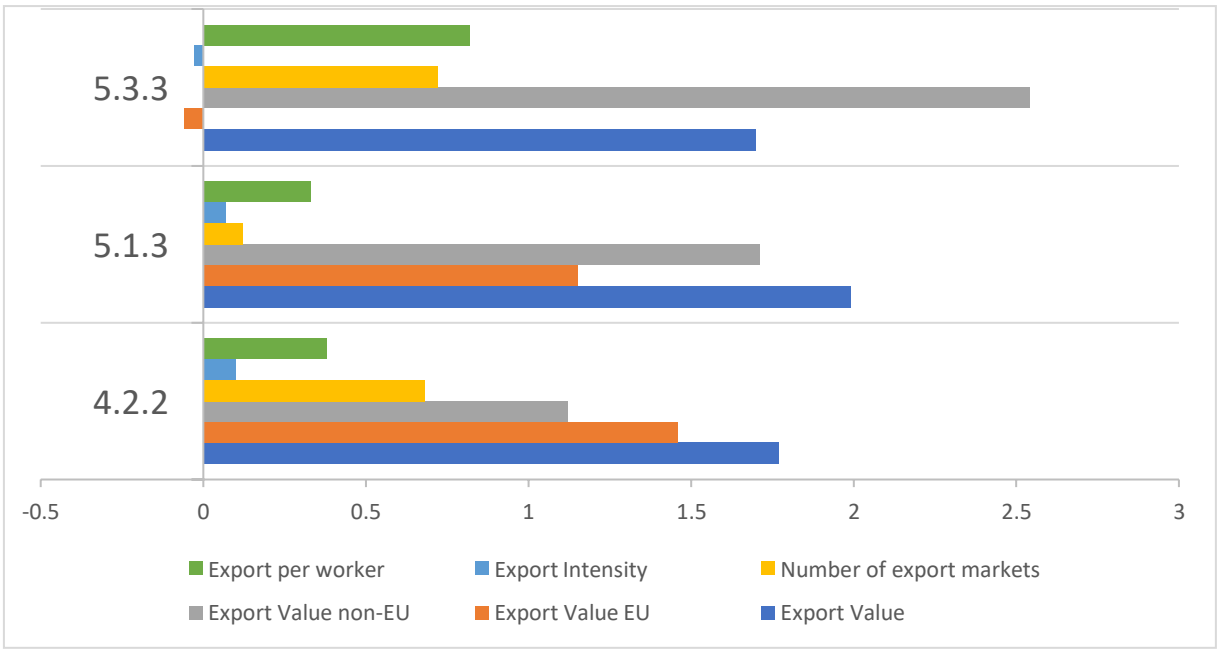
Significance levels : ∗:5% ∗∗:1% ∗∗∗ : 0.1%

4.5 Discussion of results

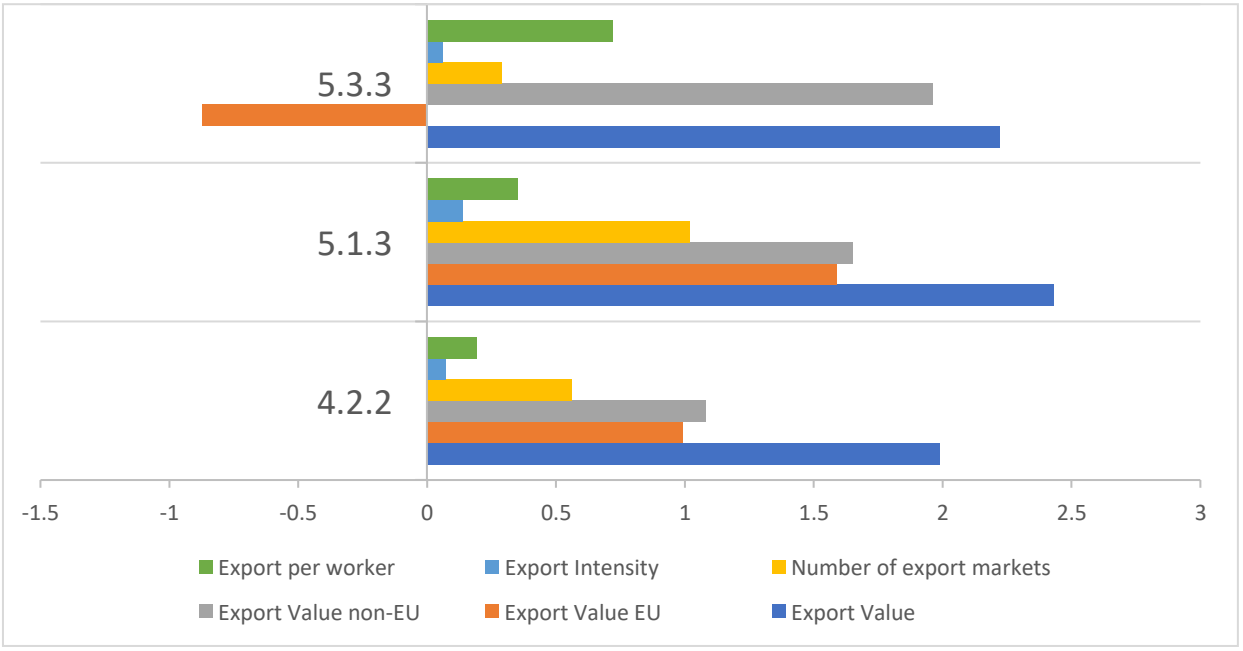
The summarized view can be seen in Graph 1. Summary comments are the following. The most statistically significant results were from Activity 5.1.3, probably because it has the greatest number of treated firms. Thus, results from other Activities do not show as many statistically significant effects. The difference in results can be present because of how non-financial support is different from the financial one. It is easier to implement counseling support than the financial one. This fact can describe, why this Activity has the most significant impact on the new export market expansion. Another important finding is that export per worker has a more significant increase than export value, but increase in the t+1 and t+2 periods are higher in the export value, whereas export per worker can drop in the next years. The best export per worker result is after treatment by Activity for developing the export capacity (5.5.3). The export value was improved by the different Activities by a similar number in periods t+1 and t+2. It is worth mentioning that non-financial support has increased export value more rapidly, in other words, it has the highest effect in the first year, but in the following year's effect is almost the same. These results have not shown a drastic jump in the growth of export performance. Probably firms, which were treated by multiple Activities have shown better results, but this idea should be tested separately.



Graph 1. Propensity Score ATT of Values by Activities in the first period



Graph 2 Propensity Score ATT of Values by Activities in the second period



Graph 3 Propensity Score ATT of Values by Activities in the third period

Overall, from tables 6-8 following findings are deduced:

- Activities are a vital part of the economic development, which influence in our case export.
- Both financial and non-financial grants affect export performance.

- There are no significant differences between the effects on exporting to EU and non-EU markets, excluding Activity 5.1.3
- There is no universal consistency of prolonged effect, in t+1 and t+2 periods. Sometimes it drops, sometimes it rises.
- Instead of expanding the export markets, Activities incline firms to focus on existing markets.

These results are in line with the claims of the previous papers. We can see, that the European Funds strategy has a positive impact on the development of businesses as was shown also in RodrÍguez-Pose, Fratesi(2004), and Beugelsdijk Eijffing (2005). Namely, the treatment effect can quantify the change of selected export metrics. They were influenced by the grants from Cohesion Fond, which in our case caused in most cases an increase in export values. The economic and statistical significance of the results from this thesis disproves the contrary to the conclusions from Dapkus and Streimikiene (2014), that EU Funds is a sophisticated and useful, but not yet "perfect" tool for financing the companies.

One still has to be cautious in comparing the results of the current thesis to those of the earlier studies, as the latter was conducted in different periods and used other metrics. This paper also goes in line with the master thesis from Marite Promvalds (2020) and the study by Vicente (2014) that have analyzed the effects of the grants by Enterprise Estonia, and that also proved, that grants have a positive effect on the export. There were unexpected similarities to Ricardo Vicente's paper (2014), like the fact that Activities, which are dedicated to one direction, like R&D in his case, can prove useful also in other direction (the significant effect from the Activity 4.2.2), and that negative effects of grants can appear and be statistically and economically significant (as with value-added per employee in authors case). On the other hand results from this thesis did not show gradual growth in the export indicators' values in all 3 evaluation periods after the receipt of the grant, like it was found in the Promvalds thesis (2020), in our circumstances growth in t+1 was more prominent economically than in the period t+2. Despite that, the results of this thesis are broadly in line with the conclusions of Promvalds (2020) regarding the positive effects of grants on companies' exports. This thesis shows that grants have a positive and significant effect on the export per worker, whereas in the report (Ettevõtlus- Ja Innovatsioonipoliitika Vahehindamine 2014) funding showed a strongly negative effect on value added per employee.

At the same time, this research shows positive effects of the grants, which contradicts Nyikos et.al (2020) result, that grants can mostly be effective as a complementary source of funding to private financing. It should be also stated, that this analysis has faced similar problems, which were present in Fattorini et al.(2020). One of them is the heterogeneity of firms, which means how different are firms from each other. That can be seen in tables 2 and 3 regarding the variables such as age, profit per worker and export value, which have the highest standard deviation. Also, analysis supports the idea to review the Cohesion Fund strategy, and the latter should address more distributional inefficiencies within regions. It means that firms can use grant with not as high efficiency as expected by policymakers, due to different factors. If that holds, then firms overall are in a better situation than previously after receiving the grants. This positive change in treated firms can lead to economic growth (Becker, Egger, Von Ehrlich 2012).

5 Conclusions

Any grant techniques, like in this case Cohesion Fund Regional policy of European Commission, cannot be perfect. Therefore, studies are required to evaluate their performance to improve them. The Cohesion Fund, regardless of critique, is a vital part of economic development in Europe. Notwithstanding, some adjustments are needed to enhance its' performance. The Cohesion fund is operated in multiple countries, which differ from each other by geographical location, historical factors, and most importantly by economic circumstances. For instance, it would be unwise to implement the same policy in Latvia and Greece in the same way. Thus, every state tailors it due to the needs of a specific region. This study was focused specifically on Estonia, but conclusions may also apply in other Baltic states to varying degrees. This thesis has studied the effect of selected grants from the Cohesion Fund on the export performance of the Estonian SMEs.

The strategy and aspirations of the Cohesion Fund were oriented on the crux components of European welfare, but it needs further tailoring by taking into account the individual specifics of each region. The increase of gross national income (GNI) is set as the primary target, but it is not always clear how to achieve this, and which indicators shall give a precise understanding of the results of the implementation of the policy. One relevant set of indicators is the export performance indicators. It can show the effects of treatment from a different angle and can be more efficient for countries, which have a relatively small-sized inner market, like in the Estonian case. The chosen variables in this study may seem not particularly profound, but they can show a good overview of the situation. These are the number of new export markets, export intensity, and export value, all measured for individual companies for different years. The treatment variables are based on the grants distributed within two export-focused activities and one R&D focused. That may be caused by the fact that funding in the first part of the firm's lifespan is more efficient than during the other ones. The studied companies are mostly small and medium-sized ones, and it is probably easier for them to make changes in their activities as compared to the larger companies.

The technical part consists of treatment effect evaluation, which was computed by different types of matching, namely greedy and propensity score matching techniques. That was done to see research from different angles. Results show evaluation effects for three periods. The most significant results were shown by Activity 5.1.3, and it is the only activity of the studied three activities, where the grant effects increased gradually over time across all the considered export indicators. High statistical significance can be explained by the fact that overall three studied activities the largest number of companies received grants under that particular activity. Grants of activity 5.3.3 have a negative effect on the value of exports to the EU countries. On the contrary, both economically and statistically significant impact on the export value to the non-EU countries was found. This activity is focused on developing the export capacity. It pushed firms to find new markets in non-EU countries or redirected exports to non-EU countries. The activity of Financial grants to SMEs to support R&D (4.2.2) did not show that it is more impactful but proved still to be useful for exports, although not being the export-oriented Activity.

For the Estonian economy, SMEs are essential, because they generate 77% of total value-added and 79% of the workplaces according to European Small Business Finance Outlook: June 2019.

Therefore, keeping this type of business in a 'healthy' state is vital, especially during an economic crisis or pandemic outburst. European funds create useful assistance for SMEs. This research was dedicated to the export capabilities of the Estonian small and medium-sized businesses. Empirical analysis, which was conducted for this thesis fortifies the idea of European economic cohesion. Although overall results from different Activities have a lot in common, still they have their specifics. For instance, non-financial support is easier to implement, than the financial one, therefore the first-year treatment effect is higher for the first one. On the other hand, it means, that effect of the financial Activities is more gradual, which means that the effect in the second or third years is more pronounced. Another argument is that Activities 5.3.3 and 5.1.3, which specialized in increasing export showed more significant results. Nevertheless, R&D oriented Activity also showed an increase in export value. Namely, companies not only increased the value of goods exported but also increased the number of export markets, primarily in the EU.

Another limitation of the thesis is that the given thesis deals with factors, which are hard to identify and measure. For instance, the given thesis has looked only at the export, but export-oriented Activities can also cause alteration in other parameters, like profit, employee turnover rate, or else. Notwithstanding, in the author’s opinion the Cohesion fund mostly fulfills its goals. The question is how efficient that process is. The thesis showed that treatment from the Cohesion Fund can give positive and significant results in terms of firm-level export, but it is hard to scale these results. For instance, can 10% of export intensity growth be considered a satisfactory outcome? Thus, further studies have to be conducted to enhance the performance of the Cohesion Fund and reach the goals of the overall funding strategy – to create a robust economic environment in the European Union.

I see the following directions for further studies. Firstly, it will be fruitful also to determine, what is the overall treatment effect on the export across Europe, basically similar analysis can be conducted in other EU countries. Secondly, nowadays there are also machine learning approaches available for matching, that are specifically made to address firms' heterogeneity issue, but still, they are not easy to implement (S. Athey, G.W. Imbens 2017). Thirdly, further developments in the trade theory can also get useful results for the study of the effects of grants on firm-level exports. Also, it is worth noting, that thesis has limitations in the case of the firm’s selection.

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Euroopa Liidu ühtekuuluvusfondide mõju Eesti ettevõtete ekspordile

Kokkuvõte

Käesolev magistritöö analüüsib Euroopa Liidu ühtekuuluvusfondi raames Eestis ettevõtetele antud toetuste mõju toetatud ettevõtete ekspordile. Me kasutame analüüsis detailseid Eesti ettevõtete mikroandmeid perioodist 2015-2018, sealhulgas Äriregistri andmeid ettevõtete finanstandmete kohta ning Maksu- ja Tolliameti statistikast pärit detailseid ettevõtte, sihturu ja toote taseme andmeid ettevõtete ekspordi kohta. Põhjuslike seoste tuvastamiseks kasutati lähima naabri sobitamist ja tõenäosuslikku sobitamist, kus toetatud ettevõtetele konstrueeriti statistlised toetust mitte saanud nn kaksikud, viimased täitsid niisiis analüüsis kontrollgrupi rolli. Analüüsis keskenduti kahele ettevõtete ekspordi edendamisele suunatud tegevuse ja ühele teadus- ja arendustegevuse edendamisele suunatud tegevuse mõjude hindamisele. Analüüsitavad väljundnäitajad, millele toetuste mõju vaadati, olid mitmesugused ettevõttetaseme ekspordi indikaatorid, nagu ekspordi kogumaht, eksportturgude arv, eksport Euroopa Liidu riikidesse ja kolmandatesse riikidesse. Tulemused näitasid üle kõigi kolme analüüsitud tegevuse ja erinevate ekspordinäitajate toetuste positiivset ning statistiliselt ja majanduslikult olulist mõju. Niisiis töö tulemused on kooskõlas vaatega, et ühtekuuluvusfondidest rahastatud toetused täidavad oma rolli parandada ettevõtete tegevusedukust. Erinevate analüüsitud tegevuste lõikes olid kõige suurema positiivse majanduslikult olulise mõjuga ekspordi edendamise eesmärgil antud mitterahalised toetused ning teadus- ja arendustegevuse edendamise meetme raames antud toetused.

Võtmesõnad: ühtekuuluvusfond, eksport, Eesti, tõenäosuslik sobitamine, lähima naabri sobitamine.

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