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Keskusteluaiheita – Discussion papers

No. 1225

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BUSINESS SUBSIDIES IN FINLAND: THE DYNAMICS OF APPLICATION AND ACCEPTANCE STAGES

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ABSTRACT: We use a comprehensive database concerning the application and allocation of business subsidies in Finland merged with the firm-level data comprising about 330 000 firms from the year 2004 to 2008. We find strong continuities in participation both within and between the different public support programs. Continuity in the firms' participation in the *same* support programs arises both from the application and acceptance stages. A firm that has once received subsidy from an agency, tends to apply it again, and it also seems that the agencies target their support to the firms they have previously subsidized. We further find that the firms that have once entered the Finnish subsidy system not only actively seek further support from the same organization but also from the other agencies allocating business subsidies. In addition, a firm's probability to apply subsidy from one agency is positively related to its probability to apply subsidy simultaneously from another agency.

In line with the previous empirical findings, and against the general public policy aims to target particular support for the SMEs, we find that all agencies favor larger companies. Also, contradictory to the learning hypothesis related to firm age, and on the other hand, supporting public policy lines favoring newly established or start-up companies in subsidy funding decisions, we find that younger firms both are more likely to apply for and to receive subsidies than the older ones.

Key words: business subsidies, selection process, continuity

JEL codes: D21, L53, O25

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TIIVISTELMÄ: Raportoitu tutkimus perustuu laajaan aineistoon yritystukien hakemisesta ja jakamisesta Suomessa yhdistettynä yritystason tietoihin noin 330 000 yrityksestä vuosilta 2004-2008. Yritysten osallistumisessa eri organisaatioiden tukiohjelmiin on havaittavissa jatkuvuutta yli ajan sekä eri tukiohjelmien sisällä että niiden välillä. Jatkuvuus tukiohjelmien sisällä selittyy sillä, että aiempaa tukea joltakin organisaatiolta saaneet yritykset hakevat tukea tältä organisaatiolta muita yrityksiä todennäköisemmin ja lisäksi tuen myöntäjät suosivat rahoituspäätöksissään yrityksiä, joita ne ovat jo aiemmin tukeneet. Aiempaa tukea joltakin organisaatiolta saaneet yritykset hakevat myös muiden organisaatioiden tarjoamia tukia muita yrityksiä todennäköisemmin. Lisäksi yrityksen eri organisaatioille osoitettujen samanaikaisten tukihakemusten välillä näyttäisi olevan positiivinen riippuvuussuhde.

Aiempia empiirisiä tutkimustuloksia tukien, ja vastoin yleisiä PK-yritysten tukemista painottavia politiikkalinjauksia, kaikki tukia myöntävät organisaatiot näyttävät suosivan isoja yrityksiä. Toisaalta, tukipolitiikkatavoitteiden mukaisesti, nuoremmat yritykset sekä hakevat että saavat tukea todennäköisemmin kuin vanhemmat yritykset.

Avainsanat: yritystuet, valikoitumisprosessi, jatkuvuus

1. Introduction

This empirical study focuses on the allocation mechanism of the public support for firms by explicitly distinguishing the roles of applying firms and public agencies in the firms' selection to public support programs. We are particularly interested in whether there are continuities in the firms' reception of business subsidies over time. Also, as most prior empirical studies focus merely on R&D subsidies, our study - covering a wider range of different business subsidies - sheds light on the issue whether the subsidy allocation process differs across business subsidy types. We use an extensive database concerning the allocation of business subsidies by the major Finnish public agencies during the years 2004-2008.

The economic literature concerning firms' participation in public support programs is relatively scarce. The majority of the reported studies focus on the effects and efficiency of public support programs but very few studies present a systematic empirical analysis focusing on the selection process as such. The issue of selection is typically considered in the context of the evaluation of the effects of a certain treatment involving a non-random selection to the treatment that is necessary to control for, without explicitly considering how the selection happens and what type of firms are selected (see for example Segerström, 2000; Almus and Czarnitzki, 2003) However, both David et al. (2000) and Blanes and Busom (2004) argue that this lack of focus on the features of the selected firms and structure of selection process may explain why the findings about the effects of public support are ambiguous, and thus call for more extensive research about participation in public support programs.

Another distinctive feature of previous empirical studies concerning public subsidies is that they almost exclusively focus on R&D subsidies, though there are various other public support instruments that vary both concerning the type of financial instrument used and the objective of support offered (see for example Pajarinen et al., 2009). We use the terms public support and

business subsidies equivalently to refer to all public support instruments from grants to loans and guarantees offered to the firms as well as different types of support services (e.g. consultation targeted to help firms to internationalize their activities). Our aim is to specifically investigate whether and in what respects the selection processes to different government subsidy programs differ in regard to the characteristics of applying and selected firms.

Various previous studies relate to the topic of this paper. Heckman and Smith (2004) present a framework for analysing how different stages of participation process to social programs - eligibility, awareness, application, acceptance and enrolment – affect the participation of the potential applicants in a program. Distinguishing the application and acceptance stages is particularly important – but often, as also in case of Heckman and Smith (2004), impossible due to data limitations¹ - for understanding in what respects it is the decision of the applicant to apply and the agency's acceptance decision that determines firm's participation in the program.

The literature provides only few empirical studies able to differentiate between the firms' application and acceptance to the public support programs. Tanayama (2007a, b) explores the firms' participation to the R&D subsidy programs of Finnish Funding Agency for Technology and Innovation's (Tekes) from January 2000 to June 2002. Tanayama's (2007a) empirical analysis using count data models suggests that larger firms, exporting firms and firms who have previously received R&D subsidies are more likely to apply for subsidies from Tekes than others. These results are explained by lower application costs of such firms, arising from, e.g., external knowledge and learning effects. However, firm's age correlates negatively with application rate, suggesting that opportunity costs of application are lowest for young firms.

¹ Often data concerning only accepted applications, but not the rejected ones, is available (Aschhoff, 2008). Then, the results about agencies' allocation policies have to be based on heavy assumptions. In their study about policies of German agencies providing R&D subsidies for start-ups, Cantner and Kösters (2009) try to correct for this problem by interviewing also firms that did perform R&D activities but did not receive subsidies. The limitation of this approach is that they are unable to observe the characteristics of firms that were rejected by agencies and didn't perform R&D activities. Kösters (2009) uses similar method when researching the allocation policies of non-R&D subsidies for start-ups in Germany.

Tanayama (2007b) further finds that the agency allocating supports tends to favour, in line with its officially stated policy, SMEs and firms applying funding for the projects with high technological content and high level of collaboration.² The study of Takalo et al. (2007) using the same project-level data on the R&D financing of Tekes from January 2000 to June 2002 as Tanayama relates closely to this study. It focuses on the distribution and determinants of the returns of R&D subsidies, and finds that ignoring the applications costs for subsidy programs can result in substantially upward biased estimates of the R&D subsidy treatment effects.

This study utilizes a richer dataset on the applications and acceptance of firms to public support programs than the previous ones. Our data comprise not only the selection of firms to the R&D programs but also for other direct public subsidy, service subsidy and government sponsored loan and guarantee programs. Business subsidies of our data cover the public support programs of the five major public agencies in Finland allocating support for firms.³ Our empirical analysis can thus detect whether there are similarities and/or differences between the underlying factors of the application and selection stages of different types of subsidy programs. Also, our database extends time-wise for a longer horizon than the previous ones as it covers the firms' history of subsidy use from the year 2004 to the year 2008.

Though various studies fail to distinguish between the application and acceptance stages, they provide interesting results. Aschhoff (2008) using German data and Duguet (2004) and Blanes and Busom (2004) using French and Spanish data, respectively, all find that large firms with already high level of R&D activities and the firms that have previously received R&D support are more likely to receive subsidies. Similarly, Gonzales et al. (2005) suggests

² These findings are in line with those of Koski (2008) suggesting that the best predictors of whether or not a firm receives Tekes finance are, consistent to the publicly available selection criteria, those factors that measure the order of magnitude of a firm's collaboration with the external parties within the planned project.

³ Pajarinen et. al (2009) and Koski and Pajarinen (2010) have used the same data for a descriptive analysis concerning the attributes of firms receiving public support.

that in Spain, large, mature firms and firms who have previously received funding are more likely to receive R&D subsidies. These results are explained by similar arguments as in Tanayama's (2007a) studies, such as learning effects and external knowledge, but have to rely on stronger hypotheses as they cannot distinguish whether the attributes of subsidized firms relate to the application or acceptance decision.

The paper of Bannò and Sgobbi (2009) provides an exception to the international public support participation studies as it empirically investigates the determinants of the firms' participation in an internationalisation subsidy program. Bannò and Sgobbi (2009) use the determinants of self-selection and agency's selection criteria as control variables in their logit regression model to compensate for their inability to differentiate between the application and acceptance decisions in their data. They come to a conclusion that firms' application decision is determined by their differences in application costs, financial constraints and riskiness of FDI projects.

Studies evaluating whether the agencies' allocation policies are consistent with their perceived policy generally find that the behaviour of agencies is in line with their official targets. For instance, Lichtenberg's (1998) study hints that funding decisions for biomedical research on different diseases is based on the importance of diseases for public health. Feldman and Kelley (2001, 2006) find out that R&D projects with larger expected spill-over effects are more likely to win an award from an American Advanced Technology Program, which is in line with its policy to support R&D projects with the highest social benefits.

Generally, differences in agencies' acceptance policies make it difficult to compare the participation in different programs and the effects of public support.⁴ David et al. (2000) question whether there is any point in comparing the effects of different public support programs as they differ significantly in their design and institutional setting. These points are

⁴ Aschhoff (2008) argues that participation in support programs should be evaluated case by case to receive any meaningful results.

important when considering how applicable the methods and results of existing literature are for future research. This question is particularly relevant in the context of this study, in which public support is not limited to R&D subsidies, as our analysis can shed light on whether there are differences in the determinants of subsidy reception of different public support programs.

This paper is organized as follows. Section 2 briefly describes the Finnish public support systems in regard to the major public support organizations and introduces our data. Section 3 establishes a framework for our empirical analysis. Section 4 presents the econometric model and estimation results. Section 5 concludes with some suggestions for future research.

2. *Business subsidies in Finland*

2.1 Data on business subsidies

In 2008, over 30 000 Finnish firms (i.e. almost 10 percent of total population of firms in Finland) received, in total, about 1,77 billion Euros of public support from the major government programs granting money for entrepreneurial activities. In the small-country context this sum is non-negligible: it was 4 percent of the total budget of the Finnish government and almost one percent of Finland's GDP. Our definition of public support or business subsidies here covers all forms of public support and funding for firms from direct investment, employment, R&D and start-up grants⁵ to service subsidies, and loans and guarantees. In 2008, the budget of major government support programs for firms was allocated among the different business subsidy types as follows: the share of grants was 31 percent, loans 32 percent and guarantees about 37 percent.

⁵ Statistical data on start-up grants is available only for the years 2007 and 2008. It can be combined with the firm-level data only for the year 2008.

Table 1. Public support for the Finnish firms 2000-2008 (million Euros)

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Tekes									
Grants	154	160	148	153	166	179	192	203	209
Loans	46	48	47	40	33	47	71	-	-
Capital loans	34	34	35	33	39	25	6	-	-
Total	233	242	230	226	238	252	268	284	293
Finnvera									
Loans	333	327	360	357	400	397	374	387	480
Guarantees	377	401	443	433	505	535	588	612	655
Total	710	728	803	790	905	932	962	999	1136
Ministry of employment and the economy									
Grants	114	121	114	151	173	194	236	240	279
Ministry of agriculture and forestry									
Grants	-	32	33	39	44	48	21	7	60

Source: Statistics on business subsidies by the Statistics Finland, calculations of Koski and Pajarinen (2010). The mark "-" indicate that information is not available or information cannot be published due to the Finnish law on data protection that prohibits publishing findings concerning less than three firms.

This study uses "Statistics on business subsidies" database of Statistics Finland comprising the allocation of public support for firms during the period of 2004-2008 by the following five major public funding agencies in Finland: Finnvera plc, TEKES (the Finnish Funding Agency for Technology and Innovation), the Ministry of employment and the economy⁶, the Ministry of agriculture and forestry, and Finpro.⁷ Finnvera plc is the biggest provider of public support covering in 2008 about 64 percent of the total support allocated for companies. It offers loans, venture capital investments, and it is the only public provider of guarantees in Finland. Tekes, the only source of R&D grants and loans, and the Ministry of employment and the economy distributing various different types of grants covered each about 17 percent of public funds targeted for firms. The Ministry of agriculture and forestry offers primarily subsidies for the firms in the agriculture and forestry sector but also for other small rural companies. Its share

⁶ The ministry of employment was established in the beginning of the year 2008 as a merger of the two ministries, ministry of trade and industry and ministry of labour. Prior to 2008, our data comprise the total public support of the two merged ministries.

⁷ Statistics on business subsidies by Statistics Finland comprises information from business subsidies for the years 2000-2008. Data concerning Finpro's service subsidies is, however, limited to the years 2004-2008. We therefore, to have comparable data from all public support organization, limit our analysis for these years.

of public funding was relatively small, less than 4 percent of the total funds. The relative shares of these public support providers have not changed much during the sample years (Koski and Pajarinen, 2010).

Finpro is one of the largest organizations (in terms of the number of employees) providing business services in Finland (Hyytinen et al, 2009). It provides service subsidies particularly targeted to the commercialization and internationalization of innovative activities and new products. Our data concerning Finpro's service subsidies capture only whether a firm has been Finpro's customer during the years 2004-2008 but not the order of magnitude of service subsidies obtained by the firms.

Our database enables us to distinguish annually firms of which business subsidy applications have been accepted by the five aforementioned organizations during the years 2004-2008. We also have annual data from the rejections of the firms' applications from Finnvera and Tekes, but not from the two ministries or Finpro. Thus, in our empirical analysis we can distinguish the application and acceptance stages for the two organizations providing over 81 percent of the registered business subsidies in Finland.

2.2 Firm-level data

The Statistics on business subsidies database comprising all public support in Finland is merged with the business register of firms operating in Finland and databases about firms' financial information, R&D activities and patents, all provided by Statistics Finland. The resulting database – as the use of lagged variables further limit the estimated equations for the applications and acceptance stages to the years 2005-2008 - comprises a total of about 330 000 firms and information about their characteristics and participation in support programs. The data contain information about direct subsidies (including service subsidies), loans, capital loans and guarantees approved and paid by Finnvera, Tekes, Finpro, Ministry of

Employment and the Economy (MEE, including its predecessors Ministry of Trade and industry and Ministry of Labour) and Ministry of Agriculture and Forestry (MAF). For Tekes and Finnvera the data also contain information about the sums of rejected applications for each firm. This allows us to create variable for application by combining the sum of rejected applications with approved support. For Tekes this variable can be created for every year between 2004 and 2008, but for Finnvera, due to data limitations, it can be only created for the years 2007 and 2008.

3. *Determinants of access to business subsidies?*

Previous empirical studies propose several characteristics affecting a firm's likelihood to have access to public support. Three major factors explaining participation across different support programs are the firm's **size** and **age** and its **prior experience** on receiving public support. These characteristics tend to have different impacts on the application and granting decisions, and also their importance for granting decisions may vary between the agencies as the aims and target groups of different government support programs generally are not the same.

Several previous studies hint that, in general, large firms, mature firms and firms with previous experience on support programs are more likely to receive public support and attribute this to the application decision of firms based on the widely accepted assumption that application cost determines whether a firm applies for support (Tanayama, 2007a; Bannò and Sgobbi, 2009)⁸. Large firms are expected to have more skills and capacity to apply for business subsidies, and they tend to face relatively lower fixed application costs (compared to the firm's revenues) than the smaller companies (Busom and Blanes, 2004; Gonzalez et al,

⁸ Also the descriptive findings of Pajarinen et al. (2009) and Koski and Pajarinen (2010) using the Finnish data give support for this hypothesis.

2005; Aschhoff 2008). Maturity and previous experience generate learning effects that decrease a firm's applications costs and increase its likelihood of applying for business subsidies (Duguet, 2004; Bannò and Sgobbi, 2009).

The reported findings concerning the role of previous subsidy experience relate only to the firm's prior history on the particular subsidy program of interest, however, and neglect potential interactions among the different government subsidy programs. It seems possible that firms actively seeking support from one organization have prior to subsidy application explored more widely potential sources of public support, and are then also more likely to apply for business subsidies provided by the other organizations. Therefore, we assume that not only the firm's prior experience on the subsidy program of the public funding agency in question but also experience on the programs of other agencies positively relate to its likelihood for applying support from the agency.

The relationship between firm size, age and its likelihood of receiving public support is not clear, however. We would expect Finnish agencies in general to favour small and young firms due to the widely accepted principals to target business subsidies particularly to SMEs and newly established companies. For instance, Finnvera's subsidy programs offering loans and guarantees have several different objectives, but one distinctive characteristic of most programs is their focus on the micro enterprises (i.e. firms employing 5 or less people) and SMEs (i.e. firms employing less than 250 people)⁹. In addition, Finnvera's strategy involves advancing the firms' exports and internationalization and the realization of the government's regional policy aims.

Also, Ministry of Agriculture and Forestry's targets its support to rural micro enterprises, particularly in the agriculture and forestry sector, with a special focus on employment of the

⁹ In addition to support for smaller firms, Finnvera also supports firms' internationalisation, and has specific programs targeting projects with positive environmental effects and women's entrepreneurship. However, due to data limitations concerning firms' characteristics we are unable to explore how these policy goals affect the selection process.

youth and women. Then, particularly in case of Finnvera and MAF, the relationship between firm size and the probability of receiving subsidy should be negative.

The general public policy principles favoring SMEs and newly established companies may – given that the firms are aware of these principles - increase smaller and younger companies likelihood to apply for support programs counteracting the benefits related to larger size and maturity in the application stage.

It is not clear how prior business subsidies affect a firm's likelihood to have its subsequent public support applications accepted. On the one hand, descriptive findings suggest that there are substantial continuities in the distribution of business subsidies such that a relatively large share of firms receives subsidies repeatedly (see, e.g., Koski and Pajarinen, 2010). On the other hand, one of the guiding principles of public subsidy allocation is their temporary nature and thus we would expect that a firm's prior business subsidies increase the agencies' likelihood to reject its further applications.

Innovation relates closely to the growth, and thus the order of magnitude of a firm's R&D can provide a signal of its growth potential or its future success. The agencies may then favour firms with greater R&D activities as they are considered to have more potential to provide favourable economic results in return for the public subsidies. Thus, we expect that a firm's R&D intensity relates positively to its likelihood of receiving public support. The prior R&D activities of a firm may be relevant factor in both the application and granting stages particularly in case of Tekes that is practically the sole provider of R&D subsidies. Generally, it is an empirical question whether the firms with greater R&D intensity are also more active applicants of public subsidies.

The findings of previous empirical studies concern primarily the allocation process of R&D subsidies, and there is not much empirical evidence giving guidelines on whether the observed patterns apply to the allocation of other business subsidies. Therefore, as the

determinants of service subsidy reception remain rather unexplored, we have no strong a priori expectations concerning the properties of Finpro's clients. The descriptive findings of Hyytinen et al. (2009), however, suggest that the receivers of service subsidies provided by Finpro tend to be larger, older and to use more likely other forms of public support than the other firms, on average.

The analysis is further complicated by the multiple different subsidy forms allocated by the agencies. Ministry of Employment and the Economy (MEE), and until 2007 its predecessors Ministry of Trade and Industry and Ministry of Labour, offers firms subsidies with several different objectives. MEE offers subsidies to support employment of the unemployed, internationalisation of the Finnish firms, investments, and projects that improve the environment and the operational climate for SMEs. Due to the diversity of MEE's support objectives, we have no strong prior expectations on the relationship between the considered firm characteristics and the granting decisions in general. Differences in the officially stated selection criteria may also create variation in the firms' application decisions.

4. *Empirical analysis*

4.1 Empirical models and variables

Our econometric model explores the relationship between a set of firm-specific factors and the application and acceptance decisions for business subsidy programs made by the firms and the financing agencies, respectively. We use the random-effects logit model to estimate the selection equations individually for each support agency.¹⁰ The data allow us to estimate the equations for the application and acceptance stages separately for Finnvera and Tekes, while for Ministry of Employment and the Economy, Ministry of Agriculture and Forestry and Finpro it

¹⁰ Certain dummy variables that do not change over time, such as the location of a firm, prevent us from using the fixed effects logit model.

is not possible to distinguish between the application and acceptance stages. The sample years cover primarily 2004-2008 though the analysis of Finnvera's applications are limited to the years 2007 and 2008 due to the lack of applications data from the earlier years.

We thus have two equations for Tekes and Finnvera – one in which the dependent variable is a dummy variable that gets value 1 if the firm has applied for business subsidy from the agency and 0 otherwise, and another where the dependent variable is a dummy variable that gets value 1 if the firm's application has been accepted by the agency and 0 otherwise. As basically all Finnish firms are potential applicants of the subsidies of Finnvera and Tekes, we estimate the application equations using all firms in the database. With the acceptance estimates, however, the set of observations is the subset of firms that have applied for support. This enables us to analyze separately application and acceptance stages, i.e. which characteristics affect the firms' decisions to apply for support, and which characteristics determine which firms the agencies select among the applicants (see Table 3 for results).

We are also interested in whether there exist contemporary interdependencies between the firms' applications of different forms of funding as well as between the different agencies' acceptance decisions. As the samples of applicants for the funding of different agencies are only partially overlapping, it is not possible to tackle the question of contemporary interdependence of the acceptance decisions. For applications, we estimate the bivariate probit model using pooled data of Tekes and Finnvera applications for the years 2007-2008 (i.e. for the years for which Finnvera applications data exist). The bivariate probit model allows the error terms of the two equations to be correlated via the correlation term, ρ . If the estimated correlation term gets value that is (statistically significantly) different from 0, the two applications decisions are correlated and a firm's probability of applying funding from one agency depends on its probability of applying funding from the other agency. Table 4 presents the estimation results of the bivariate probit model.

In case of the two ministries and Finpro, the dependent variable of the estimated equation is a dummy variable that gets value 1 if the firm receives support from the agency in question, and 0 otherwise. In these estimations, as it is not possible to separate between the application and acceptance stages, the set of observations comprises all firms in the data. We can thus only hypothesize whether the estimation results of reception equations (see Table 5 for the results) are an outcome of firms' application or agencies acceptance decisions. We estimate the reception equation also for Finnvera and Tekes to compare the estimation results to those received from the application and acceptance equations, and to make conclusions about the importance of the empirical distinction between application and acceptance stages.

Finnvera, Tekes and the two ministries select the subsidized companies via the official application procedure requiring the candidate firms to fill in application forms for the support. The users of service subsidies, instead, become the clients of Finpro without such a formal process. Therefore, to be precise, the estimated equation for Finpro does not capture similarly selection to the public support program as for the other agencies but is rather an equation explaining variation in the firm's probability to be a client of Finpro.

The key explanatory variables explaining a firm's participation in public support programs are the firm's size, age and its previous experience from the support programs. Firm's size and age are measured by the logarithm of number of employees (variable SIZE) and the logarithm of age (variable AGE). A firm's previous experience from support programs is captured by the dummy variables that get value 1 if the firm has received support from the given agency during the previous sample years beginning from the year 2000 (variables FINNVERA_PAST, TEKES_PAST, MEE_PAST, MAF_PAST and FINPRO_PAST), and 0 otherwise.

Table 2. Description of the variables

Description of variable	Variable name	Mean	Standard deviation
DEPENDENT VARIABLES:			
Dummy variable that gets value 1 if firm has applied for public support from Finnvera, and 0 otherwise.	FINNVERA_APPLICANT	0.023	0.151
Dummy variable that gets value 1 if firm has received public support from Finnvera, and 0 otherwise.	FINNVERA_RECEIVER	0.022	0.145
Dummy variable that gets value 1 if firm has applied for public support from Tekes, and 0 otherwise.	TEKES_APPLICANT	0.005	0.072
Dummy variable that gets value 1 if firm has received public support from Tekes, and 0 otherwise.	TEKES_RECEIVER	0.004	0.063
Dummy variable that gets value 1 if firm has received public support from Ministry of Employment and the Economy, and 0 otherwise.	MEE_RECEIVER	0.009	0.092
Dummy variable that gets value 1 if firm has received public support from Ministry of Agriculture and Forestry, and 0 otherwise.	MAF_RECEIVER	0.003	0.053
Dummy variable that gets value 1 if firm has received public support form Finpro, and 0 otherwise.	FINPRO_RECEIVER	0.007	0.092
EXPLANATORY VARIABLES:			
Log firm's number of employees.	SIZE	-0.410	2.721
Log firm's age.	AGE	1.860	2.371
Log firm's R&D spending relative to its turnover.	RD	-16.052	1.938
Dummy variable that gets value 1 if firm has a foreign owner, and 0 otherwise.	FOREIGN	0.009	0.095
Dummy variable that gets value 1 if firm has received public support from Finnvera in previous years, and 0 otherwise.	FINNVERA_PAST	0.071	0.257
Dummy variable that gets value 1 if firm has received public support from Tekes in previous years, and 0 otherwise.	TEKES_PAST	0.013	0.113
Dummy variable that gets value 1 if firm has received public support from Ministry of Employment and the Economy in previous years, and 0 otherwise.	MEE_PAST	0.029	0.169

Dummy variable that gets value 1 if firm has received public support from Ministry of Agriculture and Forestry in previous years, and 0 otherwise.	MAF_PAST	0.011	0.102
Dummy variable that gets value 1 if firm has received public support from Finpro in previous years, 0 otherwise.	FINPRO_PAST	0.010	0.101
Dummy variable that gets value 1 if a firm's headquarter is located in the province of Southern Finland, and 0 otherwise.	SOUTHERN_FINLAND	0.412	0.492
Dummy variable that gets value 1 if a firm's headquarter is located in the province of Western Finland, and 0 otherwise.	WESTERN_FINLAND	0.381	0.486
Dummy variable that gets value 1 if a firm's headquarter is located in the province of Eastern Finland, and 0 otherwise.	EASTERN_FINLAND	0.102	0.302
Dummy variable that gets value 1 if a firm's headquarter is located in the province of Oulu, and 0 otherwise.	OULU	0.073	0.261
Dummy variable that gets value 1 if a firm's headquarter is located in the province of Lapland, and 0 otherwise.	LAPLAND	0.033	0.177

Figure 1. Percentage of subsidized firms receiving prior support from the agencies

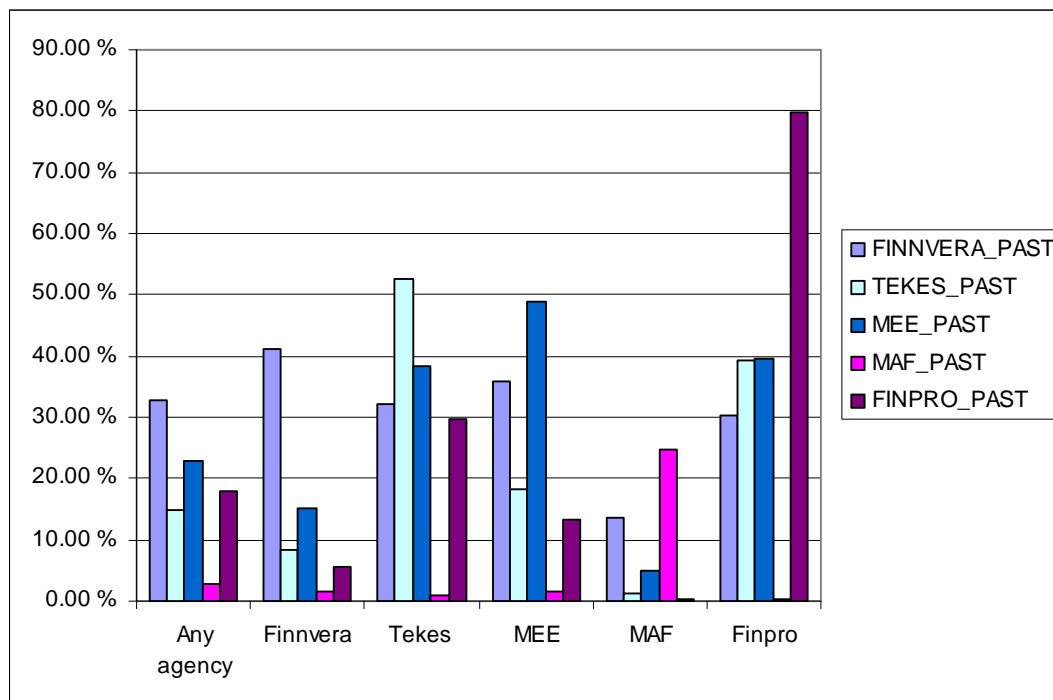


Figure 1 shows the percentages of the subsidized firms, by the agency, that received prior support from the agencies. This descriptive figure hints that there is substantial persistency in the allocation of business subsidies in Finland. The persistency is clearly strongest for Finpro:

about 80 percent of Finpro's clients were already receiving its service subsidies previously. Also over 50 percent of Tekes customers obtained R&D subsidies from Tekes more than once. The Ministry of employment and economy allocated multiple support for almost 50 percent and Finnvera for about 40 percent of its subsidy receivers during the sample years. Continuity was relatively weak among the MAF clients: the Ministry of agriculture and forestry offered prior support for about 25 percent of its clients.

The effect of a firm's R&D intensity to its participation in support programs is measured by the firm's R&D spending relative to its turnover (variable RD). We also control for a firm's ownership by the dummy variable that gets value 1 if the firm has a foreign owner (variable FOREIGN). In addition, we use a set of dummy variables to control for the industry and location of the companies. The regional dummy variables are of interest as such as there are regional policy goals that aim at providing support particularly for the firms functioning in the regions lagging behind others.

In case of the estimated equation for Ministry of agriculture and forestry, we had to exclude the variables measuring the R&D spending, foreign ownership and past experience from the agencies other than MAF as there was not sufficient variation in these explanatory variables to perform estimations.¹¹

4.2 Estimation results

A firm's previous experience from the support programs seems to affect both the firm's probability to apply for and to have a new application accepted (see Table 3 for estimation results). Both in case of Finnvera and Tekes, a firm's prior subsidy from the agency increases its likelihood to apply for a new subsidy and to have its application accepted by the *same* agency. When the application and acceptance stages are not separated, but we estimate the

¹¹ The clients of MAF typically have no R&D spending, are domestically owned and have not previously been customers of the other agencies.

model with the full sample (see Table for 4 for the estimation results), the prior experience from the same program gets also a positive and statistically significant coefficient in all of the estimated equations. Our data concerning Tekes and Finnvera hint that the underlying reason for this finding is that not only subsidized companies learn and have lower application costs after previous experience from a support program, and tend to thus repeatedly apply support from the same organization, but also the agencies learn to know firms they have financed before and tend to favor them in their funding decisions.

The correlation term ρ is positive and statistically significant in the estimation of the bivariate probit model for Tekes and Finnvera applications hinting that there is contemporary, positive correlation between a firm's probability to apply funding from the two agencies. Furthermore, the firm's application for all public support programs relate positively to the previous use of business subsidies provided by any *other* agency, with the exception of the Ministry of agriculture and forestry of which prior subsidies tend not to relate significantly to the acceptance of subsidy application by Finnvera or Tekes. The firms that once enter to the Finnish subsidy system thus are more likely than others to seek not only further subsidies from the same organization but also from the other agencies providing business subsidies.

The estimation results of the acceptance equation provides some support for the hypothesis that the agencies tend to select firms that have previously received public support from some other agency.¹² Finnvera favors firms that have previously been subsidized by the Ministry of Employment and the Economy and Finnpro. Tekes, instead, seems to be more likely to reject the applications of firms that have previously been funded by Finnvera, while those funded by MAF are more likely to receive a positive Tekes funding decision than others.

¹² Relatedly, the empirical study of Väänänen (2003) finds complementarities between the firms' public and private funding.

Table 3. The estimation results of the random effects logit model for Tekes and Finnvera application and acceptance

Variable	FINNVERA	TEKES	FINNVERA	TEKES
	Dependent variable: Dummy variable that gets value 1 if firm has applied for subsidy from Finnvera/Tekes and 0 otherwise		Dependent variable: Dummy variable that gets value 1 if firm has received subsidy from Finnvera/Tekes and 0 otherwise	
CONSTANT	-5.369*** (-47.210)	-5.476*** (-24.920)	7.180*** (3.750)	1.865*** (3.780)
SIZE	0.253*** (28.070)	0.580*** (44.060)	0.232*** (7.500)	0.246*** (10.000)
AGE	-0.250*** (-87.080)	-0.132*** (-22.640)	-0.129*** (-9.480)	-0.041*** (-2.590)
RD	0.003 (0.610)	0.151*** (42.330)	-0.034** (-1.95)	0.081*** (12.860)
FOREIGN	-1.983*** (-9.870)	-0.944*** (-8.440)	-1.325 (-1.540)	-0.366 (-1.640)
FINNVERA_PAST	2.348*** (87.500)	0.667*** (13.790)	1.03*** (9.43)	-1.174** (-1.940)
TEKES_PAST	0.775*** (12.400)	1.212*** (21.550)	0.404 (1.530)	0.159* (1.75)
MEE_PAST	0.475*** (10.980)	1.042*** (19.410)	0.948*** (4.720)	0.083 (0.890)
MAF_PAST	0.099 (1.080)	0.640*** (3.790)	0.649 (1.540)	0.807** (1.980)
FINPRO_PAST	0.259*** (3.740)	0.380*** (5.810)	0.803** (2.270)	0.068 (0.062)
Western Finland	0.331*** (11.810)	-0.248*** (-5.540)	0.728*** (6.490)	-0.054 (-0.060)
Eastern Finland	0.509*** (12.840)	-0.163** (-2.300)	1.428*** (7.550)	0.550*** (3.510)
Oulu	0.530*** (12.210)	-0.038 (-0.500)	0.703*** (4.280)	-0.088 (-0.630)

Lapland	5.810*** (9.920)	-0.430*** (-3.20)	0.507** (0.210)	-0.237 (-0.87)
YEAR_2006		-0.046 (-0.99)		-0.281*** (-2.57)
YEAR_2007		-0.126*** (-2.70)		-0.314*** (-2.910)
YEAR_2008	-0.023 (-1.07)	-0.454*** (-9.17)	-0.335*** (-3.80)	-0.274*** (-2.410)
Industry dummies (see Annex for estimation results)	YES	YES	YES	YES
Number of Obs.	520162	987622	10872	5369
Number of firms	292854	330424	9651	3865
Log likelihood	-41227.903	-19719.362	-3364.030	-2412.592

T-values are reported in the parentheses. Significance levels are reported below t-values, where *** denotes significance level of 1%, ** significance level of 5% and * significance level of 10%.

Table 4. The estimation results of the bivariate probit model for Tekes and Finnvera applications using pooled data 2007-2008

Variable	FINNVERA	TEKES
	Dependent variable: Dummy variable that gets value 1 if firm has applied for subsidy from Finnvera/Tekes and 0 otherwise	
CONSTANT	-2.359*** (-54.300)	-2.030*** (-21.230)
SIZE	0.009*** (27.830)	0.218*** (35.810)
AGE	-0.103*** (-91.360)	-0.049*** (-16.760)
RD	0.001 (0.560)	0.067*** (37.960)
FOREIGN	-0.787*** (-10.430)	-0.461*** (-8.030)

FINNVERA_PAST	1.008*** (95.850)	0.239*** (10.250)
TEKES_PAST	0.359*** (14.070)	0.728*** (25.950)
MEE_PAST	0.211*** (12.020)	0.337*** (12.600)
MAF_PAST	0.027 (0.073)	0.239*** (3.070)
FINPRO_PAST	0.129*** (4.510)	0.105*** (3.170)
Western Finland	0.124*** (11.450)	-0.120*** (-5.610)
Eastern Finland	0.196*** (12.630)	-0.114** (-3.290)
Oulu	0.205*** (12.020)	-0.004 (-0.110)
Lapland	2.190*** (9.440)	-0.153** (-2.46)
YEAR_2008	0.011 (1.26)	-0.111*** (-6.03)
Industry dummies	YES	YES
ρ	0.273*** (16.69)	
Number of Obs.	520161	
Number of firms	330424	
Log likelihood	-51253.895	

T-values are reported in the parentheses. Significance levels are reported below t-values, where *** denotes significance level of 1%, ** significance level of 5% and * significance level of 10%.

The regression results further suggest that many firm characteristics have rather similar effects on the application and acceptance decisions across different support agencies, even though there are some agency specific differences. In general, younger and larger firms with previous experience from support programs and higher level of innovation activities are more likely to receive public support.

Size affects positively a firm's probability to have access to any of business subsidies offered by the Finnish agencies. Large firms are both more likely to apply for and to be accepted to support programs of Finnvera and Tekes, and they also more likely to receive support from the two ministries and to obtain service subsidies from Finpro. These findings support the hypothesis that larger firms are more likely to apply for public support due to their lower application costs. However, the finding that both Tekes and Finnvera tend to accept the financing applications of larger firms among the applicants is against our hypothesis that the agencies are likely to target business subsidies towards SMEs. This result is especially surprising in case of Finnvera as its official policy has a strong focus on micro and small enterprises.

Our estimation results indicate that younger firms are more likely to both apply for and to be among the receivers of all forms of public support. This finding provides support for our initial hypothesis that newly established firms tend to be the particular target group of business subsidies. It contradicts, instead, with the hypothesis of the importance of experience and lower application costs of more mature firms. One possible explanation is that the outcome is a result of the firms' self selection as they are aware that the agencies tend to favor younger firms in their funding decisions.

There are some differences in the impacts of a firm's R&D intensity in the estimated equations for different agencies. It seems that a firm's R&D intensity does not relate to its probability to apply for funding from Finnvera but, among the applicants, the firms with a relatively low R&D intensity tends to get accepted to Finnvera's support program more often than others. Instead, both Tekes applicants and, among them, the firms that receive a positive funding decision from Tekes, tend to be those with a higher R&D intensity. Also the clients of Finpro and MEE tend to be more innovative firms. In other words, our data suggest that the firms with greater innovation intensity (and success potential) are more likely to receive R&D subsidies, direct support and service support for internationalization – but not loans or guarantees – than other companies.

Table 5. The estimation results of the random effects logit model for the firms' reception of business subsidies

	FINNVERA	TEKES	MEE	FINP RO	MAF
Variable	Dependent variable: Dummy variable that gets value 1 if firm has received subsidy from the given organisation and 0 otherwise				
CONSTANT	-5.324*** (-62.380)	-5.579*** (-21.040)	-5.982*** (-55.830)	-7.726*** (-31.180)	-6.525*** (-66.920)
SIZE	0.292*** (41.650)	0.626*** (42.810)	0.399*** (43.020)	0.682*** (45.720)	0.080 (7.800)
AGE	-0.255*** (-124.630)	-0.138*** (-21.150)	-0.161*** (-44.170)	-0.041*** (-3.500)	-0.119*** (-20.080)
RD	0.002 (0.710)	0.166*** (43.320)	0.013*** (3.750)	0.026*** (6.090)	-
FOREIGN	-2.124*** (-13.090)	-1.038*** (-8.860)	-1.348*** (-10.630)	0.436*** (5.030)	-
FINNVERA_ PAST	2.279*** (109.450)	0.589*** (11.060)	0.599*** (18.520)	0.203*** (3.430)	-
TEKES_PAST	0.728*** (15.040)	1.103*** (17.850)	0.462*** (9.160)	0.993*** (14.340)	-
MEE_PAST	0.512*** (15.450)	0.985*** (16.950)	1.996*** (57.650)	0.838*** (13.540)	-
MAF_PAST	0.150** (2.100)	0.798*** (4.390)	0.299*** (3.070)	0.032 (0.120)	3.077*** (61.410)
FINPRO_PAST	0.281*** (5.240)	0.273*** (3.970)	0.117** (2.140)	4.878*** (94.100)	-
Western Finland	0.436*** (19.970)	-0.226*** (-4.520)	0.218*** (6.480)	-0.407*** (-7.760)	1.480*** (19.960)
Eastern Finland	0.617*** (20.050)	-0.016 (-0.210)	0.994*** (23.900)	-0.657*** (-6.950)	2.010*** (25.170)
Oulu	0.587*** (17.240)	-0.045 (-0.540)	1.082*** (24.370)	-0.545*** (-5.440)	1.753*** (19.780)

Lapland	0.697*** (15.500)	-0.440*** (-2.840)	1.334*** (23.740)	-0.247* (-5.440)	1.427*** (11.290)
YEAR_2006		-0.103** (-1.97)	-0.078** (-2.33)	-4.74*** (-9.40)	-0.777*** (-13.31)
YEAR_2007		-0.193*** (-3.69)	-0.451*** (-12.69)	-1.140*** (-20.86)	-1.889*** (-23.05)
YEAR_2008	0.264*** (8.71)	-0.472*** (-8.58)	-0.174*** (-5.20)	-0.697*** (-13.50)	-1.194*** (-3.91)
Industry dummies (see Annex for estimation results)	YES	YES	YES	YES	YES
Number of Obs.	987623	987622	987623	987623	1182338
Number of firms	330424	330424	330424	330424	402042
Log likelihood	-72419.387	-15655.852	-35139.433	-15711.021	-144985.659

T-values are reported in the parentheses. Significance levels are reported on superscripts, where *** denotes significance level of 1%, ** significance level of 5% and * significance level of 10%.

Generally, the domestically owned companies apply for business subsidies – at least loans, guarantees and R&D subsidies - more actively but they are not significantly more likely to get their applications accepted than the foreign owned firms.

Compared to the firms located to the reference region, Southern Finland, firms in others parts of Finland are more likely to apply for funding from Finnvera, and Finnvera seems also to favor non-Southern firms in its funding decisions. This is not surprising as Finnvera's strategy is to use its funding to promote the government's regional policy goals. In case of Tekes, firms located to Southern Finland tend to apply for R&D funding more often than firms located to Western and Eastern Finland and Lapland. The only regionally distinctive group of firms that is favoured by Tekes in its funding decisions are those located to Eastern Finland. The estimation results concerning firms receiving support using the whole sample, without separating the application and acceptance stages, indicates that the receivers of direct support from the two ministries tend to be located areas outside the Southern part of Finland, whereas Finpro's clients are particularly located to the Southern part of Finland.

5. Conclusions

We use a comprehensive database concerning the application and allocation of business subsidies in Finland merged with the firm-level data on about 330 000 firms from the year 2004 to 2008. Our empirical findings indicate that there is strong persistency in participation both within and between the different public support programs. We find that persistence in the firms' participation in the *same* support programs repeatedly over time arises both from the application and acceptance stage. In other words, firms both repeatedly apply funding from the organizations which have provided prior subsidies with them, and the agencies target their support to the firms they have previously subsidized. We further find that the firms that have once entered the Finnish subsidy system not only actively seek further support from the same organization but also from the other agencies allocating business subsidies.

Our findings concerning the role of a firm's prior experience on business subsidies emphasize the importance of learning and applications costs. Once a firm has received support from any agency, it is more likely to apply it later from both the same agency and the other agencies. Also, our estimation results show contemporary correlation between a firm's probabilities to apply funding from different agencies hinting that a firm that applies for subsidy from one agency is also more likely to apply it *simultaneously* from another agency. One possibility for these findings is that there is asymmetric information between the subsidized and non-subsidized firms due to the funding agencies that actively provide information for their customers concerning other complementary business subsidy options available in Finland. Another possibility, not excluding the first one, is that the subsidized firms more actively seek themselves information on the available complementary public subsidy options. For instance, a firm that has received R&D subsidy from Tekes for a new product development may, if the new product seems promising, decide to expand its production and internationalize its

activities. This could lead to the further public support applications by the firm, e.g., for loans from Finnvera and service subsidies from Finpro.

In line with the previous empirical findings, and against the general public policy aims to target particular support for the SMEs, we find that larger firms tend to be accepted to the public support programs of all sample agencies. Not only lower application costs and learning of larger firms explain this finding as we also find that large firms are more likely to apply for business subsidies than the smaller ones. Also, contradictory to the learning hypothesis related to firm age, and on the other hand, supporting public policy lines favoring newly established or start-up companies in subsidy funding decisions, we find that younger firms both are more likely to apply for and to receive subsidies than the older ones.

Public agencies allocating R&D support, direct subsidies and service support seem to favor firms more actively involved in innovation activities measured by their R&D intensity. This could reflect the agencies' picking the winner strategy, i.e. subsidizing firms that show more capability to succeed in the future. However, it is also possible that more innovative firms provide greatest potential for the growth and largest externalities benefiting the society, and thus the greatest return for business subsidies. It also seems possible that more innovative intensive firms have more potential to expand their market abroad and are thus seeking more actively service subsidies for internationalization.

Our estimation results also hint that the regional policy goals play a significant role in the allocation of public subsidies in Finland. Both the two ministries allocating direct subsidies and Finnvera offering loans and guarantees favor firms located to the less developed areas outside of the Southern Finland, whereas R&D subsidy allocation decisions of Tekes favor firms in the Eastern Finland. Service subsidies of Finpro, instead, are used more often by those firms that are located in the Southern Finland than others.

Overall, our estimation results show that a firm's probability to access the funds of the Finnish public support program have many joint determinants applying for all agencies (such as larger size, younger age, prior experience on public subsidies) and some program-specific determinants (such as R&D intensity). One caveat is worth noting: we are not able to observe the informal part of the application process that may already lead to the pre-selection of firms *before* the official application stage. In other words, those potential applicants that have contacted the funding agency but never officially applied for funding due to the negative initial response from the agency's representative are excluded from the sample. Thus, the observed sample of the applicants may to some extent reflect the agencies' informal pre-selection that we cannot control for.

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Annex. Industry-specific dummy variables*Descriptive statistics of industry dummies*

Variable name	Mean	Standard deviation
Primary production & mining	0.143	0.351
Foodstuff	0.006	0.078
Textiles	0.008	0.088
Forest	0.009	0.096
Chemistry	0.003	0.059
Metal	0.017	0.128
Machinery and equipment	0.015	0.121
Electronics	0.006	0.076
Other industries and energy	0.025	0.155
Construction	0.126	0.332
Wholesale and retail trade	0.161	0.368
Transportation	0.080	0.272
Finance & Insurance	0.014	0.117
Real estate activities	0.054	0.227
IT Services	0.018	0.132
Business services and R&D	0.117	0.321
Other services	0.197	0.398

The estimation results of industry dummies for Tekes and Finnvera application and acceptance

Variable	FINNVERA	TEKES	FINNVERA	TEKES
	Dependent variable: Dummy variable that gets value 1 if firm has applied for subsidy from Finnvera/Tekes and 0 otherwise.		Dependent variable: Dummy variable that gets value 1 if the application of a firm has been accepted by Finnvera/Tekes and 0 otherwise.	
Foodstuff	0.323** (2.530)	1.618*** (6.680)	-0.297* (-1.690)	0.402 (1.240)
Textiles	0.664*** (5.360)	1.217*** (4.520)	0.132 (0.750)	0.484 (1.380)
Forest	0.521*** (4.660)	1.134*** (4.680)	0.119 (0.760)	0.254 (0.790)
Chemistry	0.720*** (5.120)	1.849*** (7.730)	0.405** (2.120)	0.431 (1.380)
Metal	0.570*** (6.040)	1.369*** (6.110)	-0.028 (-0.200)	0.371 (1.210)
Machinery and equipment	0.574*** (5.730)	1.537*** (6.900)	0.181 (1.230)	0.273 (0.900)
Electronics	0.310** (2.370)	2.060*** (8.990)	0.015 (0.090)	0.681** (2.230)
Other industries and energy	0.243** (2.470)	1.293*** (5.750)	-0.254* (-1.750)	0.229 (0.740)
Construction	-0.101 (-1.250)	0.050 (0.230)	-0.230* (-1.810)	0.241 (0.760)
Wholesale and retail trade	0.441*** (5.680)	0.707*** (3.290)	-0.134 (-1.110)	0.558 (1.840)
Transportation	-0.132 (-1.530)	0.231 (1.010)	-0.431*** (-3.200)	0.804** (2.470)
Finance & Insurance	-0.270 (-1.250)	1.374*** (3.200)	-0.139 (-0.390)	0.698 (1.280)
Real estate activities	-0.174* (-1.690)	0.615** (2.450)	-0.065 (-0.410)	0.595* (1.670)
IT Services	0.369*** (3.660)	3.047*** (14.170)	-0.360** (-2.330)	0.798*** (2.670)
Business services and R&D	0.077 (0.950)	1.892*** (8.980)	-0.365*** (-2.890)	0.690** (2.320)
Other services	0.066 (0.840)	0.099 (0.450)	-0.577*** (-4.740)	0.585* (1.860)

T-values are reported in the parentheses. Significance levels are reported on superscripts, where *** denotes significance level of 1%, ** significance level of 5% and * significance level of 10%.

Estimation results of logit model for the firms' reception of business subsidies

	FINNVERA	TEKES	MEE	FINP RO	MAF
Variable	Dependent variable: Dummy variable that gets value 1 if firm has received subsidy from the given organisation and 0 otherwise				
Foodstuff	0.551*** (5.810)	1.645*** (5.710)	0.903*** (7.780)	1.422*** (5.280)	0.701*** (6.330)
Textiles	0.783*** (8.330)	1.433*** (4.580)	0.629*** (4.710)	2.054*** (7.610)	-0.216 (-1.110)
Forest	0.663*** (7.810)	1.186*** (4.100)	1.594*** (15.960)	2.010*** (7.960)	0.581*** (5.690)
Chemistry	0.741*** (6.790)	1.876*** (6.630)	1.631*** (13.990)	1.969*** (7.530)	-0.222 (-0.770)
Metal	0.605*** (8.230)	1.595*** (5.930)	1.416*** (15.210)	1.196*** (4.840)	0.498*** (5.190)
Machinery and equipment	0.717*** (9.350)	1.592*** (5.930)	1.028*** (10.380)	1.866*** (7.700)	-0.082 (-0.610)
Electronics	0.614*** (6.340)	2.131*** (7.800)	0.937*** (8.030)	2.066*** (8.150)	-0.924*** (-2.580)
Other industries and energy	0.404*** (5.400)	1.310*** (4.810)	1.191*** (12.670)	1.173*** (4.790)	0.123 (1.140)
Construction	-0.081 (-1.290)	0.173 (0.640)	-0.425*** (-4.540)	-0.403 (-1.590)	-0.801*** (-9.710)
Wholesale and retail trade	0.486*** (8.030)	0.898*** (3.440)	-0.063 (-0.710)	0.939*** (4.030)	-0.766*** (-9.860)
Transportation	-0.144** (-2.150)	0.439 (1.600)	-0.551*** (-5.440)	0.706*** (2.930)	-1.070*** (-9.730)
Finance & Insurance	-0.106 (-0.480)	1.666*** (3.500)	0.177 (0.630)	0.962** (2.250)	-1.913*** (-4.250)
Real estate activities	-0.058 (-0.730)	0.727** (2.390)	0.156 (1.400)	0.121 (0.420)	-1.158*** (-7.480)
IT Services	0.419*** (5.330)	3.024*** (11.570)	0.861*** (8.430)	0.996*** (3.980)	-1.159*** (-4.540)
Business services and R&D	0.077 (1.220)	1.971*** (7.660)	0.216** (2.410)	1.114*** (4.750)	-0.992*** (-9.810)
Other services	0.080 (1.300)	0.136 (0.510)	-0.529*** (-5.750)	-0.354 (-1.410)	-0.334*** (-5.370)

T-values are reported in the parentheses. Significance levels are reported on superscripts, where *** denotes significance level of 1%, ** significance level of 5% and * significance level of 10.