

When are investment subsidies crucial for investments?

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Abstract

EU enlargement to the less developed countries in Central and Eastern Europe is forcing policy makers to reconsider the role of business subsidies in the EU. For example, to what extent the use of investment subsidies should be allowed in the future? Which regions should be supported? In this paper we study conditions under which investment subsidy is a necessary requirement for investments in Finland. Empirical analysis is conducted using micro level data on investment projects of private sector firms. The data set comprises 1,836 projects that received public investment subsidies between 2001 and 2003. Our results show that the necessity of the investment subsidies is strongly dependent on the location of investment project and the intensity of aid.

Keywords: Investment subsidies, public policy, investment projects, regional policy

JEL classification: H2

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1 Introduction

Investment literature provides two main motives for the use of investment subsidies. First, they can be granted for firms to compensate for market failure that exists in the conventional financing markets (e.g. Storey, 1994; Felsenstein, Fleischer and Sidi, 1998). Second, the investment subsidies can also be viewed as instruments of regional policy (Harris, 1991; Schalk and Untiedt, 2000). Governments may provide investment aid in an attempt to encourage investment activity, and hence induce growth of business and reduce regional disparities in income and employment.

Over the past decades, investment subsidies have been extensively used in the member states of the European Union. The EU enlargement to the less developed countries in Central and Eastern Europe is forcing policy makers to reconsider the role of business subsidies in the EU. Given that the need for the investment subsidies is considerable larger in the new member states, and the subsidies can limit competition and give rise to market inefficiencies, to what extent the use of investment subsidies should be allowed in the future? Which regions should be supported?

In Finland, investment subsidies are seen crucial for the implementation of investment projects, especially for distant regions. Nevertheless, little emphasis has been laid on the analysis of the investment subsidies.¹ In fact, to our knowledge, no detailed analysis on the importance of investment subsidies for individual projects has been conducted in Finland. This is surprising given that currently investment subsidies can be granted in most parts of the country (at different intensity), but some of them might be denied the use of investment subsidies in the future. This paper attempts to fill this gap.

Public investment aid in Finland is financed from the national funds as well as from the European Regional Development Fund (ERDF), which participates in the EU Objective Areas in financing. Member States of the EU cannot assess themselves the eligibility for State Aid, but the framework of rules on the Aid is defined by the EC Treaty. Finance from the ERDF traced out by the EC Regulation.

The aim of the empirical analysis is to study the conditions under which investment subsidy is a necessary requirement for investment projects. The analysis utilises a recent micro level data set on Finnish firms' investment projects. This unique data set comprises projects that received investment subsidies from the Ministry of Trade and Industry between 2001 and 2003. Although many types of investment aid for businesses exist in Finland, the investment subsidies that we study are grants, in that the recipient firm is not obliged to pay the money received back to the distributor. These investment subsidies are enacted in the Aid to Business Act (1068/2000) and the Decree of Council of State (1200/2000), according which the subsidies can be granted for the purchase of fixed assets, such as machinery and equipment, buildings and the pertaining land areas.

Our empirical analysis provides critical information on the importance of the investment subsidies for policy makers who plan investment subsidy programmes. It is found there that the necessity of the subsidy varies significantly between investment projects. Firstly, in terms of project implementation, the investment subsidies are much more crucial for projects in distant regions (i.e. Northern and Eastern Finland) than for projects in central areas (i.e. Southern Finland). Secondly, investment subsidies are less important for firms with large overall turnover than for firms with little turnover. Our estimation results also suggest that the necessity of the investment subsidy increases significantly with the size of the investment project and the intensity of aid.

The remainder of this paper is organised as follows. In the next section we briefly review relevant literature on the investment subsidies. Our data set and modelling framework is then introduced in Section 3. Estimation results are presented in Section 4. The conclusion contains a summary of the main results obtained in the paper.

¹ See, however, Venetoklis (2001) for an overall evaluation of the business subsidies in Finland. See also Kangasharju and Venetoklis (2003) for a recent analysis of employment effects of wage subsidies in Finland.

2 Framework for investment subsidies

Investment subsidies granted for firms can be viewed as policy instruments that compensate for market failure that exists in the conventional financing markets (e.g. Storey, 1994; Felsenstein, Fleischer and Sidi, 1998). The existence of market failures means that some firms can be denied access to credit despite the fact that they have viable business projects. For these firms public aid to investment might be a prerequisite for the project implementation.

Information asymmetries may explain why capital does not always flow to firms with profitable investment opportunities (e.g. Stiglitz and Weiss, 1981). While many essential features of the project are known to the firm, it may not be able to credibly communicate them to outside financiers due to well-known problems of adverse selection and moral hazard (e.g. Petersen and Rajan, 1994). In addition, assembling reliable information on investment projects can be costly for the banks. In such situations, lenders are likely to minimise risk by rationing credit, in which case viable projects are overlooked and a market failure arises. Finance from the public sector may be the only alternative, if a firm wants to carry out an investment project.

Only if the condition of necessity of subsidy is fulfilled, the impacts of subsidy on firm's behaviour can have additional value from the social viewpoint. Otherwise processes stimulated by subsidies would have developed still without public intervention. These development processes can be such as learning, R&D or internationalisation, i.e. competitiveness factors, which can be realised, for example, in investment intensity, employment or economic growth of the firm.

It is commonly argued that capital subsidies stimulate investment, because the subsidies lower the costs of investments (e.g. Faini and Schiantarelli, 1987; Harris, 1991; Schalk and Untiedt, 2000). It is also widely documented that investment subsidies induce output growth (Bergström, 2000; Schalk and Untiedt, 2000). However, the impact of investment subsidies on labour demand remains more uncertain. Schalk and Untiedt (2000) find that the investment subsidies have succeeded in improving employment in Germany, while some other empirical studies suggest a nearly negligible or even

negative employment effect; see Faini and Schiantarelli (1987) for Scotland, Harris (1991) for Northern Ireland, and Daly et al. (1993) for Canada.

Investment subsidies can also be viewed as instruments of regional policy (Harris, 1991; Schalk and Untiedt, 2000). Governments may provide investment aid, for example, in an attempt to encourage investment activity, and hence induce growth of business and reduce regional disparities in income. But again an efficient allocation of resources requires that the condition of necessity of subsidy is fulfilled.

But for which investment projects the public subsidies are most likely to be prerequisite? Prior evidence suggests that firm's access to credit, and therefore need for public aid, depends especially on the size, business experience and location of the firm (e.g. Storey, 1994; Felsenstein, Fleischer and Sidi, 1998; Wren, 1998; Felsenstein and Fleischer, 2002). Young firms do not have much evidence to show about their competence and trustworthiness. Small firms are unlikely to be monitored by rating agencies or financial press. Hence, size and age are observable and powerful signals to banks on investment risk (see also Wren, 1998). Similarly, location of the firm may matter in determining the risk profile of the firms (Felsenstein and Fleischer, 2002). Therefore, the small and young firms, especially if located in remote or peripheral areas, are likely to face high costs of private funds and thus make investment projects unviable.

Finally, it is important to note that the use of investment subsidies is, however, not unproblematic. Firstly, subsidy programmes may result in sub-optimal allocation of resources. One argument is that the subsidies prevent the shift of resources to areas where they would have a greater productivity. Secondly, although governments argue in favour of subsidy programmes, they may be driven by political considerations rather than economic efficiency (Michell and Munger, 1991). Finally, the existence of subsidy programmes may encourage rest-seeking behaviour on the part of firms. In the worst case, investment aid completely substitutes for private funds and generates no increase in investment scale and thus implies an arbitrary transfer of resources from tax payer to producer (Wren, 1996).

3 Data and modelling framework

Our data set comprises 1,958 investment projects that have been financed by the Ministry of Trade and Industry between 2001 and 2003.² The data is used in a larger research project and thus restricted to investment projects, which have received all the payments from T&E Centre by the end of May 2004. In the following analysis presented below we only consider investment projects of private firms. Therefore, investment projects of public firms, together with some observations with missing data, are deleted from the data. This leaves us with 1,836 investment projects.

The investment subsidies that we study are enacted in the Aid to Business Act (1068/2000) and the Decree of Council of State (1200/2000). These subsidies are grants, in that the recipient firm is not obliged to pay the money received back to the distributor. They can be granted to a firm for the purpose of financing fixed assets investments when such a firm is starting business, expanding its operations, or modernising its fixed assets. Investment aid can be granted for the purchase of fixed assets, such as machinery and equipment, buildings and the pertaining land areas in all businesses, except for those in farming and fishing sectors. Additionally, the Act provides that aid is granted only if intended expansion or modernisation is deemed to lead to major improvements in terms of increasing the number of jobs, adding value to production or enhancing the level of services as the target for the project. An exception to this rule can be made if modernisation essentially upgrades the standard of technology of fixed assets of the firm.

The investment subsidies are mostly granted by the regional Employment and Economic Development Centres (T&E Centres). Only in cases where investment projects with costs exceeding 1.7 million euro are concerned, the financing decision is made by the Ministry of Trade and Industry. Besides that the Ministry steers and controls T&E Centres in terms of aid to business.

The European Regional Development Fund (ERDF) participates in the EU Objective Areas in the financing of the investment subsidies. In our data set, 92.4 percent of the

² Unfortunately, no unambiguous data of rejected investment projects is available. However, it is known that almost one third of the investment projects applied for subsidy are denied by T&E centre (exactly 30.1 % in 2003).

investment projects received subsidies from the ERDF. On average, about 44 percent of the subsidy funding came from the ERDF, the remainder from the national funds.³

Our data set contains versatile information on the investment project and the subsidised firm. Firstly, they include economic industry, location, intensity of aid and size of the project as well as turnover and business experience of the subsidised firm. Secondly, after the firm had submitted its application for project funding, its investment project and the firm itself are evaluated by the corporate analyst of T&E Centre. In the evaluation procedure several aspects relating to the project and the applicant organisation are taken into account. For example, operation of the firm, content of the project, need of capital, financial plan of the project as well as the financial standing of the applicant firm are reviewed. Most extensive and significant projects are evaluated more specifically than minor ones. In the large projects also branch, market structure and development prospects, corporate strategy and success factors are considered. Based on this evaluation and the firm's application, it is determined if the subsidy is a prerequisite for the project implementation. However, project can be financed also from other arguments.

Regardless, in this study we are exclusively interested in whether the investment subsidy is a prerequisite for the project implementation. Of the 1,836 investment projects, for 299 the investment subsidy is considered as a necessary requirement for the project implementation (16.3 percent of the projects). At the same time, we recognise that investment subsidy may have some other aspired effects. For example, it may expand the size of the project, advance the beginning of the project, or improve the quality of the project. However, such effects are much harder to quantify.

Hence, dependent variable of our econometric model, *necessity of investment subsidy*, is specified as follows:

$$y_i = 1, \text{ if the investment subsidy is a necessary requirement} \\ \text{for the project implementation;} \\ y_i = 0, \text{ otherwise.}$$

³ The role of the ERDF is considerable larger in the so called National Assisted Areas 1 and 2 (48.2 % and 49.9 %) compared to the National Assisted Area 3 (42.9 %) or to the other regions (37.6 %); see Figure 1 for the regional classification.

The construction of the dependent variable as binary suggests a use of a probit (or logit) model (see e.g. Greene, 1997). Thereby, we assume that the necessity of investment subsidy, y_i , is determined according to a latent variable y_i^* :

$$y_i^* = \beta' x_i + \varepsilon_i, \quad \varepsilon_i = N(0, \sigma_i^2) \quad (1)$$
$$y_i = 1, \text{ if } y_i^* > 0; \text{ and } y_i = 0, \text{ if } y_i^* \leq 0$$

where x_i is a vector of explanatory variables and β is a parameter vector. The error term ε_i is assumed to normally distributed with variance σ_i^2 . The explanatory variables used in the econometric analysis are discussed below. Operational definitions of the variables, together with their mean values, are presented in Table 1.

Table 1. Variable definitions and mean values

Variable	Definition	Mean
Necessity of investment subsidy (y_i)	1 if the investment subsidy is a necessary requirement for the project implementation; 0 otherwise.	0.163
Project costs	Total project costs (euro) as estimated by the firm in its investment subsidy application.	295,957
Turnover of firm	Annual turnover of firm (million euro)	1.357
New firm	1 if the investment project is implemented by the new firm that is assessed to become obliged to VAT i.e. annual turnover of firm exceeds 8 500 e when founded; 0 otherwise.	0.207
Relative intensity of aid (%)	Intensity of aid (%) minus the average intensity of aid (%) in the Assisted Area where the project is implemented. Intensity of aid is calculated as a ratio of investment subsidy to the total project cost (%)	0
<i>Regional dummies</i>		
Assisted Area 1	1 if the project is implemented in the National Assisted Area 1; 0 otherwise; see Figure 1.	0.220
Assisted Area 2	1 if the project is implemented in the National Assisted Area 2; 0 otherwise.	0.160
Assisted Area 3	1 if the project is implemented in the National Assisted Area 3; 0 otherwise.	0.387
Other regions	1 if the project is implemented outside the National Assisted Areas 1 - 3; 0 otherwise. Reference region.	0.234
<i>Industry dummies</i>		
Industry 1	1 if the project is in mining and quarrying etc.; 0 otherwise.	0.059
Industry 2	1 if the project is in the manufacture of metal products etc.; 0 otherwise.	0.522
Industry 3	1 if the project is in the manufacture of electrical, optical and transport equipment and furniture; 0 otherwise.	0.111
Industry 4	1 if the project is in the wholesale and retail trade, or repair of motor vehicles, motorcycles and personal and household goods; 0 otherwise.	0.030
Industry 5	1 if the project is in a hotel or restaurant industry; 0 otherwise.	0.079
Industry 6	1 if the project is in the transport, storage and communication, or financial intermediation; 0 otherwise.	0.021
Industry 7	1 if the project is in the real estate, renting and business activities; 0 otherwise. Reference industry; industry dummies are created using TOL 2002 at the first digit level.	0.117
Other industries	1 if the project is in an industry other than 1-7; 0 otherwise.	0.061

Notes: Number of observations: 1,836. Only investment projects of private firms are included. The data also includes three year dummies (2001, 2002, 2003) that indicate when the financing has been granted.

Regional classification

As discussed earlier, necessity of investment subsidy is likely to be related to the location of the firm (Section 2). To study regional differences in the necessity of investment subsidy, we have divided Finland into National Assisted Areas using Council Regulation (EC) No 1260/1999 (Figure 1), which defines regional structure of the Aid to Business Act. This classification is founded on the regional level of development and development needs. It closely resembles the EU Objective Programme Areas for Finland (2000 - 2006).

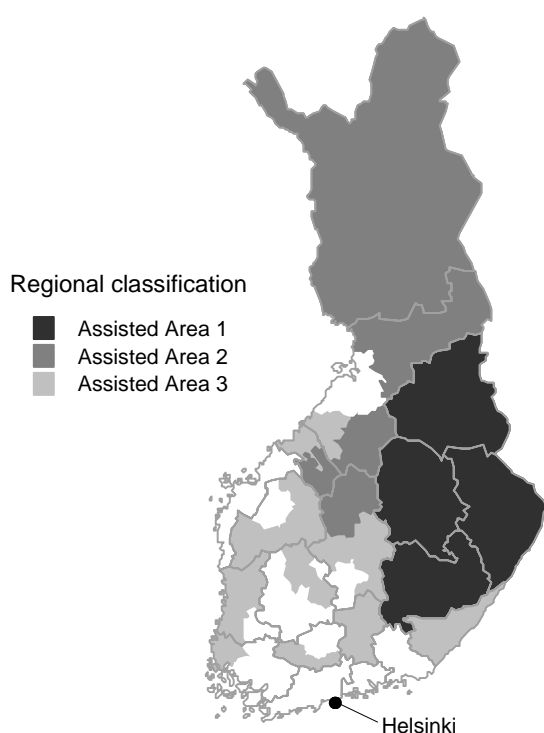


Figure 1. National Assisted Areas in Finland (with borders of NUTS III regions)

Projects in the National Assisted Area 1 are eligible for the highest intensity of investment aid, which is 30 % of purchasing cost of the fixed assets at the maximum; see also Table 2 below. It covers the entire East Finland NUTS II area, which is made up of the four NUTS III regions (“maakunnat”) of Kainuu, North Karelia, North Savo and South Savo. Projects in the National Assisted Area 2 are eligible for slightly smaller intensity of investment aid (24 % of purchasing cost of the fixed assets at the maximum). It covers entire Lapland and municipalities in North Ostrobothnia, Central

Finland and Central Ostrobothnia. The Assisted Areas 1 and 2 have higher unemployment and lower GDP growth than the national average. Their economy depends heavily on the public sector, as well as agriculture and forestry. These two areas are identical to EU Objective 1 Programme Areas (i.e. Northern and Eastern Obj. 1). Projects in the National Assisted Area 3 are eligible for significantly smaller intensity of the investment aid (max. 15 %) than the projects in the Assisted Area 1 or 2. Outside the National Assisted Areas, only small businesses are eligible for the investment aid of max. 10 %.⁴

Regional distribution of investment subsidy rate (i.e. investment subsidies / investments) and level of investment subsidies can be seen from Figure 2. The investment subsidies are much more significant for private sector's firms in Eastern and Northern Finland than in Southern Finland. Investment subsidy rate is highest in the Eastern Finland (1.09 - 1.43 %) and smallest in the Southern Finland (0 - 0.2 %). On average, about 0.3 percent of private sector's investments were financed by investment subsidies in Finland in 2001 - 2003. There are also significant regional differences in the level of investment subsidies in Finland. Level of investment subsidies is highest in North Savo (12.1 million euro per year). Lapland has also received substantial amount of investment subsidies recently (8.3 million euro per year). Notice also that the level of investment subsidies is relatively small in Kainuu (2.8 million euro per year) even though its investment subsidy rate is high (1.09 %).

⁴ A small business is defined as a firm with personnel not exceeding 50 employees and with either an annual turnover of maximum 7 million euros or a balance sheet total of maximum 5 million euros.

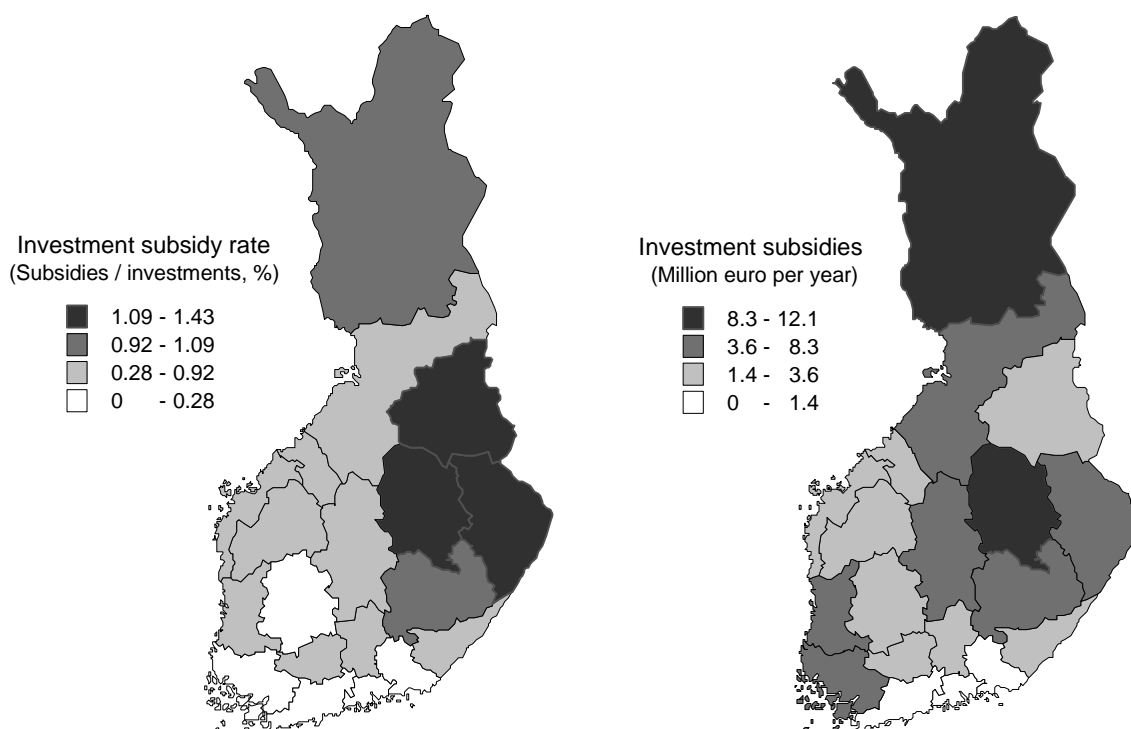


Figure 2. Regional investment subsidy rate and level of investment subsidies in the private sector in 2001 – 2003 (NUTS III regions).⁵

Regional differences in the characteristics of the firms and projects can be examined by simple analysis of variance tests (Table 2). As can be seen, statistically significant regional differences exist logically with respect to the necessity of investment subsidy and the intensity of aid. In the Assisted Area 1, for 27.5 percent of the investment projects the subsidy is a necessary condition for the project implementation. This is more than in the Assisted Area 2 and 3, let alone other regions in Finland. For example, in the Assisted Area 3, only for 12.4 percent, the investment subsidies are a necessary condition for the project implementation. Intensity of aid behaves in a similar manner to the necessity of the investment subsidy, being the highest in the Assisted Area 1. Since the aid is given in accordance with the regional development needs, it is not surprising that the F-test shows highly significant regional differences in the intensity of aid.

⁵ Source: Statistics Finland and Ministry of Trade and Industry.

Table 2. Descriptive statistics by the National Assisted Area

<i>Variable</i>	Mean values by National Assisted Area				F-test
	Assisted Area 1	Assisted Area 2	Assisted Area 3	Other regions	
y_i (necessity of investment subsidy)	27.48 %	19.80 %	12.39 %	9.79 %	21.0*
Intensity of aid	30.18 %	26.14 %	15.67 %	12.24 %	4446*
Project costs (million euro)	0.324	0.301	0.297	0.264	0.62
Turnover of firm (million euro)	1.422	1.112	1.642	0.990	5.55*
Number of projects	404	293	710	429	1836

Notes: Intensity of aid is calculated as a ratio of investment subsidy to the total project cost (%). * = F-test statistic indicates significant differences in means at the 5 percent risk level.

When looking at the project costs, no significant regional differences can be observed (Table 2). Though, the sample mean of the project costs for the Assisted Area 1 is again higher than for other regions, being the smallest for the regions outside the Assisted Areas 1 - 3. On the contrary, a significant geographical divide can be seen in the turnover of the supported firms. The mean value of the turnover is over 1.6 million euros for the Assisted Area 3, whereas the corresponding figure is less than 1 million euros for the regions outside the Assisted Areas 1 - 3.

Differences in the project costs, the relative intensity of aid and the turnover of the firms in the necessity of the investment subsidies are reported in Table 3. As can be seen from the simple two-sample t-tests, project costs and the relative intensity of aid are significantly higher in those investment projects for which the investment subsidies are necessary requirement for the project implementation. Here, the relative intensity of aid is calculated by deducting the average regional intensity of aid (%) from the intensity of aid (%) that the project obtains. Finally, it looks as if turnover of firm is, on average, smaller at those investment projects for which the investment subsidies are necessary requirement for the project implementation. However, the difference in the means is not statistically significant.

Table 3. Descriptive statistics by necessity of investment subsidy (y_i)

Variable	Mean by y_i (std. dev.)		Overall mean (std. dev)	t-test
	$y_i = 0$	$y_i = 1$		
Project costs (million euro)	0.277 (0.577)	0.393 (0.894)	0.296 (0.640)	-2.145*
Turnover of firm (million euro)	1.381 (2.935)	1.230 (2.386)	1.357 (2.853)	0.961
Relative intensity of aid (%)	-0.068 (2.512)	0.351 (3.108)	0 (2.622)	-2.195*
Number of projects	1537	299	1836	1836

Notes: * = Two-sample t-test statistic indicates significant differences in means at the 5 percent risk level.

Given our discussion of investment literature (Section 2) and the descriptive analysis above, we would expect that, *ceteris paribus*, the necessity of investment subsidy increases with the project costs and the relative intensity of aid but decreases with the turnover and business experience of the firm. We would also expect that the investment subsidies are most crucial for investment projects in the Assisted Area 1 and least crucial for projects outside the Assisted Areas. To test whether these hypotheses hold, however, requires estimation of our econometric model.

4 Results

Table 4 displays estimation results of our probit model for the necessity of investment subsidy. Before interpreting the results in detail, we consider robustness of the results by comparing different model specifications (1 - 3). A number of diagnostic results for each model specification are given at the bottom of the table.⁶

Specification (1) includes project costs, turnover and business experience of the firm, regional dummies and constant term as explanatory variables. In this specification, all coefficients reach statistical significance at the 5 percent level, except for the dummy variables “New firm” and “Assisted Area 3” that are insignificant at the 5 percent level.

Hence, contrary to our prior expectations, business experience of firm does not have a significant impact on the necessity of investment subsidy. This finding is not dependent on the specification (see Table 4). One explanation for the result might be that our experience variable is not accurately measured.

Looking at the diagnostics, we can see that the Likelihood Ratio (LR) test statistic for heteroskedasticity is insignificant at the 5 percent level, so that the null hypothesis of homoskedasticity is not rejected. Normality assumption of the error term is not, however, satisfied in the specification (1). The Conditional Moment (CM) test rejects the null hypothesis of normality at the 5 percent level.

Table 4. Parameter estimates of the probit models

<i>Variable</i>	Model specification					
	(1)		(2)		(3)	
Constant	-2.728**	(0.365)	-3.083**	(0.391)	-2.856**	(0.447)
ln(project costs)	0.125**	(0.031)	0.130**	(0.032)	0.139**	(0.032)
Turnover of firm	-0.042*	(0.016)	-0.048**	(0.017)	-0.044**	(0.017)
New firm	0.019	(0.090)	0.064	(0.094)	0.040	(0.094)
Relative intensity of aid (%)					0.043**	(0.014)
<i>Regional dummies</i>						
Assisted Area 1	0.713**	(0.107)	0.711**	(0.108)	0.721**	(0.109)
Assisted Area 2	0.460**	(0.119)	0.477**	(0.121)	0.492**	(0.122)
Assisted Area 3	0.168	(0.104)	0.139	(0.105)	0.143	(0.106)
<i>Industry dummies</i> (7)	No		Yes		Yes	
<i>Year dummies</i> (2)	No		Yes		Yes	
<i>Diagnostics</i>						
Log-likelihood	-777.88		-769.49		-764.36	
LR test for heteroskedasticity	2.633		3.168		5.248	
CM test for normality	8.318*		2.402		1.219	

Notes: Dependent variable: necessity of investment subsidy (0, 1). Number of observations: 1,836. First the estimated parameter is given, followed by the asymptotic standard error in brackets. Variable definitions are given in Table 1. * (**) = Statistically significant at the 0.05 (0.01) level. The test statistics for the heteroskedasticity and the normality are $\chi^2(2)$ distributed.

⁶ In the LR test for heteroskedasticity, the variance of the error term ε_i is assumed to depend on a set of explanatory variables, z_i (Davidson & MacKinnon, 1984): $\sigma_i^2 = [\exp(\gamma' z_i)]^2$. We specified the variable of the error term as a function of turnover of firm and ln(project costs). Thus the test statistic is $\chi^2(2)$ distributed. Heteroskedasticity is tested, since departures from homoskedasticity can bias the estimated parameters and standard errors in non-linear models (Godfrey, 1988). The CM test for the normality of the error term is implemented as described in Newey (1985, p. 1062). The test statistic is $\chi^2(2)$ distributed as well.

Specification (2) adds industry and year dummies to the explanatory variables. Now, all reported coefficients, except for the two dummies “New firm” and “Assisted Area 3”, reach statistical significance at the 1 percent level. Introduction of the industry and year dummies improves model specification in terms of the diagnostics. Both the homoskedasticity and normality assumptions of the error terms are not rejected at the 5 percent level. Comparison of log-likelihood values also shows improvement on the fit of the model. The estimated parameters hardly differ between two model specifications, implying stability of our results.

In specification (3) relative intensity of aid is added to the second model specification. It allows us to study whether the necessity of aid is truly dependent on the location of the project (i.e. demand for finance) or rather it is the intensity of aid that dominates (i.e. supply of finance). Intensity of aid is highly dependent on the region where investment project is implemented (Table 2). Thus, we cannot include both the regional dummies and the intensity of aid in our econometric model. Instead, we have used relative intensity of aid as an additional explanatory variable. It allows us to compare intensity of aid that the project obtains with the average intensity of aid in the region where the project is implemented.

Table 4 shows that the relative intensity of aid reaches statistical significance at the 1 percent level. At the same time, other parameter estimates hardly change. Hence, model specification (3) is preferred even though the diagnostic tests are also satisfied in the second specification. Finally, note that in all specifications project costs are included in logarithmic form to capture non-linearity in the effect of the project costs on the necessity of investment subsidy.⁷

As regards results, they are in accordance with our prior expectations (Table 4). The higher are the project costs, or the lower is the turnover of the firm, the more likely the investment subsidy is a necessary condition for the project implementation, everything else being equal. The estimation results show that, in terms of project implementation, the investment subsidy is more crucial for projects in the Assisted Areas 1 and 2 than for projects outside the Assisted Areas 1 - 3 (reference region). However, no significant

⁷ We also tried to add turnover of firm in a second polynomial form to study whether the impact of turnover on the necessity of investment subsidy is dependent on the level of turnover. However, since first and second polynomial terms were not significant at the 5 percent level, it was concluded that the impact of turnover on the necessity of investment subsidy does not vary with the level of turnover.

differences in the necessity of the investment subsidies are found between the Assisted Area 3 and the reference region. Finally, the results indicate that the higher is the relative intensity of aid when compared to other projects in the region, the more likely the investment subsidy is a prerequisite for the project implementation.

In order to get a better overview of the effects, conditional predicted probabilities have been computed for selected cases (Table 5).⁸ The predicted probabilities are computed using the preferred model specification (3). In each case other explanatory variables are held at their median values. They are the following: project costs, 110,000 euro; turnover of firm, 403,735 euro; project is implemented in Assisted Area 3 in the industry 2 (manufacture of metal products); funding is applied for in 2001 by old firm; and the relative intensity of aid is -0.672 %.⁹

Table 5. Illustration with predicted probabilities, $\text{Prob}(y_i = 1)$

Predicted probability conditional on other variables are held at median values			
Case 1: Location of project			
Assisted Area 1	Assisted Area 2	Assisted Area 3	Other regions
0.242	0.176	0.101	0.078
Case 2: Project costs			
Project costs are 50,000 euro	Project costs are 100,000 euro	Project costs are 500,000 euro	Project costs are 1 million euro
0.083	0.098	0.143	0.166
Case 3: Turnover of firm			
Turnover of firm is 0 euro	Turnover of firm is 0.5 million euro	Turnover of firm is 1 million euro	Turnover of firm is 10 million euro
0.104	0.100	0.096	0.044
Case 4: Relative intensity of aid			
Relative intensity is -5 %	Relative intensity is 0 %	Relative intensity is 5 %	Relative intensity is 10 %
0.071	0.106	0.151	0.207

Notes: The probabilities have been calculated using model specification (3) in Table 4. Median values are the following: project cost is 110,000 euro, turnover of firm is 403,735 euro, project is in the Assisted Area 3 in industry 2, funding is applied for in 2001 by old firm, and the relative intensity of aid is -0.672 %. Variable definitions are given in Table 1.

⁸ The predicted probabilities have been provided, because it is difficult to see magnitude of the effects from parameter estimates, for example, when explanatory variable is in logarithmic form.

⁹ In our data the range in the project costs and the turnover of firm is [1275, $1.1 \cdot 10^7$] and [0, $3.75 \cdot 10^7$] euro, respectively.

Table 5 shows that the necessity of investment subsidy is strongly dependent on the location of the project (Case 1). The probability that the investment subsidy is a necessary requirement for the project implementation is three times larger for projects in Assisted Area 1 than for projects outside the Assisted Areas. Case 4 shows that the necessity of investment subsidy also depends heavily on the relative intensity of aid. For example, if the project's intensity of aid is 10 percentage points higher than the regional average¹⁰, then the necessity of investment subsidy is approximately two times larger (see also Table 2). Hence, it seems that the necessity of investment subsidy depends on the demand and supply of the finance.

Finally, the effect of project costs and turnover on the necessity of investment subsidy appears smaller (Case 2 and 3). For example, assuming that other variables are held at their median values, an increase of project costs by 400,000 euro, from 100,000 euro to 500,000 euro, increases the necessity of the investment subsidy by approximately 4.5 percentage points. In addition, difference in the necessity of the investment subsidies between firms with turnover of 1 and 10 million euro is little more than 5 percentage points.

5 Conclusion

This paper has examined conditions under which investment subsidy is a necessary requirement for project implementation in Finland. It is shown that the necessity of the investment subsidies varies significantly between investment projects. First, in terms of project implementation, the investment subsidies are much more crucial for projects in distant regions (i.e. in Northern and Eastern Finland) than for projects in central areas (i.e. in Southern Finland). Second, investment subsidies are less important for firms with large overall turnover than for firms with little turnover. Finally, our estimation results suggest that the necessity of the investment subsidy increases significantly with the size of the investment project and the intensity of aid.

Given that the financial resources are limited, it is important to recognise that investment subsidies are more crucial for some projects than others. It might be useful focus on those projects for which investment subsidies are critical in terms of the

¹⁰ That is, the average intensity of aid in the region where the project is implemented. In this case, average intensity of aid is 15.6 percent from the project costs (Assisted Area 3).

project implementation. Our empirical analysis provides some guidance for policy makers in this respect. However, in the future, it is also important to consider other implications of the investment subsidies on the economic activity in Finland. For example, do the investment subsidies induce growth of business or employment? Do the investment subsidies generate increase in investment scale or are they simply complete substitutes for private funds? Also quantifying other aspired effects of investment subsidies than solely the necessity of subsidy, such as expansion and advancing, could make sense in respect of studying benefits of investment subsidies.

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