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Lotta Väänänen

DOES PUBLIC FUNDING HAVE A HALO EFFECT?

Evidence from Finnish SMEs*

* Lotta Väänänen, Etlatieto Oy, Lönnrotinkatu 4 B, FIN-00120 Helsinki, E-mail: lotta.vaananen@etla.fi. This paper is one of the supporting studies conducted for the Evaluation of the Finnish Innovation Support System, and as such, its main function is to serve as support material for the evaluators. The views expressed are those of the author. The usual caveat applies.

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ABSTRACT: One commonly mentioned rationale for public funding is its positive signaling effect, often called the “halo-effect”, to the private sector financial institutions about the quality of the firm. This is based on the market failure argument based on the existence of asymmetric information between the financier and the firm, and lack of transparency, particularly in smaller firms. This paper empirically explores the effects of public funding on firms’ willingness and ability to gain access to private sector financing. Overall, the results indicate that market failures based on asymmetric information exist, and that firms do take active steps in trying to make their firms more transparent and signal their quality to the financiers (e.g. by using internationally recognized auditors). This does seem have a positive effect on the firms’ ability to raise external market finance. What kind of role public funding plays in reducing this asymmetry remains unclear. The crucial question that remains in interpreting the results in this paper is the order of moves: is it the public sector funding that induces further private sector financing, or is it the other way around?

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TIIVISTELMÄ: Julkisen rahoituksen saanti on usein sanottu antavan positiivisen signaalin yrityksen laadusta yksityisille rahoittajille, niin sanottu ”halo-efekti”. Tämä perustuu markkina-
puute argumenttiin, johtuen varsinkin pienten yritysten heikosta läpinäkyvyydestä ja epäsymmetrisestä informaatiosta yritysten ja rahoittajien välillä. Tutkimme empiirisesti julkisen rahoituksen saannin vaikutuksia yritysten haluun ja mahdollisuuksiin saada rahoitusta yksityiseltä sektorilta. Tulokset viittaavat siihen, että epäsymmetriseen informaatioon perustuva markkina-
puute on olemassa ja, että yritykset lisäävät läpinäkyvyyttään esimerkiksi käyttämällä kansainvälisesti tunnettuja tilintarkastajia. Tällä näyttää olevan positiivinen vaikutus mahdollisuuksiin saada rahoitusta yksityiseltä sektorilta. Julkisen rahoituksen rooli epäsymmetrisen informaation pienentämisessä jää tämän tutkimuksen valossa epäselväksi. Tärkeä kysymys johon tutkimus ei anna vastauksia on siirtojen järjestys: saako julkinen rahoitus aikaan lisärahoituksen saannin yksityiseltä sektorilta, vai onko se toisin päin?

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1 Introduction

The provision and use of public funding in Finland has recently received attention in Finnish research. For example, Hyytinen and Väänänen (2003) examined the characteristics of firms using public funding, and Hyytinen and Toivanen (2003) explored whether the public funding disproportionately helps firms in industries dependent on external finance to boost R&D intensity and growth expectations. There are also studies on the additionality effects of public R&D funding (Ali-Yrkkö and Pajarinen 2003).

One commonly mentioned rationale for public funding is its positive signaling effect, often called the “halo-effect”, to the private sector financial institutions about the quality of the firm. This is based on the market failure argument resulting from asymmetric information between the financier and the firm, and lack of transparency, particularly in smaller firms. It is often assumed that the public sector may have superior screening ability, and that it can put more resources to this process than the private sector. Thus, a positive funding decision by a public sector organization functions as a signal to the private sector about the firm quality, and should lead to increased ability of the firm to gain access to private sector finance.

The rigor of a selection process may produce valuable information about R&D project quality. The award itself serves as an information signal that other agents may believe and are willing to act upon... This reputation effect is termed “halo-effect”, whereby award winners receive more favourable treatment from other agents compared to similar firms with similar R&D projects. (Feldman & Kelley 2001, p.33)

Relatively little literature exists on the empirical examination of a halo-effect. Feldman and Kelley explore whether firms that win an award from the Advanced Technology Program in the U.S. benefit from a halo effect, and find that

“The NIST/ATP selection process produces valuable information about R&D project quality and provides an information signal that other agents are willing to act upon. Furthermore, the ATP selection signal has information content beyond that provided by technical and business reviewer ratings.” (Feldman & Kelley 2001, p.39)

Private and public sector co-financing is relatively common in Finland (particularly in venture capital financing as well as through Finnvera’s guarantees on private sector loans) but the halo effect remains unexplored. The aim of this paper is to empirically examine whether such halo-effect exists for firms in the Finnish SME population. Several econometric models are used to find evidence for this, although any approach will have limitations in directly answering the following questions that are put forward in this paper:

- 1) What firm characteristics explain firms' reported need for external financing?
- 2) What firm characteristics explain firms' getting access to (or rather firms' *inability* to access) external financing from the private sector, given the reported financing need? Is there evidence of a market failure based on asymmetric information?
- 3) How does previous positive funding decisions by public organizations affect firms' willingness and ability to access private sector finance?
- 4) Do the same firms get financing from both public and private sector at one time?
- 5) Is there a difference between public sector subsidies and public sector debt/equity instruments in inducing firms to access additional financing from the private sector?

Finally, the results of the paper still leave us to ponder whether the public funding decision is crucial for the firm's decision to seek private sector finance on the one hand, and on the other hand, whether the public funding decision works as a signal that conveys firm/project quality to the private financier so that it eases access to finance.

2 Empirical analysis

The empirical analysis in this paper takes the following path: first, it establishes the characteristics of firms that explain its reported need for external finance. It then takes those firms that report a need for external finance, and explores factors that affect firms' ability to receive finance from the private sector. The attempt here is to establish whether there are certain firm characteristics that are associated with a reduced ability to access private sector finance, and thus determine whether a market failure based on information asymmetries exists. In both cases Probit regressions are run, where independent variable dummies are included for whether the firm had received public funding in the previous year, and the year before that. If positive, significant coefficients appear, this could be taken as evidence for a halo-effect. Other factors related to success in attaining public funding, that may also influence the effectiveness of the firm in attracting additional funding from the private sector, are controlled for.

The analysis then moves on to jointly determine the factors explaining firms' willingness and ability to access financing from the private and public sectors. Biprobit regressions enable the analysis of correlations between the error terms of the two regressions.

Finally, the analysis takes another way to model the effects of public funding on firms' access to private sector finance, which attempts to solve problems of causality and endogeneity of the funding variable. The model used in Hyytinen and Toivanen (2003) is modified, replacing the independent variable by a dummy for whether a firm received finance from the private sector.

The empirical analysis in this paper is based on two combined ETLA surveys on SMEs. The first survey, conducted between December 2001 and January 2002, offers detailed information on SMEs (for description, see Hyytinen and Pajarinen 2003). The second survey, conducted in November 2002, complements the first one by asking further questions on the use of both private and public sector financing (for description, see Väänänen 2003a). The combined surveys provide us with information on firms' applications and use of public funding for three consecutive years. Table 1 describes the explanatory variables used in the regressions.

Table 1. Variable description

Name	Type	Description
AGE	continuous	the age of firm in years
EMP	continuous	the number of employees
SMALL	dummy	firm employs < 20 people and has a turnover of < 1 million euros
GROWTH	dummy	targeted average sales growth rate over the next 3 years > 10%
GROWN	dummy	turnover has grown by more than 5% during the last 12 months
PROFIT	dummy	firm's return on assets was positive in the last fiscal year
R&D	continuous	the ratio of R&D expenditures to sales
PATENT	dummy	the firm owns patents
INTANG	dummy	the firm owns intangible assets other than patents
INNO	dummy	the firm innovated a product/process in the past three years
HIGHEXPORT	dummy	the firms exports/sales > 25%
AUDIT	dummy	the firm is audited by one of the 'Big Five' accounting firms
PUBF00	dummy	received public funding in the year 2000 or prior to it
PUBF01	dummy	received public funding in the year 2001
PUBSUB00	dummy	received public subsidies in the year 2000 or prior to it
PUBD00	dummy	received public sector debt/equity in the year 2000 or prior to it
PUBSUB01	dummy	received public subsidies in the year 2001
PUBD01	dummy	received public sector debt/equity in the year 2001
OLDPUB	continuous	share of public sector debt in the balance sheet previous year
OLDPRIV	continuous	share of private sector debt in the balance sheet previous year
REGION	dummy	firm resides in an agricultural municipality
SECTOR		
High-tech	dummy	NACE Rev.1: 244, 30, 321, 322, 353
Medium-tech	dummy	NACE Rev.1: 24 (excl. 244), 29, 31, 323, 33, 34, 352
Info-intensive	dummy	NACE Rev.1: 642, 721, 722, 73, 743
Other	dummy	
PROVINCE		
Uusimaa	dummy	
West	dummy	
East	dummy	
North	dummy	Provinces of Oulu and Northern Finland

Note: also non-linearities of AGE and EMP have been tested for but remained insignificant.

2.1 Regression results

2.1.1 Does market failure based on asymmetric information exist?

The first part of the analysis determines factors explaining firms' need for external finance. The results of the probit regressions on firm's *need for finance*¹, (table 2), indi-

¹ The dependent variable is a dummy equal to 1 if the respondent in the survey replied either having applied for private sector debt and/or equity (questions 4 and 13) or having had a need for external finance but not applied for it from the private sector (questions 5 and 14), and equal to 0 otherwise.

cate that there are several firm characteristics that are associated with an increased need for external finance:

- High R&D intensity, and growth orientation. These results are quite intuitive, as these features directly affect the firm's financing need.
- Prior proportion of debt in the balance sheet, and having received public funding previous year. These are also indicative of certain firms' dependence on external finance, i.e. the financing need persists.
- Using an internationally recognized auditor. This is probably not a factor affecting the financing need but rather a signaling tool by those firms that depend on external financing.

Finally, firms from the knowledge intensive services sector have a reduced likelihood of stating a need for finance. Intuitively, these firms have no capital needs as they operate in the "market for ideas".

The same table shows the results from running regressions on the firm's *success in getting finance*² from the private sector, given its stated need for funding. The following points summarize the results:

- There are three factors that appear to *increase* firm's likelihood of being successful in getting private sector finance: Prior proportion of private sector debt in the balance sheet, having an international auditor, and coming from the medium-tech industry sector rather than the high-tech sector. These point to factors that have reduced the asymmetry of information between the firm and the financier. Also, firms from the medium-tech industry typically have fixed capital that can serve as collateral for financing.
- There are some factors that appear to *reduce* the firm's probability of getting finance from the private sector: Intangible assets in the balance sheet, coming from the high-tech industry sector, and having a high export intensity. At least the first two point towards the conclusion that market failures based on asymmetric information do exist. The reduced ability of firms with high export inten-

² The dependent variable is a dummy equal to 1 if the respondent in the survey replied that some or all of their applications for debt and/or equity had been successful (questions 6 and 15, b or c), and equal to 0 if all of their applications had failed or if they had not applied despite their need.

sity to attain finance from the private sector may be a result of risk-aversity of presumably high export market risks.

Overall, these results indicate that market failures based on asymmetric information may exist, and that firms do take active steps in trying to make their firms more transparent (use internationally recognized auditors).

Table 2. Need for finance, access to private sector finance

	Need finance		Got priv finance	
	Coeff.	z-stat.	Coeff.	z-stat.
AGE _i	0.00	0.49	0.00	0.41
EMP _i	0.00	1.31	0.01	1.06
SMALL _i	0.03	0.18	-0.23	0.83
RD _i	1.18	2.56 **	0.04	0.05
INNO _i	0.21	1.55	0.05	0.18
PATENT _i	0.15	0.70	0.45	1.18
INTANG _i	-0.01	0.08	-0.46	1.68 *
PUBF00i	0.11	0.79	0.20	0.80
PUBF01i	0.31	2.05 **	0.29	1.07
OLDPUBi	0.01	2.32 **	-0.01	1.67 *
OLDPRIVi	0.01	3.50 ***	0.01	1.64
HIGHEXPORT _i	-0.25	1.35	-0.73	2.16 **
GROWNi	-0.01	0.08	0.03	0.12
GROWTHi	0.49	3.43 ***	0.30	1.04
AUDITi	0.36	2.52 **	0.72	2.71 ***
REGION _i	0.03	0.19	-0.17	0.55
SECTOR				
Medium-tech	-0.01	0.05	0.82	2.28 **
Info-intensive	-0.40	1.71 *	0.16	0.43
Other	0.09	0.45	0.81	2.44 **
PROVINCE				
West	-0.21	1.56	-0.41	1.62
East	-0.26	1.05	-0.25	0.62
North	-0.06	0.26	0.33	0.89
Constant	-1.20	4.33 ***	-0.23	0.46
Observations	541		212	
Log likelihood	-312.78		-98.27	
LR Chi ²	98.92		39.67	
degr. of freedom	22		22	
significance	0.00		0.01	
R ² _{pseudo}	0.14		0.17	

* significant at 10%; ** significant at 5%; *** significant at 1%

Source: ETLA surveys on SMEs

2.1.2 Do public and private sector finance go hand in hand?

The following analysis aims to determine the factors associated with firms having accessed private sector finance and public sector finance. In addition, analysis of the correlation between the error terms enables us to determine whether public and private sector finance go together (to the same firms, or firms with a same unobserved characteristic). Biprobit regressions were run for the following pairs of dependent variables: 1) private sector debt vs public sector debt/equity (Table 3), 2) private sector debt vs public sector subsidies (Table 4), 3) private sector equity vs public sector debt/equity (Table 5), 4) private sector equity vs public sector subsidies (Table 6).³ In these regressions, to avoid the results being driven by the obvious co-financing between Finnvera's guarantees and private sector loans, the dependent variable "public subsidies" does not include these guarantees.

Having applied for and received *private sector debt* is significantly affected by the following:

- The proportion of private sector debt in the firm's balance sheet has a positive effect on the likelihood of a firm having applied for and received debt from the private sector. For one, it probably tells us that certain firms are dependent on external finance and thus are more likely to seek new financing than others, i.e. those that have relied on it before, need it again. These firms may also have assets that easily serve as collateral and thus make external financing cheaper. It can also indicate that firms that have once been screened by the private sector financiers have easier access to new financing than those that attempt to access the market for the first time. It may also be that firms' that have invested in credit ratings at one point, face lower costs of obtaining finance later on.
- Having an international auditor increases the firm's likelihood of having applied for and received debt from the private sector. This could be evidence of a market-based signaling mechanism, "voluntary disclosure", (as opposed to government screening) where the firm uses an internationally recognized auditor to convey its quality to the financier. Having a recognized auditor also works as a

³ The dependent variables are dummies equal to 1 if the respondent in the survey replied that they had applied for and received private sector debt (question 6, b or c), private sector equity (question 15, b or c), public sector subsidies (questions 23_2, 23_3, 23_4), and public sector debt/equity (questions 24_1, 24_2, 24_3, 24_4), and equal to 0 otherwise (in each case respectively).

monitoring factor, which alleviates market imperfections arising from moral hazard.

- High growth prospects is (obviously) a factor affecting firms' need for finance.
- Of the public funding variables, only having received public sector debt/equity the previous year has a positive effect. This could be taken as evidence for a halo-effect, but it may also be just another factor indicating to firms' reliance on external finance, be it public or private.⁴

Having applied for and received *private sector equity* is positively influenced by the following firm characteristics:

- Young age.
- Firm innovativeness (firms with high R&D intensity, with patents, and having innovated a new product/process in the past three years).
- Having an international auditor.
- Having received public sector debt/equity the previous year. As with private sector debt, this result could merely be indicating firms' reliance on external finance, or it could point to public private co-financing, or a possible halo-effect.

Having applied for and received *public sector debt/equity* is affected by the following:

- Three of the four public funding variables get a positive and significant coefficient. Both types of public funding the previous year, and public sector debt the year before last, all have a positive effect on the likelihood of a firms having applied for and received public sector debt/equity this year. This may simply be indicative of the fact that firms' projects last several years and they receive public funding throughout the time. It could also point towards a less desirable outcome, that firms that once access the public sector remain nurtured by it for years on, without moving away from subsidized support even when it is not needed. It may also be a case where the public sector ends up refunding projects in trying to avoid facing a failure (throwing good money after bad). Of course, if the public funding each year is based on the positive externality argument, as with R&D funding, it is not a cause for concern.

⁴ The public funding variables (and all other independent variables) were tested for multicollinearity: the VIFs are in the range of 1.07-1.61, thus multicollinearity is not a problem in these models.

- In addition to the funding variables, R&D intensity has a positive effect. Younger firms are also more likely to apply for and receive public sector debt or equity. These indicate that funding does go to firms that generate externalities, as well as to young firms, which are likely to suffer from financial market failures.

Having applied for and received *public sector subsidies* is affected by the following:

- Innovativeness. Having a high R&D intensity and having innovated a product/process in the past three years.
- Prior public funding, both subsidies and debt/equity. This may simply be indicative of the fact that firms' projects last several years and they receive public funding throughout the time. It could also point towards a less desirable outcome, that firms that once access the public sector remain nurtured by it for years on, without moving away from subsidized support even when it is not needed.

Table 3. Biprobit regressions: Used private debt vs Used public sector debt/equity

	Private debt		Public debt/equity	
	Coeff.	z-stat.	Coeff.	z-stat.
AGE _i	0.00	0.08	-0.01	1.86 *
EMP _i	0.00	1.32	0.00	1.39
SMALL _i	-0.10	0.66	-0.26	1.30
RD _i	0.64	1.37	1.59	2.85 ***
INNO _i	0.20	1.37	0.15	0.82
PATENT _i	0.20	0.92	0.39	1.60
INTANG _i	-0.22	1.32	0.00	0.00
PUBSUB00i	0.04	0.25	0.02	0.09
PUBD00i	0.15	0.97	0.46	2.49 **
PUBSUB01i	0.17	1.06	0.33	1.75 *
PUBD01i	0.32	1.74 *	0.73	3.67 ***
OLDPUB _i	0.01	0.88	0.01	0.99
OLDPRIV _i	0.01	3.92 ***	0.00	0.60
HIGHEXPORT _i	-0.40	2.03 **	-0.09	0.42
GROWNI	-0.01	0.11	-0.19	1.12
GROWTH _i	0.50	3.26 ***	-0.24	1.22
AUDIT _i	0.48	3.27 ***	0.06	0.32
REGION _i	0.02	0.12	-0.21	0.90
SECTOR				
Medium-tech	0.21	0.94	-0.11	0.40
Info-intensive	-0.41	1.62	-0.35	1.11
Other	0.24	1.13	0.06	0.22
PROVINCE				
West	-0.30	2.10 **	0.09	0.48
East	-0.25	1.01	0.09	0.28
North	-0.06	0.29	0.50	1.86 *
Constant	-1.51	5.10 ***	-1.45	4.07 ***
Observations		543		
Log likelihood		-429.44		
Wald Chi ²		164.35		
degr. of freedom		48		
significance		0.00		
Rho		0.28		
LR test Chi ²		7.19		
significance		0.01		

* significant at 10%; ** significant at 5%; *** significant at 1%

Source: ETLA surveys on SMEs

Table 4. Biprobit regressions: Used private debt vs Used public subsidy

	Private debt		Public subsidy	
	Coeff.	z-stat.	Coeff.	z-stat.
AGE _i	0.00	0.07	-0.01	1.31
EMP _i	0.00	1.30	0.00	0.87
SMALL _i	-0.09	0.61	-0.23	1.30
RD _i	0.62	1.34	1.00	1.84 *
INNO _i	0.19	1.34	0.32	1.92 *
PATENT _i	0.21	0.95	0.29	1.21
INTANG _i	-0.21	1.28	0.02	0.13
PUBSUB00i	0.06	0.36	0.28	1.59
PUBD00i	0.15	0.97	0.25	1.47
PUBSUB01i	0.17	1.04	0.85	5.25 ***
PUBD01i	0.32	1.72 *	0.50	2.62 ***
OLDPUBi	0.00	0.84	-0.01	1.52
OLDPRIVi	0.01	3.99 ***	0.00	0.40
HIGHEXPORT _i	-0.40	2.03 **	0.34	1.64
GROWNi	-0.02	0.13	-0.20	1.36
GROWTHi	0.51	3.32 ***	0.32	1.80 *
AUDITi	0.48	3.26 ***	0.15	0.88
REGION _i	0.01	0.07	0.28	1.43
SECTOR				
Medium-tech	0.22	0.97	0.02	0.07
Info-intensive	-0.41	1.60	-0.18	0.65
Other	0.25	1.18	-0.09	0.40
PROVINCE				
West	-0.31	2.16 **	0.02	0.12
East	-0.25	1.02	0.38	1.38
North	-0.08	0.35	0.23	0.90
Constant	-1.53	5.16 ***	-1.69	5.15 ***
Observations	542			
Log likelihood	-477.08			
Wald Chi ²	234.73			
degr. of freedom	48			
significance	0.00			
Rho	0.07			
LR test Chi ²	0.52			
significance	0.47			

* significant at 10%; ** significant at 5%; *** significant at 1%

Source: ETLA surveys on SMEs

Table 5. Biprobit regressions: Used private equity vs Used public sector debt/equity

	Private equity		Public debt/equity	
	Coeff.	z-stat.	Coeff.	z-stat.
AGE _i	-0.03	1.86 *	-0.01	1.88 *
EMP _i	0.00	0.16	0.00	1.33
SMALL _i	-0.17	0.56	-0.24	1.18
RD _i	1.79	2.74 ***	1.51	2.62 ***
INNO _i	0.50	1.76 *	0.22	1.15
PATENT _i	0.56	1.78 *	0.36	1.51
INTANG _i	-0.32	1.13	-0.01	0.06
PUBSUB00i	0.42	1.36	0.04	0.19
PUBD00i	0.08	0.30	0.49	2.65 ***
PUBSUB01i	0.08	0.28	0.30	1.57
PUBD01i	0.55	1.88 *	0.68	3.40 ***
OLDPUBi	-0.01	1.26	0.01	1.05
OLDPRIVi	0.00	0.36	0.00	0.50
HIGHEXPORT _i	-0.49	1.51	-0.02	0.11
GROWNi	0.16	0.62	-0.19	1.12
GROWTHi	0.30	0.81	-0.18	0.94
AUDITi	0.43	1.71 *	0.03	0.19
REGION _i	0.06	0.19	-0.28	1.18
SECTOR				
Medium-tech	0.35	0.88	-0.06	0.23
Info-intensive	-0.20	0.45	-0.31	0.96
Other	0.14	0.35	0.16	0.59
PROVINCE				
West	0.14	0.47	0.12	0.64
East	0.25	0.52	0.10	0.31
North	0.85	2.28 **	0.53	1.96 *
Constant	-2.85	4.23 ***	-1.58	4.39 ***
Observations	537			
Log likelihood	-223.63			
Wald Chi ²	126.12			
degr. of freedom	48			
significance	0.00			
Rho	0.40			
LR test Chi ²	5.23			
significance	0.02			

* significant at 10%; ** significant at 5%; *** significant at 1%

Source: ETLA surveys on SMEs

Table 6. Biprobit regressions: Used private equity vs Used public subsidy

	Private equity		Public subsidy	
	Coeff.	z-stat.	Coeff.	z-stat.
AGE _i	-0.04	2.00 **	-0.01	1.21
EMP _i	0.00	0.13	0.00	0.80
SMALL _i	-0.16	0.53	-0.26	1.45
RD _i	1.70	2.62 ***	1.05	1.88 *
INNO _i	0.51	1.73 *	0.33	1.98 **
PATENT _i	0.61	1.96 *	0.27	1.15
INTANG _i	-0.33	1.16	0.05	0.26
PUBSUB00i	0.43	1.39	0.28	1.58
PUBD00i	0.12	0.40	0.27	1.53
PUBSUB01i	0.13	0.47	0.81	4.86 ***
PUBD01i	0.53	1.76 *	0.51	2.61 ***
OLDPUBi	-0.01	1.42	-0.01	1.57
OLDPRIVi	0.00	0.18	0.00	0.48
HIGHEXPORT _i	-0.46	1.40	0.34	1.66 *
GROWNi	0.10	0.38	-0.24	1.60
GROWTHi	0.29	0.76	0.38	2.08 **
AUDITi	0.38	1.48	0.20	1.17
REGION _i	0.02	0.07	0.31	1.56
SECTOR				
Medium-tech	0.34	0.86	-0.02	0.06
Info-intensive	-0.20	0.43	-0.16	0.60
Other	0.15	0.36	-0.15	0.65
PROVINCE				
West	0.12	0.41	-0.04	0.24
East	0.33	0.69	0.29	1.03
North	0.89	2.38 **	0.19	0.71
Constant	-2.77	4.06 ***	-1.67	5.04 ***
Observations	536			
Log likelihood	-264.76			
Wald Chi ²	202.84			
degr. of freedom	48			
significance	0.00			
Rho	-0.09			
LR test Chi ²	0.25			
significance	0.62			

* significant at 10%; ** significant at 5%; *** significant at 1%

Source: SME surveys on SMEs

The correlations between the error terms in the four pairs of regressions show two things:

- Positive significant coefficients appear in the two regressions regressing private sector finance with *public sector debt/equity*. Thus, there are uncontrolled factors, which affect the willingness and ability of firms to gain access to both private and public finance in the same way, or it is possible that it is the same firms that access both types of financing. If this is the case, it could be that the public sector's funding decision has played a role in either the firm's willingness to seek additional financing, or the private financier's willingness to grant financing, or both. It may also be that the public financing has both a risk-reducing role and a leverage effect from the private financier's point of view. However, it is not possible to draw any robust conclusions regarding these aspects.
- No significant coefficients appear in the two regressions regressing private sector finance with *public sector subsidies*. This evidence points to the conclusion that public sector subsidies are accessed by firms that generally do not also access private sector finance. Thus, public sector subsidies do not seem to positively affect either firms' willingness or ability to seek additional financing from the private sector. Then again, assuming that financial needs are limited rather than boosted by the initial (public) funding, one would expect negative correlation between the error terms, which is also not the case here.

2.1.3 Does public funding reduce information asymmetry?

Another way to try and assess the effects of public funding on the firms' willingness and ability to gain access to private financing is by using the model put forward by Hytinen and Toivanen 2002. While their dependent variables were R&D intensity and growth expectations of the firm, the model in this paper uses their set of explanatory variables to explain whether the firm applied for and received private sector finance. Their argument was based on the fact that if capital market imperfections exist, the supply of public funding should boost firms' growth expectations and R&D intensity disproportionately in firms coming from industries that are dependent on external finance. My argument here is similar: if capital market failures that are based on asymmetric information and inability of the private sector to screen sufficiently exist, then the sup-

ply of public funding should increase the firm's ability to gain access to private sector funding, and disproportionately so in the industries most dependent on external finance.

- No significant coefficient appears for the interaction variable (supply of public funding * industry's dependence on external finance) in explaining firm's access (willingness and ability) to private sector finance.

Thus, from this model it seems that supply of public funding does not mitigate market failures based on asymmetric information.

2.2 Assessment

The above results are somewhat mixed. It does seem that there may be a market failure based on asymmetrical information, and that firms take actions of voluntary disclosure to overcome them. What kind of role public funding plays in reducing this asymmetry remains unclear. As regards public subsidies, the findings are consistent with the absence of a halo effect. On the other hand, some of the results concerning public sector debt/equity could be consistent with the existence of a halo effect.

- Lack of positive correlation of error terms in regressing private sector finance with public subsidies is consistent with the interpretation that subsidies do not induce firms to seek and receive additional financing from the private sector the year they receive a subsidy. The lack of positive significant coefficients for past public subsidies in explaining private sector debt or equity is consistent with the analysis that public subsidies do not have a halo-effect.
- Lack of positive significant coefficients of any "public funding in 2000 or prior" -variable in explaining private sector debt or equity is consistent with the interpretation that positive public funding does not have a *long-lasting* halo-effect.
- Lack of positive significant coefficients of the supply of public funding on the firm's willingness and ability to seek private sector finance is consistent with the interpretation that positive public funding does not have a halo-effect.
- Positive significant coefficients of public sector debt/equity during the previous year in explaining both private debt and private equity can be consistent with the

existence of a positive halo-effect. It could also be the result of co-financing in projects that last more than a year.

- Positive correlation of error terms in regressing private sector finance with public sector debt/equity can be consistent with a halo-effect, or that good firms have access to both public and private funding (or co-financing).

It is likely that when seeking to finance a project, when the public sector agrees to fund a part of it, the firm looks for the remaining part from the private sector. If it is that the positive funding decision by the public organization is a crucial factor in the firm getting access to private finance, it is a case of halo-effect. However, it could also be that the firm could have received private sector finance regardless of the public funding decision. It may also be that the public sector funding decision is the critical factor in the firm deciding to undertake the project. Then, without public funding, the project would not have been undertaken at all and no private financing would have been sought for. This would point to the additionality effect of public funding. It is quite impossible to determine which one is the case here. The crucial question that remains in interpreting the above results is the order of moves: is it the public sector funding that induces further private sector financing, or is it the other way around? It could just as well be, that private sector financing comes first, and it then seeks public funding to accompany it for leverage and to reduce risks, or that it is easy for the public funding to come in after the private sector has screened the project/company.

3 Conclusions

One commonly heard claim about the positive effects of public funding is that it works as a signal to the private financiers about the quality of the firm or the project. From theoretical perspectives, it is possible to argue that a market failure exists due to asymmetric information between financiers and firms, especially young, small, innovative firms. Thus, if the screening by the public organizations is viewed as thorough and reliable by the private sector, it may then have the claimed “halo-effect” on private financing that would otherwise not have been accessible by the firms in question. This paper empirically explores the effects of public funding on firms’ willingness and ability to gain access to private sector financing in the following years.

The first step was to explore whether empirical evidence can back the existence of a market failure based on asymmetric information between the financier and the firm. The results showed that:

- Factors that have reduced the asymmetry of information between the firm and the financier, i.e. prior proportion of private debt in the balance sheet and having an international auditor, appear to increase firm’s likelihood of being successful in getting private sector finance.
- Factors that appear to reduce the firm’s probability of getting finance from the private sector are related to the existence of asymmetrical information. That is, intangible assets in the balance sheet (financial institutions tend to rely on collateral) and coming from the high-tech industry sector (high risk and unpredictability of the projects).
- Overall, these results indicate that market failures based on asymmetric information may exist, and that firms do take active steps in trying to make their firms more transparent and signal their quality to the financiers (internationally recognized auditors). This does have a positive effect on the firms’ ability to raise external market finance.

The empirical evidence shows that public subsidies do not seem to have a positive effect on firms’ willingness and ability to raise private sector finance. On the other hand, public sector debt/equity financing seems to go hand in hand with private sector financing, at least to some extent. The evidence in this paper is not sufficient to reach conclusions about the causality. However, it does provide some evidence on this issue

and points way to further research. Based on the empirical results of this paper, three competing hypotheses can be formulated which warrant further examination:

- 1) “Good” firms that need financing seek and receive it from both the public and private sectors. The public funding decision is not a prerequisite for the firm to undertake the project and also seek private financing (no additionality), nor is it a prerequisite for the private financier to grant the firm financing (no halo-effect). Thus, without the public funding, the project would have been undertaken financed from the private sector alone and public funding is superfluous.
- 2) Firms seek funding from the public sector for a project, and the funding decision is a prerequisite for the firm to undertake the project and seek complementary financing from the private sector (additionality). The same project could have been funded by the private sector alone, but the firm does not have an incentive to undertake it, possibly due to large spillover effects, and thus the public funding decision (subsidized financing) is critical for the project. The public funding is alleviating the positive externalities -based market failure.
- 3) Firms would have the incentive to undertake the project with market-priced financing alone, but due to the nature of the project or the firm, they are not granted financing from the private sector (or the cost is excessively high), because of the firm’s inability to convey its quality to the financier. Then, if the public organisation’s screening process is believed to be of high quality, the positive public funding decision works as a signal to the private financier about the firm’s quality and thus mitigates the capital market failure based on information asymmetries.

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THE RESEARCH INSTITUTE OF THE FINNISH ECONOMY

LÖNNROTINKATU 4 B, FIN-00120 HELSINKI

Puh./Tel. (09) 609 900

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