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IMPACT OF BUSINESS SUBSIDIES ON GROWTH OF FIRMS - PRELIMINARY EVIDENCE FROM FINNISH PANEL DATA

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Abstract: This study examines the impact of business subsidies on beneficiary and non-beneficiary firms during a short three year period, from 1995 to 1997. The indicator measuring the impact of subsidies on these firms is their Value Added growth over the three-year period. The study is based on financial data of firms and data of subsidies given to firms found in the databases of the Finnish Taxation Authorities. In the data analysed the aid is distributed through four different organisations: the Ministry of Trade and Industry (KTM), the National Technology Agency (TEKES), the Ministry of Labour (TM) and the Ministry of Agriculture (MMM).

A very large amount of records (approx. 36 000) with firm-specific data is utilised. Some of the firms (35 percent) had received subsidies during the period examined and some had not. Several multivariate models are built at aggregate and disaggregate level. From the analysis it appears that there is a positive relationship between subsidies and Value Added growth. However, the relationship is sensitive to the choice of variables in the models. Only in some of the models do the subsidies turn out statistically significant. And even then, the magnitude of the subsidies' influence to the firms' Value Added growth is relatively small considering the amounts of subsidies spent. Notwithstanding certain limitations in the study, the low estimated impact raises questions on the effectiveness of the business subsidy policies currently in force.

Key words: Value Added Growth, Business Subsidies, Impact

Tiivistelmä: Tutkimuksessa käsitellään yritystuen vaikutuksia tukea saaneisiin yrityksiin ja ilman tukea toimineisiin yrityksiin lyhyellä kolmen vuoden jaksolla 1995–1997. Vaikutuksia mitataan yritysten arvonlisäyksen kasvulla vuosina 1995–1997. Tutkimus perustuu yritysten tilinpäätöstietoihin ja verohallituksen tietokantoihin. Analysoinnin kohteena olevaa tukea jakaa neljä eri organisaatiota: kauppa- ja teollisuusministeriö (KTM), Teknologian kehittämiskeskus (TEKES), työministeriö (TM) ja maa- ja metsätalousministeriö (MMM).

Tutkimuksessa käytetään hyväksi hyvin suuren yritysjoukon (noin 36 000) yrityskohtaista aineistoa. Osa (35 prosenttia) näistä yrityksistä sai yritystukea tutkitun jakson aikana, osa ei. Aggregoidulla ja disaggregoidulla tasolla rakennettiin useita monimuuttujamalleja. Analyysi osoittaa, että tukien ja arvonlisäyksen kasvun välillä on positiivinen riippuvuus. Se on kuitenkin herkkä mallien muuttujavalinnalle. Vain joissakin malleissa yritystukien vaikutus osoittautuu tilastollisesti merkitseväksi. Ja silloinkin suuruusluokka, jolla tuki vaikuttaa yritysten arvonlisäyksen kasvuun, on suhteellisen pieni, kun ottaa huomioon tukeen käytetyt rahamäärät. Tutkimuksen tietyistä rajoituksista huolimatta tulokseksi saatu tukien vähäinen vaikuttavuus oikeuttaa kysymään, kuinka tehokasta nykyisin käytössä oleva yritystukipolitiikka on.

Asiasanat: Arvonlisäyksen kasvu, yritystuet, vaikuttavuus

1. Introduction[1]

The study and its importance

This study examines the impact of government business subsidies on the performance of firms. The impact is measured by estimating the effect of subsidies on the Value Added growth of a sample of firms, some of which have received and some others which have not received subsidies. Microdata from a large population of firms is available for the years 1995-1997. Hence we use observations from that period to calculate the Value Added growth indicator. In the sample, the subsidies received have been granted from four different government bodies, namely the Ministry of Trade and Industry (KTM), the National Technology Agency (TEKES), the Ministry of Labour (TM), and the Ministry of Agriculture (MMM).

The study attempts to answer two simple but very vital questions: *Is there any real impact - measured in Value Added growth - when distributing business subsidies to firms? What is the magnitude of the impact of implementing this policy on both the beneficiary and non-beneficiary firms?*

The answers to these questions are important for many obvious reasons. First, notwithstanding the pressures for fiscal consolidation, large amounts of public funds are still spent for business subsidies in many countries. Second, questions of unfair competition rise through the implementation of this subsidising process. Third, socio-economic convergence goals are imposed by governments who attempt to fulfil them through subsidies. Fourth, business subsidies are widely used as a tool in correcting market inefficiencies and failures. Finally, one must not disregard the legal accountability of the distributors of subsidies which stems from the European Union (EU) directives and the Finnish legislation.

Some aggregate statistics on business subsidies

In most countries governments tend to subsidise private firms in many ways. In the EU the business subsidies amount to about 1,12 percent of GDP and to 2,35 percent of total central government expenditure. As shown in Table 1, disparities among the Member States are evident. For example, between 1996 and 1998 the respective figures for Portugal were 1,63 and 3,44 percent, for Italy 1,57 and 3,04 percent, but for the UK 0,52 and 1,20 percent and for Sweden 0,78 and 1,24 percent.

Also in Finland, the respective share has traditionally been lower. From 1984 to 1996 business subsidies ranged between 0,7 to 1,16 percent of GDP and 2 to 3 percent of total government expenditure. In the 1990s the development of business subsidies has been counter-cyclical; they peaked in 1991-1993 when the Finnish economy went through a severe recession. The present study focuses on observations from the years 1995 to 1997, a period characterised by an economic recovery and declining subsidy outflows. In 1997 business subsidies had dropped to about 0,5 percent of GDP and 1,6 percent of total government expenditure[2] (Table 2). Nonetheless, subsidies still constitute a substantial amount of public outlays.

1 I would like to thank Matti Virén, Jaakko Kiander, Seppo Kari, Roope Uusitalo, Teuvo Junka, Risto Sullström, George Nikolakaros and Jyrki Ollikainen for their helpful comments. The author alone is responsible for the arguments stated and for any mistakes found in the text.

2 The difference between the Finnish figures shown in Table 1 and Table 2 is probably due to the different base year deflator used, as well as the different way with which total government expenditure is calculated for this purpose at EU level and at national level.

Table 1. Overall subsidies* in the EU Member States in percent of GDP and relative to government expenditure

	Subsidies as % of GDP**	Subsidies as % of Gov. Expenditure**
Austria	0,65	1,23
Belgium	1,18	2,26
Denmark	0,94	1,59
Germany	1,45	2,95
Greece	1,24	2,25
Spain	0,98	2,22
Finland	0,47	0,85
France	1,13	2,08
Ireland	0,99	2,66
Italy	1,57	3,04
Luxembourg	0,53	1,27
Netherlands	0,62	1,24
Portugal	1,63	3,44
Sweden	0,78	1,24
UK	0,52	1,20
EUR 15	1,12	2,35

Source: CEC, p. 54
* Agriculture produce subsidies not included
** Average for the period 1996-1998 in 1997 prices

Table 2. Business subsidies and government expenditures in Finland 1984-1997

Year	Subsidies *	Subsidies as % of GDP	Subsidies as % of Gov. Expenditures
1984	3 358	0,70	2,53
1985	3 400	0,69	2,42
1986	3 439	0,68	2,32
1987	3 579	0,68	2,27
1988	3 353	0,60	2,29
1989	3 951	0,68	2,59
1990	4 298	0,74	2,73
1991	5 502	1,01	2,99
1992	5 554	1,05	2,75
1993	6 094	1,16	2,84
1994	5 746	1,06	2,80
1995	4 489	0,80	2,26
1996	4 308	0,73	2,16
1997	3 018	0,48	1,64

Source: Junka and Venetoklis, pp. 233-234
* in FIM 1 000 000; in 1995 prices

Since we are dealing with Value Added growth of firms it is also interesting to examine how these amounts have developed at aggregate level. Table 3 lists the real annual Value Added of all firms residing in Finland for the period 1984 to 1997 as well as their percentage growth from year to year. Note that for the period we examine (1995-1997) the average Value Added growth was quite high, at 12,6 percent.

Table 3. Value Added growth of firms 1984-1997

Year	Value Added *	yr/yr % change	
1984	315 410		
1985	325 509	3,20	
1986	333 116	2,34	
1987	347 097	4,20	
1988	363 665	4,77	
1989	385 137	5,90	
1990	386 639	0,39	
1991	353 450	-8,58	
1992	341 086	-3,50	
1993	342 675	0,47	
1994	364 425	6,35	
1995	380 582	4,43	95-97 %
1996	399 109	4,87	change
1997	428 749	7,43	12,66

Source: Statistics Finland
* in FIM 1 000 000; in 1995 prices

Finally Table 4 lists the amount of business subsidies in Finland based on the distributing organisation for the period 1990-1997. Over 80 percent of all aid is distributed by the four organisations we have in our sample, with the KTM having the lion's share. We see that aid from TEKES is very substantial part of the total KTM aid and has been growing steadily despite the decrease of the KTM's traditional business aid. The aid through the Ministry of Labour peaked during the recession (1992-1994) but has also been gradually diminishing since. The MMM business aid is insignificant and amounts to less than 2 percent of the total business aid.

Table 4. Business subsidies* in Finland per distributor 1990-1997

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
VN - Council of State **	-3,2	-2,9	-8,4	-5,7	-8,1	-14,0	-9,0	-3,2
UM - (M)inistry of For. Affairs	33,4	41,7	50,4	40,2	34,7	34,2	32,3	26,1
SM - M of Interior	4,3	0,0	0,0	0,0	0,0	0,0	0,0	193,8
PM - M of Defence **	0,0	-0,4	1,8	3,3	1,9	4,5	3,6	1,6
VM - M of Finance	147,3	197,4	199,1	220,5	177,3	173,0	59,7	44,6
OP - M of Education	181,6	196,5	161,9	130,9	170,5	296,3	357,0	518,2
MMM - M of Agriculture	2,0	1,7	20,5	48,0	58,6	46,8	47,2	35,7
LM - M of Transport	813,3	954,7	882,0	476,7	609,4	470,3	361,8	223,9
KTM - M of Trade & Industry	2117,9	2991,2	2691,3	3830,1	3709,4	2861,2	3149,9	1667,8
- of which TEKES	191,8	251,7	308,7	446,4	325,7	607,5	615,9	665,3
TM - M of Labour	505,2	592,0	1049,7	916,1	689,9	530,4	319,8	315,0
YM - M of Environment	48,5	47,0	61,8	77,5	74,6	86,5	55,4	50,0
Total	3850,2	5018,9	5110,0	5737,5	5518,3	4489,2	4377,7	3073,5

Source: Statistics Finland
*in FIM 1 000 000
** Negative figures are probably due to redemption of state guarantee subsidies given earlier to firms

Earlier studies on business subsidies

Business subsidies and the measurement of their impacts has always been an object of interest among researchers. Especially in the last few years, the interest has been growing rapidly. This is partly due to the legislation at EU and at national level which clearly obliges the agents involved in the distribution of subsidies to evaluate these operations.

When we measure the impact of a governmental policy, we conduct a type of evaluation[3]. Here we will not attempt to make a comprehensive review of the topic. Rather, we shall refer to a few studies conducted the last few years in Finland and in Sweden. Some of them are in nature close to the current study and from which, we have obtained certain ideas on design logic and analysis.

Impact studies of business subsidies could be classified in many different ways. One could be based on the type of indicator they measure (e.g. investment growth, labour growth, R&D growth); or on their methodological approach (e.g. quantitative, qualitative, survey analysis, econometric modelling); or even on the level which they examine (e.g. aggregate/macro, disaggregate/micro, program, firm). One central feature of this study is that it attempts to measure impact at a very aggregate level. Because of this, we do not disaggregate the analysis based on the type of aid, although we have several types of subsidies distributed in our sample. Only in the latter part of the study, do we control for the *source* of aid (see section 3.2). Another characteristic, quite unique, is the vast amount of observations analysed at firm level. We have not come across to any similar studies measuring the impact of business subsidies that utilise so many records of firms (over 36 000).

Okko (1986) measured the effectiveness of public finance towards industrial firms in the southern part of Finland, using logit and tobit estimators. He concluded among others, that subsidies do not seem to play a major role in the development growth of the beneficiary firms and that it is difficult to measure with certainty the subsidies' effectiveness on the firms. Tervo (1990) used a logit regression approach to estimate displacement effects linked to characteristics of firms receiving regional development subsidies between 1975 and 1981 in Finland. Although the results indicated that these effects can be linked to certain firm characteristics, there was also certain ambiguity in the results due to misclassification. The effectiveness of grants to businesses was the focus of a study by Myhrman et al. (1995). Empirical qualitative research was employed by interviewing several companies, recipients of state aid. The study reported in general positive effects of business aid, but that depended on the type of aid examined and on the indicator measured. Another study on the effectiveness of state aid is one by Kuitunen and Lavaste (1995). The study utilised qualitative (case-study) techniques. It examined whether the aid granted created an unfair competition environment between the beneficiary and non-beneficiary enterprises. The aid in question was Investment and Development aid given by the KTM. The results were inconclusive. Itkonen et al. (1998) presented an evaluation of the Objective 2 programs in Finland for the programming period 1995-1999. In a separate section of the report, subsidies towards companies were examined. The report listed certain positive effects of the subsidies on the beneficiary firms in terms of new jobs created or sustained, improvement of operations, internationalisation, product development and profitability. Kjellman et al. (1998) analysed EU investment subsidies given to the Finnish fish processing industries using logistic regression models. The study reported that, despite considerable dead-weights, the subsidies generate investments and increase product quality. Bergström (1998) examined the effects on total factor productivity growth of public capital subsidies to industrial firms in Sweden between 1987 and 1993. Tuomiaro and Virén (in Junka, 1998) analysed the impact of subsidies on firms in the wood and furniture industrial sector during a seven-year period 1988 - 1994. Finally last year, Niininen (1999) studied the effects of public R&D subsidies on firms' R&D investment between 1985 and 1993. We will refer to the results of the last three papers in section 4.2.

A consensus of the results in the aforementioned studies is that the measured impacts of business subsidies to firms are mixed. Some studies reported positive impacts, some minimal, some none and some claimed that impacts are very difficult to calculate with certainty. In the majority of the studies where the impacts were shown to be positive, the results reflected the origin of the commissioners of the study. This is in accordance with statements made by Barkman and Fölster (1995, p.114). They argue that "…academic studies have often found only small effects of subsidies using sophisticated

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3 According to the definitions given by the US General Accounting Office (GAO, 1998, p.5) evaluation is classified into four different types, based on the focus and the usage of evaluation:

Process (or implementation) evaluation assesses the extent to which a program is operating as it was intended.

Outcome evaluation assesses the extend to which a program achieves its outcome-oriented objectives.

Cost-benefit and **cost-effectiveness** analyses compare the program's outcomes with the costs (resources expended) to produce them.

Impact evaluation is a form of outcome evaluation that assesses the net effect of a program by comparing program outcomes with an estimate of what would have happened in the absence of the program. This form of evaluation is employed when external factors are known to influence the program's outcomes, in order to isolate the program's contribution to achievement of its objectives.

methods. In contrast, studies commissioned by subsidy providing agencies often point to large positive effects, but usually utilising ‘suspect’ methods”.

The rest of the paper is organised as follows. In section 2 we describe the data at hand, and discuss the logic behind the design of the study. In the same section we also show how we selected the dependent and the predictor variables utilised in our regression models. In section 3 we list several simple ordinary least squares (OLS) models and commend on the results. We conclude in section 4, where we refer to certain policy implications that are evident from the results. At the same time we discuss the assumptions and limitations that one needs to be aware of, when reading the study. In the Appendix a table contains different aggregate amounts of total aid paid out and of Value Added growth. These amounts are used for estimation purposes.

Business subsidies encompass a whole range of financial instruments. For this study nevertheless, we define business subsidies only as direct capital outflows from government ministries and agencies/organisations to private for-profit firms. The utilisation of these funds is mainly for investments in machinery, equipment, buildings, for subsidising labour costs, for labour educational programs and finally for expenditures related to R&D. The firm does not have the obligation to return the funds to the distributing body, unless of course something goes wrong and the procedural rules are breached. Indeed our sample includes only these direct subsidies.

The names business subsidies, subsidies and aid are used interchangeably in the text and mean the same thing. The same applies for the names firms, businesses, companies and enterprises.

2. Data and variables

2.1 Data

The data used in this study consisted of several databases which were linked together. One group of databases contained Financial Statements data (Balance sheet and Profit and Loss figures) of firms which submitted their tax declarations to the Taxation Authorities (Verohallitus - VH) during the years 1995, 1996 and 1997.

Another group of databases consisted of government subsidies data paid out to firms during the years 1995, 1996 and 1997. The source of the subsidies were four different government organisations/agencies: the Ministry of Trade and Industry or KTM , the Finnish National Technology agency or TEKES, the Ministry of Labour or TM, and the Ministry of Agriculture or MMM[4].

In cases where more than one subsidy payment was recorded per firm, the payments are summed on the basis of source and on the year in which they were paid out. In other words, in our analysis we did not have payments *per project financed* but rather subsidies paid *per firm per year* from each of the aforementioned sources[5,6].

The initial joined database contained 321063 records of firms (Table 5). Some of these firms had received subsidies during the examined period (187435); some others had not (133618). Note that the amount of repeater[7,8] beneficiary firms was quite substantial. This depended on the source of aid and consequently on the *type* of aid received.

For example aid coming from the MMM was given three years in a row to more than 72% (84275/116311) of all those firms that received aid from MMM. The respective number for the KTM was 5% (372/5308) and for the TM 7% (3035/58258). It is also interesting to note that 3,7% of all beneficiary firms (7001/187435) received aid during this short three-period from more than one source of aid.

4 VH receives from each of the Ministries and Agencies either in electronic form or in paper the subsidies paid out to firms. We were assured that we received the analytical subsidies data that VH itself received in electronic form.

5 There might have been other sources from which the firms of our database received subsidies but that was not possible to examine. See also table 4 and section 4.1.

6 Of course we would have rather obtained amounts of aid paid out in total per project per firm. Had we obtained this kind of data, we would have been in a better position to attribute the growth of the firm's Value Added to the aid received and to the frequency with which she received it. However, the data given to us was not that elaborate as to which project the aid was meant for. Thus we had to contend our selves and use the yearly aid payment aggregates.

7 According to our classification, a repeater beneficiary firm is one that received aid in more than one year during the three year period; she is not necessarily a firm which received aid for different projects in more than one year. It may well be that payments for one and the same project have been disbursed over a two year or even a three year period. That depends on how quickly the firm herself has produced the respective invoices of the costs to the source of aid. See also next footnote.

8 For certain types of projects and types of aid, the beneficiary firm has first herself to pay for the costs and then present the invoices to the source for reimbursement.; for others, the funds are disbursed "right up front".

Table 5. Initial amount of records received with data on firms and their subsidies

		Source No aid	KTM	TEKES	TM	MTYE[9]	MMM	Comb.	Total
When paid	**No aid**	133618							133618
	95		1273	145	15233		8558	232	25441
	96		1174	76	13546	33	1126	59	16014
	97		1235	60	15748	27	9575	290	26935
	95, 96		619	62	4523		6519	822	12545
	95, 97		176	12	1221		444	563	2416
	96, 97		459	54	4952	22	5814	793	12094
	95, 96, 97		372	76	3035		84275	4242	92000
	Total	133618	5308	485	58258	82	116311	7001	321063

Unfortunately not all of these records of firms had financial data which we could use in our models. A substantial amount of data were missing[10]. In addition, numerous variables were erroneously inputted. We thus selected only those records of firms whose variables contained financial and subsidy values that could be used in our models. The final amount of records with firm data that was analysed is shown in Table 6.

As we mentioned in the introduction the types of subsidies analysed are used for capital investments, for labour related expenditures and for R&D. The government organisations listed below specialise in distributing specific type of subsidies (e.g. the KTM distributes capital subsidies, the TM distributes labour related subsidies and the TEKES distributes R&D subsidies to technology firms). Nonetheless, there are exceptions. For example, the KTM can distribute a so called development subsidy which may resemble slightly an R&D subsidy but geared to industrial firms. Also, particularly in the case of the MMM, the subsidies analysed refer only to investments subsidies (e.g. investments in machinery and equipment for farms); subsidies for the support of agricultural production are *not* analysed (see also footnote 17).

9 MTYE stands for the Finnish Farmers' Pension Organisation. The amount of firms receiving aid from this source are quite small, but are nevertheless reported since they appeared in our initial sample. The final sample of firms examined (Table 2) did not include any of these 82 firms.

10 As to why such a substantial amount of data was missing, there are several explanations. First, in the three-year period examined some existing firms stopped their operations and some new firms were established. We excluded those firms that did not have financial data in all three years.

Second, the majority of the firms that received aid from the MMM did not have financial data in the dataset given to us. These firms are agricultural enterprises and in Finland, for taxation purposes, agricultural enterprises are not classified as "businesses". They thus have a different reporting system for their tax declarations and their financial data. In the database we received containing the financial statements of firms, the majority of these agricultural enterprises was not present. On the contrary, in the database which contained the subsidies data, these agricultural firms were present. Hence, when we joined the two databases there was a sharp decline of observations and variables available for analysis from this subset of firms.

Finally, as far as the other missing observations are concerned from the other source categories, we can only speculate. One reason might be that the type of some of these firms is small (e.g. personal) and some do not generate financial information in the format that we could analyse. This seems to be the case at least for the firms which did not receive any aid.

Table 6. Sample of firms examined based on source of subsidies

AIDSOURC	Frequency [11]	%
No aid from KTM, TEKES, TM, MMM during 95-97	23769	64,86
KTM aid only during 95-97	1298	3,54
TEKES aid only during 95-97	118	0,32
TM aid only during 95-97	8993	24,54
MMM only during 95-97	253	0,69
Combination of aid from KTM, TEKES, TM, MMM, 95-97	2214	6,04
Total	36645	100,00

In Table 7 we list some descriptive financial data of our examined sample controlling on whether the firms in question received aid or not. The variables listed are the percentage change of Value Added growth between 1995 and 1997 (DLNVA975) and the absolute amount in marks of the Value Added growth for the same period (DVA97_5). In addition, we list the Value Added amount (VA95), the sales (SALES95T), the operating margin (OPEMA95T), the total assets (TOTA95T), the personnel amounts (PERSO95T), and the tangible assets (TANGA95T), all for the year 1995.

Table 7. Selected financial data statistics of beneficiary and non-beneficiary firms

	Variables	N	Mean *	Std. Deviation *	Skewness	Kurtosis
Non- ben. firms	**DLNVA975**	23 769	0,110	0,514	0,2	11,5
	DVA97_5 *	23 769	206	2 001	6,2	241,5
	VA95 *	23 769	1 682	3 887	8,6	108,8
	SALES95T *	22 318	9 913	573 780	148,4	22 120,6
	OPEMA95T *	23 356	570	1 783	10,5	174,2
	TOTA95T *	23 430	4 490	45 765	48,2	2 915,0
	PERSO95T	23 769	9,2	15,3	6,3	56,2
	TANGA95T *	23 769	868	4 795	16,9	374,2
Ben. firms	**DLNVA975**	12 876	0,181	0,530	0,4	10,6
	DVA97_5 *	12 876	651	3 432	5,6	97,2
	VA95 *	12 876	3 404	6 749	4,8	29,9
	SALES95T *	12 199	10 810	33 408	19,4	718,8
	OPEMA95T *	12 641	1 042	2 614	6,5	61,4
	TOTA95T *	12 685	7 563	45 520	54,4	4 108,9
	PERSO95T	12 876	18,6	27,3	3,5	15,4
	TANGA95T *	12 876	2 096	7 447	9,0	108,0

* in FIM 1 000

In general we see that the distributions of the examined variables for the beneficiary firms are more spread than the respective ones of the non-beneficiary firms (except for the SALES95T variable). The non-beneficiary firms have more skewed distributions and also more observations ”under the tails”. We also notice that the financial figures of the beneficiary firms seem to be ”better”. That is, the firms which received aid during the three year period had in general higher average sales, better operating margins, their total asset and tangible asset values were stronger and employed on average more people, at least during the first year (1995) of our examined period. Pair-wise t-tests confirmed all these differences (tests are not shown)[12].

11 These numbers differ slightly depending on the version of the independent variable used for aid. Here for example, they are based on the variable TAVA95P0 (for more on these variables, see section 2.2).

12 This is a simplistic comparison of the financial status of the two groups. However, for the purpose of this section where we want to examine for rough differences if possible, this suffices.

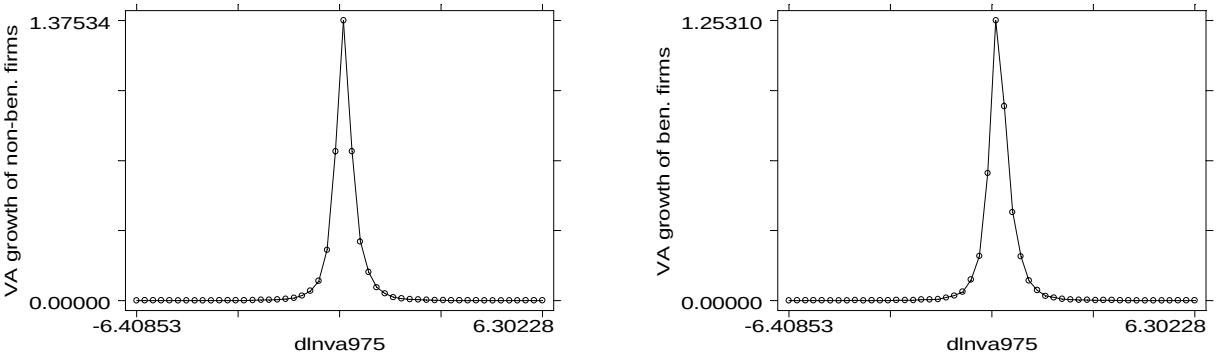
We could justify these differences by the selection process that apparently is implemented when aid is distributed. The ministries and agencies handling applications for business subsidies, select the "better" applicant firms[13]. Indeed the law stipulates that only profitable firms are eligible for aid. Later on, when we measure the impact of received aid on the growth of Value Added, this selection bias will be again discussed.

The beneficiary firms' Value Added growth rate was higher than the respective rate of the non-beneficiary firms (18,1% to 11,0%). Figure 1 below shows graphically the kernel density estimation of the Value Added growth (differences of logged values of VA for 1995 and 1997-DLNVA975) for the two groups of firms. Note that the two distributions are more or less similar. We may thus say that the firms in our sample are not growing at completely different speeds during the period examined, although on average the beneficiary firms seem to have achieved a higher Value Added growth.

Figure 2 displays again the kernel density estimation for the VA growth of the beneficiary firms but now controlling for the source. The VA growth looks to be evenly distributed around the middle regardless of the source.

Finally figure 3 lists the kernel density estimation of the subsidies received (logged) based on source. In general the distributions have a tail to the left. TEKES apparently pays out the most in subsidies per project where as TM spends the least.

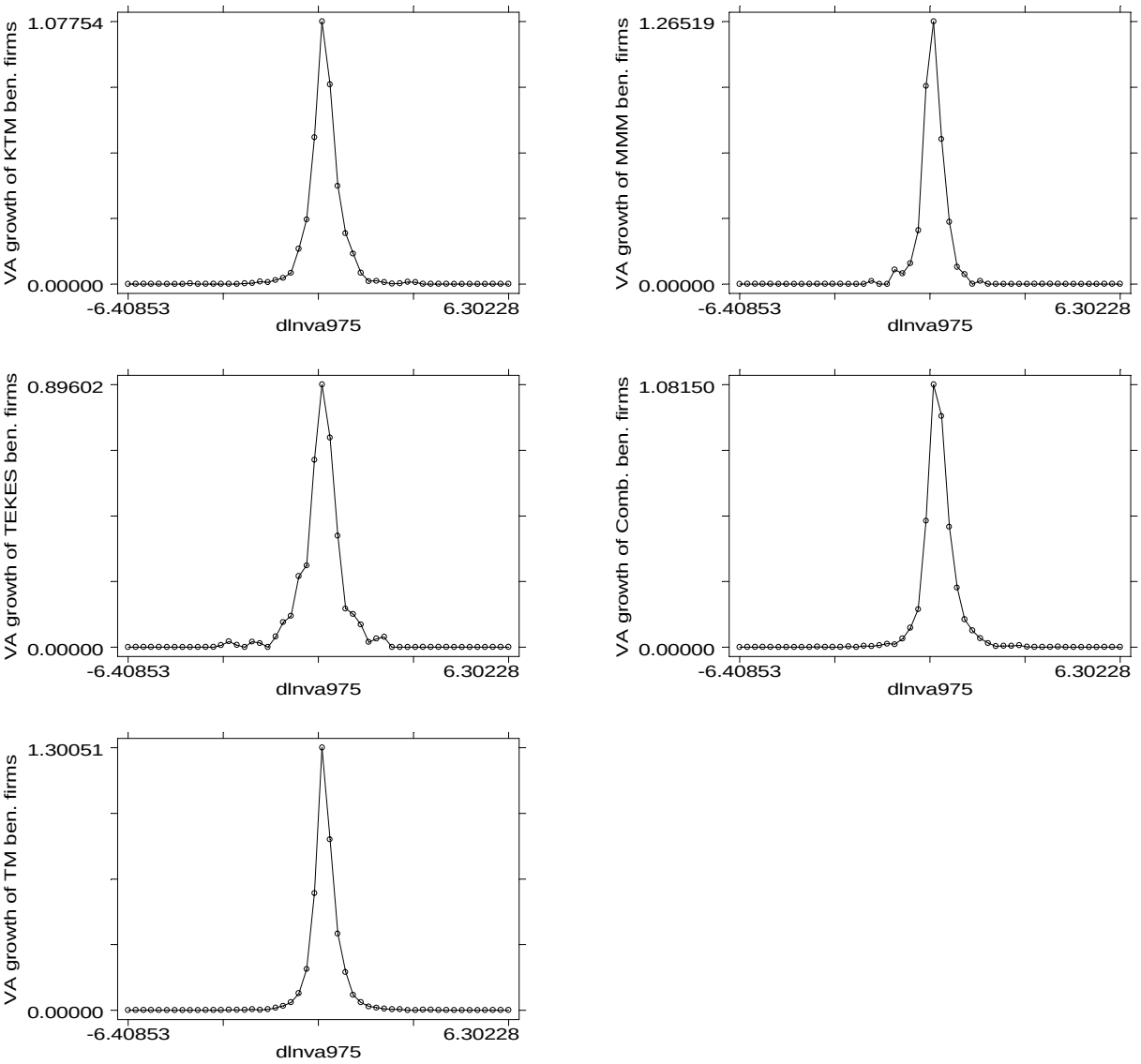
Figure 1. Kernel density estimation of VA growth* for non-benefiary and beneficiary firms



* differences of logged values

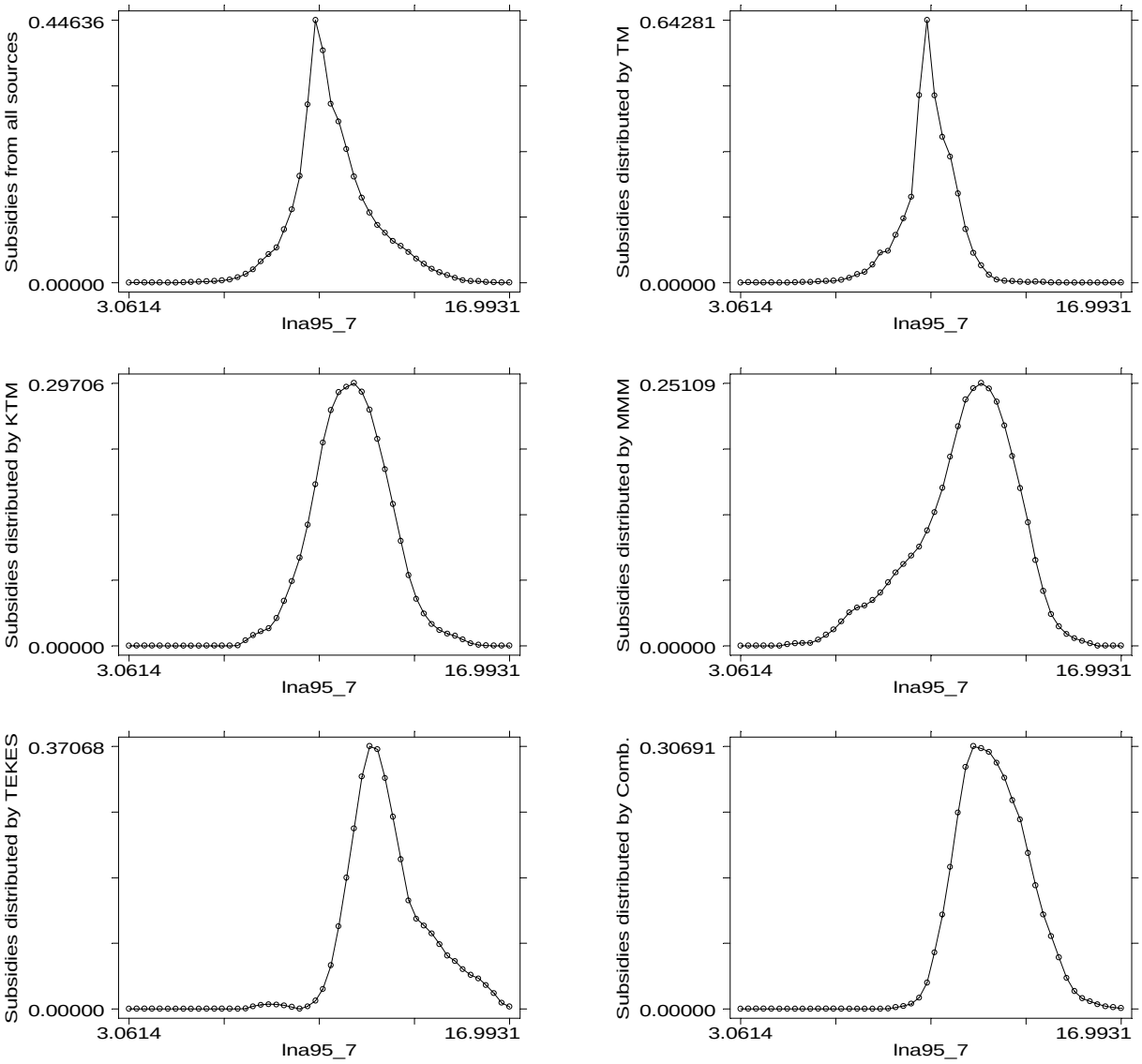
13 In contrast to these results, in a recent study by the author (Venetoklis, 1999) it was found that there were not significant differences between the firms receiving aid and those whose applications were rejected. The results of this study however, are not perfectly comparable to the other study for two reasons. First in the current study we do not know whether the non-beneficiary firms had applied or not for aid which was then rejected. We only know that they did not receive aid between 1995 and 1997 from the sources in our sample. Second, in the previous study the beneficiary firms examined received aid from KTM only; in the current study the aid comes from four different sources.

Figure 2. Kernel density estimation of VA growth* for beneficiary firms based on source



* differences of logged values

Figure 3. Kernel density estimation of subsidies* for all beneficiary firms and based on source



* logged values

2.2 The empirical model

It is not self-evident how the subsidies received by firms affect their behaviour and profitability. We could approach this problem by assuming that the subsidies reduce the costs of firms. Governments may subsidise certain investments or labour costs in order to increase R&D activities, equipment investments or labour demand. If this is the main channel of impact of subsidies the profit function (Π) of an aid receiving firm can be written as

$\Pi = pQ - C(Q,q,S,Z)$ (1), where

revenue is output (Q) multiplied by price (p), and cost is a function (C) influenced by output (Q), by factor prices (q), by business subsidies received (S) and by a vector (Z) of several dummy variables which control for different characteristics of the firm (e.g. Location, Legal status, Industrial sector).

The optimal level of a firm's capital and labour input is where the firm maximises her profits. Hence, the optimal factor inputs can be written as implicit solutions to profit maximisation:

$K^* = \arg\max \Pi(p,K,q,L,S,Z)$ (2)
$L^* = \arg\max \Pi(p,K,q,L,S,Z)$ (3)

Substituting these values into the production function yields:

$Q = f(K^*(p,q,S,Z), L^*(p,q,S,Z))$ (4)

In order to build an empirical model based on this kind of microeconomic reasoning we have to operationalise the variables used. There is not data of firm-specific factor prices. Instead, we have data on fixed capital, labour input, business subsidies and some other firm characteristics. Hence, to build the model we replace the output Q by Value Added growth (VA), the capital shock K by Tangible Assets growth (TA), the labour input L by Personnel growth (PE) and add Subsidies (S) and the other factors (Z). Then we have a reduced form equation for Value Added growth:

$\Delta VA = f(\Delta TA, \Delta PE, S, Z)$ (5)

Assuming that the production function is a Cobb-Douglas type, we can write the Value Added equation in log-linear form as follows

$\Delta VA = \beta\Delta TA + \gamma\Delta PE + \delta S + \varepsilon Z$ (6), where

$\beta,\gamma,\delta,\varepsilon$ are the parameters estimated

2.3 Description of variables

Dependent variables

Output: We defined Output (Q) as the percentage growth of Value Added from 1995 to 1997

The Value Added amount was calculated based on the following formula[14]:
Value Added for 95 (and 97 respectively) = Operating margin + Total Labour costs (Salaries, etc.) + Rents + Leasing costs (all figures for the respective year)

We first logged the yearly Value Added of each firm and then calculated its percentage growth based on the following formula:

Percentage growth[15] of Value Added from 95 to 97 = ln(VA97)-ln(VA95)

Thus the dependent variable[16] related to Value Added for the aforementioned period was DLNVA975

The motivation for the choice of the Value Added growth as our output dependent variable lies in the *plethora* of different subsidies distributed to firms and the many sources of organisations (four) distributing subsidies. In our sample, there were literally hundreds[17] of types of subsidies given for different purposes. It would be logical to assume that Value Added growth can be considered and accepted as a universal goal of subsidies, since it can easily be a direct or indirect consequence of subsidies distribution. That is, regardless of the type of subsidies given and regardless of whether it is or it is not mentioned as a pre-defined goal of the type of subsidy.

To get the whole picture at aggregate level, we examined the percentage growth of Value Added of beneficiary firms vis-à-vis of those firms which did not get money during the same period. We also looked at the beneficiary firms separately and measured what impact, if any, the received aid had on their Value Added growth.

Independent variables

a. Capital

For Capital we used the percentage growth of Tangible Assets (TA) of the firms between the years 1995 and 1997. We first logged the TA and then measured the growth using the formula:

Percentage growth of TA from 95 to 97 = ln(TA97)-ln(TA95)

Thus the independent variable related to TA for the respective period was DLNTA975

b. Labour

For Labour we used the change of Personnel (PE) of the firms between 1995 and 1997. Unfortunately in the data we received, there were personnel numbers only for the year 1995; 1996 and 1997 figures

14 The Value Added calculation is based on the formula listed by the Committee for Corporate Analysis (KERA, 1995). Note that the components of the formula differ from the ones used by Statistics Finland (1998). They use different variables when they calculate the Value Added growth of firms at aggregate level in the National Accounts listings.

15 To be technically correct, percentage growth of Value Added is defined as DLNVA975 multiplied by 100. The same applies for the percentage growth of Tangible Assets (DLNTA975 *100) and for the percentage growth of Labour (DLNPE975 * 100). See also the independent variables for Capital and Labour below.

16 The actual Value Added amounts for each year were logged and then the year to year change calculated. This of course excluded the Value Added values which were negative. We estimated that around 10% of the firms in our sample had negative Value Added for the year. We then examined to see if the negative Value Added values differed significantly between those forms that received subsidies and those that did not, amount and percentage wise. We found no significant differences, thus we preceded only with the positive Value Added logged values.

17 The KTM for example had 7 types of subsidies distributed between 1995 and 1997; TEKES had 2; TM had 9; MMM had 155 (!). Of course we did not have that many types of subsidies in our sample due to missing values. Nevertheless, the numbers show the heterogeneity of the whole subsidies system and the need for a more comprehensive approach in order to measure its impact.

were missing. Nevertheless, we estimated the personnel numbers for the respective firms for the years 1996 and 1997 based on the salaries costs for the years 1995, 1996 and 1997 (these salary costs were not missing from our database).

Since we had the amount of personnel for 1995 and the total salaries for 1995, we estimated the average salary per person for each firm for 1995. We then indexed that amount by 3% and 3,5% for the years 1996 and 1997 respectively, and got the average salary per person per firm for these two years[18],[19].

We then estimated the personnel amounts per firm using the following formulae:

PE96= Salaries costs 96/(estimated) Salary per person 96
PE97= Salaries costs 96/(estimated) Salary per person 97

Finally we logged the PE for the respective years and then measured the percentage growth between 1995 and 1997 using the simple formulae:

Percentage growth of PE from 95 to 97 = ln(PE97)-ln(PE95)

Thus the independent variable related to PE for the respective period was DLNPE975

We would have of course preferred to use other, even more informative Labour related figures (e.g. yearly hours worked per person) but those were unavailable.

c. Characteristics related to firms and to the subsidies received

In our models we used three categorical[20] variables and one continuous variable to control for certain characteristics of the firms and for the subsidies received by the beneficiary firms.

Location of firm

We used the categorical variable LAANI95T to indicate at which prefecture (lääni) the firm in our sample resided during the first year of the period examined (1995). This variable had the following categories:

1: Uusimaa
2: Turku
3: Häme
4: Kymi
5: Mikkeli
6: Pohjois-Karjala
7: Kuopio
8: Keski-Suomi
9: Vaasa
10: Oulu
11: Lappi
12: Ahvenanmaa

Industrial sector

We also attempted to control for the Industrial sector of the examined firms at 2-digit level. The variable SIC95 had the following categories:

1: Agriculture, Hunting and Forestry

18 The 3,5% increase and the 3% increase were the average salary increases in Finland for 1996 and 1997 respectively.

19 We believe that our personnel estimates for the years 1996 and 1997 are close to the real average personnel figures of the firms analysed. In our sample the average salary cost per personnel for 1995 was FIM 113 000, close enough to the actual average salary paid in Finland during 1995. Based on the Statistics Finland (1998) National Accounts the average salary was approx. FIM 121 000. The difference of FIM 8 000 is probably due to selection bias of firms and sampling error.

20 Not all of the sub-categories listed below were found in our models.

2: Fishing
3: Mining and Quarrying
4: Manufacturing
5: Electricity, Gas and Water Supply
6: Construction
7: Wholesale and Retail Trade
8: Hotel and Restaurants
9: Transport, Storage and Communication
10: Financial Intermediation
11: Real Estate
12: Public Administration and Defence
13: Education
14: Health and Social work
15: Other Community, Social and Personal Service Activities
16: Private Households with Employed Persons
17: Extra-Territorial Organisations and Bodies
18: Industry Unknown

Legal status

Finally we controlled for the legal status of the firms examined. We ended up with four general categories for the variable LEGATYPE:

1: Personal Enterprise (Toiminimi)
2: Partnership (Ay)
3: Partnership (Ky)
4: Ltd. (Oy)

Total amount of subsidies received between 1995 and 1997

All subsidies from all different sources (KTM, TEKES, TM, and MMM), for all three years in question (1995, 1996, 1997) were added together per firm (across). Since we hypothesised that the amount of subsidies has a different effect on firms of different sizes, we divided the total amount of subsidies during the three year period with another variable in order to capture this size effect.

We used four different versions of this variable:

- Total subsidies received during 1995-1997 / Sales in 1995
- Total subsidies received during 1995-1997 / Total assets in 1995
- Total subsidies received during 1995-1997 / Operating margin in 1995
- Total subsidies received during 1995-1997 / Value Added in 1995.

All these fractions were multiplied by 100 to represent percentages. For firms which did not receive aid these variables' values were zero (0).

Thus the respective independent variables were
TASA95P0
TATA95P0
TAOM95P0
TAVA95P0

What to look for and keep in mind when examining the models

Several things must be kept in mind when examining the models. We are first interested in whether the aid has had *any impact* on Value Added growth of firms. For this, in general look for t-scores less than -2 or more than +2 and for significance levels of less than 0,1000 (the shown significance level of 0,0000 means that it is actually less than 0,0001).

We are also interested on the *magnitude* of the impact of the aid when the impact is of course shown to be significant. For this check the B coefficient. This number simply tells you the amount of change of the dependent variable (in our case the Value Added growth for the period in question) when one of

the independent variables (for example the fraction where the aid paid is the nominator) increases by one, and when the other independent variables remain unchanged.

We also need to check the *sign* of the B coefficient. If the sign is positive, this indicates that when the aid increases so does the Value Added growth. When the sign is negative the opposite occurs.

Furthermore, one must look at the *number (N) of observations*. If the N is small then one should hold certain reservations on the significance levels, the B coefficient and its sign. When the N is less than 30 (for some less than 50), the power of the model is low, thus one should not conclude with the same confidence as with models with many observations.

Finally, in our comments later on, we sometimes use phrases indicating that "…aid seems to effect positively the Value Added growth…". It is important to keep in mind, that although aid might turn out to be significant and might have a positive sign, this only means that there is a positive *association* between the Value Added growth and the aid paid out. Association does *not* necessarily mean *causation*[21].

21 We could also examine association and causation in reverse order. That is, examine the impact of Value Added growth on the aid received. Could the payment of aid to a firm be a kind of "reward" because the firm's Value Added growth has been substantial? Indeed we have mentioned earlier that the law stipulates that profitable firms are to be given aid. However it is difficult to justify this reverse position just because profitable firms receive aid.

3. Results

Two sets of models were built. The first set comprised of models at aggregate level where both beneficiary and non-beneficiary firms were examined. The latter set became more detailed. There, we broke the data based on the source of aid (KTM, TEKES, TM, MMM, Combination[22]) and examined each subset of beneficiary firms separately.

3.1 Results from aggregate models

In Tables 8 and 9 we list four aggregate models each with a slight different variation of the aid independent variable (see previous section for a detailed description of each variable). To briefly reiterate,

- models 1 and 5 use the percentage of total aid over sales in 1995 (TASA95P0)
- models 2 and 6 use the percentage of total aid over operating margin in 1995 (TAOM95P0)
- models 3 and 7 use the percentage of total aid over total assets in 1995 (TATA95P0)
- models 4 and 8 use the percentage of total aid over Value Added in 1995 (TAVA95P0)

The rest of the independent variables are the same for all models.

- Growth of personnel between 1995 and 1997 (DLNPE975)
- Growth of tangible assets between 1995 and 1997 (DLNTG975)
- The location of the firm (LAANI95T)
- The Industrial code of the firm (SIC95)
- The legal status of the firm (LEGATYPE)

In the models of Table 8 we examine both non-beneficiary and beneficiary firms. In Table 9 we include only the beneficiary firms.

Due to space constrains we are not listing separately the B coefficients for each category of the three categorical variables; we just report whether the Value Added growth varies significantly among their categories[23].

At the end of each model, if the aid variable turns significant, we produce an *impact* indicator (titled **RETURN**) on the Value Added growth as a percentage of the aid paid out. The estimation of this indicator is based on values found in the appendix. We explain below how we calculate this indicator[24].

22 In this Combination category, we classified all firms that received aid from at least two different sources during the period in question.

23 Detailed models are available upon request.

24 We could maybe characterise this as an attempt for a ”brute” cost-benefit evaluation (see definition in footnote 3); brute, since we do not include in our calculations all the potential benefits and costs that may occur in such a policy implementation.

Table 8. Aggregate models with beneficiary and non-beneficiary firms

Dependent Variable: DLNVA975					
		Model 1	**Model 2**	**Model 3**	**Model 4**
Ind. Variables					
LAANI95T	**Sig.**	0,037	0,024	0,038	0,033
SIC95	**Sig.**	0,000	0,000	0,000	0,000
LEGATYPE	**Sig.**	0,000	0,000	0,000	0,000
DLNPE975	**B**	0,654	0,654	0,656	0,654
	t	176,24	178,09	178,32	179,01
	Sig.	0,000	0,000	0,000	0,000
DLNTG975	**B**	0,060	0,060	0,060	0,059
	t	25,12	25,35	25,38	25,10
	Sig.	0,000	0,000	0,000	0,000
TASA95P0	**B**	-6,91E-10			
	t	-0,02			
	Sig.	0,982			
TAOM95P0	**B**		3,38E-07		
	t		1,08		
	Sig.		0,279		
TATA95P0	**B**			2,09E-05	
	t			0,75	
	Sig.			0,450	
TAVA95P0	**B**				0,00047
	t				14,65
	Sig.				0,000
RETURN					8,88 %
R^2 (adj.)		0,503	0,505	0,506	0,509
N of firms		36968	36410	36454	36645

The personnel growth and the tangible assets growth variables are significant in all models; that is regardless of whether we examine non-beneficiary and beneficiary firms together or beneficiary firms separately. This is what one would have expected and it is in harmony with the production function design presented earlier.

It is obvious that the personnel growth is closely correlated to the Value Added growth. Personnel changes have been estimated using salary figures which in turn are part of the Value Added amount. The B coefficient of personnel growth is quite high (> 0,5) and that is of no surprise for the same reasons just mentioned[25],[26]. Note also that the tangible assets growth, is significant, although small.

25 We did not attempt to control for simultaneity problems between the VA growth dependent variable and the aid independent variables. In our models simultaneity problems indeed exist because the VA95 on the right side of the equation is correlated with the Value Added growth on the left hand side. This may create a bias on the B coefficient of the aid. (In fact, the same applies for the personnel growth variable; we have estimated personnel numbers from salary costs, and salary costs are part of the Value Added amount). The problem could be corrected, by finding a suitable variable - an Instrumental Variable (IV) that is - which correlates with the aid variable but not with the Value Added growth, hence not with the error term. This may be done in the future. An introductory description of the Hausman's specification error test is found in Maddala (1989, pp. 435-441).

This might be due to the small effect that increases of tangible assets may have on Value Added growth; that in turn might be explained by the short period of time examined (investments in tangible assets have not had time yet to influence considerably Value Added).

The variables representing the aid paid out have also produced some interesting results. For models 1, 2 and 3, where total aid is measured as a percentage of sales, operating margin and total assets for 1995 respectively, their B coefficients are very small. This indicates that a positive change in the aid paid (by whatever scale we use) would effect very little the Value Added growth. It would be small positive growth in models 2 and 3, and small negative growth in model 1 where the sign is negative. Also note that these aid variables come out insignificant.

In model 4 however aid is significant (sig. = 0,000), thus we have attempted to estimate its true impact in money terms.

In our sample the total amount of Value Added growth between 1995 and 1997 amongst all firms that received aid and those that did not was about FIM 13,2 billion. The amount of total aid paid out during the same period was about FIM 1,8 billion. The average Value Added growth increase for the period was 13.5%.The B coefficient for the variable TAVA95P0 is 0,00047 and its average value 3,5 %. As mentioned earlier, the B coefficient shows the percentage increase of the dependent variable if the independent variable increases by 1% (that is because the values are logged to the base e). Were we to increase the TAVA95P0 by 1% from 3,5% to 4,5% keeping the denominator (VA95) constant, the total aid would have to increase by approx. 28,5% (1/3,5) or by FIM 522 million (1,8 billion * 28,5%).

How much would the Value Added growth increase at the same time? This is given by the B coefficient. If the 13,5% increase represents FIM 1,8 billion, the 0,047% increase (0,00047 * 100) would represent approx. FIM 46 million ((13,2 billion * 0.047)/13,5). In other words, by spending an extra FIM 522 million of aid we would have increased the Value Added of firms by a mere 46 million, a return of about 8,8% of funds spent (46 mil / 522 mil).

We would have expected that this return indicator were at least a little over 100%, meaning that we should have at least received the funds (total aid) spent, plus a little more in order to show positive impact.

Having this aggregate approach (examining beneficiary and non-beneficiary firms) we might even say that the B coefficient could represent to some limited extend, the total effect of aid on the economy as a whole; and that, due to possible multiplier effects generated from the firms which receive aid onto the firms that do not.

In Table 9 below where we examine only those firms that have received aid during the period in question, again we see the same pattern as in Table 8. The aid variables are insignificant in models 5, 6 and 7 where we examine the aid as a percentage of sales, operating margin and total assets in 1995. Once more the B coefficients are very small. In model 8, we use as the denominator for the aid variable the Value Added for 1995, and there the aid comes out significant.

Using the same calculation described earlier, we again find that the return of the aid spent is estimated to be approx. 11,48%, much less than our ”100% plus something” minimum *return* limit. This indicates that, although the return of the subsidies paid to the beneficiary firms in terms of Value Added growth is somewhat better than when the whole sample is analysed (11,4% to 8,8%), it is still far from an acceptable level.

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26 One may argue that this creates a validity problem since it violates the assumption that variables from the right side of the equation must be independent. We run multicolleniarity tests for each model. The tolerance values of the tests ranged between 0,68 and 0,99; indeed in their majority they were over 0,9.

Table 9. Aggregate models with beneficiary firms only

Dependent Variable: DLNVA975		**Model 5**	**Model 6**	**Model 7**	**Model 8**
LAANI95T	**Sig.**	0,186	0,051	0,087	0,033
SIC95	**Sig.**	0,000	0,000	0,000	0,000
LEGATYPE	**Sig.**	0,000	0,000	0,000	0,000
DLNPE975	**B**	0,682	0,683	0,686	0,682
	t	110,61	113,72	113,93	115,23
	Sig.	0,000	0,000	0,000	0,000
DLNTG975	**B**	0,055	0,055	0,056	0,053
	t	13,80	14,19	14,21	13,84
	Sig.	0,000	0,000	0,000	0,000
TASA95P0	**B**	-2,30E-09			
	t	-0,07			
	Sig.	0,937			
TAOM95P0	**B**		2,93E-07		
	t		0,97		
	Sig.		0,332		
TATA95P0	**B**			1,10E-05	
	t			0,40	
	Sig.			0,684	
TAVA95P0	**B**				0,000455
	t				14,58
	Sig.				0,000
RETURN					11,48 %
R^2 (adj.)		0,543	0,549	0,548	0,557
N of firms		12199	12641	12685	12876

3.2 Results from models controlling for the source of aid

The previous models indicated that the impact of aid to the Value Added growth is either non-existent or minimal at aggregate level. We thus decided to examine the different sources of aid in our sample and measure whether the aid given from these sources *separately* showed any significance on the Value Added growth of firms.

We examined the beneficiary firms only and used as our independent variables the same ones as in our aggregate models. In the three first versions of the aid variable - total aid over sales (TASA95P0), total aid over operating margin (TAOM95P0) and total aid over total assets, (TATA95P0) - their B coefficients were very small just as in the aggregate models, and they came out insignificant.

In one model only, where the independent variable was total aid over sales (TASA95P0) and the source was ”Combination of sources”, did the aid come out significant. However the return was again very low (10,94%)[27].

We will only discuss the models when the independent variable for aid is total aid over Value Added for 1995 (TAVA95P0). Table 10 that follows lists five models each for the respective sources of the KTM, TEKES, the TM, the MMM and the ”Combination”.

Overall the results in these models are similar to the previous aggregate ones. We see for example that the personnel growth seems to correlate significantly to the Value Added growth of firms regardless of the source of aid. The tangible assets growth is significant when aid comes from the KTM, the TM and the ”Combination of sources”; it is not significant when aid comes from the TEKES and from the MMM. For both these sources, we could justify this result if we consider that their aid is used generally for long term development (TEKES) or for supporting agricultural production facilities, infrastructure and development (MMM).

Interesting results come out when the aid variable is examined. For the KTM it is significant, but the return once more is less than 100% (67% of the aid paid out is returned back in the form of Value Added increases). The same applies for MMM (4,88%) and for the Combination source (9,01%). With TEKES the B coefficient is very small and the aid is not significant. Again, this can be explained by the nature of the projects financed[28].

When the aid though is generated from the TM, then the return is not only significant but very productive as well. For every extra subsidy mark spent the return in the form of Value Added growth is approx. 2,8 marks (288%, or more than 2,5 times the initial outlay).

How can this be justified? First, there are obvious selection biases as to which firms receive aid from the TM. Second, one must not forget the positive correlation that exists between the dependent variable and the version of the aid variable in question, since in both variables we find that the Value Added amount for 1995 is utilised to calculate their values. Third in these disaggregate models we do not measure for the ”counterfactual”. In other words, we do not examine what would have happened *anyway* to the firms' Value Added growth had they not received the subsidies. Due to time constrains we did not examine further this result[29].

Regardless of our reservations, this last result might indicate that for *some types of aid* and for *certain types of beneficiary firms* the business subsidies do indeed enhance the firms' Value Added growth.

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27 None of the aforementioned disaggregate models are shown but they are available upon request.

28 Here we examine only a very short period of time (three years). Hence the TEKES projects (in their majority high-tech development projects) have not had time to develop yet and influence the beneficiary firms' Value Added growth. Indeed this justification could apply for aid from all the sources, and even for those that the aid is significant but the return is less than 100%. The problem is of course of timing. When is the right time to measure impact? In literature there does not seem to be a consensus. If we measure impact too early we will not capture the impact. If we measure impact too late we may capture only part of the impact since other factors may have influenced in the meantime the Value Added growth of firms.

29 It would definitely be interesting to look into the reasons why the aid from the TM, seems to have such a high impact on Value Added growth. In addition to the reasons just mentioned, another explanation may be that the TM aid is geared towards employing new persons; hence, there is a direct impact on Value Added growth of the recipient firms due to increases in salary costs. However this would justify only a 100% growth of Value Added. How has the rest 188% of Value Added growth been generated?

A future study could analyse the characteristics (factors) of firms which turn out to be significant when a firm receives aid, say from the KTM rather, than from the TM. For this, multinomial logistic regression models could be built. The categorical variable representing the source of aid (AIDSOURC) could be on the left hand side of the equation, and different continuous and categorical characteristics of the firms on the right hand side (e.g. financial data, location, Industrial code, personnel amounts, age, type of project financed, etc.).

Table 10. Disaggregate models based on source of aid

Dependent Variable: DLNVA975		**Model 9 (KTM)**	**Model 10 (TEKES)**	**Model 11 (TM)**	**Model 12 (MMM)**	**Model 13 (COMBINATION)**
Ind. variables						
LAANI95T	**Sig.**	0,192	0,893	0,000	0,192	0,457
SIC95	**Sig.**	0,028	0,412	0,000	0,910	0,000
LEGATYPE	**Sig.**	0,619	0,644	0,000	0,659	0,404
DLNPE975	**B**	0,722	0,786	0,634	0,417	0,743
	t	35,90	10,15	93,83	6,26	54,22
	Sig.	0,000	0,000	0,000	0,000	0,000
DLNTG975	**B**	0,033	0,049	0,058	0,057	0,047
	t	2,64	0,77	13,32	1,38	5,35
	Sig.	0,008	0,439	0,000	0,169	0,000
TAVA95P0	**B**	0,002	0,000	0,007	0,000	0,000
	t	6,90	1,171	30,34	2,21	10,48
	Sig.	0,000	0,244	0,000	0,028	0,000
RETURN		67,74 %		288,59 %	4,88 %	9,01 %
R^2 (adj.)		0,564	0,602	0,584	0,170	0,631
N of firms		1298	118	8993	253	2214

4. Discussion

4.1 Considerations

Regardless of the importance or not of the previous results and their possible policy implications on government subsidies to firms, we feel that there are several aspects of this study which need further comments.

These aspects refer to internal and external validity questions of the results. To put it differently, when we look at the results and their interpretation, we need to ask two questions:

- How valid (true) are these results and how close do they represent the true situation we are trying to explain? This is the internal validity question.
- How comfortable are we to infer that these results can be generalised and can be thought to refer to the whole population of firms in Finland? This is the external validity question[30].

Below we list several matters related to these internal and external validity questions.

Time span
We are examining only a very short period of time when we measure the growth of Value Added in firms. We have seen that the actual contribution of the amount of aid to the Value Added growth is either minimal or less than the amount of aid spent (RETURN < 100%). We have not examined what would have happened had we examined one or more years after the receipt of the aid, say from 1995 to 1998, or from 1995 to 1999. It is possible that the impact of subsidies comes only slowly visible.

Previous growth of firms
We do not know what was the rate of Value Added growth of firms before the periods we examined, say from 1990 to 1994. Had this been known, we could have included it in our models. In other words, the real situation might be that some of the firms in our sample have already had accelerated or decelerated Value Added growths before 1995. These growth rates might have carried over to the period we have examined. Thus they may have biased the B coefficients in our models[31].

Current and previous subsidies from other sources
We do not know whether the firms in our sample have had other types of subsidies received from other sources during the period we examined (1995-1997); that is in addition to the KTM, the TEKES, the TM and the MMM (see Table 4). This of course might have influenced their Value Added growth. We also do not know whether the same firms had received aid from all available sources before the period in question[32].

Missing values and selection bias of sample
Approximately 11% of the total amount of firms' records were finally analysed. That was due to missing values in certain variables or due to unreliable data[33]. The problem does not lie in the amount of firms analysed per se because indeed the sample is more that substantial for statistical analysis. The problem lies in the way the sample was chosen. Due to the aforementioned missing values and erroneous data, we were forced to eliminate a substantial amount of variables and records of firms. We ended up with firms that *had* existing information both related to their financial statements and to their subsidies receipt. In other words we had a sample of "convenience". Thus we are not so confident in generalising these results with absolute certainty.

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30 Validity questions in evaluation research are much more complex that the ones presented here. We have decided nevertheless, not to expand the matter in detail since it would obscure the main purpose of the study.

31 One can argue that this is not a real problem since the past Value Added growth is unknown for both group of firms (beneficiary and non-beneficiaries). Thus theoretically it is distributed evenly between the two groups and consequently cancels out.

32 See previous footnote for a similar explanation.

33 But look also footnote 10.

Selection bias of beneficiary firms

We mentioned earlier that in general, firms which receive aid are ”better” and financially ”healthier” compared to those that do not. This by itself may influence the dependent variable we are examining (the Value Added growth); that is, what ever impact we attribute to the aid given to the beneficiary firms might have also been influenced by their good financial status.

4.2 Conclusions

In the previous section we reported that in general, subsidies given during the three year period we examined, turned out *not* to influence significantly the Value Added growth of the beneficiary firms. Only in certain models did we find the aid influencing positively the Value Added growth of firms since it turned out statistically significant. However, we also observed that despite the positive influence of the aid, its actual magnitude was minimal[34].

There are several explanations for these results. One may be that the wrong firms have been subsidised. Unfortunately we can not test this hypothesis since it is not possible to examine the effects of aid on the Value Added growth of a *different* set of firms retrospectively. On the other hand this explanation might be quite valid. In an earlier study evaluating the process through which funds are distributed to firms (Venetoklis, 1999) it was found that indeed there were flaws in the distribution of funds and the selection of beneficiary and non-beneficiary firms. Another reason could be that aid does not really affect firm behaviour. As mentioned in the introductory section several studies have been proponents of this argument. A third reason could be that the true effect of aid is not found in Value Added growth but rather in other variables measured separately (e.g. productivity growth, profitability growth, increase in competitiveness); these, we did not study. Finally we must not disregard the fact that our models are very sensitive to variable specification.

What then do we conclude? A unique feature of this study is the analysis of a vast number of records with firm data. This gave our models high levels of statistical power and consequently credibility for the results. Thus, if we focus only on the results of the study as such and at the same time take under consideration the huge amount of data analysed, we may say that *the study raises questions and doubts on the effectiveness of the business subsidy policies currently in force*.

The previously listed limitations of the data and the shortness of the period examined force us to look ahead and attempt to measure with more accuracy the impact of business subsidies. The methodology described in this study has proved to be functioning, thus what is needed in the future is a refinement of the models used and a way through which one can obtain more reliable and complete data. We plan to obtain financial information of firms having received aid and of those not having received aid for the years 1998 and 1999. Furthermore, the amounts of aid paid out will also be gathered for the same years. It will then be possible to run similar models as those in the current study, but now covering the whole five-year period (1995-1999). The multinomial logistic regression modelling is another type of analysis which may be conducted in the future study[35]. Finally, a pseudo-quasi experiment could be created. We could use the group of firms having received aid as our base of reference. Then we could choose those non-beneficiary firms which pertain close characteristics to the beneficiary firms. For this we may utilise usual standard control variables such as the location of firm at Prefecture (Lääni) level, the SIC industrial classification of the firm at very low level (5-digit), the legal status of the firm, and the size of the firm in terms of Turnover and Personnel amounts.

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34 In the introduction we mentioned that some studies have found that the impact of business subsidies to firms is small. Our results are broadly consistent with those results. For example, Tuomiaro and Virén (in Junka, 1998) concluded that the impact of business subsidies to firms in the wood and furniture manufacturing sector was minimal in terms of investment and employment. Also Bergström (1998) has indicated that the impact of capital subsidies on Value Added growth is positive during the first two years but in the longer run it turns negative. On the other hand Niininen (1999) argues that public technology subsidies are effective. He is careful though to focus the positive effects on firms with intensive R&D operations; he also emphasises that subsidised loans seem to have a higher positive impact on new R&D investments than direct subsidies.

35 See also footnote 29.

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Appendix

Table 11. Amounts used for estimating the RETURN indicator

Estimates for model 4 (all ben. & non-ben. firms - aggregate)					
	N	**Sum**	**Mean**		
DLNVA975	36645		0,135		
TAVA95P0	36645		3,508		
DVA97_5	36645	13 280 413 279	362 407		
AID95670	36645	1 834 316 377	50 056		
B Coefficient	**inc 1 % TAVA95P0**	**% inc AID95670**	**FIM inc AID95670**	**FIM inc VA97_5**	**RETURN**
0,00047	4,508	28,500	522 838 355	46 217 553	0,088

Estimates for model 8 (all ben. firms - aggregate)					
	N	**Sum**	**Mean**		
DLNVA975	12876		0,181		
TAVA95P0	12876		9,984		
DVA97_5	12876	8,39E+09	651 786		
AID95670	12876	1,83E+09	142 460		
B Coefficient	**inc 1 % TAVA95P0**	**% inc AID95670**	**FIM inc AID95670**	**FIM inc VA97_5**	**RETURN**
0,0004551	10,985	10,015	183 710 374	21 101 439	0,114

Estimates for model 9 (ben. firms - KTM only disaggregate)					
	N	**Sum**	**Mean**		
DLNVA975	1298		0,157		
TAVA95P0	1298		11,365		
DVA97_5	1298	8,82E+08	679 878		
AID95670	1298	2,4E+08	184 993		
B Coefficient	**inc 1 % TAVA95P0**	**% inc AID95670**	**FIM inc AID95670**	**FIM inc VA97_5**	**RETURN**
0,002555	12,365	8,798	21 127 251	14 312 145	0,677

Table 11 (cont.)

Estimates for model 11 (ben. firms - TM only disaggregate)					
	N	**Sum**	**Mean**		
DLNVA975	8993		0,175		
TAVA95P0	8993		4,881		
DVA97_5	8993	4,31E+09	479 104		
AID95670	8993	3,04E+08	33 755		
B Coefficient	**Inc 1 % TAVA95P0**	**% inc AID95670**	**FIM inc AID95670**	**FIM inc VA97_5**	**RETURN**
0,007305	5,881	20,484	62 183 153	179 459 328	2,885

Estimates for model 12 (ben. firms - MMM only disaggregate)					
	N	**Sum**	**Mean**		
DLNVA975	253		0,034		
TAVA95P0	253		38,644		
DVA97_5	253	2 678 208	10 585		
AID95670	253	60 183 690	237 880		
B Coefficient	**inc 1 % TAVA95P0**	**% inc AID95670**	**FIM inc AID95670**	**FIM inc VA97_5**	**RETURN**
0,000986	39,644	2,587	1 557 363	76 014	0,048

Estimates for model 13 (ben. firms - combination of sources)					
	N	**Sum**	**Mean**		
DLNVA975	2214		0,241		
TAVA95P0	2214		24,636		
DVA97_5	2214	3,14E+09	1 419 323		
AID95670	2214	1,13E+09	511 017		
B Coefficient	**inc 1 % TAVA95P0**	**% inc AID95670**	**FIM inc AID95670**	**FIM inc VA97_5**	**RETURN**
0,000318	25,636	4,058	45 922 715	4 142 050	0,090