42nd European Congress of Regional Science International

August, 2002, Dortmund

Effect of Business Subsidies on Labour Demand: Overall Evaluation with Regional Extensions

Aki Kangasharju and Takis Venetoklis

Government Institute for Economic Research

Hämeentie 3, 00531 Helsinki, Finland

aki.kangasharju@vatt.fi

Abstract:

This paper investigates the effects of business subsidies on the employment of firms in Finland, and explores possible regional differences in the effects. Employment of some 26,000 firms is followed annually between 1995-1998. We find that the marginal effect of labour subsidies is about 34 per cent. As firms pay, on average, 60 per cent of the employment payroll of a worker in a subsidised job, our results suggest that labour subsidies displace the firms' own employment expenditures. Moreover, the regional analysis indicates that the displacement effect has been milder in the countryside than elsewhere, contributing to the convergence of regional economies. This conclusion is not strong however, as in some other non-central areas displacement has been high. Finally, we find that Investment and Operation subsidies have stimulated employment only slightly in subsidised firms. Interestingly, the observed positive effect is concentrated in just one group of regions, the effect being zero elsewhere in Finland.

Key words: Evaluation, Employment, Business subsidies, Regions

1. Introduction

In recent years, regional development in Finland has resulted in increasing regional divergence in the form of higher geographic concentration of population, jobs, production and the standard of living, leaving large geographical areas lagging behind (Economic Council, 2001). The governments of the majority of industrialised countries use subsidies to support economic development in lagging regions. Traditionally, investment subsidies have constituted a major part of public subsidies, whereas labour subsidies have been distributed with less frequency. Despite their minor status, a more active role for labour subsidies has been advocated as well (Akerlof et al. 1991). For example, the high proportion of investment subsidies relative to labour subsidies has been criticised to be sub-optimal, since it contributes to the unemployment problem (Begg and Portes, 1993). During the last decade there has been a sharp increase in public subsidies for research and development activities of private firms (e.g. European Commission, 2000; Fuest and Huber, 2000; Irwin and Klennow, 1996; Payne, 1998).

Most of these studies use recent quantitative evaluation methods (Blundel and Costa Dias, 2000; Heckman et al., 1999). Using these methods, Kangasharju and Venetoklis (2002) find for Finland that the marginal effect of labour subsidies with respect to employment of firms is 34 percent, i.e. one Euro more of subsidies increases the firm's payroll by 34 cents. As on average, firms pay themselves 60 per cent of the employment costs of a worker in a subsidised job, these results suggest that labour subsidies displace the firms' own employment expenditures. In addition, Kangasharju and Venetoklis (2002) report that public Investment and Operation subsidies increase employment only a little (indicating that a cost of creating jobs with this type of subsidy is high); and that public R&D subsidies have no effect on employment of firms in the short run of two years.

The purpose of the present paper is to extend the work by Kangasharju and Venetoklis (2002) by evaluating whether public Labour subsidies or Investment and Operation subsidies have contributed to or worked against the regional concentration that has been prominent in Finland since the mid 1990s. If public subsidies have no effect on employment in lagging areas, then their use is waste of money. Instead, if they have a

stronger effect on employment in lagging peripheral areas than in prospering central areas, then we should re-allocate these subsidies focusing on more to the former areas.

Our empirical data spans from 1995 to 1998 and we concentrate on short-term impacts, studying effects during the first two years of a subsidised project. We analyse a large sample of firms, taken from the registers compiled by the Finnish Tax Authority. In an international context, this administrative data is unique and rare; it covers the whole population of firms that pay taxes in Finland, including information on their financial statement accounts and possible business subsidies. One common feature of the evaluation studies on business subsidies is that they concentrate on manufacturing firms for data availability reasons. Our data deviates from this in that it include firms from various industries (manufacturing, construction, transportation, wholesale and retail trade, business services, etc.)

To preview the results, our regional analysis indicates that the displacement effect of Labour subsidies is weaker in the countryside than elsewhere, suggesting that labour subsidies have contributed to the convergence of regional economies in the country. This conclusion is not strong however, as in some other non-central areas displacement has been high. We also find that Investment and Operation subsidies have stimulated employment only slightly in subsidised firms. Interestingly, this positive effect is due to just one group of regions, the effect being zero elsewhere in Finland.

The rest of the paper is organised as follows. Section 2 provides a description of the subsidy scheme in Finland. Section 3 contains the method of evaluation. Section 4 summarises the data at hand. Section 5 analyses and comments the measured impact of subsidies. Section 6 adds a regional dimension to the analysis. Section 7 concludes.

2. Subsidy schemes in Finland

In this section we discuss briefly the business subsidy system in Finland. An attempt to give a comprehensive overview would be a lost cause considering the complexity of the system and our space constraints. We refer to the parties involved in distributing the subsidies, the types of subsidies, and the process followed.

The notion of business subsidies has different interpretations and covers many different policy 'instruments'. For this paper we define business subsidies as direct transfers of money to private sector firms from a Ministry or a government Agency. These transfers are grants, in that the recipient firm is not obliged to pay the money received back to the distributor, as for example in the case of subsidised loans[1].

In Finland business subsidies have been distributed to firms since the late 1960s. Nowadays the biggest distributor in terms of absolute amounts is the Ministry of Trade and Industry (KTM) through its regional units and one of its subsidiary Agencies, TEKES. Other important distributors is the Ministry of Labour (TM) and the Ministry of Agriculture. In our data set we examine direct subsidies distributed through the KTM, TEKES and the TM.

Subsidies are mostly distributed through the so called TE-Centres (Regional Employment and Economic Development Centres). Within each centre there are units of the aforementioned ministries and depending on the type of project in question and other criteria, (i.e. the applicant's geographical location) a firm submits its application for aid to its nearest TE-centre.

Specifically in the case of subsidies through the TM, one could classify subsidies as moneys that are given to firms not only through its units in the TE-centres, but through the local Labour offices as well. There, firms can apply for this type of support. Individuals can also apply for a subsidy, if it is for a firm start-up (more on this below).

There are different types of subsidies, meaning that they are given for different purposes (projects). This is also reflected in the distributor of subsidies (the Ministry or the Agency through which the funds flow). For example, the KTM specialises in fixed asset investments (machinery/equipment), naturally to firms in the manufacturing sector and TEKES concentrates its subsidies distribution to high-tech R & D projects. The purpose of labour subsidies is to improve human resources development of the work force as well as to encourage firms to increase employment. Labour subsidies are often directed

[1] Under the general name of business subsidies however one could classify other 'subsidy instruments' as well; for instance subsidised loans, guarantees to an export firm, investment tax credits (ITCs) etc. See for example how manufacturing subsidies to firms are classified within each EU country in European Commission (2000, pp. 29-30).

to firms who employ workers, whose productivity is lower than the level needed in active labour markets. Therefore these people are not easily employable with the prevailing minimum wage level of the sector in question. Labour subsidies are used to fill the gap between wages that firms are willing to pay to these people and the prevailing wage level.

However, there is no clear distinction of the types of projects that can be financed by a specific distributor nor of the goals that this subsidy is designed to achieve. For instance, the KTM can finance a fixed asset investment in a manufacturing firm that could be classified as an R & D investment (TEKES); it could also be that one goal of this specific project is to increase the amount of permanent jobs within the firm (TM). Though a firm may receive subsidies from more than one source within one year, no firm can have more than one project subsidised at a time.

Ever since Finland joined the EU in 1995 she automatically became eligible for Structural Funds and Community Initiative program financing. One of the major recipients of these funds are firms. EU funds can be distributed vertically (i.e. to firms located in specific geographical areas, to firms with special characteristics -such as SMEs- etc.) or horizontally meaning that all firms are eligible as long as they fulfil some other basic criteria (i.e. the type of project in question).

The Finnish legislation related to subsidies is rather vague as to defining which firms should be eligible, but basically it stipulates that the potential recipients should be profitable or should have the prerequisites to become so.

There are special programs for start-up firms which can be financed with start-up capital and/or salary compensations.

For the type of subsidies we examine, the government distributors finance only part of the total project cost; the firm must find the rest of the costs from its own reserves, tapping the private credit markets or even finding yet another government grant distributor.

The amount of subsidies distributed per project, as proportion of the total cost, depends on the type of project, the type of firm, the geographical area where the firm is located,

the source of subsidy (national, EU), etc. The average coverage of KTM subsidies is approximately 20%, but it can reach up to 60% of the total cost. For subsidies through TEKES the coverage depends on the type of high-tech development project. It ranges between 25% for product development costs, to 50% for costs relating to strategic planning, marketing, business partnership developments, etc. If the applicant is an SME the cost coverage increases by 10 percentage points.

The labour related subsidies arranged directly through the local Labour offices are based on an amount up to approx. € 840 per month for up to 10 months (in 2001). On average however, the length of subsidised period is 6 months.

The level of worker's human capital in the subsidised job determines the exact amount of subsidy. The longer the worker has been unemployed prior the subsidy, the higher the subsidy. Similarly, a lower level of education increases the subsidy. Although in principal the applicant individual can negotiate with the firm on an extra salary amount that the firm could pay him from its own funds, in general workers in subsidised jobs are paid according to the prevalent wage rate. As the typical subsidised jobs are cleaners, clerks, secretaries, office workers, unskilled manufacturing workers and salesmen, we have estimated that, on average, firms pay themselves 60 per cent of the employment payroll of a worker in a subsidised job, i.e. for each Euro received as subsidy, the firm must put on average 1.5 Euros of its own money when creating a subsidised job (1.5/(1+1.5)=0.60).[2] This estimation is based on those workers' corresponding centralised union wage agreement. Apart from their subsidised status, these jobs in private firms have exactly the same specifications as the non-subsidised ones.

In the majority of cases, the firm that has been awarded certain amount of subsidies has first to make the disbursement of funds from its own resources. Then it has to submit the relevant invoices to the respective (local) distributing organisation and (only then) gets the agreed subsidy compensation. In cases where the matter calls for start-up capital or when the distributor part-subsidises labour related activities (salaries), the

[2] According to the Ministry of Labour, average subsidy is € 620 a month and average wage in a subsidised job is € 1560.

disbursement occurs as soon as the need arises. In other words, in terms of KTM and TEKES the subsidy is given at the middle and/or at the end of the project's investment period, whereas in terms of TM, the subsidy is given already from the start.

3. Framework of empirical analysis

As we mentioned in the previous section, firm subsidies in Finland are delivered on the basis of project specific applications. When a firm receives a subsidy, it has to contribute from its own resources. When receiving labour subsidies, firms must be able to demonstrate that individual(s) have been employed with the assistance of these subsidies (there is no direct employment responsibility in the two other types of subsidies[3]). Therefore, labour subsidies affect directly payroll, the number of personnel and the value-added of firms, as the subsidies are included in the total payroll firms pay during a financial year. This results in problems with the choice of an endogenous variable for the regression analysis, as the subsidies appear in both sides of the equation. However, we can overcome this, by subtracting from the firm's employment payroll the amount of subsidies received.[4] We call this variable the firm's own (or private) payroll and run alternative regressions, where three proxies for employment are the alternative endogenous variables. These proxies are the number of personnel, payroll and own payroll.

We estimate the effect of business subsidies in the following fashion. Let D=1 denote the event of receiving a subsidy and D=0 denote the event of not receiving a subsidy. Let y represent the log of firm's own employment (subsidised employment are subtracted from the firm's total employment). Let y0 and y1 be the log of firm's own employment level when the project is not subsidised (D=0) and when it is subsidised (D=1), respectively. The 'benefit' in the firm's own employment from receiving the subsidy is $\Delta y_t = y1_t - y0_t$, where Δy_t is the effect of subsidy that we would like to find out. In this context, positive Δy_t stimulates the firm's own employment, because extra

[3] The employment responsibility is indirect in the sense that the subsidies are given to Investment and R&D projects that most probably yield positive effects on employment.

[4] Sales would be another alternative, since subsidies do not directly affect the amount of goods and services a firm can sell (worker hired with the subsidy money does not necessarily help the firm to sell extra units of its product). On the other hand however, subsidies may distort sales figures, if they affect relative prices of production factors.

employment that would have not been created without the subsidy, is indeed presently created. Note that the difference Δy can still be positive, even when the subsidy is superfluous and the released funds[5] are used to other employment expenses that could not have occurred before the subsidy funds became available.

Using the data at hand as a point of reference, this means that to be positively effective, R&D or Investment and Operation subsidies must stimulate the firms' employment in a statistically significant way. As discussed above, Labour subsidies are different however. The firm must cover 60 per cent of the employment costs of the subsidised job. Therefore, Labour subsidies are positively effective only if one Euro of subsidies stimulates firms' own (private) employment expenditures by more than 1.5 Euros (1+1.5=2.5 and 1.5/2.5=0.60).

If the subsidy effect is zero, the subsidy does not, on average, stimulate or displace the firm's own employment (payroll) expenditure. The firm adjusts its employment expenditures to accommodate the subsidised project, which the firm is committed to invest upon, when getting the subsidy[6]. In this case, subsidised and non-subsidised employment on average cancels out. Finally, a negative effect means that the subsidy displaces the firm's own employment expenditures, either because (i) not all of the released resources from subsidising a superfluous project are directed to other employment expenditures[7], or (ii) the subsidised project simply crowds out other non-subsidised employment.

Our method of analysis is a generalised version of the widely used difference-in-differences (DID) method in that our setting follows one set of firms that do not receive any subsidies in period t-1, but some of them start receiving subsidies in period t.[8] This method has also an advantage over the cross-sectional analysis, as it has observations for subsidised firms before as well as during the period of subsidy. We measure the

[5] The ones replaced by the subsidies.

[6] However, in the Finnish case at least, there is no legal obligation to invest in the project successfully. That is, the firm does not have to return the subsidies if the project does not fulfil the whatever predefined goals are stated in the initial application and in the file attached to the decision when granting the subsidies.

[7] But to other activities such as marketing, etc.

effect of subsidies estimating the change in employment in subsidised firms compared to those that continue not receiving subsidies. This is carried out by a fixed effects estimation of the panel data.

The main econometric problem is that the effect of subsidy cannot be computed for any individual firm precisely, because data on the counterfactual are missing (Blundell and Costa Dias, 2000; Heckman et al. 1999).[9] We do not know what the 'y0' would have been for firms that received subsidies. Thus, Δy_t has to be estimated. We estimate an average gain for the firms that received a subsidy in terms of payroll and personnel growth. This is called *the effect of treatment on the treated*.

We assume that conditional on the firm not having a subsidy at time t-1, receiving a subsidy at t shifts expected employment by β. Then,

$$E(y1_t \mid D_t=1, D_{t-1}=0) = E(y0_t \mid D_t=1, D_{t-1}=0) + \beta \qquad (1)$$

and

$$\beta = E(y1_t - y0_t \mid D_t=1, D_{t-1}=0) = E(\Delta_t \mid D_t=1, D_{t-1}=0). \qquad (2)$$

If the treatment and control group were randomly selected, the control group would provide a proper counterfactual. In this case an estimator β would be the simple difference in the mean employment by support status (status getting or not subsidies) in period t, conditional on not having received a subsidy at t-1. In other words, we would get an unbiased estimator, as there are no common or correlated factors determining both the probability of receiving a subsidy and the employment. In this case

$$E(y0_{it} \mid D_{it}=1, D_{it-1}=0) = E(y0_{it} \mid D_{it}=0, D_{it-1}=0) \qquad (3).$$

However, in our case as in most public policy interventions, the target group (the firms) are not randomly selected to receive subsidies. First, the firms themselves come forward and apply for subsidies. Second, in order to be considered for financing they have to

---

[8] In standard differences-in-differences method one analyses two cross-sections, one before and one after the treatment.

[9] It is not possible to have the same firms classified as having received and not having received subsidies during a certain time period.

fulfil certain general and basic criteria imposed by the program under which the subsidies are distributed (i.e. based on their geographical location, their size, their general profitability, the type of project in question, the type of subsidy, etc). Third, there is evidence to argue that the subsidy distributing Ministries and Agencies tend to 'pick the winners' by giving subsidies more often to more profitable and promising firms compared to the general population. (Branstetter and Sakakibara, 1998; Klette, et al., 1999; Lipsky, 1980; Roper and Hewitt-Dundas, 2001; Venetoklis, 2001). Finally, the probability of receiving a subsidy and the growth rates of employment certainly differ among industries. In all of these cases, $E(y0_t \mid D_t=1, D_{t-1}=0)$ in equation (1) is not identified, i.e. $y0_t$ is not mean independent of D.

We try to achieve this mean independence by conditioning expected mean employment both in subsidised and non-subsidised groups of firms based on their observable and unobservable characteristics. When conditioning on observables, we regress employment on subsidy-status and additional regressors that are correlated with subsidy-status and employment.[10]

If there is no selection on unobservables, the following condition holds.

$$E(y0_{it} \mid X_{it}, D_{it}=1, D_{it-1}=0) = E(y0_{it} \mid X_{it}, D_{it}=0, D_{it-1}=0), \qquad (4)$$

where X is a vector of covariates. Equation (4) says that conditional on X, the selection into the subsidy program is not based on variables correlated with $y0_{it}$.

Let us consider the observables. As mentioned above, there is evidence to suggest that policymakers are willing to subsidise firms that have the best prospects. This helps aid-distributors to allege that subsidies are effective. An indicator of high growth potential we use, is the profitability of firms. Apart from promising prospects, profitability eases liquidity constraints and creates room for future expansions, thus correlating with both subsidy-status and employment growth. The form of the variable is the gross profit/loss.[11] We could use this variable also as lagged by one year, when the subsidy agencies are choosing fundable projects. The lagged and current period variables are

[10] Later in the paper we replace subsidy-status dummy with the log amount of subsidies.

highly correlated however (correlation being 0.82) and the use of a lag would drop one estimable period[12] (Table A2 in Appendix). Due to the resulting multicollinearity, the dramatically lower number of observations and the very minor changes in results, we report below only the results obtained excluding the lagged profitability (results with lagged profitability are available upon request).

In order to further control for the selection, we also add the amount of sales, the average wage and fixed capital as log-form to the regression. These variables control differences between firms in output, wages and investments, all of which contribute to employment. Sales are also used in the literature as a proxy for future profitability (Klette and Moen, 1997; Lach, 2000). Wage controls for inflation, making the use of nominal, rather than real figures, sufficient.[13] Sales and fixed capital also control for the size of firms.

It is important to control for the size of firms. One consequence of the 'pick-the-winners' phenomenon is that subsidies are given more often to larger than to smaller firms, since most of the smallest firms are very young and thus less reliable survivors (Venetoklis, 2001). Moreover, it is a well-known fact that larger firms tend to have smaller relative growth rates than the smaller firms (Evans, 1987; Dunne and Hugher, 1994; Dunne et al. 1988). Therefore, the omission of a size variable would bias the estimates for the coefficient of the subsidy variable downwards, as subsidies are given more often to larger firms that have lower growth rates than smaller firms.

As far as other observable variables are concerned, it is argued that the regional impact of sectors is important. One key industry might be more important for a region than some other. Since regional officers of the subsidy agencies largely decide which firms are given subsidies, they may subsidise firms in one industry more often than its counterparts in another. On the other hand, there are clear differences in growth rates

---

[11] We do not take logarithm of this variable, as a fraction of the firms make gross losses every year (losses are negative, thus cannot be logged).

[12] Initially we have four estimable years and over 26,000 cross-sectional observations. One period (i.e. about 26,000 observations) is lost when we include lagged subsidy and control variables in the model. If we added a second lag of profitability, the number of estimable years would drop to two.

[13] Converting nominal prices into real ones would be particularly problematic in equations where the effect of different amounts of subsidies is estimated. Payroll figures could be deflated by producer price indices, whereas they cannot be used in deflating the subsidy, as subsidies are given to firms operating in different industries.

between industries. Hence, a joint 'effect' is that the industrial classification must be controlled.

In addition to the observables, we also take into account the effect of unobservable characteristics. Some of these are firm-specific but time-invariant. Others are common to all firms in one year but vary over time. We use time dummies to capture effects that are common to all the firms but vary over time. In terms of firm-specific effects, there might be regional differences in economic environment or industrial policies, or the legal form of firms could matter. Further, apart from the regional importance of industries, regional offices and officers may have different standards for applicant firms also for other reasons. Some offices or officers may grant money to firms more easily than others, partially due to the fact that in some regions there may simply be more applicant firms (Venetoklis, 1999). We remove all these time-invariant factors (some of which are firm-specific and the others industry- or region-specific) by estimating firm-specific fixed-effect models.

Moreover, the use of fixed effects also alleviates the problem of self-selection, which arises from the fact that we cannot observe all firm-specific factors that determine the probability of receiving subsidies and employment.

Thus, using all these controls and methods of analysis, we estimate the following equation:

$$E_{it} = \alpha + \beta D_{it} + \chi X_{it} + v_t + \eta_i + \varepsilon_{it} \qquad (5)$$

where, E can be (i) employment (number of personnel), (ii) total payroll (total = private + subsidy) or (iii) the firm's own (private) payroll; X is a vector of control variables (correlates with both E and D); v is a vector of time dummies, and η shows fixed effects (at the industry or individual level in our models below). D equals a dummy for subsidised firms. We also estimate models where the log amount of subsidies is substituted for subsidy dummy. Coefficients β and χ measure the structural, selection-corrected, effect of the observables on E, whereas η is the 'selection effect' (omitted variable bias) relating employment and the observables. All variables used in

estimations are described in Table 1. Table A1 in Appendix gives descriptive statistics for these variables and Table A2 shows the correlations between the variables.

Table 1. Description of variables

Variable	Form of variable
Endogenous (alternatives to each other)	
The number of personnel	Ln (the number of personnel)
Payroll	Ln(the amount of payroll)
Own payroll	Ln(the amount of own payroll)
Variable of interest (alternatives to each other)	
Dummy for subsidised firms	1= when subsidised, 0 otherwise
Amount of subsidy	Ln(1 + the amount of subsidies)
Control variables	
Profitability	Gross profits/Losses
Sales	Ln(the amount of sales)
Fixed capital	Ln(the amount of fixed capital)
Average wage	Ln(payroll per personnel)
Sector effects	20 sector dummies
Year effects	Year dummies (1995-6-7-8)
Individual effects	Individual dummies per firm

Note: Ln is natural logarithm. Ln(1 + the amount of subsidies) is Ln(1) for non-subsidised firms.

4. Description of data set

Our sample has been taken from the registers compiled by the Finnish Tax Authority. These registers cover the whole population of firms that pay taxes in Finland, including information on their industrial sector, size, financial statement accounts and possible business subsidy receipts.

In the data analysed we keep only those firms that employ at least one fulltime person each year. We drop from the sample those firm if their log size of sales has changed more than +/-2.5 times over a year (this eliminates the effects of take-overs and mergers). We also drop firms that have non-plausibly low or high average wage (payroll/the number of personnel). Finally, after these restrictions, the variables in the remaining sample have missing values in some rows. Therefore, the number of observations varies from model specification to another.

The data set under analysis spans from 1995 to 1998 and the total of 103,082 observations refer here to firm-year pairs (Table 2). There are a little more than 26,000

firms in the data, which is more than one quarter of all the observations as the panel is unbalanced. The data includes over 18,000 subsidy records that correspond to 18 per cent of all observations. Most of the subsidies in our sample are given for employment purposes (14,241), whereas R&D subsides is the smallest group of the three. In contrast, the average size of R&D subsidies is as high as € 105,826, whereas that of an employment subsidy is only € 4,240. Also note that the sum of Investments and Operation subsidies is the largest (€ 200 million).

Table 2. Summary statistics for subsidies, 1995-1998

Subsidy type	Observations on subsidies	Per cent of all observations	Average subsidy, €	Sum of subsidies, € million
Employment (through the TM)	14,241	0.138	4,240	60
Investment and operation (KTM)	5,725	0.056	34,834	200
R & D (TEKES)	1,307	0.013	105,826	138
All subsidies	18,438	0.179	21,592	398
Observations with non-subsidised firms	84,644	0.821		
All observations (firm-year pairs)	103,082	1.000		

Note: One firm may have received subsidies from more than one source in one year.

In Table 3, we list various types of subsidies spent during the period 1995-1999 controlling for the distributor. We also include the proportion of a specific sub-type of subsidy compared to the overall amount of subsidies distributed per source. This gives an idea into which types of projects emphasis is placed per distributing organisation.

Table 3. Business subsidies distributed through the KTM, TM and TEKES during 1995-1999

Source and Type	%	%
KTM (Investment and Operation subsidies)		
Investments		
Regional investments	47	
Small enterprises (mainly for investments)	15	
Energy related investments	3	65
Operation subsidies		
Research and product development	16	
Small business development operations	7	
Internationalisation	8	
Environmental purposes	4	35
All	100	100
TM (labour subsidies)		
General labour subsidies and structural aid		
Investment with employment goal	2	
Training and work	6	
EU and Structural aid	21	30
Other labour-related subsidies		
Other labour related aid	15	
Other aid through TM	41	56
Aid to entrepreneurs		
Direct labour aid to entrepreneurs	5	
Direct training and work aid to entrepreneurs	8	
Combined subsidy to private sector entrepreneurs	1	14
All	100	100
TEKES (R & D subsidies)		
Product development subsidies		59
Subsidies for applied research		41
All		100

Note: Figures are provided by the Finnish Tax Authority (Verohallitus) database which are in turn compiled from data given to them by the Ministries/Agency in question.

Be aware that this breakdown is at a very general level and it might not correspond to the exact division per subsidy type currently applied. We have compiled the table based on the data set at hand. In practice, the individual types of subsidies classified on a per-project-goal basis can be much more detailed. Finally note that due to data unavailability, the descriptive and econometric analysis that follows does not break down the amount of subsidies per sub-type, but just per source per year; that is we aggregate all the subsidies received by a firm from a specific source (TM, KTM , TEKES) during each year of the period 1995-1998. We call these subsidies as follows: Labour (TM), Investment and Operation (KTM), and R&D (TEKES) subsidies.

Overall, these subsidies are small relative to the number of employees within the assisted firms. On average € 1,226 of subsidies are given per employee, or about 6 per cent of the firm's own payroll expenditures (Table 4). Here we also see that the average size of labour subsidies is smaller than that of other types of subsidies.

Table 4. Subsidies relative to employment among subsidised firms

	Relative to personnel, €	Relative to payroll	Relative to own payroll
Labour (TM)	498	0.027	0.032
Investment and operation (KTM)	1,703	0.072	0.076
R & D (TEKES)	4,409	0.146	0.151
All subsidies	1,226	0.053	0.059

Note: As some firms receive subsidies from more than one source in a year, the proportion of KTM and TEKES subsidies relative to payroll and own payroll differ from each other.

As found elsewhere, the size distribution of firms (measured in terms of number of employees) is highly skewed to the right (Column 1 in Table 5). Almost three-quarters of firms employ 10 people or less; and the proportion of large firms, employing more than 250 people, is just one per cent. The number of subsidies has a more even distribution than the size of firms (columns 2 and 3). The proportion of subsidies for firms employing less than 10 people is smaller than their share of firms, whereas the opposite applies to firms employing at least 10 people. Also, the amount of subsidies increases linearly with the size of the firms (column 4). The average amount of subsidies is approx. € 6,100 among the smallest firms, whereas it is as high as € 165,000 among the largest ones. In contrast, the average size of subsidy per employee decreases with the increasing size of firms (column 5).

One novelty in this data set is that it includes firms outside the manufacturing sector. The proportion of manufacturing firms in our data is approx. 18 per cent of all the subsidised firms and its respective proportion of subsidy amounts is 36 per cent (Table 6). The other industrial sectors absorb a smaller proportion of subsidies relative to their number of firms, with the business service sector receiving the least amount of subsidies per firm.

Table 5. Firm size and subsidies

	(1)	(2)	(3)	(4)	(5)
Size of firm, number of employees	Proportion of all firms	Proportion of subsidised firms	2/1	Average subsidy per firm, €	Average subsidy per employee, €
1	0.153	0.034	0.2	6,096	6,057
2-10	0.565	0.420	0.7	7,392	1,597
10-50	0.227	0.382	1.7	16,145	727
50-250	0.045	0.128	2.8	47,971	488
More than 250	0.010	0.036	3.7	164,936	293
All	1.000	1.000	1.0	12,559	2,021

Finally, we take a look at firms that did not receive any subsidies in the year t-1 and compare employment (number of employees) in subsidised and non-subsidised firms in year t (Table 7). It appears that firms who start receiving subsidies in period t have clearly more employees than those that continue to be non-subsidised in the same period (t). The mean employment of firms that have not received any subsidies in period t-1 or t is 10 in both periods, whereas the respective figure for subsidised firms with labour subsidies is grows from 20 in t-1 to 29 in t. Employment in firms that start receiving Investment and Operation subsidies increases from 26 to 31, whereas that of firms that get R&D subsidies in year t is rockets from 55 to 132. The average difference between subsidised and non-subsidised firms is even higher, when we use their payroll as a comparison criterion.

Table 6. Industrial structure in the data set

Industry	(1) Proportion of firms	(2) Proportion of subsidies	(2)/(1)
Manufacturing	0.181	0.355	2.0
Other industrial production	0.138	0.123	0.9
Whole sale and retail trade	0.300	0.249	0.8
Business services	0.196	0.124	0.6
Other private services	0.186	0.148	0.8
All	1.000	1.000	

Table 7. The mean employment of subsidised and non-subsidised firms in the year t; no subsidies in t-1

	No subsidies in year t	Subsidies in year t		
		Labour subsidies	Investment and operation	R&D
Personnel (t-1), number	10	20	26	55
Personnel (t), number	10	29	31	132
Payroll, €	251,793	812,185	819,874	4,574,735
Own Payroll, €	251,793	808,769	819,874	4,574,735

Note: Payroll and Own Payroll figures are the same for firms that start receiving Investment and Operation subsidies and R&D subsidies, since there is no obligation to employ anyone with these subsidies. Therefore these subsidies do not directly affect payroll.

Based on the aforementioned results, can we conclude that subsidies have a positive and substantial impact on the employment of firms? Unfortunately no, because these results fail to take into account two things. First, labour subsidies trivially affect employment and payroll, causing a spurious correlation between labour subsidies and employment (this applies only to subsidised jobs (TM), not to the subsidies from two other sources (KTM, TEKES)). As mentioned earlier, firms receiving labour subsidies *have* to employ

someone with the money they get from the public source. Second, there is a possibility that subsidies are given more often to more promising firms that would grow faster than others, even without subsidies.

We can alleviate the first problem the using the firms' own payroll as the endogenous variable. We subtract possible public labour subsidies from the firm's total payroll and compute a new variable that is called the firm's own (private) payroll. We find that, even in this variable, employment is vastly higher in subsidised firms compared to non-subsidised ones (Table 7).

The second problem refers to omitted variables and calls for regression analysis, an investigation which follows next.

5. Results

5.1 Average effect of subsidies

We continue the analysis of firms, all of which do not receive any subsidies in the year t-2 but some of which receive in year t-1 and t. We regress three alternative employment variables on dummies for both the current subsidies and subsidies received in t-1, and current and lagged control variables described in Table 1.[14] Using firms that do not receive subsidies in t-2, we explore whether subsidies have time effects in the sense that they would be more beneficial over a longer period than one year.

In the following we report coefficients and heteroscedasticity corrected t-values. In the personnel and payroll equations, the lagged effect of subsidy is as strong as the current one (column 1 in Table 8). The effect of current subsidies on log-employment and payroll is 0.061, whereas the effect of lagged subsidies is 0.065, the sum equalling 0.126. In the own-payroll equation the lagged effect is clearly stronger than the current one. The current effect on log-payroll is 0.038, whereas that of lagged subsidies is 0.066. This implies that subsidies start bearing more fruits in a longer term than one year. The sum of the coefficients is 0.104, which equals to 11.0 per cent ($e^{0.104}$-

[14] Below we also estimate models where we replace subsidy dummies by log of subsidies.

1=0.1096).[15] Although the sum of coefficients is smaller in the own-payroll equation than in the personnel one, the difference is very small in magnitude.

Table 8. Effect of Labour (TM) subsidies with a lag; Individual fixed effects; endogenous variable is ln(E_{it}), i=1-3; N=42,883

Ln(E_{it})	D_t	D_{t-1}	Sum	R^2
Personnel	0.061 (7.0)	0.065 (6.5)	0.126 ***	0.65
Payroll	0.061 (8.1)	0.065 (7.5)	0.126 ***	0.27
Own payroll	0.038 (5.1)	0.066 (7.6)	0.104 ***	0.27

Note: E_i, i=1-3 where 1= personnel, 2= payroll and 3= own payroll. We compute the Huber/White/Sandwich estimator of variance to remove heteroscedasticity. These adjusted t-values are given in parentheses. D is a dummy for labour subsidies. Control variables include the profits (gross profit), sales, average wage and fixed capital in the current and lagged form. We also have controls for firms that have received other types of subsidies. *** denote statistical significance at the 1 per cent level, ** denote statistical significance at the 5 per cent level, and * denotes statistical significance at the 10 per cent level.

We also checked the effects of the Investment and Operation subsidies. Here we do not necessarily have to estimate the own-payroll equation, as these subsidies include no obligation to employ anyone with the subsidy received. Nevertheless, results remain very similar across the three alternative endogenous variables. When investigating the personnel equation, it turns out that the joint effect of the lagged and current period subsidies is zero when evaluated at the conventional levels of significance (Table 9). Statistical significance is not reached even when we allow investments to take place (i.e. we exclude fixed capital from the equation). Note however that the joint effect of Investment and Operation subsidies is significant at the 10 per cent level. The marginal significance is due to the fact that, the lagged effect is positive. This implies that subsidised investments start bearing fruit in a longer term. The first year would not be long enough a period to evaluate its significance.

[15] We also experimented including the profit variable lagged by two periods (i.e. lagged one period with respect to the one-period lagged subsidy dummy). In this setting, firms were applying for subsidies in t-2. Therefore their suitability for subsidies is being evaluated at that period. In these models the high correlation between three variables of profitability became a problem (correlations being between 0.82 and 0.95). Further, another lag of profitability decreased the estimable years to two, and that dramatically decreased the number of observations. Regardless of these problems, the results remained remarkably similar to those reported in Table 8. These results are not shown here.

Table 9. Effect of business subsidies on the number of personnel; Individual fixed effects; endogenous variable is ln(personnel)

	Including fixed capital as control			Excluding fixed capital as control		
	Coefficient (TM-subsidies)	Coefficient (KTM-subsidies)	Coefficient (TEKES-subsidies)	Coefficient (TM-subsidies)	Coefficient (KTM-subsidies)	Coefficient (TEKES-subsidies)
D_t	0.061 (7.0)	0.001 (0.1)	-0.054 (-0.9)	0.066 (7.7)	0.004 (0.2)	-0.056 (-0.9)
D_{t-1}	0.065 (6.5)	0.044 (2.6)	0.001 (0.0)	0.073 (7.5)	0.049 (2.8)	-0.000 (-0.0)
Sum	0.126 ***	0.045 ( )	-0.053 ( )	0.139 ***	0.053 (*)	-0.056 ( )
N (R^2-within)	42,882 (0.65)			44,925 (0.63)		

Note: D is a dummy for subsidies. Apart from fixed capital, control variables include the profits (gross profit), sales and average wage in the current and lagged form. We compute the Huber/White/Sandwich estimator of variance to remove heteroscedasticity. These adjusted t-values are given in parentheses. In the tests for the statistical significance of the sum of coefficients *** denote statistical significance at the 1 per cent level, ** denote statistical significance at the 5 per cent level, and * denotes statistical significance at the 10 per cent level.

5.2 Marginal effects

In this section we augment the analysis by exploring the effect of *sized* business subsidies. We estimate the marginal effects of subsidies using log-log models, i.e. we include natural logarithm of subsidies in the regressions (Table 10). Results indicate that the elasticity of the firm's own payroll with respect to labour subsidies is 0.0108. As the average proportion of subsidies relative to own payroll is 0.032 (see Table 4), the marginal effect of subsidies is 0.34 (0.0108/0.0322), i.e. one Euro of extra subsidies generates 34 cents of more employment payroll.

Table 10. Elasticity of own payroll with respect to labour subsidies; Endogenous variable is ln (own payroll)

Variable	Coefficient	Significance	N	R^2-within
$Ln(subsidy)_t$	0.0038	4.8		
$Ln(subsidy)_{t-1}$	0.0070	7.7		
Sum	0.0108	(***)	42,864	0.27
Results by industry	**Sum of coefficients**	**Significance**	**N**	**R^2-within**
Manufacturing	0.0106	(***)	13,047	0.34
Whole sale and retail trade	0.0091	(**)	13,757	0.22
Other private services	0.0124	(***)	16,074	0.28

Note: We compute the Huber/White/Sandwich estimator of variance to remove heteroscedasticity. These adjusted t-values are given in parentheses. In the tests for the statistical significance of the sum of coefficients (***) denotes statistical significance at the 1 % level, (**) denotes statistical significance at the 5 % level and (*) denotes statistical significance at the 10 % level. Control variables include profitability, sales and fixed capital in the current and lagged form, and subsidies from two other sources.

The magnitude of the effect is modest. To create one extra job (lasting one year), the amount of labour subsidies needed is € 15,400 per year (the average payroll per employee is € 20,700 per year; see Table A1 in Appendix), the rate of subsidy relative to the cost of one job being 0.75. The effect is actually too modest to be positively effective. Since on average the firm cover 60 per cent of the costs of a subsidised job, this suggests that labour subsidies have displaced firms own employment payroll, allowing firms to allocate their employment expenditures to other uses. This result derives from the following fact. If a firm's share is 60 %, then the public share is 40%.[16]

We also check whether there is any difference in the elasticity of labour subsidies across the industrial sector of firms. It turns out that the elasticity is rather similar over the

[16] When the public subsidies are increased by one Euro, the firm must increase payroll at least by 1.5 in order to have a positive effect (1 / 0.40 = 2.5 and 1.5 / 2.5 = 0.60).

sectors (Table 10). In business services the elasticity is 0.0124 and in manufacturing it is 0.0106 per cent. In Wholesale and Retail Trade the elasticity is somewhat smaller, 0.0091. The effect has not caused capital to be substituted by labour, as we control for fixed capital.

In Table 11 we report the coefficients and heteroscedasticity-corrected t-values for all variables in an own-payroll equation. The elasticity of KTM subsidies with respect to the own payroll (sum of the two coefficients) is 0.0036 (column (2) in Table 11).[17] The KTM subsidies are not statistically significant when the joint significance of current and lagged variables is evaluated.[18] As found earlier however, the lagged KTM subsidies are again individually statistically significant. When evaluating the economic significance, we compute the marginal effect, which is as low as 0.047 (0.0036/0.076).[19] This implies that one Euro increase in Investment and Operation subsidies increase payroll in firms on average by the minuscule amount of 5 cents. This indicates that despite of their statistical significance and objectives to increase employment, Investment and Operation subsidies are expensive from an employment point of view. As the average wage is € 21 000, one extra job created with Investment and Operation subsidies costs € 440 000 (20668/0.047=439738). In personnel equations we end up with very similar marginal effect.[20] The elasticity of personnel with respect to KTM subsidies appears to be 0.042 and the marginal effect $4.2*10^{-7}$ (see Table 4).[21] According to these estimates the cost of one job is € 430 000, which may sound very high. One has to bear in mind however, that a large part of these subsidies are given as investment subsidies. Although this result suggests that the subsidised investments have not resulted in any considerable number of new jobs, investments may nevertheless have other positive effects on firms.

[17] Note that here we have removed the firms from the data that are located in 4-digit industries where Investment and Operation subsidies were not delivered.

[18] The same applies to an otherwise similar model where we use the number of personnel as our endogenous variable. - Results are not shown but are available upon request.

[19] Recall that 0.076 is the average proportion of KTM subsidies to the payroll, as shown in Table 4.

[20] Not shown in Table 11 but are available upon request.

[21] 0.042/€1703=0.00000042

Table 11. Effects of business subsidies on the own payroll; log-log model;

	(1)		(2)	
Variable	Coefficient	t-value	Coefficient	t-value
$Ln(subsidy)_t$, TM	0.0038	4.0	0.0043	4.3
$Ln(subsidy)_{t-1}$, TM	0.0070	6.5	0.0078	6.9
$Ln(subsidy)_t$, KTM	-0.0002	-0.2	0.0000	0.0
$Ln(subsidy)_{t-1}$, KTM	0.0034	1.9	0.0035	2.0
$Ln(subsidy)_t$, TEKES	-0.0044	-0.8	-0.0059	-1.1
$Ln(subsidy)_{t-1}$, TEKES	-0.0000	-0.0	-0.0018	-0.4
Gross profit $_t$	0.0012	2.7	0.0015	3.1
Gross profit $_{t-1}$	-0.0001	-0.2	-0.0006	-0.9
Year 1997	0.0427	13.9	0.0405	11.9
Year 1998	0.0701	9.5	0.0672	7.5
$Ln(sales)_t$	0.1804	9.6	0.2058	9.8
$Ln(sales)_{t-1}$	0.0771	5.9	0.0899	5.7
$Ln(fixed\ capital)_t$	0.0412	7.7		
$Ln(fixed\ capital)_{t-1}$	0.0261	5.7		
Average wage $_t$	0.2036	18.0	0.2118	16.7
Average wage $_{t-1}$	-0.0878	-8.5	-0.0964	-8.2
Constant	7.507	18.4	7.8043	16.2
N; R^2-within	42,865; 0.65		37,127; 0.27	

Note: Model (2) excludes fixed capital controls and firms from the data that are in 4-digit sectors where KTM-subsidies were not delivered in 1995-1998. We compute the Huber/White/Sandwich estimator of variance to remove heteroscedasticity. These adjusted t-values are given in their own column.

Finally, again in Table 11 it appears that demand, approximated by the sales of firms, is positively associated with employment. Similarly fixed capital has a positive coefficient. These results accord with respective findings in literature (Hamersmesh,

1993). In contrast, the current wage coefficient has a perverse positive sign. This result is accounted for by the construct of the wage variable. Since it is the log of payroll per the number of personnel, the same (payroll) variable appears in both sides of the equation, causing the positive sign of the variable. The lagged average wage, on the other hand, has a negative sign.

6. Regional analysis

In this section we conduct a regional analysis of our data. We divide the regions of Finland into five different functional groups and cross tabulate them with six industrial sectors. Using Regional Accounts compiled by Statistics Finland, we find that the capital region, Helsinki, is characterised by a higher per capita GDP and a higher proportion of jobs in private services compared to the respective figures of the other groups (Table 12). In the 'other large university regions' and the 'other provincial centres', the proportion of public sector is somewhat higher than elsewhere. The 'manufacturing regions' are characterised by relatively high per capita GDP and (naturally) by the high presence of manufacturing jobs. In the 'countryside', the proportion of agricultural jobs is of course high, whereas the per capita GDP is, as expected, the lowest. We list all sub-regions within these six groups in Table A3 in the Appendix.

Table 12. Summary statistics for regional groups, 1999

Group	Capital region	Other large university centres	Other provincial centres	Intermediate manufacturing centres	Countryside
Population	1,163,841	876,010	1,178,559	735,743	1,211,343
GDP/capita, €	30,800	21,121	18,123	20,000	14,050
Industrial structure, %					
Agriculture	0.4	1.3	4.5	5.6	14.4
Manufacturing	13.2	22.1	21.4	30.9	21.6
Construction	5.0	5.9	5.7	5.5	5.0
Private services	55.6	37.7	33.8	29.7	26.3
Public services	24.1	29.2	30.7	24.4	28.0
Other	1.7	3.7	3.9	3.9	4.8

Note: Source: Regional Accounts, Statistic Finland

According to the Labour Employment Statistics of Statistics Finland, economic development has varied across regions since the mid-1990s when Finland started to recover from a severe economic recession (Figure 1). During the recession, employment deteriorated fast everywhere in Finland, whereas since the mid-1990s the capital region and other large university regions have outperformed positively the rest of the country. Employment in the countryside has been remarkably poor, as the 1999 levels have stayed more or less the same as the ones just after the gloomiest years of recession.

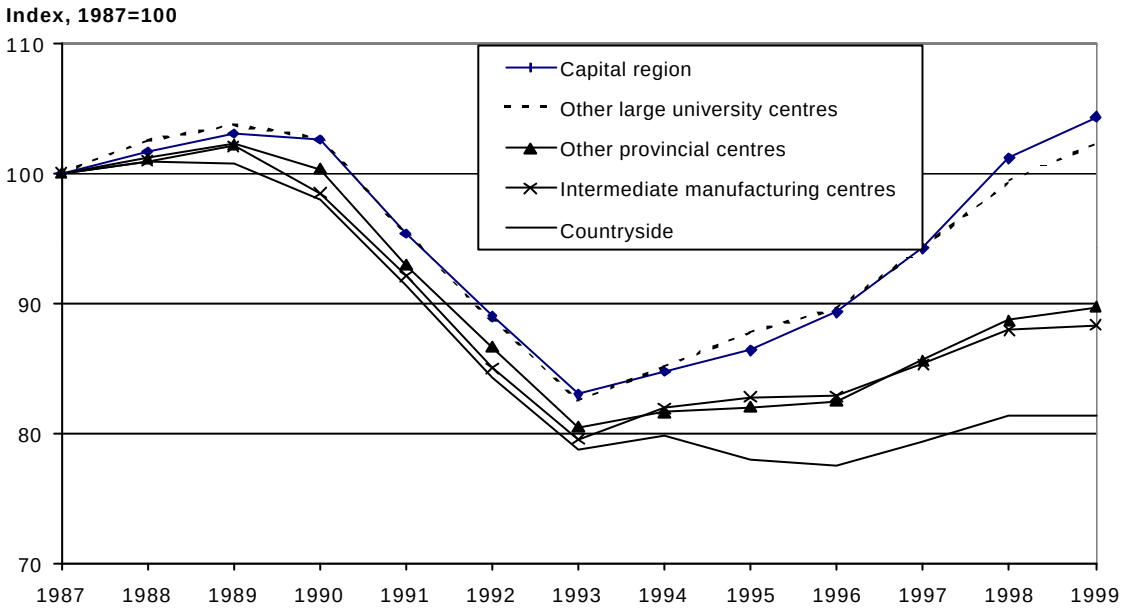

Figure 1. Evolution of the number of jobs across regional groups, 1987-1999. Source: Labour Employment Statistics, Statistics Finland.

Returning to the sample of firms at hand, the number of observations across the regional groups ranges from 12,000 to 29,000 (Table 13). The size of firms increases when moving from the countryside to the capital region. The mean employment of firms is 14 persons in the countryside, whereas it is 27 in the capital region. Among Labour subsidies the number of subsidised firms relative to the non-subsidised is the highest in the other provincial centres. Among KTM subsidies the proportion is the highest in the countryside. Firms in the capital region receive the least of both subsidies. The average size of labour subsidies ranges from € 3,600 to € 4,500 and that of KTM subsidies from € 30 000 to € 39 000.

Table 13. Summary statistics of labour subsidies across regions

	Country side	Intermediate industrial centres	Other provincial centres	Other large university centres	Capital region	All
Observations	18,146	12,084	20,720	17,563	28,977	97,490
Average employment	14	17	16	17	28	19
Labour subsidies						
N of subsidies	2,848	1,846	3,662	2,512	2,769	13,637
Share of firms subsidised	0,16	0,15	0,18	0,14	0,10	0,14
Average subsidy, €	4,435	4,499	4,486	3,609	4,178	4,229
Investment and Operation subsidies						
N of subsidies	1,671	769	1,370	810	903	5,523
Share of firms subsidised	0,09	0,06	0,07	0,05	0,03	0,06
Average subsidy, €	39,862	31,948	29,634	33,973	38,346	35,112

Note: We have dropped firms for which we do not have information on regional location.

Regional analysis may be problematic in the data at hand because the unit of observation is the firm. Some firms have several branch plants, which makes the determination of location cumbersome. However, as our description in section 4 showed, the mean size of firms (in terms of number of personnel) is very low. This implies that the number of firms with more than one establishment is fairly small as well. If the structure of the large firms located in our different geographical classifications 'differ', then the effect of Labour subsidies on the firm's own employment would change and give more a accurate estimate only when the large firms are omitted from the regression models.

Excluding the largest firms[22] from the data, regional differences appear to be surprisingly large between the elasticities of own-payroll with respect to Labour subsidies (Table 14). Elasticity (the sum of current and lagged coefficient) is the strongest in the countryside, whereas it appears to be low in the other provincial centres and the intermediate manufacturing regions. The elasticity about four times larger in the countryside compared to the latter group.

[22] When the regressions are estimated including and excluding the largest firms that most probably have more than one plant, results remain surprisingly similar. This implies that despite our original hypothesis, the location of the largest firms is not biasing our results.

As previously, we now calculate the marginal effect using the estimates for elasticity and the proportion of subsidies to own payroll (Table 14). The proportion of subsidies to own payroll is higher in the countryside and the capital region than elsewhere. The differences in this proportion between the regional groups are so large, that the regional differences in marginal effects are different from those in elasticities. While in marginal effect the countryside remains at the top, the other large university centre regions come second and the other provincial centres third. It appears that one extra Euro of subsidies increases the firm's own payroll levels (in monetary terms) by 49 cents in the countryside and only 15 cents in the intermediate industrial centres. The difference between the two extremes is rather large, as the average marginal effect over all groups was found to be 34 cents (see section 5.2).

Table 14. Marginal effects by regional group; largest firms excluded

Labour subsidies	Subsidy / own payroll	Elasticity	Marginal effect
Countryside	0.041	0.020***	0.49
Intermediate industrial centres	0.038	0.006	0.15
Other provincial centres	0.019	0.005	0.28
Other large university centres	0.027	0.012**	0.44
Capital region	0.053	0.014**	0.26
Investment and Operation subsidies	Subsidy / personnel	Elasticity	Marginal Effect
Countryside	10974	-0.001	-0.00000010
Intermediate industrial centres	10298	-0.001	-0.00000006
Other provincial centres	10555	0.013**	0.00000120
Other large university centres	8945	0.003	0.00000034
Capital region	13592	-0.001	-0.00000009

Note: Elasticities for Labour subsidies are from regressions of log-own payroll on log subsidies in the current and lagged form and control variables that include sales, fixed capital, wages and profitability in the current and lagged form and subsidies from two other sources. Elasticities for KTM subsidies are from regressions of log personnel on log subsidies (in the current and lagged form) and control variables. In both models the elasticity column reports the sum of current and lagged form coefficient. (***) denotes statistical significance at the 1 % level, (**) denotes statistical significance at the 5 % level and (*) denotes statistical significance at the 10 % level. We exclude observations whose information on their location is missing.

Although the marginal effect in the countryside is as high as 0.49, it still points to displacement, as the firm's share of the payroll in a subsidised job is 60 per cent. This means that one Euro of subsidies to be effective, it should have encouraged the firm to

increase its own payroll by more than 1.5 Euros.[23] Nevertheless, the mildest displacement effect in the countryside suggests that regional policy has been more effective in areas where the need for development has been the greatest. Therefore, there may be a case for an increase in the labour subsidies from the regional policy perspective.

Finally, it appears that the statistically significant effect of Investment and Operation subsidies in the overall evaluation is due to relatively strong effect in the other provincial centres (Table 14). Elsewhere the KTM subsidies have not had any effect on the employment (the number of personnel) of firms.

7. Conclusion

This paper evaluated the effect of business subsidies on the employment of firms during 1995-1998. The main finding was that Labour subsidies create displacement effect and Investment and Operation subsidies have had a very mild positive effect on employment.

One Euro increase in Investment and Operation subsidies causes the payroll in firms to increase on average by 5 cents. As the average wage is € 21 000, one extra job created with Investment and Operation subsidies costs € 440 000. In personnel equations we ended up with a very similar marginal effect. According to these estimates, the cost of one job is € 430 000. This indicates that despite of their statistical significance and objectives to increase employment, Investment and Operation subsidies are expensive from a purely employment point of view. However, these KTM subsidies are delivered to a great extent for investment projects. Although our results suggest that the subsidised investments have not resulted in any considerable number of new jobs, investments may nevertheless have other positive effects on firms. In such a case however, one cannot defend the use of investment subsidies on employment grounds , as the case for investment subsidies is elsewhere.

[23] We showed earlier that if firms share is 60 %, then the public share is 40%. When the public subsidies is increased by one Euro, the share of the firm must increase at least by 1.5 (1/0.40=2.5 and 1.5/2.5=0.60) in order to have a positive effect.

Labour subsidies increase the firms' own employment payroll on average by 11 per cent. The marginal effect of subsidies however, is 34 per cent. As on average firms pay themselves at least 60 per cent of the employment payroll of a worker in a subsidised job, our result suggests that labour subsidies displace the firms' own employment expenditures. This means that labour subsidies allow firms to reallocate their employment expenditure to other uses. For example in our sample, firms receiving labour subsidies tended to invest more in their physical capital than other firms. These investments contribute slightly but positively to the firms' own employment expenditure.

When considering the actual purpose of labour subsidies, the strong displacement effect is not that surprising. The purpose of labour subsidies is to improve human resources development of the work force as well as to encourage firms to increase employment. Labour subsidies are often directed to firms who employ workers, whose productivity is lower than the level needed in active labour markets. Therefore, these people are not easily employable with the prevailing minimum wage level of the sector in question. Labour subsidies are used to fill the gap between wages that firms are willing to pay to these people and the prevailing wage level.

However, poor performance of labour subsidies raises the question of whether this public outlay could be used more efficiently otherwise. One alternative is to shift subsidised jobs from the private to the public sector. We have a shortage of workers, particularly in the large health care sector, and this could easily accommodate more subsidised jobs. Earlier studies have shown a weakness in this policy, however (Aho et al.1999, Hämäläinen, 1999). A finding usually is that working in a subsidised job, has improved the subsequent labour market performance of the participant, only when the subsidised job has been in the private sector. Subsidised jobs in the public sector have not created this kind of improvement. Alternatively, we could use the resources currently devoted to labour subsidies as a tax reduction, which would improve employment in the economy by increasing disposable income. Thirdly, labour subsidies could be used more effectively in other the labour market measures. For example, we could increase training and education or improve the efficiency of other public labour market services.

This paper studied the effectiveness of labour subsidies from the firm perspective. Before a final policy conclusion is made, a wider perspective is needed. For example, a subsidy may release a firm's own funds to a use that improves the firm's performance. Investments and marketing are examples of such uses. Further, we know from earlier studies that labour subsidies have indeed improved the subsequent labour market success of the program's participants. Therefore, we cannot tell with absolute certainty whether the overall social effect of labour subsidies is positive or negative.

Regional results show that the displacement effect of labour subsidies is the smallest in the countryside. This suggests that regional policy has been more effective in areas where the need for development has been the greatest. This also implies that labour subsidies have contributed somewhat to the ongoing convergence of regional economies in Finland. The displacement however, does not increase linearly with a increasing urbanisation, as in the intermediate industrial centres the displacement effect is the strongest.

It is somewhat surprising that the effectiveness of business subsidies does not change with the economic importance of regions. While the displacement effect is the mildest in the countryside, it is not the strongest in the capital region but in the intermediate industrial centres. The same applies to both Labour and Investment and Operation subsidies. The positive effect on employment is entirely due to the other provincial centres, whereas the effect is statistically insignificant elsewhere. The regional effectiveness depends on factors, investigation of which is left to a future work.

Acknowledgements

Financial support given by Parlamentary State Auditors is gratefully acknowledged. We would like to thank the following persons for valuable discussions and comments: Kari Hämäläinen, Pekka Ilmakunnas, Jaakko Kiander, Pertti Kohi, Mauri Lehmusto, Miguel Leon-Ledesma, Sari Pekkala, Heikki Räisänen and Tony Thirwall.

References

Aho, S., J. Halme and J. Nätti (1999). Tukityöllistämisen ja työvoimakoulutuksen kohdentuminen ja vaikuttavuus 1990-1996 [in Finnish]. Työpoliittinen tutkimus 207. Ministry of Labour, Helsinki.

Akerlof, F. A. Rose, J. Yellen and H. Hessenius (1991). East Germany in from the cold: the Economic Aftermath of Currency Union. Brookings Papers for Economic Activity 1, 1 – 87.

Begg, D. and R. Portes (1993). Eastern Germany Since Unification: Wage Subsidies Remain a Better Way. The Economics of Transition 1, 383 – 400.

Blundel, R. and M. Costa Dias (2000). Evaluation Methods for Non-Experimental Data. Fiscal Studies, 41, 4, 427-468.

Branstetter, L. and M. Sakakibara (1998). Japanese Research Consortia: A microeconometric Analysis of Industrial Policy. Journal of Industrial Economics, 46, 207 – 233.

Dunne, P. and A. Hughes (1994). Age, Size, Growth and Survival: UK Companies in the 1980s. The Journal of Industrial Economics, 42, 2, 115-140.

Dunne, T., M.J. Roberts, and L. Samuelson. (1988). Patterns of Firm Entry and Exit in US Manufacturing Industries. Rand Journal of Economics, 19, 4, 495-515.

Economic Council (2001). Regional Economic Development and Regional Policy in Finland. Prime Minister's Office, Publications, 1/2001.

Evans, D.S. (1987). The Relationship between Firm Growth, Size and Age: Estimates for 100 Manufacturing Industries. Journal of Industrial Economics, 34, 4, 567- 581.

European Commission – EC (2000). Eight survey on state aid in the European Union. COM (2000) final, 11.4.2000: Brussels.

Fuest, C. and B. Huber (2000). Why do Governments Subsidise Investment and not Employment? Journal of Public Economics, 78, 171-192.

Hamermesh, D. (1993). Labor Demand. Princeton University Press. New Jersey.

Heckman, J., LaLonde and Smith (1999). The Economics and Econometrics of Active Labour Market Programs. In Ashenfelter and Card (eds.) Handbook of Labor Economics, vol. 3.Elsevier Science.

Hämäläinen, K. (1999). Aktiivinen työvoimapolitiikka ja työttömien työllistyminen avoimille työmarkkinoille [in Finnish]. The Research Institute of the Finnish Economy. B 151. Helsinki.

Irwin, D. and P. Klennow (1996). High-tech R&D Subsidies: Estimating the Effects of Sematech. Journal of International Economics, 40, 323-344.

Kangasharju, A. & T. Venetoklis. Business Subsidies and Employment of Firms. To be presented at the Congress of European Association of Labour Economists, Paris, 2003.

Klette, T. and J. Moen (1998). R&D Investment Responses to R&D Subsidies: A Theoretical Analysis and a Microeconometric Study. Mimeo, Presented at NBER Summer Institute 1998.

Klette, Tor J., Jarle Moen and Zve Griliches (1999). Do Subsidies to Commercial R&D Reduce Market Failures? Microeconomic Evaluation Studies. NBER Working Paper 6947.

Lach, S. (2000). Do R&D Subsidies Stimulate or Displace Private R&D? Evidence from Israel. NBER working Paper 7943.

Lipsky (1980).Street – level bureaucracy. Dilemmas of the individual in public services. New York: Russel Sage Foundation.

Payne, A. (1998). Does the Government Crowd-out private Donations? New Evidence from a Sample of non-Profit Firms. Journal of Public Economics, 69, 323-345.

Roper, S. and N. Hewitt-Dundas (2001). Grant Assistance and Small Firm Development in Northern Ireland and the Republic of Ireland. Sottish Journal of Political Economy, 48, 1, 99-117.

Venetoklis, T (1999). Process evaluation of business subsidies in Finland. A quantitative approach. VATT Research Reports No 58: Helsinki.

Venetoklis, T. (2001). Business subsidies and bureaucratic behaviour. A revised approach. VATT Research Reports No 83: Helsinki.

APPENDIX

Table A1. Description of variables

Variable	Mean; standard deviation	Min ; Max
Endogenous		
Ln (the number of personnel)	1.732 ; 1.240	0 ; 9.53
Ln(the amount of payroll, FIM)	13.451 ; 1.335	11.16 ; 22.03
Ln(the amount of own payroll, FIM)	13.360 ; 1.343	7.98 ; 21.83
Exogenous		
Variable of interest		
Dummy for TM subsidies	0.138 ; 0.345	0 ; 1
Dummy for KTM subsidies	0.056 ; 0.229	0 ; 1
Dummy for TEKES subsidies	0.013 ; 0.119	0 ; 1
Ln(the amount of TM subsidies)	1.334 ; 3.350	0 ; 13.81
Ln(the amount of KTM subsidies)	0.623 ; 2.588	0 ; 16.01
Ln(the amount of TEKES subsidies)	0.157 ; 1.396	0 ; 16.80
Controls		
Gross profits, FIM million	5.566 ; 75. 970	-272.1 ; 9692
Ln(the amount of sales, FIM)	14.806 ; 1.530	0 ; 24.02
Ln(the amount of fixed capital, FIM)	12.238 ; 2.026	0 ; 23.94
Ln(payroll per personnel, FIM)	11.719 ; 0.436	11.16 ; 16.12

Note: Ln is natural logarithm. One € is 5,94573 FIM.

Table 2A. Correlation table.

	1.	2.	3.	4.	5.	6.	7.
1. ln(TM subsidy), t	1.0000						
2. ln(TM subsidy), t-1	0.4312	1.0000					
3. ln(KTM subsidy), t	0.1520	0.1819	1.0000				
4. ln(KTM subsidy), t-1	0.1400	0.1736	0.5689	1.0000			
5. ln(TEKES subsidy), t	0.0583	0.0860	0.2284	0.2090	1.0000		
6. ln(TEKES subsidy), t-1	0.0453	0.0707	0.1907	0.1967	0.6371	1.0000	
7. gross profit, t	0.0445	0.0674	0.0819	0.0589	0.1678	0.1107	1.0000
8. gross profit, t-1	0.0474	0.0589	0.0815	0.0451	0.1640	0.1384	0.8163
9. Year 1997	-0.0550	-0.1372	-0.1018	-0.0886	-0.0657	-0.0588	-0.0188
10. Year 1998	-0.0465	-0.0705	-0.0585	-0.0562	-0.0290	-0.0279	-0.0207
11. Ln(sales), t	0.1947	0.2095	0.2071	0.2008	0.1527	0.1456	0.2348
12. Ln(sales), t-1	0.1844	0.2073	0.2059	0.1990	0.1509	0.1459	0.2298
13. Ln(fixed capital), t	0.1701	0.1945	0.2389	0.2269	0.1408	0.1367	0.1940
14. Ln(fixed capital), t-1	0.1594	0.1898	0.2343	0.2270	0.1401	0.1388	0.1955
15. Average wage, t	-0.0323	0.0009	0.0539	0.0553	0.0900	0.0851	0.0926
16. Average wage, t-1	-0.0189	-0.0323	0.0444	0.0482	0.0805	0.0805	0.0957

	7.	8.	9.	10.	11.	12.	13.	14.	15.
7. gross profit, t-1	1.0000								
8. Year 1997	-0.0197	1.0000							
9. Year 1998	-0.0188	-0.2416	1.0000						
10. Ln(sales), t	0.2137	-0.0400	-0.1078	1.0000					
11. Ln(sales), t-1	0.2126	-0.0458	-0.1083	0.9430	1.0000				
12. Ln(fixed capital), t	0.1780	-0.0587	-0.0801	0.6358	0.6318	1.0000			
13. Ln(fixed capital), t-1	0.1804	-0.0578	-0.0849	0.6263	0.6328	0.9459	1.0000		
14. Average wage, t	0.0808	-0.0462	-0.1115	0.2200	0.2048	0.1424	0.1397	1.0000	
15. Average wage, t-1	0.0859	0.0384	-0.0936	0.2342	0.2501	0.1614	0.1631	0.6377	1.0000

Table A3. Regional sub-regions by regional group

Capital Region	Other Large University Centres		Other Provincial Centres		Intermediate Industrial Centres	
011 Helsinki	131	Jyväskylä	201	Porvoo	103	Savonlinna
	023	Turku	081	Kouvola	052	Riihimäki
	064	Tampere	071	Lahti	082	Kotka-Hamina
	171	Oulu	043	Pori	013	Tammisaari
			211	Mariehamn	154	Jakobstadsregionen
			101	Mikkeli	022	Salo
			182	Kajaani	093	Imatra
			122	Joensuu	135	Äänekoski
			051	Hämeenlinna	134	Jämsä
			191	Rovaniemi	063	Etelä-Pirkanmaa
			162	Kokkola	041	Rauma
			142	Pohjoiset seinänaapurit	012	Lohja
			152	Vaasa	114	Varkaus
			091	Lappeenranta	174	Raahe
			112	Kuopio	192	Kemi-Tornio

Countryside			
094	Kärkikunnat	068	Lounais-Pirkanmaa
146	Järviseutu	053	Forssa
153	Sydösterbottens kustregion	024	Vakka-Suomi
124	Keski-Karjala	066	Koillis-Pirkanmaa
111	Ylä-Savo	177	Ylivieska
115	Sisä-Savo	197	Pohjois-Lappi
176	Nivala-Haapajärvi	196	Tunturi-Lappi
141	Suupohja	194	Koillis-Lappi
144	Kuusiokunnat	181	Kehys-Kainuu
172	Lakeus	178	Koillismaa
044	Pohjois-Satakunta	193	Torniolaakso
143	Eteläiset seinänaapurit	123	Ilomantsi
025	Loimaa	175	Siikalatva
121	Outokumpu	173	Ii
062	Kaakkois-Pirkanmaa	212	Föglö
067	Pohjois-Pirkanmaa	125	Pielisen Karjala
065	Itä-Pirkanmaa	137	Viitasaari
021	Åboland-Turunmaa	161	Kaustinen
042	Kaakkois-Satakunta	102	Juva
145	Härmänmaa	136	Saarijärvi
202	Loviisa	113	Koillis-Savo
105	Pieksämäki	104	Joroinen
151	Kyrönmaa	132	Kaakkoinen Keski-Suomi
061	Luoteis-Pirkanmaa	133	Keuruu
072	Itä-Häme	092	Länsi-Saimaa