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# The Relation between Firm Subsidy and Success

## Does Regional Context Matters?

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itps SWEDISH INSTITUTE FOR GROWTH POLICY STUDIES

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# Förord

Rapporten är en egeninitierad utvärdering av det regionala utvecklingsbidraget och är en fördjupning av ITPS tidigare effektutvärdering av samma bidrag, A2007:016, (ITPS, 2007b). En kritik mot tidigare rapport var att analysen inte tillräckligt hade tagit hänsyn till den regionala dimensionen. Den här rapporten är har ett specifikt fokus på att kontrollera för den regionala dimensionen. Rapporten är även en del av ITPS metodutvecklingsarbete och för att kunna tillgodogöra sig kommentarer från andra forskare och utvärderare har rapporten skrivits på engelska. Rapporten innehåller en längre sammanfattning på svenska.

Rapporten är skriven av Håkan Gadd, Gustav Hansson (projektledare) och Jonas Månsson. Rapporten har tagit lärdom av kommentarer och förslag från Torbjörn Lindqvist och seminariedeltagare vid EUNIP International Conference i San Sebastian, vid ITPS Bryssel-seminarium ”Regional Economic Growth – how can policy measures be evaluated” samt vid Örebro Summer School in Statistics.

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# Innehåll

# Sammanfattning

Den regionala tillväxtpolitiken i Sverige syftar till att skapa en utvecklingskraft i alla delar av landet med stärkt lokal och regional konkurrenskraft. Den regionala tillväxtpolitiken innefattar en lång rad olika åtgärder såsom t.ex. regionala projekt, företagsstöd, samt stöd till kommersiell service. Den här rapporten utvärderar ett av företagsstöden, det regionala utvecklingsbidraget (RUB), vilket numera benämns det regionala investeringsstödet.

Bakgrunden till att ITPS har tagit initiativ till att utvärdera det regionala utvecklingsbidraget, är att det är ett av de större företagsstöden i Sverige med utbetalningar på ungefär 9,2 miljarder kronor under perioden 1990 till 2005 (2005 års priser). En annan orsak är att ITPS tidigare har utfört en utvärdering av samma stöd (ITPS, 2007b), vilken har debatterats. En kritik som riktats mot den utvärderingen var att det ej tillräckligt hade kontrollerats för den regionala dimensionen. Den här rapporten är därför en fördjupad analys av det regionala utvecklingsbidraget, med ett fokus att kontrollera för den regionala dimensionen med hjälp av flernivåanalys. Rapporten har även ingått i ITPS metodutvecklingsarbete och ITPS erfarenheter av metoden flernivåanalys finns beskrivet i ITPS rapport A 2009:002, (ITPS, 2009).

En av svårigheterna med att utföra en effektutvärdering av ett företagsstöd, är att det kontrafaktiska utfallet, dvs. det utfall som hade skett utan bidraget, är okänt. Skillnaden mellan det verkliga utfallet och det kontrafaktiska utfallet är vad som i utvärderingslitteraturen definieras som en effekt (ITPS, 2009). Ett framgångsrikt angreppssätt är att jämföra utfallet i stödföretag med det i icke-stödföretag som i utgångsläget är så lika stödföretagen som möjligt. Genom att jämföra företag med deras ”tvillingar”, som så nära som möjligt representerar en kontrafaktisk situation, kan effekterna av stödet utvärderas. Propensity score matching är en metod för att matcha individer, företag osv. med varandra (Rosenbaum och Rubin, 1983). Intuitionen bakom matchning är att vi vill jämföra stödföretag med icke-stödföretag, vilka i utgångsläget har samma förutsättningar till att realisera ett visst utfall framöver. Genom att jämföra stödföretag och icke-stödföretag som i utgångsläget har samma förutsättningar, kan vi få en uppfattning om effekten av stödet.

Propensity score matching kan sammanfattas i tre steg: I det första steget estimeras sannolikheten för ett företag att få stödet. I det andra steget används dessa sannolikheter till att para ihop stödföretagen med de icke-stödföretag som har samma eller liknande sannolikheter. Stödföretagen blir på så sätt matchade med sina ”tvillingar” bland icke-stödföretagen. I det tredje steget jämförs stödföretagens utveckling med utvecklingen hos de matchade icke-stödföretagen. Om stödföretagen har haft en bättre utveckling än sina ”tvillingar” tolkas detta som en effekt av stödet.

Då matchningen i steg två bygger på skattningen i steg ett, är det viktigt att alla de faktorer som både påverkar sannolikheten att få stöd och utfallet tas med. Det är därför viktigt att i det här skedet kontrollera för både företagskarakteristika och den regionala dimensionen. För att kontrollera för den regionala dimensionen används både ”kontext” variabler såsom arbetslöshet, inflyttning till regionen, andelen högskoleutbildade o.s.v., samt ”konstanta” effekter såsom specifika kommuneffekter. Det är i skattningen av de ”konstanta” effekterna som metoden flernivåanalys har använts. Metoden gör det möjligt att identifiera effekter som relaterar sig till olika nivåer. Denna egenskap hos metoden gör den speciellt lämpad vid studier med en regional dimension.

Flernivåanalysen ger att det är framför allt företagskarakteristika som spelar en roll för vilka företag som får stöd. En sådan variabel är om företag har ansökt och fått stöd tidigare, vilket dels återspeglar företagets förmåga att söka stöd, samt hur pass välkänt företaget är hos stödgivande myndighet.

Variablerna som mäter en kommunkontext är inte statistiskt signifikanta, däremot är de ”konstanta” kommuneffekterna signifikanta. Detta betyder att det finns en variation mellan kommuner vilken påverkar sannolikheten för ett företag att få ett stöd, men att denna variation kan vi inte beskriva med hjälp av våra kontextvariabler. Då studien endast innehåller stödkommuner, är det inte så konstigt att kontextvariablerna inte är signifikanta.

Efter att ha avklarat steg ett, att skatta sannolikheten att få stöd, går vi vidare till steg två: att matcha stödföretag med icke-stödföretag. För att se huruvida matchningen har varit framgångsrik så utförs ett balanstest. Balanstestet visar att stödföretagen och de matchade icke-stödföretagen är lika varandra – är balanserade – med avseende på företags- och kommunkarakteristika. Balanstestet visar således att vi har lyckats att matcha liknande företag verksamma i liknande kommuner.

I matchningens tredje steg jämförs stödföretagen med icke-stödföretagen avseende sex olika utfallsvariabler och deras förändring över ett och tre år, dvs. totalt 12 utfall. De olika utfallsvariablerna är: förändring i antalet anställda, förändring i nettoomsättning, förändring i rörelseresultat, förändring i avkastning av totalt kapital, förändring i avkastning på eget kapital, förändring i rörelseresultat per anställd.

Stödföretagen har haft en signifikant mer gynnsam utveckling än icke-stödföretagen angående förändring i antalet anställda efter ett år, samt förändring i nettoomsättning efter tre år. Ser vi till de övriga utfallsvariablerna har dock stödföretagen haft en signifikant sämre utveckling angående förändring i avkastning på totalt kapital efter tre år och avkastning på eget kapital efter ett år. Angående de resterande utfallsvariablerna kan vi inte hitta några signifikanta skillnader mellan stöd- och icke-stödföretag.

Att det regionala utvecklingsbidraget verkar ha bidragit till en positiv förändring i antalet anställda och omsättning, visar att stödet har bidragit till att företagen har växt i storlek. Att stödet inte verkar ha haft några positiva effekter på avkastning eller vinst, och att stödföretag till och med uppvisar betydligt sämre avkastning än jämförbara företag, är dock problematiskt. Till viss del kan det förväntas att avkastningen på totalt kapital och eget kapital är densamma, men att avkastningen skall vara sämre är inte en fördelaktig utveckling. Det hade också varit mer fördelaktigt om det visade sig att stödet påverkade rörelseresultatet positivt.

Dessa resultat baseras dock endast på de företag som fick det regionala utvecklingsbidraget år 2000 och kan matchas med liknande företag. Det finns således stödföretag vars utveckling vi ej har redovisat, då vi ej lyckas hitta en acceptabel matchning för dessa företag. En annan omständighet är att vi endast har undersökt förändringen efter ett och tre år. Dessa resultat är i linje med ITPS tidigare studie (ITPS, 2007b) vilken fann en positiv effekt på antalet anställda, men ej på avkastning på kapital.

# Summary

In this paper, we investigate if firms who received the Regional Development Grant are performing better than firms that did not receive the subsidy. Using data on Swedish stock companies and a wide range of variables of regional characteristics, we firstly estimate a multilevel logit model of the probability of receiving the subsidy, and then use propensity score matching to assess the successfulness of the subsidy. The multilevel approach enables us to adequately take into account the regional context. Secondly, we use propensity score matching to assess the successfulness of the subsidy.

The results show that the number of employees, whether the firm had received a firm subsidy prior, and whether the firm's main economic activity is in services, all significantly influence the probability of being selected for the RDG subsidy. The municipality context variables does, however, not seem to matter for the probability to receive the RDG. Using a multilevel logit approach identifies a significant fixed municipality effect. This effect is only significant in some samples.

Using propensity score matching to match subsidized firms with similar non-subsidized firms, we can evaluate the effectiveness of the RDG subsidy. The subsidized firms seem to have had a more successful development concerning employment growth and net turnover, than the unsubsidized companies. Unfortunately, neither employment growth nor increases in turnover, tells nothing about the profitability or productivity of the company. Concerning the profitability measures (operation income, return on assets, return on equity, and income per employee) the subsidized firms are either found not significantly different from the non-subsidized firms, or significantly worse off than the non-subsidized firms. The RDG subsidy does therefore not seem to have increased the profitability or productivity amongst the studied companies.

# 1 Introduction

The regional development policy in Sweden focuses on creating growth, sustainable development and a high level of service for women and men in all parts of the country. The primary role of the policy is to foresee and prevent structural problems and to create the right conditions for regional growth and competitiveness. Policy measures should focus on long-term sustainable development, which should characterize all development work. The aim of regional development policy is effective, sustainable local labor-market regions which offer high levels of service throughout the country.

According to estimations by ITPS in the period 2003-2005, Sweden invested between 25-30 billion SEK annually in different types of state aid to businesses. Included in these figures are employment subsidies, start-up grants, regional support in the form of reduced social security contributions, transport support and regional development grants, as well as aid to small businesses. One of the purposes of these types of supports is to increase employment and thus also to promote economic growth. Selective subsidies as regional policy subsidies are used to support industry in eligible areas especially in the north of Sweden. Totally, about 730 million SEK is granted annually.

In this paper we examine one of these regional policy subsidies, the Regional Development Grant (RDG, *regionalt utvecklingsbidrag*). The reasons why we focus on this support scheme is that it is with regard to budget one of the largest subsidies in Sweden with about 9.2 billion SEK granted for the period 1990 to 2005. Another reason is that it seems to be few quantitative studies of the impacts from the scheme (ITPS, 2007b).

The Regional Development Grant is used to support businesses in certain support areas and the objective is to increase growth and balanced regional development. The grant is largely a capital subsidy that covers up to 35 % of an investment. For a firm to be eligible for a subsidy, it must be used for investments in machinery, equipment, buildings or a service activity that is aimed to increase the market for the enterprise. Before approval of an application for support it is assessed by the county administrative board. Larger support, which exceeds 25 million SEK, is granted by NUTEK (the Swedish agency for economic and regional growth).

The primary objective of this study is to investigate whether firms who have received the Regional Development Grant are performing better than those firms that have not received the subsidy. As pointed out by Pellegrini and DeCastris (2007), evaluation studies of industrial aid systems often lack a spatial dimension. A second objective of this study is therefore to investigate and discuss if the regional context matters for the probability to receive the subsidy.

We implement the investigating in two steps: Firstly we employ a multilevel logit model to estimate the probability of receiving the RDG. Included in the model are a range of variables capturing firm characteristics and the regional context. Furthermore, the multilevel approach enables us to adequately control for the possible regional heterogeneity. Multilevel models are applied when there is a hierarchical structure in the data, with the dependent variable measured at the lowest level and a set of variables on different levels. In our case we have the company at level 1, the municipality (*kommun*) at level 2, and the county (*län*) at level 3. One of the main advantages of this kind of models is the capacity to define and explore variations at each level of the hierarchy after

controlling for relevant explanatory variables. Multilevel regression models are therefore particularly appropriate for the analysis of contextual factors.

Secondly, to evaluate the effects of subsidies we make use of a propensity score matching technique. Following Rosenbaum and Rubin (1983) we first estimate the probability to receive the RDG subsidy, based on the multilevel logit results. The subsidized and non-subsidized firms are then matched on these probabilities, and we can therefore estimate the effect of the subsidy on employment growth and firm productivity, measured as return on total assets.

The main contribution of this paper is that we use a wide range of regional contextual variables, as well as utilizing a multilevel approach which adequately takes into account the regional context. Furthermore, although the RDG is one of the largest firm subsidies in Sweden, there are few empirical evaluations that study the effectiveness of the subsidy. This paper is therefore well motivated.

The paper is organized as follows: Section 2 shortly describes the motivation for state aid and previous literature. Section 3 presents the data and estimation approach. Section 4 presents the results, whereas Section 5 concludes.

# 2 Motivations for State Aid and Previous Literature

In most cases, government intervention is motivated when markets are not working optimally and there is a sub-optimal allocation of resources in a market or industry. In simple terms, if the market does not allocate scarce resources efficiently and in a way that achieves the highest social welfare, Governments justify their intervention as being in the public interest.

According to the economic literature, market failures have negative effects on the economy because an optimal allocation of resources is not attained. In other words, the social costs of producing the goods or services are not minimized, and this results in a waste of resources. The issue of market failures and how they should be addressed is a source of contention between different schools of economic thought.

In the neoclassical perspective, if a certain result is Pareto efficient, then it is not considered a market failure, regardless of whether or not it serves the public interest. Furthermore, the so-called Public Choice School, and advocates of laissez-faire capitalism, argues that there is no such concept as market failure. They argue that market failure does not necessarily imply that governments should attempt to solve market failures, because the costs of government failure may be worse than those of the market failure it attempts to fix. Others, such as social democrats and New Deal liberals, view market failures as a common problem of any unregulated market system, and therefore argue for extensive state intervention in the economy. However, if, on the one hand, state intervention is necessary to reach Pareto efficiency, it could, on the other, be harmful to competition, something that has led to a great amount of legislation concerning the legitimacy of state aid (ITPS, 2007a).

One theoretical starting point for discussing the impact of state subsidy is to focus on the optimal choice of the input mix in production. In general we can think of two effects: substitution of factors of production due to lower input prices, and an increase in firm output. Previous research gives little guidelines on what to be expected.

Gabe and Kraybill (2002) find that the substitution effect outweighs the output effect. Kangasharju and Venetoklis (2002) find that employment growth within firms in Finland is larger in subsidies firms. Schalk and Untiedt (2000) find, on the contrary, that the output effect outweighs the substitution effect. This is also in line with results reported by Pellegrini and Centra (2006), that growth in turnover, employment and fixed assets are more dynamic in subsidized firms but that productivity grows less than in the non subsidized firms. A similar result is found in an evaluation of the RDG subsidy where there are some positive effects on employment growth and investment, but not for the return on total assets (ITPS, 2007b).

Subsides could also have an effect on the efficiency and productivity, i.e. the use of factors of production. The literature, however, suggests no such effects (see e.g. Bergström 2000). Tzelepis and Skuras (2004) find that subsidized investments under the regional development frameworks (structural fund programs) are ineffective. Besides these direct impacts there could be a regional transmission, i.e. subsidies to firms in less developed areas may result in an overall increase of firm localization in the area (see e.g. Midelfart-Knarvik and Overman, 2002). The Previous literature thus gives mixed results concerning the effectiveness of state aid and firm subsidy.

# 3 Data and Estimation Approach

## 3.1 A Multilevel Approach

At the first stage, the aim of this paper is to estimate the probability of receiving the firm subsidy; the Regional Development Grant (RDG). Based on previous literature, we conjecture that the probability depends on both firm and regional characteristics, as well as municipality and county heterogeneity. In order to adequately take into account the possible municipality and county heterogeneity, we employ multilevel modeling (see e.g. Gelman and Hill, 2007; Twisk, 2006; and Bickel, 2007).

Multilevel models are applied when there is a hierarchical structure in the data, with the dependent variable measured at the lowest level and a set of variables on different levels. In our case we have the firm at level 1, the municipality at level 2, and the county at level 3. One of the main advantages of this kind of models is the capacity to define and explore variations at each level of the hierarchy after controlling for relevant explanatory variables. Multilevel regression models are therefore particularly appropriate for the analysis of contextual factors.

Multilevel analysis provides an efficient way of taking into account of possible regional heterogeneity, i.e. providing an efficient way of estimating different municipality and county intercepts, where municipality is nested within county, so called "random intercepts." Multilevel analysis also provides an efficient way of taking into account of the possibility that for example the effect of a company characteristic differs between municipalities, i.e. estimating different slopes or interactions, so called "random coefficients."

The model is set as follows: Let subscript $k$ refer to county groups ($k$ = 1,…,$L$), $j$ to municipality groups ($j$ = 1,…,$m$), and $i$ to companies ($i$ = 1,…,$n$), where companies are nested within municipalities, which are nested within counties. $x_{hijk}$ then represents all $r$ ($h$ = 1,…,$r$) variables of interest (to be explained in greater detail below). To be able to capture county and municipality heterogeneity we allow for county and municipality random intercepts, denoted $\eta_{0k}$ and $\nu_{0j}$ respectively. The model can be defined as follows:

$$f(\pi_{ijk}) = \beta_0 + \sum_{h=1}^{r} \beta_h x_{hijk} + \nu_{0j} + \eta_{0k}, \qquad (1)$$

where $\pi_{ijk} = \Pr\left(y_{ijk} = 1 \mid x_{ijk}, \eta_{0k}, \nu_{0j}\right)$, and $y_{ijk}$ is our binary response variable equal to 1 if company $i$, in municipality $j$, county $k$, received a firm subsidy, and 0 otherwise. $f(\pi_{ijk})$ is the link function that ensures that the predicted probabilities $\pi$ derived from the fitted model is between 0 and 1. We apply a logit link.

In equation (1) we have both fixed coefficients $\left(\beta_h\right)$, which are interpreted as in an ordinary logit estimation, and the random intercepts $\nu_{0j}$ and $\eta_{0k}$, which can be interpreted as error terms. The random intercepts are assumed to be normally distributed with zero means $\left(E(\eta_{0k}) = E(\nu_{oj}) = 0\right)$ and constant variances ( $\mathrm{var}(\eta_{0k}) = \sigma^2_{0\eta}$ and $\mathrm{var}(\nu_{0j}) = \sigma^2_{0\nu}$ ). If the estimated variance of the random intercept at the municipality level $\left(\hat{\sigma}^2_{0\nu}\right)$ is

significantly different from zero, we conclude that there is municipality heterogeneity in the data.

In addition, if we conjecture that for example some of the effects of a firm characteristic, say return on total assets, differ between municipalities (i.e. different slopes, or random coefficients), we could estimate the following model:

$$f(\pi_{ijk}) = \beta_0 + \sum_{h=1}^{r} \beta_h x_{hijk} + \sum_{h=1}^{q} \nu_{hj} x_{hijk} + \nu_{0j} + \eta_{0k} \quad , \qquad (2)$$

where $\nu_{hj}$ are the random coefficients for the first $q$ variables, at the municipality level. As we will explain in section 4, we test for random intercepts for both municipality and county, as well as random coefficients. The final model, however, only includes municipality random intercepts. As it turns out, we are not able to improve on this model by including country intercepts or random coefficients.

It is reasonable to assume that the development in a given company or region, are to a large extent affected by factors present within the company or region itself. It is also reasonable to assume that developments in a given company or region affects development in other nearby companies or regions. There are several reasons for this: for example, it is reasonable to suppose that government support for a company in a particular region may also affect the company's subcontractors and/or retailers in other nearby regions. In addition, support may also impact the company's competitors and thus have an overall negative effect on, say, employment in that particular region or regions close by. Some empirical research based on Swedish data suggests that if government regional support has a negative effect on regional unemployment, this in turn will have a positive effect on migration to that region which is of considerable significance for regional policies (Aronsson et al., 2001, and Lundberg, 2003). It would therefore be desirable to also adequately control for spatial dependency between regions. In the estimation that follows we try to control for location characteristics using a variable capturing the municipalities distance to a larger market. Unfortunately, we have not controlled for border dependencies, and it is something we leave for future studies.

## 3.2 Data

The data used in the multilevel logit and propensity score matching estimations consists of data from three primary areas: data on firm subsidy, data on firm accounts, and data on municipality characteristic.

### 3.2.1 Firm Subsidy Data

For the data on firm subsidy in Sweden we make use of the STINS database, which is provided by NUTEK, the Swedish government agency that administers the subsidy. The STINS database includes, among other things, data on all firms that received the Regional Development Grant, as well as other firm subsides. From the STINS database we therefore construct our dependent variable *RDG* which equals 1 if the company received the subsidy during the year 2000, and 0 otherwise.

With data on the Corporate Employment Grant (*sysselsättnings bidrag*), the Rural Area Subsidy (*landsbygdsstöd*) as well as the Aid to Small Businesses (*småföretagarbidrag*) we construct two explanatory variables: *OtherSubsidy2000* which equals 1 if the company received any of the other subsidies during the year 2000, and *OtherSubsidyPrior* which

equals 1 if the company received the Regional Development Grant or any of the other subsides during the years 1995-1999.

### 3.2.2 Firm Accounts Data

From MM-partner[1] we receive accounts data for all companies in Sweden. From this database we extract the number of employees in1999 (*Employees1999*), the rate of return on total assets 1999 (*Return on Assets 1999*), and *Equity-Debt ratio 1999* (i.e. shareholders' equity divided by total assets). From MM-partner we also construct the variable *NewCompany* which equals 1 if the company was registered as a company in the year 1999 but not in 1998.

These variables are intended to capture the primary information the subsidy administrator considers. The variables *OtherSubsidy2000* and *OtherSubsidyPrior* capture the history of the company and can be interpreted as the firm's ability of writing subsidy applications. The variables *Employees1999, Return on Assets 1999*, and *Equity-Debt ratio1999* refers to the company's profitability and financial position and are standard variables considered by for example commercial banks and other institutions granting loans. Moreover, to better account for the differences in economic activity in the firms, we also construct the dummy variable *Services*, which equals 1 if the company is primarily a service company and 0 otherwise.[2]

A complicating factor with the variables based on accounts data is that the account year in Sweden is divided into four different periods: May 1 to April 30, July 1 to June 30, September 1 to August 31, and January 1 to December 31. Except from these dates, companies can also have a special account year, if they have a special permission from the tax authorities. Comparing companies with different account period may lead to bias results in the propensity score matching. Therefore, we have constructed dummy variables for the four standard account periods, which are used as controls in the multilevel logit estimation. The accounts data is set to belong to the year 2000 if the account closed in the year 2000.

From MM-partner we also derive our six outcome variables to be used in the propensity score matching. The six outcome variables are: the change in employees (*Diff. Employees*); the change in net turnover (*Diff. Net turnover*); the change in operating income (*Diff. Operating income*); the change in return on total assets (*Return on assets*); the change in return on stockholders' equity (*Return on equity*); and finally the change in income per employee (*Diff. Income/employee*). These changes are calculated for 1 and 3 years (2000-2001, and 2000-2003).

The outcome variables are divided between absolute and relative measures. The absolute measures indicate an absolute change in income or the number or employees. The relative measures put these changes in relation to total assets or number of employees, and therefore measure a change in profitability and productivity.

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*[1] MM-partner is a commercial company selling and producing statistics on firms account. The statistics are based on official register data form sources such as Statistics Sweden.*

*[2] Where a company is defined as a manufacturing company if it has SNI 2002 >=50000 and SNI 2002 < 99999, where SNI 2002 is the Swedish economic activity index version 2002 (Svenskt näringslivsindex), which is in parity with NACE, the statistical classification of economic activities in the European Community.*

### 3.2.3 Municipality Data

The main focus in this paper is on the regional context. As pointed out by Pellegrini and DeCastris (2007), evaluation studies of industrial aid systems often lack a spatial dimension. An objective of this study is therefore to investigate and discuss if the regional context matters for the probability to receive the subsidy.

Sweden was dived into 21 counties (*län*) and into 289 municipalities (*kommuner*) in the year 2000. On the municipality level we aim at investigating what type of characteristic are important to receive subsidy. The municipality characteristics considered in this paper can broadly be divided into four areas: composition of the residents, location based characteristics, economic, and political situation. The municipality variables are:

- Composition of the Residents:
  - Share Higher Education
  - Share Foreign Born
- Location Based Characteristics:
  - Log Distance to Market
  - Log Population Density
  - University
- Economic Situation:
  - Unemployment rate
  - Income
  - Migration
  - Share State Employed
- Political Situation:
  - Left
  - Political Strength

The composition of the residents variables includes *Share Higher Education* which measures the share of the population in the municipality with more than upper secondary school (more than *gymnasium*). The variable *Share Foreign Born* measures the share of the population which are born in another country than Sweden.

Location based characteristics aims to capture the opportunities in the municipality provided to the firm in terms of both local labor force and proximity to market. *Log Population Density* is a proxy for the size of the market in the municipality. *Log Distance to Market* measures the log distance in kilometers to the nearest large market, either Stockholm or Copenhagen.[3] *University* is a dummy variable equal to 1 if a college or university is located in the municipality (*högskola* or *universitet*).

[3] *Measured by using the Great Circle formula (http://mathworld.wolfram.com/GreatCircle.html), and latitude and longitude data from the GeoLite data created by MaxMind (http://www.maxmind.com).*

The economic situation is captured by the variables *Unemployment Rate*, average *Income* per person, and *Migration* (measured as the net share of the population in the municipality that moved in and out of the municipality). The variable *Share State Employed*, measures the share of the population which are employed by the state. We conjecture that a municipality with a high share of state employed often signals that the region is struggling, with few employment opportunities in private firms.

The political situation is measured by the variables *Left* and *Political Strength*. The variable *Left* is a political ideology variable and equals 1 if the left parties (the Social Democratic Party, the Left Party, and the Green Party) hold more than 50 percent of the mandates in the municipal assembly, and 0 otherwise. *Political Strength* is measured as the Herfindahl-Hirschman Index of the mandate composition in the municipal assembly. A high value indicates that the majority of the mandates are spread over a few parties. Included in the multilevel logit estimation is also the interaction between *Left* and *Political Strength*. The municipality variables are all for the year 2000. The municipality variables are based on data from Statistics Sweden.

### 3.2.4 Selection

Due to limitations in decree 2000:279 (*förordning 2000:279*), which describes the regulations concerning the RDG, the data has been screened to only include companies legally eligible for the subsidy.

Firstly, the data is restricted to only include companies with 250 employees or less. Secondly, the data is restricted to companies with at most 43 million Euros in total capital. Thirdly, companies with main activity in fishing, farming, transport, textile, metal and vehicle manufacturing are deleted.[4] Fourthly, the data is limited to the counties and municipalities which are especially assigned as support areas by decree 1999:1382 (*förordning 1999:1382*). The support areas are divided into A and B areas, where companies in the A areas are considered first and foremost. The support areas are specified at the municipality level, and in some rare instances at certain congregations. We include all municipalities specified as a support area A or B.[5]

Furthermore, the data is restricted to stock companies (*aktiebolag*). The data has also been screened for odd values. This is especially true for the accounts data and the measure *Equity-Debt ratio 1999* (shareholders' equity divided by total assets) which we restrict to only includes values between 0 and 100 percent.

[4] *In SNI-code (economic activity index) this includes: (SNI>=05011 & SNI<05025) or (SNI>=01111 & SNI<02029) or (SNI>=17000 & SNI<18000) or (SNI>=27000 & SNI<28000) or ( SNI>=34100 & SNI34200) or (SNI>=35100 & SNI<35200) or (SNI>=60100 & SNI<62200).*

[5] *Support area A: Arvidsjaur, Arjeplog, Gällivare, Haparanda, Jokkmokk, Kalix, Kiruna, Pajala, Älvsbyn, Överkalix, Övertorneå, Boden, Piteå, Bjurholm, Dorotea, Lycksele, Malå, Norsjö, Sorsele, Storuman, Vilhelmina, Vindeln, Åsele, Skellefteå, Berg, Bräcke, Härjedalen, Krokom, Ragunda, Strömsund, Åre, Östersund, Sollefteå, Ånge, Sundsvall, Örnsköldsvik, Ljusdal, Malung-Sälen, Orsa, Vansbro, Älvdalen, Torsby. Support area B: Luleå, Boden, Nordmaling, Robertsfors, Vännäs, Umeå, Skellefteå, Härnösand, Kramfors, Timrå, Sundsvall, Örnsköldsvik, Bollnäs, Hofors, Smedjebacken, Rättvik, Avesta, Mora, Fagersta, Norberg, Skinnskatteberg, Hällefors, Karlskoga, Degerfors, Laxå, Ljusnarsberg, Arvika, Eda, Filipstad, Hagfors, Munkfors, Sunne, Kristinehamn, Storfors, Årjäng, Säffle, Bengtsfors, Dals-Ed, Åmål, Mellerud, Färgelanda, Töreboda, Gullspång, Mariestad, Karlsborg, Västervik, Vimmerby, Hultsfred, Högsby.*

Table 1and Table 2 presents the descriptive statistics for the explanatory variables and the outcome variables, divided between both the treated (companies who received the RDG) and the control group that did not.

Table 1 Descriptive Statistics (explanatory variables)

| | Regional Development Grant = 0 | | | | | Regional Development Grant = 1 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Variable | Obs. | Mean | Std. Dev. | Min | Max | Obs. | Mean | Std. Dev. | Min | Max |
| Employees 1999 | 17573 | 5.688 | 14.907 | 0.000 | 525.000 | 79 | 44.228 | 50.181 | 0.000 | 234.000 |
| Return on Assets 1999 | 17573 | 7.397 | 20.684 | -534.400 | 522.700 | 79 | 8.349 | 9.959 | -24.400 | 34.600 |
| Equity-Debt Ratio 1999 | 17573 | 39.061 | 25.086 | 0.000 | 100.000 | 79 | 32.924 | 19.688 | 4.000 | 85.000 |
| New Company (dummy) | 17573 | 0.066 | 0.249 | 0.000 | 1.000 | 79 | 0.063 | 0.245 | 0.000 | 1.000 |
| Other Subsidy 2000 (dummy) | 17573 | 0.036 | 0.186 | 0.000 | 1.000 | 79 | 0.304 | 0.463 | 0.000 | 1.000 |
| Other Subsidy Prior (dummy) | 17573 | 0.124 | 0.330 | 0.000 | 1.000 | 79 | 0.886 | 0.320 | 0.000 | 1.000 |
| Services (dummy) | 17573 | 0.683 | 0.465 | 0.000 | 1.000 | 79 | 0.215 | 0.414 | 0.000 | 1.000 |
| Share Higher Education | 17573 | 22.983 | 8.524 | 11.934 | 43.681 | 79 | 18.838 | 6.594 | 11.934 | 43.681 |
| Share Foreign Born | 17573 | 44.407 | 7.008 | 30.806 | 66.361 | 79 | 43.878 | 6.320 | 31.521 | 57.769 |
| Share Foreign Born | 17573 | 5.952 | 3.598 | 2.031 | 37.556 | 79 | 6.401 | 5.086 | 2.031 | 37.556 |
| Log Distance to Market | 17573 | 5.973 | 0.469 | 4.927 | 6.861 | 79 | 6.009 | 0.490 | 4.973 | 6.818 |
| Log Population Density | 17573 | 1.626 | 1.199 | -2.140 | 3.474 | 79 | 0.924 | 1.397 | -2.140 | 3.474 |
| Unemployment rate | 17573 | 3.279 | 0.721 | 1.311 | 5.767 | 79 | 3.364 | 0.878 | 1.914 | 5.767 |
| Income | 17573 | 62.547 | 4.005 | 54.333 | 69.555 | 79 | 60.607 | 3.966 | 54.333 | 67.408 |
| Migration | 17573 | -0.011 | 0.015 | -0.058 | 0.042 | 79 | -0.016 | 0.016 | -0.052 | 0.015 |
| University (dummy) | 17573 | 0.359 | 0.480 | 0.000 | 1.000 | 79 | 0.228 | 0.422 | 0.000 | 1.000 |
| Left (dummy) | 17573 | 0.825 | 0.380 | 0.000 | 1.000 | 79 | 0.861 | 0.348 | 0.000 | 1.000 |
| Political Strength | 17573 | 0.257 | 0.042 | 0.166 | 0.378 | 79 | 0.272 | 0.038 | 0.198 | 0.363 |
| Account period May-April (dummy) | 17573 | 0.182 | 0.386 | 0.000 | 1.000 | 79 | 0.139 | 0.348 | 0.000 | 1.000 |
| Account period July June (dummy) | 17573 | 0.132 | 0.339 | 0.000 | 1.000 | 79 | 0.101 | 0.304 | 0.000 | 1.000 |
| Account period Sept.-Aug. (dummy) | 17573 | 0.172 | 0.377 | 0.000 | 1.000 | 79 | 0.139 | 0.348 | 0.000 | 1.000 |

Table 2 Descriptive Statistics (outcome variables)

| | Regional Development Grant = 0 | | | | | Regional Development Grant = 1 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Variable | Obs. | Mean | Std. Dev. | Min | Max | Obs. | Mean | Std. Dev. | Min | Max |
| Diff. Employees 1 | 17573 | -0.079 | 3.882 | -142.000 | 90.000 | 79 | 1.392 | 14.436 | -100.000 | 60.000 |
| Diff. Employees 3 | 16200 | -0.120 | 7.404 | -150.000 | 258.000 | 75 | 1.187 | 22.852 | -100.000 | 75.000 |
| Diff. Net turnover 1 | 17778 | 148.539 | 15415.550 | -1241488.000 | 1156063.000 | 79 | 3971.215 | 18697.400 | -58762.000 | 70749.000 |
| Diff. Net turnover 3 | 16515 | 891.853 | 23220.100 | -1244211.000 | 1738657.000 | 75 | 14416.750 | 43229.680 | -90068.000 | 173656.000 |
| Diff. Operating income 1 | 17742 | -77.605 | 3327.486 | -204919.000 | 92986.000 | 79 | -2519.797 | 7119.148 | -29934.000 | 20096.000 |
| Diff. Operating income 3 | 16484 | -58.730 | 4959.136 | -274633.000 | 101983.000 | 75 | -1029.840 | 9352.717 | -29312.000 | 35071.000 |
| Diff. Return on assets 1 | 17519 | -1.967 | 43.860 | -1013.100 | 1010.400 | 79 | -4.105 | 12.997 | -80.700 | 49.600 |
| Diff. Return on assets 3 | 16083 | -1.196 | 38.312 | -1009.500 | 991.100 | 75 | -3.619 | 9.944 | -30.800 | 16.900 |
| Diff. Return on equity 1 | 16887 | -6.110 | 125.360 | -1222.800 | 1634.800 | 78 | -30.421 | 83.909 | -590.400 | 102.900 |
| Diff. Return on equity 3 | 15384 | -2.769 | 130.922 | -1991.200 | 1634.800 | 75 | -41.516 | 182.137 | -1507.500 | 73.900 |
| Diff. Income/employee 1 | 13858 | -5.725 | 549.691 | -19037.000 | 49401.000 | 74 | -30.054 | 170.416 | -603.000 | 846.000 |
| Diff. Income/employee 3 | 12292 | 4.254 | 349.810 | -11005.000 | 10168.000 | 70 | 100.700 | 1226.385 | -661.000 | 10104.000 |

*Notes: Diff. Employees = Difference in the number of employees. Diff. Net turnover = difference in net turnover (sales value excluding taxes and discounts). Diff. Operating income = Difference in operating income. Diff. Return on assets = Difference 100*(operation income/total assets). Diff. Return on equity = Difference 100*(income after financial items/stockholder's equity). Diff. Income/employee = Difference 100*(operating income/employees). 1 indicates difference in 1 year (2000-2001), 3 indicates 3 years difference (2000-2003). Diff. Net turnover and Diff. Operating income is in thousand SEK.*

# 4 Results

## 4.1 Multilevel Logit Estimation

Table 3 presents the results of the multilevel logit estimation with RDG (=1 if Regional Development Grant) as the dependent variable. Since the predicted probabilities are later used in a propensity score matching with 12 different outcome variables, we have 12 slightly different samples – depending on data availability – and therefore we have performed 12 multilevel logit estimations. The results of the four samples are highly similar and due to space constraints Table 3 only presents the estimation results concerning the first sample (*Diff employees 1*).

The first part of the table presents the estimated coefficients and associated marginal effect of the fixed effects. These are to be interpreted as in an ordinary logit estimation. The second part of the table presents the estimates of the random intercept. To evaluate if the random intercept is of importance, we compute the Likelihood ratio test (LR-test) of the multilevel logit model against the ordinary logit model. According to the LR-test, the municipality effects (random intercepts) are significant. Another way is to compare the variance with the standard error of the variance, similar to a Wald test. However, it is not theoretically correct to perform the Wald test on variance parameters, but according to Twisk (2006, p.43) it might still give an indication of whether the intercept is important or not.

In order to asses the magnitude of the municipality effects is to calculate the Intraclass Correlation (ICC), i.e. the proportion of variance that is between groups. For a multilevel least squares model the ICC would be calculated as the variance of the random intercept in relation to the total variance $\left(\sigma_{o\nu}^2 / \left(\sigma_{o\nu}^2 + \sigma_{\varepsilon,ijk}^2\right)\right)$. This measure ranges from 0 if the grouping conveys no information, i.e. the $\sigma_{o\nu}^2$ is very small, to 1 if all of the variation in the outcome variable is between groups. In the logit case, the ICC is calculated as $\hat{\sigma}_{o\nu}^2 / \left(\hat{\sigma}_{0\nu}^2 + \pi^2/3\right)$.[6] In our case the ICC $\approx$ 0.1, would indicate that about 10% of the variance in the probability to receive RDG occurs between municipalities. Although it is possible to calculate the ICC in a multilevel logit analysis, it is questionable whether this should be done because a correlation coefficient for a dichotomous variable is difficult to interpret (see e.g. Twisk, 2006, p. 46 and the reference therein).

As previously mentioned in section 3.1, we have tried different model specifications. Since a substantial part of the decision of who receives subsidy and who does not, is administered at the county level, a model with county as random intercept has also been tested. A county effect could be interpreted as that there is a difference between how the decision process is being implemented, i.e. and "administrator" effect. Nonetheless, the LR-test points to that there does not seem to be such an effect (results not shown). Other specifications with interactions (random coefficients) has also been tested involving municipality and *Equity-Dept ratio 1999*, *University*, and *OtherSubsidyPrior*. These random slopes also turn out insignificant (results not shown).

Directing our attention to the fixed effects, the variables *Employees1999* and *Employees1999Squared* are both significant, indicating that the number of employees has a

[6] *Where $\pi$ = 3.1416. For a 3 level model the ICC all the variances of the random intercepts are simply added to the numerator and denominator. See e.g. Twisk (2006) and Bickel (2007).*

hump shaped effect on the probability of being selected for RDG. *Return on assets 1999* and *Equity-Debt ratio 1999* are surprisingly not statistically significant.

Table 3 Multilevel Logit Estimation

| Dependent Variable: Regional Development Grant (RDG) | | | |
|---|---|---|---|
| | Coefficient | Standard Error | $\partial P / \partial x$ |
| Employees 1999 | 0.0561*** | 0.0077 | - |
| Employees 1999 squared | -0.0002*** | 0.0000 | - |
| Return on Assets 1999 | 0.0075 | 0.0066 | 0.000004 |
| Equity-Debt Ratio 1999 | 0.0025 | 0.0060 | 0.000001 |
| New Company (dummy) | 0.2004 | 0.4949 | 0.000116 |
| Other Subsidy 2000 (dummy) | 0.0212 | 0.2898 | 0.000011 |
| Other Subsidy Prior (dummy) | 3.0915*** | 0.3855 | 0.007275 |
| Services (dummy) | -0.7562** | 0.3056 | -0.000470 |
| Share Higher Education | -0.0269 | 0.0564 | -0.000014 |
| Share State Employed | -0.0121 | 0.0326 | -0.000006 |
| Share Foreign Born | 0.0286 | 0.0340 | 0.000015 |
| Unemployment rate | 0.0100 | 0.2041 | 0.000005 |
| Migration | 0.4271 | 11.5315 | 0.000226 |
| Income | -0.0459 | 0.0631 | -0.000024 |
| University (dummy) | 0.8053 | 0.5400 | 0.000103 |
| Log Distance to Market | 0.2440 | 0.5744 | 0.000129 |
| Log Population Density | -0.2236 | 0.2525 | -0.000118 |
| Political Strength | 6.0581 | 8.6861 | 0.003209 |
| Left (dummy) | 1.5233 | 2.5152 | 0.000541 |
| Left*Political Strength | -3.3596 | 9.6546 | -0.001780 |
| Account period May-April (dummy) | 0.2336 | 0.3703 | 0.000134 |
| Account period July June (dummy) | 0.0530 | 0.4155 | 0.000027 |
| Account period Sept.-Aug. (dummy) | 0.1746 | 0.3647 | 0.000098 |
| Intercept | -7.5835* | 4.3816 | - |
| Random Intercepts | Estimate | Standard Error | No. of groups (Average obs./group) |
| Var.(municipality) = $\hat{\sigma}^2_{0\nu}$ | 0.3317 | 0.2670 | 86 (205.3) |

Likelihood Ratio test vs. logistic regression: $\chi^2$ = 2.41. Prob. $\geq \chi^2_{df=1}$ = 0.0604

Number of obs.: 17652 (where 79 have RDG =1)

*Notes: The estimation is based on the sample for Diff employees 1. ***, **, * is for significance at 1%, 5%, and 10% respectively. $\partial P / \partial x$ is the marginal effect evaluated at the mean. For dummy variables, $\partial P / \partial x$ equals the change in probability if the dummy changes from 0 to 1. The effect from Employees1999 is nonlinear. At the mean, an increase in employees by 1 would increase the probability by 0.000029. The ordinary logit model (without the random intercepts) receives a pseudo R-square of 0.36.*

The dummy variable *OtherSubsidyPrior*, which equals 1 if the company has received a state subsidy prior to the year 2000, is significant at the 1% level. This variable can be interpreted as both a learning effect, that the company knows how to write a successful application, but also as a familiarity effect, that the company is known to the subsidy administrator. According to these results: a company that received an *OtherSubsidyPrior* has 0.007 points higher probability of being selected to receive a subsidy, compared to a

company which did not receive a subsidy, all evaluated at the mean. Since only 76 out of the 17652 companies in the sample received a subsidy in 2000, the effect from receiving an *OtherSubsidyPrior* is moderate (79/17652=0.004).

The economic activity of the company also seems to matter for the probability to receive the RDG. The variable *Services*, equal to one if the company is in the service industry, is negative and statistically significant at the 5 percent level.

None of the municipality context variables are neither individually nor in blocks, statistically significant. This result may at first seem odd, but is perfectly reasonable. In the selection of the sample, it is only municipalities in certain support areas that are selected. We should thus not expect a wide variation depending on municipality characteristics. Alternatively, since only support areas are included in the sample, there is less variation to be explained.

That the municipality variables are insignificant may also be reassuring. The political variables, *Left* and *Political Strength*, as well as their interaction are all far from significant. This is reassuring since significant estimates would indicate that political pressure influences the decision process.

The only municipality effect that is significant is the random intercept. If an ordinary logit is estimated without the random intercept, the municipality context variables are also far from significant. The random intercept thus measure an unobservable fixed municipality effect. The significance of the random intercept is, however, only significant in some samples. Because of the matching of 12 outcome variables, we have estimated 12 multilevel logit estimation like the one in Table 3, for 12 slightly different samples. As we can see in Table 4, the random intercept for the municipality effect is only significant in some of the specifications.

Table 4 Likelihood Ratio test vs. logistic regression

| Sample | $\chi^2$ | Prob. $\geq \chi^2_{df=1}$ |
|---|---|---|
| **Diff. Employees 1** | **2.41** | **0.0604** |
| Diff. Employees 3 | 0.14 | 0.3527 |
| **Diff. Net turnover 1** | **2.36** | **0.0624** |
| Diff. Net turnover 3 | 0.14 | 0.3558 |
| **Diff. Operating income 1** | **2.34** | **0.0630** |
| Diff. Operating income 3 | 0.14 | 0.3560 |
| **Diff. Return on assets 1** | **2.33** | **0.0636** |
| Diff. Return on assets 3 | 0.13 | 0.3588 |
| **Diff. Return on equity 1** | **2.42** | **0.0599** |
| Diff. Return on equity 3 | 0.11 | 0.3687 |
| Diff. Income/employee 1 | 0.14 | 0.3552 |
| Diff. Income/employee 3 | 0.00 | 0.9998 |

*Notes: Likelihood ratio test of multilevel logit regression versus ordinary logit regression.*

To summarize: the firm characteristics *Employees1999*, *OtherSubsidyPrior*, as well as being a *Services* company seem to matter for the firms' probability to receive the RDG subsidy. The random intercept is significant, which indicates that there is a municipality effect. However, the municipality context variables do not have much success in influencing the decision probability. This result is not surprising since the sample is restricted only to designated support areas.

## 4.2 Propensity Score Matching

Based on the predicted probabilities from the multilevel logit estimations, this section presents the results when the RDG companies and the control companies are matched with the help of propensity score matching following Rosenbaum and Rubin (1983). The intuition behind propensity score matching is that we want to match the treated company with a control company, which has the same opportunity in time *t*, to receive a certain outcome in time $t + T$. The predicted probabilities from the multilevel logit estimation is thus used to individually match treated and untreated companies. The treated group (which received the RDG) and the matched untreated group (which did not receive the RDG) are then compared concerning the 12 outcome variables.

The predicted probabilities are based on the fixed and random effects of the multilevel estimation. Although the random intercepts for the municipalities are only estimated as one coefficient, the specific effect for each municipality can be retrieved post-estimation. The predicted probabilities are thus derived for both the fixed and random effects.

Since the matching consists of few treated in relation to many controls, we employ the Radius matching technique which use all the comparison members within a certain boundary or radius (the caliper). The Radius matching and other over-sampling techniques such as kernel matching are to be recommended when the control group is large and there are more than one nearest neighbors (Caliendo and Kopeinig, 2005).[7]

Before we turn to the results of the propensity score matching, a few comments has to be made concerning the matching and the successfulness of the matching. The use of propensity score matching relays on what in the literature is known as the conditional independence assumption (CIA). This assumption implies that in order for the following matching to work the initial selection model has to capture the selection, here to get RDG. In our case we have little previous empirical or theoretical work to rely on and therefore a potential problem with our method is that the CIA does not hold. It is therefore crucial that the propensity score matching is followed by a balancing test. Table 5 presents the results of how similar the treated group and the matched untreated control group are concerning the firm and municipality variables. An examination of the means of the treated and matched control group reveals that the two groups indeed seem similar. The third column lists the percentage bias between the treated and the control. The forth column lists the result of a t-test of the equality of means between the treated and the control. With p-values well above 0.1 indicates that the null of equal means can not be rejected at the 10 percent level for all variables. Table 5 therefore indicates that the propensity score matching matches adequately on the firm and municipality characteristics used in the logit estimation, i.e. the matched untreated group of firms is similar, in firm and municipality characteristics, to the matched treated group of firms.

The results of the propensity score matching is presented in Table 6. Column 1 lists the 12 outcome variables, Column 2 lists the mean value of the outcome variable of the treated, and Column 3 lists the mean value of the outcome variable for the matched control group. Column 8 reports the total number of treated companies in that sample, and Column 7 reports the number of treated companies with common support, i.e. the number of treated companies that found a match in the control group.

[7] *Estimation done with Stata's psmatch2 command written by Leuven and Sianesi (2003).*

The main result is presented in Column 4 which lists the difference between treated and control. More exactly, this is the difference-in-difference (diff-in-diff) of the outcome, since the outcome variables are calculated as differences over 1 and 3 years. A positive diff-in-diff indicates that the treated as a group has had a better outcome, than the controls as a group has had, and vice versa. If the values in Column 4 are divided with their standard errors in Column 5, we get the t-statistics which is presented in Column 6. The t-statistics report the result of the test whether the difference-in-difference in Column 4 is significantly different from zero or not. The variables in bold are significant at the 5% level.

Table 5 Balancing Test

| | Mean | | | t-test | |
|---|---|---|---|---|---|
| Variables | Treated | Control | %bias | t | p>\|t\| |
| Employees 1999 | 35.403 | 27.759 | 20.7 | 0.96 | 0.340 |
| Return on Assets 1999 | 9.224 | 9.252 | -0.2 | -0.01 | 0.992 |
| Equity-Debt Ratio 1999 | 32.371 | 32.626 | -1.1 | -0.07 | 0.946 |
| New Company (dummy) | 0.081 | 0.061 | 8.0 | 0.42 | 0.672 |
| Other Subsidy 2000 (dummy) | 0.323 | 0.317 | 1.4 | 0.06 | 0.952 |
| Other Subsidy Prior (dummy) | 0.855 | 0.916 | -18.9 | -1.07 | 0.288 |
| Services (dummy) | 0.274 | 0.268 | 1.4 | 0.08 | 0.938 |
| Share Higher Education | 19.385 | 19.053 | 4.4 | 0.29 | 0.770 |
| Share State Employed | 44.188 | 44.357 | -2.5 | -0.14 | 0.892 |
| Share Foreign Born | 6.006 | 6.917 | -20.7 | -0.89 | 0.373 |
| Unemployment rate | 3.300 | 3.419 | -14.8 | -0.78 | 0.436 |
| Migration | -0.015 | -0.016 | 7.2 | 0.40 | 0.693 |
| Income | 60.804 | 60.736 | 1.7 | 0.09 | 0.927 |
| University (dummy) | 0.210 | 0.241 | -6.8 | -0.41 | 0.683 |
| Log Distance to Market | 6.041 | 6.029 | 2.4 | 0.13 | 0.894 |
| Log Population Density | 0.899 | 0.913 | -1.1 | -0.06 | 0.954 |
| Political Strength | 0.270 | 0.270 | -1.0 | -0.06 | 0.955 |
| Left (dummy) | 0.839 | 0.851 | -3.3 | -0.19 | 0.853 |
| Account period May-April (dummy) | 0.161 | 0.183 | -5.9 | -0.32 | 0.750 |
| Account period July June (dummy) | 0.097 | 0.113 | -5.1 | -0.29 | 0.769 |
| Account period Sept.-Aug. (dummy) | 0.177 | 0.134 | 11.9 | 0.66 | 0.511 |

*Notes: Balancing after matching on matched sample. %bias is the bias in percent between mean treated and mean control. t-test reports the t-statistic and p-value associated with the test of equality of means between the treated and the control. The null hypothesis of equal means can not be rejected at the 10% level for any of the variables. This balancing test is for the Diff. employees 1 sample in Table 3. The balancing test concerning the other samples presents similar results*.

As mentioned earlier, the outcome variables are divided into absolute and relative variables. The absolute variables measure a total change, whereas the relative variables measure puts the change in relation to something and therefore indicate the effectiveness or productivity of the firm. Surprisingly, almost all the diff-in-diffs for the absolute measures are positive, while almost all the diff-in-diffs for the relative measures are negative. Moreover, it is only 4 out of the 12 diff-in-diffs which are significantly different from zero.

The diff-in-diff for the change in employees in one year (*Diff. Employees 1*) is positive and significant. This means that the treated companies, on average, increased the number of employees by almost 5 compared to the control companies. Considering that the mean

number of employees among the matched firms is about 30, this is a rather large effect. The effect is, however, not significant after three years. Additionally, increasing the number of employees is not normally the target for a profit maximizing firm. The short term increase in the number of employees could therefore be in line with a substitution effect, i.e. a substitution of factors of production.

Table 6 Propensity Score Matching

| | Average Treatment effect of the Treated. ATT | | | | | | |
|---|---|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Variables | Treated | Controls | Difference (2)-(3) | S.E | t-stat. | treated w/common support | Treated |
| Absolute measures | | | | | | | |
| **Diff. Employees 1** | **0.952** | **-3.726** | **4.678** | **2.058** | **2.27** | **62** | **79** |
| Diff. Employees 3 | 2.222 | -1.174 | 3.396 | 2.904 | 1.17 | 63 | 75 |
| Diff. Net turnover 1 | 2325.738 | 504.344 | 1821.395 | 2397.124 | 0.76 | 65 | 79 |
| **Diff. Net turnover 3** | **17436.541** | **1744.696** | **15691.845** | **6072.396** | **2.58** | **61** | **75** |
| Diff. Operating income 1 | -1928.523 | -768.529 | -1159.994 | 867.460 | -1.34 | 65 | 79 |
| Diff. Operating income 3 | 540.016 | -538.929 | 1078.945 | 1181.577 | 0.91 | 61 | 75 |
| Relative measures | | | | | | | |
| Diff. Return on assets 1 | -4.146 | -0.783 | -3.363 | 3.312 | -1.02 | 65 | 79 |
| **Diff. Return on assets 3** | **-2.522** | **23.036** | **-25.557** | **2.999** | **-8.52** | **60** | **75** |
| **Diff. Return on equity 1** | **-26.254** | **4.559** | **-30.813** | **13.680** | **-2.25** | **63** | **78** |
| Diff. Return on equity 3 | -17.303 | -13.861 | -3.442 | 11.449 | -0.30 | 61 | 75 |
| Diff. Income/employee 1 | -17.708 | -2.537 | -15.171 | 34.228 | -0.44 | 65 | 74 |
| Diff. Income/employee 3 | 134.644 | -36.530 | 171.174 | 174.670 | 0.98 | 59 | 70 |

*Notes: Variables in **Bold** have a Difference (col. 4) significantly different from zero at the 5% level (two-sided). Propensity Score Matching based on Radius matching with caliper=0.001, on common support. Notes: Diff. Employees = Difference in the number of employees. Diff. Net turnover = difference in net turnover (sales value excluding taxes and discounts). Diff. Operating income = Difference in operating income. Diff. Return on assets = Difference 100*(operation income/total assets). Diff. Return on equity = Difference 100*(income after financial items/stockholder's equity). Diff. Income/employee = Difference 100*(operating income/employees). 1 indicates difference in 1 year (2000-2001), 3 indicates 3 years difference (2000-2003). Diff. Net turnover and Diff. Operating income is in thousand SEK.*

The diff-in-diff for the net turnover in three years (*Diff. Net turnover 3*) is also positive and significant. The value of sales (excluding taxes) has thus been much larger for the treated companies. The diff-in-diff for operating income, i.e. the firms result after operating costs, are insignificant for both one and three years. Operating income is arguably a better measure for the firms productivity than turnover and employment growth.

Concerning the relative measures it is only the diff-in-diffs for return on assets for three years (*Diff. Return on Assets 3*), and return on equity for one year (*Diff. Return on Equity 1*) which are significant. These values are in percent, which indicates that treated firms had 25 percent worse return on total assets compared to the control group, over a three year period. This is a fairly large effect.

To conclude: the subsidized companies seem to have had a more successful development concerning employment growth and net turnover, than the unsubsidized companies. However, neither employment growth nor increase in turnover, tells nothing about the profitability or productivity of the company. Concerning the profitability measures (*operation income*, *return on assets*, *return on equity*, and *income per employee*) the subsidized firms are either found not significantly different from the non-subsidized firms, or significantly

worse off than the non-subsidized firms. The RDG subsidy does therefore not seem to have increased the profitability or productivity amongst the studied companies. There is also no clear evidence that the RDG subsidy have either short term (one year) or more long term (three year) effects.

# 5 Conclusions

The primary objective of this study is to investigate whether firms who have received the Regional Development Grant (RDG) are performing better than those firms that have not received the subsidy. A second objective of this study is to investigate whether the regional context matters for the probability to receive the subsidy. Using data on Swedish stock companies and a wide range of variables of regional characteristics, we first estimate a multilevel logit model of the probability of receiving the subsidy, and then use propensity score matching to assess the successfulness of the subsidy.

The results show that the number of employees, whether the firm had received a firm subsidy prior, and whether the firm's main economic activity is in services, all significantly influence the probability of being selected for the RDG subsidy. The municipality context variables does, however, not seem to matter for the probability to receive the RDG. Using a multilevel logit approach identifies a significant fixed municipality effect. This effect is only significant in some samples. Consequently, there are only some evidence that the regional context matters for the probability to receive the RDG.

Using propensity score matching to match subsidized firms with similar non-subsidized firms, we can evaluate the effectiveness of the RDG. The subsidized firms seem to have had a more successful development concerning employment growth and net turnover, than the unsubsidized companies. Unfortunately, neither employment growth nor increases in turnover, tells nothing about the profitability or productivity of the company. Concerning the profitability measures (operation income, return on assets, return on equity, and income per employee) the subsidized firms are either found not significantly different from the non-subsidized firms, or significantly worse off than the non-subsidized firms. The RDG subsidy does therefore seem to have increased the growth but not profitability amongst the studied companies.

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