JYVÄSKYLÄ STUDIES IN BUSINESS AND ECONOMICS
104

Anu Tokila

Econometric Studies of Public Support to Entrepreneurship

JYVÄSKYLÄN YLIOPISTO

JYVÄSKYLÄ STUDIES IN BUSINESS AND ECONOMICS 104

Anu Tokila

Econometric Studies of Public Support to Entrepreneurship

Esitetään Jyväskylän yliopiston taloustieteiden tiedekunnan suostumuksella
julkisesti tarkastettavaksi yliopiston Vanhassa juhlasalissa S212
elokuun 26. päivänä 2011 kello 12.

Academic dissertation to be publicly discussed, by permission of
the School of Business and Economics of the University of Jyväskylä,
in building Seminarium, Auditorium S212, on August 26, 2011 at 12 o'clock noon.

UNIVERSITY OF JYVÄSKYLÄ

JYVÄSKYLÄ 2011

Econometric Studies of Public Support to Entrepreneurship

JYVÄSKYLÄ STUDIES IN BUSINESS AND ECONOMICS 104

Anu Tokila

Econometric Studies of Public Support to Entrepreneurship

UNIVERSITY OF JYVÄSKYLÄ

JYVÄSKYLÄ 2011

Editor
Tuomo Takala
Jyväskylä University School of Business and Economics
Pekka Olsbo, Ville Korkiakangas
Publishing Unit, University Library of Jyväskylä

URN:ISBN:978-951-39-4408-7
ISBN 978-951-39-4408-7 (PDF)

ISBN 978-951-39-4383-7 (nid.)
ISSN 1457-1986

Copyright © 2011, by University of Jyväskylä

Jyväskylä University Printing House, Jyväskylä 2011

ABSTRACT

Tokila, Anu
Econometric studies of public support to entrepreneurship
Jyväskylä: University of Jyväskylä, 2011, 157 p.
(Jyväskylä Studies in Business and Economics
ISSN 1457-1986; 104)
ISBN 978-951-39-4383-7 (nid.), 978-951-39-4408-7 (PDF)
Finnish summary
Diss.

The entrepreneurial capacity of an economy is regarded as a key determinant of economic growth and productivity improvements. Governments throughout the world see entrepreneurial interventions as crucial instruments for encouraging new firm formation, generating new ideas and new products, creating employment and decreasing unemployment, and enhancing competitiveness. This research examines the public support of entrepreneurship in Finland from 1988 to 2004. The studies first consider the existence of the deadweight effect. At the project level, deadweight is recognised as the degree to which projects would have been implemented even without public assistance; thus, deadweight indicates wasted public spending. If a large deadweight effect is observed, then the intervention is not efficient. Second, this research studies effectiveness (i.e., the impacts of support on outcomes) in terms of business success. Business success is measured by the survival of start-ups and the income of entrepreneurs. Together, these two aspects of public interventions are necessary to yield positive net impacts on society.

The results show that start-up grants have a positive effect on the duration of self-employment. The findings show encouraging results regarding the income of entrepreneurs. Particularly high returns were found for highly educated entrepreneurs in rural areas. Furthermore, the papers show that regional business subsidies are not intended to be very efficient because relatively high levels of wasted spending are accepted ex ante by the public sector. This deadweight effect reduces the positive effects on outcomes. A rational policy must examine these two aspects together and attempt to balance the avoidance of deadweight with the pursuit of maximising net impacts.

Keywords: entrepreneurship, self-employment, public subsidies, start-ups, education

Author's address	Anu Tokila Regional Council of Central Finland Sepänkatu 4, 40100 Jyväskylä, Finland anu.tokila@jyu.fi
Supervisor	Professor Hannu Tervo School of Business and Economics University of Jyväskylä
Reviewers	Kari Hämäläinen Government Institute for Economic Research (VATT) Helsinki, Finland Helena Lenihan University of Limerick Department of Economics Limerick, Ireland
Opponent	Kari Hämäläinen Government Institute for Economic Research (VATT) Helsinki, Finland

ACKNOWLEDGEMENTS

This dissertation studies support to businesses, but most importantly, it is us, humans, who need to be supported to reach our goals. During my PhD studies, I have been supported and kindly advised by many great people, to whom I wish to express my gratitude. In addition, I would like to thank the Finnish Academia, the Yrjö Jahnsson Foundation, the Jenny and Antti Wihuri Foundation, the Finnish Concordia Fund, the University of Jyväskylä, and the Finnish Doctoral Programme in Economics for financial support.

First, I owe my utmost gratitude to my supervisor, Professor Hannu Tervo, for guiding me to the world of academic research and for his expertise, kindness, and, most of all, his patience. Thanks to him, I have received long-term funding for my studies, which assisted me in concentrating on my research.

I also wish to express gratitude and appreciation to my preliminary thesis examiners, docent Kari Hämäläinen and Dr. Helena Lenihan, whose feedback significantly assisted me in finalising my work. I am honoured to have Kari Hämäläinen as my opponent.

The School of Business and Economics has provided the support and equipment needed to produce and complete my thesis. The doors of the staff, including professors, have always been open when I have sought assistance. I wish to thank leading professor Kari Heimonen for his encouragement and support with regard to any worries that I had relating to research or other academic issues. Furthermore, I appreciate Professor Jaakko Pehkonen for always providing prompt feedback and Professors Mika Maliranta and Ari Hyytinen for their valuable comments regarding my thesis.

During my years at the university, I was privileged to have Dr. Jari Ritsilä as my mentor in my daily work. Dr. Ritsilä offered me growing responsibilities and opportunities that were valuable in building my career. He always had solutions to my problems, answers to my questions and kind words when I experienced health problems.

I am much obliged to Dr. Mika Haapanen for coauthoring three papers with me. I have gained most of my knowledge regarding econometrics and academic routines from him. I also wish to thank Dr. Sanna-Mari Hynninen for her consistently wise and honest advice. Our discussions regarding many shared, sometimes problematic, projects have been fruitful and insightful.

I would like to extend special gratitude to my ex-colleague and dear friend Dr. Signe Jauhiainen. We were linked by economics more than a decade ago and since then have overcome many obstacles together, but most of all, we have talked, laughed and developed wild ideas, many of which were successfully launched and some of which have not yet been realised. Without her valuable peer support, this project would have been much more difficult.

I am grateful to all of my colleagues and the other PhD students for providing an encouraging and fun environment in which to work, including many joyful conference trips at home and abroad. Many of them have become my personal friends, with whom I share a bond that is not entirely based on economics.

In addition, this project would not have been completed without the support of my family. My parents have always encouraged me to study but have not pressured me to do so. I am truly thankful for their support over the years. My sister, Marika, and my cousin, Hanna, and their families have always provided good company when I needed to escape from academic stress and deadlines.

Finally, I want to express my thanks to Janne, who makes my life easy and my every day enjoyable. Your sincere support has given me the strength to finalise this lengthy project. Most importantly, you have reminded me of what is most important in life. May your love and support always surround me.

Jyväskylä, 13 July, 2011

Anu Tokila

LIST OF ORIGINAL PUBLICATIONS

Article 1. pp. 48-64
Tokila, A., Haapanen, M. and Ritsilä, J. 2008. ”Evaluation of investment subsidies: When is deadweight effect zero?” *International Review of Applied Economics* 22 (5), 585-600

Article 2. pp. 65-81
Tokila, A. and Haapanen, M. 2009. “Evaluating project deadweight measures: evidence from Finnish business subsidies” *Environment and Planning C: Government and Policy* 27 (1), 124-140

Article 3. pp. 82-99
Tokila, A. and Haapanen, M. (forthcoming) “Evaluation of deadweight spending in regional enterprise financing” *Regional Studies*

Article 4. pp. 100-126
Tokila, A. (in referee process) “Start-up grants and duration of self-employment”

Article 5. pp. 127-153
Tokila, A. and Tervo, H. (forthcoming), “Regional differences in returns to education for entrepreneurs vs. wage earners” *The Annals of Regional Science*

CONTENT

CHAPTER 1 INTRODUCTION

1.1 Background

The entrepreneurial capacity in an economy is regarded a key determinant of economic growth and productivity improvements. Public interventions to support self-employment and entrepreneurship are widely recognised and commonly used tools in market economies. Governments all over the world see such interventions as a crucial instrument for boosting new firm formation, generating new ideas and new products, creating employment and decreasing unemployment, and enhancing competitiveness. Entrepreneurship can also be seen as a route out of poverty and disadvantage (Blanchflower, 2000). These social benefits may be a reason for government intervention if investment in entrepreneurship is not otherwise adequate. However, critics claim just the opposite. For example, Shane (2009) suggests that encouraging more people to start businesses will not enhance economic growth or create many jobs because start-ups, in general, are not the source of our economic vitality or job creation. The impact of entrepreneurship on economic growth is also correlated with the economic phase (e.g., Bosma et al., 2009). A recent review by van Praag and Versloot (2007) provides unambiguous evidence of the relationship between entrepreneurship and economic outcomes. Nevertheless, in Finnish entrepreneurship policy, public support has been seen as a key instrument in initiating business projects, especially in distant regions (e.g., Ministry of Justice 2006b; The Prime Minister's Office, 2005).

Regional disparities are a common target of support (Glancey and McQuaid, 2000; OECD, 2000). Through entrepreneurship promotion, governments frequently encourage economic development of remote or high-unemployment and low-growth areas. The European Union and all of its member states also provide this type of subsidy (e.g., Mercado et al., 2001; Molle, 2007). Two main arguments, namely, equity and efficiency, motivate these subsidies. The equity argument states that the government should aim to equalise regional levels of development and thus should help firms with economic problems in economically backward regions. The firms in these regions do not benefit from agglomeration effects, which might lead to growing polarisation relative to regions without government intervention (Bergström, 2000). The second argument regarding efficiency emphasises the role of the government in reducing different market failures that hinder firms from implementing profitable projects. Such market failures are higher in more geographically remote regions (Coval and Moskowitz, 1999). Oukarfi and Baslé (2009) claim that against a backdrop of slowed European economic growth, the emergent trend is towards efficiency of public-sector policies aimed at business relocation for locations with more plentiful local endogenous sources of business growth. Baldwin and Obuko (2006) assume firm-level heterogeneity and find that production subsidies aimed at promoting industry in disadvantaged regions can have a sorting effect. This finding means that subsidies will relocate all of the most productive firms to the core of a region, while all the least productive firms will locate in the periphery.

Funding for public interventions to support entrepreneurship comes from the taxpayer. The total public budget devoted to support entrepreneurship is difficult to quantify because it is fragmented under different policies and programmes. The sums of money are notable. On average, OECD countries use 1-2 percent of their GDPs for industrial subsidies (OECD, 2002). Because using public resources, it is essential to monitor and evaluate how this money is used. Storey (2006) emphasises the importance of evaluation in the policy-making process. Evaluation should not only be used on an ex-post basis but also to modify current policies in the light of evidence of policy efficiency and effectiveness. According to Molle (2007), two steps are needed to demonstrate that the public resources spent on subsidies are justified. First, we must show that no money has been wasted; in other words, that the policy has been efficient. Second, we must show that the policy has reached its objectives; in other words, that it has been effective. Evaluation is needed to demonstrate the efficiency and effectiveness of the policy. Still, evaluation of public entrepreneurship interventions is not widespread in practice, and evaluation studies have not produced consensus about the utility of these public interventions.

1.1.1 Aims

This research deals with public support to entrepreneurship in Finland in 1988-2004 and their evaluation. Public support can be evaluated on a number of criteria, but the key to effective assessment is the issue of additionality. Storey (2006) defines additionality as the "true impact of the programme". In other words, additionality quantifies the impact that would not have happened without the programme. Additionality measures the net sum of the direct and indirect impacts generated by the intervention, which tend to be reduced by possible deadweight. At the project level, deadweight is recognised as a counterfactual component of additionality - the extent to which projects would have gone ahead even without public assistance (see Robinson et al., 1987). The relation between additionality and deadweight is shown diagrammatically in Figure 1. The existence of deadweight indicates wasted spending because the project could have been implemented without public support. This may be a signal that market failure does not exist in a particular case.

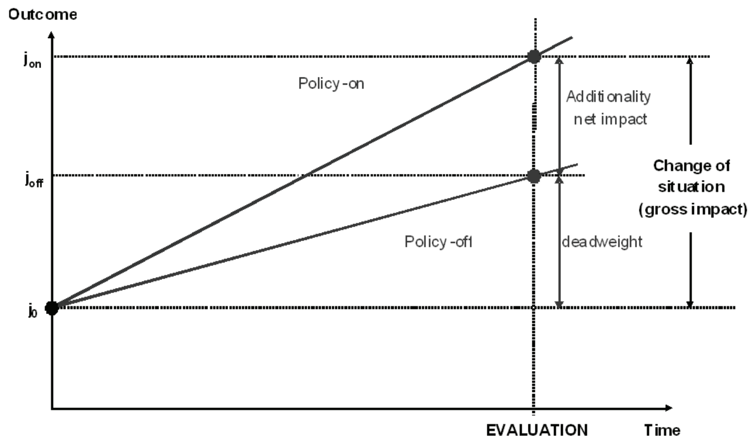

FIGURE 1 Evaluation framework (European Commission, 1999)

This study considers, first, existence of deadweight. If a large deadweight effect is observed, the intervention is not efficient. The deadweight effect of business subsidies is examined from various perspectives. Second, it studies effectiveness, i.e., the impacts of support in terms of business success. Business success is measured as survival of start-ups and income of entrepreneurs. Together, these two aspects of public interventions are needed to yield positive net impacts on the society[1]. More precisely, the following research questions are studied:

1) When is deadweight lowest? In other words, under which kind of conditions would subsidised investment projects be abandoned without public assistance (i.e., zero deadweight)? (Chapter 2)
2) How can deadweight be assessed? What is the correlation between different measures of deadweight? (Chapter 3)
3) What share of subsidies is wasted (i.e., regarded as deadweight spending)? (Chapters 3 and 4)
4) What explains regional deadweight spending? (Chapter 4)
5) How do grants affect business success? How does a public start-up grant influence self-employment duration? (Chapter 5)
6) How does education affect business success? Does a level of education imply a higher rate of return for the entrepreneur than for the wage earner, and are there regional differences in these returns? (Chapter 6)

---

1 Notably, even businesses that fail may produce positive net effects on the society. They may be a consequence of spillovers (Møen, 2007) or of greater variance of firms that raises the value of pursuing risky innovations (Syverson, 2010).

1.1.2 Definitions and data

The first, often problematic, task in studies of entrepreneurship is to define the concepts of 'entrepreneur' and 'self-employed', which are both used in widely diverse ways (e.g., Parker 2004). Self-employment is not an uncontroversial measure of entrepreneurship but is more or less the simplest kind of entrepreneurship (Blanchflower, 2000). The self-employed person is someone who is working for him- or herself rather than for another person or company. The individual is responsible for generating his or her own source of income, paying taxes and supplying a working space and materials. Individuals who start their own business can also be considered entrepreneurs. Here, the terms 'entrepreneur' and 'self-employed' are used as synonyms.

In the subsequent chapters, the information on entrepreneurship comes from official registers. First, in Chapters 2-4, enterprises and their projects are observed. The information on enterprises comes from the official register data of the Ministry of Trade and Industry. Definitions of firms and eligibility for these subsidies are enacted in the Aid to Business Act (1068/2000) (Ministry of Justice 2006a) and the Decree of Council of State (1200/2000), which refer to the European Union law (Ministry of Justice 2000).

In Chapters 5-6, the focus is on self-employed individuals. The information on employment status comes from the Longitudinal Census File. Thus, the concept of entrepreneurship directly follows from the statistical definitions used by Statistics Finland (see Statistics Finland 2001). The data on employment status are based on a person's national insurance status and type of income and describe whether the person is a wage earner or entrepreneur. The third category, non-employed individuals, is not considered in this study. Entrepreneurs are defined as persons who have a self-employed person's pension insurance during the last week of the year and whose income from entrepreneurship exceeds a specified level of earnings. The income threshold is used to distinguish full-time entrepreneurs from individuals with only a complementary entrepreneurial activity. This threshold is set inferentially using data from the Labor Force Survey (for details, see Statistics Finland 2001).

Governments attempt to promote entrepreneurship and achieve its multiple objectives in numerous ways. The direct tools include start-up finance; offering grants, subsidies and loans; and providing assistance, training and advice[2]. The training and advisory services can be provided either separately or as part of the financial grant system. Education can be regarded as an indirect method of promotion because it is believed that human capital, including education, increases an individual's probability of becoming self-employed (e.g., Rees and Shah 1986).

This study focuses on regional business subsidies, start-up finance and education. The subsidies to be studied are all grants; that is, the recipient firm is not obliged to pay back the grant to the distributor. Later, *grant, subsidy* and

---

[2] In addition, tax reductions, regulatory policies, other credit market tools such as guarantees and venture capital represent the most widely used intervention tools.

assistance are used as synonyms following from different support schemes. *Support* is a wider concept used to describe all public interventions to promote entrepreneurship.

In Chapters 2-4, the analysis is focused on regional investment and development subsidies by the Ministry of Trade and Industry. These subsidies are granted directly to small and medium-sized enterprises (SMEs). Only in rare cases are subsidies granted to larger enterprises. Investment subsidies can be granted to a firm for fixed-asset investment projects when a firm is starting its business, expanding operations, or modernising its fixed assets. Development subsidies can be granted to projects enhancing the competitiveness or internationalisation of an enterprise in the long term (Ministry of Justice, 2006a). Intensity of assistance is dependent on the type of assisted area, size of the firm, and form of the subsidy. Notably, these regionally allocated subsidies are not R&D or innovation subsidies[3], which are mostly granted by Tekes in Finland. As such, they do not have innovation aims but mainly goals for regional development.

The data contain the business projects for which the Ministry of Trade and Industry granted subsidies between 2000 and 2003. It is combined set from two sources. First, it contains data of all of the financed projects (5,844 projects) from official registers. Second, to gather private information on deadweight, 222 firms were interviewed at the end of 2004; that is, 1–3 years after the beginning of their projects. The sample was randomly selected from the population of subsidised private projects. The telephone interviews, lasting an average of 30 minutes, were conducted according to a structured questionnaire that was sent to the respondents in advance. The respondents were firm owners or project managers, whoever was most involved with the implementation of the subsidised project.

Chapter 5 focuses on start-up grants, the purpose of which is to help entrepreneurs through the critical seed and start-up phases. As such, they are assumed to increase the supply of entrepreneurship (Holz-Eakin et al., 1994). This type of employment assistance scheme has several goals, such as unemployment reduction, job creation and the fostering of the business sector. The largest employment assistance schemes have operated in the UK, France, Spain, Germany and Denmark (Parker, 2009). The policy tool is known by different names in different countries, for example, self-employment assistance, bridging allowances or support grants for self-employment (OECD, 2000). In Finland, a nationwide system of start-up grants was launched in 1988. Grant size is linked to the size of the unemployment benefit and has averaged 500−650 € per month for a maximum of 10−15 months. A grant is awarded on the condition that the firm could not be started without it (Ministry of Labour, 2005). The Employment Office makes decisions on the awarding of a start-up grant and consults third-party experts to evaluate the applicant as a potential entrepreneur and to determine whether the business concept is viable. The start-up grant applicant

---

3 Tanayama (2009) and Ali-Yrkkö (2008) provide insight into impacts of this kind of technology and R&D subsidy in Finland.

must have entrepreneurial experience or training (Ministry of Labour, 2005; Stenholm, 2006).

In Chapter 6, formal education is studied. Education is measured as the individual's highest completed level of education, where six levels are distinguished: basic, secondary/vocational, lowest tertiary, lower tertiary (bachelor's), higher education (master's) and postgraduate. The levels are converted into years according to the standard length of education (respectively, 9, 12, 14, 16, 17 and 21 years) based on the classifications by Statistics Finland.

Chapters 5 and 6 utilise longitudinal data files collected and maintained by Statistics Finland. The dataset is based on the Longitudinal Census File and the Longitudinal Employment Statistics File constructed by Statistics Finland. These two register-based datasets have been updated annually since 1987. They, together with some other registers, provide panel data on each resident of Finland. A random sample of 7 percent of all individuals in this dataset in 2001 was taken for this study. The dataset includes very rich information on individuals' educational attainments, labour market performance, regional and family characteristics, and many other variables from the period of 1987-2002 and from the earlier years of 1970, 1975, 1980, and 1985.

1.2 Entrepreneurship and self-employment

Besides the product market, entrepreneurs are highly engaged in the labour market, namely via occupational choice and by hiring employees (Parker, 2006). Entrepreneurship intersects with the labour market in several ways. Human capital theory can be used to explain the success of entrepreneurs. Also, traditional motivation for business subsidies can be drawn from labour market needs, namely, employment growth and unemployment reduction. Besides him- or herself, the entrepreneur may employ someone who would otherwise remain unemployed.

1.2.1 Self-employment as an occupational choice

From an economist's point of view, an individual will choose self-employment instead of being an employee if the utility of being self-employed exceeds that of being an employee. This view originates from Knight's (1921) idea of expected utility theory. Let $U(.)$ be a utility function whose argument is income y. Income y equals the product of working hours and the hourly wage: $y = h.w$, where $h>0$ and $w>0$. For entrepreneurs, income is uncertain, depending in part on the stochastic term θ with distribution $F(\theta)$. Then, the expected utility of self-employment is:

$$E(U) = \int U[h.w(\theta)]dF(\theta) \qquad (1)$$

An individual will choose self-employment if *E(U)* exceeds the expected utility from paid employment (or unemployment). This approach allows only for financial utility. Many studies show that non-pecuniary benefits (e.g., independence and freedom) are often more important to entrepreneurs than financial benefits are (Hamilton, 2000). Hence, an entrepreneur's expected surplus is the utility difference between entrepreneurship and employment including not only income differences but also various effort costs. The choice of self-employment is also fostered by the difference between expected profits and current local income in the same sector as well as the degree of risk aversion and the differences in risk of the two occupational alternatives (Cressy, 2006; Santarelli and Vivarelli, 2006).

1.2.2 Human capital in self-employment

Human capital has long been recognised to correlate with a firm's profit through increased productivity (Mincer, 1974; Becker, 1975; Bates, 1985). The human capital theory holds that knowledge augments the cognitive abilities of an individual, thus enhancing his or her productivity. Naturally, human capital is helpful in running a business because it may provide crucial knowledge and skills. Human capital enhances the abilities needed in business, such as risk awareness and comprehension of market prospects.

Utilisation of human capital theory can inform government policy in several ways. For example, if returns to education are higher for entrepreneurs than they are for wage earners, there might be a case for giving more weight to entrepreneurship in labour and education policies. Such a policy could include enterprise education programmes in schools and universities. Furthermore, if human capital is crucial for business survival, it may indicate a demand for public training services.

Human capital can be divided into general and specific human capital, both of which are crucial in the self-employment context (Becker, 1975). Education and work experience represent general human capital. The evidence relating to education shows mixed results. According to Bates (1990), highly educated entrepreneurs – those with four or more years of college – are the most likely to create firms that remain in operation. Bates (1998) and Cowling (2003), however, find the effect of education to be negative. Age is generally interpreted as a proxy for accumulated informal human capital. The effect of age is non-linear (inverse U-shaped) so that middle-aged persons benefit most from their informal human capital. However, some arguments suggest that the earnings-age relationship is weaker for self-employed workers than for paid workers because the self-employed often acquire less training than employees do (Kawaguchi, 2003). Also, the self-employed might be confronted by a flatter age-earnings profile caused by decreased productivity compared to wage-earners (cf. Hellerstein and Neumark, 2005).

In the context of self-employment, specific human capital is distributed as industry-specific and entrepreneurship-specific human capital (e.g., Young and Francis, 1991; Brüderl et al., 1992). Industry-specific experience increases productivity because the main activities of the industry have already been learned. It may also yield knowledge about potential niches in business. Hyytinen and Maliranta (2008) find evidence for entrepreneurial learning of employees, especially in smaller firms. Entrepreneur-specific human capital can best be obtained through self-employment experience, although some entrepreneurial skills may also be achieved through special entrepreneurial training (e.g., Brüderl et al., 1992; Firkin, 2003). Another type of entrepreneur-specific human capital is experience as a manager or director. Those with managerial experience in paid work may also have better skills for running businesses of their own.

This type of experience becomes particularly important when a firm expands from mere self-employment to hiring more employees. Entrepreneur-specific human capital may also originate from parental self-employment. Either managerial or firm-specific skills may transfer inter-generationally to children of self-employed parents through everyday interactions (Niittykangas and Tervo, 2005). In addition, a parental example of success in business may encourage an individual to take risks and persist in self-employment.

Traditional human capital research has focused on the effect of earnings. Brüderl et al. (1992) were the first to elaborate on the mechanisms through which human capital affects survival chances. In terms of survival, an entrepreneur's higher productivity means that he or she is more efficient in the production process or in attracting customers. Higher human capital improves several abilities needed in business, such as risk awareness and market prospects comprehension. In addition, human capital has an important role for lenders in assessing potential borrowers. Human capital and its easily observable indicators act as signals of profitable projects for financiers. Thus, entrepreneurs with high human capital are less likely to suffer from debt rationing. In fact, Cressy (1996a; 1996b) suggests that the influence of assets on survival is explained endogenously by human capital.

1.2.3 Entrepreneurship in Finland

Entrepreneurship rates tend to vary a great deal across countries and time. It is difficult to obtain consistent estimates by country because of differences in the way entrepreneurship is measured across countries. As a consequence, there is no single definitive measure of the total number of firms or entrepreneurs in the economy.

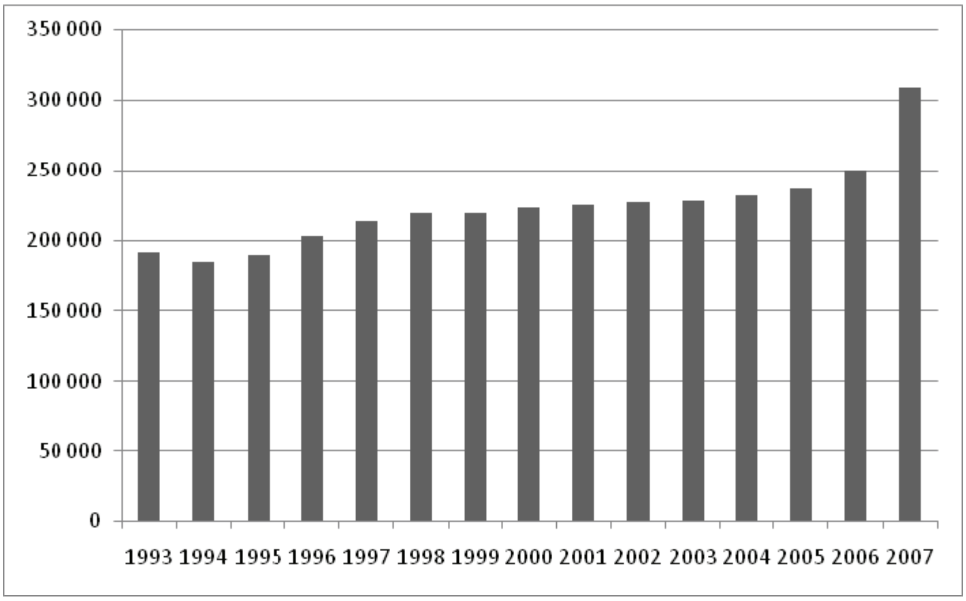

FIGURE 2 Number of firms in Finland, 1993-2007 (Statistics Finland, 2010)

Figure 2 gives the number of firms in Finland, defined as firms and places of business whose time of operation was longer than 6 months, number of personnel over ½ persons and annual turnover over an annual threshold (9 636 € in 2007). The number of firms increased beginning in 1994[4], following a period of decline (Ministry of Employment and the Economy, 2010). The number of firms exceeded 200 000 except in the early 1990s, when the economy experienced a heavy downturn leading thousands of firms into bankruptcy. However, the economy recovered from the recession rapidly, and the number of firms has been rising ever since. This pattern is contrary to the general trend in the OECD countries, for which Blanchflower (2004) found declining self-employment rates. Notably, according to Pajarinen et al. (2006), about one-third of start-ups do not represent new business; they are either old firms with new business IDs or firms that did not activate their business yet.

[4] In 2006, the information basis for the Register of Enterprises and Establishments by Statistics Finland was widened, which explains part of the exceptional jump from 2006 to 2007. According to the Ministry of Employment and the Economy, changes in compilation of statistics explain more than one-third of the increase.

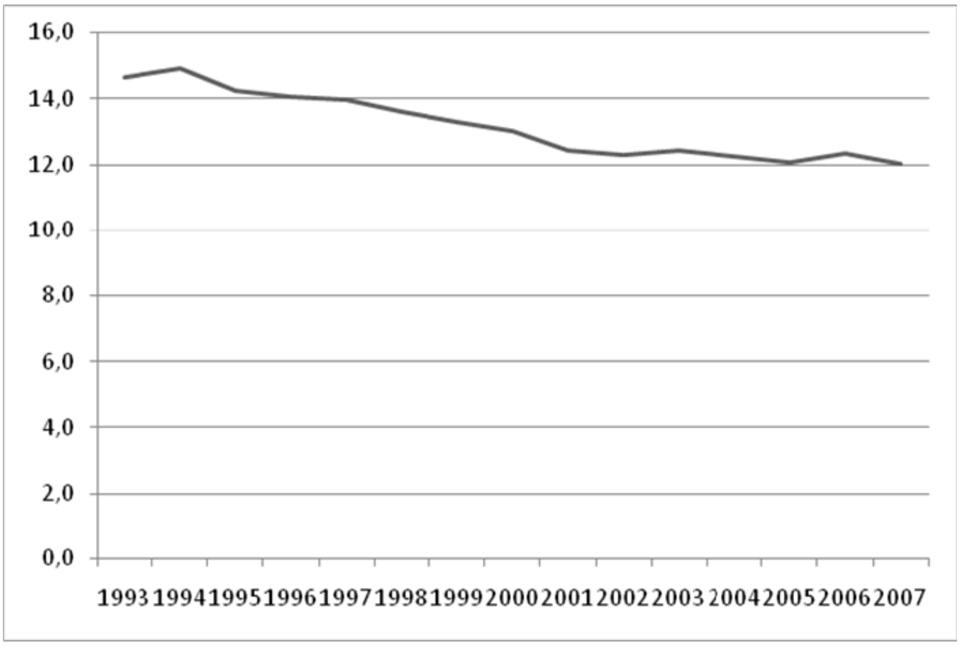

FIGURE 3 Self-employment rate in Finland, 1993-2007 (Statistics Finland, 2010)

Figure 3 shows that the trend of self-employment is decreasing. The self-employment[5] rate as a share of all employed persons was over 16 percent in the early 1990s but has fallen to 12–13 percent per year in 2000–2007. However, these numbers are based on the Labour Force Survey, which has a margin of error, and thus, they should be interpreted with caution. According to the Ministry of Employment and the Economy, the self-employment rate was 8.5-9.5 percent during the time period in question (Ministry of Employment and the Economy, 2010).

1.3 Public support to entrepreneurship

Public support to entrepreneurship can be implemented under both macroeconomic and microeconomic policy. Macroeconomic policy includes interventions relating to the operational environment, such as macroeconomic stability, taxation, regulation, legal and cultural issues. Here, we are interested in microeco-

[5] Self-employed persons are those who are engaged in economic activities on their own account and at their own risk. Self-employed individuals may or may not employ others, such as own-account workers or freelancers. A person acting in a limited company, who, alone or together with his or her family, owns at least one half of the company, is counted as self-employed. These numbers also include unpaid family workers who are members of the same household working without actual pay in an enterprise or farm owned by a family member (Statistics Finland, 2010).

nomic policy targeted directly to the entrepreneurial actors, whether firms or individuals. For the most part, public support is only aimed at SMEs, although there are some drawbacks to supporting only small firms. These smaller-sized firms tend to provide less training and pay lower salaries than large ones, which does not advantage the national skill base (Parker, 2009). Shane (2009) claims that supporting typical small start-ups is not optimal policy. Instead, the focus should be on encouraging the formation of high-quality, high-growth companies. Furthermore, by eliminating incentives to create low-potential companies, policy makers could improve the average performance of new businesses.

Lundström and Stevenson (2005; 2007) distinguish between entrepreneurship policies and SME policies. The former are intended to increase the number of start-ups, whereas the latter are focused on the stock of existing firms. Entrepreneurship policy is mainly allocated to individuals and SME policy at the corporate level. Different countries make different choices about the balance between the policies. These policies are closely linked to other major policies. Start-up finance and training, which encourage people to start their own businesses, are tools for employment policy as well. Formal education is naturally based on general educational principles, although the element of entrepreneurial education is a growing trend in educational policy.

A customary way to classify public subsidy policy is to distinguish between horizontal and vertical measures of support. Horizontal subsidising policy is concerned with supporting selected economic activities, such as R&D, employment, environment, trade, energy savings, start-ups, technology diffusion and entrepreneurial education, with no selectivity regarding economic sectors. Vertical policy is concerned about supporting specific economic sectors, such as shipbuilding, coal mining, or steel. The trend in the European Union is moving from vertical aid to horizontal aid (e.g., Riess and Välilä, 2006). Regardless, the recent evaluation literature emphasises that policy instruments should be discretionary and selective; otherwise, public resources would be spread to targets too small to be effective (Molle, 2007). The term ‘discretionary’ means that subsidies are paid to new or existing firms that meet ex-ante criteria and have applied for aid. Selectivity demands that they be targeted to certain groups only, e.g., those in certain regions or certain industrial sectors.

1.3.1 When is intervention justified?

Government intervention in a market economy is widely justified by the existence of market failure (e.g., Storey, 1994; Felsenstein et al., 1998). The market failure arguments for public intervention include both externalities of entrepreneurial activity and financial and non-financial barriers to activity (e.g., Takalo, 2009). The term ‘market failure’ refers to allocative or productive inefficiency in the market outcome that is not due to governmental regulation. In the case of market failure, the market cannot fully or correctly value the social benefits and costs resulting from entrepreneurship, and thus, they lead to a misallocation of resources. As such, it encompasses the failure of competitive markets to obtain the socially optimal outcome but also inefficiencies due to imperfect competition, imperfect information and other systemic problems that are not automatically solved by market forces. However, it is strongly argued that the presence of market failure is a necessary but not sufficient condition for intervention. A positive net social effect and welfare gain should be demonstrated as a result of intervention according to liberal economists (e.g., Storey, 1982).

The logic behind market failure rationale is that the failures hinder the operation of a free market and can lead to socially insufficient entrepreneurship (e.g., Storey, 1994, 2003; Felsenstein et al., 1998). A frequently cited work by Stiglitz (1988) specifies six main reasons for market failure, namely, information imperfections, existence of public goods, incomplete markets, externalities, failure of competition, and macroeconomic disequilibrium. Storey (2003) specifies four reasons particularly for SME policies, which are: imperfect information on the private benefits of starting a business; imperfect information on the private benefits of obtaining external advice; the inability of financial institutions to accurately assess the risks of SMEs; and the presence of externalities. The first three of these relate to Stiglitz's (1988) imperfect information and the final one to a divergence between social and private returns. Recent studies provide further evidence that information imperfections and indirect positive externalities are the main failures in the financial market of SMEs (e.g., European Commission, 2007; Stam et al., 2007).

At its simplest, information imperfections refer to basic ignorance about private benefits of starting a business, which may prevent people from entering self-employment (Parker, 2009). Second, existing business owners may not fully understand the private benefits to their business of taking a certain course of action (Storey, 2006). Workforce training and external consultancy provide examples of this. Asymmetric information, the third embodiment of such imperfections, explains why free market capital does not always flow to firms with viable[6] business projects. In other words, firms are credit constrained by the financial system. While many essential features of the project are known to the firm, it may not be able to communicate them credibly to outside financiers due to the well-known problems of adverse selection and moral hazard (e.g., Petersen and Rajan, 1994). Financial institutions may not be able to recognise viable and potential projects, which can lead to overestimated risk rates and rejection of finance (Stiglitz and Weiss, 1981). Because of negative adverse selection and incentive effects, banks may ration credit rather than raise the interest rate. Such imperfections may result from shortcomings in the bank's assessment process or from overly negative expectations on behalf of the applicant firm (Stam et al., 2007). Some firms can be denied access to credit despite the fact that they have viable projects. Holmström and Tirole (1997) show that credit constraints followed by moral hazard hit poorly capitalised firms the hardest. Many financiers demand a sufficient amount of own capital from a firm as proof of motivation and quality. In that case, entrepreneurs who do not have enough liquid assets

---

6 The term 'viable' indicates that that project has a positive net present value (cf. Cressy, 2006).

may be credit constrained. Particularly, the projects that are desirable from the standpoint of social welfare might be rejected by private financers. These informational problems are acknowledged to be particularly severe in the financing of R&D projects. R&D potential is hard to verify, especially when the main assets are founders' human capital and intellectual property (Takalo and Tanayama, 2010). Governments can bridge the information gap by providing an informative signal through partial finance, which is adequate to provide information on a project's viability to private financiers.

Externality refers to the divergence of private and social costs (Glancey and McQuaid, 2000). An externality is positive if the behaviour of some agent makes another agent better and negative if that behaviour makes another agent worse. In a situation with positive externalities, the social returns of a business project exceed its private returns. These economic benefits may not be fully incorporated into the market. The private value of entrepreneurship may differ from its public or social value for a number of reasons. First, the firms create new products, services and production processes that increase productivity and furthermore enhance the welfare of consumers. This additional social value is known as an 'appropriability effect' (Murray et al., 2009).

A second type of positive social externality comes from technological spillovers. Knowledge is cumulative and sequential capital spilling over time. Subsequent firms are able to learn from the past experience and knowledge developed by their forerunners so that they can more efficiently manage critical innovation costs. Thus, the initial innovators cannot capture all of the benefits from their creations. R&D and innovation activity provide typical examples of such a situation. R&D commonly yields technological spillovers that benefit society as a whole more than they do the firm itself. Without public support, the level of R&D activity may not be sufficient for society (Bartik, 1990).

A third source of positive externalities lies in business clusters, where firms can benefit from agglomeration benefits of other firms, such as network externalities, reduced transportation costs and more efficient labour market matching. Entrepreneurs are only rarely able to build a cluster by themselves because they cannot capture all of the benefits to cover the set-up costs (Parker, 2009). This issue might require the public sector to develop facilities where entrepreneurs can cluster together. These interventions can take the form of science, technology and research parks, for example, which attract creative people and innovative firms.

1.3.2 Arguments against public intervention

It is claimed that, despite the amount of theoretical literature suggesting the possibility of credit constraints, empirical evidence for their existence is not convincing (Cressy, 2006). The risk of overstating the hindering role of credit constraints is particularly high in surveys where entrepreneurs are asked to list their main difficulties in business. They have a tendency to exaggerate the lack of external financial support, although in most cases this is just a symptom of more fundamental deficiencies internal to the firm (Vivarelli and Santarelli, 2006). Thus, it is not guaranteed that the relaxation of credit constraints will increase desired entrepreneurial activities.

Opponents claim that asymmetric information tends to cause overinvestment in entrepreneurial projects, implying that entrepreneurship should be discouraged on the basis of asymmetric information (de Meza and Webb, 1987). In the presence of different expected returns to the project, outside financiers cannot separate good projects from bad ones, and they typically end up financing both kinds of projects. Thus, good projects will cross-subsidise bad ones, leading to a socially excessive level of investment results. This problem of overinvestment worsens if funding becomes cheaper (e.g., Takalo, 2009). Thus, it is argued that external funding of project investments or their returns should be taxed, not subsidised. Recent studies, e.g., de Meza (2002), do not find a theoretically coherent argument for public project financing arising from adverse selection. However, the signalling effect of public financing is still widely supported (e.g., Takalo and Tanayama, 2010).

Positive externalities can argue against public interventions. Subsequent followers, e.g., new firms, may benefit from already established ones and thus, may benefit from already established ones, when public support may give unfavorable advantage over other enterprises. As an example, subsidised start-ups may crowd out already established ones if the subsidies are granted in a fixed marketplace (Storey, 1994). This process is called a displacement effect (e.g., Tervo, 1989; 1990). This unfavourable advantage is mostly prohibited under the subsidy legislation (e.g., Ministry of Justice, 2006a). Also, if there is a high first mover advantage in business, it may attract too many firms to the market. This type of overinvestment is not beneficial from society's perspective.

The ultimate purpose of a utilitarian government policy is to improve the welfare of its citizens. Public interventions carry the risk of government failure, which can be defined as failure by the government to correct a market failure (e.g., Winston, 2006). Therefore, subsidisation of private sector investments is not unproblematic even in the presence of market failure. The existence of subsidy programmes may, for example, encourage a firm to reduce its own inputs to the investment project. In the worst case, investment assistance entirely substitutes for private funds and thus generates no increase in the scale of investment, implying an arbitrary transfer of resources from taxpayer to producer (Wren, 1996). Empirical evidence shows that substitution is a real problem. David et al. (2000) conclude that one third of the studies they review report that public R&D acts as a substitute to private finance R&D investments. Binelli and Maffioli (2007) claim that when firms' preferences are not directly observable, the granting of direct subsidies is more likely to incur the risk of adverse selection attracting firms that would have invested in a project even in the absence of public support or abandoned some of the non-financed projects, thus leaving unchanged or decreasing the overall level of expenditures in R&D. In that event, the firm could have obtained finance in any case, so public resources are being used needlessly (cf. deadweight effect).

1.3.3 Public subsidies in Finland

Public support to entrepreneurship is granted under a number of policies, including employment policy, regional policy, trade policy, competition policy, entrepreneurship policy and innovation policy. As a consequence, the responsibility for granting is dispersed to many different ministries and offices, though harmonisation has begun. The Ministry of Employment and Economy (a combination of the former Ministry of Trade and Industry and Ministry of Labour) is the major distributor of support to businesses.

The total amount of subsidies was at its highest, namely 5.7 billion Finnish marks (almost 1 billion euro), during the economic recession in 1993 (Junka, 1998). Since then, the support decreased until an upward trend began again in recent years (excluding 2007). The increase in business subsidies is reflected in the increasing volume of recent literature on the dynamics of the granting of subsidies (e.g., Koski and Pajarinen, 2010; Koski and Tuuli, 2010; Ylhäinen, 2010).

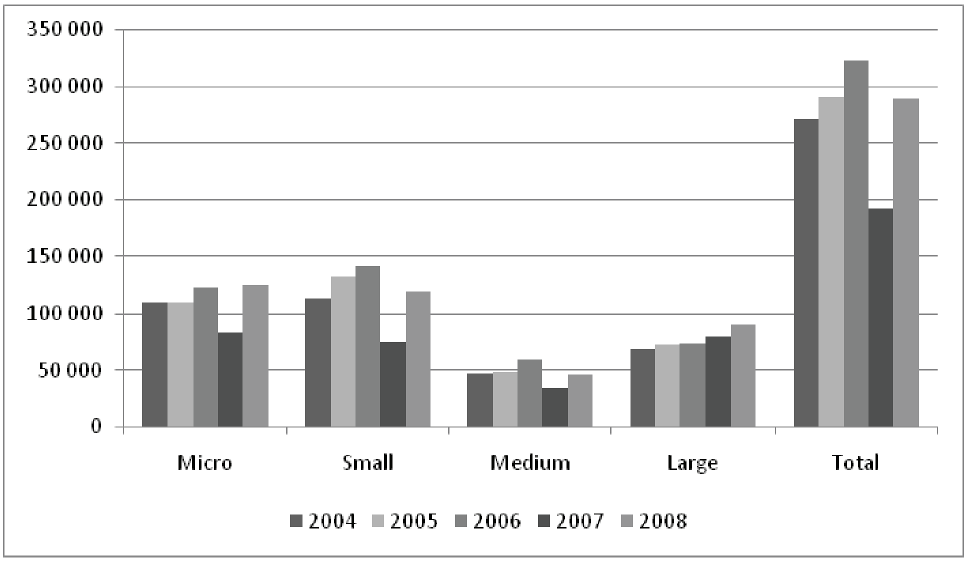

FIGURE 4 Public business subsidies directly granted in Finland (1,000 €), 2004-2008 (Statistics Finland, 2010)

Figure 4 illustrates direct business subsidies paid in Finland in 2004-2008. Public support to industries now constitutes about 2 percent of the total expenditures of the government, matching around 1 percent of GDP. The amount of subsidies granted has been around 250-300 million euro annually. In 2007, the amount was below 200 million euro, while it exceeded 320 million euro in the following year. This exceptionally low number follows from the fact that 2007 was the first year in the new financial period. The programmes and instructions changed at this time and were not available immediately.

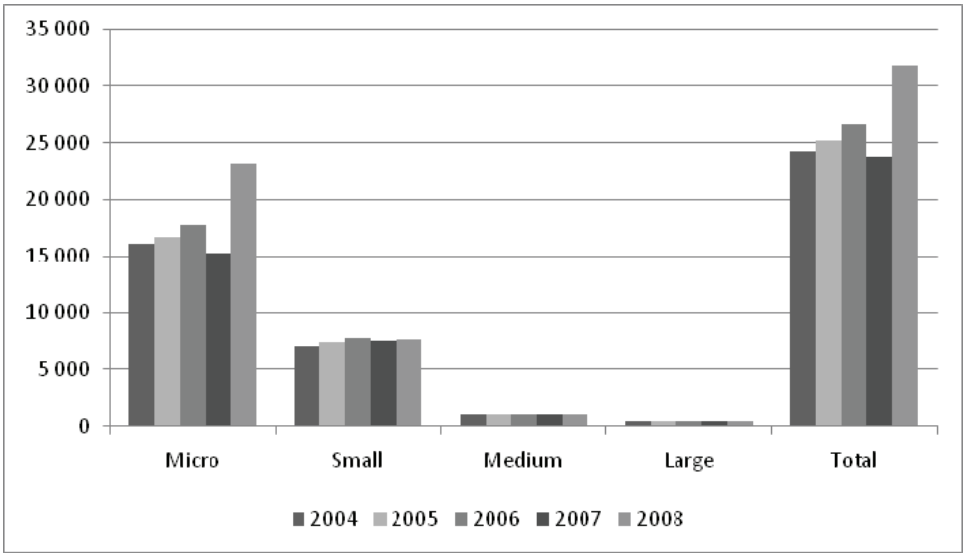

FIGURE 5 Number of directly subsidised firms in Finland, 2004-2008 (Statistics Finland, 2010)

The most important financing instrument of support has been direct grants, and the most important policy objective has been regional support. Subsidies are mostly paid to micro and small firms (Figure 5). However, even though subsidies to large firms are only exceptional under many programmes, in practice they receive a substantial share of subsidies in financial terms.

1.4 Evaluation of public support

Public subsidies have a number of objectives. This diversity complicates the process of assessing the effects of programmes. The measured outcome of public support can be in the form of, for example, additional output, the number of firms, employment, sales or exports. Although the concept may seem simple, it is not easy to quantify the difference between gross and net impact. The first difficulty involves distinguishing what occurs in firms as a result of participation in a programme (i.e., the causal effect of treatment).

The classic programme evaluation is based on the models presented by Roy (1951) and Rubin (1974). The two potential outcomes are $Y_i(0)$ (individual/firm does not receive treatment, W_i=0) and $Y_i(1)$ (individual/firm receives treatment, W_i=0). The observed outcome for individual *i* is as follows:

$$Y_i = Y_i(W_i) = Y_i(0)(1 - W_i) + Y_i(1)W_i. \qquad (2)$$

The treatment effect for each individual *i* is then defined as the difference between the potential outcomes: τ_i = $Y_i(1)$- $Y_i(0)$. A problem arises because an individual or a firm may either participate or not participate but may not simultaneously choose both options. This distinction causes an evaluation problem in terms of observing the counterfactual outcomes for participants in cases of non-participation. The construction of a convincing counterfactual case is a key component of evaluation methods (Blundell and Dias, 2009).

A key feature of the current evaluation literature is the accommodation of the general heterogeneity of treatment effects. No single parameter can capture the effect of various policies (Imbens and Woolridge, 2009). Rather, estimation methods should identify the average effect of treatment over some subpopulation. The most commonly used parameters are the population average treatment effect (ATE), the average treatment effect on individuals that were assigned to treatment (ATT) and the average effect on non-participants (ATNT). In the fourth paper of this thesis, the interest is in the ATT, which is given by the following:

$$E\{\mathrm{Y_i}(1) - \mathrm{Y_i}(0) | \mathrm{W_i} = 1\} \quad (3)$$

where $E\{\mathrm{Y_i}(0) | \mathrm{W_i} = 1\}$ describes the hypothetical outcome without treatment for those who received treatment. Because this term is usually not equivalent to $E\{\mathrm{Y_i}(0) | \mathrm{W_i} = 0\}$ with non-experimental data, the estimation of ATT based on the difference in subpopulation means will lead to the selection bias discussed in Chapter 1.4.4.

The first three papers of the thesis instead focus on factors that influence $E\{\mathrm{Y_i}(0) | \mathrm{W_i} = 1\}$. Thus, the starting point is the hypothetical outcome, in which the research seeks to determine what would have happened if the subsidised firms were not subsidised. This is concerned here a the deadweight effect , which offers an alternative approach to the classical evaluation problem. Despite the availability of recently developed statistical methods for handling problems that include selection bias and counterfactual construction, the analysis should be supplemented with surveys targeting programme participants (Bartik, 2004). These alternative approaches can provide additional evidence regarding the impacts of a programme, provide more insight regarding how and why a programme is effective, and suggest ways in which a programme can be improved.

1.4.1 Evaluation of the deadweight effect

Economists usually evaluate public interventions based on changes in economic efficiency or social welfare (Parker, 2009). A loss of efficiency may arise for at least two reasons. Public subsidies may encourage inefficient firms to engage in unprofitable operations. Caballero et al. (2009) recently showed how this type of subsidy leads to lower levels of job creation, higher levels of job destruction and lower productivity. Inefficiencies may also arise in situations in which firms are able to implement their projects even without public subsidies. This thesis is focused on the issue of deadweight spending (that is, funding allocated to this type of non-additional project). This topic has become increasingly important in

EU expenditure evaluations due to increasing demands to maximise the added value of spending in this context (Mairate, 2006).

The level of deadweight involved in each project is difficult to assess. Lenihan (1999) draws a distinction between full (pure), partial, and zero deadweight. Full deadweight refers to a situation in which a project would have been implemented as originally planned even if it had not received a grant subsidy. Thus, the level of deadweight is 100 percent. In the opposite situation, the project would have been abandoned if it had not received a subsidy. In this case, there is zero deadweight. Partial deadweight lies somewhere between full and zero deadweight. For instance, partial deadweight can occur when a project would have proceeded on a reduced scale, at a reduced level of quality or with a delayed time schedule if a subsidy had not been granted (cf. Lenihan, 1999; 2004; Lenihan and Hart, 2004).

Various calculation methods yield consistently high estimated levels of deadweight. Deadweight can constitute up to 78 percent of employment and 56 percent of the share of assistance approved and can occur in more than 90 percent of subsidised business projects (Lenihan, 1999; Lenihan and Hart, 2004). Deadweight amongst supported start-ups is often as high as 70 percent (Cowling, 2006). Thus, two-thirds of supported individuals would have eventually entered self-employment anyway.

A risk of deadweight is recognised in the Finnish process of granting business subsidies, in which a project and a firm are evaluated by researchers at the Employment and Economic Development Centre with a representative from the applicant firm. The degree of the deadweight effect of a project is estimated by posing the hypothetical question of what will happen if the project is not subsidised. The possible answers to this question are as follows: (1) the project will be abandoned; (2) the project will be implemented on a reduced scale; (3) the project will be implemented at a reduced level of quality; (4) the project will be implemented at a later date; and (5) the project will be implemented as originally proposed. Option (1) implies zero deadweight, options (2) through (4) imply partial degrees of deadweight, and option (5) implies pure deadweight.

In the evaluation of this question, the assessors account for a wide range of details regarding the projects and the applicant firms. For instance, the operation of a firm, the content and financial plan of a project, the capital needs of the project, and the financial standing of the applicant firm are reviewed. A more specific method of assessment is used for more extensive projects, in which factors relating to the branch of industry, market structure, development prospects, corporate strategy and success are closely scrutinised. However, no specific criteria for the evaluation of deadweight have been established; instead, this evaluation primarily depends on the assessors themselves. The assessment of deadweight may be influenced by a `pick-the-winners' effect. Thus, authorities may favour the greatest number of potential projects that could have been implemented as originally planned without a subsidy because successful projects improve the records of the assessor and ensure performance pay. Moreover, self-reports provided by firms suffer from intrinsic difficulties, which are commonly known as 'respondent effects' or 'response biases' (e.g., Lenihan, 1999; Lenihan and Hart, 2004). Applicant firms may deliberately exaggerate or downplay the importance of assistance because of a fear that this aspect may influence current or future public funding.

Finally, deadweight is not unambiguously negative, at least not in situations in which projects yield positive externalities, such as regional spillover and leverage effects (e.g., Hart and Lenihan, 2006). Even in the presence of deadweight spending, subsidies may have a variety of direct and indirect positive effects on regional development. However, subsidies may also slow necessary restructuring and creative destruction (see, for example, Caballero et al., 2009). For a fuller picture of the net value of regional subsidies, a further evaluation of their effectiveness is needed. Thus, one must consider the trade-off between deadweight spending and the net impacts of subsidised projects.

1.4.2 Impact evaluation: measuring success as business survival

The typical way to evaluate the success of supported start-ups is to analyse their survival. Self-employment offers an opportunity for the individual to become rich, but if the business fails the individual may lose his or her job, savings and even home if it was used as collateral on a loan. Nevertheless, the survival of supported start-ups is also a matter of social interest, and public resources are wasted if the newly supported entrepreneur quits shortly after entering self-employment. The empirical evidence reveals that many businesses are born to die or stagnate very young (Storey, 1982; Burns, 1989). It has been shown that up to 40 percent of start-ups do not survive even the first two years (Scarpetta et al., 2002).

The traditional approach to explaining survival is to use a probit or logit model to estimate significant covariates for the dependent binary variable of survival. This technique is very one-sided because the model distinguishes only continuation or failure, not taking into account the length of survival. A solution to this issue is to utilise a hazard function in the estimation of covariates of survival.

In the case of annual data, a discrete time specification for modelling the hazard rate must be used. The discrete hazard rate $h(a_j)$ is the probability of exit in the interval $(a_{j-1}, a_j]$, and it is defined as:

$$h(a_j) = P(a_{j-1} < T \leq a_j \,|T < a_j) = 1 - \frac{S(a_j)}{S(a_{j-1})}, \quad (4)$$

where $S(a_{j-1})$ is the value of the survivor function at the start of the jth interval, and analogously, $S(a_j)$ is the value of the survivor function at the end of the same interval j. The probability of survival until the end of interval j, assuming that the hazard rate is constant over time, can be defined as:

$$S(j) = \prod_{k=1}^{j}(1 - h_k) = (1 - h)^j. \quad (5)$$

The specification most commonly used in discrete-time hazard models is the logistic model, which was primarily developed for intrinsically discrete data but has been shown to be consistent with underlying continuous data as well (Sueyoshi, 1995). Another widely used specification is the so-called complementary log-log (cloglog) model, which is the discrete-time representation of a continuous-time proportional hazards model. It is derived as:

$$h(j, X) = 1 - \exp\left(-\exp\left(\beta' X + \gamma_j\right)\right), \tag{6}$$

where γ_j is the log of the difference between the integrated baseline hazard evaluated at the end and at the beginning of interval j. γ_j are assumed to summarise the pattern of duration dependence in the interval hazard and to be consistent with the different shapes of the hazard function within each spell.

The hazard estimates are often vulnerable to the problem of unobserved heterogeneity (frailty). The model with no frailty overestimates the degree of negative duration dependence in the hazard. The proportionate response of the hazard rate to a change in a regressor is no longer constant, and the true proportionate response of hazard to a change in a regressor is underestimated. (Bergström and Eden, 1992; Lancaster, 1979). The presence of unobserved heterogeneity is conceivable in the case of self-employment due to totally unobservable entrepreneurial skills, which are uncorrelated with observable skills. Fortunately, duration models can be extended to account for heterogeneity in a number of ways, e.g., by estimating a cloglog model that incorporates a normally distributed random effects term with mean zero to summarise unobserved frailty connected to each spell. The random effects term describes unexplained heterogeneity, the influence of unobserved risk factors in the model.

Only a few previous studies have dealt with the impact of start-up grants on the duration of self-employment. Cueto and Mato (2006) performed a study where the determinants of the continuity of subsidised self-employment activities were analysed by means of duration models in one region in Spain. They estimate two separate models: one for men and one for women. However, only data from subsidised firms are utilised. Thus, comparison with non-subsidised firms is lacking.

Del Monte and Scalera (2000) study the duration of small firms created within a start-up programme in Italy. They estimated survival models by considering only three explanatory variables: size, capital/labour ratio and subsidy. On the basis of their limited results, the researchers argue that a comparison between the survival times of supported and non-supported firms is not an appropriate criterion for appraising subsidy programmes because the set purpose of such subsidies is to reduce the gap between such firms and those that do not need subsidies. This is also the guideline in the Finnish start-up grant system. However, a comparison between supported and non-supported groups can provide evidence as to whether the subsidy programme is adequate for this purpose, that is, whether the gap is diminished.

Pfeiffer and Reize (2000), in their study of start-ups, concentrated on firm survival together with employment growth. They use data on newly registered enterprises in Western and Eastern Germany. Their sample includes both publicly subsidised and non-subsidised firms. The survival of subsidised firms was lower in both regions.

1.4.3 Impact evaluation: measuring performance as income

The well-known earnings function first popularised by Mincer (1974) explains individuals' income in terms of their number of years of education and experience. The general specification for a Mincer-type earnings equation is:

$$lnw_i = \beta_0 + \beta_1 s_i + \beta_2 t_i + \beta_3 t_i^2 + X_i'\gamma + u_i, \quad (7)$$

where w_i is the wage of individual i, s_i is a function of the educational attainment of individual i, t_i represent labour market experience, X other characteristics of the individual, and u_i is a random error. In the standard version, s_i is years of education, i.e., it is assumed that the logarithm of earnings is a linear function of years of completed education. In this semi-log earnings function specification, the coefficient on years of schooling can be interpreted as the average private rate of return to one additional year of education, regardless of the educational level to which this year of schooling refers. The extended version of this specification estimates returns to education at different levels by converting the continuous years of schooling variable into a series of dummy variables referring to the completed level of education (i.e., primary, secondary or tertiary education). The private rate of return to different levels of education can be derived by comparing adjacent dummy variable coefficients.

Although the Mincerian approach is widely used because of its simplicity, there are several pitfalls to using this method. Analysis of self-employment income data should be performed with caution for several reasons. First, measurement and definition of the self-employed wage are ambiguous. Entrepreneurs may underestimate their income for taxation reasons. Owners of incorporated firms may be classified in different ways – as employees or employers. Survey-based datasets suffer from high non-response rates from entrepreneurs. Furthermore, measuring employee fringe benefits and elements of entrepreneur income is problematic. Second, the self-employed are vulnerable to selection bias also because their unobservable individual characteristics, such as ability and motivation, affect both occupational choice and business performance. Additionally, general problems such as education not being standardised and being an endogenous variable relate to entrepreneurs as well. The first of these problems indicates that higher quality schooling may generate higher rates of return (Henley, 2004). The latter suggests that people endogenously decide to invest in schooling, at least partly, because of higher expected income. Nevertheless, econometric methods have been proposed to tackle these challenges (see Chapter 1.4.4).

Psacharopolous (1994) estimates an average rate of return to education of 6.6 in OECD countries. Many previous studies suggest that the rates of return to schooling are lower for entrepreneurs than they are for wage earners (Brown and Sessions, 1998, 1999; Hamilton, 2000; García-Mainar and Montuenga-Gómez, 2004), although the opposite has also been reported (Evans and Leighton, 1990; Robinson and Sexton, 1994; Alba-Ramirez and Sansegundo, 1995; van der Sluis et al., 2004). Van der Sluis et al. (2004) find that the average return to a marginal year of education for entrepreneurs was 6.1 percent across 94 previous studies. A study by Iversen et al. (2006) finds that higher levels of schooling result in larger returns for the self-employed, while lower levels of education indicate hardly any return in self-employment. In contrast, García-Mainar and Montuenga-Gómez (2004) conclude that secondary education is the most profitable choice for the self-employed. Psacharopoulos (1994) reiterates that private returns to schooling are considerably higher than social returns because of the public subsidisation of education. The degree of public subsidy increases with the level of education considered, which has regressive policy implications.

Finally, the much-debated hypothesis of a screening effect of education should be mentioned. Spence (1973) was the first to claim that greater human capital is acquired only to signal inherent productivity. The weak screening hypothesis concedes that the effect of education is manifested both through signalling and through increased productivity (Spence, 1973; Arrow, 1973). In the strong screening hypothesis, education operates merely as a signal of inherent productivity, having no role in enhancement of productivity (Psacharopoulos, 1979).

In the case of the self-employed, the signalling role of education is not that clear because these individuals employ themselves; thus, the self-employed are often used as a control group in studies of screening effect. For wage earners as well, more evidence has been presented for the weak hypothesis than for the strong one (e.g., Brown and Sessions 1998, 1999). Thus, the idea that education has an important role in the generation of earnings gains has not been disproved, though the undisputable and universal positive correlation between education and earnings can be interpreted in many different ways (Psacharopoulos, 1994).

1.4.4 Selection bias

Ideally, evaluations include data pertaining to firms that applied to participate in the programme but were rejected, those that were eligible but unaware of the programme, or those that were aware but chose not to apply (Storey, 2006). There are two types of non-random selection: one relating to the observables and another relating to the unobservables (Blundell and Dias, 2009). Thus, the control group should be similar, on average, in terms of the observed and unobserved characteristics that affect the outcomes. Otherwise, the groups would be expected to experience different changes even in the absence of the programme. As a result, a simple comparison of two groups provides a biased measure of the effects of the programme.

Self-selection bias may occur for many reasons; for example, the bias may exist if programme participants are more motivated to succeed. Because motivation is not fully observable, we tend to underestimate how a firm would have performed without the programme. Consequently, the effect of intervention (deadweight) is specified as too high (low), and the programme's effect is overestimated (Storey, 2006). Another example of bias results from committee selection, which refers to 'picking-up winners'. In this case, programme authorities select participants according to their expected success. They are likely to eliminate those applicants who are likely to perform poorly; thus, the selection process is clearly non-random. In addition, observed differences in performance between programme participants and other firms cannot be attributed solely to the effects of the programme.

Traditionally, rigorous evaluations of the the effects of public support require the use of experimental methods. In random experiments (social or natural), a firm is randomly placed in a programme participation group (treatment group) or a control group that is eligible for support but not selected. In such cases, the causal effect of the programme can be evaluated by comparing economic outcomes in the treatment and control groups. Frequently, experimental data are unavailable, or an experiment is infeasible; thus, programmes should be evaluated using statistical techniques that attempt to determine the extent to which the difference in economic outcomes between groups results from the programme. Several techniques address the issue of selection bias and are able to detect the true effect of a programme on firm outcomes.

The most widely used of these techniques are associated with the methods proposed by Heckman (1979) that statistically control for observed variables that affect outcomes and that may be correlated with programme participation by including observed variables in the estimation equation used to predict the outcome variable. The estimation is performed in two steps. In the first step, the selection (participation) equation is estimated using a set of explanatory variables and a disturbance term with unit variance. The selection equation should contain at least one variable that is not related to the dependent variable in the substantial equation. If such a variable is not present, severe problems of multicollinearity may arise, and the addition of a correction factor to the substantial equation may lead to estimation difficulties and unreliable coefficients. Next, fitted values for selection are computed to achieve the 'inverse Mills ratios', which are added to the earnings equation in the second step of the estimation. Thus, this method directly characterises the choice problem facing individuals who are deciding whether to participate (Blundell and Dias, 2009).

The second method in this study uses an instrumental variable (IV) that predicts participation but is uncorrelated with unobservable variables that affect economic outcomes (Angrist and Krueger, 2001). The challenge is to find good, convincing identification instruments that satisfy two conditions: (i) the instrument should not be correlated with the error term, and (ii) the instrument should be highly correlated with the endogenous variable of interest. The former condition relates to the validity of the instrument, and the latter condition refers to its quality. Family background is a widely used instrument for education. Estimations are performed using two-stage least squares (2SLS), in which the first stage estimates the structural form of the earnings equation and the second stage reduces the form of the equation with instrumental variables. According to Heckman and Urzúa (2009), the choice between using IV or a more structural approach, such as Heckman's two-step approach, should be made on the basis of Marschak's maxim: estimators should be selected on the basis of their ability to solve well-posed economic problems with minimal assumptions. These authors suggest that structural methods are essentially more informative than the IV method.

A third approach is to match programme participants with non-participants who are similar with respect to observed characteristics. Thus, matching does not remove selection in terms of unobservables as the Heckman two-step and IV methods do. Recent studies suggest that matching should be based on the estimated propensity score, which is an estimated probability given observed variables that a given entity will participate in a programme (Heckman et al., 1997). This propensity score should be estimated using variables that predict participation and that are correlated with the desired outcomes, independent of participation. Matching data must fulfil assumptions regarding conditional independence and common support. The first assumption demands that participation be independent of the subsequent outcomes, conditional on observable exogenous factors. The second assumption ensures that there are treated and non-treated individuals for all values of the characteristic *X*.[7]

In an analysis of deadweight, the control group approach is problematic in many senses because non-assisted firms do not form a reliable control group with similar characteristics (Storey, 1990). One obvious difference emerges because they either did not apply for or did not obtain regional assistance; thus, they probably had no desire to expand their activities (Armstrong and Taylor, 2000). Hence, the results from deadweight cannot be generalised to all business projects in Finland due to the selectivity of the subsidised projects. This approach can be viewed as complementary to the recent econometric treatment literature. The implementation of microeconometric treatment models would require information regarding a control group that is, information pertaining to projects that were not subsidised.

---

[7] Other widely used evaluation approaches not used in this study include the discontinuity design and control function methods (see Blundell and Dias, 2009).

1.5 Main results of the study

The present study concentrates on two themes regarding public support to entrepreneurship: 1) efficiency of support: existence of a deadweight effect, which tends to decrease net impacts of public support; and 2) effectiveness: impacts of support (start-up grant and education), namely on survival and income. The study consists of five separate, independently written papers, which are presented in Chapters 2-6.

Chapter 2 studies the profile of subsidised zero-deadweight investment projects – projects that would have been abandoned without public subsidies – in Finland. The study is one of the first analysing the existence of deadweight and its determinants by econometric methods. If there are deadweight effects in an assisted project, some (or even all) of the planned/desired economic activity would have happened even in the absence of the intervention. Therefore, to maximise the added value of public finance, the primary focus should be on projects for which investment subsidies have no deadweight effect.

The empirical analysis is conducted using micro-level data on investment projects by private-sector firms. The data set comprises 3,423 projects by private firms that were granted public investment subsidies between 2001 and 2003. The data include information collected before the grant assistance decision on the characteristics of the subsidised firm and investment project as well as on the location of the subsidised firm, thus allowing us to carry out an ex ante evaluation of the deadweight effect. This is in contrast to the previous ex post studies that have used data collected after the grant has been paid to the firm (e.g., Lenihan 1999, 2004).

The analysis shows that the likelihood of investment subsidies' having zero deadweight varies significantly between investment projects with different characteristics. The likelihood that the deadweight effect is zero is greater for projects in distant regions (i.e., Northern and Eastern Finland) than in central areas (i.e., in Southern Finland). Our interpretation is that these regional differences are due partly to differences in need for public assistance and partly to differences in the intensity of assistance. The investment-bearing capacity of the firm, defined as the ratio of turnover to project costs, is found to determine the deadweight effect of the investment subsidy rather than the mere size of the firm. Moreover, the results show that the deadweight of the investment subsidy is smaller for new firms than for old and that likelihood of deadweight diminishes with the size of the investment project. These results can be linked to access to finance as lower investment-bearing capacity and less business experience on the part of the firm and a smaller project size may be signals of higher risk. The findings are thus consistent with the prior literature on access to financing and reasons for deadweight.

Chapter 3 broadens the analysis of deadweight by evaluating different project deadweight measures and their correlations. Deadweight represents a situation in which public and private benefits diverge. Regardless, it must be assumed that only a firm knows the real deadweight, whereas a representative of the public sector attempts to elicit it using certain criteria. If these criteria (the subsidy programme) are designed correctly, the deadweight measures of the public and private sectors should be similar. Previously, deadweight has been studied by public and private measures separately. The novelty of the paper is the joint evaluation of the two measures of deadweight; namely, we discuss and compare deadweight assessments by the public sector and by private firms. Then we identify the characteristics that affect deadweight measures. Comparison of these characteristics can indicate differences in the processes that generate the private and public measures of deadweight. Lastly, we calculate rough estimates for deadweight spending.

First, we discovered some form of deadweight in 66 – 84 percent of the subsidised projects. The largest deadweight estimate was obtained from public assessment; this result does not support the pick-the-winners theory. Assessors do not seem to understate the possibility of deadweight, although this strategy might result in less assistance being approved. The control question yielded the smallest deadweight values, implying that firms' representatives do not intentionally underestimate in their direct deadweight assessments.

Second, no strong correlation between different measures of deadweight was found. The results do not show a significant relation between the public assessment of deadweight and the indirect measurement of private deadweight. The strongest correlation was found between the two private measures of deadweight. Thus, private assessment may be closest to the real deadweight, as expected. Public and private assessments clearly constitute different measures for deadweight and cannot be used as substitutes. However, no evidence was found for either the pick-the-winners effect or the response bias. Instead, asymmetric information seems the more likely explanation for the differences. Public assessment may not be able to recognise the real deadweight of the project due to asymmetric information because many essential features of the project and its funding possibilities are known only to the firm. As the researcher does not know the real deadweight, it can be tempting to select the most indefinite option, partial deadweight.

Third, the characteristics that affect deadweight measures were identified. Analysis supports the fact that the measures are divergently formed. The public and private sectors emphasise, in part, different aspects in their reviews, which may indicate that the subsidy programme is not able to recognise the causes of real deadweight. Therefore, they may not be able to pick those projects that need subsidies most severely. The control variable is explained by purely financial factors. The difference between direct and indirect private assessments may indicate that the question of deadweight is fully clear to the respondents. Finally, our analysis shows that deadweight spending is a serious issue. By all measures, a significant share of subsidies is used potentially as deadweight spending for reasons that should be more widely analysed. Analysis demonstrated that, without creating a set of additional assumptions (e.g., Lenihan, 1999), the range of estimates for deadweight spending tends to be wide.

Overall, this paper shows that assessments from public and private perspectives constitute different measures of deadweight. The measures should not be used as substitutes but rather as complements. When reporting deadweight, the source of the information should be highlighted, and policy recommendations should be drawn from the view of the source only.

Chapter 4 concentrates on the regional aspects of deadweight and develops more sophisticated methods for financial measurement of deadweight. Based on previous literature, a relatively high deadweight was expected, although the literature provided little insight regarding regional variation. Thus, the results provide new information on the regional allocation of enterprise financing.

First, the descriptive analysis of deadweight spending showed substantial regional differences. In monetary terms, deadweight spending is on average the highest in Assisted Area 1 and the lowest outside of the Assisted Areas. This difference is not explained by the percent variation in the degree of deadweight but rather by the total amounts in euros of subsidies and projects[8]. Thus, allocating more resources to developed areas would not decrease wasted spending.

Second, the econometric analysis shows regional variation in the determination of deadweight spending. These differences are particularly large for variables describing the type of the project and the size and industry of the firm. Thus, the efficiency of regional business subsidies could be increased by favouring different kinds of projects in different regions rather than applying nationally mandated guidelines.

Third, the observed discrepancies explained a majority of the pair-wise regional differences in expected deadweight spending. Only the comparison between Assisted Areas 1 and 2 indicates a substantial unexplained difference in spending. Hence, subsidies may be wasted more easily in Assisted Area 1 than in Assisted Area 2. These differences should be studied more carefully to improve allocation systems.

Finally, we also compare the current EU policy to alternative schemes that reallocate subsidies from developed regions to less developed regions. If resources allocated to business subsidies are to be decreased, the highest efficiency in terms of avoiding deadweight can be achieved by concentrating subsidies in these least developed areas. The negative relationship between deadweight and economic development is understandable because distant locations often provide weaker opportunities for private finance (cf. Felsenstein and Fleischer, 2002).

Chapter 5 studies the impacts of the subsidies by analysing the impact of public start-up grants on business survival. The paper analyses the success of self-employed entrepreneurs who received start-up grants by comparing the duration of these entrepreneurs' start-ups to those of non-grant recipients.

The paper analyses the impact of the start-up grants that were disbursed in Finland between 1988 and 2001. The supported start-ups are tracked for a period of 14 years and compared to non-supported firms, whereas prior studies

---

8 Thus, the result is correlated with the results in Chapter 2.

tend to be based on small samples and short time periods and have lacked the appropriate control groups. Propensity score matching is used to control the selection to a start-up grant programme. All of the tests indicate that matching was successful. Duration analysis is used to investigate the survival of self-employment and its components.

The most important finding of the study is that start-up grants have a positive impact on the duration of self-employment. This finding was confirmed even after controlling for the selection bias that is related to start-up grant selection and unobserved entrepreneurial skills. Contrary to the findings of previous studies, this study finds that the risk of failure is clearly smaller for supported spells of self-employment according to all of the different specifications.

Although the grants are only allotted to support an entrepreneur for several months, or at most a year, their impact on a firm's operation seems to be more prolonged. It is very possible that the supported firms survive better because of the prerequisites they must meet to receive a grant. Experts in start-up activities scrutinise the applicants' entrepreneurial capabilities and business plans. Clearly, firms that have undergone such an assessment process have a better chance of survival compared to firms whose business concepts have not necessarily been examined as closely (e.g., Chrisman et al., 2005). This finding supports pick-the-winners (or cream skimming) theory. Thus, authorities may favour most potential firms that could have been started even without a subsidy because successful projects improve the records of the researcher and ensure performance pay.

Chapter 6 studies the success of entrepreneurs with regard to income and returns to education. On average, in Finland, entrepreneurs are less educated than wage earners are. The paper analyses the returns to education for entrepreneurs in urban and rural regions in Finland and compares these to the returns for wage earners. These regions differ in many respects, including entrepreneurial activity. Descriptive analysis shows that in general, rural areas have a higher self-employment rate compared to urban areas. However, if we look only at the group of highly educated self-employed individuals, regional differences in entrepreneurial activity become considerably smaller.

The returns to education are similar for entrepreneurs and wage earners when educational attainment is measured in years. In the dichotomous comparison between the highly educated and others, the estimated return is slightly higher for entrepreneurs than for employees, although no clear-cut risk premium was found for educated entrepreneurs. Urban areas dominate the results for the entire country, whereas rural areas show divergent results. In rural areas, returns to education are higher for entrepreneurs. Especially high returns were found for highly educated entrepreneurs in rural areas. The results suggest that entrepreneurship is a more attractive employment choice for highly educated individuals in rural areas, whereas the return is about the same for both occupational choices in urban areas. In terms of choosing location, educated entrepreneurs are financially better off in rural areas. For wage earners, region of residence does not have as much importance in terms of returns to education.

Regionally, these findings raise the question of the causes of regional variation in the rate of entrepreneurship and the relative strengths of pull and push factors. Are individuals pulled or pushed into self-employment? Is it market pull and higher expected earnings that dominate, or are individuals pulled into entrepreneurship because nothing else is available? Our results suggest that well-educated individuals get a high return to education, especially in rural areas. Agglomeration economies do not seem to play a significant role for highly educated entrepreneurs as income earners. Even so, the option of entrepreneurship is not a highly popular one among the highly educated in rural areas. Regional differences in the intensity of entrepreneurship do not stem from differences among the well educated but rather from differences among the less educated. Consequently, it is the push effect that dominates, not the pull effect. Regional differences in the rate of self-employment are more likely due to fewer paid employment opportunities in rural and other weak economic areas than to higher expected earnings. Finally, variations in relative returns to education across regions do not seem to account for the prevailing regional differences in entrepreneurship.

1.6 Conclusion

Parker (2009) highlights that instead of numerous objectives, public interventions should be addressed only to specific and demonstrable market failures. Governments should intervene only when there is clear evidence that the benefits of the actions outweigh the costs. If governments are tempted to enlarge the scope of promotions schemes, researchers must provide them with more convincing evidence of the social and economic benefits to offset the costs. This study deals with several different intervention tools to support entrepreneurship. First, it assesses the existence of a deadweight effect, which tends to decrease net impacts. Second, it analyses impacts on outcome. Together, these two aims constitute additionality of public support. To sum up these results, let us start with changes in outcome and then virtually subtract the deadweight effect from them, bearing in mind that these two aspects concentrate on different tools and thus do not provide a comprehensive picture of any particular intervention.

Governments should redirect their attention to the quality rather than the quantity of new start-ups (see also Parker, 2006; Shane, 2009). There is little point in encouraging entry into self-employment if the firms fail to survive. In the future, the focus of public support should be directed to business success instead of to the number of business entries. Impact evaluation of survival and income showed mainly positive results for public support. Start-up grants have a positive impact on the duration of self-employment. Furthermore, the study shows encouraging results from income of entrepreneurs. Especially high returns were found for highly educated entrepreneurs in rural areas. This finding supports subsidising (or building facilities for) highly educated entrepreneurship in rural areas, where their rate is not high despite higher returns for education. On the other hand, higher returns for entrepreneurs may not be socially optimal if they are a consequence of too little competition and overpricing.

The papers show that regional business subsidies are not intended to be very efficient because relatively high wasted spending is accepted ex ante by the public sector. Also, private assessments of deadweight by the firms themselves proved to be high when separated from the granting process. This deadweight effect downsizes the positive effects on outcome. Higher levels of efficiency could be achieved by concentrating on projects that cannot be implemented in the absence of a subsidy, that is, on projects with zero deadweight. However, even if policies are planned carefully, deadweight spending is not completely avoidable because the government never has full information about a firm's action in the absence of a subsidy. Thus, better knowledge about deadweight and the attainment of higher efficiency require a better exchange of information from firms and private financiers to the public sector. This can be done, for example, by developing more efficient screening and information systems; see the discussion in Lundström and Stevenson (2007) and Takalo and Tanayama (2010). Trust and knowledge between the public sector and the firms can also be improved with long-term relations. Defining an 'acceptable level' of deadweight would also require thorough cost-benefit analysis of subsidies, but anything below the previously documented average of 50 percent (Armstrong and Taylor, 2000) could be interpreted as a positive sign.

Seeking a more efficient policy in the sense of minimising deadweight effect by concentrating subsidies on these least developed areas may lead to significantly lower subsequent impacts because the operational environment is not very fruitful for the generation of economic benefits. Such public subsidies may even encourage inefficient firms to take on unprofitable operations, which lead to lower levels of job creation as well as lower productivity. On the other hand, selection of the most promising applicants in terms of expected impacts maximises the occurrence of deadweight effects because these individuals and firms also have the most potential for finding private funds for their projects. Hence, a rational policy examines these two aspects together and attempts to balance avoidance of deadweight and pursuit of impacts to maximise net impacts (see discussion, e.g., in Santarelli and Vivarelli, 2006). Overall, careful policy planning requires taking account of the deadweight effect, displacement effects and the cost of overseeing the programme relative to the benefits generated by supported entrepreneurs.

REFERENCES

Alba-Ramirez, A. and Sansegundo, M. J. 1995."The returns to education in Spain" *Econonomic Education Review* 14, 155–166

Ali-Yrkkö, J. 2008. "Essays on the Impacts of Technology Development and R&D Subsidies" *Acta Universitatis oeconomicae Helsingiensis* A-326

Angrist, J. D. and Krueger, A. B. 2001. "Instrumental Variables and the Search for Identification: From Supply and Demand to Natural Experiments" *Journal of Economic Perspectives* 15(4), 69–85

Armstrong, H. and Taylor J. 2000. "Regional Economics and Policy" (3rd ed.) Blackwell, Oxford

Arrow, K. J. 1973. "Higher education as filter" *Journal of Public Econonomics* 2, 193–216

Baldwin, R. E. and Okubo, T. 2006. "Heterogeneous Firms, Agglomeration and Economic Geography: Spatial Selection and Sorting" *Journal of Economic Geography* 6(3), 323-346

Bartik, T. J. 1990. "The market failure approach to regional economic development policy" *Economic Development Quarterly* 4, 361–370

Bartik, T. J. 2004. "Evaluating the impact of local economic development policies", in Nolan, A. and Ging, W. (eds.) *Evaluating local economic and employment development: how to assess what works among programmes and policies* OECD Organization for Economic Co-operation and Development

Bates, T. 1985. "Entrepreneur human capital endowments and minority business variability" *The Journal of Human Resources* 20, 540-554

Bates, T. 1990. "Entrepreneur Human Capital Inputs and Small Business Longevity" *The Review of Economics and Statistics* 72(4), 551-559

Bates, T. 1998. "Survival Patterns Among Newcomers to Franchising" *Journal of Business Venturing* 13(2), 113-130

Becker, G. 1975. *Human capital* Columbia University Press, New York

Bergström, F. 2000. "Capital Subsidies and the Performance of Firms" *Small Business Economics* 14, 183–193.

Bergström, R. and Eden, P.-A. 1992. "Time Aggregation and the Distributional Shape of Unemployment Duration" *Journal of Applied Econometrics* 7(1), 5-30

Binelli, C. and Maffioli, A. 2007. "A Micro-econometric Analysis of Public Support to Private R&D in Argentina" *International Review of Applied Economics* 21(3), 339–359

Blanchflower, D. G. 2000. "Self-Employment in OECD Countries" *National Bureau of Economic Research (NBER) Working Paper* 7486

Blanchflower, D. G. 2004. "Self-employment: More may not be better" *National Bureau of Economic Research (NBER) Working Paper* 10286

Blundell, R. and Costa Dias, M. C. 2009. "Alternative Approaches to Evaluation in Empirical Microeconomics" *The Journal of Human Resources* 44(3), 565-640

Bosma, N., Acs, Z. J., Autio, E., Coduras, A. and Levie, J. 2009. *Global Entrepreneurship Monitor* Babson College, Universidad del Desarrollo, and London Business School

Brown, S. and Sessions, J. G. 1998. "Education, employment status and earnings: a comparative test of the strong screening hypothesis" *Scottish Journal of Political Economy* 45, 586–591

Brown, S. and Sessions, J. G. 1999. "Education, employment status and earnings: a test of the strong screening hypothesis in Italy" *Economic Education Review* 18, 397–404

Brüderl, J., Preisendorfer, P. and Ziegler, R. 1992." Survival chances of newly founded business organizations" *American Sociological Review* 57(2), 227-242

Burns, P. 1989. "Strategies for Success and Routes to Failure" In Burns. P. and Dewhurst J. (eds.) *Small business and entrepreneurship* Macmillan Education Ltd., London, 32-67

Caballero, R. J., Hoshi, T. and Kashayap, A. K. 2009. "Zombie lending and depressed restructuring in Japan" *American Economic Review* 98, 1943–1977

Chrisman, J. J., McMullan, E. and Hall, J. 2005. "The influence of guided preparation on the longterm performance of new ventures" *Journal of Business Venturing* 20, 769–791

Coval, J. D. and Moskowitz, T. J. 1999. "Home bias at home: local equity preference in domestic portfolios" The Journal of Finance 54, 2045–2073

Cowling, M. 2003. "Productivity and Corporate Governance in Smaller Firms" *Small Business Economics* 20, 335-344

Cowling, M. 2006. "Early Stage Survival and Growth" in Parker, S. C., (ed.) *International handbook series on entrepreneurship*: The life cycle of entrepreneurial ventures, Springer, New York, 479-506

Cressy, R. C. 1996a. "Are Business Startups Debt-Rationed?" *The Economic Journal* 106(438), 1253-1270

Cressy, R. C. 1996b. "Loan commitments and business starts: an empirical investigation on UK data" *Small Business Economics* 8(5), 397-408

Cressy, R. C. 2006. "Debt finance and credit constraints on SMEs" in Parker, S.C. (ed.) *International handbook series on entrepreneurship: The life cycle of entrepreneurial ventures*, Springer, New York, 187-225

Cueto, B. and Mato, J. 2006. "An analysis of self-employment subsidies with duration models" *Applied Economics* 38, 23-32

David, P., Hall, B. and Toole, A. 2000. "Is public R&D a complement or substitute for private R&D: a review of the econometric evidence" *Research Policy* 29, 497–529

De Meza, D. 2002. "Overlending?" *Economic Journal* 112, F54-F72

De Meza, D. and Webb, D. C. 1987. "Too much investment: a problem of asymmetric information" *Quarterly Journal of Economics* 102, 281-92

Del Monte, A. and Scalera, D. 2000. "The Life Duration of Small Firms Born Within a Start-up Programme. Evidence from Italy" *Regional Studies* 35(1), 11-21

European Commission 1999. *Evaluating Socio-Economic Programmes: Transversal Evaluation of Impacts on the Environment, Employment and Other Intervention Priorities MEANS Collection 5*, EC Structural Funds, Office for Official Publications of the European Communities, Luxembourg

European Commission 2007. *Evaluation of data and sources underlying the analysis of market gaps in access to finance for SMEs in the EU*, DG Enterprise and Industry, Luxembourg

Evans, D. S. and Leighton, L. S. 1990. "Small business formation by unemployed and employed workers" *Small Business Economics* 2, 319–330

Felsenstein, D. and Fleischer, A. 2002. "Small-scale entrepreneurship and access to capital in peripheral locations: an empirical analysis" *Growth and Change* 33, 196–215

Felsenstein, D., Fleischer, A. and Sidi, A. 1998. "Market failure and the estimation of subsidy size in a regional entrepreneurship programme" *Entrepreneurship and Regional Development* 10, 151–165

Firkin, P. 2003. "Entrepreneurial capital" in De Bruin, A. and Dupuis, A. (eds.) *New perspectives in a global age* Ashgate, UK, 57-75

García-Mainar, I. and Montuenga-Gómez, V. M. 2004. "Education returns of wage earners and self-employed workers: Portugal vs. Spain" *Econonomic Education Review* 24, 161–170

Glancey, K. S. and McQuaid, R. W. 2000. *Entrepreneurial Economics* Palgrave, New York

Hamilton, B. H. 2000. "Does entrepreneurship pay? An empirical analysis of the returns to self-employment" *Journal Political Economy* 10, 604–631

Hart, M. and Lenihan, H. 2006. "Evaluating additionality and leverage: the interplay between public and private sector equity finance in Ireland (2000–2002)" *Venture Capital* 8, 331–351

Heckman, J. 1979. "Sample selection bias as a specification error" *Econometrica* 47, 153–161

Heckman, J. J. and Urzúa, S. 2009. "Comparing IV with Structural Models: What Simple IV Can and Cannot Identify" *IZA Discussion Papers* No. 3980, Institute for the Study of Labor

Heckman, J. J., Ichimura, H. and Todd, P. 1997. "Matching as an Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Programme" *Review of Economic Studies* 64(4), 605–654

Hellerstein, J. K. and Neumark, D. 1995. "Are Earnings Profiles Steeper Than Productivity Profiles?" *Journal of Human Resources* 30(1), 89

Henley, A. 2004. "Self-employment status: The role of state dependence and initial circumstances" *Small Business Economics* 22, 67-82

Holmström, B. and Tirole, J. 1987. "Financial intermediation, loanable funds and the real sector" *The Quarterly Journal of Economics* CXII(3), 663-690

Holz-Eakin, D., Joulfaian, D. and Rosen, H. S. 1994. "Entrepreneurial Decisions and Liquidity Constraints" *The RAND Journal of Economics* 25(2), 334-347

Hyytinen, A. and Maliranta, M. 2008. "When Do Employees Leave Their Job for Entrepreneurship?" *Scandinavian Journal of Economics* 110(1), 1-21

Imbens, G., and Woolbridge, J. M. 2009. "Recent Developments in the Econometrics of Program Evaluation" *Journal of Economic Literature* 47(1), 5-86

Iversen, J., Malchow-Møller, N. and Sørensen, A. 2006. "Returns to schooling in self-employment" *Centre for Economic and Business Research (CEBR), Discussion paper* 19

Junka, T. 1998. "Trends in the public support to industries in 1984–1996" (in Finnish) *VATT Government Institute for Economic Research Discussion Paper* No. 165

Kawaguchi, D. 2003. "Human Capital Accumulation of Salaried and Self-employed Workers" *Labor Economics* 10, 55-71

Knight, F. H. 1921. "Risk, Uncertainty, and Profit" Houghton Mifflin, New York

Koski, H. and M. Pajarinen, M. 2010. "Access to Business Subsidies: What Explains Complementarities and Persistency?" *ETLA, the Research Institute of the Finnish Economy, Discussion Papers* No. 1226

Koski, H. and Tuuli, J. 2010. "Business Subsidies in Finland: The Dynamics of Application and Acceptance Stages" *ETLA, the Research Institute of the Finnish Economy Discussion Papers* No. 1225

Lancaster, T. 1979. "Econometric Methods for the Duration of Unemployment" *Econometrica* 47(4), 939-956

Lenihan, H. 1999. "An evaluation of a regional development agency's grants in terms of deadweight and displacement" *Environment and Planning C: Government and Policy* 17, 303–318

Lenihan, H. 2004. "Evaluating Irish industrial policy in terms of deadweight and displacement: a quantitative methodological approach" *Applied Economics* 36, 229–252

Lenihan, H. and Hart, M. 2004. "The use of counterfactual scenarios as a means to assess policy deadweight: an Irish case study" *Environment and Planning C: Government and Policy* 22, 817–839

Lundtsröm, A. and Stevenson, L. A. 2005. *Entrepreneurship Policy: Theory and Practice. International Studies in Entrepreneurship* (Vol. 9), Springer-Verlag, New York

Lundström, A. and Stevenson, L. A. 2007. "Dressing the emperor: the fabric of entrepreneurship policy" in Audretsch, D.B., Grilo, I. and Thurik, A.R. (eds.) *The Handbook of research on Entrepreneurship Policy* Edward Elgar, Cheltenham

Mairate, A. 2006. "The 'Added Value' of European Union Cohesion Policy" *Regional Studies* 40, 167–178

Mercado, S., Welford, R. and Prescott, K. 2001. *European Business* (4th ed.) Financial Times, Prentice Hall

Mincer, J. 1974. *Schooling, experience and earnings* Columbia University Press, New York

Ministry of Employment and the Economy 2010. *Entrepreneurship Review 2010* MEE Publications Employment and entrepreneurship 60/2010, Edita Publishing Ltd, Helsinki

Ministry of Justice 2000. "Decree of Council of State, 1200/2000" in Linhala, J. (ed.) *The Statutes of Finland* No. 1199-1201, Edita, Helsinki, 3202–3209.

Ministry of Justice 2006a. "Aid to Business Act 1068/2000" in *Finnish Law I* (Talentum, Finland) translation available http://www.finlex.fi/en/laki/kaannokset/2000/en20001068.pdf

Ministry of Justice 2006b. "Regional Development Act (602/2002)"in *Finnish Law I*, Edita, Helsinki

Ministry of Labour 2005. *Self-employment as an alternative – Brochure* Helsinki

Molle W. 2007. *European Cohesion Policy* Routledge, Oxon

Murray, G., Hyytinen, A. and Maula, M. 2009. "Growth Entrepreneurship and Finance" in the Ministry of Education and the Ministry of Employment and the Economy, *Evaluation of the Finnish National Innovation System* – Full Report, Taloustieto Oy, Helsinki, 147-202

Niittykangas, H. and Tervo, H. 2005. "Spatial variations in intergenerational transmissions of self-employment" *Regional Studies* 39, 319–332

OECD 2000. *The Partial Renaissance of the Self-Employed* OECD Employment Outlook, OECD, Paris

OECD 2002. *OECD Workshop on environmentally harmful subsidies, OECD work on defining and measuring subsidies in industry* Directorate for Science, Technology and Industry

Oukarfi, S. and Baslé, M. 2009. "Public-sector financial incentives for business relocation and effectiveness measures based on company profile and geographic zone" *Annals of Regional Science* 43, 509–526

Pajarinen, M., Rouvinen, P. and Ylä-Anttila, P. (2006) "Growth orientation of new entrepreneurs in Finland" (in Finnish) *ETLA, The Research Institute of the Finnish Economy Discussion Papers*1052, Helsinki

Parker, S. C. 2004. *The economics of self-employment and entrepreneurship* Cambridge University Press, Cambridge

Parker, S. C. 2006. "Entrepeneurship, self-employment and the labour market"in Caasin, M., Yeung, B., Basu, A. and Wadeson, N. (eds.) *The Oxford Handbook of Entrepreneurship* Oxford University Press, 435-460

Parker, S. C. 2009. *The Economics of Entrepreneurship* Cambridge University Press, Cambridge

Petersen, M. A. and Rajan, R. G. 1994. "The benefits of lending relationships: evidence from small business data" *Journal of Finance* 49, 3–37

Pfeiffer, F. and Reize, F. 2000. "Business start-ups by the unemployed – an econometric analysis based on firm data" *Labour Economics* 7, 629-663

Psacharopoulos, G. 1979. "On the weak versus the strong version of screening hypothesis" *Economic Letters* 4, 181–185

Psacharopoulos, G. 1994. "Returns to investment in education: A global update" *World Development* 22(9), 1325-1343

Rees, H. and Shah, A. 1986. "An empirical analysis of self-employment in the UK" *Journal of Applied Economics* 1, 95–108

Riess, A. and Välilä, T. 2006. "Industrial policy: a tale of innovators, champions, and B52s" in EIB (2006) *An industrial policy for Europe?* EIB Papers 11(1), 10-35

Robinson F., Wren C. and Goddard, J. 1987. *Economic Development Policies: An Evaluative Study of Newcastle Metropolitan Region* Clarendon Press, Oxford

Robinson, P. B. and Sexton E. A. 1994. "The effect of education and experience on self-employment success" *Journal of Business Venturing* 9, 141–156

Roy, A. 1951. "Some thoughts on the distribution of earnings" *Oxford Economic Papers* 3(2), 135-145

Rubin, D. 1974. "Estimating causal effects to treatments in randomised and nonrandomised studies" *Journal of Educational Psychology* 66, 688-701

Santarelli, E. and Vivarelli, M. 2006. "Entrepreneurship and the Process of Firms' Entry, Survival and Growth" *IZA Institute for the Study of Labor Discussion Paper* No. 2475

Scarpetta, S., Hemmings, P., Tressel, T. and Woo, J. 2002. "The Role of Policy and Institutions for Productivity and Firm Dynamics: Evidence from Micro and Industry Data" *OECD Economics Department Working Papers* No. 329, OECD Publishing

Shane, S. 2009. "Why Encouraging More People to Become Entrepreneurs Is Bad Public Policy" *Small Business Economics* 33, 141-149

Spence, M. 1973. "Job market signalling" *Journal of Labor Economics* 87, 355–374

Stam, E., Suddle, K., Hessels, S. J. A. and van Stel A. 2007. "High Growth Entrepreneurs, Public Policies and Economic Growth" *Jena Economic Research Paper* 2007-019, Jena, http://ssrn.com/abstract=1019429

Statistics Finland 2001. *Population census 2000 Handbook* Helsinki

Statistics Finland 2010. *Statistical Yearbook of Finland 2009* Helsinki

Stenholm, P. 2006. *With help of the start-up grant to entrepreneurship – Experiences from the startup grant trial* (in Finnish) Ministry of Labour research 320

Stiglitz, J. E. 1988. *Economics of the Public Sector 1st ed*, Norton, London

Stiglitz, J. E., and Weiss, A. 1981. "Credit rationing in markets with imperfect information" *American Economic Review* 71, 393–410

Storey, D. J. 1982. *Entrepreneurship and the New Firm* London, Croom Helm Ltd

Storey, D. J. 1990. "Evaluation of policies and measures to create local employment" *Urban Studies* 27, 669–684

Storey, D. J. 1994. *Understanding the small business* Routledge, London

Storey, D. J. 2003. "Entrepreneusrhip, small and medium sized enterprises and public policies" in Acs, Z. J. and Audretsch, D. B. (eds.) *Handbook of Entrepreneurship Research: An interdisciplinary survey and introduction* Kluwer, Boston

Storey, D. J. 2006. "Evaluating SME policies and programmes: Technical and political dimensions" in Caasin, M., Yeung, B., Basu, A. and Wadeson, N. (eds.) *The Oxford Handbook of Entrepreneurship* Oxford University Press, 248-278

Sueyoshi, G. T. 1995. "A Class of Binary Response for Grouped Duration Data" *Journal of Applied Econometrics* 10(4), 411-431

Takalo, T. 2009. “Rationales and instruments for public innovatiopn policies” *ETLA, the Research Institute of the Finnish Economy Discussion papers* No. 1185

Takalo, T. and Tanayama, T. 2010. “Adverse selection and financing of innovations: Is there need for R&D subsidies?” *Journal of Technology Transfer* 35, 16-41

Tanayama, T. 2009. “Allocation and effects of R&D subsidies: selection, screening and strategic behavior” *Acta Universitatis oeconomicae Helsingiensis* A-309

Tervo, H. 1989. “A micro-level approach to the analysis of the displacement effects of regional incentive policy: the case of Finland” *Regional Studies* 23, 511–521

Tervo, H. 1990. “Factors underlying displacement: an analysis of Finnish regional incentive policy using survey data on assisted firms” *Applied Economics* 22, 617–628

The Prime Minister’s Office 2005. ”Entrepreneurship Policy Programme”*Government Policy Programmes*

van der Sluis, J. M., van Praag, M. and van Witteloostuijn, A. 2004. ”Entrepreneurship, selection and performance: a meta-analysis of the role of education” *Tinbergen Institute Discussion Paper* 03-046/3, Tinbergen Institute, Amsterdam

van Praag, C. M., and Versloot, P. H. 2007. “What Is the Value of Entrepreneurship? A Review of Recent Research” *Small Business Economics* 29, 351-382

Winston, C. 2006. *Government failure vs. market failure: microeconomics policy research and government performance* Washington, DC: AEI – Brookings Joint Center

Wren, C. 1996. “Fund substitution and the incentive effects of public investment subsidies” *Scottish Journal of Political Economy* 43, 534–548

Ylhäinen, I. 2010. “Persistence of Government Funding in Small Business Finance” *ETLA, the Research Institute of the Finnish Economy Discussion Papers* No. 1232

Young, R. and Francis, J. 1991. “Entrepreneurship and Innovation in Small Manufacturing Firms” *Social Science Quarterly* 72, 149-162

CHAPTER 2
EVALUATION OF INVESTMENT SUBSIDIES: WHEN IS DEADWEIGHT EFFECT ZERO?

International Review of Applied Economics
Vol. 22, No. 5, September 2008, 585–600

Evaluation of investment subsidies: when is deadweight zero?

Anu Tokila*, Mika Haapanen and Jari Ritsilä

School of Business and Economics, University of Jyväskylä

In the evaluation of investment subsidies one of the critical issues concerns the assessment of deadweight, that is, the degree to which projects would have been carried out without grant assistance. With the increasing restrictions on and cuts in subsidies for investment projects in the EU countries maximisation of the impact of the public resources that remain can be achieved through their allocation for projects with minimum deadweight. This paper studies the profile of subsidised zero deadweight investment projects – projects that would be abandoned without public subsidies – in Finland. The empirical analysis is conducted using micro level data on investment projects by private sector firms. The data set comprises 3,423 projects that were granted public investment subsidies between 2001 and 2003. Our results show that the likelihood of zero deadweight is significantly dependent on the characteristics of the subsidised firm, the characteristics of the investment project and the location of the subsidised firm.

Keywords: Investment subsidies; deadweight effect; investment projects; public policy; regional policy

JEL classifications: H25, R58, D92, C25

1. Introduction

Public business subsidies are a form of financial support given by the state to private sector firms either directly or through intermediary organisations. This support can take the form, for example, of investment aid, small-business aid or aid for development of the business environment. Governments all over the world see such business subsidies as a crucial instrument for boosting new firm formation, generating new ideas and new products, creating employment and decreasing unemployment, and enhancing competitiveness. Also in Finnish entrepreneurship policy, public subsidies have been seen as a key instrument in initiating business projects, especially in distant regions (see e.g. The Prime Minister's Office 2005; Ministry of Justice 2006a,b).

EU enlargement to include less developed countries in Central and Eastern Europe has caused a serious shake-up of the EU's financial framework (Council of the European Union 2006; European Commission 2004a,b). The so called cohesion policy channels funds to areas and projects that have a maximum impact on competitiveness and growth at the Community level. Simultaneously, the member countries are committed to lowering the ceiling on appropriations. As a result, business subsidies, like many other policy instruments, are reconsidered and reallocated. In particular, investment aid is to be reduced and targeted at the most deserving investment projects. This means that a number of regions and projects currently eligible for subsidies are likely to be denied investment subsidies in the future.

*Correspondence address. Email: anu.tokila@econ.jyu.fi

ISSN 0269-2171 print/ISSN 1465-3486 online
© 2008 Taylor & Francis
DOI: 10.1080/02692170802287631
http://www.informaworld.com

Practically all of the literature on business subsidies has focused solely on the impacts of subsidised projects on the behaviour of firms and on regional growth (e.g. Bergström 2000; Harris and Taylor 2005; Nijkamp and Blaas 1995). Before such considerations, however, it is important to study the initial deadweight effect of the subsidy. That is, the degree to which the project would have been carried out without grant assistance (Lenihan 2004; see also Wren 1996). If the deadweight effect is large, the subsequent changes (e.g. in employment) are irrelevant as they would have been generated without the subsidy. In such cases, the subsidy is a mere transfer payment from tax payer to firm owner. Studies on the deadweight effect of business subsidies have only been occasional so far. However, in her seminal research Lenihan (1999, 2004) studied which projects in Ireland would have gone ahead in the absence of subsidies. In Finland, no detailed analysis on the deadweight effect of business subsidies has so far been conducted.

The purpose of the present paper is to study the conditions under which subsidised investment projects would be abandoned without public assistance (i.e. zero deadweight).[1] The analysis provides critical information on the importance of investment subsidies for the policy makers who negotiate investment subsidy programmes and for the authorities who grant the subsidies.

Our empirical analysis is conducted using rich data on investment projects by private sector firms in Finland between 2001 and 2003. The data include information, collected before the grant assistance decision, on the characteristics of the subsidised firm and investment project as well as on the location of the subsidised firm, thus allowing us to carry out an *ex ante* evaluation of the deadweight effect. This is in contrast to the previous *ex post* studies that have used data collected after the grant has been paid to the firm (e.g. Lenihan 1999, 2004).[2]

The following section discusses the framework for the analysis of investment subsidies. Our data set, variables and empirical modelling framework are then introduced. In the third section, the estimation results are presented and illustrated. Finally, the conclusion summarises the results and discusses their policy implications.

2. Evaluation of investment subsidies

2.1. Market failures in the financial markets

The use of investment subsidies is commonly justified by the existence of market failure in the conventional financial markets (e.g. Storey 1994; Felsenstein, Fleischer, and Sidi 1998). Because of market failures some firms can be denied access to credit despite the fact that they have viable projects. In particular, investments that are desirable from the standpoint of social welfare might be rejected by private financers. For such investment projects, public assistance might be the only possibility for their implementation.

Information asymmetries may explain why capital does not always flow to firms with profitable investment opportunities (e.g. Stiglitz and Weiss 1981). While many essential features of the project are known to the firm, it may not be able credibly to communicate them to outside financiers due to the well-known problems of adverse selection and moral hazard (e.g. Petersen and Rajan 1994). In addition to failure of information, public goods, incomplete markets, externalities, failure of competition and macroeconomic disturbances can cause market failures and may provide the rationale for government activity (e.g. Stiglitz 2000).

The likelihood of market failures and access to finance is dependent on the characteristics of the firm. The prior literature suggest that a firm's access to finance increases with the size and business experience of the firm (e.g. Storey 1994; Wren 1998). Young firms do not have much evidence to show regarding their competence and trustworthiness. Small firms are unlikely to be monitored by rating agencies or the financial press. The costs of obtaining information are high in relation to the amount of capital to be supplied (Storey 1994). Hence, size and age are observable and powerful signals to lenders of investment risk. According to recent research by the European Union access to finance is a major constraint for 20% of smaller sized firms (European Commission 2003). In addition, the firm's location frequently matters in determining its risk profile (Felsenstein and Fleischer 2002). A distant location may increase the cost of finance and thus create constraints on investment.

There are reasons to believe that project-related factors also affect access to finance and, therefore, the need for public subsidies. As Graham and Harvey (2001) state: 'the project likely has different risk attributes than the overall firm' (p. 232). Therefore, alongside the characteristics of the firm, we must pay attention to risk factors based on the project to be implemented. Evidence for including project characteristics in the risk modelling is also found in Harris (1999), who identifies a set of 12 project risk attributes. The study established that it is not the size of the firm, but rather the relative size of the project, which determines the uncertainty of the outcome.

Just as there can be market failure, so there can be government failure. Government failures can be defined as failures by government to correct a market failure (see e.g. Winston 2006). Therefore, subsidisation of private sector investments is not unproblematic even in the presence of market failure. The existence of subsidy programmes may, for example, encourage a firm to reduce its own inputs to the investment project. In the worst case, investment assistance entirely substitutes for private funds and generates no increase in the scale of investment and thus implies an arbitrary transfer of resources from tax payer to producer (Wren 1996). In that event, the firm could have obtained finance in any case and thus public resources are being used needlessly. This particular problem of deadweight is discussed below.

2.2. *Additionality and deadweight*

A key element in the evaluation of any public subsidy instrument is the extent to which the impacts of the project can be attributed to the instrument. The concept of 'additionality' measures the amount of output from a subsidy instrument compared with what would have occurred without subsidy. Additionality is counterfactually linked to displacement and deadweight. When a subsidy to a firm reduces activity elsewhere in the economy, we are dealing with displacement. Investment subsidies that promote investment activity in certain areas may draw resources from other areas, thus reducing the net impacts of the instrument.[3]

Deadweight – another component of additionality – refers to project outcomes which would have occurred anyway without intervention. The key is to distinguish the changes (intended and unforeseen, positive and negative) which have resulted due to the intervention from those which have not. Some of the effects might have arisen anyway and therefore should not be attributed to the intervention. Deadweight may occur because an intervention is not properly targeted or because the rationale for market failure is faulty. In terms of project implementation, deadweight can be defined as the degree to which projects would have been carried out without grant assistance (Lenihan 2004).

Lenihan (1999) draws a distinction between degrees of deadweight (see also Lenihan and Hart 2004; Wren 1996). 'Pure (or full) deadweight' indicates that the project would have gone ahead as now unchanged in terms of scale, time and location even in the absence of public financial support. 'Partial deadweight' refers to situations where the project would have gone ahead without financial support, but at a different location, at a later date or on a reduced scale. Deadweight can be minimised by focusing the finance on viable projects that would not be implemented without public aid. 'Zero deadweight' refers to situations in which public subsidy is a prerequisite for project implementation as it would be abandoned in the absence of financial support. Zero deadweight is an optimal starting point for public funding as positive deadweight reduces the net impacts, for example, on growth and employment (see e.g. European Commission 1999c).

Most previous studies (e.g. Lenihan 1999; Lenihan and Hart 2004) have estimated the degree of deadweight and displacement (see also Lenihan, Hart, and Roper 2005). To our knowledge, the likelihood of deadweight for individual firms has been investigated only in Lenihan (2004). In that Irish study it was found that grant type, size of firm, number of earlier grants and whether the investment appraisal included grant had a significant impact on the likelihood of a firm to report deadweight. However, the amount of the grant received, sector, age of firm, turnover or the amount of the grant as a percentage of turnover proved to be non-significant factors in her logit model.

Deadweight is regarded as a serious indication of inefficiency, and should be addressed in the evaluations of public expenditure programmes within the EU (European Commission 1997). Earlier evaluations on EU funding detected a higher degree of deadweight for bigger companies, as they are likely to have access to other sources of funding such as bank loans and requited forms of public support (e.g. European Commission 1997; see also Wren 1998). In addition, Heijs (2003) found larger firms to be more often 'freeriders' in terms of public finance for R&D activities.[4] The EU evaluations suggest also that in richer regions the danger of deadweight tends to be higher, that is, investments would more probably be made even without Community support (see e.g. European Commission 1997, 2004c).

3. Data, variables and model

3.1. Investment subsidies in Finland

Although many types of public assistance for business exist in Finland, the investment subsidies administrated by the Ministry of Trade and Industry (KTM) that we are concerned with here are all direct grants in that the recipient firm is not obliged to pay back the cash grant to the distributor. In 2003, a total of 1364 investment projects were subsidised with €66.4 million, which makes investment subsidies the biggest group of business subsidies by the KTM, accounting for 47.1% of all projects and 60.0% of all finance (Ministry of Trade and Industry, 2004). In the regions they accounted for 0.1–0.8% of all private sector investments in 2001–2002 (Ritsilä and Tokila 2005). Other forms of non-repayable grants by the KTM are aimed at the development and operating environment of small and medium size enterprises.[5] Definitions of eligibility for these subsidies are enacted in the Aid to Business Act (1068/2000) (Ministry of Justice 2006a) and the Decree of Council of State (1200/2000) (Ministry of Justice 2000). Primarily the Member States of the EU cannot themselves assess a firm's eligibility for state aid, but the framework of the rules on the Aid is defined by the European Community Treaty.

The investment subsidies studied here are discretionary, in that a firm's eligibility for grant assistance, and the intensity of assistance is determined by regional authorities rather than tightly specified in legislation. However, in accordance with the law, investment subsidies can be granted to a firm for the purpose of financing fixed assets when the firm is starting up, expanding its operations, or modernising its fixed assets. Investment assistance can be granted for the purchase of machinery and equipment, buildings and land in all businesses, except for those in the farming and fishing sectors. The law provides that assistance can only be given if the intended expansion or modernisation is deemed to lead to major improvements in terms of increasing the number of jobs, adding value to production or enhancing the level of services. An exception to this rule can be made if modernisation essentially upgrades the firm's technology (Ministry of Justice 2000, 2006a).

Subsidies for investment are mostly granted by the regional Employment and Economic Development Centres. The KTM only makes the financing decision in cases where the cost of the investment project exceeds €1.7 million. The European Regional Development Fund (ERDF) participates in the provision of investment subsidies for Objective Areas (Ministry of Justice 2000, 2006a). In our data set, which is introduced below, 90.4% of the investment projects received subsidies from the ERDF. On average, about 43% of this funding came from the ERDF, the remainder coming from national funds.

3.2. *Data set and variables*

The empirical analysis utilises a data set on investment projects by Finnish firms. The unique data set comprises 3585 investment projects that were initiated and granted investment subsidies between 2001 and 2003.[6] In the following analysis, we only consider investment projects by private firms. Therefore, public investment projects, together with some observations with missing data, are excluded. This leaves us with 3423 investment projects. The data set includes a broad range of information not only on the subsidised firm but also on the investment project (see Appendix). Importantly, the data set contains information on the precise assessment made after the firm had submitted its application for project funding.

In the assessment, the investment project and the firm itself are evaluated by researchers at the Employment and Economic Development Centre together with a representative from the applicant firm. The degree of the deadweight effect of the project is estimated by posing the hypothetical question of what will happen if the project is not subsidised. The options in answer to this question are: (1) the project will be abandoned; (2) the project will be implemented on a reduced scale; (3) the project will be implemented on a reduced qualitative level; (4) the project will be implemented at a later date; (5) the project will be implemented unchanged. Hence, option (1) implies zero deadweight, options (2)–(4) all imply partial degrees of deadweight and option (5) implies pure deadweight.

In the evaluation of this question, the assessors take into account a wide range of details of the project and the applicant firm. For instance, operation of the firm, content and financial plan of the project, and its need for capital, as well as the financial standing of the applicant firm are reviewed. A more specific method of assessment is used for the most extensive projects, where factors relating to the branch of industry, market structure and development prospects, corporate strategy and success are closely scrutinised. However, no specific criteria for the evaluation of deadweight are established; instead much depends on the assessors themselves. Nevertheless, we argue that this method of assessing deadweight is more reliable than mere self-report by the applicant firm.[7] Self-reports suffer from intrinsic difficulties, commonly known as the 'respondents effect' or 'response bias' (see e.g. Lenihan 1999; Lenihan and Hart 2004). The applicant firms may deliberately exaggerate, or in some cases underestimate, the importance of assistance for the fear that it may influence present or future public funding. This effect is clearly decreased, when an external evaluator makes the final decision of *ex ante* deadweight effect.

In this paper, the interest is in determining the conditions under which deadweight is zero.[8] Therefore, we specify a dummy variable, y_i, for the analysis as follows:

$y_i = 1$, if the project would have been abandoned in the absence of the investment subsidy (i.e. deadweight is zero);
$y_i = 0$, otherwise.

In explaining the likelihood of zero deadweight, we use variables that describe the characteristics of the subsidised firm and investment project as well as the location of the subsidised firm (see Appendix). The turnover of the firm is measured annually in millions of euros. Its impact on the likelihood of zero deadweight is assumed to be negative due to size factors affecting access to finance, as previously explained (see e.g. Heijs 2003). The dummy variable of business experience (new firm) indicates whether the firm was recently founded or has been operating for a longer time. *A priori* one would expect longer experience to diminish the probability of zero deadweight (c.f. Wren 1998).

The project costs are defined as the purchasing cost of the fixed assets estimated by the applicant firm. Their impact on the probability of zero deadweight is assumed to be positive, since greater costs evidently indicate a higher project risk. In our study, investment-bearing capacity is used to characterise the relative level of project risk. The value of this capacity is calculated by dividing the firm's turnover by the project costs. Therefore, the firm's investment-bearing capacity is positively related to the size of the firm and negatively to the size of the project. Our *a priori* expectation is that the better the firm's investment-bearing capacity is, the less likely the firm is to need public assistance; for example, it is likely to be able to manage the risks involved in the investment project better and to have access to private funds (see also Harris 1999).

The value for the relative intensity of assistance is calculated according to the average intensity of assistance in the Assisted Area where the project is implemented (see regional division below). This value is likely to have a positive effect on the project's need for a public subsidy; the higher the intensity of assistance, the more important the role of assistance in the implementation of the investment project. High intensity of public assistance may also advance the chances of generating finance from the private sector.

Regional dummies are used to analyse the effects of the location of the subsidised firm on the likelihood of zero deadweight. We have divided Finland into National Assisted Areas using the regional state aid map for Finland[9] (Figure 1), which shows the regional structure of the Aid to Business Act. This classification is based on the regional level of development and development needs. According to the Treaty establishing the European Community (Article 87), public subsidies are mainly targeted at lagging and peripheral regions.

Projects in National Assisted Area 1 are eligible for the highest intensity of investment aid, which is up to 30% of the purchasing cost of the fixed assets.[10] It covers the entire Eastern Finland NUTS II area, which is made up of the four NUTS III regions ('maakunnat') of Kainuu, North Karelia, North Savo and South Savo. Projects in National Assisted Area 2 are eligible for a slightly lower maximum intensity of investment assistance (up to 24% of purchasing cost of the fixed assets). It covers the whole of Lapland and municipalities in North Ostrobothnia, Central Finland and Central Ostrobothnia.

Assisted Areas 1 and 2 have higher unemployment and weaker economic growth rates than the national average.[11] Their economies depend heavily on the public sector as well as on agriculture and forestry. These two areas are identical to the EU's Objective 1 Programme Area (i.e. Northern and Eastern Obj. 1). Projects in National Assisted Area 3 are eligible for a significantly smaller maximum level of investment assistance (15%) than projects in Assisted Areas 1 or 2. The Assisted Area 3 closely resembles the EU's Objective Programme Area 2. Outside the National Assisted Areas, only small businesses[12] are eligible for investment assistance (max. 10%) and EU funding for structural change areas. Our

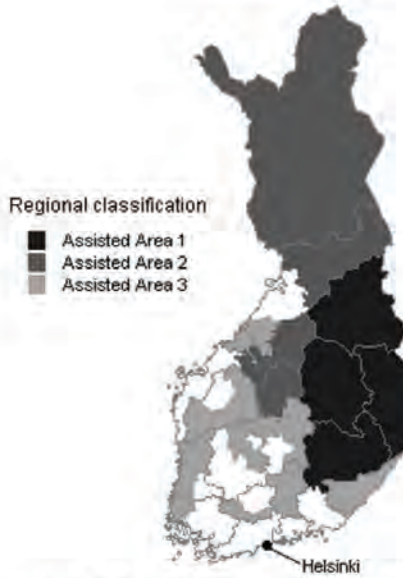

Figure 1. National Assisted Areas in Finland (with borders of NUTS III regions).

expectation is that the likelihood of zero deadweight is greater in the peripheral regions (Assisted Areas 1 and 2) as a distant location may weaken opportunities for finance from the private sector (cf. Felsenstein and Fleischer 2002).

As in many previous studies, we also control for the timing and industry of the project with dummy variables (see e.g. Bergström 2000; Harris and Taylor 2005). The industry dummies can capture the influence of factors that are common to all projects belonging to the same industry. The year dummies are used to capture cyclical changes in the necessity of investment subsidies and thus in the likelihood of zero deadweight.

3.3. Descriptive analysis

Table 1 displays the descriptive statistics by zero deadweight together with simple two-sample *t*-tests. First, note that of the 3423 investment projects zero deadweight is found for 578 (16.9% of the projects), that is, the project would have been abandoned in the absence of the investment subsidy. Second, the project costs are significantly higher and the investment-bearing capacity lower in projects with zero deadweight ($y_i = 1$). While, the *t*-test shows no significant differences in mean turnover. As discussed above, the relative intensity of assistance compares the intensity of assistance in a specific project with the average intensity of assistance in the region where the project is implemented. The *t*-test shows no significant differences in its means in the samples of $y_i = 0$ and $y_i = 1$.

The descriptive analysis suggests that the deadweight effect of the investment subsidy does not seem to vary with the relative intensity of assistance. To test whether this and the other descriptive findings hold after other factors have been controlled for requires estimation

Table 1. Descriptive statistics by zero deadweight (y_i).

Variable	Mean by y_i (std. dev.)				Overall mean (std. dev)		
	$y_i = 0$		$y_i = 1$				*t*-test
Project costs (€ millions)	0.249	(0.614)	0.493	(1.483)	0.290	(0.832)	−3.889*
Turnover of firm (€ millions)	1.528	(4.274)	2.159	(8.496)	1.635	(5.235)	−1.742
Investment-bearing capacity	10.392	(32.720)	6.362	(11.205)	9.711	(30.219)	5.239*
Relative intensity of assistance	0.997	(0.169)	1.013	(0.184)	1.000	(0.172)	−1.899
Number of projects	2845		578		3423		3423

Notes: Two-sample *t*-test is conducted because Bartlett's test rejected the hypothesis of equal variances in all four cases. *Indicates significant differences in means at the 5% risk level.

of our econometric model; see equations (1) and (2) below. Since the intensity of assistance is highly dependent on the region where investment project is implemented, we cannot include both the regional dummies and the intensity of assistance in our econometric model. Instead, we use the relative intensity of assistance as an explanatory variable together with the regional dummies. These variables allow us to study whether the deadweight effect of the subsidy depends on the intensity of assistance after controlling for the location of the project.

3.4. *Modelling framework*

The construction of the dependent variable y_i, as binary suggests the use of a probit (or logit) model (see e.g. Greene 2003). Thus, we assume that zero deadweight y_i, is determined according to a latent variable y_i^*:

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

where x_i is a vector of the explanatory variables and β is a parameter vector. The variance of the error term ε_i is allowed to depend on a set of explanatory variables, z_i (see e.g. Davidson and MacKinnon 1984):

$$\sigma_i^2 = \left[\exp\left(\gamma' z_i\right)\right]^2, \tag{2}$$

where γ is an additional parameter vector to be estimated with β. This multiplicative heteroskedasticity is introduced into the model, because uncorrected departures from homoskedasticity can bias the estimated parameters and standard errors in non-linear models (Godfrey 1988). Note that a homoskedastic probit model can be estimated by setting the variance of the error term to one ($\sigma_i^2 = 1$). Thus, the presence of heteroskedasticity can be tested easily, for example, with Likelihood Ratio (LR) tests (Greene 2003).

4. Results

Table 2 displays the estimation results of our probit models for zero deadweight. Before interpretation, the validity of the results is scrutinised by comparing three different probit model specifications. The comparisons are made with a number of diagnostic test results; these are given at the bottom of the table.[13]

First, a homoskedastic model specification (1) is given. Looking at the diagnostic results, we can see that the LR test statistic for heteroskedasticity is highly significant, so that the null hypothesis of homoskedasticity is rejected. This test compares specification (1) to (2), where the variance of the error term is allowed to depend on the ln(project costs) and the turnover of the firm.[14] The validity of our model specifications is also investigated with normality tests. We find that the normality assumption of the error term is rejected in specification (1): the Conditional Moment (CM) test rejects the null hypothesis of normality at the 5% level.[15] In contrast, the normality of the error term is not rejected in specification (2). Thus, model specification (2) is clearly preferred to (1).

Table 2. Parameter estimates of the probit models.

	Model specification					
Variable	(1)		(2)		(3)	
Constant	−1.666**	(0.197)	−2.202**	(0.333)	−2.239**	(0.318)
Turnover of firm	0.008	(0.005)	−0.066	(0.034)	–	
New firm	0.193**	(0.067)	0.234*	(0.111)	0.251*	(0.104)
ln(project costs)	0.093**	(0.021)	0.436**	(0.067)	0.363**	(0.060)
Investment-bearing capacity	−0.007**	(0.003)	−0.022**	(0.007)	−0.020**	(0.008)
Relative intensity of assistance	0.444**	(0.155)	0.754**	(0.253)	0.751**	(0.238)
Regional dummies						
Assisted Area 1	0.702**	(0.080)	1.141**	(0.142)	1.060**	(0.137)
Assisted Area 2	0.455**	(0.086)	0.787**	(0.147)	0.721**	(0.140)
Assisted Area 3	0.149	(0.078)	0.245	(0.127)	0.228	(0.119)
Industry dummies						
Metal	0.010	(0.097)	0.203	(0.173)	0.161	(0.163)
Wood	0.138	(0.102)	0.370*	(0.182)	0.322	(0.171)
Other manufacturing	0.131	(0.096)	0.325	(0.173)	0.270	(0.163)
Trade	0.107	(0.116)	0.192	(0.194)	0.203	(0.184)
Transport	0.334	(0.172)	0.681*	(0.296)	0.627*	(0.281)
Other industries	0.055	(0.114)	0.240	(0.205)	0.211	(0.194)
Year dummies (2)	Yes		Yes		Yes	
Correction for heteroskedasticity						
ln(project costs)	–		−0.204**	(0.029)	−0.186**	(0.032)
Turnover of firm	–		0.050**	(0.016)	0.023	(0.014)
Diagnostics						
Log-likelihood	−1462.52		−1447.80		−1450.91	
LR test for heterosked.	29.43** (d.f.=2)		–		–	
LR test for more general heteroskedasticity	–		6.58 (d.f.=6)		9.01 (d.f.=6)	
CM test for normality	10.91* (d.f.=2)		3.95 (d.f.=2)		2.39 (d.f.=2)	
LR test for omitted variable	–		–		6.21* (d.f.=1)	

Notes: Dependent variable: 1 if deadweight is zero, 0 otherwise. Number of observations: 3423. First, the estimated parameter is given, followed by the asymptotic standard error in brackets. Definitions of variables are given in the Appendix. * (**) = Statistically significant at the 0.05 (0.01) level. All diagnostic test statistics are χ^2 distributed (d.f. = degrees of freedom).

Given that the turnover of firm does not have a significant direct affect on the likelihood of zero deadweight in specification (2), we examined whether it could be dropped from the explanatory variables; see specification (3). The LR test for the omitted variable – i.e. comparison of specifications (2) and (3) – implies that the turnover of firm should be included in the explanatory variables. Hence, we conclude that the second model specification is the most parsimonious. The estimated parameters hardly differ between the two model specifications, implying stability of our results.[16] In the preferred model specification (2), all the reported coefficients reach statistical significance at the 5% risk level, except for the dummy variable Assisted Area 3 and the turnover of the firm.

As regards the signs of the parameter estimates, a variable with a positive (negative) coefficient is associated with an increased (decreased) probability of zero deadweight and thus a decreased (increased) probability of deadweight. In accordance with our expectations and consistent with Wren (1998) the results show that the likelihood of zero deadweight is significantly smaller for new firms than for old. Thus, the investment project is more likely to be abandoned in the absence of the subsidy in new firms. This result is in contrast with Lenihan (2004), in which the age of a firm has a non-significant, positive effect on the deadweight.

As expected, the size of deadweight is also estimated to be significantly smaller the higher the project costs, *ceteris paribus*. The project costs are included in logarithmic form to capture non-linearity in their effect on deadweight. A unit increase in the project's costs has a larger effect on the likelihood of zero deadweight when the costs are smaller (see also the illustration below). However, we reject our initial expectation that turnover itself has negative effect on the likelihood of zero deadweight. Instead, we find that investment-bearing capacity, defined as the ratio of turnover to project costs, determines the deadweight effect of the investment subsidy. This supports the findings of Harris (1999) that it is the relative size of the project rather than the size of the firm that increases the project risk.

Continuing with the regional variables, the results support Felsenstein and Fleischer (2002) and the European Commission (1997, 2004c). As expected, the likelihood of zero deadweight is higher in the lagging and peripheral regions. The investment subsidy is more crucial for projects in Assisted Areas 1 and 2, located in Eastern and Northern Finland, than for projects outside Assisted Areas (the reference region located in the Southern and Western Finland). No significant differences are found between Assisted Area 3 (Central Finland) and the reference region. Further on, the results lend support to our hypothesis that the higher the relative intensity of assistance when compared to other projects in the region, the greater the likelihood of zero deadweight is.[17] As a whole, these regional findings suggest that the concentration of public assistance to peripheral regions seems to be justified.

Six industry dummies, together with year dummies, were used as control variables (see also Appendix). Interestingly, our findings show that deadweight is dependent on industry even after controlling for other factors. The industry dummy variables suggest that deadweight is smallest for projects in wood manufacturing (including furniture), and in transport, storage, communication and financial intermediation. Although, there are no strong *a priori* reasons for these differences, one possible explanation is that the wood and transportation industries are capital intensive and have traditionally been supported by the state (see e.g. Junka 1998).

In order to obtain an overview of the size of the effects, conditional predicted probabilities of zero deadweight were computed for selected hypothetical cases using the preferred model specification (2); see Table 3. The predicted probabilities are provided, because it is difficult to see the magnitude of the effects from the parameter estimates when the error variance is a function of the explanatory variables (presence of heteroskedasticity) and/or

Table 3. Illustration with predicted probabilities, $\text{Prob}(y_i = 1)$.

Predicted probability conditional on other variables are held at median values			
Case 1: Project costs			
Project costs are €10,000	Project costs are €100,000	Project costs are €500,000	Project costs are €1 million
0.069	0.097	0.125	0.154
Case 2: Investment-bearing capacity			
Investment-bearing capacity is 0	Investment-bearing capacity is 5	Investment-bearing capacity is 10	Investment-bearing capacity is 50
0.104	0.095	0.086	0.047
Case 3: Location of project			
Assisted Area 1	Assisted Area 2	Assisted Area 3	Other regions
0.223	0.165	0.096	0.073
Case 4: Relative intensity of assistance			
Relative intensity is 0.5	Relative intensity is 1	Relative intensity is 1.5	Relative intensity is 2
0.063	0.097	0.142	0.199

Notes: The probabilities have been calculated using model specification (2) in Table 2. Median values are the following: project cost €92,503, turnover of firm €380,000, investment-bearing capacity 4.072, project is manufacturing of fabricated metal products in Assisted Area 3, funding is granted to operating (i.e. non-new) firm in 2001, and the relative intensity of assistance is 0.955. Definitions of variables are given in the Appendix. Changes in project costs cause diversity in investment-bearing capacity. Likewise, when predicting probabilities for investment-bearing capacity, turnover is allowed to change.

the explanatory variable is in logarithmic form. In each case the other explanatory variables are held at their median values; for the median values see the notes to the table.[18]

The predicted probability is first given as a function of project costs (Case 1). Assuming that the other variables are held at their median values, except for investment-bearing capacity, which is allowed to change accordingly, an increase in the project costs for instance by €400,000, from €100,000 to €500,000, would raise the probability of zero deadweight by approximately three percentage points. Whereas a change in the project costs from €100,000 to €1 million increases the probability of zero deadweight by almost six percentage points. Similarly, Case 2 shows that an increase from 5 to 10 in investment-bearing capacity (e.g. doubling turnover while project costs remain unchanged) would reduce the probability of zero deadweight by approximately one percentage point.[19]

Zero deadweight is more strongly dependent on the location of the project and relative intensity of assistance (Case 3 and 4). The probability of zero deadweight is over three times larger for investment projects in Assisted Area 1 and over two times greater in Assisted Area 2 than for projects outside the Assisted Areas. In addition, if the project's intensity of assistance is twice the regional average, then the probability of zero deadweight is more than two times greater (i.e. comparing the relative intensities of 1 and 2). Hence, it seems that the deadweight of an investment subsidy depends on the intensity of assistance even after controlling for the location of the project.

5. Conclusion

Given that public funding and opportunities for subsidising investments are likely to decrease in the future, it is important to consider what would most likely happen to projects in the absence of public funding. If there are deadweight effects in an assisted project, some (or even all) of the planned/desired economic activity would have happened anyway in the absence of the intervention. Therefore, to maximise the added value of public finance, the primary focus should be on projects for which investment subsidies have no deadweight effect. Our empirical analysis has provided some important prospects for policy makers in this respect. Besides programme planning, the results may be useful in the development of more specific indicators for evaluating the deadweight of projects applying for subsidies.

The analysis has clearly shown that, at least in Finland the likelihood of investment subsidies having zero deadweight varies significantly between investment projects with different characteristics. The likelihood that the deadweight effect of an investment subsidy is zero is greater for projects in distant regions (i.e. in Northern and Eastern Finland) than in central areas (i.e. in Southern Finland). Our interpretation is that these regional differences are partly due to differences in need for public assistance and partly due to differences in the intensity of assistance. We also find that the investment-bearing capacity of the firm, defined as the ratio of turnover to project costs, determines the deadweight effect of the investment subsidy rather than the mere size of the firm. Moreover, our results show that the deadweight of the investment subsidy is smaller for new firms than for old, and that it diminishes with the size of the investment project. These results can be linked to access to finance, as lower investment-bearing capacity and less business experience on part of the firm and a smaller size of project may be signals of higher risk. Our findings are thus consistent with the prior literature on access to finance and reasons for deadweight.

It should be taken into account that the impact of a subsidy on the implementation of a project is only the first condition for the subsidy. After this, other implications that investment subsidies might have for economic activity can be studied. For example, do investment subsidies promote growth of business or employment, or do they generate an increase in the private funding of investment projects? In addition, comparison of *ex ante* analysis with *ex post* information could provide valuable information on appraising the deadweight effect of a project.

Acknowledgement

We gratefully acknowledge funding from the Yrjö Jahnsson Foundation (projects 4977 and 5204). Anu Tokila also wishes to thank the Academy of Finland for financial support (project 200856). The authors would like to thank Mikko Mäkinen, Francois Pouget, Hannu Tervo, Petri Böckerman and Boris A. Portnov for their valuable comments on this paper.

Notes

1. We concentrate on zero deadweight projects only, because their net impacts are more straightforward compared to partial deadweight projects despite the fact that zero deadweight projects also include the possibility of displacement effects.
2. These two stages of evaluation are linked together (see e.g. European Commission 1999a–c). *Ex ante* evaluation helps to ensure that the subsidised projects are in accordance with the objectives of the programme. *Ex post* evaluation recapitulates and judges an intervention when it is over.
3. For more on displacement, see e.g. Tervo (1989, 1990) and Lenihan (1999).
4. Note the term 'freerider' in Heijs (2003) can be referred to as deadweight.
5. Besides non-repayable cash grants, the Ministry of Trade and Industry also supports business by loans, guarantees and export finance.
6. Finland's post-war economic development was based on intensive investment and the import of foreign capital (Ministry of Finance 2005). In the 1960s and 1970s the investment rate, i.e. investment as a proportion of total output, was extremely high, occasionally exceeding 30%. The investment rate fell during the deep recession of the early 1990s. After reaching its lowest, 15.5%

in 1994, investment began to recover, peaking at 20.5% in 2001. Since, it has fallen slightly to around 18–19% during 2002–2006 (Ministry of Finance 2006a).

7. Alternatively, one could have tried to evaluate deadweight by using control groups that allow controlling for selectivity bias (see e.g. Roper and Hewitt-Dundas 2001). However, we are unable to construct a suitable group of investment projects, as it is very difficult to access data on non-assisted investment projects in Finland. See Lenihan and Hart (2004), and references therein, for a general discussion of alternative approaches in evaluating the impact of government policies.
8. We only consider the option of zero deadweight, as the options of partial deadweight (2)–(4) are much harder to quantify by size.
9. Based on Letters to the Member States, Regional Aid Map 2000–2006, SG(99) D/10189.
10. The maximum amounts of aid for each Assisted Area are directive and can be exceeded depending on the character and the significance of the project.
11. The Finnish economy experienced a very deep recession in the early 1990s. From the mid 1990s, after joining the EU and adopting the euro currency, Finland's economic growth took an upward turn, with a GDP growth of 3–6% in 1995–2000. The growth rate fell to 2% in 2001–2002, but it has accelerated since (see e.g. Ministry of Finance 2006b).
12. According to the Decree of Council of State (1200/2000) (Ministry of Justice 2000), a small business is defined as a firm with personnel not exceeding 50 employees and with either an annual turnover of a maximum of €7 million or a balance sheet total of a maximum of €5 million.
13. Since our specification of the error variance in model (1) is different from that in models (2) or (3), a direct comparison of parameter estimates is not advisable.
14. Note that the form of heteroskedasticity is not rejected in specification (2) and (3) when tested against a more general form of heteroskedasticity (see diagnostics in Table 2). The test for the more general heteroskedasticity compares the model with a model that includes all the independent variables save the constant term, industry and year dummies in the heteroskedastic function.
15. The CM test for the normality of the error term is implemented as described in Newey (1985: 1062).
16. We also tried to add the turnover of the firm in a second polynomial form to study whether the impact of turnover is dependent on its level. Because it was not significant at the 5% level, it was concluded that the impact of turnover on zero deadweight does not vary with the level of turnover.
17. We also tried various other regional variables, including the level of urbanisation, provincial centre dummies and the firm's distance from the provincial centre, but they did not prove to be significant determinants.
18. In our data the range of project costs, turnover of the firm and relative intensity of assistance are [832, 20 million], [0, 118.7 million] and [0.192, 2.427], respectively. The mean values of the variables are given in the Appendix.
19. Because the illustration assumes that the project costs are same (€92,503), the difference in the investment-bearing capacities (5 vs 10) means that the annual turnover is €462,515 in the former firm and €925,030 in the latter firm.

References

Bergström, F. 2000. Capital subsidies and the performance of firms. *Small Business Economics* 14: 183–193.

Council of the European Union. 2006. Council Decision of 6 October 2006 on Community strategic guidelines on cohesion (2006/702/EC). *Official Journal of the European Union*, L 291/11.

Davidson, R., and J.G. MacKinnon. 1984. Convenient specification tests for logit and probit models. *Journal of Econometrics* 25: 241–262.

European Commission. 1997. *Evaluation EU Expenditure Programmes: A Guide, Ex Post and Intermediate Evaluation*. Budgetary Overview and Evaluation XIX/02, Directorate General – Budgets.

European Commission. 1999a. *Evaluating Socio-Economic Programmes: Evaluation Design and Management*. MEANS Collection 1, EC Structural Funds. Luxembourg: Office for Official Publications of the European Communities.

European Commission. 1999b. *Evaluating Socio-Economic Programmes: Principal Evaluation Techniques and Tools*. MEANS Collection 3, EC Structural Funds. Luxembourg: Office for Official Publications of the European Communities.

European Commission. 1999c. *Evaluating Socio-Economic Programmes: Transversal Evaluation of Impacts on the Environment, Employment and Other Intervention Priorities.* MEANS Collection 5, EC Structural Funds. Luxembourg: Office for Official Publications of the European Communities.

European Commission. 2003. *Microcredit for Small Businesses and Business Creation: Bridging a Market Gap.* Brussells: Enterprise Publications.

European Commission. 2004a. Communication from the Commission to the Council and the European Parliament: Financial perspectives 2007–2013. COM (2004) 487.

European Commission. 2004b. Communication from the Commission to the Council and the European Parliament: Building our common Future Policy challenges and Budgetary means of the Enlarged Union 2007–2013. COM (2004) 101.

European Commission. 2004c. Annual evaluation review 2003: overview of the Commission's evaluation activities and main evaluation findings. Directorate-General for the Budget, SEC (2004) 662.

Felsenstein, D., and A. Fleischer. 2002. Small-scale entrepreneurship and access to capital in peripheral locations: an empirical analysis. *Growth and Change* 33: 196–215.

Felsenstein, D., A. Fleischer, and A. Sidi. 1998. Market failure and the estimation of subsidy size in a regional entrepreneurship programme. *Entrepreneurship and Regional Development* 10: 151–165.

Godfrey, L.G. 1988. *Misspecification tests in econometrics: the Lagrange multiplier and other approaches.* Cambridge: Cambridge University Press.

Graham, J.R., and C.R. Harvey. 2001. The theory and practice of corporate finance: evidence from the field. *Journal of Financial Economics* 60: 187–243.

Greene, W.H. 2003. *Econometric analysis*, 5th edn. Upper Saddle River, NJ: Prentice-Hall.

Harris, E. 1999. Project risk assessment: a European field study. *British Accounting Review* 31: 347–371.

Harris, R., and M. Taylor. 2005. Capital subsidies and their impact on total factor productivity: firm-level evidence from Ireland. *Journal of Regional Studies* 45: 49–74.

Heijs, J. 2003. Freerider behaviour and the public finance of R&D activities in enterprises: the case of the Spanish low interest credits for R&D. *Research Policy* 32: 445–461.

Junka, T. 1998. Trends in the public support to industries in 1984–1996 (in Finnish). Government Institute for Economic Research, Discussion Paper No. 165.

Lenihan, H. 1999. An evaluation of a regional development agency's grants in terms of deadweight and displacement. *Environment and Planning C: Government and Policy* 17: 303–318.

Lenihan, H. 2004. Evaluating Irish industrial policy in terms of deadweight and displacement: a quantitative methodological approach. *Applied Economics* 36: 229–252.

Lenihan, H., and M. Hart. 2004. The use of counterfactual scenarios as a means to assess policy deadweight: an Irish case study. *Environment and Planning C: Government and Policy* 22: 817–839.

Lenihan, H., M. Hart, and S. Roper. 2005. Developing an evaluative framework for industrial policy in Ireland: fulfilling the audit trail or an aid to policy development. In *Quarterly Economic Commentary, Summer 2005*, 69–85. Dublin: Economic and Social Research Institute.

Ministry of Finance (Finland). 2005. Economic survey, February 2005. *Economic and Economic Policy Surveys* 1b/2005.

Ministry of Finance (Finland). 2006a. Economic survey, February 2006. *Economic and Economic Policy Surveys* 1b/2006.

Ministry of Finance (Finland). 2006b. Employment determination, job creation and destruction in the present economic cycle in Finland. *Economics Report* 3/2006.

Ministry of Justice (Finland). 2000. Decree of Council of State (1200/2000). *The Statutes of Finland.*

Ministry of Justice (Finland). 2006. Aid to Business Act (1068/2000). *Finnish Law I.* Available at http://www.finlex.fi/en/

Ministry of Justice (Finland). 2006. Regional Development Act (602/2002). *Finnish Law I.*

Ministry of Trade and Industry (Finland). 2004. *Annual Report 2003.* Annual Reports of Ministry of Trade and Industry.

Newey, W.K. 1985. Maximum likelihood specification testing and conditional moment tests. *Econometrica* 53: 1047–1070.

Nijkamp, P., and E. Blaas. 1995. Comparative regional policy impact analysis: ex post evaluation of the performance of the European Regional Development Fund. *Journal of Regional Science* 35: 579–597.

Petersen, M.A., and R.G. Rajan. 1994. The benefits of lending relationships: evidence from small business data. *Journal of Finance* 49: 3–37.
Ritsilä, J., and A. Tokila. 2005. Evaluation of the effectiveness and functioning of the aid scheme under the Aid to Business Act 1068/2000 (in Finnish). Publications of Ministry of Trade and Industry 21/2005.
Roper, S., and N. Hewitt-Dundas. 2001. Grant assistance and small firm development in Northern Ireland and the Republic of Ireland. *Scottish Journal of Political Economy* 48: 99–117.
Stiglitz, J.E. 2000. *Economics of the public sector*, 3rd edn. London: Norton.
Stiglitz, J.E., and A. Weiss. 1981. Credit rationing in markets with imperfect information. *American Economic Review* 71: 393–410.
Storey, D.J. 1994. *Understanding the small business sector*. London: Routledge.
Tervo, H. 1989. A micro-level approach to the analysis of the displacement effects of regional incentive policy: the case of Finland. *Regional Studies* 23: 511–521.
Tervo, H. 1990. Factors underlying displacement: an analysis of Finnish regional incentive policy using survey data on assisted firms. *Applied Economics* 22: 617–628.
The Prime Minister's Office. 2005. Entrepreneurship Policy Programme. *Government Policy Programmes*.
Winston, C. 2006. *Government failure vs. market failure: microeconomics policy research and government performance*. Washington, DC: AEI – Brookings Joint Center.
Wren, C. 1996. Fund substitution and the incentive effects of public investment subsidies. *Scottish Journal of Political Economy* 43: 534–548.
Wren, C. 1998. Subsidies for job creation: is small best? *Small Business Economics* 10: 273–281.

Appendix

Table A1. Definitions of variables and their mean values.

Variable	Definition	Mean
Zero deadweight (y_i)	1 if the project would have been abandoned in the absence of the investment subsidy (i.e. deadweight is zero); 0 otherwise	0.169
Turnover of firm	Annual turnover of firm (€ millions)	1.635
New firm	1 if the investment project is implemented by new firm (definition by Statistics Finland); 0 otherwise	0.238
Project costs	Total project costs (i.e. purchasing cost of the fixed assets) as estimated by the firm in its investment subsidy application (€ millions)	0.290
Investment-bearing capacity	Turnover of firm divided by project costs	9.711
Relative intensity of assistance	Intensity of assistance divided by the average intensity of assistance in the Assisted Area where the project is implemented. Intensity of assistance is calculated as a ratio of investment subsidy to the total project costs	1
Regional dummies		
Assisted Area 1	1 if the project is implemented in the National Assisted Area 1; 0 otherwise; see Figure 1	0.222
Assisted Area 2	1 if the project is implemented in the National Assisted Area 2; 0 otherwise	0.190
Assisted Area 3	1 if the project is implemented in the National Assisted Area 3; 0 otherwise	0.361
Other regions	1 if the project is implemented outside the National Assisted Areas 1–3; 0 otherwise. Reference region (cf. line 41).	0.228
Industry dummies		
Metal	1 if the project is manufacturing of fabricated metal products; 0 otherwise	0.268
Wood	1 if the project is manufacturing of wood and of products of wood and cork, including furniture, or of articles of straw and plaiting materials; 0 otherwise	0.157
Other manufacturing	1 if the project is in another manufacturing industry; 0 otherwise	0.234
Trade	1 if the project is in wholesale and retail trade, repair of motor vehicles, motorcycles and personal and household goods, or hotels and restaurants; 0 otherwise	0.091
Transport	1 if the project is in transport, storage and communication, or financial intermediation; 0 otherwise	0.024
Business	1 if the project is in real estate, renting and business activities; 0 otherwise. Reference industry	0.132
Other industries	1 if the project is in another industry; 0 otherwise	0.094

Notes: Number of observations: 3423. Only the investment projects of private firms are included. Data also include three year dummies (2001, 2002, 2003) that indicate when the funding was granted. Industry dummies have been created using the TOL 2002 industrial classification.

CHAPTER 3
EVALUATING PROJECT DEADWEIGHT MEASURES: EVIDENCE FROM FINNISH BUSINESS SUBSIDIES

Environment and Planning C: Government and Policy 2009, volume 27, pages 124 – 140

doi:10.1068/c0804b

Evaluating project deadweight measures: evidence from Finnish business subsidies

Anu Tokila, Mika Haapanen
School of Business and Economics, PO Box 35, FIN-40014 University of Jyväskylä, Finland;
e-mail: anu.tokila@econ.jyu.fi, mika.haapanen@econ.jyu.fi
Received 8 January 2008; in revised form 14 May 2008; published online 15 December 2008

Abstract. An important problem in measuring the impacts of business subsidies is their separation from deadweight, which refers to changes that would have occurred even in the absence of intervention. Both public and private assessments have been used previously to study deadweight, but so far little is known about how they correspond to each other. To address this issue we conducted a joint evaluation of the private and public assessments of deadweight for Finnish business projects. A unique dataset combines large register data with both public and private information on projects financed in 2000 – 03. First, our results suggest that the different measures for deadweight are greatly uncorrelated, and thus cannot be used as substitutes. Second, characteristics affecting the public and private measures of deadweight are identified using ordered probit models. We find that the public and private sectors emphasize different factors in their assessment of deadweight. Third, an upper bound for the level of deadweight spending is estimated at 73.8%.

Introduction

Governments all over the world use business subsidies to maximize social and economic welfare. Entrepreneurs are believed to generate positive outcomes such as new innovations and employment, which in turn motivate the use of public interventions in the absence of private investment (Parker, 2004). Access to private equity and loans can prove an obstacle, even for firms with a profitable project, if the market does not correctly or fully value the social benefits resulting from entrepreneurship. This situation indicates market failure, which frequently results in misallocation of resources (Glancey, 2000).

Different theoretical reasons have been suggested for the existence of market failures.(1) In practice, the latest studies suggest that information imperfections and indirect positive externalities could be the main reasons for the market failures identified in the financial market of small and medium-sized enterprises (SMEs) (eg European Commission, 2007; Stam et al, 2007). With regard to information imperfections,(2) financial institutions may not be able to recognize viable and potential projects — this can lead to overestimated risk rates and rejection of financing (eg Stiglitz and Weiss, 1981). Such imperfections may result from shortcomings in the bank's assessment process, or from expectations on behalf of the applicant firm that are too negative (Stam et al, 2007). When the participants are not equally well informed, the market outcome might not prove efficient without public intervention (Leach, 2003). This happens if socially viable projects are not implemented in the absence of finance. Governments can fill the information gap through either full or partial finance, which provides information on a project's viability to private financiers.

(1) Stiglitz (1988), highly cited in the literature, specifies six main reasons for market failure existence — namely, failure of information, existence of public goods, incomplete markets, externalities, failure of competition, and macroeconomic disequilibrium.

(2) In such cases, information may be missing, inadequate, or incorrect (Glancey, 2000).

Externality refers to the divergence of private and social costs (Glancey, 2000). An externality is positive if the behavior of some agent makes another agent better, and is negative if that behavior makes another agent worse. In a situation with positive externalities, the social returns of a business project exceed its private returns. These economic benefits may not be fully incorporated into the market. Research and development (R&D) activity provides a good example of such a situation. R&D commonly yields external positive impacts—such as technological spillovers—that benefit society as a whole more than a firm itself. Without public support, the level of R&D activity may not be sufficient for society (Bartik, 1990).

The task of correcting market failures generally falls on the government (Leach, 2003). For example, the intervention logic underpinning European Union support for SMEs stems much from the presence of market failure and market gaps (European Commission, 2007). However, market failures do not necessarily justify government intervention; interventions must also be beneficial and lead to improved resource allocation. In other words, subsidies among other government interventions should lead to a Pareto-optimal allocation of resources. In practice, government is represented by an individual who is supposed to possess all the relevant information to determine the Pareto-optimal allocation of resources, on the basis of which the decision on optimal subsidies is made (Mueller, 2003). In that optimal situation, economic intervention is supposed to increase social welfare.

However, inefficiency may arise for different reasons. Public subsidies may encourage the firm to reduce its inputs to the project. In the worst case, subsidy entirely substitutes private funds and does not generate an increase in the scale of the project, and thus implies an arbitrary transfer of resources from tax payer to producer (Wren, 1996). In that event, the firm may have obtained finance from other sources; therefore, public resources are being used unnecessarily. This leads us to the problem of deadweight discussed in this paper. More precisely, we focus on project deadweight, in which deadweight is defined as the degree or level to which a project would have been carried out without grant assistance (see Lenihan, 1999; 2004).(3)

Deadweight represents a situation in which private benefits are increased at the expense of social welfare. Hence, public and private benefits are highly divergent in terms of deadweight. For this reason, assessments of deadweight cannot be expected to be similar between those groups. Previous studies have been based solely on either private (eg Lenihan, 1999; 2004) or public (Tokila et al, 2008) assessment of deadweight; a comparative study of deadweight assessments by the public sector and by the private firm itself is lacking. Our study aims to fill this gap in the literature. We analyze and discuss the correlation between different measures of project deadweight.(4) Then we identify the characteristics that affect deadweight measures. Comparison of these characteristics can indicate differences in the processes that generate the private and public measures of deadweight. Lastly, we calculate estimates for deadweight spending. Thus, we offer an extensive analysis of project deadweight, and broaden information on the analytical methods for studying deadweight.

(3) The concept of deadweight with this meaning has been known from the 1980s (see, for instance, Robinson et al, 1987), but Lenihan has brought back the concept into the literature. Related topics have been evaluated even earlier (eg see Zimmermann, 1985). This concept of deadweight should not be confused with the concept of deadweight loss, which can be defined as a loss in economic efficiency in the market caused by, for example, taxation, monopoly power, and the price ceiling or floor (eg see Frank and Bernanke, 2001; Hines, 1999).

(4) To evaluate the reliability of the private deadweight assessment, an alternative indirect measure of deadweight based on the grant replacement possibilities is also used.

Literature on deadweight

In terms of public subsidies, deadweight is recognized as a counterfactual component of additionality.[5] At project level, deadweight can be directly identified as a non-additionality (eg see Luukkonen, 2000), but at a regional level displacement[6] and other possible replacement effects must also be taken into account. Additionality measures the net sum of the direct and indirect impacts generated due to intervention, whereas possible deadweight and displacement tend to reduce them. However, the percentage level of deadweight involved in each project is difficult to assess. Lenihan (1999) draws a distinction between full (pure), partial, and zero deadweight. The former refers to a situation in which the project would have been implemented unchanged without a grant subsidy. Thus, the level of deadweight is 100%. In the opposite situation, the project would have been abandoned without receiving subsidy. Then, deadweight does not occur—that is, there is zero deadweight. Partial deadweight lies somewhere between full and zero deadweight. It can occur, for instance, when a project would have gone ahead on a reduced scale or quality, or with a delayed time schedule, if a subsidy was not granted (cf Lenihan, 1999; 2004; Lenihan and Hart, 2004).

Project deadweight is a young and widely unexplored academic field. Lenihan (1999; 2004) has done pioneer work of deadweight with Irish data (see also Lenihan and Hart, 2004; Lenihan et al, 2005). Her results indicate that deadweight is a problem to be reckoned with. Estimates of deadweight levels are high according to different ways of calculation. Deadweight can constitute up to 78% of employment and 56% of the share of assistance approved, and can occur in more than 90% of subsidized business projects (Lenihan, 1999; Lenihan and Hart, 2004).

Prior evidence of the reasons behind deadweight is equally limited thus far. Some evidence of the determinants of deadweight has been reported separately on a public and private basis. In Lenihan's (2004) analysis, the level of deadweight was found to be influenced by grant type, size of firm, number of earlier grants, and whether the investment appraisal included a grant. In that study, data were collected via interviews from the firms. Tokila et al (2008) utilized register data to analyze conditions for zero deadweight. Here, the deadweight of a project was evaluated by public researchers. Analysis showed that a location in a prosperous region, a strong investment-bearing capacity, a higher age of firm, and a large subsidy size may raise the likelihood of deadweight when considering investment projects.

Analyses of project additionality offer an indirect view into deadweight. Many of this type of study indicate that public subsidies do not have a significant effect on the implementation of a project, which strongly suggests occurrence of deadweight (eg see Luukkonen, 2000). These studies show that larger firms, firms with higher activity in R&D, and firms with more expensive projects are more likely to carry on the same level of activity even in the absence of support (eg Heijs, 2003). These studies are typically based on surveys or interviews, and therefore offer a private assessment of the subject. However, project additionality should not be confused with the large literature of input additionality, in which the concept of additionality is somewhat different (eg see Czarnitzki and Fier, 2002; David et al, 2000; González et al, 2005; Kaiser, 2004; Lach, 2002; Wallsten, 2000). These focus on how public support influences a project's private finance: a common viewpoint, especially within R&D subsidies.

(5) Additionality is a concept with several meanings in the subsidy literature. Besides project additionality, output additionality, and input additionality, behavioural additionality, and cognitive capacity additionality are also known (see Davenport et al, 1998; Georghiou et al, 2002).

(6) Displacement occurs if the subsidized project causes activity reduction elsewhere in the economy. Consideration of displacement is essential when evaluating regional net impacts of the policies (eg see Tervo, 1989; 1990).

Business subsidies in Finland

Although the share of business subsidies from government expenditure is smaller in Finland compared with other EU-15 member states, the amount spent on those subsidies is still significant (see Venetoklis, 2001). The Ministry of Trade and Industry (KTM),[7] the major distributor of aid to businesses, makes over 50% of all subsidy appropriations. Although KTM participates in business venturing by many instruments such as loans and guarantees, the subsidies we are concerned with are all grants—that is, the recipient firm is not obliged to pay back the grant to the distributor. In 2000–03 three types of subsidies for implementation of business projects were available: subsidies for investment, development, and operating environment projects. The latter subsidies differ from the others because they are not granted directly to firms, but to projects initiated mostly by foundations or by public or private sector corporations, in order to improve the business environment of companies. Therefore, such projects are not comparable in deadweight with other projects, and are excluded from this analysis. The other two forms of aid are granted directly to microsized enterprises and SMEs.[8] Only in rare cases are subsidies granted to larger enterprises.

Investment subsidies can be granted to a firm for fixed-asset investment projects when a firm is starting its business, expanding operations, or modernizing its fixed assets. Development subsidies can be granted to projects enhancing the competitiveness or internationalization of an enterprise in the long term (Ministry of Justice, 2006). Intensity of assistance is dependent on the type of assisted area, size of the firm, and the form of subsidy. For development projects, the intensity of assistance is generally higher, reaching up to 50% of accepted costs. With regard to investment projects, small firms may be granted 10–30% of the costs, and medium-sized firms 5–20% of the costs (Ministry of Justice, 2000).

For example, in 2003 KTM granted a total of €107 million business subsidies. In total, of the 3405 projects that applied for financing, 893 were denied subsidy[9] (Ministry of Trade and Industry, 2004). Subsidies were mostly granted to micro-sized and small-sized firms. With regard to the project type, the share of investment projects was larger compared with that of development projects, in terms of both number of projects and their financing. Financing for investment projects was more than twice that of development projects.

In practice, subsidies are applied for from the fifteen local Employment and Economic Development Centres, where they are also mostly granted. The Ministry of Trade and Industry only makes financing decisions in cases where the cost of the investment project exceeds €1.7 million. To receive subsidies, feasible project and financing plans are required, and an assessment made by the researchers at the Employment and Economic Development Centre. In the assessment process, the project, the applicant firm, and the need for public finance are fully described and evaluated. In addition, predictions of the financial situation of the firm and of the financial impact of the project must be favorable.

(7) However, the system for business subsidies is very fragmented. Public finance for enterprises is also granted by the ministries of foreign affairs, transport and communications, labor, agriculture and forestry, and finance (Muotio, 1998).

(8) A microsized (small-sized, medium-sized) enterprise refers to an enterprise which employs fewer than 10 (50, 250) persons, has an annual turnover not exceeding €2 (€10, €50) million or an annual balance sheet total not exceeding €2 (€10, €43) million, and fulfils the characteristics depicting the autonomy of an enterprise (European Commission, 2003).

(9) Unfortunately, no information is recorded on the rejected projects.

Data and deadweight measures

In the empirical analysis we investigate deadweight in the business projects for which the Ministry of Trade and Industry granted subsidies between 2000 and 2003. We use a unique dataset from two sources: first, register data comprising all the financed projects (5844 projects), of which 5744 were conducted by private sector firms. These private sector projects were selected for analysis. The dataset is considerably larger than that of most previous deadweight studies [see reviews by Foley (1992) and Lenihan et al (2004)], and includes a broad range of information on the firms and their projects (see appendix, table A1).[10]

Importantly, the register dataset in this study contains information on the public assessment of deadweight for all the financed projects. In the assessment, the project and the firm are evaluated by the researchers at the Employment and Economic Development Centre. The researchers raise a hypothetical counterfactual question: what would happen if the project were not subsidized? The options that answer this question are as follows: (1) the project will be abandoned; (2) the project will be implemented on a reduced scale; (3) the project will be implemented on a reduced qualitative level; (4) the project will be implemented at a later date; and (5) the project will be implemented unchanged. Hence, option 1 implies zero deadweight, options 2–4 imply partial degrees of deadweight, and option 5 pure deadweight.

Second, to gather private information on deadweight, 222 firms were interviewed at the end of 2004—that is, one to three years after the beginning of their projects. The sample was randomly selected from the population of subsidized private projects.[11] The telephone interviews, lasting an average of thirty minutes, were carried out by a structured questionnaire[12] sent to the respondents in advance. The respondents were firm owners or project managers—whoever was most involved with the implementation of the subsidized project. Project deadweight was assessed through the same counterfactual question mentioned earlier.

It must be assumed that a firm knows the 'real' deadweight—what would really happen if a project was not subsidized. While making an assessment, the firm attends to factors that affect project implementation. The researcher ought to assess this real deadweight by certain criteria; however, the researcher may not have the full information about the firm due to asymmetric information, or the criteria may emphasize different factors to those which the firm emphasizes in its assessment. Furthermore, both assessments may be influenced by subjective motives, which may constitute interpretation of possible differences in the results. The researcher's assessment of deadweight may be influenced by a 'pick-the-winners' effect. This means that authorities may favor the greatest number of potential projects, which could have been implemented unchanged without subsidy, as successful projects improve the records of the researcher and ensure performance pay. Self-assessment of deadweight may be problematic due to 'respondent's effect' or 'response bias' (Lenihan, 1999; Lenihan and Hart, 2004; McEldowney, 1997), which means that respondents may purposely underestimate or overestimate the impact of financing. Some might be overoptimistic, as a positive outlook is likely to be a common characteristic of entrepreneurs. Others might be pessimistic, thinking their response would help gain future support (Curran and Storey, 2000).

(10) The register dataset is used to form our explanatory variables of the econometric model introduced later.

(11) Representativeness of the sample was investigated using distribution tests. They showed that the sample is identical to the population in most characteristics. The test results are available on request from the authors.

(12) The questionnaire was tested with ten firms to ensure that questions are clear and that there is no confusion regarding the issues addressed.

As regards deadweight, underestimation of the changes that would have occurred in the absence of intervention is the most likely case (European Commission, 2006).

To investigate the reliability of the deadweight assessments, an alternative indirect measure of project deadweight is used, a measure that can be drawn from subsidy replacement possibilities. In the interview, firms were also asked whether the subsidy could have been replaced by another funding method. Replying 'yes, completely' can be seen as an indication of full deadweight. Partial replacement possibilities indicate partial deadweight and 'no possibility' zero deadweight.

Table 1 shows the frequency distributions of the deadweight measures. The distribution of the public assessment is similar between population and sample (columns 1a and 1b). Partial deadweight dominates, while the number of full deadweight projects is low. The distribution of private assessment shows a higher degree of zero deadweight as well as a higher degree of full deadweight (column 2). When the deadweight is investigated indirectly, by asking about the firm's subsidy replacement possibilities (column 3), distribution is much more constant than that of a direct assessment of deadweight. While the distributions depend somewhat on the measure used in calculation of deadweight, these simple figures indicate some form of deadweight in 66–84% of the subsidized projects. The range is in line with prior evidence. For example, Lenihan (1999) found deadweight in 90% of business projects when firms were asked directly. The first estimates from Robinson et al (1987) were somewhat lower, namely 38.4–73.9%. In our sample data, the largest deadweight estimate is from the public assessment (84%), and the smallest is from the indirect private assessment (66%), with the direct private assessment of deadweight (79%) between the two. A comparison of the private deadweight figures indicates that direct assessment may underestimate both full and zero deadweight. Thus, no direct conclusion from the overall difference can be drawn.

Table 1. Frequency distributions of alternative deadweight measures.

Deadweight (DW)	(1a) DW assessment by researchers (population)	(1b) DW assessment by researchers (sample)	(2) DW assessment by firms	(3) Subsidy replacement possibilities as reported by firms
Zero	967 (16.8)	36 (16.2)	47 (21.3)	75 (33.8)
Partial	4695 (81.7)	183 (82.4)	149 (67.4)	79 (35.6)
Full	82 (1.4)	3 (1.4)	25 (11.3)	68 (30.6)
Total	5744 (100)	222 (100)	221 (100)	222 (100)

Note. The number of observations is given first, followed by the percentages in parentheses.

Correlation between deadweight measures

These simply frequency distributions do not, however, reveal whether the deadweight of a particular project is evaluated similarly by public sector and firm. The direction and strength of the pair-wise relationship between public and private measures can be investigated using Kendall's τ_b coefficient (Agresti, 1984; Kendall and Gibbons, 1990). This nonparametric coefficient of association for ordinal variables can have values between −1 and 1. The sign of the coefficient indicates the direction of the relationship, and its absolute value indicates the strength of the relationship. The coefficient reaches 1 when all entries are on the diagonal of a square bivariate frequency table.

Positive but not necessarily significant relationships are expected between the alternative measures of deadweight. As discussed, besides the pick-winners effect and response bias, asymmetric information may produce differences in the measures. Many essential features of the project and its funding possibilities are known only to the firm.

Therefore, public assessment may not be able to recognize the real deadweight of a project. A public researcher may also intentionally stress firm, project, and regional factors differently than a private firm. The researcher may, for example, emphasize local unemployment when considering the necessity of finance and level of deadweight.

Table 2 presents the cross-tabulation of deadweight measures and their pair-wise correlation coefficients. Sample data from the 222 subsidized projects are used. Although the correlation between the public and private assessment of deadweight (columns 1b and 2) is significantly different from zero ($p < 0.01$) and positive, the relationship is rather weak (Kendall's $\tau_b = 0.172$). This can also be seen in the sample frequencies. For example, of those thirty-six projects that public researchers label zero deadweight projects, some form of deadweight is reported in more than half of the private assessments. No significant relationship between the public assessment of deadweight and the indirect measurement of private deadweight (columns 1b and 3) is found. The correlation coefficient is practically zero ($\tau_b = 0.009$) and highly insignificant ($p = 0.887$). The strongest, but again fairly moderate, relationship is found between the two private measures of deadweight ($\tau_b = 0.276$). The null hypothesis of independence is clearly rejected ($p < 0.001$).

These results show that public and private views differ on the deadweight of the project. They constitute different measures for deadweight and cannot be used as substitutes. Since the firms report more of both zero and full deadweight, no clear explanation for the differences can be given. If the public researchers were picking winners, the private deadweight would be estimated to be high, relative to public deadweight. On the other hand, if firms systematically exaggerated the importance of assistance, they would

Table 2. Cross-tabulation of deadweight measures: observed and expected frequencies.

	(2) Deadweight assessment by firms				(3) Subsidy replacement possibilities as reported by firms			
	zero	partial	full	total	zero	partial	full	total
(1b) Deadweight assessment by researchers (sample)								
Zero	13	21	2	36	12	12	12	36
	(7.7)	(24.3)	(4.1)		(12.2)	(12.8)	(11)	
Partial	34	126	22	182	63	66	54	183
	(38.7)	(123)	(20.6)		(61.8)	(65.1)	(56.1)	
Full	0	2	1	3	0	1	2	3
	(0.6)	(2)	(0.3)		(1)	(1.1)	(0.9)	
Total	47	149	25	221	75	79	68	222
(2) Deadweight assessment by firms								
Zero					29	15	3	47
					(16)	(16.8)	(14.2)	
Partial					39	57	53	149
					(50.6)	(53.3)	(45.2)	
Full					7	7	11	25
					(8.5)	(8.9)	(7.6)	
Total					75	79	67	221

Coefficients of association
1b versus 2: $\tau_b = 0.172$ (test of independence: $p = 0.008$)
1b versus 3: $\tau_b = 0.009$ (test of independence: $p = 0.887$)
2 versus 3: $\tau_b = 0.276$ (test of independence: $p < 0.001$)

Notes. The observed frequency is reported; expected frequency under independence is shown in parentheses below. The coefficient of association is Kendall's τ_b for ordered categorical variables ($-1 \leqslant \tau_b \leqslant 1$).

report a much lower deadweight compared with public assessment. These simple statistics do not, however, straightforwardly support either the pick-the-winners or the response-effect hypotheses. Instead, asymmetric information seems the more likely explanation. The researchers do not know the real deadweight and thus they are more likely to choose the most indefinite option of partial deadweight. The significant correlation of two private assessments supports the reliability of private assessment. This dependence is fairly thin, which may indicate that the question of subsidy replacement possibilities is clearer and more concrete for the firms.

Determination of deadweight

The determination of deadweight for a particular project is investigated using econometric models. In all three cases, the determinant, project deadweight, is measured on an ordered, three-level scale ranging from 1 to 3. This suggests the use of ordered probit models (eg see Long, 1997).[13] In each case, it is assumed that y_i, the observed categorical level of deadweight of a project i, is determined according to a latent variable y_i^*:

$$y_i^* = \beta' x_i + \varepsilon_i, \qquad \varepsilon_i \sim \mathrm{N}(0, 1); \tag{1}$$

$$y_i = j, \quad \text{if} \quad \kappa_{j-1} < y_i^* \leqslant \kappa_j, \qquad j = 1, 2, 3 \text{ (zero, partial, full)}, \tag{2}$$

where x_i is a set of explanatory variables, β is a parameter vector, and κ are unknown threshold parameters ($\kappa_0 = -\infty$ and $\kappa_3 = -\infty$). The error term ε_i is the distributed standard normal.[14] Given these assumptions, the probability of deadweight level j can be computed as

$$\Pr(y_i = j) = \Phi(\kappa_j - \beta' x_i) - \Phi(\kappa_{j-1} - \beta' x_i), \tag{3}$$

where $\Phi(.)$ denotes the cumulative distribution function of the standard normal.

The explanatory variables used in the model include firm-level and project-level factors, and the characteristics of the region where the firm is located. One limitation of most deadweight studies is that they focus only on one particular year, which is insufficient to illustrate any trend in the deadweight (McEldowney, 1997). Our data include observations from four consecutive years; hence, we are able to capture cyclical changes in the deadweight using three year dummies. The explanatory variables are described in more detail in the appendix (table A1).

Table 3 displays the estimation results of the ordered probit models for deadweight. The first column gives the determinants of deadweight based on the public assessment of deadweight (population data). The second column reports our estimates for the direct private assessment of deadweight, followed by the indirect assessment of deadweight based on the subsidy replacement possibilities as reported by firms (sample data). A variable with a positive (negative) coefficient is associated with an increased (decreased) deadweight. To allow for a comparison of the magnitude of the effects, marginal effects on the probability that deadweight is partial or full[15] are given in the appendix (see table A2).

The literature on industrial policy suggests that a firm's access to finance increases with the size and business experience of the firm (eg Storey, 1994; Wren, 1998).

[13] The ordered characteristic in the dependent variables would not be reached, had we used, for example, the multinomial logit (MNL) model. Another difficulty with the MNL model is that, although it is more flexible in terms of estimated parameters, it may be impossible to estimate the parameters for all classes if the number of observations in one class is small. In analysis of deadweight, for example, the number of firms reporting full deadweight can be small (see table 1).

[14] Owing to normalization, only two threshold parameters, but no constant, are estimated.

[15] For brevity, only these marginal effects are reported instead of separate marginal effects for zero, partial, and full deadweight. Note that the marginal effect on the probability of zero deadweight is the additive inverse of the marginal effect reported in table A2.

Table 3. Determination of deadweight: parameter estimates of ordered probit models.

Variable	(1a) Deadweight assessment by researchers	(2) Deadweight assessment by firms	(3) Subsidy replacement possibilities as reported by firms
Firm characteristics			
New firm	−0.226** (0.107)	−0.093 (0.699)	−0.415 (0.497)
Employees	0.001 (0.001)	−0.014* (0.008)	−0.012 (0.009)
Turnover of firm	0.033*** (0.010)	0.243*** (0.084)	0.238** (0.099)
Project characteristics			
Project costs	−0.378*** (0.097)	0.162 (0.299)	−0.867*** (0.316)
Project costs squared	0.019** (0.009)		
Intensity of assistance	−0.021*** (0.003)	−0.059*** (0.018)	−0.028* (0.014)
Investment project	−0.416*** (0.109)	−1.559*** (0.541)	−0.424 (0.487)
Investment project × new firm	0.268** (0.129)	0.388 (0.747)	0.381 (0.609)
Start-up project	−0.027 (0.115)	0.678 (0.708)	0.543 (0.502)
Industry			
Metal	−0.185*** (0.069)	−0.317 (0.326)	−0.237 (0.275)
Wood	−0.265*** (0.080)	−1.350*** (0.385)	−0.216 (0.316)
Other manufacturing	−0.183*** (0.067)	−0.682* (0.347)	−0.444 (0.283)
Trade	−0.069 (0.096)	−0.197 (0.364)	−0.399 (0.447)
Transport	−0.226 (0.142)	−1.486*** (0.467)	−0.951* (0.548)
Other industries	−0.034 (0.091)	−0.291 (0.420)	−0.647 (0.400)
Regional characteristics			
Unemployment rate (%)	−0.016** (0.007)	0.044 (0.031)	0.005 (0.025)
R&D expenditure	0.018*** (0.005)	0.008 (0.022)	0.030 (0.026)
Year dummies			
2000	0.223*** (0.072)	0.295 (0.382)	0.734*** (0.277)
2001	0.182*** (0.065)	0.267 (0.346)	0.201 (0.279)
2002	0.080 (0.068)	0.039 (0.347)	0.818 (0.276)
Threshold parameters			
κ_1	−2.068 (0.181)	−3.299 (0.794)	−1.409 (0.775)
κ_2	1.356 (0.176)	−0.830 (0.756)	−0.384 (0.774)
Log-likelihood	−2396.08	−130.57	−190.90
Number of observations	4932	187	188

*** Significant at the 0.01 level; ** significant at the 0.05 level; * significant at the 0.1 level.
Notes. Dependent variables can have three ordered categorical values. The estimated parameter is first given followed by the robust standard error in parentheses. Definitions of variables are given in the appendix, table A1.

Young firms do not have much evidence to show their competence and trustworthiness. Banks and other lenders may be too risk averse or too unfamiliar with the new business to lend the money needed through early loss making and risky years. Small firms may also face financial constraints, as they are unlikely to be monitored by rating agencies or the financial press. Hence, we would expect deadweight to increase with the size and business experience of the firm.

Our results are in accordance with these expectations. Deadweight increases significantly with turnover, regardless of the measure used, ceteris paribus. The magnitude of the impact is largest when the deadweight is asked indirectly from the firms. If the turnover increases by one million euros, the probability of deadweight (partial or full) increases by almost nine percentage points. The impact of turnover on deadweight is estimated to be smaller in the direct assessment of deadweight (marginal effect 5.5%), and particularly in the public assessment of deadweight (marginal effect 0.8%). The results based on public assessment of deadweight show that deadweight is smaller for new firms than for old firms, apart from those firms implementing investment projects. Directions of the effects are the same but coefficients are not significant when private measures of deadweight are used. However, contrary to Lenihan (2004), the size of the firm, in terms of number of employees, does not seem to be an important determinant of deadweight in any of the assessments.

Alongside the characteristics of the firm, we must pay attention to the characteristics of the project, as the project may have different risk attributes than the overall firm. The above discussion led us to suspect that larger costs imply greater project risk and smaller deadweight. Our results are consistent with these views. Apart from in very large projects (over €10 million), project costs have a negative effect on the deadweight in the public assessments. Project costs are included in squared form to capture the non-linear effect on deadweight. The squared term was highly insignificant in the private assessments of deadweight, and was therefore dropped from the final specifications reported in columns 2 and 3.[16] In the indirect assessment the cost effect is large and negative. Contrary to our expectations, project costs do not, however, significantly affect deadweight in the direct private assessment (column 2).

Intensity of public assistance for the project has been calculated as a ratio of grant to total project costs. On one hand, high intensity of assistance may reflect the importance of assistance in the implementation of the project (small deadweight). For example, the project may be too costly relative to its returns for an individual firm, while having significant positive external effects on the local economy. On the other hand, high intensity of public assistance may also increase deadweight, as it tends to advance the chances of generating additional finance from the private sector. Our results suggest that the former effect dominates the latter. The intensity of assistance has a negative and significant impact on deadweight. The probability of deadweight decreases approximately by one percentage point when the intensity of assistance increases by one percentage point. In the public assessment of deadweight, the effect is again significant but only by half the magnitude.

The type of project is also a significant determinant of deadweight. The public assessment of deadweight implies that, for existing firms, investment projects have about, ceteris paribus, a ten percentage point smaller probability of deadweight than development projects. Therefore, deadweight seems to be a lesser problem in investment projects than in development projects. These differences may be related to project costs and the risks involved in the projects, or firms may simply rely more on public support when investment decisions are planned. Physical capital tends to be more difficult to move from one region to another than the outcome of a development project: a factor that may increase risks in investment projects. The difference between the project types is estimated as smaller (4%) for new firms, and greater when private assessment of deadweight is used.

Regarding industry effects, deadweight is estimated to be smallest in wood and transport industries when public and direct assessment of deadweight are used (cf Tokila et al, 2008). Interestingly, the negative effects are particularly large and significant when direct private deadweight assessment is used. One partial possible explanation for these findings is that the wood and transportation industries are capital intensive and have traditionally been supported by the state (eg see Junka, 1998). In indirect assessment, only the transportation industry shows significantly low

[16] We also tried to add the investment-bearing capacity of the firm, defined as the ratio of turnover to project costs, to the models, but it was highly insignificant in all three models and was therefore dropped from the final specifications.

levels of deadweight. This may indicate that, in reality, deadweight is not dependent on the industrial sector, as subsidy replacement possibilities do not differ significantly between sectors.

Regional characteristics only reach statistical significance in public assessment of deadweight. Deadweight decreases with the unemployment rate in the region, and increases with R&D expenditures in the region. This may indicate that authorities tend to exaggerate the regional aspect of the subsidies, although in reality they do not influence the deadweight of the project. This public emphasis is, presumably, particularly strong when economic disparities are large, and public sector aims at reducing those disparities. Regional differences have increased after the deep recession in the early 1990s: a serious concern for regional development and policy—see, for example, the discussion in Tervo (2005) and in Kangasharju and Pekkala (2004). Note also a decreasing trend in deadweight between 2000 and 2003 (see year dummies in columns 1a and 3).(17)

In summary, public and private sectors emphasize different determinants in their assessment. Public assessment of deadweight seems best explained by the variables.(18) The researchers clearly emphasize project costs, form of subsidy, industrial sector, and regional characteristics in their assessment. The firms themselves make their assessment based on the size of the firm, form of subsidy, and industrial sector. Unobserved factors such as the riskiness of a project probably affect the firms' assessment more. The control measure of subsidy replacement possibilities is weakest as explained by the chosen composition of variables. The impact is dominated by the financial factors. These results suggest that deadweight measures are formed divergently. The difference between columns 2 and 3 is the most problematic. It indicates that the firms do not internalize direct and indirect deadweight similarly. These differences in determinants are likely to cause the differences in deadweight measures as well.

Estimating deadweight spending

Another way of looking at deadweight is to ask how much public money is spent on the nonadditional projects. To arrive at an estimate of the deadweight spending, we will first add up the public assistance on the three types of subsidized projects (zero, partial, and pure deadweight). We let S^z, S^p, and S^f denote public spending on all the zero, partial, and full deadweight projects, respectively.(19) The deadweight spending on a project is clearly zero if abandoned in the absence of subsidy (ie zero deadweight).(20) Accordingly, if a project is implemented unchanged in the absence of subsidy (full deadweight), then the public assistance completely substitutes private funds (pure deadweight spending). Hence, the degree of deadweight spending, D (%) can be estimated as a ratio of deadweight spending to the total public subsidies, as follows:

$$D = \frac{100(0S^z + \theta S^p + 1S^f)}{S^z + S^p + S^f}, \qquad (4)$$

(17) The number of subsidized projects decreased in 2000–03, which may suggest that projects were more carefully selected during the latter part of the period, and explain the decreasing trend in deadweight. The profitability of SMEs remained good and largely unchanged during the period (Statistics Finland, 2004).

(18) Of course, this is partly due to the larger sample size.

(19) That is, $S^z = \sum_i S_i^z$, where S_i^z is the public assistance on a project i with zero deadweight.

(20) Note, however, that the reverse is not necessarily true. If public assistance acts as an incentive ('leverage')—that is, increasing private spending on a project (cf Wren, 1996, page 535), and if the project would have been implemented smaller but on a positive scale in the absence of subsidy, then the deadweight spending is zero, but the deadweight is nevertheless positive.

where $S^z + S^p + S^f$ is the total public spending on subsidized projects, $0S^z + \theta S^p + 1S^f$ is an estimate of the amount of public spending that substitutes private funds, and θ is the assumed degree of deadweight in the partial deadweight case ($0 \leqslant \theta \leqslant 1$).

Equation (4) can be used to estimate the range of deadweight spending by varying the parameter θ. We obtain a lower bound for the estimate of the degree of deadweight spending by assuming that deadweight is zero at the partial deadweight category (ie setting $\theta = 0$). By setting $\theta = 1$, we obtain an upper bound for the estimate. Naturally, if we are willing to assume, for example, that $\theta = 0.5$, we then obtain a 'middle' estimate for the degree of deadweight spending from the middle of the two bounds.[21] Note that these estimates will naturally depend on the operationalization of the deadweight concept (table 1).

Public subsidies and estimated deadweight spending are reported in table 4,[22] and are given for each of our deadweight measures. Looking at the reported population figures first, we can see that almost €205 million of business subsidies were granted in 2000–03. Most subsidies were spent on partial deadweight projects. However, it is

Table 4. Public subsidies and deadweight (DW) spending.

	Public subsidies, on average	Public subsidies, in total	Estimated deadweight spending
(1a) DW assessment by researchers (population)			
Zero ($N = 967$)	56 077.8	54 227 209	If $\theta = 0$, then $D = 1.6\%$
Partial ($N = 4695$)	31 381.1	147 334 140	If $\theta = 0.5$, then $D = 37.6\%$
Full ($N = 82$)	40 917.1	3 355 203	If $\theta = 1$, then $D = 73.5\%$
Total ($N = 5744$)	35 674.9	204 916 552	
(1b) DW assessment by researchers (sample)			
Zero ($N = 36$)	81 389.9	2 930 036	If $\theta = 0$, then $D = 0.2\%$
Partial ($N = 183$)	27 840.7	5 094 852	If $\theta = 0.5$, then $D = 31.9\%$
Full ($N = 3$)	4 326.7	12 980	If $\theta = 1$, then $D = 63.5\%$
Total ($N = 222$)	36 206.6	8 037 868	
(2) DW assessment by firms			
Zero ($N = 47$)	44 688.3	2 100 349	If $\theta = 0$, then $D = 8.1\%$
Partial ($N = 149$)	35 271.7	5 255 478	If $\theta = 0.5$, then $D = 41.0\%$
Full ($N = 25$)	26 081.6	652 041	If $\theta = 1$, then $D = 73.8\%$
Total ($N = 221$)	36 234.7	8 007 868	
(3) Subsidy replacement possibilities as reported by firms			
Zero ($N = 74$)	37 698.8	2 827 411	If $\theta = 0$, then $D = 25.4\%$
Partial ($N = 79$)	40 113.4	3 168 955	If $\theta = 0.5$, then $D = 45.1\%$
Full ($N = 68$)	30 022.1	2 041 502	If $\theta = 1$, then $D = 64.8\%$
Total ($N = 222$)	36 206.6	8 037 868	

Notes: Deadweight spending is computed as $D = 100(0S^z + \theta S^p + 1S^f)/(S^z + S^p + S^f)$, where S^z, S^p, and S^f are public spending for the zero, partial, and full deadweight projects, respectively, and θ is the assumed degree of deadweight in the partial deadweight case.

[21] The reasoning is that deadweight spending is a linear function of θ. One way to arrive at $\theta = 0.5$ is to consider θ as uniformly distributed between 0 and 1 across projects. Then the expected value of θ is 0.5.

[22] We only consider deadweight spending on the subsidized firms. However, raising public funds for subsidies requires imposing taxes elsewhere in the economy, which in turn tends to create further deadweight loss in the market as discussed in the standard economic literature (eg see Frank and Bernanke, 2001).

reassuring to find that the amount of assistance is, on average, largest for the zero deadweight projects. Deadweight spending is estimated to be between 1.6% and 73.5%.

The sample data allow for better comparison of the deadweight, because the figures are based on the same projects. Deadweight spending is now estimated to be between 0.2% and 63.5%, when the deadweight measure is based on public assessment (31.9% in the middle, assuming $\theta = 0.5$). In direct private assessment, the upper bound estimate for the deadweight spending is larger (73.8%); the lower bound estimate (8.1%) and middle estimate (41.0%) increase as well. Indirect assessment of deadweight, based on subsidy replacement possibilities, leads to the narrowest range of deadweight spending (25.4 – 64.8%).

As deadweight spending is defined and estimated differently in previous studies, it cannot be directly compared with the estimates of this study. Foley (1992) reported that deadweight spending can be up to 90%, whereas De Koning (1993) discovered deadweight spending as low as 40%. Lenihan and Hart (2004) estimated a range of deadweight spending of 46.2 – 55.8%. Our estimates show a larger range than in any previous study. Obviously, this results from the fact that no assumptions were made concerning partial deadweight. If we are willing to assume that, on average, θ is 0.5 in the case of partial deadweight, the results are in line with prior evidence.

Conclusion

Deadweight represents a situation in which public and private benefits diverge. Regardless, it must be assumed that only a firm knows the real deadweight, whereas a representative of the public sector attempts to elicit it using certain criteria. If these criteria (the subsidy program) are designed correctly, the deadweight measures of the public and private sectors should be similar. Previously, deadweight has been studied by public and private measures separately. The novelty of our paper has been the joint evaluation of the two measures of deadweight; namely, we have discussed and compared deadweight assessments by public sector and by private firm. Furthermore, we have used an alternative measure of subsidy replacement possibilities as a baseline for the reliability of direct measures.

First, we discovered some form of deadweight in 66 – 84% of the subsidized projects. The largest deadweight estimate was obtained from public assessment; this result does not support the pick-the-winners theory. Researchers do not seem to understate the possibility of deadweight, though this might result in less approved assistance. The control question yielded the smallest deadweight numbers, implying that firms' representatives to not intentionally underestimate when directly assessing deadweight.

Second, when considering the correlation between different measures of deadweight, no strong relation was found. Results did not show a significant relation between the public assessment of deadweight and the indirect measurement of private deadweight. The strongest correlation was found between the two private measures of deadweight. Thus, private assessment may be closest to the real deadweight, as expected. Public and private assessments clearly constitute different measures for deadweight, and cannot be used as substitutes. However, no evidence was found either for the pick-the-winners effect or for the response bias. Instead, asymmetric information seems the more likely explanation for the differences. Public assessment may not be able to recognize the real deadweight of the project due to asymmetric information, as many essential features of the project and its funding possibilities are only known to the firm. As the researcher does not know the real deadweight, it can be tempting to select the most indefinite option, partial deadweight.

Third, the characteristics that affect deadweight measures were identified. Analysis supports the fact that the measures are divergently formed. The public and private sectors emphasize, in part, different aspects in their reviews, which may indicate that the subsidy program is not able to recognize the reasons that cause real deadweight. Therefore, they may not be able to pick those projects that need subsidies most severely. The control variable is explained by purely financial factors. The difference between direct and indirect private assessments may indicate that the question of deadweight is fully clear to the respondents. More evidence is needed to study this in detail.

Finally, our analysis showed that deadweight spending is a serious issue. By all measures, a significant share of subsidies is used potentially as deadweight spending, for reasons that should be more widely analyzed. Analysis demonstrated that, without creating a set of additional assumptions (eg see Lenihan, 1999), the range of estimates for deadweight spending tends to be wide. In future, this issue of partial deadweight requires more thorough investigation.

All in all, this study shows that assessments from public and private views constitute different measures of deadweight. The measures should not be used as substitutes but rather as complements. When reporting deadweight, the source of the information should be highlighted, and policy recommendations should be drawn from the view of the source only.

Acknowledgements. This paper is part of a research programme on Business Know-how (LIIKE2, project no 112116) financed by the Academy of Finland. The financial support from the Yrjö Jahnsson Foundation (project 5597) is gratefully acknowledged by the first author. The authors are also grateful for the helpful comments provided by Hanna Tervo, Ari Hyytinen, and two anonymous referees on an earlier draft of this paper.

References

Agresti A, 1984 *Analysis of Ordinal Categorical Data* (John Wiley, New York)

Bartik T J, 1990, "The market failure approach to regional economic development policy" *Economic Development Quarterly* **4** 361 – 370

Curran J, Storey D J, 2000, "Small Business Policy: Past Experiences and Future Directions", The Small Business Service and Kingston University Small Business Research Centre, Small and Medium-sized Enterprise Seminar Series: Linking Research and Policy, Department of Trade and Industry Conference Centre, 12 December, London, http://business.kingston.ac.uk/research/kbssbs/curstor.pdf

Czarnitzki D, Fier A, 2002, "Do innovation subsidies crowd out private investment? Evidence from the German service sector" *Applied Economics Quarterly* **48** 1 – 25

Davenport S, Grimes C, Davies J, 1998, "Research collaboration and behavioural additionality: a New Zealand case study" *Technology Analysis and Strategic Management* **10** 55 – 67

David P, Hall B, Toole A, 2000, "Is public R&D a complement or substitute for private R&D: a review of the econometric evidence" *Research Policy* **29** 497 – 529

De Koning J, 1993, "Measuring the placement effects of two wage subsidy schemes for the long-term unemployed" *Empirical Economics* **18** 447 – 468

European Commission, 2003, "The annex of recommendation 2003/361/EC" *Official Journal of the European Communities* **66** 41, 3 November (European Commission, Brussels)

European Commission, 2006 *Evaluation Methods for the European Union's External Assistance: Evaluation Tools Volume 4* Office for Official Publications of the European Communities, Luxemburg

European Commission, 2007, "Evaluation of data and sources underlying the analysis of market gaps in access to finance for SMEs in the EU", Directorate General for Enterprise and Industry, Luxemburg, http://ec.europa.eu/enterprise/dgs/doc/eval/sme-access_to_finance_final_report_v2.pdf

Foley P, 1992, "Local economic policy and job creation: a review of evaluation studies" *Urban Studies* **29** 557 – 598

Frank R, Bernanke B, 2001 *Principles of Microeconomics* (McGraw-Hill, New York)

Georghiou L, Rigby J, Cameron H (Eds), 2002 *Assessing the Socio-economic Impacts of the Framework Programme* PREST Publications, Manchester

Glancey K S, 2000 *Entrepreneurial Economics* (Palgrave, New York)

González X, Jaumandreu J, Pázo C, 2005, "Barriers to innovation and subsidy effectiveness" *Rand Journal of Economics* **36** 930 – 950

Heijs J, 2003, "Freerider behaviour and the public finance of R&D activities in enterprises: the case of the Spanish low interest credits for R&D" *Research Policy* **32** 445 – 461
Hines Jr J R, 1999, "Three sides of Harberger triangles" *Journal of Economic Perspectives* **13** 167 – 188
Junka T, 1998, "Trends in the public support to industries in 1984 – 1996", DP 165, Government Institute for Economic Research (in Finnish)
Kaiser U, 2004, "Private R&D and public subsidies: microeconometric evidence from Denmark", DP 2004-19, Denmark, http://www.cebr.dk/upload/dp2004-19.pdf
Kangasharju A, Pekkala S, 2004, "Increasing regional disparities in the 1990s: the Finnish experience" *Regional Studies* **38** 255 – 267
Kendall M G, Gibbons J D, 1990 *Rank Correlation Methods* 5th edition (Oxford University Press, Oxford)
Lach S, 2002, "Do R&D subsidies stimulate or displace private R&D? Evidence from Israel" *The Journal of Industrial Economics* **4** 369 – 390
Leach J, 2003 *Course in Public Economics* (Cambridge University Press, New York)
Lenihan H, 1999, "An evaluation of a regional development agency's grants in terms of deadweight and displacement" *Environment and Planning C: Government and Policy* **17** 303 – 318
Lenihan H, 2004, "Evaluating Irish industrial policy in terms of deadweight and displacement: a quantitative methodological approach" *Applied Economics* **36** 229 – 252
Lenihan H, Hart M, 2004, "The use of counterfactual scenarios as a means to assess policy deadweight: an Irish case study" *Environment and Planning C: Government and Policy* **22** 817 – 839
Lenihan H, Hart M, Roper S, 2005, "Developing an evaluative framework for industrial policy in Ireland: fulfilling the audit trail or an aid to policy development", in *Economic and Social Research Institute Quarterly Economic Commentary* Summer, 69 – 85
Long J S, 1997 *Regression Models for Categorical and Limited Dependent Variables* (Sage, Thousand Oaks, CA)
Luukkonen T, 2000, "Additionality of EU framework programs" *Research Policy* **29** 711 – 724
McEldowney J J, 1997, "Policy evaluation and the concepts of deadweight and additionality" *Evaluation* **3** 175 – 188
Ministry of Justice, 2000, "Decree of Council of State 1200/2000", in *The Statutes of Finland No. 1199 – 1201* Ed. J Linhala (Edita, Helsinki) pp 3202 – 3209
Ministry of Justice, 2006 *Aid to Business Act* 1068/2000 *Finnish Law I* (Talentum, Finland); translation available at http://www.finlex.fi/en/laki/kaannokset/2000/en20001068.pdf
Ministry of Trade and Industry, 2004 *Annual Report 2003* Ministry of Trade and Industry, Helsinki
Mueller D C, 2003 *Public Choice III* (Cambridge University Press, West Nyack, NY)
Muotio M, 1998, "Pk-yritykset ja julkinen tuki" [SMEs and the public support] Publications of the Research Institute of the University of Vaasa No. 77, Vaasa (in Finnish)
Parker S C, 2004 *The Economics of Self-Employment and Entrepreneurship* (Cambridge University Press, Cambridge)
Robinson F, Wren C, Goddard J, 1987 *Economic Development Policies: An Evaluative Study of Newcastle Metropolitan Region* (Clarendon Press, Oxford)
Stam E, Suddle K, Hessels S J A, van Stel A, 2007, "High growth entrepreneurs, public policies and economic growth", Jena Economic Research Paper 2007-019, Jena, http://ssrn.com/abstract=1019429
Statistics Finland, 2004, "Business enterprises—net results and balance sheets 2002", Statistics Finland, Helsinki (in Finnish), http://pxweb2.stat.fi/sahkoiset_julkaisut/yritystoiminann_tulo_ja_taseet2002/html/tejulk.pdf
Stiglitz J E, 1988 *Economics of the Public Sector* 1st edition (Norton, London)
Stiglitz J E, Weiss A, 1981, "Credit rationing in markets with imperfect information" *American Economic Review* **71** 393 – 410
Storey D J, 1994 *Understanding the Small Business Sector* (Routledge, London)
Tervo H, 1989, "A micro-level approach to the analysis of the displacement effects of regional incentive policy: the case of Finland" *Regional Studies* **23** 511 – 521
Tervo H, 1990, "Factors underlying displacement: an analysis of Finnish regional incentive policy using survey data on assisted firms" *Applied Economics* **22** 617 – 628
Tervo H, 2005, "Regional policy lessons from Finland", in *Regional Disparities in Small Countries* Eds D Felsenstein, B A Portnov (Springer, Berlin) pp 267 – 282
Tokila A, Haapanen M, Ritsilä J, 2008, "Evaluation of investment subsidies: when is deadweight zero?" *International Review of Applied Economics* **22** 585 – 600
Venetoklis T, 2001, "Business subsidies and bureaucratic behaviour: a revised approach", VATT research reports 83, Government Institute for Economic Research, Helsinki, http://www.vatt.fi/file/vatt_publication_pdf/t83.pdf

Wallsten S J, 2000, "The effects of government-industry R&D programs on private R&D: the case of the small business innovation research program" *The Rand Journal of Economics* **31** 82 – 100
Wren C, 1996, "Fund substitution and the incentive effects of public investment subsidies" *Scottish Journal of Political Economy* **43** 534 – 548
Wren C, 1998, "Subsidies for job creation: is small best?" *Small Business Economics* **10** 273 – 281
Zimmermann H, 1985, "Der Mitnahmeeffekt: Inhalt und Meßkonzepte, dargestellt am Beispiel der Zuweisungen an Gemeinden" *Räumliche Aspekte des kommunalen Finanzausgleichs, Forschungs- und Sitzungsberichte der Akademie für Raumforschung und Landesplanung* **159** 293 – 311

Appendix

Table A1. Definitions of variables and their mean values.

Variable	Definition	Mean
Firm characteristics		
New firm	1 if the project is implemented by the new firm (definition by Statistics Finland); 0 otherwise.	0.218
Employees	The number of employees in the firm.	16.069
Turnover of firm	Annual turnover of the firm (€ million).	1.754
Project characteristics		
Project costs	Total project costs (ie purchasing cost of the fixed assets) as estimated by the firm in its subsidy application (€ million).	0.149
Intensity of assistance	Ratio of the grant to the total project costs (%).	32.182
Investment project	1 if the project is an investment project; 0 otherwise.	0.524
Start-up project	1 if it is about starting up a business; 0 otherwise.	0.107
Development project	1 if it is a development project (enhancing competitiveness or internationalization of enterprise); 0 otherwise. (Reference project type.)	0.369
Industry		
Metal	1 if the project is manufacturing of fabricated metal products; 0 otherwise.	0.255
Wood	1 if the project is manufacturing of wood and of products of wood and cork, including furniture, or of articles of straw and plaiting materials; 0 otherwise.	0.135
Other manufacturing	1 if the project is in another manufacturing industry; 0 otherwise.	0.255
Trade	1 if the project is in wholesale and retail trade, repair of motor vehicles, motorcycles and personal and household goods, or hotels and restaurants; 0 otherwise.	0.060
Transport	1 if the project is in transport, storage and communication, or financial intermediation; 0 otherwise.	0.020
Business	1 if the project is in real estate, renting, and business activities; 0 otherwise. (Reference industry.)	0.201
Other industries	1 if the project is in another industry; 0 otherwise.	0.074
Regional characteristics		
Unemployment rate	Unemployment rate (%) in the municipality where the firm is located. Source: Statistics Finland.	12.590
R&D expenditures	R&D expenditures (€100 million) in the NUTS 4 region where the firm is located. Source: Statistics Finland.	2.635
Year		
2000	1 if the funding was granted in 2000; 0 otherwise.	0.259
2001	1 if the funding was granted in 2001; 0 otherwise.	0.366
2002	1 if the funding was granted in 2002; 0 otherwise.	0.256
2003	1 if the funding was granted in 2003; 0 otherwise.	0.118

Notes. Only the projects of private firms are included. Industry dummies have been created using the TOL 2002 industrial classification. Means have been computed using the estimation sample, where observations with missing information have been deleted ($N = 4932$).

CHAPTER 4
EVALUATION OF DEADWEIGHT SPENDING IN REGIONAL ENTERPRISE FINANCING

Regional Studies, pp. 1–17, iFirst article

Routledge

Evaluation of Deadweight Spending in Regional Enterprise Financing

ANU TOKILA and MIKA HAAPANEN
Jyväskylä School of Business and Economics, University of Jyväskylä, PO Box 35, Jyväskylä FI-40014, Finland.
Emails: anu.tokila@econ.jyu.fi and mika.haapanen@econ.jyu.fi

(Received January 2009: in revised form May 2010)

TOKILA A. and HAAPANEN M. Evaluation of deadweight spending in regional enterprise financing, *Regional Studies*. The problem of deadweight spending has been previously studied using diverse methods. However, regional variations in deadweight spending have not yet been considered. An evaluation of regional business subsidies in Finland during 2000–2003 is conducted. The analysis reveals regional differences in deadweight spending in proportional and, particularly, in monetary terms. Deadweight spending is dependent on many firm-, project- and regional-level factors, which also largely account for regional differences. However, there seems to be some regional variation in deadweight spending that originates from differences in the subsidy processes among regions.

Enterprise financing   Regional policy   Deadweight spending   Business projects   Subsidies

TOKILA A. and HAAPANEN M. 衡量区域公司财政资助中的无谓损失，区域研究。无谓损失的问题前人在研究中已通过多种方法进行了讨论。然而，无谓损失中存在的区域差异却至今鲜有人涉及。我们对芬兰2000－2003年间的区域商业资助进行了评估。分析揭示出无谓损失在其所占比例以及货币形式上存在的区域差异。无谓损失取决于公司，项目以及区域等多种要素，而上述因素同时也多是形成区域差异的原因。然而，某些无谓损失中存在的区域差异似乎是源自区域间资助过程本身的差异。

公司财政   区域政策   无谓损失   商业项目   资助

TOKILA A. et HAAPANEN M. Evaluer les investissements non-productifs dans l'aide régionale à la création d'entreprise, *Regional Studies*. Dans le passé, la question des investissements non-productifs a été étudiée à partir de diverses méthodes. Cependant, la variation régionale des investissements non-productifs n'a pas prêté jusqu'ici beaucoup d'attention. On évalue les subventions en faveur des entreprises régionales en Finlande entre 2000 et 2003. L'analyse laisse voir des variations régionales des investissements non-productifs quant à leurs montants disproportionnés et, notamment, en termes monétaires. Les investissements non-productifs dépendent de plusieurs facteurs aux niveaux de l'entreprise, du projet et de la région qui expliqent aussi dans une large mesure d'importantes variations régionales. Toujours est-il que dans une certaine mesure la variation des investissements non-productifs remonte aux divergences de l'affectation régionale des subventions.

Aide à la création d'entreprise   Politique régionale   Investissements non-productifs   Projets commerciaux   Subventions

TOKILA A. und HAAPANEN M. Untersuchung von verlorenen Zuschüssen bei der Finanzierung regionaler Unternehmen, *Regional Studies*. Das Problem der verlorenen Zuschüsse wurde bereits früher mit Hilfe verschiedener Methoden untersucht. Allerdings wurden hierbei regionale Abweichungen bei den verlorenen Zuschüssen bisher nicht berücksichtigt. Wir untersuchen die regionalen Subventionen für Firmen in Finnland im Zeitraum von 2000 bis 2003. Aus der Analyse gehen regionale Unterschiede bei den verlorenen Zuschüssen in proportionaler und insbesondere monetärer Hinsicht hervor. Die verlorenen Zuschüsse hängen von zahlreichen Faktoren auf Firmen-, Projekt- und Regionalebene ab, die zum großen Teil auch regionale Unterschiede erklären. Allerdings scheint es bei den verlorenen Zuschüssen einige regionale Abweichungen zu geben, die von den Unterschieden zwischen den Subventionsprozessen der einzelnen Regionen herrühren.

Unternehmensfinanzierung   Regionalpolitik   Verlorene Zuschüsse   Geschäftsprojekte   Subventionen

TOKILA A. y HAAPANEN M. Valoración del subsidio perdido en la financiación empresarial regional, *Regional Studies*. El problema del subsidio perdido ha sido previamente estudiado mediante varios métodos. Sin embargo, todavía no se han considerado las variaciones regionales del subsidio perdido. Aquí realizamos una evaluación de los subsidios comerciales regionales en Finlandia entre 2000 y 2003. El análisis muestra las diferencias regionales en el subsidio perdido en términos proporcionales y, en particular, monetarios. El subsidio perdido depende de muchos factores a nivel de las empresas, los proyectos y las regiones, lo que también explica en gran medida las diferencias regionales. Sin embargo, parece haber algunas variaciones regionales en el subsidio perdido que se deben a las diferencias en los procesos de subsidios entre las regiones.

0034-3404 print/1360-0591 online/10/000001-17 © 2010 Regional Studies Association   DOI: 10.1080/00343404.2010.497134
http://www.regional-studies-assoc.ac.uk

Downloaded By: [Valtion Taloudellinen Tutkimuskeskus] At: 07:06 18 January 2011

Financiación empresarial Política regional Subsidio perdido Proyecto comerciales Subsidios

JEL classifications: H25, L53, R58

Downloaded By: [Valtion Taloudellinen Tutkimuskeskus] At: 07:06 18 January 2011

INTRODUCTION

Many governments, especially in Organisation for Economic Co-operation and Development (OECD) countries, grant business subsidies to promote growth and employment in regions that lag behind economically (GLANCEY and MCQUAID, 2000; OECD, 2000). The European Union and all its member states also provide this type of subsidies (for example, MERCADO *et al.*, 2001; and MOLLE, 2007). Two main arguments, namely, equity and efficiency, motivate these subsidies. The equity argument states that the government should aim to equalize regional levels of development and thus should help firms with economic problems in economically backward regions. The firms in these regions do not benefit from agglomeration effects, which might lead to growing polarization between regions without government intervention (BERGSTROM, 2000). The second argument regarding efficiency emphasizes the role of the government in reducing different market failures that hinder firms from implementing profitable projects. Such market failures are found to be higher in more geographically remote regions (COVAL and MOSKOWITZ, 1999). However, government efforts to correct market failures may lead to government failure in such efforts due to inefficient interventions (for example, WINSTON, 2006).

A loss of efficiency may arise from at least two reasons. Public subsidies may encourage inefficient firms to take on non-profitable operations. CABALLERO *et al.* (2009) recently showed how this kind of subsidizing leads to lower levels of job creation, higher levels of job destruction as well as lower productivity. Inefficiencies may also arise if firms could implement their projects even without public subsidies. The present authors are interested in deadweight spending, that is, funding allocated to this kind of non-additional projects. This topic has become increasingly important in European Union expenditure evaluations in which context the demands to maximize the added value of spending have risen (MAIRATE, 2006).

Deadweight spending has been studied using a variety of methods (for example, ROBINSON *et al.*, 1987; FOLEY, 1992; and DE KONING, 1993); some studies have even focused on spending in regionally allocated subsidies (LENIHAN, 1999, 2004; TOKILA and HAAPANEN, 2009). However, a regional comparison of deadweight spending has been absent in previous studies, even though most subsidy schemes are allocated on a regional basis. European Union regional aid is also granted according to the level of disadvantage experienced by a region and it absorbs the largest share of the European Union budget (for example, BALDWIN and WYPLOSZ, 2006). Many critics consider the European regional (that is, cohesion) policy very inefficient, taking up a lot of resources and employing an army of bureaucrats (MOLLE, 2007). Thus, given the size of the expenditures, it is relevant whether or not this amount of public money is wasted spending.

If a policy is well specified, deadweight spending should be minimal, and no regional differences should emerge. To analyse this question, an *ex-ante* evaluation of the regional business subsidies in Finland during 2000–2003, which is the beginning of the recent European Union programme period 2000–2006, is conducted. More precisely, possible deadweight loss is measured from the *ex-ante* perspective. Using a five-step scale, company analysts rank each applicant project before subsidizing according to their possible deadweight level. The paper (1) develops a method for financial measurement of regional deadweight spending, (2) aims at explaining determinants and differences of them, and (3) gives policy recommendations of alternative subsidy schemes. An *ex-ante* evaluation is based on information available before the implementation of projects, and as such it is needed to ensure the internal coherence of the programme (JAKOBY, 2006). It can also be used to improve the planning of future European Union regional policy programmes. As assessed *ex-ante*, deadweight spending represents funding that is accepted as wasted in advance. That is, it is not necessarily the same as deadweight spending realized *ex-post* (cf. TOKILA and HAAPANEN, 2009).

Next, the previous literature on deadweight spending is discussed. The Finnish subsidy system is briefly described, followed by a discussion of the unique data, which include 5744 private-sector business projects that were granted public subsidies of nearly €205 million during 2000–2003. Deadweight spending is estimated for the National Assisted Areas of European regional policy. The descriptive results show substantial regional differences in deadweight spending, which contradicts the hypothesis that the allocation of subsidies is coherently specified. To provide an explanation, an ordered probit model is estimated for each Assisted Area. A decomposition analysis is implemented to study the extent to which pairwise regional differences in the deadweight spending can be explained by differences in business projects across the Assisted Areas.

Before the concluding remarks, the policy implications for alternative policy schemes are discussed. These alternative scenarios are formed on the future predictions of business subsidy schemes according to which the subsidies will be diminished and concentrated only on the poorest regions (for further details, see COUNCIL OF THE EUROPEAN UNION, 2006; and EUROPEAN COMMISSION, 2004a, 2004b).

LITERATURE ON DEADWEIGHT SPENDING

Deadweight spending can be defined and estimated in different ways. Generally, it is measured as that percentual share of a subsidy that is not required to implement a project. Deadweight spending can also be measured in terms of employment non-additionality, that is, in terms of jobs that would have been created without the subsidy (for example, PICARD, 2001; and LENIHAN and HART, 2006). Both approaches are used to evaluate different kinds of subsidies, but in the end they both describe the same phenomenon, namely public finance that is not strictly required. In this study deadweight spending is defined as wasted spending in monetary terms, whereas the degree of deadweight refers to its proportional share from the subsidy. Deadweight spending is calculated from the total amount of public subsidy granted to each project multiplying that by the degree of deadweight.

Theoretically, deadweight is defined as one of the two counterfactual components of additionality;[1] the other is displacement.[2] Additionality measures the net sum of the direct and indirect impacts of intervention, whereas possible deadweight and displacement tend to reduce them. At the project level, deadweight can be identified as non-additionality (LUUKKONEN, 2000), which is the extent to which projects would have gone ahead even without public assistance (also ROBINSON *et al.*, 1987). The studies on deadweight represent 'external reviews on financial efficiency' in the field of policy evaluation (see the classification in TUROK, 1990). These studies emphasize efficiency in the provision of public finance instead of effectiveness in generating desired economic outcomes (FOLEY, 1992). The interest in deadweight developed substantially in the 1980s (for example, LAYARD and NICKELL, 1980; ZIMMERMANN, 1985; and ROBINSON *et al.*, 1987). Along with the increasing importance of European Union regional policy, the concept of deadweight and other related topics have been brought back into academic debate (LENIHAN, 1999, 2004; LUUKKONEN, 2000; PICARD, 2001; HEIJS, 2003; LENIHAN and HART, 2004; LENIHAN *et al.*, 2005; TOKILA *et al.*, 2008).

Since deadweight spending represents a loss of efficiency, the goal of the government should be to avoid or minimize deadweight spending. The evidence from prior studies shows that deadweight spending is a serious problem. While the actual results vary according to the projects examined and the assumptions made, deadweight spending has been observed to be as large as 90% of subsidies (for example, FOLEY, 1992), although DE KONING (1993) discovered deadweight spending as low as 40%. LENIHAN (1999) and LENIHAN *et al.* (2005) found deadweight spending between 40% and 80%. LENIHAN and HART (2004) estimated the range of deadweight spending to be 42.6–55.8%, but their recent study (LENIHAN and HART, 2006) pegged this figure even higher at 73.2%. TOKILA and HAAPANEN (2009) provided rather inexact previous figures from Finland. They estimated deadweight spending between 0.2% and 63.5% using a public assessment.

Even if policies are planned carefully, deadweight spending is not completely avoidable because the government never has full information about a firm's actions in the absence of the subsidy (LAYARD and NICKELL, 1980). The source of deadweight spending lies in the asymmetry of information between the government and the private firm (PICARD, 2001). This logic is supported by TOKILA and HAAPANEN (2009) with respect to Finnish data.

DATA AND BUSINESS SUBSIDIES

The Finnish Ministry of Trade and Industry (Kauppa- ja teollisuusministeriö) is the major distributor of aid to business, with over 50% of all subsidy appropriations in Finland. Although it participates in business venturing through many instruments such as loans and guarantees, the authors are concerned with non-repayable grant subsidies, that is, the recipient firm is not obliged to pay back the grant to the distributor.[3] In the programme period 2000–2006, three types of direct business subsidies were available for firms: subsidies for investments, business start-ups and development projects. These subsidies were granted to micro-, small and medium-sized enterprises[4] as well as larger enterprises in rare cases.

Investment subsidies can be granted to a firm for fixed asset investment projects when the firm is starting its business, expanding its operations or modernizing its fixed assets. A start-up subsidy can be granted to a small business starting its operations. Development subsidies can be granted for projects that enhance the competitiveness or internationalization of an enterprise in the long-term (MINISTRY OF TRADE AND INDUSTRY, 2006). For development projects, the intensity of assistance is generally higher, reaching up to 50% of accepted costs. Start-ups are eligible to support up to 45% of accepted costs. With regard to investment projects, small firms may be granted 10–30% of costs and medium-sized firms 5–20% of costs, but these figures are only directive and depend on the National Assisted Areas (for details, see below) (MINISTRY OF JUSTICE, 2000).

The subsidies are administered from the fifteen local Employment and Economic Development Centres, where they are also mostly granted.[5] To be subsidized,

Downloaded By: [Valtion Taloudellinen Tutkimuskeskus] At: 07:06 18 January 2011

Downloaded By: [Valtion Taloudellinen Tutkimuskeskus] At: 07:08 18 January 2011

a business must present feasible project and financing plans along with an assessment made by the company analysts who deal with subsidy applications at the Employment and Economic Development Centres. In the assessment process, the project, the applicant firm, and the need for public finance are fully described and evaluated. In addition, the predicted impacts of the project must be favourable.

The present authors investigate deadweight spending in projects for which the Ministry of Trade and Industry granted subsidies between 2000 and 2003.[6] The data set is comprised of all financed projects, though only those conducted by private-sector firms were selected for analysis.[7] The total amount of subsidies granted to the 5744 projects under study was nearly €205 million. In terms of project costs, their total value was €906 million with an average of €158000 (for details, see Table 2). The data set is more extensive than that used by many previous studies on deadweight spending (see the reviews by FOLEY, 1992; and LENIHAN *et al.*, 2005). It includes a broad range of advance information on firms and their projects (Table 4). Importantly, the register data set also contains information on the assessment process through which the project and the firm are evaluated *ex-ante*. This advance view on deadweight spending distinguishes the present study from many previous, *ex-post* studies that have used data collected after the project (for example, LENIHAN, 1999, 2004; however, for *ex-ante* evaluations, see ROPER *et al.*, 2004).

A fundamental difficulty in any type of evaluation is to establish what would have happened in the absence of intervention (MARTIN and TYLER, 2006; see also the discussion by BASLÉ, 2006). In this study, the counterfactual is formed in an assessment in which company analysts answer a hypothetical question of what will happen if the project were not subsidized; in other words, this question evaluates the level of deadweight. The assessment is based on an extensive analysis of the firm and its market, industry and regional conditions. The possible deadweight options are as follows:

(1) The project will be abandoned.
(2) The project will be implemented at a reduced scale.
(3) The project will be implemented at a reduced qualitative level.
(4) The project will be implemented at a later date.
(5) The project will be implemented unchanged.

Hence, the first option implies zero deadweight; the second to fourth options imply partial degrees of deadweight; and the fifth option implies pure deadweight. This *ex-ante* deadweight evaluation represents the public-sector assessment of the necessity of a subsidy. Thus, it is not necessarily equivalent to the firm's true need for a public subsidy, but rather it can be interpreted as accepted wasted money, since the projects are subsidized even on the condition that they yield deadweight spending.

The frequency distribution of this deadweight measure is shown in Table 1. Over 80% of projects would have been implemented to some degree even without a subsidy. Thus, some form of deadweight exists in most projects.[8]

This assessment is used in the calculation of deadweight spending, which measures the amount of spending on non-additional shares of the project. In practice, deadweight spending, d_i, is computed by multiplying the amount of public subsidy for project i, s_i, by the degree of deadweight, δ_{ij}:

$$d_i = s_i \delta_{ij} \qquad j = 1, 2, \ldots, 5 \tag{1}$$

where the degree of deadweight varies between 0% and 100%. Clearly, $\delta_1 = 0$ when deadweight is zero, and $\delta_5 = 1$ in the case of pure deadweight.

The three levels of partial deadweight are more problematic to convert into exact degrees of deadweight. To assist this process, 221 firms were interviewed after the initiation of their respective projects. The firms that reported a reduction in project scale described that without the subsidy the size of a project would be less intensive in terms of physical investments or services. A reduction in the qualitative level instead indicates that without a subsidy the firm would purchase less technologically advanced or second-hand machinery; the firm may also use less qualified consultation or training. A later date indicates that the implementation of a project is delayed generally six to twelve months, though it can be delayed by up to thirty-six months.

These qualitative findings together with the assessment guides of the Ministry of Trade and Industry imply that the degree of (partial) deadweight is lower when it involves a reduction in scale than when it involves a reduction in qualitative level and highest when the project is only projected to start at a later date (see also LENIHAN and HART, 2004). Without exact a priori knowledge, it is at first assumed that the degree of deadweight increases in even intervals. That is, $\delta_2 = 0.25$ (reduced scale), $\delta_3 = 0.50$ (reduced qualitative level) and $\delta_4 = 0.75$ (a later date). Since the estimates depend on this operationalization, other scales are used to check that this assumption is not driving the results (see the Appendix).

For the regional analysis, the National Assisted Areas classification during the programme period 2000–2006

Table 1. Frequency distribution of deadweight

Deadweight	Number of observations	Percentage
1. Zero deadweight	967	16.8
2. Reduced scale	2264	39.4
3. Reduced qualitative level	1640	28.6
4. Later date	791	13.8
5. Full deadweight	82	1.4
Total	5744	100

Downloaded By: [Valtion Taloudellinen Tutkimuskeskus] At: 07:08 18 January 2011

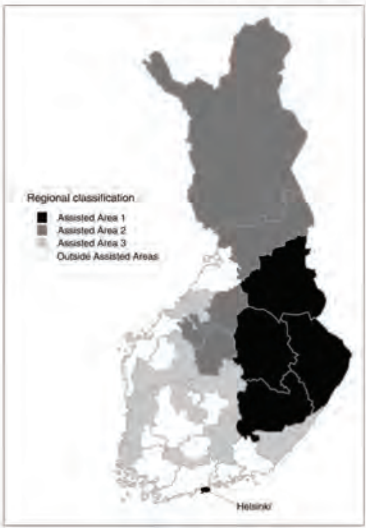

Fig. 1. National Assisted Areas in Finland, 2000–2006 (with the borders of NUTS-3 [Nomenclature des Unités Territoriales Statistiques] regions)

is used (Fig. 1). This classification is based on the regional level of development and development needs. Assisted Areas 1 and 2 have higher rates of unemployment and weaker economic growth rates than the national average. Their economies depend heavily on the public sector as well as on agriculture and forestry. These two areas are identical to the European Union's Objective 1 Programme Area (that is, Northern and Eastern Objective 1). Assisted Area 3 closely resembles the European Union's Objective Programme Area 2. Despite their confusing official name, 'outside Assisted Areas' are eligible for some, though the smallest amount, of assistance.

Table 2 displays key descriptive statistics by region (see also Table 4 and Table A1 in the Appendix). According to Article 87 of the treaty establishing the European Community, public subsidies should be mainly targeted at lagging and peripheral regions (that is, National Assisted Area 1). Hence, it is quite surprising to find that the intensity of assistance is on average almost as high in Assisted Area 1 as it is outside the Assisted Areas. Although more public subsidies are on average given to projects in Assisted Area 1 than outside the Assisted Areas, the project costs are also highest in Assisted Area 1. At the aggregate level, the largest shares of total assistance are allocated to Assisted Areas 1 and 3, even though the number of subsidized projects is highest outside the Assisted Areas.

Regional deadweight measures are presented in Table 3. They show that the regional average of project-level deadweight spending varies between 32.3% in Assisted Area 1 and 38.2% in Assisted Area 3. The regional differences in average deadweight spending in monetary terms are more substantial. Average deadweight spending (€) is negatively associated with regional development and is highest in Assisted Area 1. This result turned out to be robust to the methodological choices (see the discussion in the Appendix). Furthermore, the descriptive results in Tables 2 and 3 together suggest that regional differences in deadweight spending (€) are due to the relatively large amount of public subsidies given for projects in Assisted Area 1 rather than to a greater degree of deadweight (%). The largest amount of wasted subsidies (€19.5 million) occurs in Assisted Area 3. Overall, €64.1 million can be regarded as wasted spending.

METHODS

The level of project deadweight is measured using an ordered, five-level scale ranging from 1 to 5. To

Table 2. Description of project characteristics by region

Project characteristics	Assisted Area 1	Assisted Area 2	Assisted Area 3	Outside Assisted Areas	All areas
Project-level averages					
Public subsidies (€, thousands)	63.2	47.5	31.1	21.2	35.6
	(197.7)	(120.1)	(70.0)	(25.7)	(106.0)
Project costs (€, thousands)	209.6	177.4	193.8	91.8	157.8
	(685.8)	(506.5)	(1231.0)	(194.5)	(790.2)
Intensity of assistance (%)	36.0	32.2	27.1	34.9	32.3
	(8.5)	(9.9)	(15.2)	(16.3)	(14.5)
Aggregate level					
Public subsidies (€, thousands)	67959	35554	57412	44002	204917
Project costs (€, thousands)	225303	132668	357836	190403	906210
Intensity of assistance (%)	30.2	26.8	16.0	23.1	22.6
Number of observations	1075	748	1846	2075	5744

Note: Standard deviations are given in parentheses below the means.

Table 3. Deadweight and deadweight spending by region

	Assisted Area 1	Assisted Area 2	Assisted Area 3	Outside Assisted Areas	All areas
Distribution of deadweight					
Zero deadweight (%)	24.6	18.3	14.2	14.6	16.8
Reduced scale (%)	38.1	34.1	36.9	44.2	39.4
Reduced qualitative level (%)	23.3	30.9	31.3	28.0	28.6
Later date (%)	11.5	16.3	17.0	11.2	13.8
Full deadweight (%)	2.5	0.4	0.5	2.0	1.4
Total (%)	100.0	100.0	100.0	100.0	100.0
Average project-level deadweight spending (%)	32.3	36.6	38.2	35.5	35.9
	(26.0)	(24.6)	(23.8)	(23.5)	(24.3)
Average project-level deadweight spending	16.9	14.7	10.5	7.4	11.1
(€, thousands)	(57.1)	(34.4)	(22.5)	(11.5)	(31.4)
Total deadweight spending (€, thousands)	18161.6	10977.2	19466.4	15456.6	64061.7
Number of observations	1075	748	1846	2075	5744

Note: Standard deviations are given in parentheses below the means.

Downloaded By: [Valtion Taloudellinen Tutkimuskeskus] At: 07:56 18 January 2011

model its determination, an ordered probit model is estimated for each region r (Assisred Areas 1, 2, 3 and outside Assisted Areas). In each of these four regions, it is assumed that y_{ir}, the observed deadweight level associated with project i, is determined according to a latent variable y_{ir}^*:

$$y_{ir}^* = \beta_r' x_{ir} + \varepsilon_{ir}, \quad i = 1, 2, \ldots, N_r, \quad r = 1, 2, 3, 4$$
$$y_{ir} = j, \quad \text{if} \quad \kappa_{(j-1)r} < y_{ir}^* \leq \kappa_{jr}, \quad j = 1, 2, \ldots, 5$$
$$\varepsilon_{ir} \sim N(0, 1), \quad \sum_r N_r = N \tag{2}$$

where x_{ir} is the vector of independent variables; $\boldsymbol{\beta}_r$ is a vector of unknown coefficients for a region r; and κ_i is an unknown threshold parameter with $\kappa_0 = -\infty$ and $\kappa_5 = \infty$. For each region, the disturbance term, ε_{ir}, is assumed to have a standard normal distribution. N_r is the number of observations in region r; and N is the total number of observations.

To explain the determination of the deadweight level in each region, variables describing the characteristics of the firm, its project and its region are used (Table 4) (for descriptive statistics, see Table A1 in the Appendix). The theoretical hypotheses of these variables are drawn from the access to finance and risk literature.

The dummy variable for a new firm indicates whether a firm was founded within a year or has been operating for a longer time. The size of a firm is measured in terms of employees and annual turnover as well as using a self-employment dummy.[9] A firm's access to finance is likely to increase with business experience and size (STOREY, 1994; WREN, 1998). Young firms do not have much evidence to show their level of competence and trustworthiness. Banks and other lenders may be too risk-averse or simply too unfamiliar with the new business to lend the money needed during a firm's early non-profitable and risky years. Small firms may also face financial constraints. Thus, public finance is more crucial for new and small firms, and thus wasted spending on these firms can be assumed to be relatively low.

Alongside the characteristics of a firm, attention must be paid to the characteristics of the project as it may have risk attributes distinct from the firm itself. Project costs and public subsidies are included as well as the intensity of assistance, the latter of which measures the amount of subsidies relative to project costs. A high intensity of assistance may indicate dependence on public finance and thus decrease deadweight. At the same time, a high intensity and a large amount of public assistance may increase the chances of generating finance from the private sector. Three dummy variables control for the project type. Start-up projects are assumed to have low deadweight due to the risks in starting a business.

Seven industry dummies capture the influence of factors common to all projects belonging to the same industry. Wood and transport industries are assumed to show low rates of deadweight, as these industries are capital intensive and have traditionally been supported by the state (for further analysis, see JUNKA, 1998). Regional characteristics include unemployment rates, and disposable income and research and development expenditure per capita. A low level of disposable income and a high unemployment rate indicate a low regional level of purchasing power, which can have a negative effect on the financial capacity of firms, thus inducing a severe need for subsidies. High research and development is often connected to low levels of deadweight at the project level (for example, HEIJS, 2003), since it is linked with a positive social externality from which economic benefits are not fully incorporated by the firm. At the regional level the effect can also be the opposite, since the firm may benefit from others' research and development investments in the region. Because the analysed projects are from four consecutive years

Downloaded By: [Valtion Taloudellinen Tutkimuskeskus] At: 07:08 18 January 2011

Table 4. Definitions of variables

Variable	Definition
Firm characteristics	
New firm	1 if the project is implemented by a new firm that is up and running in the subsidy year (definition by Statistics Finland); 0 otherwise
Self-employed	1 if the project is implemented by a self-employed person; 0 otherwise
Employees[a]	Number of employees in the firm
Turnover of the firm[a]	Annual turnover of firm (€, millions)
Project characteristics	
Project costs	Total project costs (that is, the purchasing cost of the fixed assets) as estimated by the firm in its subsidy application (€10 000)
Public subsidy	Amount of public subsidy to the business project (€10 000)
Intensity of assistance	Ratio of the public subsidy to the project costs (%)
Investment project	1 if the project is an investment project; 0 otherwise
Start-up project	1 if it is about starting up a business; 0 otherwise
Development project	1 if it is a development project (enhancing competitiveness or internationalization of enterprise); 0 otherwise (reference)
Industry	
Metal	1 if the project is manufacturing of fabricated metal products; 0 otherwise
Wood	1 if the project is manufacturing of wood and of products of wood and cork, including furniture, or of articles of straw and plaiting materials; 0 otherwise
Other manufacturing	1 if the project is in another manufacturing industry (including textiles, rubber and plastic products, food products and beverages); 0 otherwise
Trade	1 if the project is in wholesale and retail trade, repair of motor vehicles, motorcycles and personal and household goods, or hotels and restaurants; 0 otherwise
Transport	1 if the project is in transport, storage and communication, or financial intermediation; 0 otherwise
Business services	1 if the project is in real estate, renting and business activities; 0 otherwise (reference)
Other industries	1 if the project is in another industry; 0 otherwise
Regional characteristics	
Unemployment rate	Unemployment rate (%) in the NUTS-4 region where the firm is located. *Source:* Ministry of Employment and the Economy
Disposable income	Disposable income (€, thousands) per capita in the NUTS-4 region where the firm is located. *Source:* Statistics Finland
Research and development expenditure	Research and development expenditure (€, thousands) per capita in the NUTS-4 region where the firm is located. *Source:* Statistics Finland
Location[b]	
Assisted Area 1	1 if the project is implemented in National Assisted Area 1; 0 otherwise
Assisted Area 2	1 if the project is implemented in National Assisted Area 2; 0 otherwise
Assisted Area 3	1 if the project is implemented in National Assisted Area 3; 0 otherwise
Outside Assistance Areas	1 if the project is implemented outside National Assisted Areas 1–3; 0 otherwise

Notes: Only projects of private firms are included. Data also include four year dummies (2000–2003) that describe when funding was granted. Industry dummies were created using the TOL 2002 industrial classification.

[a]Observations with missing information were imputed.

[b]For a description of the Assisted Areas, see MINISTRY OF JUSTICE (2000); see also Fig. 1.

NUTS, Nomenclature des Unités Territoriales Statistiques.

(2000–2003), annual changes in deadweight spending can be captured with three separate year dummies. It is expected that deadweight is largest at the beginning of the programme period in 2000; that is, grants are probably distributed more loosely when plenty of money still exists.

After estimating the model for the level of deadweight, the expected value of deadweight spending, $E(d_{ir})$, is computed as follows:

$$E(d_{ir}) = s_{ir} \sum_{j=1}^{5} \delta_j P(y_{ir} = j) \qquad (3)$$

where s_{ir} is the amount of subsidy given to project i in region r; and δ_j is the assumed degree of deadweight at that level (see equation 1). $P(y_{ir} = j)$ is the estimated probability of deadweight level j, which is computed using the ordered probit model (GREENE, 2008, p. 832). To evaluate the impact of particular explanatory variables on expected deadweight spending, the average marginal effects are used (for formulas and a discussion, see the Appendix).

The descriptive analysis showed substantial regional differences in average deadweight spending. These regional differences may simply result from discrepancies in the observed characteristics of the business projects and firms, or they may result from various characteristics having divergent effects on deadweight

Downloaded By: [Valtion Taloudellinen Tutkimuskeskus] At: 07:56 18 January 2011

spending. To evaluate the amount explained by the observed differences in these characteristics, NEUMARK's (1988) decomposition analysis is adopted (for more details on this approach, see also OAXACA and RANSOM, 1994; and BAUER and SINNING, 2008). Namely, the difference in the expected deadweight spending between two regions, *A* and *B*, is expressed as follows:

$$\begin{aligned} E(d_{iA}|x_{iA}) - E(d_{iB}|x_{iB}) = &\left[E_{\beta^*}(d_{iA}|x_{iA}) - E_{\beta^*}(d_{iB}|x_{iB})\right] \\ &+ \left[E_{\beta_A}(d_{iA}|x_{iA}) - E_{\beta^*}(d_{iA}|x_{iA})\right] \\ &+ \left[E_{\beta^*}(d_{iB}|x_{iB}) - E_{\beta_B}(d_{iB}|x_{iB})\right] \end{aligned} \quad (4)$$

The first term in square brackets on the right-hand side estimates the impact of the differences in the observed characteristics assuming similar behaviour across regions, whereas the two latter terms estimate the behavioural differences assuming the same observed characteristics. A pooled model is used to derive the coefficient vector β^* in the absence of regional differences in the determination of deadweight spending. It captures the general structure of deadweight spending in the two regions under comparison. In practice, for each pairwise comparison of regions, three models are estimated: one for region *A*, one for region *B*, and a pooled model for regions *A* and *B*. Expected deadweight spending values are then calculated for each observation in the two regions, and the terms in equation (4) are computed using regional averages of these predictions.

RESULTS

Table 5 displays the estimation results of the ordered probit models for deadweight (see equation 2). The first four columns provide estimates for the Assisted Areas, followed by estimates for the entire country. The latter estimates, however, conceal significant differences in the estimated behavioural parameters across the four areas; an approximate likelihood ratio (LR) test clearly rejected the homogenous specification in column 5.[10] Therefore, it can be concluded that the separate regional models reported in columns 1–4 are warranted. However, these results are not discussed in more detail as they are only an intermediate step in

Table 5. Parameter estimates of the ordered probit models

Variable	Assisted Area 1	Assisted Area 2	Assisted Area 3	Outside Assisted Areas	All Areas
New firm	−0.090	−0.030	−0.078	0.000	−0.030
Self-employed	−0.092	0.228	−0.143	−0.600***	−0.205***
Employees	0.000	−0.002	−0.003*	0.002	0.000
Turnover of firm	0.015	0.019	0.023**	−0.004	0.011*
Public subsidy	−0.054**	−0.055*	−0.018**	0.013	−0.006
Project costs	0.013**	0.010	0.000	−0.003	−0.001
Intensity of assistance	0.013	−0.009	−0.012*	−0.018***	−0.016***
Investment project[a]	0.246	−0.063	0.001	−0.247	−0.179**
Start-up project[a]	0.188	0.102	−0.265**	0.097	−0.009
Metal[b]	−0.191*	0.034	−0.109	−0.055	−0.100**
Wood[b]	−0.412***	−0.178	−0.144	−0.061	−0.182***
Other manufacturing[b]	−0.211**	0.010	−0.158*	0.010	−0.098**
Trade[b]	−0.142	0.078	−0.105	−0.100	−0.047
Transport[b]	−0.208	0.031	−0.381	−0.174	−0.122
Other industries[b]	−0.282*	−0.106	0.036	0.069	−0.022
Unemployment rate	−0.011	0.026**	−0.039**	0.037***	0.014**
Disposable income	−0.162	−0.056	−0.009	0.119***	0.040**
Research and development expenditure	−0.017	−0.076	0.221**	−0.046	0.002
2000[c]	0.076	0.086	0.234*	0.073	0.176***
2001[c]	−0.198	−0.053	0.031	0.178**	0.054
2002[c]	−0.167	−0.133	0.057	0.125	0.026
Threshold parameters					
κ_1	−2.460	−1.551	−2.149***	0.308	−0.934***
κ_2	−1.425	−0.560	−1.012	1.617***	0.203
κ_3	−0.644	0.379	−0.077	2.532***	1.089***
κ_4	0.281	2.115**	1.581**	3.478***	2.271***
Log-likelihood	-1469.38	-995.77	-2414.55	-2700.28	-7712.38
Number of observations	1075	748	1846	2075	5744

Notes: The dependent variable is the level of deadweight (1, 2, 3, 4, 5) in project *i*. Estimated parameters are reported. Significance levels are based on robust standard errors. *Statistically significant at the 10% level; **statistically significant at the 5% level; and ***statistically significant at the 1% level. Definitions of variables are given in Table 4.

[a]Reference project category is development project.

[b]Reference industry is business services.

[c]Reference year is 2003.

Downloaded By: [Valtion Taloudellinen Tutkimuskeskus] At: 07:06 18 January 2011

the computation of expected deadweight spending and the average marginal effects.

The average marginal effects show the direction and size of the effects on deadweight spending (Table 6). To allow for comparison across the Assisted Areas, the average percentage change in expected deadweight spending is reported in square brackets below the marginal effect. The implications of the methodological choices on these results are discussed in the Appendix.

As expected, deadweight spending tends to be smaller in projects implemented by recently established firms, *ceteris paribus*. The marginal effect is largest in Assisted Area 1, which is the area with the lowest level of economic development; expected deadweight spending decreases on average by €1158 (−6.6%), but the effect is not statistically significant. Outside the Assisted Areas, deadweight spending is much smaller at −34% for projects run by a self-employed person

Table 6. Average marginal effects on deadweight spending (€, thousands)

Variable	Assisted Area 1	Assisted Area 2	Assisted Area 3	Outside Assisted Areas	All Areas
New firm	−1.158	−0.291	−0.499	−0.001	−0.221
	[−6.6%]	[−1.9%]	[−4.5%]	[0.0%]	[−1.9%]
Self-employed	−1.175	2.240	−0.906	−2.544***	−1.481***
	[−6.8%]	[14.5%]	[−8.2%]	[−33.9%]	[−12.7%]
Employees (ten persons)	0.004	−0.016	−0.018*	0.010	0.001
	[0.0%]	[−0.1%]	[−0.2%]	[0.1%]	[0.0%]
Turnover of the firm (€, millions)	0.189	0.187	0.147**	−0.019	0.082
	[1.1%]	[1.2%]	[1.3%]	[−0.3%]	[0.7%]
Public subsidy (€10000)	−0.699**	−0.537	−0.112	0.061	−0.046
	[−4.0%]	[−3.5%]	[−1.0%]	[0.8%]	[−0.4%]
Project costs (€10000)	0.171*	0.097	−0.002	−0.013	−0.009
	[1.0%]	[0.6%]	[0.0%]	[−0.2%]	[−0.1%]
Intensity of assistance (%)	0.170	−0.091	−0.078*	−0.082***	−0.121***
	[1.0%]	[−0.6%]	[−0.7%]	[−1.1%]	[−1.0%]
Investment project[a]	3.079	−0.613	0.006	−1.109	−1.331**
	[20.9%]	[−3.9%]	[0.1%]	[−14.5%]	[−10.7%]
Start-up project[a]	2.336	1.003	−1.662**	0.449	−0.071
	[15.9%]	[6.3%]	[−15.0%]	[5.9%]	[−0.6%]
Metal[b]	−2.562*	0.331	−0.699	−0.251	−0.746**
	[−12.7%]	[2.1%]	[−6.0%]	[−3.4%]	[−6.1%]
Wood[b]	−5.347***	−1.723	−0.922	−0.276	−1.349***
	[−26.7%]	[−10.9%]	[−7.9%]	[−3.7%]	[−11.0%]
Other manufacturing[b]	−2.826*	0.099	−1.013*	0.048	−0.734**
	[−14.1%]	[0.6%]	[−8.7%]	[0.6%]	[−6.0%]
Trade[b]	−1.925	0.760	−0.672	−0.453	−0.354
	[−9.6%]	[4.8%]	[−5.8%]	[−6.0%]	[−2.9%]
Transport[b]	−2.786	0.299	−2.409	−0.780	−0.911
	[−13.9%]	[1.9%]	[−20.7%]	[−10.4%]	[−7.4%]
Other industries[b]	−3.740*	−1.025	0.232	0.318	−0.163
	[−18.6%]	[−6.5%]	[2.0%]	[4.2%]	[−1.3%]
Unemployment rate (%)	−0.138	0.250**	−0.246**	0.167***	0.101**
	[−0.8%]	[1.6%]	[−2.2%]	[2.3%]	[0.9%]
Disposable income (€, thousands, per capita)	−2.101	−0.549	−0.057	0.544***	0.298**
	[−12.2%]	[−3.5%]	[−0.5%]	[7.3%]	[2.6%]
Research and development expenditure (€, thousands, per capita)	−0.224	−0.735	1.408**	−0.210	0.011
	[−1.3%]	[−4.7%]	[12.8%]	[−2.8%]	[0.1%]
2000[c]	1.010	0.840	1.491*	0.328	1.298***
	[5.5%]	[5.4%]	[14.5%]	[4.8%]	[11.8%]
2001[c]	−2.532	−0.517	0.195	0.804**	0.395
	[−13.9%]	[−3.3%]	[1.9%]	[11.7%]	[3.6%]
2002[c]	−2.152	−1.288	0.358	0.562	0.190
	[−11.8%]	[−8.3%]	[3.5%]	[8.2%]	[1.7%]
$E(y\|x_i)$	16.804	14.724	10.645	7.457	11.170

Notes: Marginal effects were computed as averages over observations using Appendix equation (A1). Average percentage changes in expected deadweight spending are given in square brackets. The definitions of variables are given in Table 4.

*Statistically significant at the 10% level; **statistically significant at the 5% level; and ***statistically significant at the 1% level. Significance levels are based on 750 bootstrap samples.

[a]Reference project category is development project.

[b]Reference industry is business services.

[c]Reference year is 2003.

than for other projects. In Assisted Area 3, deadweight spending decreases with the number of employees but increases with a firm's turnover; when turnover increases by €1 million, the expected deadweight spending increases on average by €147. Although the impact is statistically significant, it is small at 1.3%.

The interpretation of the marginal effects of public subsidies is complicated by the fact that a marginal change in the subsidy will also change the intensity of assistance. Therefore, average marginal effects that allow for an indirect effect on deadweight spending have also been computed (see equation A2 in the Appendix). The calculations imply that a €1000 increase in the amount of public subsidies increases deadweight spending on average by €365 (15.8%) in Assisted Area 1, by €245 (10.2%) in Assisted Area 2, by €299 (12.7%) in Assisted Area 3, and by €227 (9.7%) outside the Assisted Areas. All these effects are statistically significantly different from zero.[11] Similar computations for project costs imply that a €10 000 increase in project costs has a negative impact on deadweight spending in Assisted Area 1 (−€237) but a positive impact in all other areas (€242–537). By itself, the intensity of assistance has a significant negative effect on deadweight spending in Assisted Area 3 and outside the Assisted Areas, *ceteris paribus*. The negative effect in Assisted Area 2 and the positive effect in Assisted Area 1 are not statistically significant.

Even after controlling for other factors, deadweight spending in Assisted Area 1 is estimated to be much higher for investment and start-up projects at 20.9% and 15.9%, respectively, relative to development projects (Table 6). In Assisted Area 3, deadweight spending is particularly small for start-up projects, and outside the Assisted Areas, it is particularly small for investment projects. No large differences exist between project types in Assisted Area 2. Looking at industry effects, deadweight spending tends to be particularly high for real estate, renting and business activities, which is the reference category, while it is small in the wood industry. For example, the difference across these sectors in deadweight spending is on average almost 27% in Assisted Area 1. In Assisted Area 2, industry differences are considerably smaller, but again, deadweight spending is smallest in the wood industry. In Assisted Area 3 and outside the Assisted Areas, the lowest levels of deadweight spending are estimated for the transportation industry.

Of the regional variables, the average marginal effect of disposable income is only significant outside the Assisted Areas; a €1000 increase in disposable income per capita raises expected deadweight spending on average by €544 (7.3%). It is somewhat surprising that the effect of regional unemployment is significantly negative only in Assisted Area 3 (positive in Assisted Area 2 and outside Assisted Areas). In that same area (3), the impact of regional research and development expenditure on expected deadweight spending is positive.[12] As expected, deadweight spending tends to be higher during the beginning of the programme period (year 2000) when the directions are not stable and more funding is available. This finding calls for a more careful selection of subsidized projects over the course of the programme period, particularly in Assisted Area 3.

The analysis now turns to the question of whether the significant regional differences in deadweight spending can be explained by differences in project, firm and regional characteristics. Table 7 displays the decomposition of expected pairwise regional differences in deadweight spending (see equation 4). The decomposition breaks down differences into explained and unexplained composites. The first row compares Assisted Areas 1 and 2. The results imply that of the average difference in expected deadweight spending (€2080), approximately 46% is explained by the characteristics under analysis. For all other pairwise comparisons, a considerably larger proportion is explained (93.3–99.8%). For example, the largest difference in expected deadweight spending (€9347) is almost entirely (99.7%) explained by the differences in the observed factors between projects in Assisted Area 1 and outside the Assisted Areas. Robustness checks are reported in the Appendix.

Table 7. Decomposition of pairwise regional differences in expected deadweight spending (€)

Two regions compared	Due to differences in the observed characteristics		Unexplained difference		Total difference	
Areas 1 and 2	€952	(45.8%)	€1128	(54.2%)	€2080[a]	(100%)
Areas 1 and 3	€5744	(93.3%)	€415	(6.7%)	€6159	(100%)
Area 1 and Outside	€9319	(99.7%)	€29	(0.3%)	€9347	(100%)
Areas 2 and 3	€3957	(97.0%)	€122	(3.0%)	€4079	(100%)
Area 2 and Outside	€7250	(99.8%)	€17	(0.2%)	€7267	(100%)
Area 3 and Outside	€3073	(96.4%)	€115	(3.6%)	€3188	(100%)

Notes: Figures were computed using equation (4) and using the parameters reported in Table 5 (averages over observations). Row percentages are reported in parentheses.

Areas 1, 2 and 3 = Assisted Areas 1, 2 and 3; Outside = Outside Assisted Areas.

[a]Average deadweight spending in Assisted Area 1 – average deadweight spending in Assisted Area 2 (€). Similarly for the other comparisons.

Downloaded By: [Valtion Taloudellinen Tutkimuskeskus] At: 07:08 18 January 2011

Downloaded By: [Valtion Taloudellinen Tutkimuskeskus] At: 07:06 18 January 2011

POLICY IMPLICATIONS

The tendency in European Union regional policy is to limit the available funding and to concentrate on the least developed regions (for example, MAIRATE, 2006). Thus, current policy is compared here with schemes in which subsidies are reallocated across regions and also diminished in terms of aggregate size (Table 8). In the alternative schemes, grants are redistributed evenly relative to the current level of subsidies given to projects. Deadweight spending is then predicted for each project, and regional aggregates are computed.

The schemes that reallocate subsidies from developed regions to less developed regions lower deadweight spending. When subsidies are evenly distributed from outside Assisted Areas to projects in all Assisted Areas (that is, Case 2a in Table 8), total deadweight spending is decreased by 18%. A larger decrease is achieved if subsidies are concentrated into the most remote regions, that is, in Assisted Areas 1 and 2. When these subsidies are merely distributed to Assisted Area 1, the decrease is 20.5% (Case 2c), and it is even higher (22.6%) when divided between Areas 1 and 2 (Case 2b). Reducing the amount of subsidies by 50% diminishes deadweight spending by 69.6% if subsidies are distributed to Assisted Area 1 (Case 3b) and by approximately 54.7% if they are distributed to Assisted Areas 1 and 2 (Case 3a). The higher decrease in Case 3b results from greater elasticity of deadweight spending with respect to amount of subsidies in Assisted Area 1 than 2.

DISCUSSION

This paper has estimated the level of deadweight spending across regions in Finland and has provided explanations for regional differences. Based on the previous literature, a relatively high deadweight was expected, though the literature provided little insight regarding regional variation. Thus, the results provide new information on the regional allocation of enterprise financing.

Table 8. Estimated regional deadweight spending with alternative policy schemes (€, thousands)

Policy schemes	Assisted Area 1	Assisted Area 2	Assisted Area 3	Outside Assisted Areas	Total
Case (1) Current policy					
Public subsidies	67 959	35 544	57 412	44 002	204 917
Deadweight spending	18 065	11 013	19 651	15 473	64 202
Case (2a) Redistribute grants from Outside Areas to Assisted Areas 1, 2 and 3					
Public subsidies	86 542	45 263	73 111	0	204 917
	[27.3%]	[27.3%]	[27.3%]	[−100%]	[0%]
Deadweight spending	18 421	11 155	23 053	0	52 629
	[2.0%]	[1.3%]	[17.3%]	[−100%]	[−18.0%]
Case (2b) Redistribute grants from Outside Areas to Assisted Areas 1 and 2					
Public subsidies	96 850	50 655	57 412	0	204 917
	[42.5%]	[42.5%]	[0%]	[−100%]	[0%]
Deadweight spending	19 053	10 966	19 651	0	49 670
	[5.5%]	[−0.4%]	[0%]	[−100%]	[−22.6%]
Case (2c) Redistribute grants from Outside Areas to Assisted Area 1					
Public subsidies	111 961	35 544	57 412	0	204 917
	[64.7%]	[0%]	[0%]	[−100%]	[0%]
Deadweight spending	20 393	11 013	19 651	0	51 058
	[12.9%]	[0%]	[0%]	[−100%]	[−20.5%]
Case (3a) Reduce the amount of grants by 50% and distribute them all to Assisted Areas 1 and 2					
Public subsidies	67 273	35 185	0	0	102 458
	[−1.0%]	[−1.0%]	[−100%]	[−100%]	[−50.0%]
Deadweight spending	18 094	10 993	0	0	29 086
	[0.2%]	[−0.2%]	[−100%]	[−100%]	[−54.7%]
Case (3b) Reduce the amount of grants by 50% and distribute them all to Assisted Area 1					
Public subsidies	102 458	0	0	0	102 458
	[50.8%]	[−100%]	[−100%]	[−100%]	[−50.0%]
Deadweight spending	19 496	0	0	0	19 496
	[7.9%]	[−100%]	[−100%]	[−100%]	[−69.6%]
Number of observations	1075	748	1846	2075	5744

Note: Regional aggregates are shown. They are based on the project-level simulations using equation (3). Percentage changes relative to the current policy are given in square brackets. In the alternative schemes, grants are redistributed evenly relative to the current amount of subsidies given to the project.

Downloaded By: [Valtion Taloudellinen Tutkimuskeskus] At: 07:08 18 January 2011

First, the descriptive analysis of deadweight spending showed substantial regional differences. In monetary terms, deadweight spending is on average the highest in Assisted Area 1 and the lowest outside the Assisted Areas. This difference is not explained by the variation in the degree of deadweight (%), but rather by the sizes of subsidies and projects (€). Thus, allocating more resources to developed areas would not decrease wasted spending.

Second, the econometric analysis showed regional variation in the determination of deadweight spending. These differences were particularly large for variables describing the type of project and the size and industry of the firm. Thus, the efficiency of regional business subsidies could be increased by favouring different kinds of projects in different regions rather than by applying nationally mandated guidelines.

Third, the observed discrepancies explained a majority of the pairwise regional differences in expected deadweight spending. Only the comparison between Assisted Areas 1 and 2 indicates a substantial level of unexplained difference in spending. Hence, subsidies may be wasted more easily in Assisted Area 1 than in Assisted Area 2. These differences should be studied more carefully in order to improve allocation systems.

Finally, the European Union current policy was also compared with alternative schemes that reallocate subsidies from developed regions to less developed regions. If resources allocated to business subsidies are to be decreased, the highest efficiency in terms of avoiding deadweight can be achieved by concentrating subsidies to these least developed areas. The negative relationship between deadweight and economic development is understandable, since distant locations often provide weaker opportunities for private finance (cf. FELSENSTEIN and FLEISCHER, 2002).

The present paper is the first to address regional differences in deadweight spending, and thus it has developed new methods for determining overall deadweight spending. One limitation to the approach is that the results cannot be generalized to all business projects in Finland due the selectivity of the subsidized projects. The approach can be seen as being complementary to the recent econometric treatment literature that has been used to estimate the impact of treatment (subsidy) on the treated (subsidized projects) as well as the net impact of subsidies (the average treatment effect). The implementation of micro-econometric treatment models would have required information on a control group, that is, on projects that were not subsidized.[15] Although the data included detailed information on subsidized projects, data on a suitable control group were missing. However, in an analysis of deadweight, the control group approach is problematic in many senses, since non-assisted firms do not form a reliable control group with similar characteristics (STOREY, 1990). One obvious difference emerges from the fact that they either did not apply or did not obtain regional assistance, and thus they probably had no desire to expand their activities (ARMSTRONG and TAYLOR, 2000).

Second, although the results seem robust to the implemented deadweight measure and computational assumptions regarding partial deadweight, a clear limitation of the approach is that a degree of deadweight between 0% and 100% must be assumed for the partial deadweight case.

CONCLUSION

This paper has provided insight regarding the efficiency of regional enterprise financing. It shows that regional business subsidies are not intended to be very efficient, since relatively high wasted spending is accepted *ex-ante*. Higher levels of efficiency could be achieved by concentrating on projects that cannot be implemented in the absence of a subsidy, that is, on projects with zero deadweight. However, even if policies are planned carefully, deadweight spending is not completely avoidable, since the government never has full information about a firm's action in the absence of a subsidy. Thus, better knowledge about deadweight and the attainment of higher efficiency requires a better exchange of information from firms, and private financiers to the public sector. This can be done, for example, by developing more efficient screening and information systems (see also the discussions in LUNDSTRÖM and STEVENSON, 2005; and TAKALO and TANAYAMA, 2010). Trust and knowledge between the public sector and the firms can also be improved with long-term relations. Defining an 'acceptable level' of deadweight would also require a thorough cost–benefit analysis of subsidies, but anything below the previously documented average of 50% (ARMSTRONG and TAYLOR, 2000) could be interpreted as a positive sign.

Deadweight spending is not unambiguously a negative thing, at least not if the projects yield positive externalities, such as regional spillover and leverage effects (for example, HART and LENIHAN, 2006). Even in the presence of deadweight spending, subsidies may have a variety of direct and indirect positive impacts on regional development. However, subsidies may also slow down necessary restructuring and creative destruction (for example, CABALLERO *et al*., 2009). To achieve a fuller picture of the added value of regional subsidies across different types of areas, a further evaluation of their effectiveness and displacement effects is certainly needed. Thus, it is necessary to consider the trade-off between deadweight spending and the net effects of subsidized projects.

Acknowledgements – This paper is a part of a Research Programme on Business Know-how (LIIKE2, Project Number 112116) financed by the Academy of Finland. The financial support from the Yrjö Jahnsson Foundation (Project Numbers 5597 and 6039) is gratefully acknowledged. The authors would also like to thank Mike Crone, Hannu Tervo, Petri Böckerman, Sanna-Mari Hynninen, and Timo Tohmo, as well as session discussants at the 48th Congress of the European Regional Science Association (27–31 August 2008, Liverpool, UK) and the 31st Institute for Small Business & Entrepreneurship Conference (5–7 November 2008, Belfast, UK), for useful comments on this paper. Haapanen wishes to thank a visiting scholarship at the Faculty of Economics, University of Cambridge, UK (2009–2010).

APPENDIX

Computation of average marginal effects

To evaluate the impact of particular explanatory variables on the expected deadweight spending, average marginal effects are computed. By differentiating equation (3), the marginal effect of *k*th explanatory variable x_{ir}^k for a project *i* is:

$$\frac{\partial E(d_{ir}|x_{ir})}{\partial x_{ir}^k} = s_{ir} \sum_{j=1}^{5} \delta_j \frac{\partial P(y_{ir} = j)}{\partial x_{ir}^k} \quad \text{if} \quad x_{ir}^k \neq s_{ir} \quad (A1)$$

where the partial derivatives $\partial P_j / \partial x_{ir}^k$ can be computed as in GREENE (2008, p. 833). However, equation (A1) is no longer valid for computing the marginal effect of subsidy s_{ir}. In that case, it must be computed as a sum of the direct and indirect effects on deadweight spending using the product rule of differentiation:

$$\frac{\partial E(d_{ir}|x_{ir})}{\partial s_{ir}} = \sum_{j=1}^{5} \delta_j P(y_{ir} = j) + s_{ir} \sum_{j=1}^{5} \delta_j \frac{\partial P(y_{ir} = j)}{\partial s_{ir}} \quad (A2)$$

where the computation of $\partial P_j / \partial s_{ir}$ is complicated by the fact that a marginal change in the subsidy will also change the intensity of assistance, which is another explanatory variable. These project-level marginal effects are computed as discrete changes for non-continuous variables (GREENE, 2008, p. 775). Finally, average marginal effects are computed as averages over all projects, as recommended by CAMERON and TRIVEDI (2005, p. 467).

Robustness checks

First, the sensitivity of the descriptive findings is assessed by computing the regional average of deadweight spending in Table 3 using alternative deadweight measures and computational assumptions on partial deadweight. Alternative deadweight measures use self-reports from 221 projects: that is, direct self-assessment of deadweight and an indirect measure of deadweight based on grant replacement possibilities. Alternative computational assumptions on the partial deadweight assume either that reduced scale, reduced qualitative level and later date all imply 50% of deadweight; or that reduced scale implies 50%, reduced qualitative level implies 70% and later date implies 90% of deadweight (so called 'a conservative view'). These numbers are used in place of 25%, 50% and 75% in equation (1). The findings remain qualitatively unchanged. Regardless of the methodological choices, the average deadweight spending (€) was negatively associated with regional development.

Second, the average marginal effects reported in Table 6 were also computed using alternative computational assumptions on the partial deadweight. Again, only the quantity of marginal effects changed; their signs remained the same. Note that as long as the order of partial deadweight options remains unchanged (that is, the degree of deadweight is highest when the project will be implemented at a later date and smallest when it is implemented at a reduced scale), then the estimates of the ordered probit models reported in Table 5, including the probabilities $P(y_{ir} = j)$ as well as the signs of the marginal effects in Table 6, do not depend on the assumed magnitude of δ_j. Full results from the first two robustness checks are available from the authors upon request.

Third, the decomposition analysis (cf. Table 7) was conducted using alternative computational assumptions. The results are reported in Table A2. For brevity, only the pairwise regional differences due to differences in characteristics are reported. As seen in columns A.1–A.3, the results are quite robust to the computation of deadweight spending.

Finally, the role of missing values that have been imputed for turnover and the number of employees in the analyses were investigated. Note that 812 projects with missing values were deleted. Decomposition analysis was also performed using the alternative computational assumptions (see the results shown in columns B.1–B.3). Again, the conclusions remain unchanged; apart from the difference between Areas 1 and 2, a very large proportion of the regional differences in deadweight spending can be explained by the observed factors.

Downloaded by: [Valtion Taloudellinen Tutkimuskeskus] At: 07:06 18 January 2011

Downloaded By: [Valtion Taloudellinen Tutkimuskeskus] At: 07:56 18 January 2011

Table A1. Mean values of variables by region

Variable	Assisted Area 1	Assisted Area 2	Assisted Area 3	Outside Assisted Areas	All Areas
Firm characteristics					
New firm	0.247	0.241	0.218	0.252	0.239
Self-employed	0.041	0.064	0.074	0.041	0.054
Employees (persons)[a]	16.893	13.304	17.099	15.818	16.103
Turnover of firm (€, millions)[a]	1.681	1.423	1.996	1.729	1.766
Project characteristics					
Public subsidy (€, thousands)	63.218	47.519	31.101	21.206	35.675
Project costs (€, thousands)	209.585	177.363	193.844	91.761	157.767
Intensity of assistance	35.895	32.057	27.087	34.899	32.205
Type of project					
Investment project	0.647	0.715	0.621	0.315	0.528
Start-up project	0.265	0.242	0.295	0.510	0.360
Development project (reference)	0.087	0.043	0.083	0.175	0.112
Industry					
Metal	0.252	0.154	0.317	0.219	0.248
Wood	0.143	0.205	0.150	0.087	0.133
Other manufacturing	0.249	0.194	0.243	0.293	0.256
Trade	0.041	0.134	0.044	0.053	0.058
Transport	0.020	0.059	0.007	0.014	0.019
Business services (reference)	0.221	0.143	0.170	0.263	0.210
Other industries	0.073	0.112	0.069	0.071	0.076
Regional characteristics					
Unemployment rate	17.840	18.127	14.969	11.164	14.543
Disposable income	11.598	11.038	12.121	13.536	12.393
Research and development expenditure	0.295	0.183	0.349	1.119	0.595
Year					
2000	0.371	0.405	0.356	0.312	0.349
2001	0.337	0.324	0.306	0.348	0.329
2002	0.207	0.190	0.230	0.228	0.220
2003 (reference)	0.085	0.082	0.108	0.112	0.102
Number of observations	1075	748	1846	2075	5744

Notes: Definitions of variables are given in Table 4.
[a]Observations with missing information were imputed by regressing turnover and the number of employees on the remaining variables.

Table A2. Robustness checks of the pairwise differences due to differences in observed characteristics (%)

	Alternative specifications					
Two regions compared	A.1	A.2	A.3	B.1	B.2	B.3
Areas 1 and 2	45.8	58.4	61.3	40.8	52.6	52.9
Areas 1 and 3	93.3	99.9	100.9	98.1	102.3	102.8
Area 1 and Outside	99.7	111.6	106.8	102.6	111.9	107.6
Areas 2 and 3	97.0	109.2	102.6	88.3	103.1	95.4
Area 2 and Outside	99.8	116.6	105.3	99.5	115.4	105.2
Area 3 and Outside	96.4	116.3	101.1	98.2	115.8	102.4
Imputed missing values[a]	Yes	Yes	Yes	No	No	No

Note: The numbers 1–3 indicate alternative assumptions about the computation of deadweight spending: (1) a reduced scale implies 25%, a reduced qualitative level implies 50% and a later date implies 75% of deadweight; (2) they all imply 50% of deadweight; and (3) they imply 50%, 70% and 90% of deadweight, respectively.
[a]Missing values were imputed for a firm's turnover and the number of employees.

NOTES

1. Besides project additionality, output additionality, input additionality, behavioural additionality and cognitive capacity additionality are also recognized in the subsidy literature (DAVENPORT *et al.*, 1998; GEORGHIOU *et al.*, 2002).
2. Displacement occurs if a subsidized project reduces activity elsewhere in the economy (TERVO, 1989, 1990).
3. Deadweight spending may also occur in the case of repayable grants, that is, loans and guarantees. However, in monetary terms, the public sector loss is not that critical if the subsidy is refunded with interest to the public sector.

4. A micro-sized (small-sized, medium-sized) enterprise is one that employs fewer than ten (fifty, 250) people, has an annual turnover not exceeding €2 (€10, €50) million or an annual balance sheet total not exceeding €2 (€10, €43) million, and fulfils the characteristics depicting the autonomy of an enterprise (EUROPEAN COMMISSION, 2003).
5. The Ministry of Trade and Industry only makes financing decisions in cases in which the cost of an investment project exceeds €1.7 million.
6. Although strong economic growth temporarily slowed down in Finland in 2000–2003, the profitability of enterprises remained positive and largely unchanged (STATISTICS FINLAND, 2004; OECD, 2009).
7. A total of 100 public sector projects were excluded from the analysis.
8. Possible bias problems in deadweight measures are discussed by TOKILA and HAAPANEN (2009).
9. The data are missing values for turnover or the number of employees for 812 observations. These missing values were imputed using predicted values from two regression models in which turnover and the number of employees were regressed on the remaining variables in the data.
10. The LR test compares the sum of the log-likelihoods of the regional models with the log-likelihood for the entire country. The $\chi^2(75)$-distributed test statistic was 264.8 ($p < 0.001$). Parameters in column 5 together with three regional dummies were also estimated, but the specification was rejected in favour of columns 1–4 ($p < 0.001$).
11. Additional analyses show that elasticity of deadweight spending is close to 1 in Assisted Area 1. That is, a 1% increase in the public subsidies is on average associated with a 1.03% increase in deadweight spending. In all other regions, elasticity is between 0.60% and 0.76%.
12. The NUTS-4 (Nomenclature des Unités Territoriales Statistiques) population was also used as an additional explanatory variable. However, because it was not significant in any of the regional models and did not alter the results, it was dropped from the final specification.
13. For further details on the estimation of treatment effects and other recent advances in econometric methods, see ANGRIST and PISCHKE (2009). Problems related to sample selection are also discussed by GREENE (2008, ch. 24.5). Regarding other methodological approaches available for the evaluation of deadweight, including the cost–benefit analysis (for example, WREN, 2007), see the discussion and references in LENIHAN and HART (2004, 2006). The net impacts of subsidies were recently investigated with treatment models by KANGASHARJU (2007) and MOLE *et al.* (2008).

REFERENCES

ANGRIST J. D. and PISCHKE J.-S. (2009) *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton University Press, Princeton, NJ.

ARMSTRONG H. and TAYLOR J. (2000) *Regional Economics and Policy*, 3rd Edn. Blackwell, Oxford.

BALDWIN R. and WYPLOSZ C. (2006) *The Economics of European Integration*, 2nd Edn. McGraw-Hill, London.

BASLÉ M. (2006) Strengths and weaknesses of European Union policy evaluation methods: *ex-post* evaluation of Objective 2: 1994–99, *Regional Studies* **40**, 225–236.

BAUER T. K. and SINNING M. (2008) An extension of the Blinder–Oaxaca decomposition to nonlinear models, *Advances in Statistical Analysis* **92**, 197–206.

BERGSTRÖM F. (2000) Capital subsidies and the performance of firms, *Small Business Economics* **14**, 183–193.

CABALLERO R. J., HOSHI T. and KASHAYAP A. K. (2009) Zombie lending and depressed restructuring in Japan, *American Economic Review* **98**, 1943–1977.

CAMERON A. C. and TRIVEDI P. K. (2005) *Microeconometrics: Methods and Applications*. Cambridge University Press, Cambridge.

COUNCIL OF THE EUROPEAN UNION (2006) Council Decision of 6 October 2006 on Community strategic guidelines on cohesion (2006/702/EC), *Official Journal of the European Union* **L 291**, 11.

COVAL J. D. and MOSKOWITZ T. J. (1999) Home bias at home: local equity preference in domestic portfolios, *Journal of Finance* **54**, 2045–2073.

DAVENPORT S., GRIMES C. and DAVIES J. (1998) Research collaboration and behavioural additionality: a New Zealand case study, *Technology Analysis and Strategic Management* **10**, 55–67.

DE KONING J. (1993) Measuring the placement effects of two wage-subsidy schemes for the long-term unemployed, *Empirical Economics* **18**, 447–468.

EUROPEAN COMMISSION (2003) Commission Recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises (2003/361/EC), *Official Journal of the European Communities* **L 124(46)**, 36–41.

EUROPEAN COMMISSION (2004a) *Communication from the Commission to the Council and the European Parliament: Financial Perspectives 2007–2013*. COM (2004) 487. European Commission, Brussels.

EUROPEAN COMMISSION (2004b) *Communication from the Commission to the Council and the European Parliament: Building The Common Future Policy Challenges and Budgetary Means of the Enlarged Union 2007–2013*. COM (2004) 101. European Commission, Brussels.

FELSENSTEIN D. and FLEISCHER A. (2002) Small-scale entrepreneurship and access to capital in peripheral locations: an empirical analysis, *Growth and Change* **33**, 196–215.

FOLEY P. (1992) Local economic policy and job creation: a review of evaluation studies, *Urban Studies* **29**, 557–598.

GEORGHIOU L., RIGBY J. and CAMERON H. (Eds) (2002) *Assessing the Socio-economic Impacts of the Framework Programme*. PREST Publ, Manchester.

GLANCEY K. S. and MCQUAID R. W. (2000) *Entrepreneurial Economics*. Palgrave, New York, NY.

GREENE W. H. (2008) *Econometric Analysis*, 6th Edn. Prentice-Hall, Englewood Cliffs, NJ.

Downloaded By: [Valtion Taloudellinen Tutkimuskeskus] At: 07:06 18 January 2011

HART M. and LENIHAN H. (2006) Evaluating additionality and leverage: the interplay between public and private sector equity finance in Ireland (2000–2002), *Venture Capital* **8**, 331–351.

HEIJS J. (2003) Freerider behaviour and the public finance of R&D activities in enterprises: the case of the Spanish low interest credits for R&D, *Research Policy* **32**, 445–461.

JAKOBY H. (2006) Evaluation as part of the regional policy life cycle: the example of North Rhine-Westphalia, Germany, *Regional Studies* **40**, 281–284.

JUNKA T. (1998) *Trends in the Public Support to Industries in 1984–1996.* Discussion Paper Number 165. Government Institute for Economic Research, Helsinki [in Finnish].

KANGASHARJU A. (2007) Do wage subsidies increase employment in subsidized firms?, *Economica* **74**, 51–67.

LAYARD D. and NICKELL S. J. (1980) The case for subsidizing extra jobs, *Economic Journal* **90**, 51–73.

LENIHAN H. (1999) An evaluation of a regional development agency's grants in terms of deadweight and displacement, *Environment and Planning C: Government and Policy* **17**, 303–318.

LENIHAN H. (2004) Evaluating Irish industrial policy in terms of deadweight and displacement: a quantitative methodological approach, *Applied Economics* **36**, 229–252.

LENIHAN H. and HART M. (2004) The use of counterfactual scenarios as a means to assess policy deadweight: an Irish case study, *Environment and Planning C: Government and Policy* **22**, 817–839.

LENIHAN H. and HART M. (2006) Evaluating the additionality of public sector assistance to Irish firms: a question of ownership?, *Policy Studies* **27**, 115–133.

LENIHAN H., HART M. and ROPER S. (2005) Developing an evaluative framework for industrial policy in Ireland: fulfilling the audit trail or an aid to policy development, *Quarterly Economic Commentary Summer 2005.* Economic and Social Research Institute **June**, 69–85.

LUNDSTRÖM A. and STEVENSON L. A. (2005) *Entrepreneurship Policy: Theory and Practice.* International Studies in Entrepreneurship Vol. 9. Springer, New York, NY.

LUUKKONEN T. (2000) Additionality of EU framework programs, *Research Policy* **29**, 711–724.

MAIRATE A. (2006) The 'added value' of European Union Cohesion Policy, *Regional Studies* **40**, 167–178.

MARTIN R. and TYLER P. (2006) Evaluating the impact of the structural funds on Objective 1 regions: an exploratory discussion, *Regional Studies* **40**, 201–210.

MERCADO S., WELFORD R. and PRESCOTT K. (2001) *European Business,* 4th Edn. Financial Times/Prentice Hall, London.

MINISTRY OF JUSTICE (2000) Decree of Council of State, 1200/2000, in LINHALA J. (Ed.) *The Statutes of Finland No. 1199-1201,* pp. 3202–3209. Edita, Helsinki.

MINISTRY OF TRADE AND INDUSTRY (2006) *Aid to Business Act (1068/2000) Finnish Law I.* Talentum for Kauppa- ja teollisuusministeriö (KTM), Helsinki (translation available at: http://www.finlex.fi/en/laki/kaannokset/2000/en20001068.pdf).

MOLE K., HART M., ROPER S. and SAAL D. (2008) Differential gains from Business Link support and advice: a treatment effects approach, *Environment and Planning C: Government and Policy* **26**, 315–334.

MOLLE W. (2007) *European Cohesion Policy.* Routledge, Abingdon.

NEUMARK D. (1988) Employers' discriminatory behaviour and the estimation of wage discrimination, *Journal of Human Resources* **23**, 279–295.

OAXACA R. L. and RANSOM M. (1994) On discrimination and the decomposition of wage differentials, *Journal of Econometrics* **61**, 5–21.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD) (2000) *OECD Small and Medium Enterprise Outlook 2000 Edition.* OECD Publ., Paris.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD) (2009) *OECD Factbook 2009: Economic, Environmental and Social Statistics.* OECD Publ., Paris.

PICARD P. M. (2001) Job additionality and deadweight spending in perfectly competitive industries: the case for optimal employment subsidies, *Journal of Public Economics* **79**, 521–541.

ROBINSON F., WREN C. and GODDARD J. (1987) *Economic Development Policies: An Evaluative Study of Newcastle Metropolitan Region.* Clarendon, Oxford.

ROPER S., HEWITT-DUNDAS N. and LOVE J. H. (2004) An *ex-ante* evaluation framework for the regional benefits of publicly supported R&D projects, *Research Policy* **33**, 487–509.

STATISTICS FINLAND (2004) *Business Enterprises – Net Results and Balance Sheets 2002.* Statistics Finland, Helsinki. [in Finnish]

STOREY D. J. (1990) Evaluation of policies and measures to create local employment, *Urban Studies* **27**, 669–684.

STOREY D. J. (1994) *Understanding the Small Business Sector.* Routledge, London.

TAKALO T. and TANAYAMA T. (2010) Adverse selection and financing of innovations: is there need for R&D subsidies?, *Journal of Technology Transfer,* **35**, 16–41.

TERVO H. (1989) A micro-level approach to the analysis of the displacement effects of regional incentive policy: the case of Finland, *Regional Studies* **23**, 511–521.

TERVO H. (1990) Factors underlying displacement: an analysis of Finnish regional incentive policy using survey data on assisted firms, *Applied Economics* **22**, 617–628.

TOKILA A. and HAAPANEN M. (2009) Evaluating project deadweight measures: evidence from Finnish business subsidies, *Environment and Planning C: Government and Policy* **27**, 124–140.

TOKILA A., HAAPANEN M. and RITSILÄ J. (2008) Evaluation of investment subsidies – when is deadweight zero?, *International Review of Applied Economics* **22**, 585–600.

Downloaded By: [Valtion Taloudellinen Tutkimuskeskus] At: 07:06 18 January 2011

TUROK I. (1990) Evaluation and accountability in spatial economic policy: a review of alternative approaches, *Scottish Geographical Magazine* **106**, 3–11.

WINSTON C. (2006) *Government Failure vs. Market Failure: Microeconomics Policy Research and Government Performance*. American Enterprise Institute (AEI) –Brookings Joint Center, Washington, DC.

WREN C. (1998) Subsidies for job creation: is small best?, *Small Business Economics* **10**, 273–281.

WREN C. (2007) Reconciling practice with theory in the micro-evaluation of regional policy, *International Review of Applied Economics* **21**, 321–337.

ZIMMERMANN H. (1985) Der Mitnahmeeffekt. Inhalt und Meßkonzepte, dargestellt am Beispiel der Zuweisungen and Gemeinden, in Räumliche Aspekte des Kommunalen Finanzausgleichs, *Forschungs- und Sitzungsberichte der Akademie für Raumforschung und Landesplanung* **159**, 293–311.

Downloaded By: [Valtion Taloudellinen Tutkimuskeskus] At: 07:06 18 January 2011

CHAPTER 5

Article 4. pp. 100-126

Tokila, A. (in referee process)
"Start-up grants and duration of self-employment"

CHAPTER 6
REGIONAL DIFFERENCES IN RETURNS TO EDUCATION FOR ENTREPRENEURS VS. WAGE EARNERS

Ann Reg Sci
DOI 10.1007/s00168-010-0374-8

ORIGINAL PAPER

Regional differences in returns to education for entrepreneurs versus wage earners

Anu Tokila · Hannu Tervo

Received: 10 March 2009 / Accepted: 13 March 2010
© Springer-Verlag 2010

Abstract Many studies suggest that rates of return to schooling are lower for entrepreneurs than for employees, although the opposite has also been reported. This paper analyses the returns to education for entrepreneurs in urban and rural regions in Finland and compares these to the returns for wage earners. These areas show different rates of self-employment, higher rates being found in rural areas and lower rates in urban areas. The analysis is based on a rich, register-based dataset that includes a 7% random sample of all Finns. To avoid potential sources of bias, Mincer-type income equations are estimated using different estimation procedures. The results show regional variation in returns to education. In rural areas, returns to education are somewhat higher for entrepreneurs than for wage earners. Highly educated entrepreneurs especially gain advantage from their education. In urban areas as well as in the entire country, the returns for the two occupation groups are rather similar.

JEL Classification J31 · J24 · R23 · I21 · L26

1 Introduction

Human capital theory predicts that education augments an individual's abilities in the labor market, thereby enhancing his/her productivity and earned income. Due to labor and product market conditions, returns to education may differ across regions. In the new economic geography literature, as well as in the earlier regional science

A. Tokila (✉) · H. Tervo
School of Business and Economics,
P.O. Box 35, 40014 University of Jyväskylä, Finland
e-mail: anu.tokila@econ.jyu.fi

H. Tervo
e-mail: htervo@econ.jyu.fi

Published online: 08 April 2010

literature, agglomeration economies should lead to higher productivity of workers and hence higher wages and higher returns to education (Fujita et al. 1999; see also de Blasio and Di Addario 2005; Dalmazzo and de Blasio 2007; Lehmer and Möller 2009). Marshall (1890) was the first to find that spatial agglomerations create location advantages in terms of spillovers, such as labor pooling and co-operation between firms. Agglomeration economies may also enhance the earnings and returns to education for entrepreneurs. In addition, variation in relative returns to education across regions may account for the prevailing regional differences in entrepreneurship; these regional differences in entrepreneurship are pronounced and persistent in many countries (e.g. Bernhardt 1994). On the other hand, labor and product market conditions may also account for the rate of entrepreneurship (Georgellis and Wall 2000; Parker 2004). For instance, less-educated individuals in a small, dispersed labor market may be pushed into self-employment if they see no other realistic options (Carrasco and Ejrnæ 2003; Tervo 2008).

Apart from enhancing earnings, it is also generally believed that human capital, including education, increases an individual's probability of becoming self-employed (e.g. Rees and Shah 1986). Thus, education can potentially be seen as a tool for supporting entrepreneurship. In order to be an attractive choice, an earnings premium may be necessary to compensate for the greater uncertainty and higher inherent risk of entrepreneurship (Storey 1994; Hamilton 2000). If educated entrepreneurs do not achieve an adequate premium for their risk in a region, entrepreneurship may not be an attractive occupational choice, whereas high expected earnings will pull educated individuals into entrepreneurship. In many countries and regions, however, individuals with a higher level of education have a lower probability of being self-employed. This is the case in Finland (Johansson 2000; Niittykangas and Tervo 2005), which has one of the most expensive education systems in the world. This prompts the question as to why highly educated individuals do not choose entrepreneurship, even though they have better abilities. Is it not profitable for them? In order to be an attractive choice, entrepreneurship should yield an adequate earnings premium for the higher inherent risk it entails (Storey 1994).

The performance of educated entrepreneurs can be studied by comparing their returns to those of wage earners. No clear assumption on either theoretical or empirical grounds can be made about whether the returns to education for entrepreneurs will be higher or lower. Many previous studies suggest that the rates of return to schooling are lower for entrepreneurs than for wage earners (Brown and Sessions 1998, 1999; Hamilton 2000; García-Mainar and Montuenga-Gómez 2004), although the opposite also has been reported (Evans and Leighton 1990; Robinson and Sexton 1994; Alba-Ramirez and Sansegundo 1995; van der Sluis et al. 2004). The impact of education on income varies according to the labor market and levels of education. van der Sluis et al. (2004) observed that studies that focused on the impact of education on income in Europe more often indicated lower returns for entrepreneurs, while the evidence from the United States was the opposite. A study by Iversen et al. (2006) found that higher levels of schooling resulted in larger returns for the self-employed, while lower levels of education indicated hardly any return in self-employment. In contrast, García-Mainar and Montuenga-Gómez (2004) concluded that secondary education is the most profitable choice for the self-employed.

In this paper, we are interested in how regional variation affects returns to education for entrepreneurs and wage earners. The role of region in general wage differentials has been studied to some extent (e.g. Dumond et al. 1999; Duranton and Monastiriotis 2002; Bernard et al. 2003; Goetz and Rupasingha 2004), but regional comparison between entrepreneurs and wage earners has been largely ignored in the literature. We ask: does the education attained by an individual imply a higher rate of return for the entrepreneur than for the wage earner, and are there regional differences in these returns? Typically, studies on regional wage differentials analyze specific regions. We instead focus on types of regions in order to provide more generalized results. In our analysis, Finnish regions are classified into urban and non-urban regions on the basis of the number of inhabitants and population density. These regions show different rates of self-employment, with the rate being higher in rural areas and lower in urban areas.

The analysis is based on a rich register-based dataset that includes a 7% random sample of all Finns. In the analysis, we apply Mincer-type income equations that are estimated separately for employees and the self-employed (cf. Parker 2004). Different estimation procedures are used to avoid potential sources of bias in the results. To avoid selection bias, we apply Heckman (1979) method. For the instrumentation of the possible endogenous education variable, we also use a set of family background variables as identifying instruments. For the sake of comparison, the standard OLS-method is also applied.

Our estimation results suggest that returns to education are similar for entrepreneurs and wage earners for the entire country. No clear-cut premium for entrepreneurs is discovered except in rural areas, where the return to higher education is much higher for entrepreneurs. The estimated returns to higher education for entrepreneurs remain smaller in urban areas than in rural areas. Even so, well-educated individuals in rural areas do not opt for entrepreneurship, although the general level of entrepreneurship is high. This result suggests that it is the push rather than the pull effect that accounts for regional differences in entrepreneurship, meaning it is more likely that regional variation in entrepreneurship is due to weak employment conditions rather than higher expected earnings.

The rest of the paper is organized as follows. Theoretical issues are discussed in Sect. 2. Section 3 presents the model, data and variables, including basic definitions and information on the income and educational choices in the two different types of regions. In Sect. 4, the estimation results for the entire data set are presented first, followed by the results for the regions. Section 5 concludes the paper.

2 Theoretical issues and empirical antecedents

Human capital theory states that higher education levels should be rewarded in the labor market for both entrepreneurs and wage earners. Higher education improves several abilities needed in business, such as risk awareness and comprehension of market prospects (Kangasharju and Pekkala 2002). However, the returns for the self-employed may be more dependent on factors other than formal education. For instance, many entrepreneurial skills such as motivation and salesmanship are non-academic in nature (Parker 2004). This may lead to lower returns to education for entrepreneurs. In the case of wage earners, part of their return to productivity may be exploited by the firm, thus lowering their returns to education (García-Mainar and Montuenga-Gómez 2004).

Human capital can be divided into general and specific human capital (Becker 1975). Education and work experience measured in years or levels represent general human capital. In the context of self-employment, specific human capital is distributed as industry-specific and entrepreneurship-specific human capital. Industry-specific experience in paid work increases the productivity of entrepreneurs, as they already have familiarity with the main activities of the industry. In addition, it may yield knowledge about potential niches in business. Entrepreneur-specific human capital can best be obtained through self-employment, although some entrepreneurial skills may also be acquired through special entrepreneurial training (e.g. Firkin 2003).

Spence (1973) was the first to claim that greater human capital is acquired only to signal inherent productivity. The weak screening hypothesis concedes that the effect of education is manifested both through signaling and through increased productivity (Spence 1973; Arrow 1973). In the strong screening hypothesis, education operates merely as a signal of inherent productivity, having no role in enhancement of productivity (Psacharopoulos 1979). In the case of the self-employed, the signaling role of education is not that clear, as these individuals employ themselves. For wage earners as well, more evidence has been presented for the weak hypothesis than for the strong one (e.g. Brown and Sessions 1998, 1999). This lends further support to the idea that education has an important role in the generation of earnings gains.

Earnings are an important incentive in occupational choice. Self-employment and paid work represent the two largest sources of income. However, their characteristics and degree of inequality are fundamentally different (Parker 1999). In most countries, the earnings of entrepreneurs range more widely than those of employees. This means that a relatively larger number of the self-employed are concentrated in the lower and upper tails of the income distribution compared to wage earners (Parker 2004). This is also the case in Finland (Tervo and Haapanen 2010). Comparisons between the mean income of entrepreneurs and paid workers may be strongly influenced by a few very high-income entrepreneurial superstars (Rosen 1981; Hamilton 2000). For this reason it might be better to use the median income in the comparative analyses.

In some studies, rural areas have been found to suffer from substantially lower rates of returns to education than urban areas (Goetz and Rupasingha 2004). People may accept a lower income in exchange for other amenities in a region, such as scenery (see e.g., Power and Barrett 2001). On the other hand, for individuals with high qualifications, the gap in regional rates has been found to be relatively low (Bennett et al. 1995). In peripheral regions, jobs with higher educational demands are more comparable in rates of pay with jobs in central areas, while for lower-skill jobs, rates are determined more by the local labor market. Yet, very little is known about the regional variation in returns to education between self-employment and paid work. Studies on regional wage differentials are commonly based on aggregate level approaches, which are incapable of yielding explanations or sources for regional inequalities in returns to education (see e.g. Duranton and Monastiriotis 2002).

3 Method, data and definitions

3.1 Methodology

It is important that the effect of education (formal schooling) on entrepreneurial performance is measured consistently. We apply the income equations first suggested by Mincer (1974) to estimate causal effects that are not biased due to the neglect of unobserved heterogeneity or the endogenous nature of the occupational choice (employment/self-employment). According to the Mincerian approach, the main determinants of individual earnings are schooling and experience. The general specification for a Mincer-type earnings equation is:

$$\ln Y_i = f(edu_i) + \beta X_i + u_i, \tag{1}$$

where Y_i is the annual earnings of individual i, $f(edu_i)$ is a function of the educational attainment of individual i, X_i contain labor market experience and other characteristics of the individual, and u_i is a random error. In the standard version, $f(edu_i)$ is years of education, i.e., it is assumed that the logarithm of earnings is a linear function of years of completed education. In addition to this linear approach, we consider a specification[1] in which we use a dummy to compare the effect of having higher education with the effect of not having higher education.

Since we are estimating earnings functions separately for entrepreneurs and wage earners, it is necessary to take account of possible selection bias. Those who enter self-employment or paid employment may not be a random sample from the population. A common way of removing possible selection bias is Heckman (1979) method in which the estimation is performed in two steps. In the first step, the selection (participation) equation is estimated:

$$z_i = \omega' W_i + v_i, \tag{2}$$

where z_i indicates whether individual i is an entrepreneur/wage earner, W_i is a set of explanatory variables and v_i is a disturbance term with unit variance. The selection equation should contain at least one variable that is not in the outcome equation. In our case, several variables describing family background and regional features are used. Computing fitted values for z_i yields the 'inverse Mills ratios':

$$\lambda_i = -\phi(\bar{z}_i)/\Phi(\bar{z}), \tag{3}$$

which are added to the earnings equation in the second step of the estimation.

Another bias may follow from the endogenous nature of education. For this reason, many previous studies on returns to education for entrepreneurs are potentially biased

[1] Additional specifications with dummies for separate education levels and orders of the education polynomial (for years of schooling) were also performed. These estimations supported the hypothesis of non-linearity in the return to education and the highest returns for the higher education. However, the rate of return was decreasing for the highest level of education (doctorate or equivalent level).

(van der Sluis et al. 2004). Their methodological approaches lag behind, especially in terms of identification. A cross-sectional correlation between education and earnings may not reflect the true causal effect of education (Card 1999). Generally, OLS estimates of the returns to education are biased downwards (Ashenfelter et al. 1999). These problems have long received attention in other types of studies on returns to education. A standard solution to the problem of identification is the instrumental variables (IV) estimation, where identifying instruments must satisfy two conditions: (i) the instrument should not be correlated with the error term and (ii) the instrument should be highly correlated with the endogenous variable of interest. The former relates to the validity of the instrument and the latter to its quality. Family background is a widely used instrument for education. In our case, a set of variables for parents' education are used to instrument the schooling choice of an individual. Estimations are performed using two-stage least squares (2SLS), in which the first stage estimates the structural form of the earnings equation, and the second stage reduces the form of the equation with instrument variables. Two recent studies suggest that correcting for the endogeneity of schooling substantially increases the estimated rate of return for entrepreneurs (Parker and van Praag 2004; van der Sluis et al. 2004). To confront both types of biases in the same model, we use a combined Heckman-IV approach in which the inverse Mills ratios are included in the IV regression.

3.2 The dataset

The dataset is based on the Longitudinal Census File and the Longitudinal Employment Statistics File constructed by Statistics Finland. These two register-based datasets have been updated annually since 1987. They, together with some other registers, provide panel data on each resident of Finland. A 7% random sample of all the individuals in this dataset in 2001 was taken for this study. The dataset includes very rich information on individuals' educational attainments, labor market performance, regional and family characteristics, and many other variables from the period of 1987–2002 and from the earlier years of 1970, 1975, 1980, and 1985. We analyze the rates of return in the base year 2001, as the dataset for this year contains the most comprehensive information on earnings.

In this paper, the sample is restricted to persons from 18 to 64 years old, in paid or self-employment, and who had a net earned income in 2001. Persons employed in the agricultural sector are excluded from the sample due to the special nature of agricultural entrepreneurship (see e.g. Parker 2004). The total number of individuals in the sample is 148,861, of which 11,528 (7.7%) are self-employed and 137,333 (92.3%) are wage earners.

3.3 Definitions of entrepreneur and income

The first often-problematic task in studies of entrepreneurship is to define the concept of 'entrepreneur.' Self-employment and entrepreneurship are concepts used in widely diverse ways (see e.g., Parker 2004). In this analysis, the information of employment status comes from the Longitudinal Census File. Thus, the concept of entrepreneurship

Table 1 Education levels for entrepreneurs and wage earners

	Entrepreneurs (%)	Wage earners (%)
General education	29.5	20.2
Secondary education	44.0	43.7
Lower tertiary education	20.0	25.8
Higher education	6.5	10.3

directly follows from the statistical definitions used by Statistics Finland (see Statistics Finland 2001). The data on employment status are based on a person's national insurance status and type of income, and thus describe whether the person is a wage earner or entrepreneur. The third category, the non-employed, is not considered in this study. Entrepreneurs are defined as persons who have a self-employed person's pension insurance during the last week of the year, and whose income from entrepreneurship exceeds a specified level of earnings. The income threshold is used to distinguish full-time entrepreneurs from the individuals with only a complementary entrepreneurial activity. This threshold is set inferentially using data from the Labor Force Survey (for details, see Statistics Finland 2001).

The data give the highest level of education completed by the individual. A shortcoming is that no previous same-level degrees or uncompleted degrees are recorded. Our dataset shows that wage earners are more educated than entrepreneurs (Table 1). The share of persons with only basic education is statistically greater in the group of entrepreneurs, whereas wage earners more often have a level of education beyond secondary. In the empirical analysis, higher education (master, doctorate or equivalent level) is used as the baseline in the analysis of education levels.

Another problem concerns the definition and measurement of income, as these are not unambiguous for entrepreneurs. Analysis of self-employment income data should be performed with caution for several reasons (Parker 2004). Entrepreneurs may underestimate their income for taxation reasons. Owners of incorporated firms may be classified in different ways—employees or employers. Survey-based datasets suffer from high non-response rates from entrepreneurs. Furthermore, measuring employee fringe benefits and elements of entrepreneur income is problematic.

Due to its official nature, the data used here are reliable. The measurement of income is based on the tax files of the National Board of the Inland Revenue, which offers an excellent starting point for an accurate analysis of earnings. Hence, problems related to survey data collection or classification are not notable in our analysis. Income underreporting and other kinds of undeclared income, however, remain unresolved problems.

The dependent variable is defined as the logarithm of the individual's annual gross income minus transfer payments. The transfer payments in question are unemployment benefit and daily, maternity, and home care allowances. Gross income includes wage income and entrepreneurial income, as well as social security benefits. In order to apply logarithmic transformation, some zero and negative observations were dropped from the dataset. The number of these observations (75 in total, 63 entrepreneurs), however, has a negligible effect on the results. Due to data protection legislation, the

Table 2 Self-employment rate in the regions

	General education	Secondary education	Lower tertiary education	Higher education	All
Urban areas	8.3	5.8	5.0	4.8	6.0
Rural areas	16.6	12.6	9.9	6.4	12.7
Total	10.9	7.8	6.1	5.0	7.7

highest percentile in income subject to state taxation is given as a mean in the data. This should not have a significant influence on the results.

3.4 Regional classification

The analysis is based on the comparison between urban and rural areas. The basic regional unit used is a statistical grouping of municipalities into three groups. Here we use location of workplace (instead of dwelling place) as a unit of observation, since returns are based on work and not on dwelling. In 2001, there were 488 municipalities in Finland. Urban municipalities are defined as those where at least 90% of the population lives in an urban settlement, or where the population of the largest urban settlement is at least 15,000. All other municipalities are defined as rural, despite the fact that the original classification separates semi-urban municipalities from rural municipalities. Thus, the two groups of semi-urban and rural municipalities are combined in our analysis. For the purposes of international comparison, Finnish semi-urban municipalities are more rural than urban. Also, according to Labridianis (2006), smaller-sized towns are more suited for inclusion in rural areas in the regional analysis.

Distinct differences are found in regional entrepreneurial activity by educational classes (Table 2). Overall intensity of entrepreneurship is more than double in rural areas compared to urban ones. This can be explained by the fact that they offer fewer wage earning opportunities than urban areas (Tervo 2008). It is interesting to note that entrepreneurial activity among the highly educated shows much less variation. For highly educated individuals, self-employment may be a less attractive choice than employment (Kangasharju and Pekkala 2002). There are several possible reasons for this. According to some studies, highly educated individuals would earn more as paid workers than as entrepreneurs (e.g. Hamilton 2000; Uusitalo 2001). In addition, compared to employees, entrepreneurs have a less constant income stream and less security than do employees (Storey 1994). Instead, the non-pecuniary benefits of the job are often more important than financial benefits for the self-employed (Hamilton 2000).

Table 3 shows how median income varies according to the level of education and type of region in the groups of entrepreneurs and wage earners. In general, median income is lower in rural areas than in urban areas, and the higher the education, the higher the individual's income. There are, however, a couple of exceptions, especially among entrepreneurs. In rural areas, higher educated entrepreneurs earn significantly more than wage earners. With respect to the level of education, entrepreneurs with a secondary education have a lower median income than those with a general education. In all, it seems that the income of entrepreneurs varies more than the income of wage

Table 3 Median income of entrepreneurs and wage earners according to education and type of region

Region	General education		Secondary education		Lower tertiary education		Higher education		All	
	E	W	E	W	E	W	E	W	E	W
Urban areas	20,400 (1,774)	21,400 (19,519)	18,350 (2,668)	21,300 (43,330)	26,291 (1,457)	26,500 (27,816)	39,900 (603)	38,500 (11,968)	22,200 (6,371)	23,600 (92,619)
Rural areas	18,100 (1,626)	19,500 (8,176)	17,100 (2,409)	20,300 (16,737)	22,800 (846)	24,400 (7,676)	40,900 (145)	33,989 (2,111)	18,800 (5,026)	21,300 (34,700)
Finland in aggregate	19,190 (3,400)	20,800 (27,695)	17,700 (5,077)	21,000 (60,067)	24,900 (2,303)	26,000 (35,492)	40,100 (748)	37,700 (14,079)	20,363 (11,528)	23,100 (137,333)

E entrepreneurs, *W* wage earners. Number of observations in parentheses earners. This may also suggest that the returns to education for entrepreneurs and wage earners vary between regions.

3.5 Other variables

In addition to level of education, many other explanatory variables are used in the estimations. These include experience, field of education, age, gender and mother tongue. Experience is divided into experience in wage work and self-employment experience. In the IV estimations, the parental education is used as identifying instruments. In the Heckman estimations, parental self-employment history is used in the estimation of the selection equation in addition to other variables. Furthermore, the Heckman estimations include variables that describe regional characteristics, as well a variable that indicates whether an individual is residing in his/her region of birth. The descriptions and means of all the variables are given in Appendix (Table 7).

4 Estimation results

Our estimation strategy is to apply the Mincerian approach first to the data for the entire country and then to the two different types of regions. The aim is to estimate causal effects that are not biased due to the endogenous nature of the decision to invest in schooling or to the problem of self-selection. We apply the Heckman and combined Heckman-instrumental variable (IV) approaches, and compare these results to the OLS estimates of the returns to education. In the estimations, the first specifications consider the impact of education on earnings in years, whereas the latter specifications compare the effect of higher education on earnings to that of lower levels of education. Years of schooling are a standard measure where information is derived from the level of education. A linear relationship is assumed to exist between years of education and log-income, and the results indicate the marginal effect of an extra year of schooling. An alternative is to use levels of education, regardless of how many years it takes an individual to attain. In this case, the annual marginal effect of schooling does not have to be constant, but may vary according to education level. The level obtained by an individual may be more informative than the number of years needed to attain it: a vocational qualification or university degree may matter more than years of schooling per se (Card 1999; García-Mainar and Montuenga-Gómez 2004). As we were especially interested in the effect of higher education, the latter specifications use a dummy that separates the individuals with higher education from those without.

4.1 Results for the entire country

Table 4 displays the results obtained from the standard OLS method. The results of the Heckman and Heckman-IV estimations are reported in Table 5. In the OLS estimation, education has a highly statistically significant effect on earnings. The results indicate that an extra year of education yields a return of 10.4% for entrepreneurs and 10.8% for wage earners. Rates of return to schooling are lower for self-employed than for

Table 4 Earnings equations: results for entrepreneurs (E) and wage workers (W) from OLS estimations (the entire country)

Variable	E	W	E	W
Education				
Education years	0.104 (0.006)***	0.108 (0.001)***	–	–
Higher education	–	–	0.630 (0.040)***	0.574 (0.005)***
Working experience				
Wageexp1	0.317 (0.028)***	0.361 (0.006)***	0.319 (0.028)***	0.357 (0.006)***
Wageexp2	0.585 (0.046)***	0.653 (0.006)***	0.590 (0.047)***	0.648 (0.007)***
Entreexp1	0.370 (0.029)***	0.109 (0.011)***	0.368 (0.029)***	0.100 (0.011)***
Entreexp2	0.681 (0.036)***	0.274 (0.024)***	0.665 (0.036)***	0.254 (0.024)***
Field of education				
Edutrade	−0.041 (0.036)	−0.027 (0.005)***	0.219 (0.031)***	0.204 (0.005)***
Edutechn	−0.095 (0.027)***	0.009 (0.004)*	0.098 (0.024)***	0.173 (0.004)***
Eduhesoc	0.090 (0.045)*	0.058 (0.006)***	272 (0.041)***	0.232 (0.006)***
Eduservi	−0.268 (0.036)***	−0.050 (0.006)***	−0.123 (0.035)***	0.066 (0.006)***
Other variables				
Age	0.005 (0.008)	0.049 (0.001)***	0.008 (0.009)	0.042 (0.001)***
Age2	−0.004 (0.009)	−0.039 (0.001)***	−0.008 (0.009)	−0.044 (0.001)***
Woman	−0.392 (0.023)***	−0.354 (0.004)***	−0.386 (0.023)***	−0.346 (0.004)***
Swedish	0.040 (0.038)	0.041 (0.007)***	0.046 (0.038)	0.049 (0.007)***
Otherlan	−0.177 (0.073)*	−0.041 (0.013)**	−0.208 (0.074)**	−0.098 (0.013)***
Public sector	–	−0.137 (0.004)***	–	−0.102 (0.004)***
Constant	8.205 (0.183)***	7.587 (0.023)***	9.187 (0.173)***	8.651 (0.022)***

E entrepreneurs, *W* wage earners. Standard errors in parentheses. **p* value ≤ 0.05, ***p* value ≤ 0.01 and ****p* value ≤ 0.001

employees, but the difference is small. van der Sluis et al. (2004) summarized that the average return to a marginal year of education for entrepreneurs was 6.1% across 94 previous studies. Our estimates of returns are higher than in most of the existing literature, but it should be noted that they are based on gross earnings. If we look at the results according to level of education, we can see that they show a higher return to highly educated entrepreneurs than for highly educated wage earners. For entrepreneurs, the return for a highest academic degree is 63% higher than for those who do not have higher education, while for wage earners it is 57%.

Before commenting on the results for the other variables, it is necessary to increase the quality of the estimates. The first step is to use the Heckman method to correct for possible selection bias related to employment choice. Selectivity is controlled by estimating a Heckman selection model and including the inverse Mill's ratio ('Heckman's lambda') in the second-step regressions. Several variables are used to correct for the non-random nature of choice of employment. They include level of education and its field, gender, age, language, education of parents and regional factors. The results of the probit estimations for the self-employment decision, in which education is measured in years, are presented

Table 5 Earning equations: results for entrepreneurs (E) and wage workers (W) from the Heckman and combined Heckman-IV estimations

Variable	Heckman				Heckman-IV			
	(1)		(2)		(1)		(2)	
	E	W	E	W	E	W	E	W
Education								
Education years	0.103 (0.007)***	0.107 (0.000)***	–	–	0.169 (0.022)***	0.132 (0.003)***	–	–
Higher education	–	–	0.583 (0.043)***	0.570 (0.006)***	–	–	1.200 (0.163)***	0.996 (0.025)***
Working experience								
Wageexp1	0.316 (0.028)***	0.354 (0.006)***	0.310 (0.028)***	0.350 (0.006)***	0.314 (0.028)***	0.360 (0.006)***	0.314 (0.028)***	0.351 (0.006)***
Wageexp2	0.586 (0.047)***	0.642 (0.006)***	0.575 (0.047)***	0.636 (0.007)***	0.567 (0.048)***	0.656 (0.006)***	0.563 (0.048)***	0.655 (0.007)***
Entreexp1	0.375 (0.029)***	0.1114 (0.011)***	0.376 (0.029)***	0.106 (0.011)***	0.375 (0.029)***	0.112 (0.011)***	0.378 (0.029)***	0.116 (0.011)***
Entreexp2	0.683 (0.031)***	0.287 (0.023)***	0.666 (0.036)***	0.268 (0.025)***	0.686 (0.037)***	0.287 (0.024)***	0.668 (0.037)***	0.284 (0.025)***
Field of education								
Edutrade	−0.035 (0.037)	−0.039 (0.006)***	0.201 (0.031)***	0.186 (0.006)***	−0.223 (0.071)**	−0.081 (0.008)***	0.172 (0.033)***	0.180 (0.005)***
Edutechn	−0.093 (0.027)***	−0.015 (0.005)**	0.081 (0.025)**	0.143 (0.005)***	−0.195 (0.042)***	−0.024 (0.005)***	0.108 (0.025)***	0.171 (0.005)***
Eduhesoc	0.087 (0.045)	0.0858 (0.006)***	0.024 (0.042)***	0.263 (0.007)***	−0.096 (0.074)	0.031 (0.007)***	0.134 (0.052)**	0.269 (0.007)***
Eduservi	−0.268 (0.038)***	−0.026 (0.006)***	−0.125 (0.036)***	0.092 (0.007)***	−0.378 (0.051)***	−0.067 (0.008)***	−0.128 (0.036)***	0.113 (0.006)***
Other variables								
Age	0.006 (0.009)	0.049 (0.001)***	0.018 (0.009)*	0.054 (0.001)***	−0.014 (0.011)	0.034 (0.002)***	−0.004 (0.011)	0.038 (0.002)***
Age2	−0.005 (0.010)	−0.046 (0.002)***	−0.018 (0.010)	−0.053 (0.002)***	0.014 (0.012)	−0.033 (0.002)***	0.002 (0.011)	−0.037 (0.002)***
Woman	−0.405 (0.031)***	−0.387 (0.004)***	−0.440 (0.030)***	−0.383 (0.004)***	−0.326 (0.040)***	−0.344 (0.008)***	−0.385 (0.023)***	−0.345 (0.009)***
Swedish	0.043 (0.038)	0.050 (0.007)***	0.064 (0.038)	0.058 (0.008)***	0.018 (0.039)	0.033 (0.007)***	0.029 (0.039)	0.034 (0.007)***

Table 5 continued

Variable	Heckman				Heckman - IV			
	(1)		(2)		(1)		(2)	
	E	W	E	W	E	W	E	W
Otherlan	−0.179 (0.074)*	−0.034 (0.014)*	−0.183 (0.073)*	−0.089 (0.015)**	−0.182 (0.073)*	−0.030 (0.013)*	−0.214 (0.075)**	−0.074 (0.014)***
Public sector	–	−0.269 (0.007)***	–	−0.253 (0.007)***	–	−0.162 (0.004)***	–	−0.163 (0.005)***
Constant	8.127 (0.253)***	7.474 (0.025)***	8.493 (0.253)***	8.510 (0.026)***	8.339 (0.243)***	7.473 (0.057)***	9.621 (0.355)***	8.607 (0.083)***
Lambda	0.036(0.092)	−0.596(0.024)***	0.150(0.055)**	−0.680(0.024)***				
Sargan statistics					1.118	22.207***	3.551	86.619***
Number of observations	11,359	135,869	11,359	135,869	11,359	135,869	11,359	135,869

E entrepreneurs, *W* wage earners. Standard errors in parentheses. *p value ≤ 0.05, **p value ≤ 0.01 and ***p value ≤ 0.001

in Appendix (Table 8). However, these are not commented on here as they are not of direct interest.

The lambda turns out to be significantly negative for wage earners, which indicates the importance of controlling for self-selection bias. For entrepreneurs the lambda is positive, but significant only in the latter specification. A negative sign indicates negative covariance between the error terms in the employment choice and wage functions, whereas a positive sign indicates the opposite. Thus, a negative lambda suggests that unobserved factors tend to decrease the likelihood of selection to entrepreneurship, while they increase earned income. Due to the selection process, wage earners might have better earnings while self-employed. Comparison of the OLS and Heckman results shows them to be rather similar, with one important exception. The adjustment for selectivity has a substantial impact on the coefficient of the return to higher education for entrepreneurs, which is now much closer to (though still higher than) the return for wage earners. Thus, compared to the OLS estimation, this estimation shows a smaller risk premium for highly educated entrepreneurs. Otherwise, the effects on the estimated coefficients are minor. In the specification in which education is defined in years, the rate of return is approximately 10% for a marginal year of education for both groups, while still remaining slightly bigger for wage earners.

The next step is to control for the possible endogeneity of choice of education together with self-selection. An instrumental variable method is combined with the Heckman method, in which the education of parents is used as identifying instruments for the choice of education. First, the selection model is estimated, from which the inverse Mills ratios are then included in the IV regression. In line with previous studies (e.g., van der Sluis et al. 2004, 2008), the use of the IV method produces higher returns to education. The estimated annual marginal effect of schooling is clearly higher for entrepreneurs than for wage earners: for entrepreneurs it is now 16.9% and for wage earners 13.4%. With respect to the results for wage earners, the estimated effects are higher than in many previous studies conducted in Finland (e.g., Asplund 1993, 2000), but similar to the results obtained by Uusitalo (1999). The results of the latter specifications suggest that higher education levels raise the income of entrepreneurs by as much as 120%. For wage earners, the comparable rate of return is somewhat smaller (99.6%), but still substantially high.

Thus, these results show strikingly higher returns to education than previous results. Which are more credible?[2] One approach is to test the validity and over-identification of the instruments in the IV estimation. These are tested with the Hansen–Sargan test. The test indicates whether the instruments are uncorrelated with the error term and whether the excluded instruments are correctly excluded from the estimated equation.

[2] Uusitalo (1999) suggests three distinct explanations for the difference between the OLS and IV estimates. First, the OLS estimates may be downward biased because of measurement error in schooling, while the IV estimates are consistent in the presence of measurement errors. Second, the instruments may be wrongly specified, which could bias the instrumental variable estimates upwards. Third, individuals may optimize their behavior, which leads to a correlation between schooling and the earnings equation error and furthermore to a bias in the OLS estimates. Griliches (1977) considered that this correlation is negative in practice; educational attainment is cheaper for individuals who have less income to lose in the course of education. Thus, their optimal amount of schooling is larger and the OLS estimates tend to be downward biased.

For entrepreneurs the over-identification test supports the null hypothesis, but it does not do so for wage earners. This suggests that the instruments are not valid for wage earners. The reason for this is not clear, as the education of parents is widely suggested and used as an instrument of schooling choice. Another common instrument is the education of the spouse (see e.g. Iversen et al. 2006), but as all individuals do not have a spouse, this is not a workable solution.[3] For these reasons, the results given by the combined Heckman-IV estimation remain somewhat ambiguous, and more weight should be given to the plain Heckman results.

To comment briefly on the results for the other variables, the first item of note is the importance of the other main determinant of the Mincerian earning equation, namely experience. All the experience variables are highly statistically significant as expected. Prior experience in wage work is a more important determinant of employees' earnings, whereas experience in entrepreneurship matters more for entrepreneurs. Interestingly, experience in entrepreneurship does not have such a big effect on the earnings of wage workers as experience in wage work has on the earnings of entrepreneurs. The results suggest a non-linear relationship between earnings and age for wage earners, while age does not have a significant effect for entrepreneurs. Field of education has a widely significant effect, especially in the latter specifications. Gender has a distinct effect: females earn less than males. The language dummies show, first, that individuals who speak a language other than Finland's two official languages (Finnish or Swedish) as their mother tongue, i.e., immigrants, have lower earnings than natives, and second, that earnings are statistically higher for Swedish-speaking employees but not for Swedish-speaking entrepreneurs. Employees in the public sector have lower earnings than employees in the private sector.

Taken as a whole, most of our control variables proved to be significant and behave as expected. The obtained results using different methods and specifications are mostly consistent. As to the estimated return to education measured in years, this proved to be similar for entrepreneurs and wage earners in the plain OLS estimation and especially in the Heckman estimation in which choice of employment is controlled for. On the contrary, in the comparison between higher education and other education, the results suggested a somewhat higher return for entrepreneurs than for wage earners. However, no clear sign of a risk premium was found for educated entrepreneurs.

4.2 Regional results

Let us now turn to the regional estimations (Table 6). Results by type of region give us an insight into regional differences in returns to education for entrepreneurs and wage earners. The specifications include the same control variables as the equations for the entire country, but for brevity these results are not shown in Table 6.

To begin with, the results seem to diverge to some extent between the two types of regions. In urban areas, the estimated return to education is fairly similar between wage earners and entrepreneurs. An exception is the Heckman-IV specification in which education is measured in years: these results would suggest a higher return for

[3] Instead, information on parental education for all individuals is available.

Table 6 Regional earning equations: results for entrepreneurs (E) and wage workers (W)

Region type	Variable	OLS				Heckman				Heckman-IV			
		(1)		(2)		(1)		(2)		(1)		(2)	
		E	W	E	W	E	W	E	W	E	W	E	W
Urban areas	Education years	0.099 (0.008)***	0.107 (0.001)***	–	–	0.109 (0.008)***	0.107 (0.001)***	–	–	0.144 (0.022)***	0.124 (0.003)***	–	–
	Higher education	–	–	0.554 (0.045)***	0.559 (0.006)***	–	–	(0.575) (0.047)***	(0.561) (0.006)***	–	–	(0.967) (0.151)***	(0.935) (0.021)***
Rural areas	Education years	0.098 (0.012)***	0.102 (0.002)***	–	–	0.112 (0.013)***	0.102 (0.002)***	–	–	0.120 (0.044)***	0.103 (0.006)***	–	–
	Higher education	–	– (0.089)***	0.770 (0.013)***	0.574	–	– 0.092***	0.802 (0.014)***	0.572	–	– (0.468)**	1.219 (0.059)***	0.921
Sargan statistics										2.447	17.016***	4.524	60.015***
										1.479	5.038***	2.133	18.918***

E entrepreneurs, *W* wage earners. Standard errors in parentheses. *p value ≤ 0.05, **p value ≤ 0.01 and ***p value ≤ 0.001. The specifications contain the same control variables as the specifications for the entire country (see Table 4), but these results are not presented here entrepreneurs than for wage earners. Unfortunately, the over-identification test is still not supported for wage earners. For rural areas, the results suggest more systematically higher returns to education for entrepreneurs than for wage earners. The difference in impact measured by years is minor, but a clearer difference is found for highly educated entrepreneurs: for this group, the estimated return is clearly higher than for wage earners with the same level of education. The Heckman-IV estimation suggests a 3% point higher return for entrepreneurs. The return for an extra year of education was up to 1.7% points higher for these individuals depending on the estimation method used.

If we compare the results for the two types of regions, the estimations suggest that returns to education are higher for entrepreneurs in rural than in urban areas. In particular, well-educated entrepreneurs receive high returns to education in the countryside. In the group of wage earners, returns to education prove to be more alike between urban and rural regions. However, an urban environment might be a more attractive choice for employees in terms of returns to earnings.

These results support Bennett et al. (1995), who found that highly educated persons have relatively higher returns to education in rural areas compared to the less educated. In our study, this is especially true for entrepreneurs. The results are, however, the reverse of those obtained by Goetz and Rupasingha (2004), who observed that returns to higher degrees of schooling are lower in rural areas compared to urban ones. Particularly for entrepreneurs, the relationship between education and income is more likely to be non-linear in rural areas (cf. Iversen et al. 2006). It is likely that the firms owned by higher educated entrepreneurs are focused on wider markets, while low-skilled entrepreneurs confine themselves to the local market. This tends to raise the relative returns for the highly educated. Online services provide an example of the kind of business run by the highly educated.

5 Conclusions

On average in Finland, entrepreneurs are less educated than wage earners. This paper analyzed the returns to education for entrepreneurs and wage earners in two types of Finnish regions, urban and rural. These regions differ in many respects, including in entrepreneurial activity. In general, rural areas have a higher self-employment rate compared to urban areas. However, if we look only at the group of highly educated self-employed, regional differences in entrepreneurial activity become considerably smaller.

According to our results, the returns to education turned out to be similar for entrepreneurs and wage earners, when educational attainment is measured in years. In the dichotomous comparison between the highly educated and others, the estimated return is slightly higher for entrepreneurs than for employees, although no clear-cut risk premium was found for educated entrepreneurs. Urban areas dominated the results for the entire country, whereas rural areas showed divergent results. In rural areas, returns to education are higher for entrepreneurs. Particularly high returns were found for highly-educated entrepreneurs in rural areas.

What are the implications of these results for choice of employment and location of workplace? Our results suggest that entrepreneurship is a more attractive employment choice for highly educated individuals in rural areas, whereas in urban areas the return is about the same for both occupational choices. In terms of choosing location, educated entrepreneurs are financially better off in rural areas. For wage earners, region of residence does not have such importance in terms of returns to education.

Regionally, these findings raise the question of the causes of regional variation in the rate of entrepreneurship and the relative strength of pull and push factors. Are individuals pulled or pushed into self-employment? Is it market pull and higher expected earnings that dominate, or are individuals pulled into entrepreneurship because nothing else is available? Our results suggest that well-educated individuals get a high return to education, especially in rural areas. Agglomeration economies do not seem to play significant role. Even so, the option of entrepreneurship is not a highly popular one among the highly educated in rural areas. Regional differences in the intensity of entrepreneurship do not stem from differences among the well educated, but rather from differences among the less educated. Consequently, it is the push effect that dominates, not the pull effect. Regional differences in the rate of self-employment are more likely due to fewer paid-employment opportunities in rural and other weak economic areas than to higher expected earnings. Finally, variations in relative returns to education across regions do not seem to account for the prevailing regional differences in entrepreneurship.

Acknowledgments This paper is a part of the Research Programme on Business Know-how (LIIKE2, project number 112116, and project number 127049), both financed by the Academy of Finland. Financial support from the Yrjö Jahnsson Foundation (project 5597) and Finnish Concordia Fund is gratefully acknowledged by the first author. The authors wish to thank Marcus Dejardin and two anonymous referees for their valuable comments as well as the participants at the special session "Entrepreneurship and the Region" at the 47th Congress of the European Regional Science Association (29 August–2 September 2008, Paris) for contributing to the earlier version of the paper.

Appendix

See Tables 7 and 8.

Table 7 Descriptions of variables and their means/share

Variable	Definition	Entrepreneurs	Wage earners
Logincome	ln(income subject to state taxation – unemployment benefit – daily allowance and maternity allowance – home care allowance)	9.8	10.0
Urban	1 if location of workplace is in urban area, 0 otherwise	56.4	74.7
Explanatory variables			
Education			
Education in years	Number of years of education	11.2	11.7
Higher education	1 if higher-degree level tertiary education or doctorate or equivalent level tertiary, 0 otherwise	6.5	10.3

Table 7 continued

Variable	Definition	Entrepreneurs	Wage earners
Working experience			
Wageexp1	1 if wage earning experience 5–10 years, 0 otherwise	29.1	24.3
Wageexp2	1 if wage earning experience more than 10 years, 0 otherwise	7.1	54.7
Entreexp1	1 if entrepreneurship experience 5–10 years, 0 otherwise	29.2	2.3
Entreexp2	1 if entrepreneurship experience more than 10 years, 0 otherwise	40.4	0.4
Field of education			
Edutrade	1 if field of education business or social sciences, 0 otherwise	13.1	16.1
Edutechn	1 if field of education technology or natural sciences, 0 otherwise	28.9	26.7
Eduhesoc	1 if field of education health or welfare, 0 otherwise	6.9	10.9
Eduservi	1 if field of education services, 0 otherwise	10.4	9.3
Personal characteristics			
Age	Age in years	45.2	40.2
Age2	Age-squared divided by 100	21.3	17.5
Woman	1 if female, 0 if male	33.1	50.5
Swedish	1 if native language is Swedish, 0 otherwise	6.7	5.5
Otherlan	1 if native language other than Finnish or Swedish, 0 otherwise	1.8	1.5
Native	1 if residing in sub-region of birth, 0 otherwise	64.1	60.1
Family background			
Fatinedu	1 if father has secondary education, 0 otherwise	11.9	16.5
Fathiedu	1 if father has tertiary education, 0 otherwise	9.9	14.7
Motinedu	1 if mother has secondary education, 0 otherwise	15.0	20.4
Mothiedu	1 if mother has tertiary education, 0 otherwise	6.7	10.9
Entrfat	1 if father was self-employed in 1970, 1980 or 1990, 0 otherwise	16.3	9.2
Entrmot	1 if mother was self-employed in 1970, 1980 or 1990, 0 otherwise	13.6	7.5
Regional characteristics			
Gdp	Annual index of gdp in the region	90.6	95.7
Size of firms	Average size of firms in the region (employees)	4.5	4.8
Employment rate	Unemployment rate in the region	12.6	12.0
Number of observations		11,528	137,333

Table 8 Results of the probit estimations of the Heckman selection equation (self-employment decision; education in years)

Variables	Entire country	Urban areas	Rural areas
Education years	−0.061 (0.003)***	−0.049 (0.004)***	−0.083 (0.006)***
Edutrade	0.073 (0.018)***	0.060 (0.022)**	0.171 (0.034)***
Edutechn	−0.024 (0.014)	−0.050 (0.018)**	0.042 (0.024)
Eduhesoc	0.032 (0.021)	0.077 (0.026)**	−0.040 (0.038)
Eduservi	0.218 (0.018)***	0.232 (0.023)***	0.223 (0.031)***
Age	0.082 (0.004)***	0.079 (0.005)***	0.091 (0.006)***
Age2	−0.068 (0.004)***	−0.064 (0.006)***	−0.0791 (0.007)***
Woman	−0.395 (0.012)***	−0.352 (0.014)***	−0.481 (0.020)***
Swedish	0.063 (0.022)***	0.040 (0.029)	0.040 (0.034)
Otherlan	0.262 (0.040)***	0.312 (0.044)***	0.195 (0.099)*
Native	0.035 (0.011)**	0.024 (0.013)*	0.000 (0.019)
Fatinedu	0.032 (0.016)*	0.031 (0.020)	0.063 (0.028)*
Fathiedu	0.062 (0.019)***	0.083 (0.022)***	0.083 (0.039)*
Motinedu	0.025 (0.015)	0.039 (0.018)*	0.019 (0.026)
Mothiedu	0.065 (0.022)**	0.071 (0.026)**	0.098 (0.045)*
Entrfat	0.339 (0.019)***	0.302 (0.023)***	0.393 (0.032)***
Entrmot	0.223 (0.020)***	0.228 (0.025)***	0.199 (0.035)***
Gdp	−0.001 (0.001)**	−0.001 (0.001)**	−0.000 (0.000)
Size of firms	−0.070 (0.006)***	0.055 (0.010)***	−0.035 (0.008)***
Employment rate	−0.001 (0.002)	0.010 (0.002)***	−0.010 (0.002)***
Constant	−2.496 (0.092)***	−3.412 (0.123)***	−2.215 (0.152)***

E entrepreneurs, *W* wage earners. Standard errors in parentheses. *p value ≤ 0.05, **p value ≤ 0.01 and ***p value ≤ 0.001

References

Alba-Ramirez A, Sansegundo MJ (1995) The returns to education in Spain. Econ Educ Rev 14:155–166
Arrow KJ (1973) Higher education as filter. J Public Econ 2:193–216
Ashenfelter O, Harmon C, Oosterbeck H (1999) A review of the schooling/earnings relationship with tests for publication bias. Labour Econ 6:453–470
Asplund R (1993) Essays on human capital and earnings in Finland. The Research Institute of the Finnish Economy, Series A 18, Helsinki
Asplund R (2000) Private returns to education in Finland: back to basics. The Research Institute of the Finnish Economy, Discussion Papers 720, Helsinki
Becker G (1975) Human capital. Columbia University Press, New York
Bennett R, Glennester H, Nevison D (1995) Regional rates of return to education and training in Britain. Reg Stud 29:279–295
Bernard AB, Redding S, Schott PK, Simpson H (2003) Relative wage variation and industry location. National Bureau of Economic Research (NBER), Working Paper 9998
Bernhardt I (1994) Comparative advantage in self-employment and paid work. Can J Econ 27:273–289
Brown S, Sessions JG (1998) Education, employment status and earnings: a comparative test of the strong screening hypothesis. Scottish J Polit Econ 45:586–591
Brown S, Sessions JG (1999) Education, employment status and earnings: a test of the strong screening hypothesis in Italy. Econ Educ Rev 18:397–404

Card D (1999) The causal effect of education on earnings. Handbook of labor economics 3:1801–1863. North-Holland, Amsterdam
Carrasco R, Ejrnæ M (2003) Self-employment in Denmark and Spain: institution, economic conditions and gender differences. Centre for Applied Microeconometrics, Institute of Economics, University of Copenhagen
Dalmazzo A, de Blasio G (2007) Social returns to education in Italian local labor markets. Ann Reg Sci 41:51–69
de Blasio G, Di Addario S (2005) Do workers benefit from industrial agglomeration. J Reg Sci 45:797–827
Dumond M, Barry H, Macperson D (1999) Wage differentials across labor markets: does cost of living matter. Econ Inquiry 37:577–589
Duranton G, Monastiriotis V (2002) Mind the gaps: the evolution of regional earnings inequalities in the U.K., 1982–1997. J Reg Sci 42:219–256
Evans DS, Leighton LS (1990) Small business formation by unemployed and employed workers. Small Bus Econ 2:319–330
Firkin P (2003) Entrepreneurial capital. In: De Bruin A, Dupuis A (eds) New perspectives in a global age. Ashgate, UK
Fujita M, Krugman P, Venables AJ (1999) The spatial economy. The MIT Press, Cambridge
García-Mainar I, Montuenga-Gómez VM (2004) Education returns of wage earners and self-employed workers: Portugal vs. Spain. Econ Educ Rev 24:161–170
Georgellis Y, Wall HJ (2000) What makes a region entrepreneurial? Evidence from Britain. Ann Reg Sci 34:385–403
Goetz SJ, Rupasingha A (2004) The returns to education in rural areas. Rev Reg Stud 34:245–259
Griliches Z (1977) Estimating the returns to schooling: some econometric problems. Econometrica 45:1–22
Hamilton BH (2000) Does entrepreneurship pay? An empirical analysis of the returns to self-employment. J Polit Econ 108:604–631
Heckman J (1979) Sample selection bias as a specification error. Econometrica 47:153–161
Iversen J, Malchow-Møller N, Sørensen A (2006) Returns to schooling in self-employment. Centre for Economic and Business Research (CEBR), Discussion paper 19
Johansson E (2000) Self-employment and the predicted earnings differential—evidence from Finland. Finnish Econ Pap 13:45–55
Kangasharju A, Pekkala S (2002) The role of education in self-employment success in Finland. Growth Change 33:216–237
Labridianis L (2006) Fostering entrepreneurship as a means to overcome barriers to development of rural peripheral areas in Europe. Eur Plan Stud 14:3–8
Lehmer F, Möller J (2009) Interrelations between the urban wage premium and firm-size wage differentials: a microdata cohort for Germany. Ann Reg Sci (forthcoming)
Marshall A (1890) The principles of economics. Macmillan, London
Mincer J (1974) Schooling, experience and earnings. Columbia University Press, New York
Niittykangas H, Tervo H (2005) Spatial variations in intergenerational transmissions of self-employment. Reg Stud 39:319–332
Parker SC, van Praag M (2004) Schooling, capital constraints and entrepreneurial performance. Tinbergen Institute Discussion Papers 04-106/3, Tinbergen Institute, Amsterdam
Parker SC (1999) The inequality of employment and self-employment incomes: a decomposition analysis for the UK. Rev Income Wealth 45:263–274
Parker SC (2004) The economics of self-employment and entrepreneurship. Cambridge University Press, Cambridge
Power TM, Barrett RN (2001) Post-cowboy economics: pay and prosperity in the new American West. Island Press, Washington DC
Psacharopoulos G (1979) On the weak versus the strong version of screening hypothesis. Econ Lett 4:181–185
Rees H, Shah A (1986) An empirical analysis of self-employment in the UK. J Appl Econom 1:95–108
Robinson PB, Sexton EA (1994) The effect of education and experience on self-employment success. J Bus Venturing 9:141–156
Rosen S (1981) The economics of superstars. Am Econ Rev 71:845–858
Spence M (1973) Job market signalling. J Labor Econ 87:355–374
Statistics Finland (2001) Population census 2000 handbook. Helsinki

Storey D (1994) Understanding the small business. Routledge, London
Tervo H (2008) Self-employment transitions and alternation in Finnish rural and urban labour markets. Pap Reg Sci 87:55–76
Tervo H, Haapanen M (2010) The nature of self-employment: how does gender matter? Int J Entrepreneurship Small Bus 9:349–371
Uusitalo R (1999) Essays in economics of education. Academic Dissertation, February, University of Helsinki, Faculty of Social Science, Helsinki
Uusitalo R (2001) Homo entreprenaurus? Appl Econ 33:1631–1638
van der Sluis JM, van Praag M, van Witteloostuijn A (2004) Entrepreneurship, selection and performance: a meta-analysis of the role of education. Tinbergen Institute Discussion Paper 03-046/3, Tinbergen Institute, Amsterdam
van der Sluis J, van Praag M, Vijverberg W (2008) Education and entrepreneurship selection and performance: a review of the empirical literature. J Econ Surv 22(5):95–841

CORRECTION APPENDIX

TABLE 4 Earnings equations: results for entrepreneurs (E) and wage workers (W) from OLS estimations (the entire country), variable Native added

Variable	E	W	E	W
Education				
Education years	.104*** (.006)	.108*** (.001)	-	-
Higher education	-	-	.630*** (.040)	.574*** (.005)
Working experience				
Wageexp1	.317*** (.028)	.361*** (.006)	.319*** (.028)	.357*** (.006)
Wageexp2	.585*** (.046)	.653*** (.006)	.590*** (.047)	.648*** (.007)
Entreexp1	.370*** (.029)	.109*** (.011)	.368*** (.029)	.100*** (.011)
Entreexp2	.681*** (.036)	.274*** (.024)	.665*** (.036)	.254*** (.024)
Field of education				
Edutrade	-.041 (.036)	-.027*** (.005)	.219*** (.031)	.204*** (.005)
Edutechn	-.095*** (.027)	.009* (.004)	.098*** (.024)	.173*** (.004)
Eduhesoc	.090* (.045)	.058*** (.006)	272*** (.041)	.232*** (.006)
Eduservi	-.268*** (.036)	-.050*** (.006)	-.123*** (.035)	.066*** (.006)
Other variables				
Age	.005 (.008)	.049*** (.001)	.008 (.009)	.042*** (.001)
Age2	-.004 (.009)	-.039*** (.001)	-.008 (.009)	-.044*** (.001)
Woman	-.392*** (.023)	-.354*** (.004)	-.386*** (.023)	-.346*** (.004)
Swedish	.040 (.038)	.041*** (.007)	.046 (.038)	.049*** (.007)
Otherlan	-.177* (.073)	-.041** (.013)	-.208** (.074)	-.098*** (.013)
Native	-.060*** (.020)	-.046*** (.006)	-.074*** (.020)	-.071*** (.003)
Public sector	-	-.137*** (.004)	-	-.102*** (.004)
Constant	8.205*** (.183)	7.587*** (.023)	9.187*** (.173)	8.651*** (.022)

Notes: Standard errors in parentheses. *p-value ≤ .05, **p-value ≤ .01 and ***p-value ≤ .001.

TABLE 5 Earning equations: results for entrepreneurs (E) and wage workers (W) from the Heckman and combined Heckman - IV estimations, Heckman - IV re-estimated (cf. Table 8)

	Heckman				**Heckman - IV**			
	(1)		(2)		(1)		(2)	
Variable	E	W	E	W	E	W	E	W
Education								
Education years	.103***	.107***	-	-	.163***	.125***	-	-
	(.007)	(.000)			(.021)	(.003)		
Higher education	-	-	.583***	.570***	-	-	1.171***	.957***
			(.043)	(.006)			(.154)	(.022)
Working experience								
Wageexp1	.316***	.354***	.310***	.350***	.311***	.360***	.312***	.351***
	(.028)	(.006)	(.028)	(.006)	(.028)	(.006)	(.028)	(.006)
Wageexp2	.586***	.642***	.575***	.636***	.566***	.655***	.563***	.654***
	(.047)	(.006)	(.047)	(.007)	(.048)	(.006)	(.048)	(.007)
Entreexp1	.375***	.1114***	.376***	.106***	.382***	.119***	.382***	.119***
	(.029)	(.011)	(.029)	(.011)	(.029)	(.011)	(.029)	(.011)
Entreexp2	.683***	.287***	.666***	.268***	.700***	.294***	.676***	.287***
	(.031)	(.023)	(.036)	(.025)	(.037)	(.024)	(.037)	(.025)
Field of education								
Edutrade	-.035	-.039***	.201***	.186***	-.224**	-.081***	.166***	.171***
	(.037)	(.006)	(.031)	(.006)	(.072)	(.008)	(.034)	(.005)
Edutechn	-.093***	-.015**	.081**	.143***	-.211***	-.037***	.094***	.156***
	(.027)	(.005)	(.025)	(.005)	(.047)	(.006)	(.025)	(.004)
Eduhesoc	.087	.0858***	.024***	.263***	-.113	.024***	.124*	.254***
	(.045)	(.006)	(.042)	(.007)	(.080)	(.007)	(.057)	(.007)
Eduservi	-.268***	-.026***	-.125***	.092***	-.343***	-.032***	-.114**	.128***
	(.038)	(.006)	(.036)	(.007)	(.046)	(.006)	(.036)	(.006)
Other variables								-.022***
								(.004)
Age	.006	.049***	.018*	.054***	-.003	.050***	-.005	.048***
	(.009)	(.001)	(.009)	(.001)	(.010)	(.002)	(.010)	(.002)
Age2	-.005	-.046***	-.018	-.053***	.002	-.046***	.006	-.046***
	(.010)	(.002)	(.010)	(.002)	(.010)	(.002)	(.010)	(.002)
Woman	-.405***	-.387***	-.440***	-.383***	-.412***	-.418***	-.393***	-.393***
	(.031)	(.004)	(.030)	(.004)	(.031)	(.005)	(.031)	(.006)
Swedish	.043	.050***	.064	.058***	.033	.046***	.037	.042***
	(.038)	(.007)	(.038)	(.008)	(.038)	(.007)	(.038)	(.007)
Otherlan	-.179*	-.034*	-.183*	-.089**	-.151*	-.001	-.198**	-.053***
	(.074)	(.014)	(.073)	(.015)	(.075)	(.013)	(.075)	(.014)
Native	-.060***	-.036***	-.074***	-.060***	-.032	-.018***	-.045*	-.022***
	(.021)	(.004)	(.021)	(.004)	(.023)	(.004)	(.023)	(.004)
Public sector	-	-.269***	-	-.253***	-	-.155***	-	-.156***
		(.007)		(.007)		(.005)		(.005)
Constant	8.127***	7.474***	8.493***	8.510***	8.339***	6.752***	9.181***	8.106***
	(.253)	(.025)	(.253)	(.026)	(.243)	(.050)	(.276)	(.049)
Lambda	.036	-.596***	.150**	-.680***				
	(.092)	(.024)	(.055)	(.024)				
Sargan statistics					1.229	31.920***	3.767	96.001***
Number of observations	11 359	135 869	11 359	135 869	11 359	135 869	11 359	135 869

Notes: E = entrepreneurs, W= wage earners. Standard errors in parentheses. *p-value ≤ .05, **p-value ≤ .01 and ***p-value ≤ .001.

TABLE 6 Regional earning equations: results for entrepreneurs (E) and wage workers (W), Heckman - IV re-estimated (cf. Table 8)

		OLS				**Heckman**				**Heckman - IV**			
		(1)		(2)		(1)		(2)		(1)		(2)	
Region type	***Variable***	E	W	E	W	E	W	E	W	E	W	E	W
Urban areas	Education years	.099*** (.008)	.107*** (.001)	-	-	.109*** (.008)	.107*** (.001)	-	-	.147*** (.023)	.126*** (.003)	-	-
	Higher education	-	-	.554*** (.045)	.559*** (.006)	-	-	.575*** (.047)	.561*** (.006)	-	-	.968*** (.157)	.932*** (.024)
Rural areas	Education years	.098*** (.012)	.102*** (.002)	-	-	.112*** (.013)	.102*** (.002)	-	-	.125*** (.049)	.103*** (.007)	-	-
	Higher education	-	-	.770*** (.089)	.574*** (.013)	-	-	.802*** (.092)	.572*** (.014)	-	-	1.221** (.500)	.890*** (.066)
Sargan statistics										2.443	21.973***	4.603	66.459***
										1.452	5.034***	2.129	17.814***

Notes: E = entrepreneurs, W= wage earners. Standard errors in parentheses. *p-value ≤ .05, **p-value ≤ .01 and ***p-value ≤ .001. The specifications contain the same control variables as the specifications for the entire country (see Table 4), but these results are not presented here.

TABLE 8 Results of the probit estimations of the Heckman selection equation (self-employment decision; education in years)

Variables	**Entire country**	**Urban areas**	**Rural areas**
Edutrade	-.090*** (.016)	.060** (.022)	-.041 (.030)
Edutechn	-.130*** (.012)	-.050** (.018)	-.087*** (.021)
Eduhesoc	-.097*** (.020)	.077** (.026)	-.202*** (.036)
Eduservi	.150*** (.018)	.232*** (.023)	.126*** (.030)
Age	.076*** (.004)	.079*** (.005)	.082*** (.006)
Age2	-.061*** (.004)	-.064*** (.006)	-.069*** (.007)
Woman	-.396*** (.012)	-.352*** (.014)	-.482*** (.020)
Swedish	.055** (.022)	.040 (.029)	.035 (.034)
Otherlan	.273*** (.040)	.312*** (.044)	.207* (.098)
Native	.067*** (.011)	.024* (.013)	.038 (.020)
Fatinedu	.011 (.016)	.031 (.020)	.033 (.028)
Fathiedu	-.009 (.019)	.083*** (.022)	-.011 (.038)
Motinedu	.000 (.015)	.039* (.018)	-.009 (.026)
Mothiedu	-.002 (.022)	.071** (.026)	.015 (.044)
Entrfat	.337*** (.019)	.302*** (.023)	.386*** (.032)
Entrmot	.219*** (.020)	.228*** (.025)	.204*** (.035)
Gdp	-.001** (.001)	-.001** (.001)	-.000 (.000)
Size of firms	-.074*** (.006)	.055*** (.010)	-.036*** (.008)
Employment rate	-.001 (.002)	.010*** (.002)	-.012*** (.002)
Constant	-2.957*** (.089)	-3.412*** (.123)	-2.865*** (.143)

Notes: Standard errors in parentheses. *p-value ≤ .05, **p-value ≤ .01 and ***p-value ≤ .001.

SUMMARY IN FINNISH (YHTEENVETO)

Ekonometrisia tutkimuksia yrittäjyyden julkisesta tukemisesta

Yrittäjyys ja yritykset ovat keskeisessä roolissa talouskasvun ja tuottavuuden kehittymisen kannalta. Tämän vuoksi useat valtiot ympäri maailman rahoittavat yrittäjyyttä erilaisin tuki-instrumentein. Nämä julkiset interventiot nähdään elintärkeäksi välineeksi yritysten syntymisen, uusien ideoiden ja tuotteiden edistämiseksi sekä työllisyyden ja kilpailukyvyn kohentamiseksi. Tämä tutkimus tarkastelee näitä julkisen sektorin yrittäjyyteen suuntaamia tukitoimia. Tarkastelun kohteena ovat suomalaisen järjestelmän eri tukimuodot vuosina 1988-2004. Tutkimus koostuu viidestä erillisestä esseestä, jotka jakaantuvat kahteen teemaan. Kolmessa ensimmäisessä artikkelissa tarkastelun kohteena on niin sanottu deadweight -vaikutus eli se julkisen tuen osuus, joka olisi ollut korvattavissa muulla rahoituksella. Hanke olisi siis toteutunut myös ilman julkista tukea ja tämä osuus voidaan tulkita turhaksi julkiseksi tueksi. Deadweight -vaikutuksen esiintyminen kertoo tukijärjestelmän tehottomuudesta. Kaksi viimeistä esseetä käsittelee julkisen tukemisen vaikutuksia yritysten menestymiseen, jota mitataan yrittäjyyden kestona ja yrittäjien tuloina. Yhdessä nämä kaksi näkökulmaa, tehokkuus ja vaikuttavuus, ovat välttämättömiä tukien positiivisen nettovaikutuksen toteamiseksi. Suuretkaan vaikutukset eivät ole yhteiskunnan kannalta myönteisiä, jos ne olisivat toteutuneet myös ilman julkista tukea.

Luvussa 2 tutkimuksen ensimmäinen empiirinen essee tutkii deadweight -vaikutuksen merkitystä investointihankkeissa ja erityisesti ”nolla deadweightin” esiintymistä. Nolla-deadweightillä tarkoitetaan tuettua hanketta, jossa ei esiinny deadweight -vaikutusta. Toisin sanoen hanketta ei olisi toteutettu lainkaan ilman tukea. Vaikuttavuuden maksimoimiseksi tuen kohdentaminen tällaisiin hankkeisiin voi olla perusteltua EU:n tukiohjelmia uudistettaessa. Aineistona on 3,423 Kauppa- ja teollisuusministeriön vuosina 2001-2003 tukemaa investointihanketta. Tieto deadweight -vaikutuksesta on kerätty tuen myöntämishetkellä. Tulokset osoittavat, että investointitukien turhassa myöntämisessä on alue- ja hankekohtaisia eroja. Syrjäseuduilla (Pohjois- ja Itä-Suomessa) toteutettavat hankkeet ovat riippuvaisempia julkisesta tuesta kuin Etelä-Suomessa toteutettavat hankkeet. Tämä johtuu osin suuremmasta julkisen tuen tarpeesta ja osittain syrjäisten tukialueiden korkeammasta tukiosuudesta. Deadweight -vaikutus on lisäksi suurempaa pitkään toimineilla ja isommilla yrityksillä. Investoinnin kantokyky (hankkeen koko suhteessa yrityksen liikevaihtoon) merkitsee enemmän kuin yrityksen koko indikoimalla hankkeen riskistä. Mitä suurempi kantokyky, sitä suurempi deadweight-vaikutus eli todennäköisemmin tuki olisi voitu korvata muulla rahoituksella.

Luvussa 3 toinen empiirinen essee laajentaa deadweight -vaikutuksen analyysia tutkimalla erilaisten deadweight -mittareiden ominaisuuksia ja korrelaatiota. Tutkimuksessa oletetaan, että ainoastaan yritys voi tietää todellisen

deadweight -vaikutuksen tason eli sen yritys olisiko toteuttanut hanketta ilman tukea. Jos julkinen sektori on asettanut tukikriteerinsä oikein, pitäisi myös sen pystyä havaitsemaan hankkeen deadweight -taso. Kontrollimittarina tutkimuksessa toimii yritykseltä kysytty tieto olisiko tuen osuutta voitu korvata muulla rahoituksella. Tutkimus havaitsee positiivista deadweight -vaikutusta yli 2/3 tuetuista hankkeista ja turhan alueellisen yritystuen osuudeksi jopa 73.8 prosenttia tukirahoituksesta. Deadweight on siis todellinen riski julkisessa yritysrahoituksessa. Julkisen sektorin omat arviot deadweight -vaikutuksen tasosta ovat yritysten arvioita korkeammat. Tulosten mukaan erilaiset aiemmissa tutkimuksissa käytetyt mittarit deadweight –vaikutuksen tasosta eroavat huomattavasti toisistaan, eikä niitä voi käyttää toistensa substituutteina vaan toisiaan täydentävänä informaationa.. Syynä eroon on todennäköisesti epäsymmetrinen informaatio. Tukitoimijat ja yritysten edustajat painottavat erilaisia tekijöitä arvioidessaan tuen merkitystä hankkeen toteuttamiselle. Yrityksen lähtökohta oli rahoitukseen liittyvissä kysymyksissä, kun taas yritystutkijat painottivat aluetaloudellisia tekijöitä.

Luku 4 tarkastelee deadweight -vaikutuksen alueellista jakautumista ja kehittää tarkempia menetelmiä turhan yritystuen rahalliseen arviointiin (deadweight spending). Tutkimus paljastaa suuria alueellisia eroja turhassa yritystuen myöntämisessä. Suurinta turhan yritystuen osuus on Tukialueella 1 ja pienintä tukialueiden ulkopuolella. Keskimäärin yli kolmasosa tuesta on ollut turhaan myönnettyä. Turhaan yritystuen myöntämiseen vaikuttavat tukityyppi, yrityksen koko ja toimiala. Aluekohtaiset vertailut osoittavat, että tukialueiden välisissä myöntöprosesseissa on pieniä eroja, joiden tutkiminen voisi tehostaa tukijärjestelmää. Turhan yritystuen myöntämistä voitaisiin vähentää aluekohtaisilla ohjeistuksilla kansallisten myöntöohjeiden sijaan.

Luvussa 5 esitetty tutkimus keskittyy starttirahan vaikutusten tarkasteluun ja yrittäjyyden kestoon. Analyysin kohteena ovat Suomessa vuosina 1988-2001 tuetut starttirahayrittäjät verrattuna muihin uusiin yrittäjiin, jotka eivät starttirahaa saaneet. Analyysissa käytetään duraatiomalleja ja ryhmät vertaistetaan propensity score matching-menetelmällä. Tutkimuksen tärkein tulos on, että starttirahayrittäjien yrittäjyyden kesto on pidempi kuin verrokkiryhmän. Tämä tulos saavutetaan useilla eri malleilla ja se eroaa aiemmista kansainvälisistä tutkimustuloksista. Starttirahalla tuettujen yrittäjien riski lopettaa yritystoiminta on pienempi koko tarkastelujakson ajan, vaikka starttirahaa myönnettiin maksimissaan noin vuodeksi.

Luvun 6 tutkimuksessa käsitetään julkisen sektorin tarjoama koulutus yhtenä julkisen tuen muotona. Tarkastelun kohteena on koulutuksen tuotto yrittäjillä verrattuna palkansaajiin. Tutkimus analysoi koulutuksen tuottoa koko maassa sekä erikseen maaseutumaisilla ja kaupunkimaisilla alueilla. Artikkelissa hyödynnetään yhdistettyä instrumenttimuuttujamenetelmää ja Heckmanin menetelmää koulutukseen ja yrittäjäksi valikoitumisen kontrollointiin. Suomessa yrittäjyysaktiivisuus on korkeampaa maaseutumaisilla alueilla. Korkeakoulutettujen joukossa alueellinen ero on kuitenkin pienempi. Tulokset koulutuksen tuotosta osoittavat, että tuotto koulutusvuotta kohden on koko maan tasolla samankaltainen yrittäjille ja palkansaajille. Sen sijaan maaseutumaisilla alueilla koulutuksen tuotto on yrittäjillä korkeampaa kuin palkansaajilla. Erityisesti korkeakoulutetut yrittäjät saavat koulutukselleen parempaa tuottoa sijoittuessaan maaseudulle. Maaseudun yrittäjyysaktiivisuutta dominoivat siis enemmänkin työntö- kuin vetotekijät, koska matalasti koulutettujen yrittäjyysaktiivisuus on korkeampaa heikommasta koulutuksen tuotosta huolimatta.

Kaiken kaikkiaan empiiriset esseet osoittavat, että julkisella tuella voidaan pidentää yritysten kestoa ja parantaa yritysten menestystä myös yrittäjien tulojen muodossa. Toisaalta tutkimus toteaa deadweight -vaikutuksen olevan merkittävä riski. Tämä turhaan myönnetty tuen osuus pienentää hankkeiden aikaansaamia positiivisia vaikutuksia. On kuitenkin huomattava, että tarkastelun kohteena on eri tukimuotoja, joten tuloksia ei voi suoraan laskea yhteen. Tukien vaikuttavuustarkastelussa tulisi kuitenkin aina vaikuttavuuden lisäksi huomioida se olisiko hanketta toteutettu ilman julkista tukea. Tukien yhteiskunnallisen kokonaishyödyllisyyden arviointiin tarvitaan lisäksi mahdollisten syrjäytysvaikutusten ja tukijärjestelmän kustannusten huomiointi.

J Y V Ä S K Y L Ä   S T U D I E S   I N   B U S I N E S S   A N D   E C O N O M I C S

1 LAINE, JUHANI, Toimialareseptin ja yritysparadigman muutos sekä sen vaikutus strategiseen muutokseen. Laadullinen ja historiallinen case-tutkimus perheyrityksen siirtymisestä monialayhtymän osaksi. - Change in industry recipe and company paradigm and its impact on strategic change. A qualitative and longitudinal case study on a one-family owned company which moved into the context of a multi-business company. 252 p. Summary 12 p. 2000.

2 WAHLGRÉN, ASTA, Mastery and slavery. Triangulatory views on owner-managers' managerial work. - Isäntä ja renki. Trianguloituja näkökulmia omistajajohtajien johtamistyöhön. 138 p. Yhteenveto 4 p. 2000.

3 SEPPÄ, MARKO, Strategy logic of the venture capitalist. Understanding veture capitalism - the businesses within - by exploring linkages between ownership and strategy of venture capital companies, over time, in America and Europe. 321 p. Yhteenveto 9 p. 2000.

4 PEKKALA, SARI, Regional convergence and migration in Finland, 1960-95. 121 p. Yhteenveto 1 p. 2000.

5 KORHONEN, JOUNI, Industrial ecosystem. Using the material and energy flow model of an ecosystem in an industrian system. - Teollinen ekosysteemi - Ekosysteemin materiaali- ja energiavirtamallin soveltaminen teollisessa systeemissä.131 p. Tiivistelmä 1 p. 2000.

6 KARVONEN, MINNA-MAARI, An industry in transition. Environmental significance of strategic reaction and proaction mechanisms of the Finnish pulp and paper industry. 146 p. Yhteenveto 2 p. 2000.

7 RITSILÄ, JARI, Studies on the spatial concentration of human capital. 140 p. Yhteenveto1 p. 2001.

8 LITTUNEN, HANNU, The birth and success of new firms in a changing environment. 261 p. Yhteenveto 2 p. 2001.

9 MATTILA, MINNA, Essays on customers in the dawn of interactive banking. - Asiakkaat interaktiivisen pankkiliiketoiminnan aamunkoitossa. 154 p. Yhteenveto 3 p. 2001.

10 HYRSKY, KIMMO, Reflections on the advent of a more enterprising culture in Finland: an exploratory study. 244 p. Tiivistelmä 4 p. 2001.

11 KUJALA, JOHANNA, Liiketoiminnan moraalia etsimässä. Suomalaisten teollisuusjohtajien sidosryhmänäkemykset ja moraalinen päätöksenteko. - Searching for business morality. Finnish industrial managers' stakeholder perseptions and moral decision-making. 217 p. Summary 4 p. 2001.

12 LÄMSÄ, ANNA-MAIJA, Organizational downsizing and the Finnish manager from an ethical perspective. - Organisaation kutistaminen ja suomalainen liikkeenjohto eettisestä näkökulmasta tarkasteltuna 61 p. (115 p.) Summary 5 p. 2001.

13 GRONOW, TITO, Material flow models in environmental policy planning. Case: pulp and paper industry. - Materiaalivirtamallit ympäristöpolitiikan ja -toimintatapojen suunnittelussa. Case: Massa- ja paperiteollisuus. 103 p. (144 p.) Yhteenveto 1 p. 2001.

14 MOILANEN, RAILI, A learning organization: machine or human? - Oppiva organisaatio: kone vai oppivien ihmisten yhteisö? 55 p. (162 p.) Yhteenveto 7 p. 2001.

15 HOKKANEN, SIMO, Innovatiivisen oppimisyhteisön profiili. Ammattikorkeakoulujen tekniikan ja liikenteen koulutusalan näkökulmasta tarkasteltuna. - The factors contributing to the profile of an innovative learning community. 242 p. Summary 10 p. 2001.

16 PAAJANEN, PEKKA, Yrittäjyyskasvattaja. Ammattikorkeakoulun hallinnon ja kaupan alan opettajien näkemykset itsestään ja työstään yrittäjyyskasvattajana. - An entrepreneurship educator. Teachers´ views of themselves and their work as an entrepreneurship educator at the polytechnic level, in the field of business and administration. 276 p. Summary 9 p. 2001.

17 MANGELOJA, ESA, Nordic stock market integration. - Pohjoismaisten osakemarkkinoiden integraatio. 164 p. Yhteenveto 2 p. 2001.

18 KARJALUOTO, HEIKKI, Electronic banking in Finland. Consumer beliefs, attitudes, intentions, and behaviors. - Elektroninen pankkitoiminta Suomessa. Kuluttajien uskomukset, asenteet, aikomukset ja käyttäytyminen. 195 p. Yhteenveto 3 p. 2002.

19 VIRTANEN, AILA, Laskentatoimi ja moraali. Laskenta-ammattilaisten käsityksiä hyvästä kirjanpitotavasta, hyväksyttävästä verosuunnittelusta ja hyvästä tilintarkastustavasta. 184 p. Summary 4 p. 2002.

20 TENHUNEN, MARJA-LIISA, The professional growth of an accounting agency entrepreneur. - Tilitoimistoyrittäjän ammatillinen kasvu. 121 p. (359) Yhteenveto 7 p. 2002.

21 ALANKO, JUHA, Siipien alla ilmaa. Liikenneilmailun lentotoiminnan johtaminen liikennelentäjien miehistönkäytön tehokkuudella ja kustannuksilla mitattu. Empiirisenä kohteena Finnair Oy 1980- ja 1990-luvuilla. - Air under wings. 240 p. Summary 2 p. 2002.

22 NIEMELÄ, TARJA, Inter-Firm Co-operation Capability. - A Processual Empirical Study on Networking Family Firms. 204 p. Yhteenveto 1 p. 2003.

23 SAJASALO, PASI, Strategies in transition - the internationalization of Finnish forest industry companies. 223 p. Yhteenveto 8 p. 2003.

24 NEVANPERÄ, ERKKI, Yrittäjyys Suupohjan opiskelijanuorten ajattelussa. Tutkimus Suupohjan seudun nuorisoasteen opiskelijoiden yrittäjyysnäkemyksistä sekä yrittäjyysopetuksen opetussuunnitelman kehittämispyrkimyksistä. - How the young residents in Suupohja region see entrepreneurship: study of students´ opinions

about entrepreneurship in juvenile degree schools and the efforts in developing the curriculum of entrepreneurship education. 210 p. Summary 2 p. 2003.

25 JOUTSEN-ONNELA, MERJA, Turvallisuutta ja sopusointua vai jännitystä ja valtaa. Tutkimus sairaanhoitaja- ja terveydenhoitajaopiskelijoiden yrittäjyys- ja muista arvoista. - Security and harmony or thrills power. 229 p. Summary 3 p. 2003.

26 RAJOTTE, ALAIN, Knowledge and decisions in environmental contexts. A case study of the pulp and paper industry. 190 p. 2003.

27 HAAPANEN, MIKA, Studies on the Determinants of Migration and the Spatial Concentration of Labour. 127 p. Yhteenveto 1 p. 2003.

28 SUORANTA, MARI, Adoption of mobile banking in Finland. - Mobiilipankkipalveluiden adoptio Suomessa. 79 p. (167 p.) Yhteenveto 3 p. 2003.

29 MATTILA, ANSSI, Understanding seamless mobile service interface between customer and technology: An empirical study 62 p. (170 p.) Yhteenveto 3 p. 2003.

30 HALTTUNEN, JUSSI, Teollisten perheyritysten kasvudynamiikan systeemiteoreettinen tarkastelu. - The growth dynamics of industrial family-owned firms – a systems theory approach. 302 p. Summary 8 p. 2004.

31 MADUREIRA, RICARDO, The role of personal contacts of foreign subsidiary managers in the coordination of industrial multinationals: the case of Finnish subsidiaries in Portugal. 186 p. - Ulkomaisten tytäryhtiöiden johtajien henkilökohtaisten kontaktien rooli koordinoinnissa monikansallisissa teollisuusyrityksissä. Case: Suomalaiset tytäryhtiöt Portugalissa. Yhteenveto 1 p. 2004.

32 KOIVUNEN, MAURI, Osaamisperustaisen kilpailukyvyn ja yrittäjyyden edistäminen. Tutkimustapauksena Raahen tietotekniikan muuntokoulutusohjelma insinööreille. - Enhancing competence-based competitiveness and entrepreneurship. Research case: Professional degree upgrading in information technology for engineers in Raahe. 216 p. Summary 3 p. 2004.

33 KANSIKAS, JUHA, Myyjiä, tuotekehittäjiä ja tuotejohtajia. Tuotepäälliköiden tehtävärakenteen heijastuminen tuotekehitysprojektissa sisäiseen yrittäjyyteen ja intuitiiviseen päätöksentekotyyliin kuuluviin tekijöihin. - Sales people, product developers and product champions – product managers´ responsibilities and job roles in a product development project and their reflection to intrapreneurship and intuitive decision making style. 258 p. Summary 6 p. 2004.

34 MUNNUKKA, JUHA, Perception-based pricing strategies for mobile services in customer marketing context. 65 p. (151 p.) Yhteenveto 1 p. 2004.

35 PALOVIITA, ARI, Matrix Sustainability: Applying input-output analysis to environmental and economic sustainability indicators. Case: Finnish forest sector. - Matriisikestävyys: Panos-tuotosanalyysin soveltaminen ekologisen ja taloudellisen kestävyyden indikaattoreihin. Case: Suomen metsäsektori. 216 p. Yhteenveto 2 p. 2004.

36 HANZELKOVA, ALENA, Re-establishing traditional Czech family businesses. A multiple case study on the present challeges. 306 p. Tiivistelmä 1 p. 2004.

37 TUUNANEN, MIKA, Essays on franchising in Finland – Empirical findings on franchisors and franchisees, and their relationships. 143 p. (252 p.) 2005.

38 AHLFORS, ULLA, Successful interactive business: Integration of strategy and IT. - Menestyksellinen vuorovaikutteinen e-liiketoiminta: Strategian ja informaatioteknologian integrointia. 353 p. Yhteenveto 2 p. 2005.

39 NIEMI, LIISA, The father, the son and the refreshed spirit. Strategic renewal after family business succession in the context of the textile, clothing, leather and footwear industry. - Isä, poika ja yritys yhä hengissä. Perheyrityksen strateginen uudistuminen sukupolvenvaihdoksen jälkeen – tapaustutkimus tekstiili-, vaatetus, nahka- ja kenkäteollisuudessa. 219 p. Summary 2 p. 2005.

40 LASSILA, HILKKA, Matkailutilan sukupolvenvaihdos talonpoikaisten arvojen ohjaamana prosessina. – Traditional values affecting succession in farm tourism businesses. 206 p. Summary 12 p. 2005.

41 TURJANMAA, PIRKKO, Laadun oppiminen pienissä yrityksissä. Mallin konstruointi ja kehittäminen. – Learning of quality in small companies. Construction and Development of a model. 204 p. Summary 6 p. 2005.

42 YLÄOUTINEN, SAMI, Development and functioning of fiscal frameworks in the Central and Eastern European countries. - Finassipolitiikan kehikkojen kehittyminen ja toiminta Keski- ja Itä-Euroopan maissa. 220 p. Yhteenveto 4 p. 2005.

43 TÖRMÄKANGAS, RAILI, Perheyrittäjyyden arjen kulttuuri. Kolmen sukupolven sahatoimintaa. – The everyday culture of entrepreneurship over three generations in a saw mill. 203 p. Summary 3 p. 2005.

44 TUNKKARI-ESKELINEN, MINNA, Mentored to feel free. Exploring family business next generation members´ experiences of non-family mentoring. - Mentoroinnilla vapauden-tunteeseen: Kartoittava tutkimus perheyritysten seuraajasukupolven mentoroinnista saamistaan kokemuksista. 233 p. Yhteenveto 3 p. 2005.

45 LINTULA, PAAVO, Maakuntalehden toimittajan toimintatila teknis-rationaalisessa ajassa. - The action scope of a journalist in a regional newspaper under pressure of a technical-rational discourse. 321 p. Summary 3 p. 2005.
46 HEIKKILÄ, MAURI, Minäkäsitys, itsetunto ja elämänhallinnan tunne sisäisen yrittäjyyden determinantteina. - The self-concept, the self-esteem and the sense of life control as the determinants of the intrapreneurship. 209 p. Summary 5p. 2006.
47 SYRJÄLÄ, JARI, Valoon piirrettyjä kuvia. Tarinoita ja tulkintoja sähköalan murroksesta hyvinvoinnin ja henkilöstöstrategian näkökulmasta. - Pictures in Light. Narratives and interpretations of changes in the energy sector from the point of view of welfare and personnel strategy. 333 p. 2006.
48 NIEMELÄ, MARGIT, Pitkäikäisten perheyritysten arvoprofiili. Pitkäikäisten perheyritysten arvojen ja jatkuvuuden kuvaus Bronfenbrennerin ekologisen teorian avulla. - The value profile of long-lived family firms. The description of the values and the continuity of long-lived family firms as seen through Bronfenbrenner's ecological theory . 187 p. Summary 2 p. 2006.
49 KAKKONEN, MARJA-LIISA, Intuition and entrepreneurs. A Phenomenological Study of managerial intuition of finnish family entrepreneurs. 176 p. Tiivistelmä 2 p. 2006.
50 LAHTONEN, JUKKA, Matching heterogeneous job seekers and vacancies. Empirical studies using finnish data. 110. p. Yhteenveto 2 p. 2006.
51 OLLIKAINEN, VIRVE, Gender Differences in Unemployment in Finland. 157. p. Yhteenveto 1 p. 2006.
52 PURONAHO, KARI, Liikuntaseurojen lasten ja nuorten liikunnan markkinointi – Tutkimus lasten ja nuorten liikunnan tuotantoprosessista, resursseista ja kustannuksista. - Sport marketing by sport clubs for children and youngsters – Exploring the production process, resources and costs of children's and youngsters' sport activities. 236 p. Summary 3 p. 2006.
53 POIKKIMÄKI, SANNA, Look closer to see further. Exploring definitions, goals and activities of environmental life cycle management 153. p. Yhteenveto 1 p. 2006.
54 SILJANEN, TUULA, Narratives of expatriates in the Middle East. Adaptation, identity and learning in non-profit organizations. 250 p. Tiivistelmä 2p. 2007.
55 WESTERHOLM, HELY, Tutkimusmatka pienyrittäjän työvalmiuksien ytimeen. Kirjallisuuteen ja DACUM-analyysiin perustuva kartoitus. – A journey into the core of the occupational competence and attitudes of small business entrepreneurs. 221 p. Summary 5 p. 2007.
56 HYNNINEN, SANNA-MARI, Matching in local labour markets: Empirical studies from Finland. 100 p. Summary 2 p. 2007.
57 TOHMO, TIMO, Regional economic structures in Finland: Analyses of location and regional economic impact. 53 p. (273 p.) Tiivistelmä 2 p. 2007.
58 HIIRONEN, MARJA-LIISA, Hoivayritykset kotona asuvien ikääntyvien toimintakyvyn tukena. Ikääntyvien, kuntapäättäjien ja hoivayrittäjien näkökulma. - Care enterprises and the functionality of elderly people living at home. The perspectives of aging people, municipal decision-makers and care entrepreneurs. 153 p. Summary 2 p. 2007.
59 ARHIO, KAIJA, Luova laatu ja arvoinnovaatiot oppivan verkoston tuottamina. Tapaustutkimus rakennuspuutuoteteollisuuden verkostosta. - Creative quality and value innovations created by a learning network. Case-study within a building components manufacturing network. 191 p. Summary 10 p. 2007.
60 HEIKKINEN, EILA, Yrittäjän persoonallisuus ja sen yhteys yrityksen kasvuun BigFive-teorian mukaan tarkasteltuna. - An entrepreneur's personality and its impact on the firm's growth: An analysis through the Big Five Theory. 139 p. Summary 5 p. 2007.
61 ELO-PÄRSSINEN, KRISTA, Arvot ja yhteiskuntavastuullinen toiminta suurissa suomalaisissa perheyrityksissä. Omistajan näkökulma. - Values and corporate social performance in large Finnish family firms. Owners view. 188 p. Summary 2 p. 2007.
62 NYYSSÖLÄ, HANNU, Omistajaohjaus, sisäinen yrittäjyys ja tuloksellisuus ammattikorkeakouluissa. - Corporate governance, intrapreneurship and effectiveness in the Universities of Applied Sciences. 361 p. Summary 9 p. 2008.
63 KAUKO-VALLI, SOFIA, Subjective well-being as an individually constructed phenomenon. 179 p. Summary 1 p. 2008.
64 SINTONEN, TEPPO, Diversiteetti ja narratiivisuus. Tutkielmia diskursiivisesta organisaatiotodellisuudesta. - Diversity and Narrative. Discursive approaches to organizational reality. 59 p (123 p.) Summary 2 p. 2008.
65 KOOSKORA, MARI, Understanding corporate moral development in the context of rapid and radical changes . The case of Estonia. 105 p. (198 p.) Tiivistelmä 9 p. 2008.
66 TAKANEN-KÖRPERICH, PIRJO, Sama koulutus – eri urat. Tutkimus Mainzin yliopistossa soveltavaa kielitiedettä vuosina 1965–2001 opiskelleiden suomalaisten urakehityksestä palkkatyöhön, freelancereiksi ja yrittäjiksi. – Same Education – Different Careers. The study of the Finnish nationals who have studied applied linguistics in the University of Mainz, Germany, during the years 1965–

87 OVASKAINEN, MARKO, Qualification requirements of SMEs in Internet-based electronic commerce. - Findings from Finland. - Pk-yritysten kvalifikaatiovaatimukset Internet-pohjaisessa elektronisessa kaupankäynnissä – löydöksiä Suomesta. 273 p. Yhteenveto 6 p. 2010.

88 KUIVANIEMI, LENI, Evaluation and reasoning in the entrepreneurial opportunity process: Narratives from sex industry entrepreneurs. - Arviointi ja päättely liiketoimintamahdollisuuksien tunnistamisprosessissa. Yrittäjien tarinoita seksiteollisuudesta. 216 p. 2010.

89 STORHAMMAR, ESA, Toimintaympäristö ja PK-yritykset. Havaintoja yritysten toimintaan vaikuttavista tekijöistä. - Local environment and the small and medium sized enterprises. Observations of the factors which affect the operations of firms. 188 p. Summary 3 p. 2010.

90 KOSKINEN, HANNU, Studies on money and labour market dynamics and goods market imperfections. - Tutkimuksia raha- ja työmarkkinadynamiikasta ja hyödykemarkkinoiden epätäydellisyyksistä. 106 p. Yhteenveto 2 p. 2010.

91 HÄMÄLÄINEN, ILKKA, Suunnittelijat innovaatiotoiminnan ja kasvun ytimessä. - Architects and consulting engineers in the core of innovation and growth. 270 p. Summary 2 p. 2010.

92 KETOLA, HANNU U., Tulokkaasta tuottavaksi asiantuntijaksi. Perehdyttäminen kehittämisen välineenä eräissä suomalaisissa tietoalan yrityksissä. - Transformation from a recruit (newcomer) into a productive expert. The job orientation process as a tool for personnel development in Finnish ICT companies. 212 p. 2010.

93 RAUTIAINEN, ANTTI, Conflicting legitimations and pressures in performance measurement adoption, use and change in Finnish municipalities. - Ristiriitaiset legitimaatiot ja paineet suoritusmittauksen käyttöönotossa, käytössä ja muutoksessa Suomen kunnissa. 52 p. (109 p.) Summary 4p. 2010.

94 JAUHIAINEN, SIGNE, Studies on human capital flows and spatial labour markets. - Tutkimuksia inhimillisen pääoman virroista ja alueellisista työmarkkinoista Suomessa. 98 p. Summary 1p. 2010.

95 KORSUNOVA, ANGELINA, Encouraging energy conservation with 'no hard feelings': a two-part analysis of communication between energy companies and Finnish households. 213 p. 2010.

96 NOKSO-KOIVISTO, PEKKA, Verkostoaktivaattorien roolit yritysten verkostoituessa. - Roles of Network Activators in Business Networking Process. 262 p. Summary 6 p. 2010.

97 AALTONEN, HELI, Co-creation of value in advertising. An interpretive study from the consumers' perspective. - Yhteinen arvonluonti mainonnassa. Kuluttajakeskeinen tulkitseva tutkimus. 186 p. Yhteenveto 2 p. 2010.

98 YLINEN, AULIS, Opettajien yrittäjyyskasvatusvalmiudet Etelä-Pohjanmaan lukioissa. - Teachers' readiness for entrepreneurship education at Southern Ostrobothnia upper secondary schools. 221 p. Summary 8 p. 2011.

99 MUKKALA, KIRSI, Essays on regional development and labor mobility in a knowledge-based economy. - Alueellinen kehitys ja työvoiman liikkuvuus maantieteellisen keskittymisen ja osaamisintensiivisten alojen näkökulmasta. 127 p. Yhteenveto 2 p. 2011.

100 KONTINEN, TANJA, Internationalization pathways of family SMEs. - PK-perheyritysten kansainvälistymispolkuja. 98 p. (243 p). Yhteenveto 1 p. 2011.

101 ESKOLA, ANNE, Good learning in accounting. Phenomenographic study on experiencies of Finnish higher education students. - Hyvä oppiminen laskentatoimessa. Fenomenografinen tutkimus suomalaisten korkeakouluopiskelijoiden kokemuksista 191 p. Yhteenveto 5 p. 2011.

102 TURUNEN, TERO, Yrittäjyys - mitä se merkitsee?". Yrittäjyyden ja sen sukulaiskäsitteiden käyttö koulutuksessa, tutkimuksessa ja politiikassa 1900-luvun loppupuolelta 2000-luvun alkuun. - Entrepreneurship - What does it mean? The applications of entrepreneurship and its kindred concepts in education, research and policy from the end of the 20th century until the beginning of the 21th century. 238 p. 2011.

103 PATJA, PÄIVI, Perheiden omistamisen muuttuvat merkitykset. Diskurssianalyyttinen tutkimus perheiden omistamisen merkityksellistymisestä Suomessa vuosina 1976-2005. - The Changing Meanings of Family Ownership. 122 p. Summary 2 p. 2011.

104 TOKILA, ANU, Econometric studies of public support to entrepreneurship. - Ekonometrisia tutkimuksia yrittäjyyden julkisesta tukemisesta. 157 p. Yhteenveto 3 p. 2011.