University of Trento

School of Social Sciences

PhD program in Economics and Management

Doctoral Thesis

Entrepreneurial Behavior is Still a Black Box. Three Essays on How Entrepreneurial Learning and Perceptions Can Influence Entrepreneurial Behavior and Firm Performance

A DISSERTATION SUBMITTED TO THE DOCTORAL SCHOOL OF ECONOMICS AND MANAGEMENT IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DOCTORAL DEGREE (PH.D.) IN ECONOMICS AND MANAGEMENT

Author:
Svetlana Kovaleva

Supervisors:
Prof. Enrico Rettore
Prof. Enrico Zaninotto

April, 2015

Supervisors:

Prof. Enrico Rettore
University of Padova

Prof. Enrico Zaninotto
University of Trento

Evaluation committee:

Prof. Luciano Fratocchi
University of L'Aquila

Prof. Carlo Federico Perali
University of Verona

Dott. Matteo Ploner
University of Trento

Final Evaluation committee:

Prof. Roberto Gabriele
University of Trento

Dott. Giovanni Cerulli
Ceris-CNR

Acknowledgments

It would have been impossible to finish this doctoral thesis and to complete my PhD programme without people who surrounded me. Besides supporting and helping every time when it was necessary, they were inspirations and true legends in my life.

I would like to thank many people for their invaluable contributions. I would like to begin expressing my deepest gratitude to my supervisors, Prof. Rettore and Prof. Zaninotto, for all their invaluable advice, support, patience, encouragement, and inspiration during these three years. I was very fortunate to work under their guidance.

I strongly appreciate all the support offered by the Department of Economics and Management and Doctoral School of Social Sciences. I am thankful for the director of the School of Social Sciences, Prof. Mittone, and director of the PhD programme in Economics and Management, Prof. Tamborini, for their guidance and help.

A warm recognition goes to the Research Institute for the Evaluation of Public Policies, IRVAPP, where I spent these three years. I am so glad to have been part of IRVAPP for such a long time period. A special thanks goes to the director of IRVAPP, Prof. Schizzerotto, for his support, guidance and strong encouragement, and the opportunities provided to me during my time at IRVAPP. I am grateful to all colleagues working at IRVAPP for their help, optimism, generosity, intelligence, and kindness. My sincere gratitude goes to my co-advisor, Giulia Canzian, for her support and trust, for her intelligence and wisdom, and for her kindness and encouragement. Giulia is a great friend, wonderful woman and great source of inspiration for me!

My thesis benefited from my time spent at Erasmus University of Rotterdam, EUR. I am thankful for Prof. Thurik who provided useful comments and made my stay at EUR easy and enjoyable. A special thanks goes to my co-author and friend, Nardo de Vries, for his support, patience, kindness, and contribution to this thesis.

I am grateful for Prof. Gabriele and Dott. Cerulli of my doctoral committee for their valuable comments and suggestions that were very fruitful for my thesis and for my future research.

Finally, I am forever grateful for my parents, brothers, all other relatives and friends for their support, patience, love, and for the possibilities they provided to me. I cannot find words for expressing my gratitude for everything that you have done to me.

Table of Contents

Abstract

Nowadays, entrepreneurship has received a large amount of attention in such studies as economics, sociology, finance, and public policy. Furthermore, The European Union and national government have implemented several policy interventions aimed to encourage new firm formation. Entrepreneurial education is now reinforced in schools, colleges, and universities. Nevertheless, entrepreneurship remains to be a black box. Making everyday decisions on firm organization and management is a complex process, which depends on how entrepreneurs perceive the environment and their own entrepreneurial abilities. These perceptions influence firm behavior that can be represented by combination of different actions.

The main goal of this doctoral thesis is to examine how entrepreneurial perceptions and learning influence entrepreneur preferences for certain actions and thus, how they affect firm performance. The first essay aims to understand whether the effectiveness of the policy is altered by the behavioral assumption that entrepreneurs are overconfident about their entrepreneurial abilities and tend to be overoptimistic in the evaluation of future prospects. The essay applies the agent-based model that is a modified version of the financial fragility model of Delli Gatti et al. (2005). The simulation results suggest that the presence of misperceptions of entrepreneurial abilities influence the policy outcomes.

The main purpose of the second essay is to reveal how entrepreneurial perceptions of competitive environment influence their preferences for competitive strategies. Competitive advantages of firms are defined on the basis of Porter's (1980) model of generic strategies — differentiation and cost leadership. The results of the analysis suggest that perceived threat of competition pushes firms to take actions. The preferences for actions are explained by available resources such as human capital.

The third essay aims to evaluate the impact of capital grants given to microenterprises operating in the Province of Trento, Italy in 2009 and 2010. The last essay empirically illustrates how lack of restrictions imposed on the amount of possible subsidy requests and

fixed eligibility criteria has invoked subsidy-seeking behavior of firms. The results from econometric analysis suggest that subsidies have not been able to improve firm performance or to increase firm size in 2011. However, a positive effect of subsidies on the propensity to invest in training and in marketing and advertising in 2012 has been detected.

List of Tables

List of Figures

Chapter I

Introduction

Nowadays, entrepreneurship has received a lot of attention from researchers, economic scholars, politicians, policy organizations, and business institutions. "Entrepreneurship is one of the fastest-growing subfields in management research, and is increasingly appearing in economics, sociology, anthropology, finance, and even law" (Foss and Klein, 2012, p.23). Authors claim that studying and encouraging entrepreneurship are not only the main objectives of research and policy organizations (for example, the European Commission, the World Bank, the OECD, agencies involved in agricultural and rural development) but also entrepreneurship education becomes to be important at colleges and universities.

However, entrepreneurship is still a black box. Making everyday decisions on firm organization and management is a complex process, which depends on how entrepreneurs perceive both, the environment and their own entrepreneurial skills and abilities. Meantime, these perceptions are based on the amount of knowledge that entrepreneurs have about environment and their own entrepreneurial abilities. Several studies have shown that entrepreneurial perceptions are biased. For example, Busenitz and Barney (1997) have found that entrepreneurs tend to be more overconfident than managers. Camerer and Lovallo (1999) have shown experimentally that the high business failure rates might be explained by entrants' overestimation of their own abilities.

Nevertheless, entrepreneurial perceptions are "dynamic" implying that individuals can update their beliefs about uncertain prior information over time. For example, recent studies have shown that new entrants have little knowledge on their own entrepreneurial abilities and they often tend to be overconfident (Camerer and Lovallo, 1999; Grieco and Hogarth, 2004; Koellinger et al., 2007). Their choice of certain actions will depend substantially on their self-evaluation of their talents and abilities. On the other hand, incumbents that already gained more experience than start-ups tend to be more realistic and less overconfident about their real business abilities (Fraser and Greene, 2006).

Moreover, entrepreneurial behavior is not only shaped with entrepreneurial perceptions of their own abilities but also with perceptions of environment where firms operate. Kemp and Hanemaaijer (2004) claim that entrepreneurial evaluation of competition might also differ among entrepreneurs even if they operate in the same environment. Authors argue that the perception of competition is subjective and is based on a large amount of information that entrepreneurs need to process.

Upon this evidence I am proposing a simple scheme of how entrepreneurs make decisions. First, entrepreneurs build their perceptions about some real phenomena that are relative to their business activities. These entrepreneurial perceptions are heterogeneous and evolving over time. Some entrepreneurs might have perceptions that are very close to the real values of some phenomena, while perceptions of others might suffer from substantial biases. Then entrepreneurs take certain actions on the basis of their subjective perceptions. Even if entrepreneurs operate in the same environment or they have very similar skills and abilities, their actions can differ from each other because their perceptions are based on different information sets. Finally, actions taken by entrepreneurs may translate in particular outcomes like better firm performance or firm exit.

The process of how entrepreneurs make decisions is a black box. It has a simple construction but what is inside this box, nobody knows with certainty. Besides the simplicity of the decision-making algorithm, not only each component is unknown but also the processes behind them are hidden from researchers and policy makers. Recent literature on industrial policy suggests that policy makers need to obtain and process a substantial amount of information required for successful policy implementation (Pack and Saggi, 2006; Rodrik, 2007). Thus, it does not come as a surprise that the goals of industrial policies are not always being met.

Current policy instruments may control partially for possible misbehaviors of firms. Some of them are aimed to reduce moral hazard risks or, as in the case of capital grants, to impose time limitations for non-selling the object of investment financed by public authorities. But there is still lack of policy measures, which consider that firm performance and entrepreneurial actions are based on entrepreneurial perceptions. As it has been discussed before, these perceptions are often biased. This is especially true for start-ups that have little knowledge about environment and their own abilities.

Santarelli and Vivarelli (2007) argue that policy makers should take into account that the effectiveness of market mechanism can be sometimes distorted by policies targeted towards firms with the highest expected failure rates.

Even if the presence of biased misperceptions might be considered as one of the reasons of why not all policy goals are being met, there is also another feature of firm behavior that can hamper policy effectiveness. Firm learning that has been widely investigated in the literature might also influence results of government intervention. In particular, if the policy scheme is implemented for a long time-period and the restriction on the allowed amount of subsidy applications is not imposed then beneficiaries can learn how to receive additional finance from the public authority. This implies, that granted firms could start to follow subsidy-seeking strategy that might result in wasting of public money.

My doctoral thesis aims to examine how entrepreneurial perceptions and learning influence entrepreneur preferences to take certain actions and, thus, how they can affect firm performance. In the first essay, I present an agent-based approach for ex-ante policy evaluation of the impact of provision of credit guarantees to start-ups. The main goal of this research is to understand whether the effectiveness of the policy is altered by the behavioral assumption that entrepreneurs are overconfident about their entrepreneurial abilities and tend to be overoptimistic in the evaluation of future prospects. The agent-based model is a modified version of the financial fragility model of Delli Gatti et al. (2005). The novelty of my work resides in the behavioral hypothesis governing entrepreneurs' decisions on the future capital demand.

In line with the decision-making algorithm discussed above, entrepreneurs take actions on the basis of self-evaluation of their entrepreneurial abilities. In this context a firm action is operationalized by an entrepreneur desire of future capital, so that, the more biased is entrepreneurial perception, the higher is the amount of desired capital. Entrepreneurial perceptions about their business abilities are determined in such a way that the younger are the entrepreneurs, the more overconfident about their talent and the more willing to take the risky projects they must be.

In this framework, since start-ups are more financially constrained than incumbents, the public authority intervenes by guaranteeing part of start-ups loans aimed to reduce the burden of their financing costs. Overall, my simulation results suggest that the presence of misperceptions of entrepreneurial abilities influence the policy outcomes. For example, I found that, at the industry level, policy implementation had a positive effect on the average interest rate in the absence of overconfidence, while in its presence this positive effect no longer existed. Furthermore, although the policy implementation had a positive effect on firm investment in general, firm investment was much lower in the presence of overconfidence that in its absence. As regards the outcomes of taking certain actions, higher misperception pushed more firms to exit.

The second essay aims to reveal how entrepreneurial perceptions of competitive environment affect their preferences for competitive strategies. Competitive advantages of firms are defined on the basis of Porter's (1980) model of generic strategies — differentiation and cost leadership. Identification of firm's competitive strategies helps to understand how firms interact with each other. In addition, I test whether the choice of certain strategy results in better firm performance measured by labor productivity growth. Overall, the results of my analysis suggest that different threat of competition perceived by entrepreneurs pushes firms to take actions. However, none of the strategies translates in superior firm performance.

The third essay is focused on evaluation of the impact of capital grants given to microenterprises operating in the Province of Trento, Italy in 2009 and 2010. Creating policy instruments that will not be hampered by opportunistic behavior of firms has always been a challenging task for policy makers. Several scholars argue that one of the possible channels for opportunistic behavior of firms might be firm learning about how grants can be obtained (Rodrik, 2007; Santarelli and Vivarelli, 2007). My third essay empirically illustrates how lack of restrictions imposed on the amount of possible subsidy applications and fixed eligibility criteria has invoked subsidy-seeking behavior of firms.

Chapter II

Is Self Esteem Always a Good Mate for Entrepreneurs? A Story About How Overconfidence Can Alter Policy Effectiveness

2.1 Introduction

Young SMEs that are important on many aspects and are considered as the main engine of economic growth, at the same time, are often faced with many obstacles, especially, from the financial markets. Beck et al. (2005) have found evidence that SMEs suffer most of all from imperfections of financial markets and legal system and that these imperfections are the main constraints for their growth. Aghion et al. (2007) have concluded that young firms grow faster in regions with higher level of financial development, especially in industries with higher dependence from external finance. Angelini and Generale (2008) have found empirical evidence that young firms suffer more from financial constraints than incumbents.

More recently, many researchers have argued that industrial policy that is targeted to support young SMEs should be designed in such a way that firm financial constraints will be less harmful for firms. This can be justified by providing additional money to those firms that suffer from information asymmetry but have possibilities to invest and grow. However, if the public authority is not able to pick the most promising firms, the industrial policy will result in wasting of government financial resources.

Nowadays, one of the key policy instruments aimed to encourage additional lending to SMEs and, in particular start-ups, is a credit guarantee scheme (CGS). The main goal of CGSs is to improve access to finance by firms by covering a share of the default risk of the loan. In case of default, the lender is at least able to recover the value of the guarantee. The main argument in favor of CGSs is that they can help financially constrained firms with high growth opportunities to establish long-lasting relationships with banks and, thus, can make market imperfections less harmful. Furthermore, credit

guarantees can ease financial constraints of start-ups that suffer from lack of competition among banks that results in unwillingness of banks to seek for new potential borrowers like start-us.

On the other hand, it might be possible that CGSs suffer from the main drawback of many policies, that is, they are targeted towards the most vulnerable groups with the highest expected failure rates (Santarelli and Vivarelli, 2007). Firm success depends a lot on an entrepreneur who plays the main role in decision-making process, especially in start-ups. Thus, in order to avoid sustaining the most vulnerable groups, it is necessary for policy-makers to understand what kind of psychological attitudes of entrepreneurs might affect the effectiveness of the policy and, in particular, the effectiveness of credit guarantee schemes.

The literature on entrepreneurship has raised the important question as to how subjective decision-making influence firm performance and survival. The role of subjective opinions in entrepreneurial decision-making has become increasingly important starting with Knight (1921) who proposed that in the absence of known odds about success and failure, the business decisions were characterized by fundamental uncertainty. Keynes (1936) argue that entrepreneurial optimism play an essential role in determining firm success and survival because it pushes entrepreneurs to actions, rather than precise risk assessment.

Recent studies have shown that while making decisions under uncertainty people are more likely to be optimistic (Taylor and Brown, 1988) and overconfident in judgment (De Bondt and Thaler, 1994). Several studies have shown that entrepreneurs tend to be more overconfident (Cooper et al., 1988, Busenitz and Barney, 1997). Forbes (2005) argues that the degree of overconfidence is a function of both individual and contextual variables. Fraser and Greene (2006) have found that overconfidence is significantly high among start-ups.

Based on the recent literature on entrepreneurship and behavioural economics, we suppose that firms performance and outcomes dependent on entrepreneur's decisions that, at the same time, are mainly determined by the degree of how entrepreneurs rely on heuristics and biases. In particular, we argue that entrepreneurs tend to be overconfident while creating expectations about firms' future outcomes especially if they have little experience in entrepreneurship. In this paper the definition of

overconfidence introduced by Busenitz and Barney (1997) is used. The authors define overconfidence as a cognitive bias that results in over-optimistic behavior of decision makers while estimating probabilities that is especially excessive in the presence of substantial uncertainty and/or lack of knowledge necessary to deal with the problem. Thus, optimism may result in misperception of entrepreneurial abilities, so that, this misperception might have two controversial effects: on the one hand, the overestimation can initially be beneficial since it pushes entrepreneurs towards actions, and, on the other hand, it can eventually result in some misbehaviour since entrepreneurs carry on too risky or too big projects with respect to their real capacity to manage them.

The effect of overconfidence on firm decisions and performance is especially important for start-ups since their owners usually have little entrepreneurial experience. Fraser and Greene (2006) have shown that the probability to have misperception of the entrepreneurial talent is higher among start-ups and young firms. Similar idea is present in the theories of firm learning proposed by Jovanovic (1982), Frank (1988), and Hopenhayn (1992), where the authors argue that firms update their beliefs about their efficiency over time so that the bias in the estimation of the abilities diminishes.

Returning back to the literature on industrial policy, the role of subjective decision-making in the entrepreneurial behavior or misbehavior has never been investigated in the context of the effectiveness of policies targeted to support SMEs or start-ups. Though, the issue of overconfidence is relevant for most of start-ups in which entrepreneurs are owners, managers, and decision makers and, at the same time, are human beings whose decisions are based on their own heuristics, experience and judgments. The presence of overconfidence in entrepreneurial decision-making process plays an important role in determining pros and cons of many policy instruments targeted to support start-ups. The main rationale and justification for the government support of start-ups is the presence of financial constraints that make start-ups' investment and growth more burdensome. On the other hand, policy makers might support less efficient firms by means of government incentives provided to them and might create strong barriers for the functioning of the market selection mechanism.

In the next sections we argue that the initial talent misperception and the consequent learning have some effects in terms of impact of public policies targeted to start-ups and, in general, to financially constrained firms offering them better credit access and better credit conditions in line with the OECD and the EU suggestions. In particular, if the program eligibility is only determined on the basis of firms' age, credit guarantee implementation might hamper efficient economic development by firms' overinvestment and government sustain of less efficient entrepreneurs.

In order to test our hypothesis we employ a modified version of the model by Delli Gatti et al. (2005), in which heterogeneous financially fragile firms are confronted with strict financial conditions from the banking sector when offering a low collateral or having low net worth values. The model is able to replicate a set of both macro and micro stylized facts, and for this reason it can be extended to test the influence of talent misperception on the effectiveness of credit guarantee schemes.

The remainder of this chapter is structured as follows. In Section 2.2, the review of existing literature on overconfidence and agent-based approach is presented. Section 2.3 describes our theoretical model and policy design. Section 2.4 presents simulation results. Section 2.5 presents sensitivity analysis. Section 2.6 concludes and discusses the study.

2.2 Literature review

Misperception of a talent

The literature on behavioural economics and economic psychology suggests that people generally tend to be overconfident when judging their own skills and abilities. Camerer and Lovallo (1999) have created experimental entry games in order to show that the high business failure rates might be explained by entrants' overestimation of their own abilities. They also found that overconfidence is stronger in the existence of self-selection in the experiment implying the presence only of those individuals who were perfectly aware before the experiment that their pay-offs strongly depend on their skills and who chose to participate in experiment by themselves. The authors argue that this evidence, which suggests that it is hard for an individual to adjust to changes in the reference group one competes with, might be related to the psychological phenomenon called the "inside view" (Kahneman and Lovallo, 1993). The "inside view" is defined as a way of how people tend to deal with a problem by using the full knowledge that each individual has on the subject and by focusing on specific subject's features and experience on it. Kahneman and Lovallo (1993) defined the opposite way of dealing with several issues and tasks as the "outside view", which is characterized by focusing on the statistics of class of cases chosen to be similar to the current one and guessing to which class the current case refers.

Heath and Tversky (1991) have created the "competence hypothesis" in which they propose that individuals' acceptance of ambiguous gambles depends on the level of knowledge in the respective field (the competence) perceived by individual. Larrick et al. (2007) have explored how self-evaluation of one's own skills to be better than those of average, the so-called "better-than-average" effect, is related to overconfidence. The authors have found that the positive relationship between better than average perception and overconfidence is present where the better than average perception range from worse-than-average to better-than-average effects, and confidence measure can range from under confidence to overconfidence.

Entrepreneurs have been considered as particularly overconfident because starting a business is a risky choice. Recent literature on overconfidence have related entrepreneurs' misperception of their own abilities to different questions like excess entry (Grieco and Hogarth, 2004; Koellinger et al., 2007), or insistence in loss situations (Astebro et al., 2007; Burmeister and Schade, 2007; Schade and Burmeister, 2009) and its relationship to low and high uncertain choices (Shyti, 2013). Another research by Busenitz and Barney (1997) have shown that entrepreneurs and managers in large firms differ from each other by overconfidence that they exhibit so that entrepreneurs in large firms tend to be more overconfident than managers. Forbes (2005) has shown that entrepreneurs have different cognitive biases that should be studied by future research since their existence might give better explanation for many observations. Fraser and Greene (2006) have empirically shown that start-ups tend to be overoptimistic about their entrepreneurial talents but the degree of optimism diminishes over time.

Very often overconfidence has been related to another cognitive bias — the illusion of control — first proposed by Langer and Roth (1975). The individual's belief in his or her ability to control the outcome of an uncertain event can be based upon individual's perceptions and for this reason might be biased in general. Carr and Blettner (2010) have tested whether higher illusion of control leads to lower decision quality by entrepreneurs. The authors have found that there is a negative association between high level of illusion of control and entrepreneurial decision quality that is moderated by time stress and prior experience.

Although overconfidence has been studied by many authors, it is still not clear whether it has positive or negative effect on firm performance and their behavior. The positive effect of entrepreneurs' overconfidence has been found by Van den Steen (2011) and Heller (2014). On the other hand, overconfidence might have negative effect on firm performance. For example, Hvide and Panos (2014) have found that overconfidence measured by number of trades has a negative effect on sales growth. The question of entrepreneurial overconfidence has been raised for the first time by Cooper et al (1988) who have found that the vast majority of entrepreneurs believed that their chances to succeed were very high. Cooper et al. (1988) suggest that although extreme entrepreneurial

optimism may create some obstacles for entrepreneurs in identifying problem areas, choosing the right direction for the business or making decisions on closing down the enterprise, optimism can be beneficial for entrepreneurs if they make extra effort while conducting a business.

The remaining aspect of entrepreneurial overconfidence and its consequences on firm performance that needs to be explained is whether the perception of entrepreneurial abilities differs among nascent and experienced entrepreneurs. Koellinger et al. (2007) argue that a misperception of abilities tend to decrease over time when entrepreneurs become more experienced and learn about their real entrepreneurial abilities. The authors have used the unique data aimed to represent the random sample of populations in different countries and have found that nascent entrepreneurs are in general more overconfident than entrepreneurs whose entrepreneurial skills have been already tested by the market.

The Agent-based models

One of the possible tools that can be used to understand how entrepreneurial overconfidence might affect policy effectiveness is an agent-based modeling (ABM). The ABM is a computational method for simulating environment where agents act and interact with each other. Axelrod and Tesfatsion (2006) formulated two main features of the agent-based models: "the system is composed of interacting agents; and the system exhibits *emergent* properties, that is, properties arising from the interactions of the agents that cannot be deduced simply by aggregating the properties of the agents" (p.3). The essential component of the ABM is an agent who is characterized by bundled data and behavioral rules and can represent individuals (e.g., consumers, sellers, workers), social grouping (e.g., families, firms) or institutions (e.g., markets, government).

The aims pursued by ABM researchers can be divided into four groups: *empirical understanding, normative understanding, qualitative insight and theory generation,* and *methodological advancement (*Tesfatsion, 2006*)*. Researchers whose main goal is *empirical understanding* try to reveal how existing regularities evolve and exist and whether or not they can be explained through the process of agents' interaction. ABM researchers pursuing as an objective

normative understanding try to imitate the salient aspects of an economic system and agents operating in this system and by this try to understand whether or not socially desirable and effective outcomes of policy designs and institution development can be achieved. *Qualitative insight and theory generation* group is aimed to define a full range of potential behavior of a system so that it is possible to understand the emergence of some existing regularities as well as reasons of non-occurrence of others. Researchers who pursue the *methodological advancement* as an objective try to develop different methods and tools that are targeted to improve and validate an agent-based approach.

Agent-based models have been applied to solve problems in economics, management, sociology, political economy, and financial economics. The recent development of computational procedures helps understand better firms' investment activities and innovation strategies by applying agent-based models to this context. For example, Gilbert, Pyka and Ahrweiler (2001) have designed an agent-based model of innovation networks. Their main goal was to reproduce main features of innovation networks of two sectors: personal and mobile communications and biotechnology. Zhang (2003) has designed a model that imitates Silicon Valley-type industrial clusters in order to determine the origin of high-tech industrial clusters in a landscape in which no firms existed originally. The author argues that the main factor that determines the emergence of this kind of clusters is entrepreneurial spirit that may spread across habitants through social effects.

In the past ten years several studies have raised the question of possible application of ABMs to policy issues, such as, evaluation of short and long run effects of different policy designs. European research group that has developed a macroeconomic model EURACE ('An Agent-based Software Platform for European Economic Policy Design with Heterogeneous Interacting Agents: New Insights from a Bottom Up Approach to Economic Modeling and Simulation') have made a large contribution to this field. EURACE model is aimed to simulate the European economy and to focus on European policy analysis.

Dosi, Fagiolo and Roventini (2010) have developed the model with the similar structure that is aimed to investigate the properties of macroeconomics dynamics and to estimate the impact of public policies. The model extends authors' previous model (Dosi et al. 2006, 2008) of

macroeconomic dynamics where heterogeneous firms interact with each other by producing consumption goods and machines for production. The model presented in 2010 is aimed to evaluate the impact of policy under two regimes: Schumpeterian and Keynesian, where the former is aimed to foster innovation and the latter is aimed to foster demand growth through the mechanism of public fiscal policy. The authors have concluded that in order to promote economic growth government should implement both types of policy.

2.3 The model

The model is based on the agent-based model aimed to represent financial fragility and business fluctuations of Delli Gatti et al. (2005). It describes the functioning of a single industry of relevant size, populated by N firms, heterogeneous in size, and producing the same good. Firms are not faced with any technological change, and the industry is characterized by constant returns to scale. Moreover, entrepreneurs are heterogeneous in their inner entrepreneurial talent and in the prior beliefs about their own entrepreneurial abilities.

Firms that are not able to finance their desired investment by their internal funds ask for a loan on the credit market. The credit market is composed by a banking sector that, in the presence of asymmetric information, allocates the limited amount of bank financial resources among firms by providing loans on the interest rate individual to each firm.

Entrepreneurs

Entrepreneurs have limited and vague knowledge about their entrepreneurial talent, γ_i. When they start their businesses they construct heterogeneous prior beliefs, (γ_i^*), about their entrepreneurial abilities. Then, over time they update their beliefs on the basis of the results of business activities. In particular, recalling (Fraser and Greene, 2006), it is assumed that the younger the entrepreneurs, the more overconfident they are, implying that their beliefs differ substantially from their real talent values ($\gamma_{Yit}^* \gg \gamma_i$). The degree of misperception reduces along with increasing experience in firm management, so that, the older the entrepreneurs the more realistic they become ($\gamma_{Oit}^* > \gamma_i$).

Beliefs are updated following a Bayesian mechanism based on entrepreneurs specific information set evolving over time. In each time period, the information set $\overline{I_{it}}$ of entrepreneur i is determined as the summation of all her information sets available up to t,

$$\overline{I_{it}} = \sum_{l=1}^{t} I_{il}/t, \tag{2.1}$$

where I_{il} is the information set specific to each firm i and different at time l ($l=1,...,t$).

Then, the updating rule takes the form:

$$\gamma_{it}^* = \alpha_{it}\bar{I}_{lt} + \mu_{it}(1 - \alpha_{it}) \qquad (2.2)$$

where μ_{it} is the entrepreneur's prior belief about her own talent that is assigned randomly so that younger agents have larger values of μ_{it} than older ones. The parameter α_{it} captures the variability of the information set and of the real talent distribution.

$$\alpha_{it} = (\frac{t}{\sigma_I^2})^2 + \frac{1}{\sigma_r^2} \qquad (2.3)$$

where σ_I and σ_r are the standard deviations of entrepreneur's information set I_{it} and of her real talent γ_i respectively.

Firms

At the beginning of each period, firms produce output by means of a linear production technology with one input – capital K_{it}. The output produced by firm i is given by

$$Y_{it} = \gamma_i \phi K_{it} , \qquad (2.4)$$

where ϕ is capital productivity that is constant and uniform across firms. Furthermore, it is assumed that capital stock never depreciates.

The limitation of firms' knowledge of market conditions results in uncertain prices of the product sold by firms so that individual selling price is determined by

$$P_{it} = u_{it}P_t , \qquad (2.5)$$

where P_t is the average market price, u_{it} is a random idiosyncratic shock. Firms are price takers. For the sake of simplicity, the assumptions that $P_t = 1$ and $E(u_{it}) = 1$ are held.

Another assumption made in the model claims that firms cannot obtain external money on the stock market because they are fully rationed on it. This implies that firms can finance their capital stock either by means of their own internal funds – net worth A_{it} – or by means of credit L_{it} obtained from a bank. Assuming that firms have long-term contractual relationship with banks, firms' debt commitments in real terms are equal to $r_{it}L_{it}$, where r_{it} is the real interest rate. For the sake of simplicity, it is assumed that r_{it} is also the real return on net worth, so that firms' financing costs are equal to

$$FC_{it} = r_{it}(L_{it} + A_{it}) = r_{it}K_{it} \ . \qquad (2.6)$$

Total variable costs are proportional to the financing ones and equal to $TC_{it} = gr_{it}K_{it}$, with g >1. Then, the real profit is given by

$$\pi_{it} = \gamma_i u_{it} Y_{it} - gr_{it}K_{it} = (\gamma_i u_{it}\phi - gr_{it})K_{it}, \qquad (2.7)$$

where γ_i is the entrepreneurial talent specific to each individual. Firm i's expected profit is

$$E(\pi_{it}) = (E(\gamma_i)\phi - gr_{it})K_{it} = (\gamma_{it}^*\phi - gr_{it})K_{it}. \qquad (2.8)$$

i.e, expectations about the firm's future profit depend on the entrepreneurs' perceptions about their own talent.

In the model we allow only firms with non-negative net worth values to stay in the market. By the law of motion of the net worth and the assumption that all the profits are retained, firm's net worth is determined as the sum of previous period net worth and current period profits:

$$A_{it} = A_{it-1} + \pi_{it}. \qquad (2.9)$$

Then, the bankruptcy condition is given by

$$A_{it-1} + \gamma_i u_{it}\phi K_{it} - gr_{it}K_{it} < 0, \qquad (2.10)$$

so that firms exit from the market when

$$u_{it} = \frac{1}{\phi\gamma_{it}}\left(gr_{it} - \frac{A_{it-1}}{K_{it}}\right) \equiv \bar{u}_{it} \ . \qquad (2.11)$$

For the sake of simplicity, it is assumed that u_{it} is a random variable with a uniform distribution, with support (0,2). Then, the probability of bankruptcy is given by

$$\Pr(u_{it} < \bar{u}_{it}) = \frac{\bar{u}_{it}}{2} = \frac{1}{2}\left(\frac{1}{\phi\gamma_{it}}\left(gr_{it} - \frac{A_{it-1}}{K_{it}}\right)\right). \qquad (2.12)$$

Following Greenwald and Stiglitz (1990, 1993) it is assumed that bankruptcy is costly and, in particular, bankruptcy costs are a quadratic function of firm's output, $C^f = cY_{it}^2$ with $c > 0$. Then, firm i's problem is characterized by

$$\max(E(\pi_{it}) - C^f \Pr(u_{it} < \bar{u}_{it})) \qquad (2.13)$$

Recalling equations (2.8) and equation (2.12) is given by:

$$\max\left((\gamma_{it}^*\phi - gr_{it})K_{it} - \frac{1}{2}cY_{it}^2\left(\frac{1}{\phi\gamma_{it}}\left(gr_{it} - \frac{A_{it-1}}{K_{it}}\right)\right)\right). \qquad (2.14)$$

The objective function of the firm i is

$$\Gamma_{it} = \gamma_{it}^* \phi K_{it} - gr_{it} K_{it} - \frac{\phi c}{2\gamma_{it}} (gr_{it} K_{it}^2 - A_{it-1} K_{it}). \qquad (2.15)$$

From the first order condition, the optimal capital stock at time t results to be

$$K_{it}^d = \frac{(\gamma_{it}^* \phi - gr_{it})\gamma_{it}}{c\phi gr_{it}} + \frac{A_{it-1}}{2gr_{it}}. \qquad (2.16)$$

Then, firm's investment is given by

$$I_{it} = K_{it}^d - K_{it}. \qquad (2.17)$$

Firms can finance their investment either by their internal funds, that is their previous period profits, π_{it-1}, or if needed by bank loans, ΔL_{it}, where $\Delta L_{it} = L_{it} - L_{it-1}$.

Making use of (2.6), (2.9) and (2.16), the demand for credit is equal to

$$L_{it}^d = \frac{(\gamma_{it}^* \phi - gr_{it})\gamma_{it}}{\phi c gr_{it}} - A_{it-1} \left(\frac{1-2gr_{it}}{2gr_{it}} \right) - \pi_{it}. \qquad (2.18)$$

Banks

The credit market in the model is represented by a single bank that provides firms with bank loans on the interest rate r_{it} specific to each firm. All firms operating in the market are well informed about possibilities of obtaining external finance from the bank. The bank's balance sheet is given by

$$L_t^s = E_t + D_t, \qquad (2.19)$$

where L_t^s is the total credit supply, E_t is the bank's equity base and D_t are deposits determined here as residuals. The credit supply is regulated by a prudential rule for which $L_t^s = E_{t-1}/\upsilon$, where υ is the risk coefficient. This rule implies that the aggregate supply is positively correlated with financial health of the bank.

The amount of credit offered by the bank to each firm depends on firm's size and the amount of net worth that firms had in a previous time-period:

$$L_{it}^s = \lambda L_t^s \frac{\theta_{it} K_{it-1}}{K_{t-1}} + (1 - \lambda) L_t^s \frac{A_{it-1}}{A_{t-1}} \qquad (2.20)$$

with $K_{t-1} = \sum_{i=1}^{N_{t-1}} \theta_{it} K_{it-1}$, $A_{t-1} = \sum_{i=1}^{N_{t-1}} A_{it-1}$, and $0 < \lambda < 1$. The parameter θ_{it} is a firm specific indicating how much the debt contract is collateralized. Indeed, if the borrower defaults on a loan, the borrower forfeits to the lender the property pledged as collateral. Most debt contracts, including

mortgages and corporate debt, are collateralized. When the borrower fails to either repay or meet some conditions of the loan, the lender has the right to sell collateral (Shleifer and Vishny, 2011).

The equilibrium interest rate for the ith firm is determined as credit demand (2.18) equals credit supply (2.20) that is:

$$r_{it} = \frac{2\gamma_{it}^*\gamma_{it} + cA_{it-1}}{2cg[\frac{\gamma_{it}}{\phi c} + \pi_{it} + A_{it-1} + L_t^S(\lambda\theta_{it}k_{it-1} + (1-\lambda)\alpha_{it-1})]}, \qquad (2.21)$$

where k_{it-1} and α_{it-1} are the ratios of individual to total capital and net worth, respectively.

It is assumed that the banks' equity gives the returns equal to the average of lending interest rates $\bar{r}_t$, as well as deposits are remunerated with the borrowing rate r_t^A, determining the banks' profit (π_t^B) as

$$\pi_t^B = \sum_{i\in N} r_{it}L_{it}^S - \bar{r}_t[(1-\omega)D_{t-1} + E_{t-1}], \qquad (2.22)$$

where $1/(1-\omega)$ is the spread between lending and borrowing rates. The parameter ω is required to represent the degree of competition in the banking sector so that high values of ω imply the higher monopolistic power of the banks.

Banks suffer from the bankruptcy of firms because they loose a part of their own funds given by

$$B_{it} = L_{it} - \theta_{it}K_{it}, \qquad (2.23)$$

if the firm i is drawn from the subset of bankrupt firms Ω_t. B_{it} is called bad debt. The law of motion determines the equity base of the banking system as

$$E_t = \pi_t^B + E_{t-1} - \sum_{i\in\Omega_{t-1}} B_{it-1}. \qquad (2.24)$$

In the model the public authority implements the Credit Guarantee Scheme each period in order to solve the problem of financial constraints faced by start-ups. The protection individually offered by the public authority covers up to 80 percent of the losses in the case of default of the firm. Eligible firms include all firms whose age is less than five years with an interest rate higher than the average one. After policy introduction the parameter of the collateral θ_{it}^{B} is substituted by a new one θ_{it}^{P}, so that for eligible firms the new parameter of the collateral increases ($\theta_{it}^{P}=0.8$), while for non-eligible firms it remains unchanged ($\theta_{it}^{P}=\theta_{it}^{B}$). Indeed, recalling equation (2.21) an increase of θ_{it}^{P} lowers the interest rate.

The amount of public fund is determined endogenously. The model is designed in such a way that the public authority has infinite amount of money stored in the public fund. This means that the public authority is able to fully finance all firms that applied for incentives and accepted by the government selection criteria. Two scenarios of policy implementation are considered in the model: when entrepreneurs perceptions of their own entrepreneurial abilities are biased and not.

Sequence of events

1. Firms produce homogenous goods, the outcome depends on the amount of current capital stock and real entrepreneurial talent.

2. Firms calculate desired capital and investment as a result of firm expected profit maximization. The expected profits depend on firm beliefs about their entrepreneurial talent.

3. Firms might finance their investment either by means of internal funds – i.e. using net worth – or by means of bank loans.

4. Total credit supply is a multiple of the banks' equity base. Banks must comply with some regulatory constraints.

5. Individual credit supply is allotted proportionally to firm capital stock and cash available to serve the debt. Debt contract is collateralized.

6. The interest rate is derived from the equilibrium of the individual credit supply and demand. The interest rate depends on firm beliefs.

7. The public authority sustains financially constrained start-ups by increasing the value of the collateral.

2.4 Simulation results

In line with the literature on the ABM, we implemented the Monte Carlo analysis in order to remove across-simulation variability. The reported results are based on 100 Monte Carlo replications with 200 time-periods and 300 firms of each case of the model. As it is quite common in the ABMs, the first 50 simulated periods have not been considered in the analysis of simulation results. The basic assumptions and procedures of the model are described in Appendix. The parameter settings are reported in Table 2.1. As in the model of Russo et al. (2007) we did not properly calibrate the model because our main interest lies in the accessing the qualitative features of the model.

[insert Table 2.1 here]

First, we analyze the effect of the credit guarantee scheme on several outcomes: the average interest rate, average exit rate, and the aggregate investment. In order to check for equalities of means of output data in the two scenarios — when the CGS is implemented and not, the Wilcoxon signed rank tests has been implemented.

The results reported in Table 2.2 suggest that the average interest rate has decreased after CGS implementation in the absence of overconfidence and it has remained unchanged in the presence of overconfidence. This suggests that the main goal of the CGS —the decrease of the average interest rate has only been achieved in the absence of biased entrepreneurial beliefs. When overconfidence exists banks charge more overconfident entrepreneurs with higher interest rates that results in a policy failure of decrease of the average interest rate. With respect to aggregate investment, firm investment has slightly increased in both cases – when overconfidence is present and not. Although the policy implementation had a positive effect on firm investment in general, firm investment is much lower in the presence of overconfidence that in its absence. The exit rate has also increased in both scenarios, particularly strongly in the presence of overconfidence that in its absence.

[insert Table 2.2 here]

Since the CGS is aimed to support start-ups, the results of policy implementation are in extension explored separately for two groups: start-ups and incumbents. Table 2.3 and Table 2.4 (Row

1) report the results of credit guarantee implementation on investment of start-ups and incumbents respectively. The results suggest that the effect of the credit guarantee scheme on start-ups' investment is similar to the previously found positive effect of the policy on firms' total investment — the total investment of young firms has increased in the presence and absence of overconfidence. In the presence of overconfidence incumbents' total investment does not vary between two scenarios, while in its absence incumbents' investment is higher when the CGS is introduced.

[insert Table 2.3 here]

Table 2.3 and Table 2.4 (Row 2 and 3) report the effect of the credit guarantee scheme on start-ups' and incumbents' interest and exit rates respectively. The difference in the average interest rate when the CGS is implemented and not is statistically insignificant for start-ups regardless of the presence and absence of overconfidence. As it can be seen in Table 2.4, in the presence of biased beliefs about entrepreneurial talent CGS implementation leads to a higher average interest rate charged by incumbents. This can be explained by a much higher exit rate of start-ups in the presence of overconfidence that at the same time has a negative affect on the total credit supply. The results reported in Table 2.3 suggest that the exit rate of start-ups has increased in the absence and presence of overconfidence, while the exit rate of incumbents has increased only in the absence of overconfidence. There is no statistically significant effect of the CGS on the exit rate of incumbents when entrepreneurial beliefs are biased.

[insert Table 2.4 here]

The dynamics of the main outcomes in the presence and absence of the CGS in two scenarios — when the overconfidence exists and not is presented in Figure 2.1-2.6. Figure 2.1 refers to the case of unbiased beliefs and presents the time series of firm investment when the policy is implemented and not. Firm investment dynamics in the presence of overconfidence is slightly different from those in the absence of biased beliefs. As it can be seen in Figure 2.1, firm investment is slightly increasing over time only in the presence of the CGS while firm investment remains constant in the absence of the government intervention. In contrast, Figure 2.4 shows that in the presence of overconfidence two trends of investment dynamics are parallel.

Figures 2.2 and 2.5 show the dynamics of interest rates without and with overconfidence respectively. In the case of unbiased entrepreneurial beliefs, the interest rate has no trend in both cases and its fluctuations slightly decrease over time. When overconfidence exists the dynamics of the interest rate changes dramatically: although, the interest rate remains constant over time, its fluctuations have higher amplitude in the presence of overconfidence. The dynamics of the exit rate in the presence of overconfidence is similar to those in the absence of overconfidence except that has an increasing trend in the scenario with zero overconfidence and policy existence.

Next, we turn out to the analysis of the policy effects among start-ups and incumbents separately. Figures 2.7 and 2.13 show the time-series of start-ups' investment when entrepreneurs have zero and positive bias respectively. The dynamics of start-ups' investment is similar with the investment dynamics discussed above. Figure 2.11 and 2.17 show the time-series of start-ups' exit rate in the absence and presence of overconfidence respectively. The dynamics of start-ups' exit rate is also similar with those of the whole population of firms. As it can be seen in Figures 2.9 and 2.10, the dynamics of the interest rate of start-ups and incumbents in the absence of overconfidence does not differ significantly between two scenarios — when the CGS is implemented and not, while in the presence of overconfidence (Figures 2.15 and 2.16) the dynamics of interest rate of incumbents differs between these two scenarios.

As regards the indirect effect of the CGS among incumbents, the CGS has affected the exit rate of incumbents in the case of unbiased entrepreneurial beliefs. Figure 2.12 shows that the exit rate is higher during the last 50 simulated periods in the case of existence of the CGS than in the case of its absence. Although the CGS was not targeted directly towards incumbents, it has changed their exit rates because the policy has influenced the market selection mechanism. Overall, as it can be seen in Figures 2.11, 2.12, 2.17 and 2.18, the dynamics of the exit rates in the case of unbiased entrepreneurial beliefs is characterized by existence of higher-amplitude fluctuations during the first 50 simulated periods and lower-amplitude fluctuations during the next 50 periods, while in the case of biased entrepreneurial beliefs the amplitude of fluctuations is still high but quite constant over time.

2.5 Sensitivity analysis

Sensitivity analysis plays an essential role in simulation models since it helps understand the influence of model inputs on outcome variables and how robust the model to input uncertainty (Thiele et al., 2014). The uncertainties of inputs in the model are assumed to be of low importance if there are no large changes in model outputs when model parameters are varying. Otherwise, the model should be calibrated on the base of empirical values (Bar Massada & Carmel 2008; Schmolke et al. 2010). In this section we perform local sensitivity analysis, that is, a one-factor-at-time analysis with a small variation of parameters across all time-periods. The parameters used in sensitivity analysis and their based values and their ranges are reported in Table 2.5.

Table 2.6 presents the sensitivity of the results when the collateral θ_{it}^B varies from 0.5 to 0.7 and the collateral increased by the policy remains the same as in a benchmark model ($\theta_{it}^P = 0.8$). A lower value of collateral ($\theta_{it}^B = 0.5$) results in a more severe conditions of the debt contract so that in this scenario firms appear to be more financially constrained. The opposite is true for a higher value of collateral ($\theta_{it}^B = 0.7$) — the higher is collateral the less burdensome are the conditions of the debt contract. The results presented in Table 2.6 confirm this condition: firm investment is lower when the debt contract is stricter ($\theta_{it}^B = 0.5$) and is higher when the value of collateral is higher ($\theta_{it}^B = 0.7$). With respect to the average interest rate sensitivity, Table 2.7 shows that in the absence of overconfidence a lower value of the collateral parameter results in a higher average interest rate charged by firms while in the presence of biased beliefs a stricter condition of the debt contract results in a lower value of the interest rate. This is mainly explained by the higher exit rate of firms when the conditions of the debt contract are less severe. Table 2.8 shows that when entrepreneurial beliefs are biased and the collateral parameter has the lowest value, the exit rate of firm is substantially high implying a lower value of the total credit supply and, thus, a higher value of the average interest rate.

In order to check how much the results are sensitive for the change of the collateral increased by a policy maker the sensitivity analysis has been extended by varying the value of θ_{it}^P. Table 2.9 shows that firm investment is an increasing function of θ_{it}^P regardless of the presence or absence of

overconfidence. When the value of collateral increased by a policy maker increases slightly ($\theta_{it}^P = 0.9$) there is no statistically significant difference between two scenarios. When the scenario of the full repayment of the debt by the government is considered (θ_{it}^P=1.0), the collateral secured fully by the government leads to a lower value of the average interest rate than those referring to the case of 80 percent of debt repayment by the government. The exit rate of firms is an increasing function of θ_{it}^P, so that the higher is the value of collateral secured by the government the higher the exit rate of firms is.

In addition, the analysis of the sensitivity of the results has been performed by varying the risk coefficient parameter. Table 2.10 shows that firm investment is a decreasing function of the risk coefficient in the absence of overconfidence. On the other hand, when the overconfidence is present and the CGS is implemented the form of the relationship between firm investment and the risk coefficient is U-shaped. In the presence of overconfidence and in the absence of the policy firm investment slightly increases when the parameter value increases from 0.5 to 0.6 but remains constant when the parameter value increases from 0.6 to 0.7. The form of the relationship between the average interest rate and the risk coefficient parameter depends on the presence and absence of overconfidence as well as on the presence and absence of the policy. Table 2.10 shows that in the absence of overconfidence and the policy firm investment is an increasing function of the risk coefficient parameter while in all other scenarios it has a U-shaped form. With respect to the exit rate, it is sensitive to the change of the parameter only in the absence of overconfidence and when the value of the parameter changes from 0.6 to 0.7.

Finally, we focus on the impact of the variable cost parameter on the sensitivity of the results. Table 2.13 shows that firm investment is a decreasing function of the variable cost parameter in all scenarios. The same is true for two other outcome variables — the average interest and exit rates, values of both of them decrease with the increase of the variable cost parameter.

2.6 Discussions and conclusions

Schwartz and Clements (1999) argue that main motives for government intervention can be divided into three main categories: relief from market imperfections, exploiting economies of scale in production and sustaining the social policy objectives, such as changing income distribution or increasing employment. Nowadays, information asymmetries between borrowers and lenders of funds that are referred to the problem of market imperfections can be considered as one of the most serious obstacles. It is a common practice in tackling the problem of information asymmetry by the European Union and national governments to provide firms by credit subsidies in the form of credit guarantees.

Recent studies on policy evaluation have investigated whether the CGSs were effective or not in improving firm access to additional finance and increasing firm investment. The empirical evidence of the results of credit guarantee schemes is mixed. Hancock, Peek and Wilcox (2007) have evaluated the impact of credit guarantees provided in the U.S by the Small Business Administration and have found positive effect of this kind of incentives on employment and firms' outcomes. Kang et al. (2008) have investigated the effect of credit guarantee schemes in Korea and have found that even if firms' productivity and sales increased CGS did make financial constraints of efficient SMEs less severe. The evidence of positive effect of credit guaranties has been discovered by Zecchini and Ventura (2009), who have evaluated the impact CGS for SMEs implemented in Italy. The authors have concluded that credit guarantee in Italy have started to be effective in easing SMEs financial constraints.

Our simulated results suggest that the effectiveness of the CGS is hampered by entrepreneurial overconfidence. In particular, the average interest rate has decreased only in the absence of overconfidence while in its presence it has remained unchanged. Furthermore, the average interest rate is higher in the presence of overconfidence than in its absence regardless of the policy existence. This is explained by the model design: banks are able to observe entrepreneurial beliefs about their real talents and in the case of presence of entrepreneurial misperception those entrepreneurs are charged by higher interest rate on the credit market. The existence of higher average interest rate in the presence

of overconfidence results in lower aggregate investment of firms regardless of CGS implementation. With respect to the exit rate, the CGS has increased the exit rate of firms in both scenarios: when the overconfidence is present and not. In general, entrepreneurial overconfidence substantially increases firm exit rate.

Overall, our results suggest that, the policy design based on the main criteria for policy eligibility — being a financially constrained start-up should be improved by highly selective mechanisms in order to avoid wasting of public funds. Without careful firms' scanning, policy implementation might distort the post-entry market selection of the most efficient entrepreneurs. The excess entry of too overconfident entrepreneurs leads to a higher firm exit rate that at the same time has a negative affect on the aggregate credit supply and, thus, results in creating financial constraints for the most efficient firms. Our conclusions are in line with what Santarelli and Vivarelli (2007) suggest: "subsidies should be conditional on an obvious and unambiguous occurrence of a market failure (such as capital market imperfections) which prevents otherwise efficient firms from becoming established and growing. Hence, entry subsidies should be allowed only in exceptional situations, while in "normal times" policy makers should refrain from artificially supporting new firm formation" (p.474).

Appendix A

The case when entrepreneurs are fully informed about their real talents (without overconfidence) and without credit guarantee implementation is a "benchmark" case of the model. The initial values of the basic variables of the simulation are defined at time t=1. The firm age distribution is exponential initialized at time t=1.

TABLE 2.1 PARAMETER SETTING

Acronyms	Parameter's description	Parameter's values
ϕ	Capital productivity	0.1
c	The parameter of the bankruptcy equation	1
g	The variable cost parameter	1.1
ω	The mark down on interest rate	0.002
λ	The weight the bank gives to the capital in allotting the credit supply	0.7
υ	The risk coefficient	0.5
θ_{it}^{B}	Collateral	0.6
θ_{it}^{P}	Collateral increased by policy maker	0.8
σ_I	Standard deviation of entrepreneur's information set	0.25
σ_r	Standard deviation of entrepreneur's real talent	0.03
μ	Mean parameter of the exponential firm age distribution	7.039

	Without CGS		With CGS	
	Mean	Std. Dev.	Mean	Std. Dev.
		Investment		
No Overconfidence	47.89	12.40	49.65***	13.22
Overconfidence	11.7	1.23	13.81***	1.33
		Interest Rate		
No Overconfidence	.14119**	.00308	.14112	.00298
Overconfidence	.22089	.00199	.22114	.00158
		Exit Rate		
No Overconfidence	13.29	6.02	13.51***	5.83
Overconfidence	19.87	2.84	20.81***	2.24

Note: the difference between two scenarios with and without the CGS is * significant at 5 %, ** significant at 1%, *** on the basis of the Wilcoxon signed rank tests

	Without CGS		With CGS	
	Mean	Std. Dev.	Mean	Std. Dev.
		Investment		
No Overconfidence	36.87	13.78	38.54***	14.27
Overconfidence	9.26	1.33	11.42***	1.40
		Interest rate		
No Overconfidence	.12163	.02102	.12154	.02051
Overconfidence	.19488	.00957	.19485	.00691
		Exit Rate		
No Overconfidence	2.65	1.69	2.73*	1.64
Overconfidence	6.37	1.50	7.4***	1.4

Note: the difference between two scenarios with and without the CGS is * significant at 5 %, ** significant at 1%, *** on the basis of the Wilcoxon signed rank tests

	Without CGS		With CGS	
	Mean	Std. Dev.	Mean	Std. Dev.
		Investment		
No Overconfidence	11.01	4.33	11.10*	4.11
Overconfidence	2.43	.23	2.39	.21
		Interest rate		
No Overconfidence	.13947	.00174	.13943	.00165
Overconfidence	.22110	.0011	.22152***	.00086
		Exit Rate		
No Overconfidence	10.59	4.58	10.77**	4.41
Overconfidence	13.52	2.16	13.4	1.55

Note: the difference between two scenarios with and without the CGS is * significant at 5 %, ** significant at 1%, *** on the basis of the Wilcoxon signed rank tests

TABLE 2.5 MODEL PARAMETERS USED IN SENSITIVITY ANALYSIS

Parameter	Description	Base value	Min	Max
θ_{it}^B	Collateral –without policy	0.6	0.5	0.7
θ_{it}^P	Collateral – increase in collateral by policy-maker	0.8	0.8	1
υ	The risk coefficient	0.5	0.5	0.7
g	The variable cost parameter	1.1	1	1.3

TABLE 2.6 FIRM INVESTMENT OBTAINED FROM SENSITIVITY ANALYSIS: THE COLLATERAL PARAMETER θ_{it}^B IS VARYING AND θ_{it}^P =0.8.

Collateral	Zero overconfidence				Overconfidence			
θ_{it}	Without CGS		With CGS		Without CGS		With CGS	
	Mean	St.Dev	Mean	St.Dev	Mean	St.Dev	Mean	St.Dev
0.5	31.95***	7.16	22.59***	9.05	7.09***	.73	7.16***	.82
0.6	47.89	12.40	49.65	13.22	11.7	1.23	13.81	1.33
0.7	66.83***	17.01	68.68***	18.04	57.41***	8.72	84.13***	16.31

Note: the scenario with $\theta_{it}^B = 0.6$ is a benchmark scenario; the difference between the varying scenario and the benchmark case is * significant at 5 %, ** significant at 1%, *** on the basis of the Wilcoxon signed rank tests

TABLE 2.7 FIRM INTEREST RATE OBTAINED FROM SENSITIVITY ANALYSIS: THE COLLATERAL PARAMETER θ_{it}^B IS VARYING AND θ_{it}^P =0.8.

Collateral			Zero overconfidence				Overconfidence		
θ_{it}		Without CGS		With CGS		Without CGS		With CGS	
	Mean	St.Dev	Mean	St.Dev	Mean	St.Dev	Mean	St.Dev
0.5	.14215***	.00320	.14205***	.00316	.21632***	.00223	.21631***	.00219
0.6	.14119	.00308	.14112	.00298	.22089	.00199	.22114	.00158
0.7	.14042***	.00256	.14035	.00255	.22441**	.00122	.22272***	.00115

Note: the scenario with $\theta_{it}^B = 0.6$ is a benchmark scenario; the difference between the varying scenario and the benchmark case is * significant at 5 %, ** significant at 1%, *** on the basis of the Wilcoxon signed rank tests

TABLE 2.8 FIRM EXIT RATE OBTAINED FROM SENSITIVITY ANALYSIS: THE COLLATERAL PARAMETER θ_{it}^B IS VARYING AND θ_{it}^P =0.8.

Collateral			Zero overconfidence				Overconfidence		
θ_{it}		Without CGS		With CGS		Without CGS		With CGS	
	Mean	St.Dev	Mean	St.Dev	Mean	St.Dev	Mean	St.Dev
0.5	10.85***	5.90	11.07***	5.83	15.22***	2.23	15.26***	2.31
0.6	13.29	6.02	13.51	5.83	19.87	2.84	20.81	2.24
0.7	15.89***	5.33	16.21***	5.35	40.2***	3.62	47.57***	5.20

Note: the scenario with $\theta_{it}^P = 0.6$ is a benchmark scenario; the difference between the varying scenario and the benchmark case is * significant at 5 %, ** significant at 1%, *** on the basis of the Wilcoxon signed rank tests

TABLE 2.9 FIRM INVESTMENT, INTEREST AND EXIT RATES OBTAINED FROM SENSITIVITY ANALYSIS: θ_{it}^{P} IS VARYING ($\theta_{it}^{P} = 0.9, \theta_{it}^{P} = 1.0$).

| | 0.9 | | | | 1.0 | | | |
| | Zero overconfidence | | Overconfidence | | Zero overconfidence | | Overconfidence | |
	Mean	Std.Dev	Mean	Std.Dev	Mean	Std.Dev	Mean	Std.Dev
Investment	50.80***	13.89	18.09***	3.25	51.80***	14.39	25.19***	8.62
Interest rate	0.14107	0.00296	0.22124	0.00157	.14103**	.00291	.22083**	.00171
Exit rate	13.66***	5.81	22.23***	2.32	13.86***	5.76	23.30***	2.93

Note: the scenario with $\theta_{it}^{B} = 0.6$ and $\theta_{it}^{P} = 0.8$ is a benchmark scenario; the difference between the varying scenario and the benchmark case is * significant at 5 %, ** significant at 1%, *** on the basis of the Wilcoxon signed rank tests.

TABLE 2.10 FIRM INVESTMENT OBTAINED FROM SENSITIVITY ANALYSIS: THE RISK COEFFICIENT IS VARYING

| Risk coefficient | | | Zero overconfidence | | | | Overconfidence | | |
| υ | | Without CGS | | With CGS | | Without CGS | | With CGS | |
	Mean	St.Dev	Mean	St.Dev	Mean	St.Dev	Mean	St.Dev
0.5	47.89	12.40	49.65	13.22	11.7	1.23	13.81	1.33
0.6	40.81***	14.02	44.71***	15.14	12.53***	1.56	15.15***	2.32
0.7	34.43***	14.52	37.53***	15.98	12.53***	1.56	14.02	2.29

Note: the scenario with $\upsilon = 0.5$ is a benchmark scenario; the difference between the varying scenario and the benchmark case is * significant at 5 %, ** significant at 1%, *** on the basis of the Wilcoxon signed rank tests

Risk coefficient υ	Zero overconfidence				Overconfidence			
	Without CGS		With CGS		Without CGS		With CGS	
	Mean	St.Dev	Mean	St.Dev	Mean	St.Dev	Mean	St.Dev
0.5	.14119	.00308	.14112	.00298	.22089	.00199	.22114	.00158
0.6	.14130***	.00291	.14098	.00281	.22120	.00324	.22120	.00324
0.7	.14153	.00314	.14128	.00317	.22030	.00315	.22117	.00299

Note: the scenario with $v = 0.5$ is a benchmark scenario; the difference between the varying scenario and the benchmark case is * significant at 5 %, ** significant at 1%, *** on the basis of the Wilcoxon signed rank tests

TABLE 2.12 FIRM EXIT RATE OBTAINED FROM SENSITIVITY ANALYSIS: THE RISK COEFFICIENT IS VARYING

Risk coefficient v	Zero overconfidence				Overconfidence			
	Without CGS		With CGS		Without CGS		With CGS	
	Mean	St.Dev	Mean	St.Dev	Mean	St.Dev	Mean	St.Dev
0.5	13.29	6.02	13.51	5.83	19.87	2.84	20.81	2.24
0.6	11.91*	5.85	11.67**	5.73	20.39	3.53	21.15	3.87
0.7	10.7**	6.21	10.45***	6.30	20.39	3.53	21.15	3.42

Note: the scenario with $v = 0.5$ is a benchmark scenario; the difference between the varying scenario and the benchmark case is * significant at 5 %, ** significant at 1%, *** on the basis of the Wilcoxon signed rank tests

TABLE 2.13 FIRM INVESTMENT OBTAINED FROM SENSITIVITY ANALYSIS: THE PARAMETER –VARIABLE COST IS VARYING

Variable cost parameter	Zero overconfidence				Overconfidence			
	Without CGS		With CGS		Without CGS		With CGS	
g	Mean	St.Dev	Mean	St.Dev	Mean	St.Dev	Mean	St.Dev
1.0	58.44***	14.24	61.30***	15.39	17.24***	1.70	28.63***	5.62
1.1	47.89	12.40	49.65	13.22	11.7	1.23	13.81	1.33
1.2	38.54***	9.99	40.04***	10.08	9.79 ***	.97	9.74***	.95

Note: the scenario with $g = 1.1$ is a benchmark scenario; the difference between the varying scenario and the benchmark case is * significant at 5 %, ** significant at 1%, *** on the basis of the Wilcoxon signed rank test.

TABLE 2.14 FIRM INTEREST RATE OBTAINED FROM SENSITIVITY ANALYSIS: THE PARAMETER – VARIABLE COST IS VARYING

Variable cost parameter	Zero overconfidence				Overconfidence			
	Without CGS		With CGS		Without CGS		With CGS	
g	Mean	St.Dev	Mean	St.Dev	Mean	St.Dev	Mean	St.Dev
1.0	.15460***	.00331	.15446***	.00317	.24401***	.00195	24426***	.00251
1.1	.14119	.00308	.14112	.00298	.22089	.00199	.22114	.00158
1.2	.13000***	.00281	.12992***	.00271	.20172***	.00186	.20185***	.00166

Note: the scenario with $g = 1.1$ is a benchmark scenario; the difference between the varying scenario and the benchmark case is * significant at 5 %, ** significant at 1%, *** on the basis of the Wilcoxon signed rank tests

Variable cost parameter	Zero overconfidence				Overconfidence			
	Without CGS		With CGS		Without CGS		With CGS	
g	Mean	St.Dev	Mean	St.Dev	Mean	St.Dev	Mean	St.Dev
1.0	14.48***	5.69	14.87***	5.49	22.69***	2.45	26.7***	3.78
1.1	13.29	6.02	13.51	5.83	19.87	2.84	20.81	2.24
1.2	11.93***	5.99	12.21**	5.81	18.60*	2.79	18.66***	2.44

Note: the scenario with $g = 1.1$ is a benchmark scenario; the difference between the varying scenario and the benchmark case is * significant at 5 %, ** significant at 1%, *** on the basis of the Wilcoxon signed rank tests

Figure 2.1 Firm investment dynamics without overconfidence (absolute values)
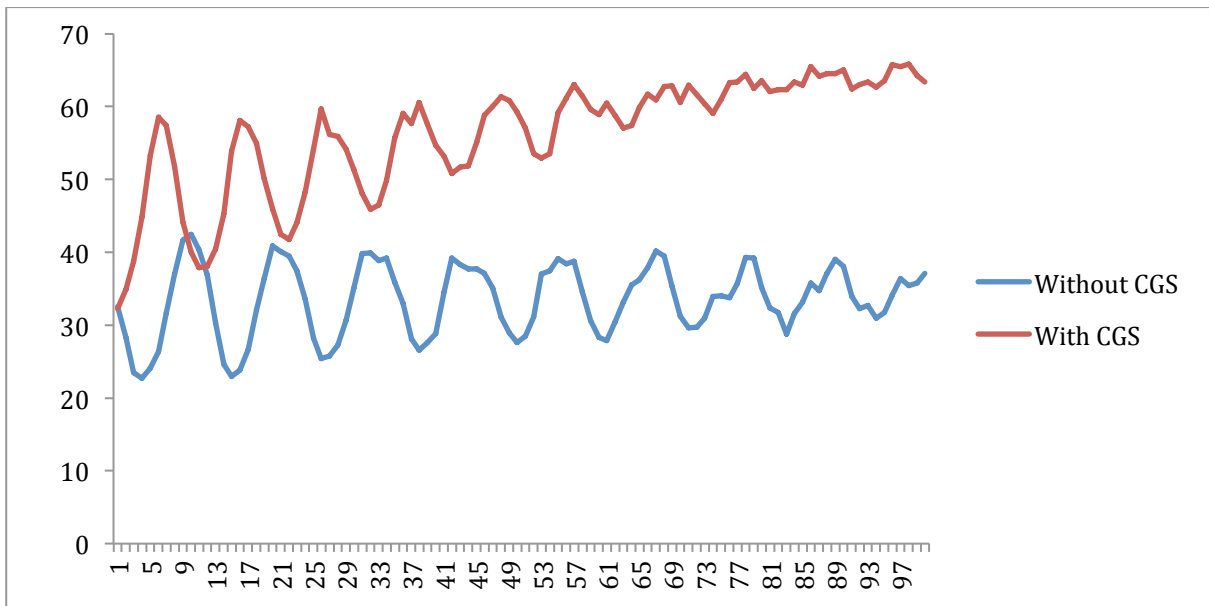
Figure 2.2 Firm interest rate dynamics without overconfidence
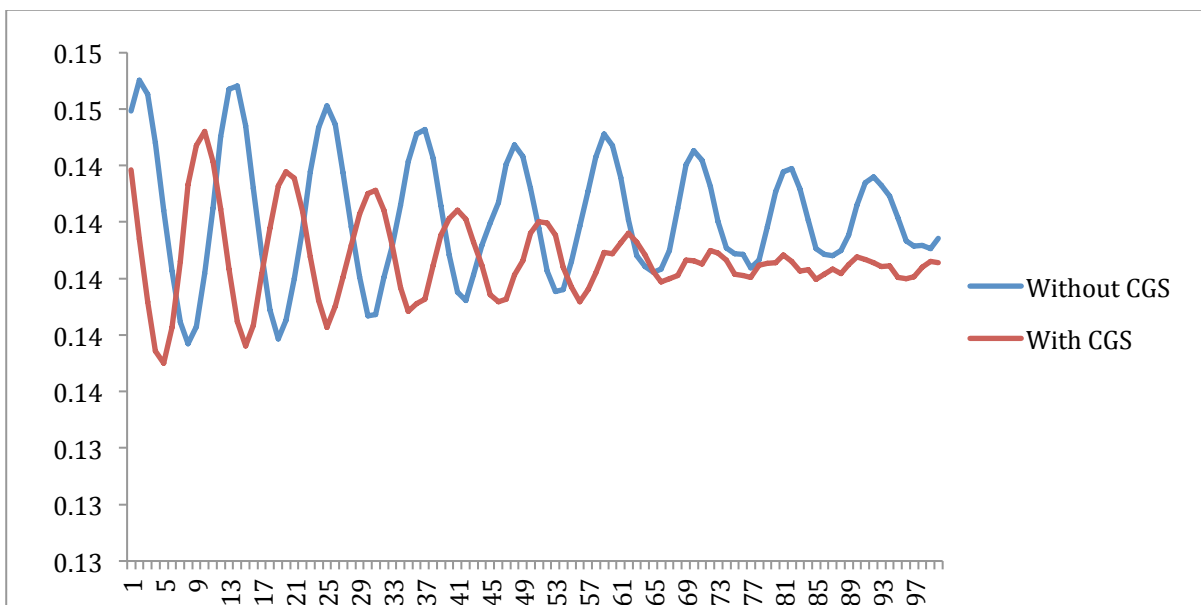
Figure 2.3 Firm exit rate dynamics without overconfidence
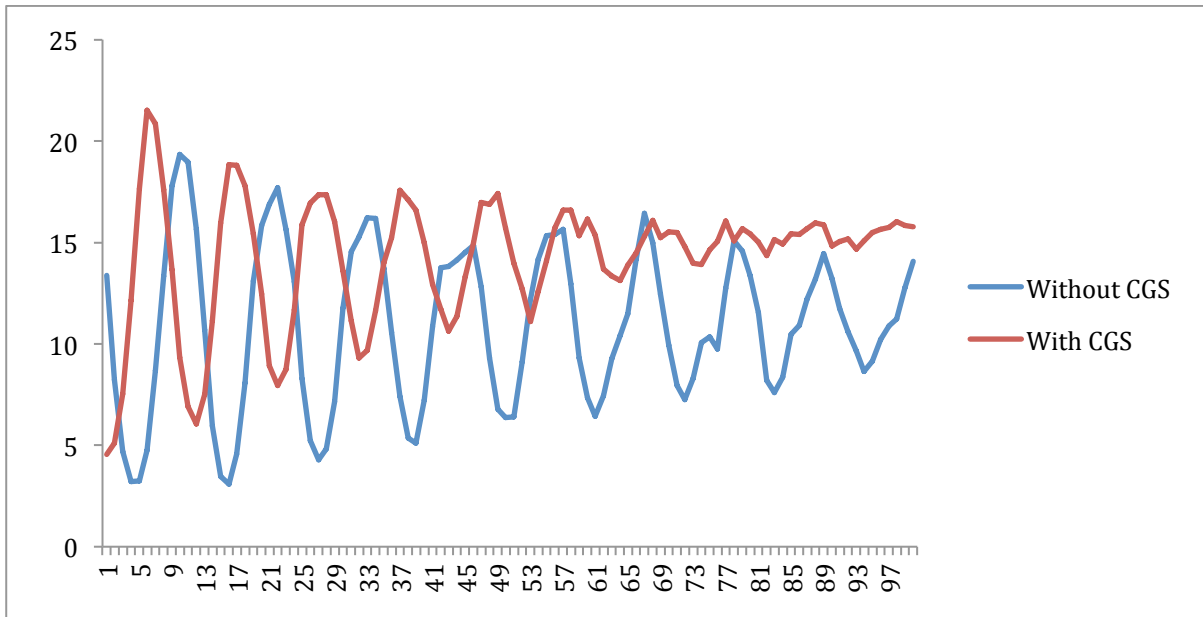
Figure 2.4 Firm investment dynamics with overconfidence (absolute values)
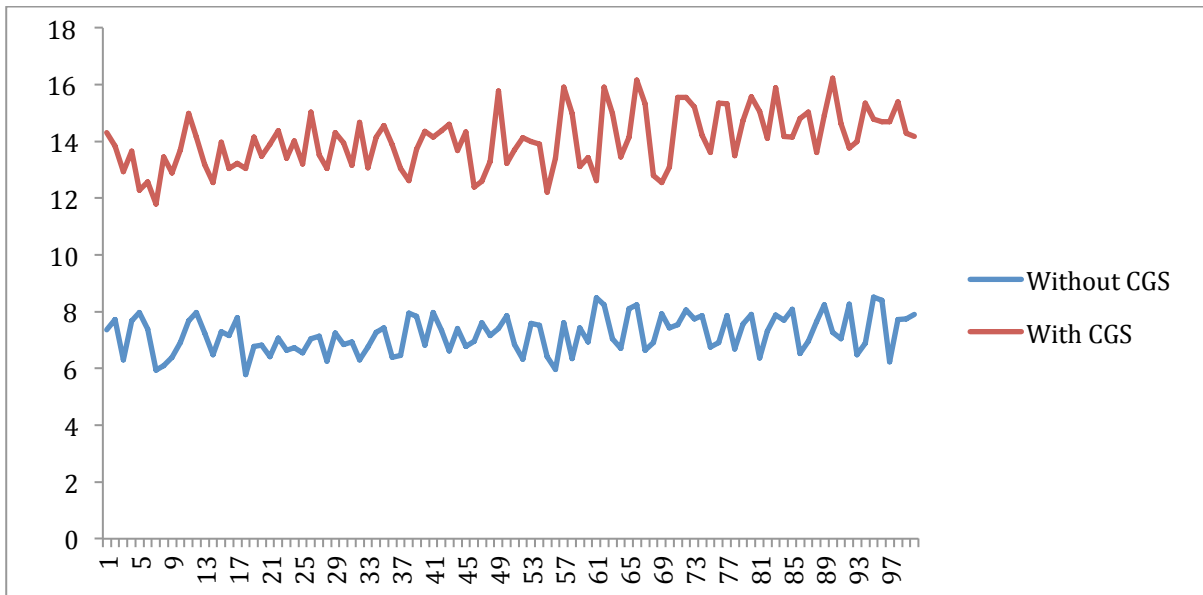
Figure 2.5 Firm interest rate dynamics with overconfidence
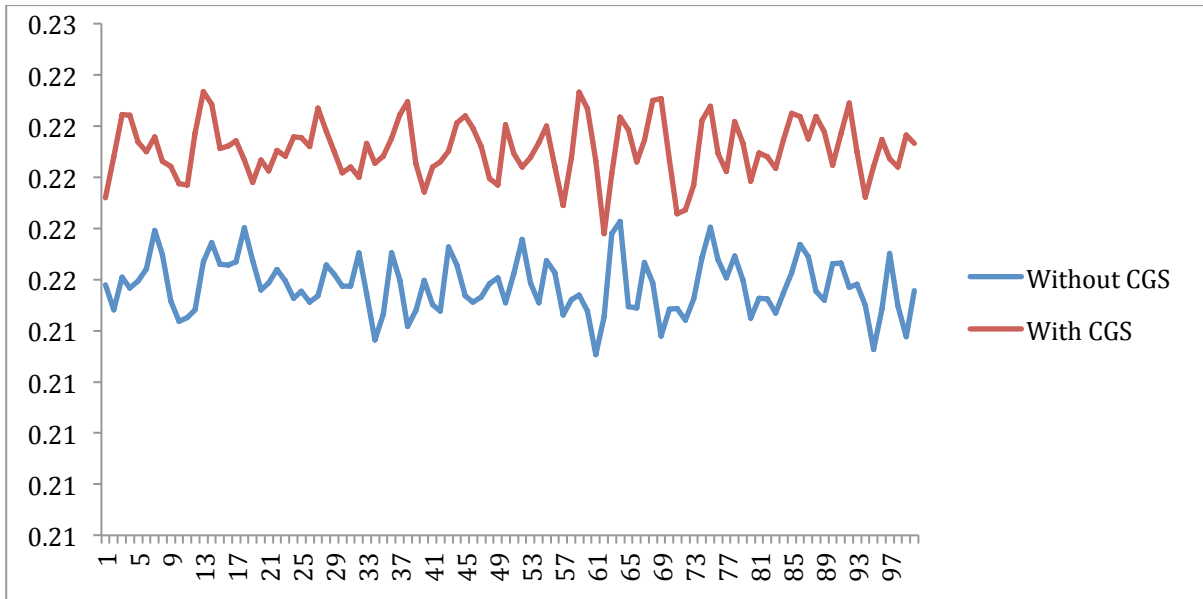
Figure 2.6 Firm exit rate dynamics with overconfidence
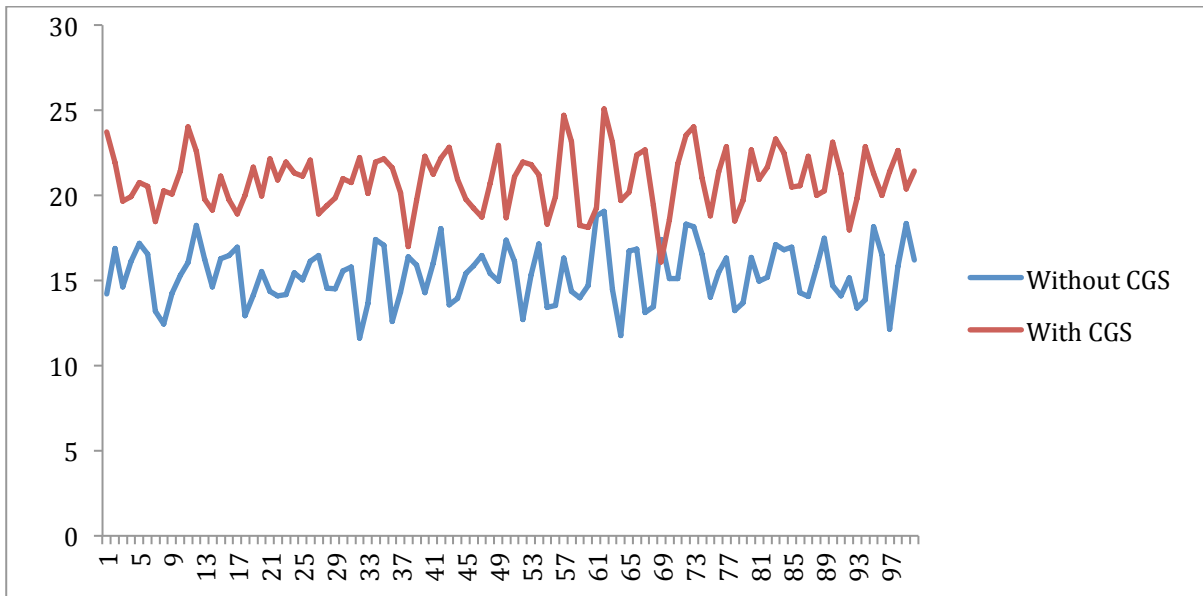
Figure 2.7 Start-ups investment dynamics without overconfidence (absolute values)
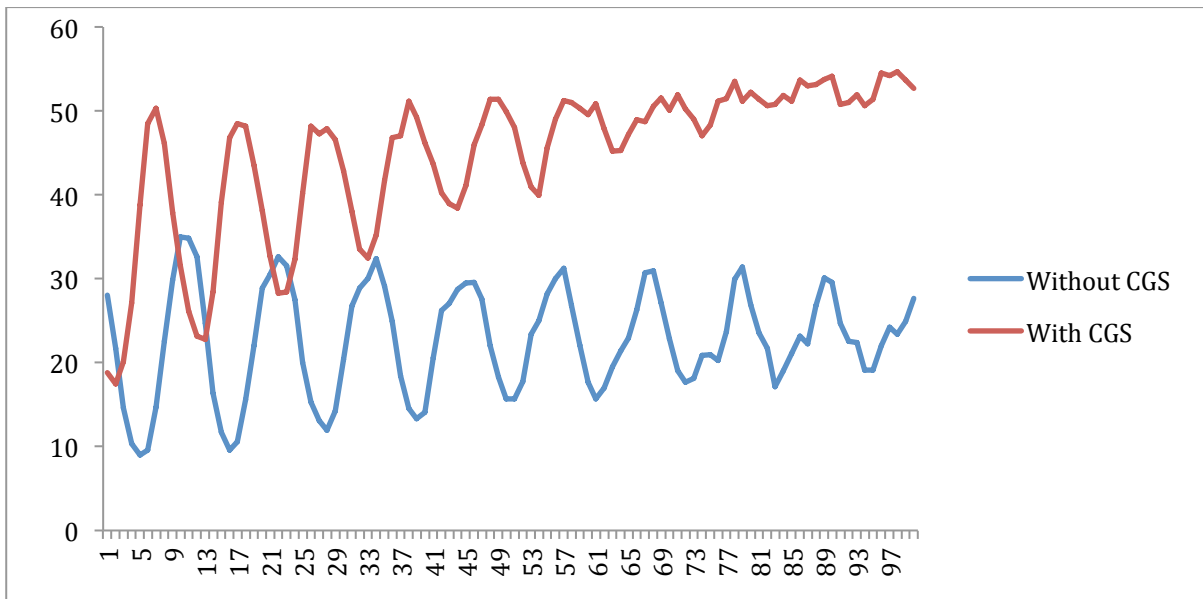
Figure 2.8 Incumbents investment dynamics without overconfidence (absolute values)
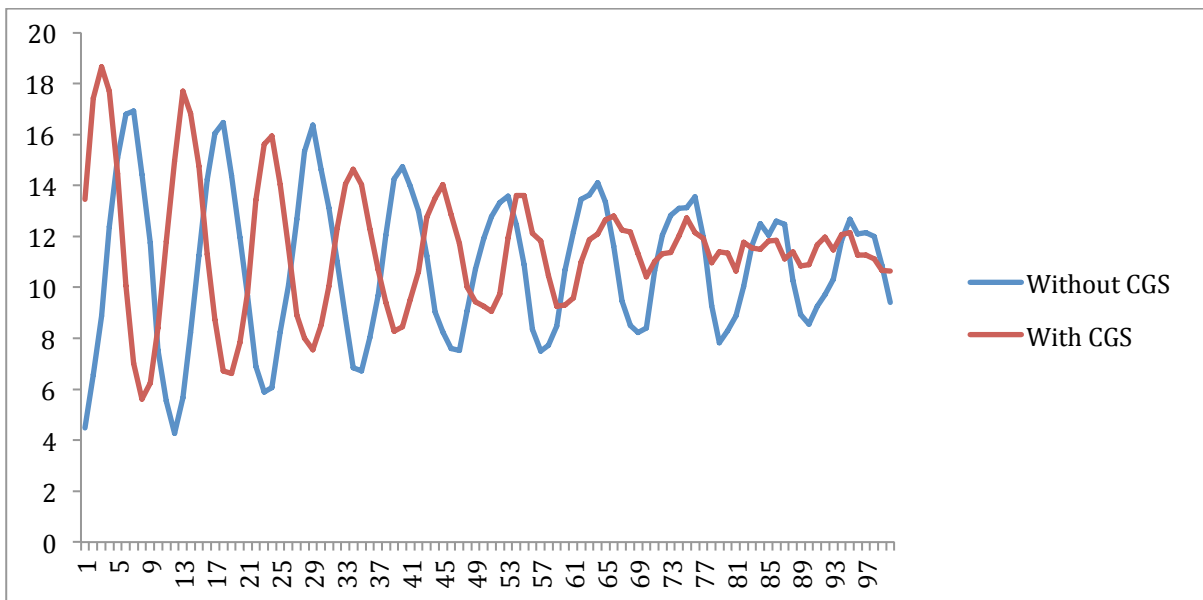
Figure 2.9 Start-ups interest rate dynamics without overconfidence
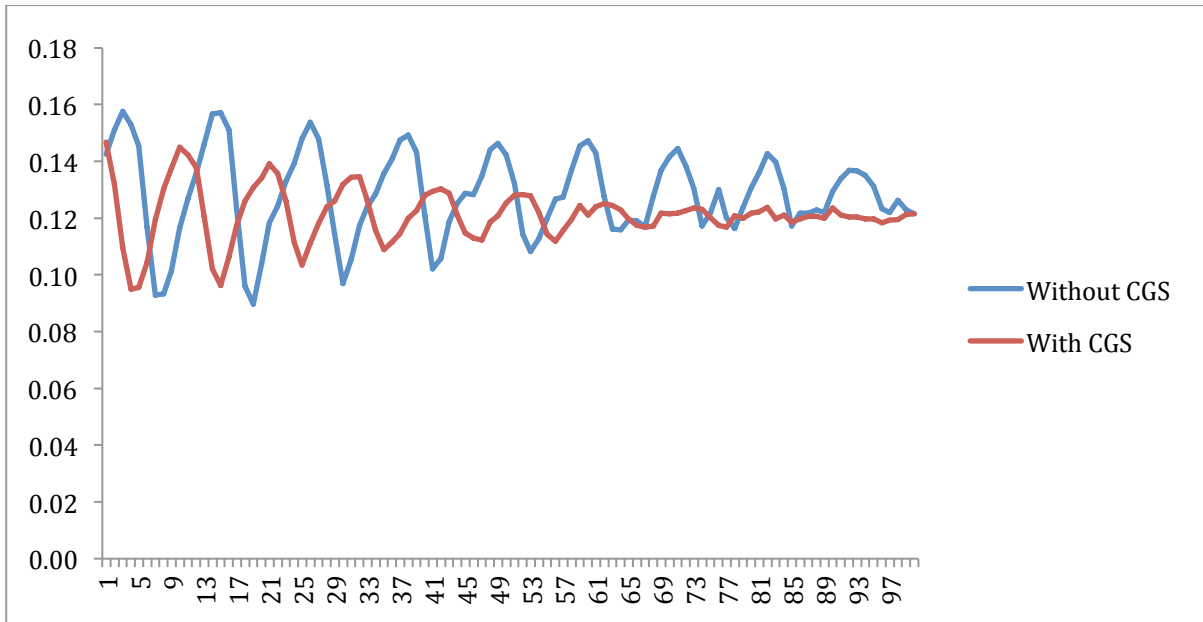
Figure 2.10 Incumbents interest rate dynamics without overconfidence
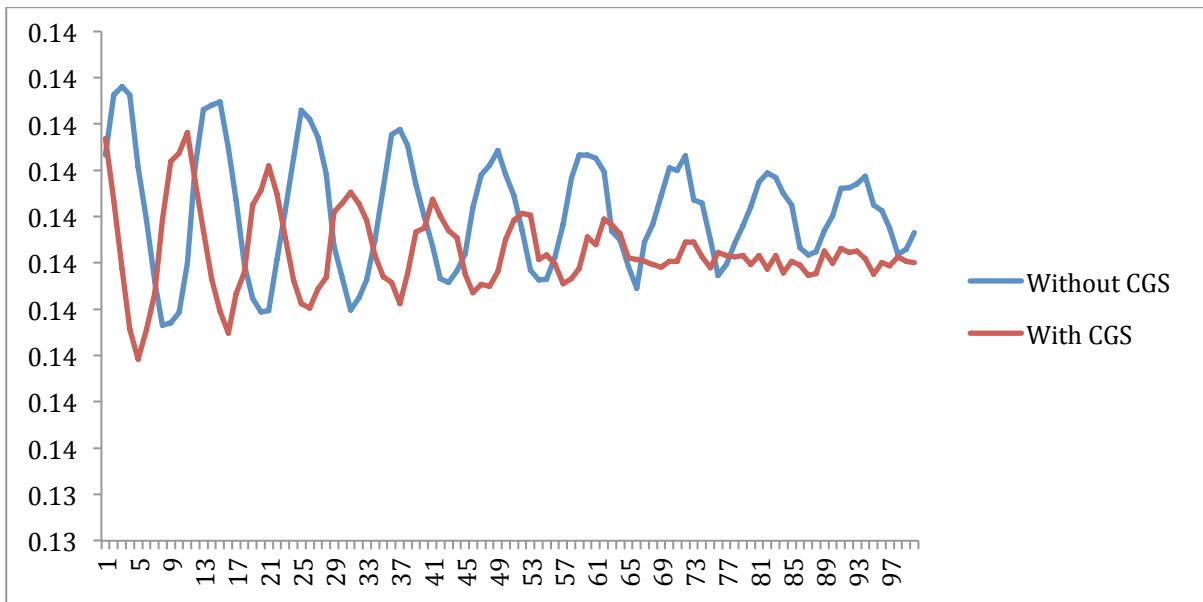
Figure 2.11 Start-ups exit rates without overconfidence
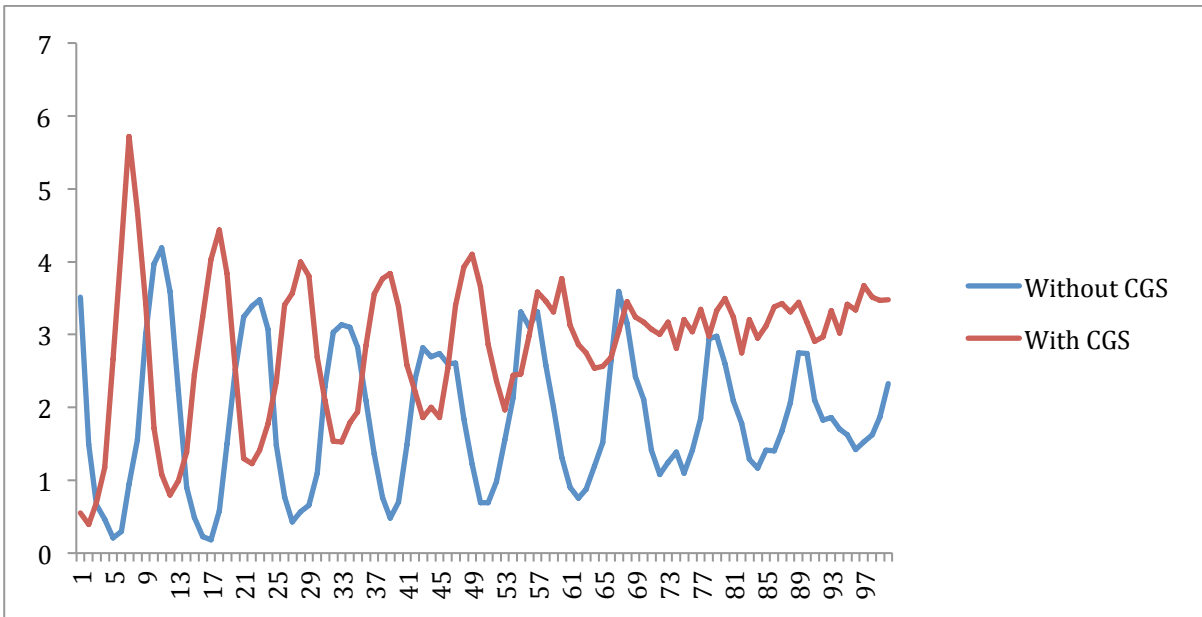
Figure 2.12 Incumbents exit rates without overconfidence
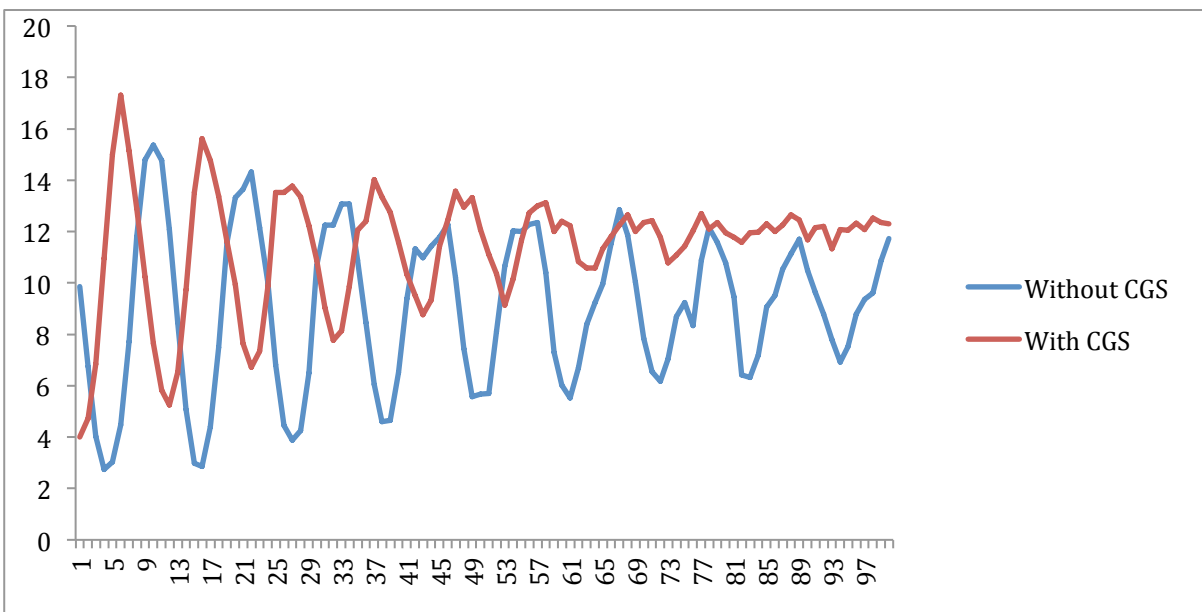
Figure 2.13 Start-ups investment dynamics with overconfidence (absolute values)
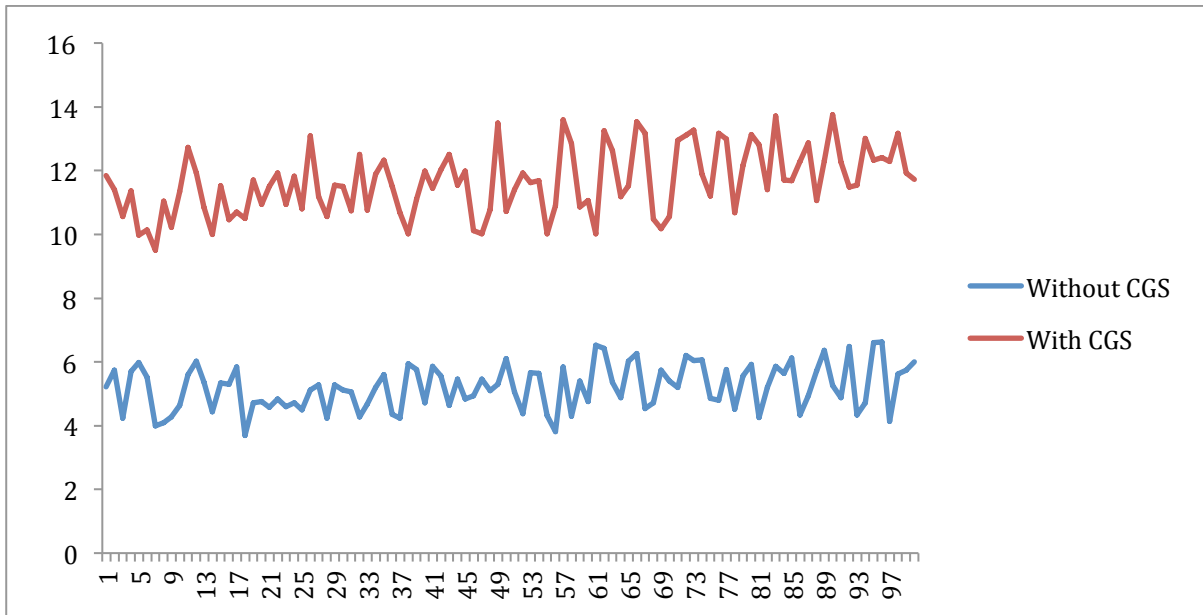
Figure 2.14 Incumbents investment dynamics with overconfidence (absolute values)
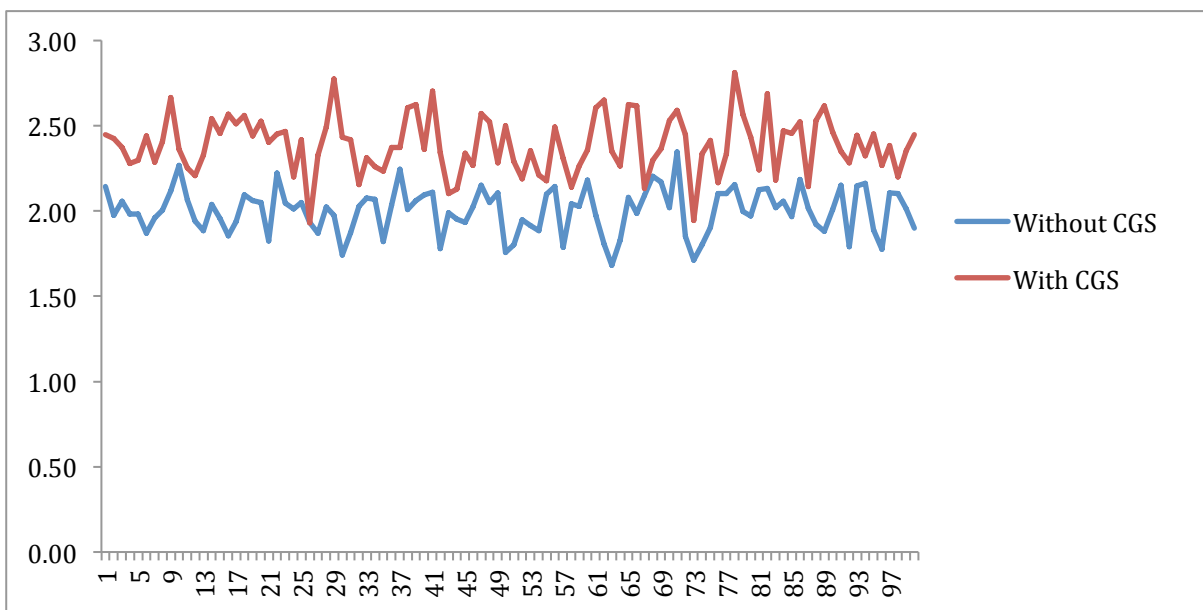
Figure 2.15 Start-ups interest rate dynamics with overconfidence
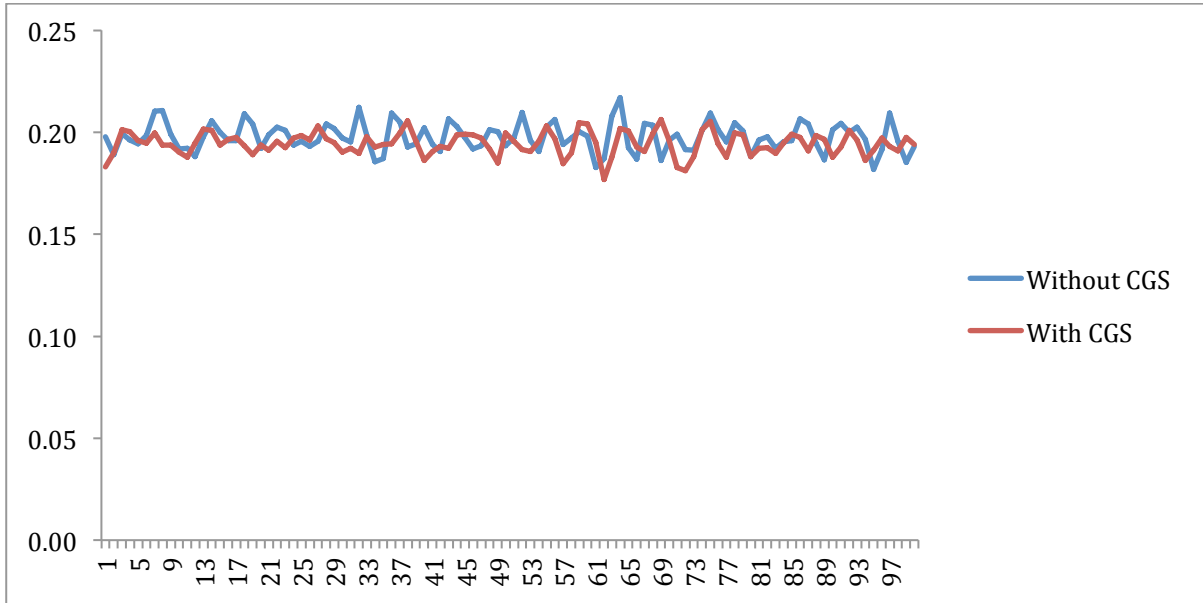
Figure 2.16 Incumbents interest rate dynamics with overconfidence
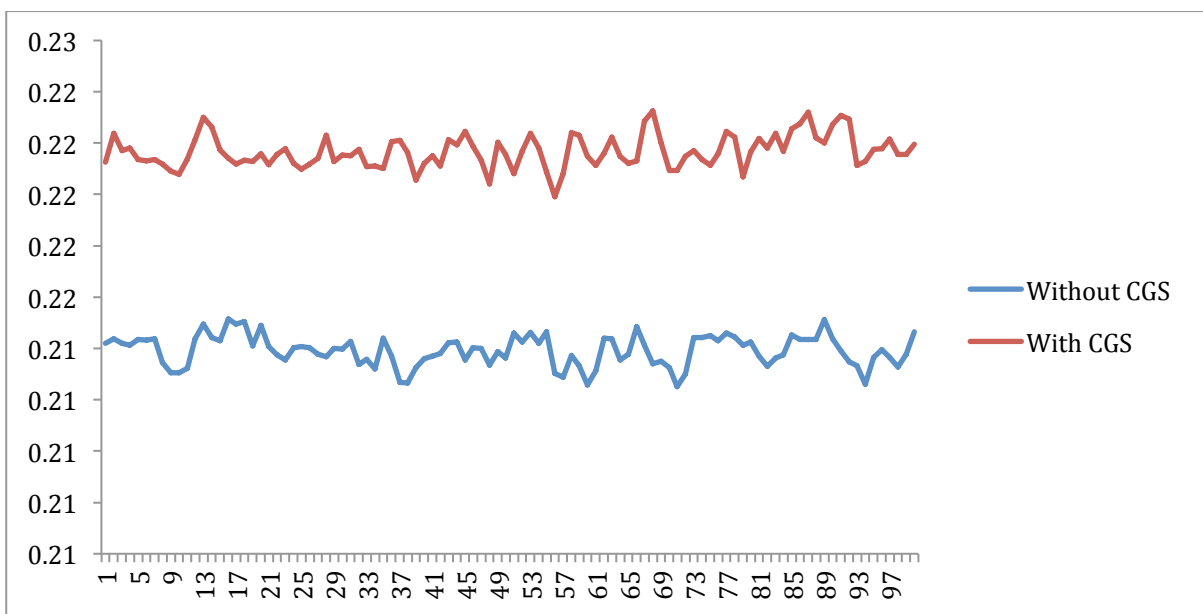
Figure 2.17 Start-ups exit rates with overconfidence
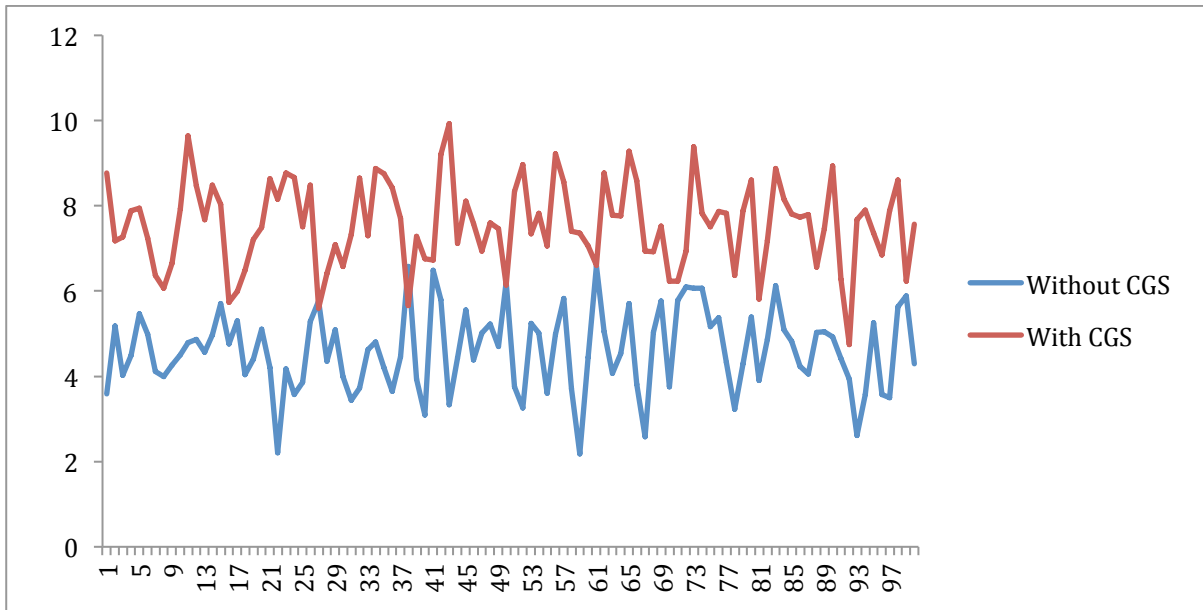
Figure 2.18 Incumbents exit rates with overconfidence
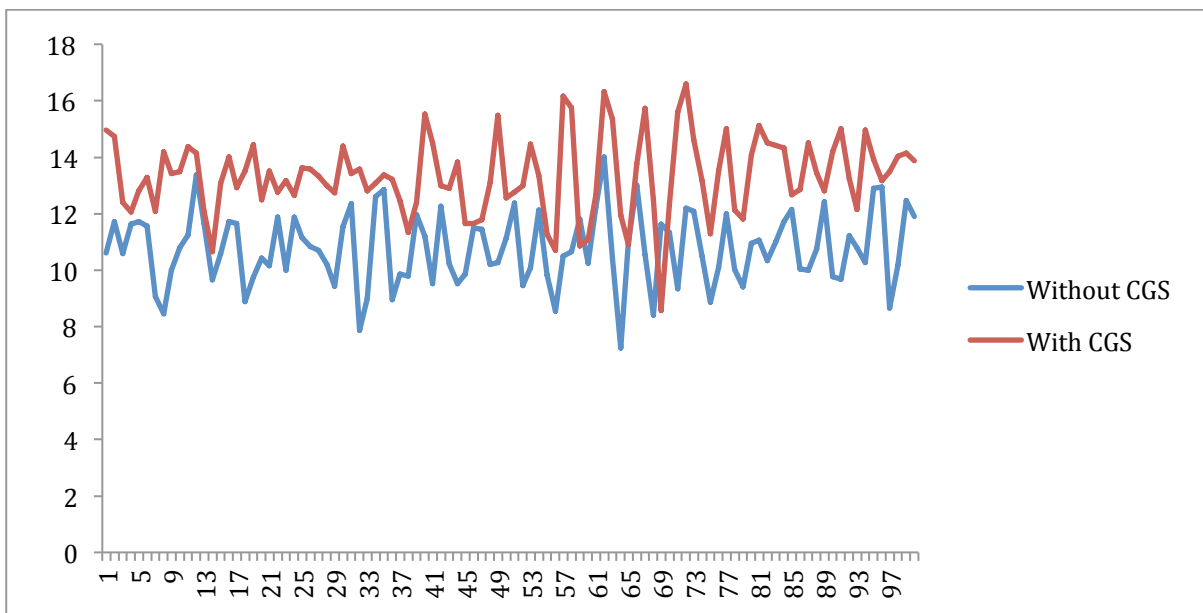
Firms　　　　　　　　　　　　**Flow Diagram**

Firms produce output $Y_{it} = \gamma_i \phi K_{it}$

Firms calculate current profits and net worth
$$\pi_{it} = u_{it}\phi - gr_{it})K_{it}$$
$$A_{it} = A_{it-1} + \pi_{it}$$

Bank

Public authority

Firms calculate expected profits $E(\pi_{it})$ depending on γ_i^*: $\gamma_{Yit}^* \gg \gamma_i$ and $\gamma_{Oit}^* > \gamma_i \Longrightarrow$ Max $E(\pi_{it})$

Firms decide the amount of K_{it}^d and investment I_{it}

L_{it}^d is defined

Allocate credit
$$L_{it}^s = \lambda L_t^s \frac{\theta_{it}K_{it-1}}{K_{t-1}} + (1-\lambda)L_t^s \frac{A_{it-1}}{A_{t-1}}$$

Firm age < 5 & $r_{it} > \bar{r}_t$

Determine the equilibrium r_{it} from
$$L_{it}^s = L_{it}^d$$

Yes

No

$A_{it-1} + \pi_{it} < 0$

Yes

$B_{it} = L_{it} - \theta_{it}K_{it}$ is defined

$\theta_{it}^B \rightarrow \theta_{it}^P$: $\theta_{it}^P > \theta_{it}^B$

$\theta_{it}^P = \theta_{it}^B$

No

Next period $t+1$

Substitute by a new entrant

Calculate $\pi_t^B = \sum_{i\in N} r_{it}L_{it}^s - \bar{r}_t[(1-\omega)D_{t-1} + E_{t-1}]$
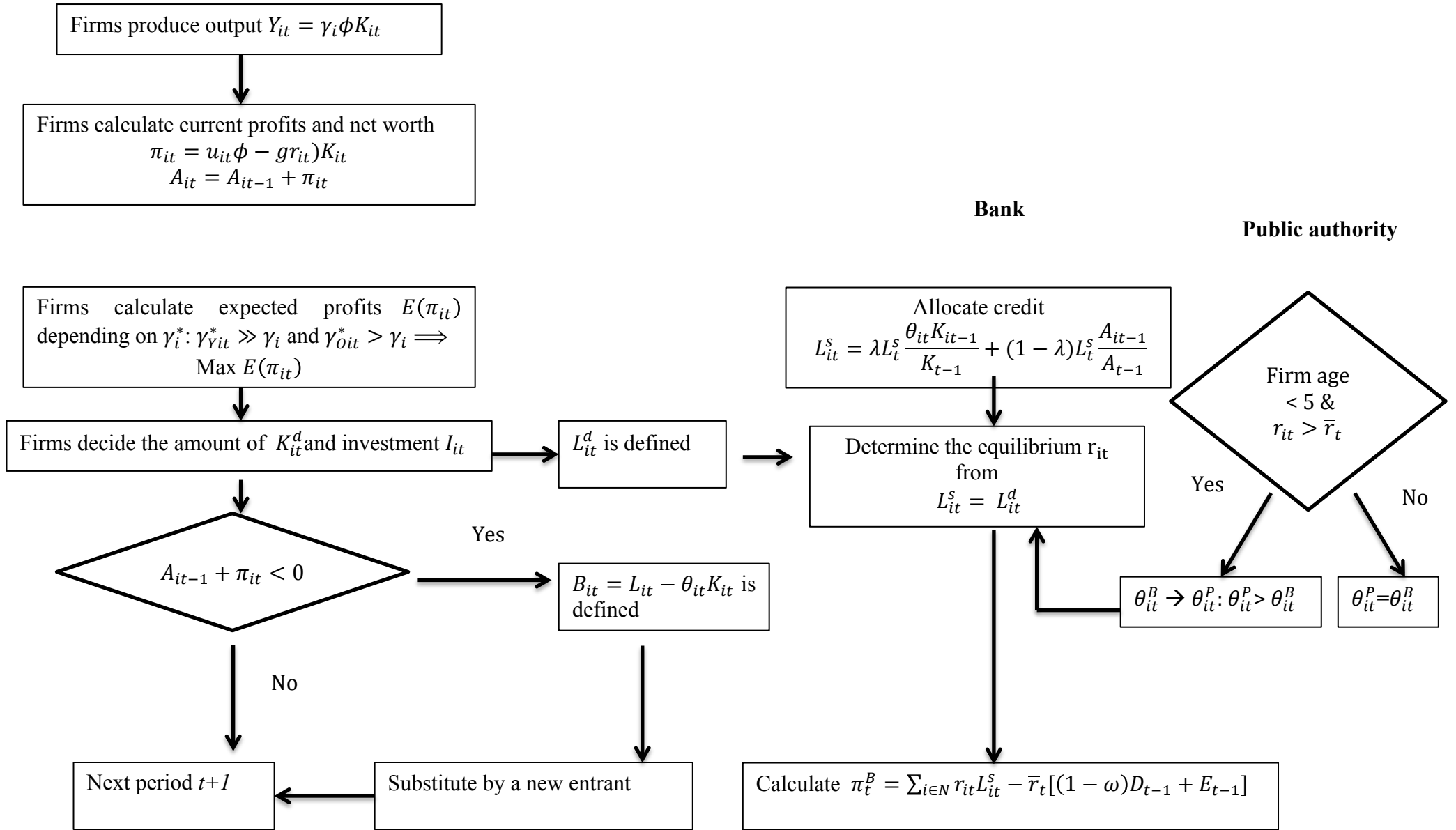
Chapter III

Competitive strategies, perceived competition and firm performance of micro firms: the case of Trento

3.1 Introduction

Competition plays a fundamental role in economics since it has a strong effect on firm behavior. Competition pushes firms to frequently undertake offensive and defensive actions that should result in their competitive advantage. Gatignon and Reibstein (1997) identified four possible reactions that might appear as a response to the threat of entry: retaliation, accommodation, ignoring, and abandonment.[1] Steenkamp et al. (2005) have found that while facing with promotion and advertising attacks of rivals the vast majority of firms in the short run prefer no reaction as a response. The authors also identified that among those firms that prefer to respond to the actions of rivals the most common response was to react in the same manner: to meet promotion attacks with promotions and the advertising attacks — with advertising.

Empirical studies have found contradictory results of the effect of competition on innovation and firm performance. The Schumpeterian view that postulates that the relationship between competition and innovation is negative because competition diminishes the post-innovation rents resulting in reduction of firm incentives to innovate have been confirmed by many studies (Kamien and Schwartz, 1982 and Cohen and Levin, 1989). Aghion et al. (2005) have found that the relationship between competition and innovation has a nonlinear form of an inverted-U shape so that competition

---

[1] Retaliation means that firms take a decision to fight against their competitions, accommodation implies that firms choose to cooperate with others that will result in joint benefits for all players, ignoring means that firms decide not to react to the threat of competition, and abandonment is a total withdrawal from the market (see Gatignon and Reibstein,1997 and Kemp, R.G.M., and Hanemaaijer, J.J., 2004 for details).

induces incentives to innovative for neck-and-neck businesses but reduces them for technological laggards.

The positive effect of competition on firm performance has been detected by several empirical studies. For example, Nickell (1996) has shown that that competition has a strong impact on productivity growth of U.K. companies. Januszewski, Koke, and Winter (2002), by using data on German manufacturing firms, have found that firms that experience higher productivity growth operate in markets with an intensive level of competition. On the other hand, Kacker (2009) has shown that competition has different effects on different enterprises: competition might be growth enhancing for low productivity growth firms and, at the same time, growth-reducing for high growth productivity ones.

This contradiction in empirical studies might be explained by existing differences among individual and behavioral factors of firms. In particular, preferences for certain actions as a response to the threat of competition can be mainly explained by variation in individual and firm characteristics. The question on how individual characteristics of the founder affect entrepreneurial actions has been widely addressed in the literature on an 'entrepreneurial imprinting effect'. The 'entrepreneurial imprinting' is defined as the firm endowment of human capital of the founder. For instance, Grilli, Jensen, and Murtinu (2013) have found that 'entrepreneurial imprinting' mainly determined by founders' specific pre-entry work experience has an effect on sales growth performance of Italian new-technology based firms (NTBFs). Several studies have shown that an entrepreneurial imprinting effect exists among firms and influences each firm's future path (Boeker, 1988; Milanov and Fernhaber, 2009; DeTienne and Cardon, 2012; DeTienne, McKelvie, and Chandler, 2012). Mathias et al. (2014) have demonstrated that the different sources of imprint navigate the way entrepreneurs take entrepreneurial actions. Specifically, the authors have shown that intentions for certain career choices or an entrepreneurial activity imprinted on humans early in life have diverse effects not only on the decision to start a new venture but also on future actions and behavior of entrepreneurs.

The effect of competition on firm behavior might significantly vary across firms of different size. Indeed, many findings related to competition and based on the sample of large firms and SMEs

cannot be reproduced when the sample of micro firms is used. Furthermore, lack of the data on micro firms and ignorance of the importance of micro firm research for a long-time result in a low number of studies investigating behavior of micro firms in the context of competition.

Microenterprises play an important role in European economy since they account for 92.4 percent of all European businesses and engage 29.9 percent of all employees (Eurostat - European Business, 2013[2]). Apart from the fact that vast majority of businesses have less than ten employees (are micro), microenterprises can be also characterized as the most vulnerable kind of firms in terms of resources. In particular, these business units often suffer from an obligation on a business, stemming from EU legislation, that is on the other hand perfectly manageable for SMEs with larger number of employees (Federation of Small Businesses, 2011).

Mettler and Williams (2011) claim that today the advantage of 'being large' does no longer exist. The technologies of the 21st century have created opportunities for microenterprises to operate in a more efficient manner avoiding the problems faced by large firms such as bureaucracy or overstaffing. This implies that the role of microenterprises should be reconsidered. The authors identified two main determinants of the rise of microenterprises — successful internalization and the Internet — that allow microenterprises to access to larger markets, make contracting faster and easier and, at the same time, to reduce substantially the contracting costs.

There is compelling evidence that small and large businesses differ in the way they build and adopt their competitive strategies. Chen and Hambrick (1995) have studied how a competitive behavior of small firms differs from that of their larger counterparts. Their findings suggest that a competitive behavior of small firms differ substantially from that of larger units, so that the former are

---

[2] Methodical note: The figures presented in this paper are based on Eurostat's structural business statistics (SBS) that provide data on the structure, conduct and performance of businesses across the European Union (EU) operating in industry, construction, trade and services. See Eurostat - Statistics Explained: Business economy - size class analysis (2013 ed.). Retrieved from December, 2, 2014 Statistics http://epp.eurostat.ec.europa.eu/statistics_explained/

more likely to initiate competitive moves while the latter are more likely to respond to attacks. In addition, the authors have indicated that small firms tend to implement competitive actions faster than large ones, whereas large firms prefer to announce their responses more quickly. Dean, Brown, and Bamford (1998) suggest that the existence of diverse impact by industry structure characteristics on large and small firms might be explained by their different endowments of the unique resources and capabilities. This raises the question of whether theoretical and empirical models and approaches specifically developed for larger business units are applicable on microenterprises.

The objective of this study is to explore what strategies micro firms adopt when they are faced with different levels of competition. Competitive advantages of firms are defined on the basis of Porter's (1980) model of generic strategies — differentiation and cost leadership. In addition, we introduce a third option that firms can choose and that is no action to competition or non-strategic behavior. Porter (1980) argues that firm's competitive strategy is mainly aimed to serve as a tool, which protects the firm from competitive forces or translates them in its favor. Thus, identification of firm's competitive strategies is essential for understanding the processes behind interactive behavior of firms as well as the outcomes of these processes. Similar to the theoretical framework of Block et al. (2015) we investigate what firm and entrepreneur characteristics affect the choice of a competitive strategy. Finally, we test whether the choice of certain strategy results in better firm performance measured by labor productivity growth. Since the effect of adopting a differentiation strategy might take longer time to occur, we add firm performance in 2011 to the performance in 2010 to control the long-term effect of differentiation.

3.2 Theoretical background

This section focuses on the previous literature on perceived competition, competitive strategies, and firm performance. Since one of the objectives of our study is to investigate how microenterprises react to different intensity of perceived competition, the section begins with discussion of perceived competition. Section 3.2.1 is mainly based on the work of Kemp & Hanemaaijer (2004), where the authors made a review of the existing theories of competition paying attention to both approaches of competition, the economic and cognitive literature. In order to identify what strategies are followed by microenterprises and how the strategy choice is attributed to firm and individual characteristics, Section 3.2.2 follows partially the paper of Block et al. (2015) where the authors show that the choice between cost leadership and differentiation strategies of microenterprises depends on the start-ups entry strategies. Finally, the last Section 3.2.3 on the relationship between firm strategies and their performance is mainly based on the study of Gibcus and Kemp (2003), which reviews the current literature on the influence of firm strategies on small firm performance.

3.2.1 Perceived competition

Kemp & Hanemaaijer (2004) emphasize the role of two streams of literature that are named as conventional approaches to the analysis of the role of competition in industries and markets – the structure–conduct–performance (SCP) paradigm that dominated in the industrial organization (IO) literature until the early 1980s and the strategic group notion from strategic management (Scherer and Ross, 1990). The main idea of SCP is that the structural characteristics of an industry (the number and size distribution of firms in an industry) determine the strategic behavior of firms (market conduct) necessary to interact with other firms, which in turn yield a specific performance (Slade, 2004). The main critique of the SCP paradigm is based on the fact that this paradigm was not derived from the models of optimal decision making of economic agents (Slade, 2004). Moreover, the increased power of the game theory let the oligopoly models, which are based on the assumptions of the exogenous

conduct (e.g., Cournot or Bertrand behavior) and endogenous entry and firm performance, to be widely accepted.

Leask and Parnell (2005) noted that the strategic group notion is often considered as a compromise between two levels of analysis: the industry level from the industrial organization (IO) literature and the organizational level of analysis from strategic management (Porter, 1981; Hergert, 1983). Hunt (1972) defined the strategic group as "A group of firms within an industry that are highly symmetric. . .with respect to cost structure, degree of product differentiation, degree of vertical integration, and the degree of product diversification... formal organization, control systems, and management rewards and punishments... (and) the personal views and preferences for various possible outcomes..." (p. 8).

Further Porter (1977, 1980) developed the concept of the strategic groups and incorporated the notions of IO economics in the strategic management. More precisely, the mobility barrier theory developed by Caves and Porter (1977) emphasizes the role of mobility barriers that are very similar to the entry barriers but the difficulty of movement between neighboring market positions is caused by the joint activities of member firms of the strategic groups. The main advantage of the strategic group theory with respect to the SCP paradigm is that the former takes into account the performance variations within industries by splitting industries and moving closer to the firm level of analysis (Leask and Parnell, 2005).

Kemp & Hanemaaijer (2004) argue that, in order to understand the competitive process entirely, it is, first, necessary to understand different directions, which can be considered as the main sources of competition. Among strategic researchers it is commonly accepted to use the Porter's five forces model (1980) in order to determine the nature and degree of competition. The Porter's model distinguishes five competitive forces: perceived threat from rivals, perceived threat from entrants, perceived threat from substitutes, perceived pressure from suppliers and perceived pressure from buyers. The main advantage of this framework is that competition is treated as a more complex process than just rivalry interaction with competitors. One of the five forces will be always able to capture the

essential issues in the division of value created by industry participants despite the ambiguity in the way of determining industry boundaries.

While conventional theories pay more attention to the outcomes of competition, the main focus of marketing and strategic literature is the process of competitive action. This kind of research that is usually carried out at firm level mainly concentrates on investigating the decision-making process of subjects who are involved in creation of firm competitive strategies. Entrepreneurs play an important role in this framework because their perception of environment influences the decisions about their further actions. This implies that strategic management should also adopt a behavioral perspective; particularly, the main knowledge about how organizations and managers behave should be obtained from the empirical analysis. The bounded rationality challenged the previous assumptions of optimal decision-making and equilibrium and suggested to consider cognitive limitations of economic agents.

The cognitive logic on competition is based on the well-known information-processing framework consisting of three sequential steps: the process of observing information, the following interpretation of obtained information and the reaction related to this perception (Kiesler and Sproull, 1982; Daft and Weick, 1984). As Kemp & Hanemaaijer (2004) have emphasized this information-processing framework have been widely used in the strategic management and marketing literature (Chernatony and Daniels and Johnson, 1993; Clark and Montgomery, 1999; Waarts and Wierenga, 2000).

3.2.2 Competitive strategy

Porter (1980) has identified three basic strategies adopted by firms "in order to create a defendable position against the five competitive forces" (Porter, 1980, p.29): overall cost leadership, differentiation, or focus. In order to cope with the threat of competition, firms need to make two choices: first, whether to pursue cost leadership or differentiation as a competitive strategy of firm and, second, whether to focus on one market segment, implying adopting the focus strategy, or to choose an industry-wide scope of activities. The overall cost leadership strategy is targeted towards price sensitive consumers and is achieved by having minimal costs of R&D, advertising, service, and sales management. Achieving a level of comparative costs lower than those of competitors results in higher average profitability even in the presence of strong competitive pressure.

According to Porter (1980) a differentiation strategy implies that the uniqueness of goods and services offered by firm. Differentiation might be reached in numerous ways: the product design, technology, customer services, and a dealer network. It is reasonable to pursue this strategy in the existence of a necessity for specific products, in the presence of specific firm resources necessary for satisfaction of consumers' needs, or in the absence of price sensibility by customers. Main challenges inherent in adopting a differentiation strategy are high costs of investments like investment in R&D or in product design.

In microenterprises, which are often presented by solo-employees, the entrepreneur plays a crucial role since the functions of firm owner comprises not only firm management but also employee functions. Thus, human capital should have a strong affect on preferences of strategies adopted by microenterprises as well as on their performance. The amount of resource, defined as human capital, is determined by the amount of knowledge accumulated by individuals working in the microenterprise. According to Polanyi (1967), knowledge can be represented by two types: explicit and tacit. While the former refers to the ability to do something, the latter includes the knowledge of doing something.

With respect to a cost leadership strategy, differentiation requires substantially more firm and individual resources because it allows firms to obtain sustained competitive advantage. For example,

the explicit and tacit knowledge accumulated by the firm is hardly imitable by its competitors at least in the short time-period. Thus, human capital can be attributed to a differentiation strategy. Riley (2011) argues that since differentiation implies offering products with unique characteristics that are probably more technologically advanced than those of competitors following another strategies, its adoption requires the increase of personal knowledge in conducting business analysis as well as specific knowledge and skills necessary to produce unique products.

Furthermore, since human capital is attributed to a differentiation strategy, it is reasonable to expect that this strategy is more likely to be adopted by better-educated and more experienced entrepreneurs. For example, Block et al. (2015) have found that a differentiation strategy is less likely to be adopted by necessity self-employed than other start-ups and these preferences can be partially explained by existing differences in human capital between two groups: necessity entrepreneurs are characterized by lower level of educational attainment and lack of entrepreneurial experience. Davidsson and Honig (2003) suggest that an entrepreneurial activity requires the interaction of both, explicit and tacit, knowledge. This implies that the amount of human capital can be increased by a means of formal and non-formal education, where the latter includes training courses and experience related either to the past entrepreneurial activity or to the previous labor market position.

3.2.3 Firm performance

Gibcus and Kemp (2003) emphasize that in the literature on strategic management (Porter, 1991) the degree of firm success is conditioned by three factors: first, an internally consistent set of goals and functional policies need to be defined and realized, second, this set of goals and policies should link properly strong and weak points of the firm with the external opportunities and threats and, third, the unique strengths that can give a company a competitive advantage have to be created and exploited. These three conditions ensure strategy consistency and good firm performance.

Gibcus and Kemp (2003) argue that the firm size and the environment might affect the strategy that leads to better performance. Adopting one of competitive strategies might result in its sustained competitive advantage if the chosen strategy is based on the resources that have been defined by Barney (1991) as valuable, rare, imperfectly imitable, and sustainable. The entrepreneurial-type activities implying strong creative and marketing abilities, and product-coordination skills are more likely to be linked with differentiation than cost-leadership. Firms that perform these types of activities are often small in size. Adopting a differentiation strategy is more favorable for SMEs since it is more likely to result in better firm performance of SMEs (Dean, Brown, and Bamford, 1998; Pelham, 1999; Gibcus and Kemp, 2003). The authors claim that cost leadership is a less suitable strategy for SMEs since it has a strong link with large-scale production.

Based on the previous findings of the management theory of small firms, Pelham (1999) maintains the view that a cost leadership strategy is often not feasible for small firms due to their limited resources. Thus, a differentiation strategy should have stronger influence on performance of small firms (Walker and Ruekert, 1987 and Pelham, 1999). Overall, recent literature investigating the relationship between firm performance and the firm size in the context of strategic responses suggest that small and large businesses possess different advantages associated with their firm size that translate into various strategic moves made by small and large firms. In particular, for small firms it is easier to adapt to quick changes in the environment as well as to meet specific market demands while

for their larger counterparts it is easier to establish lower costs and bargain with their suppliers or customers (Khosla and Sawhney, 2014).

Competitive strategies have been modified in many studies applying Poter's typology to make them applicable to SMEs (Gibcus and Kemp, 2003). For instance, Dess and Davis (1984) categorized firms into four groups similar to Poter's generic strategies and compared firm performance among these groups. The authors have found that firm performance varies among four groups. Their results suggest that the effect of a certain strategy depends on a choice for applied measure for firm performance. Specifically, the best firm performance measured by return on total assets are realized by a group adopting a cost leadership strategy while the highest sales growth are achieved by firms following a focus strategy.

Pelham (1999) argues that adoption of generic strategy by small manufacturing firms has weak influence on firm performance whereas the level of market orientation affects it strongly. The author explains these findings by the fact that a market-oriented culture is a stronger source of sustainable competitive advantage for small firms than generic strategy adoption. "Market orientation is a resource that is imperfectly imitable because of Barney's (1991) condition of social complexity requiring social engineering that may be beyond the capabilities of many firms" (Pelham, 1999, p.35).

Gibcus and Kemp (2003) have empirically questioned whether adopting one of generic strategies influences firm performance measured in various ways. Based on the data on Dutch SMEs, firm strategies have been distinguished into two groups, differentiation and cost leadership, while the former strategy has been further categorized in innovation, marketing, service, and process differentiation. Their analysis has shown that competitive strategies operationalized in that way do not influence neither an objective nor a subjective measure of firm performance. Gibcus and Kemp (2003) have concluded that their results are quite similar to those found by D'Amboise (1993), Pelham (2000), Teach and Schwartz (2000), Spanos and Lioukas (2001), and Kemp and Verhoeven (2002).

3.3. Data and measures

This study is based on the unique dataset of microenterprises that has been collected by Statistical office of Trento, Italy. This dataset is specifically targeted to microenterprises operating in the Province of Trento, Italy. Panel members are supposed to be microenterprises if the number of employees engaged in the firm is less than ten. The vast majority of micro firms presented in this panel are locally oriented. This feature of microenterprises is typical for the province implying the difficulty of generalization of findings based on these data to the entire population of microenterprises.

The data come from the 'general entrepreneurs' questionnaire' survey, which was conducted with the owners of microenterprises. The dataset is composed from three waves collected in 2010, 2011, and 2013 respectively. The first wave refers to firms' situation on December 31, 2009 and includes **2134 firms**, the second – on December 31, 2010 and includes **1895 firms** and the third one – on December 31, 2012, which includes **1544 firms**. The dataset has a structure of panel data and includes information about firms' general characteristics, firms' structure, labor force, strategic dynamics, firms' financial situation, and individual entrepreneurs' characteristics.

In addition, the data on firm value added and a number of employees in 2011 and 2010 were obtained from the regional Tax Agency[3] and Statistical Register of Active Enterprises (ASIA) respectively. The data on value added collected by the Tax Agency include smaller number of observations because firms that are solo-entrepreneurs are not obliged to declare these outcomes in the tax-paying documentations.

Panel data often suffer from the panel attrition problem. That is the process of dropout of individuals interviewed in the first wave from subsequent waves. In our case, panel attrition is mainly caused by exit of microenterprises. This is especially true for the database used in this study since the last waves refer to the situation of micro firms affected by the crisis. The exit rate of microenterprises has increased dramatically in 2012. Since submission of the questionnaire was mandatory for microenterprises, the probability that micro firms' owners refused to reply to the questionnaire is very

---

[3] The name of the Tax Agency in Italian is "Agenzia delle Entrate".

low. This suggests that the response rate of the survey is high resulting in low chances of sampling bias.

The microenterprises are mainly presented in wholesale and retail trade (25%), construction (24%), and services (22%) and less in manufacturing (8%), other services (8%), metallurgy (7%) and transport (6%). The majority of firms (about 60%) are solo-entrepreneurs. The dataset does not include any start-ups and consists mainly from very old firms. The majority of entrepreneurs are males. Many owners have a previous work-paid experience but much less have the entrepreneurial experience. Table 3.1 reports the descriptive statistics of the main firm and entrepreneur characteristics.

[insert Table 3.1 here]

Variables and measurement

Dependent variables

Given the way how we operationalize generic strategies, the primary choice of revealed competitive strategy is based on four options: to follow cost leadership, to follow differentiation, to adopt a mixed strategy, or to decide not to take any action to competition. Table 3.2 presents the descriptive statistics of micro firms' preferences of the possible competitive strategies. As it can be seen from Table 3.2, there are very few firms that combine cost leadership and differentiation strategies. Thus, we exclude the analysis of a mixed strategy from our focus. The variable that proxies a cost leadership strategy is obtained from the survey questionnaire data on microenterprises. Firms' owners were asked about the relative importance of having costs lower than those of competitors. A micro firm strategy is deemed to be cost leadership if the fact that offering prices lower than those of competitors is considered to be very important for the owner. The differentiation strategy includes three investment categories of micro firms: investment in R&D, marketing and advertising, and training. By our definition micro firms follow a differentiation strategy if they invest at least in one of the three types of investment.

[insert Table 3.2 here]

One of the principal data limitations inherent in this line of research is lack of balance sheet information necessary to explore firms' investment behavior and their financial situation. Since micro firms are not required to present all relevant financial information in the balance sheets, this kind of data limitations is not just a specific problem of our data source but it is a major issue for all data focusing on microenterprises. Thus, the only possible information related to firm investment is obtained from the survey questionnaire. Table 3.3 reports a number of firms that made investment in 2009, as well as a number of firms invested in five types if investment: investment in machinery, in land and buildings, in training, in marketing and advertising, and in innovation during the same period of time.

[insert Table 3.3 here]

The choice of investment types deemed as a differentiation strategy is explained by the fact that all three of them are caused by competitive forces. Indeed, investment in R&D is innovation driven, while investment in training and investment in marketing and advertising are human capital and positioning driven respectively. We exclude from our analysis firm investment in machinery and investment in land and buildings because they are not appropriate for our approach: micro firm investment in land and buildings is more related to the long-term orientation and is not competition driven while investment in machinery requires additional information on the amount of investment and its nature in order to consider it as a competitive strategy.

Firm performance is proxied by labor productivity growth (used in logarithms), which is operationalized by value added per employee[4]. Block et al. (2015) argue that some types of strategies can be more beneficial for long-term performance than others. Following this line of reasoning, it is possible to expect that the effect of following a differentiation strategy needs to take longer time to occur. For this reason we used firm performance in 2010 and 2011 as outcome variables. Table 3.4 shows the summary statistics of the outcome variable.

[insert Table 3.4 here]

Key independent variables

Since this study aims to identify what kind of strategies competition pushes micro firms to follow, one of the key independent variables in our study is a self-reported measure of the intensity of competition. The subjective measure of competition is based on the survey questionnaire data on microenterprises. Firms' owners were asked about the intensity of competition and their responses were allocated to the three-point scale including "strong", "weak", and "no completion". This variable provides information on perception of intensity of competition by micro firms' owners. As can be seen

---

[4] Because of data limitations firm performance can be measured only by labor productivity growth and cannot be enriched by other firm performance measures.

from Table 3.5, for the 77,5 percent of micro firms the competition is perceived to be strong. The information about firms' perceptions of competition is referred to the year 2009.

[insert Table 3.5 here]

Control variables

Based on the previous empirical and theoretical studies aimed to investigate main determinants of the strategy choice (for example, Block et al., 2015), we added a number of firm and entrepreneur level control variables. As firm level control variables, the following firm characteristics were used in the model: firm age in years, firm size in number of employees, being a family firm or not, and having a business partner or not. Since the number of firms with more than four employees (5%) is very small, firms have only been distinguished by solo employees and employee firms. As for entrepreneur level control variables, the following entrepreneur characteristics were included in the model: entrepreneur's gender, age in years, and entrepreneur level of education. We also included in the regression information about entrepreneur previous labor market position and entrepreneurial experience as well as general experience in the sector (years in the sector). In addition, we included start-up motivations in the model that are divided into three groups: entrepreneurial spirit, continuing a family tradition, and substituting a wage job.

3.4 Research design

Our empirical design is twofold. In order to test how perceived competition and firm characteristics are associated with micro firm strategies in 2009, we first estimated a multinomial logistic regression model (3.1):

$$\Pr(Y_i = j) = \frac{\exp{(X_i\beta_j)}}{\Sigma_j^J \exp{(X_i\beta_j)}} \qquad (3.1)$$

where, $\Pr(Y_i = j)$ is the probability of choosing alternative j as competitive strategy, X_i is a vector of explanatory variables and β_j are the coefficients, which are estimated using maximum likelihood estimation. The base category is non-strategic action $(Y_i = 0)$, and the alternatives are cost leadership strategy $(Y_i = 1)$ and differentiation strategy $(Y_i = 2)$.

Second, to check whether the preference for a certain strategy leads to better performance, we estimated an OLS regression with lagged independent variables (3.2).

$$Z_{it+1} = \gamma_0 + \gamma_1 X_{it} + \gamma_2 Controls_{it} + \varepsilon_i \quad (3.2)$$

where, Z_{it+1} is labor productivity growth measured as $\Delta ln \frac{Value\ added}{Empl}_i$ for the years 2010 (t+1) and 2011(t+2) respectively and X_{it} is a vector of independent variables: preferred strategies, firm and owner characteristics referring to the year 2009. γ_1 and γ_2 are the coefficients to be estimated and ε_i is the firm level error term. Several control variables referred referring to the year 2009 are included in the model.

3.5 Multivariate regression results

Table 3.6 shows how perceived threat of competition affects firm preferences for competitive strategies.

[insert Table 3.6 here]

Results presented in Table 3.6 suggest that when microenterprises perceive competition as strong they prefer to response to the threat of competition by adopting either differentiation or cost leadership strategies. By contrast, when competition is perceived to be weak micro firms prefer to follow only a differentiation strategy. These results partially support previous findings suggesting that small firms are often precluded from adopting a cost leadership strategy because of their resource limitations and impossibility to enjoy the benefits of economy of scale.

As regards firm characteristics, we find that firms operating in wholesale and retail trade are more likely to follow a cost leadership strategy than firms in services while a differentiation strategy is less preferable for micro firms operating in construction, manufacturing, and transport than for those in wholesale and retail trade. We find strong evidence that the probability to adopt a differentiation strategy is higher for microenterprises with employees than for solo-employees.

Several individual characteristics play an important role in determining the choice of micro firms' strategies. For instance, it is more likely that the firm follows a differentiation strategy when younger entrepreneur manages the firm. As for a cost leadership strategy, being managed by male owners is also a good predictor of adopting this kind of strategy. Finally, human capital measured by formal education and entrepreneurial experience has a strong effect on micro firms' strategy preferences. Highly educated entrepreneurs prefer to adopt a differentiation strategy compared to those with a low level of education. Previous entrepreneurial experience is positively associated with a preference for adopting a differentiation strategy but negatively with revealed cost leadership. As we expected, there is no statistically significant effect of an entrepreneur's previous labor market position on strategy preferences.

[insert Table 3.7 here]

The next question that has been addressed in this study is how preferences for certain strategies of micro firms are associated with their performance. Table 3.7 shows the OLS estimates of micro firms' strategies on labor productivity growth in 2010 and 2011 respectively. Our results suggest that there is no significant relationship between the choice of competitive strategy and labor productivity growth either in 2010 or in 2011.

3.6 Robustness checks

As robustness checks the simultaneous equations (3.1-3.2) are estimated using the three-stage least squares (3SLS) procedure, which allows endogeneity of both probability of choosing a certain strategy and firm performance. Table 3.8 shows the 3SLS estimates of micro firms' strategies on labor productivity growth in 2010 and 2011 respectively. The results of the 3SLS estimation confirm our previous findings: there is no a significant relationship between the choice of competitive strategy and labor productivity growth either in 2010 and 2011 respectively.

3.7 Conclusion and discussion

Many studies have used the classification of competitive strategies developed by Porter (1980). Current literature on the relationship between the firm size and the preference for a certain strategic behavior suggest that small firms tend to adopt a differentiation strategy more frequently. This is mainly explained by the fact that small firms are limited in the available recourses. Instead, the economies of scale, that can enjoy only large firms, may allow them to keep low costs. Our results partially support this evidence: while micro firms that perceive competition as strong tend to follow both strategies, those businesses that perceive competition as weak prefer to adopt only a differentiation strategy.

Overall, the results of our analysis suggest that perceived threat of competition pushes firms to take actions. The preferences for actions are explained by available resources. In particular, the preference for a differentiation strategy is determined by human capital and the age of entrepreneur, so that this kind of action is more likely to be taken by younger entrepreneurs with higher level of education and previous entrepreneurial experience. At the same time, the existence of previous entrepreneurial experience is negatively associated with the probability to choose a cost leadership strategy.

While previous studies on strategic behavior of small firms argue that small firms adopting differentiation theoretically should have better performance (Walker and Ruekert, 1987 and Pelham, 1999), empirical evidence only barely confirms these results. By contrast, many studies on small firms have found that competitive strategies do not affect firm performance (D'Amboise, 1993; Gibcus and Kemp, 2000; Teach and Schwartz, 2000; Spanos and Lioukas, 2001; Kemp and Verhoeven, 2002). Our results confirm this empirical evidence. We did not find any statistically significant effect of a preference for a certain competitive strategy on firm performance although micro firms with various firm and individual characteristics have different preferences for a competitive strategy.

Limitations and future research

Even though we use a high quality data set with features that allow us to specifically address the problem for micro firms, it still has some limitations. While not within the scope of our study (as we assessed the effect on labor productivity growth and thus required a longer time-frame and reliable performance data), start-ups operating in the province were not included in our data. Future research could address this caveat as the literature clearly indicates that generic strategies are extremely common among start-ups (Carter et al., 1994; Block et al. 2015).

Second, our data only allowed for short-term assessment of how generic strategies affect firm performance. In line with the conclusions of Leitner and Güldenberg (2010) a longer time frame, preferably ten years or longer, is necessary to properly assess the long term effects of a consistent generic strategy. Perhaps, a longer time frame can also help to uncover performance differences between different generic strategies. Especially since it can be argued that for micro firms differentiation may achieve higher returns than cost-efficiency in the long run, as there is are limitations to the amount of labor cost reduction and the period of lowered wages.

Finally, our data lacks the possibility to properly investigate firm performance of companies that implement a combination of both generic strategies As other studies point at the potential of this ambidextrous approach (Burke, van Stel, and Thurik, 2009; Leitner and Güldenberg, 2010), future research could address this gap by adapting the theory of blue and red ocean strategies to the context of micro firms (Kim and Mauborgne, 2005). It is emphasized that while competing in red oceans implies following either cost leadership or differentiation, creating blue oceans requires the combination of both generic strategies.

Appendix B

TABLE 3.1 MAIN FIRM AND FIRM OWNER CHARACTERISTICS

Variables (2009)	Freq.	Percent.
Sectors:		
Wholesale and retail trade	538	25
Construction	515	24
Services	645	30
Manufacturing	177	8
Metallurgy	133	7
Transport	126	6
Firm size in 2009:		
0 employees	1,433	67
1 employee	274	13
2 employees	153	7
3-5 employees	226	11
6-12 employees	48	2
Family firm	1,155	54
Female	386	18
Having a business partner	574	27
Higher educational level	1,015	48
Entrepreneurial experience	610	29
Previously employed	1,693	79
Total number of observations	2,134	100

Source: Own calculations based on data from Servizio Statistica della Provincia Autonoma di Trento

Table 3.2 Preferred firm strategies

	Freq.	*Percent*
Zero action	1,236	57.92
Combined	89	4.17
Cost leadership	243	11.39
Differentiation	566	26.52
Total	2,134	100.00

Source: Own calculations based on data from Servizio Statistica della Provincia Autonoma di Trento

TABLE 3.3 FIRM INVESTMENT IN 2009

Investment	Freq.	Percent	Cum.
Machinery			
No	1,393	65.28	65.28
Yes	741	34.72	100.00
Total	2,134	100.00	
Training			
No	1,721	80.65	80.65
Yes	413	19.35	100.00
Total	2,134	100.00	
Land and buildings			
No	2,081	97.52	97.52
Yes	53	2.48	100.00
Total	2,134	100.00	
Marketing and advertising			
No	1,764	82.66	82.66
Yes	370	17.34	100.00
Total	2,134	100.00	
Innovation			
No	2,065	96.77	96.77
Yes	69	3.23	100.00
Total	2,134	100.00	

Source: Own calculations based on data from Servizio Statistica della Provincia Autonoma di Trento

TABLE 3.4 In-/decreases in labor productivity in 2011 and in 2010 (in logarithms)

	Obs	Mean	Std. Dev.	Min	Max
2011	1229	.0225813	.5545582	-4.44054	3.915.891
2010	1237	.0059577	.6081319	-9.859.013	489.144

Source: Own calculations based on data from Servizio Statistica della Provincia Autonoma di Trento

TABLE 3.5 Descriptive statistics: perceived intensity of competition

...competition	Freq.	Percent
No	185	8.67
Weak	295	13.82
Strong	1654	77.51
Total	2,134	100.00

Source: Own calculations based on data from Servizio Statistica della Provincia Autonoma di Trento

TABLE 3.6 DETERMINANTS OF PREFERRED COMPETITIVE STRATEGY

Variables	Non-strategic behavior	Cost leadership	Differentiation
Strong competition	0.000	0.768**	1.061***
	(.)	(2.573)	(3.902)
Weak competition	0.000	0.204	0.897***
	(.)	(0.563)	(2.995)
No competition	ref.		
Wholesale and retail trade	ref.		
Construction	0.000	-0.331	-0.482***
	(.)	(-1.602)	(-2.871)
Manufacturing	0.000	-0.346	-0.430*
	(.)	(-1.202)	(-1.949)
Metallurgy	0.000	0.296	-0.157
	(.)	(1.035)	(-0.640)
Services	0.000	-0.690***	0.099
	(.)	(-2.971)	(0.635)
Transport	0.000	0.017	-0.892***
	(.)	(0.058)	(-3.026)
Firm age	0.000	-0.007	0.003
	(.)	(-0.827)	(0.579)
Owner's age	0.000	-0.008	-0.044***
	(.)	(-0.779)	(-5.165)
Family firm	0.000	-0.072	0.001
	(.)	(-0.434)	(0.009)
High level of education	0.000	-0.020	0.384***
	(.)	(-0.120)	(3.163)
Motive: Entrepreneurial spirit	ref.		
Motive: Continuing family tradition	0.000	0.153	0.048
	(.)	(0.677)	(0.287)
Motive: Substituting a wage job	0.000	0.141	-0.063
	(.)	(0.776)	(-0.474)
Entrepreneurial experience	0.000	-0.485***	0.226*
	(.)	(-2.649)	(1.814)
Previous labor market position	0.000	0.032	0.180
	(.)	(0.166)	(1.294)
Years in the sector	0.000	0.009	0.008
	(.)	(0.929)	(0.973)
Having employees	0.000	-0.004	1.023***
	(.)	(-0.025)	(8.737)
Business partner	0.000	0.088	0.065
	(.)	(0.471)	(0.470)

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Note: The dependent variable is the preferred strategy in 2009. The estimation model is Mlogit, z-statistics in parentheses. All control variables refer to the year 2009.

Source: Own calculations based on data from Servizio Statistica della Provincia Autonoma di Trento

TABLE 3.7 MICRO FIRMS' STRATEGIES AND FIRM PERFORMANCE IN 2010, 2011

Variables	Firm performance 2010	Firm performance 2011
Non-strategic behavior		ref.
Cost leadership	0.020	-0.066
	(0.366)	(-1.052)
Differentiation	-0.025	-0.008
	(-0.642)	(-0.229)
Wholesale and retail trade		ref.
Construction	0.047	-0.015
	(1.000)	(-0.372)
Manufacturing	0.067	0.080
	(1.205)	(1.362)
Metallurgy	0.060	0.021
	(0.868)	(0.290)
Services	-0.068	-0.044
	(-1.440)	(-0.938)
Transport	-0.026	-0.063
	(-0.392)	(-0.951)
Firm age	-0.002**	0.001
	(-1.967)	(1.257)
Owner's age	0.000	-0.004**
	(0.021)	(-2.461)
Family firm	0.005	0.033
	(0.125)	(0.986)
High level of education	0.034	-0.042
	(1.066)	(-1.290)
Motive: Entrepreneurial spirit		ref.
Motive: Continuing family tradition	-0.006	-0.047
	(-0.136)	(-0.941)
Motive: Substituting a wage job	-0.026	0.021
	(-0.579)	(0.502)
Entrepreneurial experience	-0.001	-0.060
	(-0.037)	(-1.489)

Previous labor market position	0.074	0.044
	(1.199)	(0.953)
Having employees	-0.005	0.183***
	(-0.122)	(5.118)
Business partner	-0.040	-0.005
	(-1.096)	(-0.131)
Female	-0.021	0.045
	(-0.344)	(1.043)
Constant	0.035	0.081
	(0.272)	(0.696)
Observations	1,181	1,169
R-squared	0.014	0.051

*** p<0.01, ** p<0.05, * p<0.1

Note: The dependent variable is firm performance in 2010 and 2011; measured by labour productivity in-/decreases in 2010 and 2011 respectively (in logarithms). Labour productivity growth is operationalized by value added per employee. The estimation model is OLS and robust t-statistics are presented in parentheses. All control variables refer to the year 2009.

Source: Own calculations based on data from Servizio Statistica della Provincia Autonoma di Trento

Variables	Firm performance 2010	Firm performance 2011
Non-strategic behavior		ref.
Cost leadership	-0.771	0.115
	(0.781)	(0. 567)
Differentiation	-0.004	-0. 351
	(0.335)	(0.287)
Wholesale and retail trade		ref.
Construction	0.022*	-0.039
	(0.054)	(0.486)
Manufacturing	0.050*	0.060*
	(0.061)	(0.064)
Metallurgy	0.093*	-0.002*
	(0.077)	(0.080)
Services	-0.122*	-0.021*
	(0.067)	(-0.063)
Transport	0.001*	-0.120*
	(0.087)	(-0.085)
Firm age	-0.003***	0.002**
	(0.001)	(0.001)
Owner's age	0.001***	-0.007**
	(0.004)	(0.003)
Family firm	-0.002**	0.029**
	(0.036)	(0.035)
High level of education	0.017**	-0.015**
	(0.050)	(0.043)
Motive: Entrepreneurial spirit		ref.
Motive: Continuing family tradition	0.007**	-0.042
	(0.046)	(0.50)
Motive: Substituting a wage job	-0.011**	0.014**
	(0.050)	(0.045)
Entrepreneurial experience	-0.046*	-0.030*
	(0.065)	(0.059)

Previous labor market position	0.073*	0.057**
	(0.064)	(0.050)
Having employees	-0.056	0.256 *
	(0.085)	(0.066)
Business partner	-0.030	-0.003
	(0.036)	(0.037)
Female	0.061	-0.058
	(0.076)	(0.052)
Constant	0.077	0.331
	(0.237)	(0.191)
Observations	1,181	1,169
R-squared	0.015	0.051

*** p<0.01, ** p<0.05, * p<0.1

Note: The dependent variable is firm performance in 2010 and 2011; measured by labour productivity in-/decreases in 2010 and 2011 respectively (in logarithms). Labour productivity growth is operationalized by value added per employee. The estimation model is 3SLS and robust standard errors are presented in parentheses. All control variables refer to the year 2009.

Source: Own calculations based on data from Servizio Statistica della Provincia Autonoma di Trento

Chapter IV

Counterfactual Impact Evaluation of Investment Subsidies: Micro-level Evidence from Trento

4.1 Introduction

The European Union and national government have tried to support enterprises by implementing different incentive programs. These programs have pursued a number of objectives such as improvement of growth and employment conditions, promotion of research and innovation, development of labor markets, and stimulation of investment activity. Policy analysis should be considered from two prospective: social benefits of subsidies and their costs. Sometimes the costs of incentives exceed their benefits, while result to wasting government financial resources. Bartik (2005) suggests that government subsidies can be wasteful for two reasons: local policymakers often overestimate the benefits of incentives, or the local disputes over incentives are often dominated by business interests. On the other hand, he argues that subsidies can be successful when firms become more responsive to incentive schemes as they become increasingly independent, or when increased local employment provides social benefits.

In the literature on industrial policy the deep crisis of Italian industry is mainly explained by four factors: first, a predominance of micro and small firms, second, the specialization in traditional sectors of economic activity, third, a predominance of family ownership as an ownership structure of Italian firms, and fourth, the weakness of environment like presence of corruption or weak public

administration (Balloni and Iacobucci, 2004[5]). With respect to the micro size of firms, creating policies targeted towards this group might comprise many obstacles.

Microenterprises play an important role in the Italian economy on the regional and national levels since they represent the vast majority of all Italian firms. In contrast to the stereotype that entrepreneurship is a driver of economic growth, this type of firm in many cases does not fit well with a conventional image of entrepreneurship (Hytti, 2005). Many of them are not motivated to grow and some of them, especially independent professionals, are very close to low-income ranges, (Kautonen and Palmroos, 2010). Microenterprises quite often make low investments in productivity-enhancing technologies, specialize in low-technology products, target their production only towards local markets and, thus, keep constant firm size and performance for a very long time-period. On the other hand, small firms are considered to be the most vulnerable group that often suffers from financial constraints since the private investor may evaluate the financing risks to be higher than the expected returns of firm investment. There are at least two main rationales for providing capital grants to firms: presence of financial constraints and belief that capital investment is essential for productivity growth.

The capital grant is a widespread measure that usually aims to stimulate firms' investment activity mainly because of a common belief that firm investment can improve firm growth and profitability. De Long and Summers (1991) have shown that those countries that made high equipment investment grew extremely rapidly after the Second World War. This causal relationship was present even after controlling for whether high investment was induced by high savings or by a low relative equipment price.

Bergstrom (2000) claims that the main rationale for granting capital subsidies to firms is that it can affect productivity that is important for long-term growth. The author suggests that subsidization can have a positive influence on productivity mainly because of two reasons: subsidies can help to improve technological development of firms or they can help the firms to utilize economies of scale in a more effective way. Nevertheless, policy implementation is a challenging task for policy makers that

---

[5] See Bianchi, Labory, and Pontarollo (2010) for more discussions on industrial policy issues in Italy in the last 30 years.

includes many obstacles. Pack and Saggi (2006) argue that the information required for "proper" implementation of the policy is extraordinary and policy makers "have to understand the relevance of, and be accurately informed about, a huge range of complex questions and have the ability to accurately evaluate very subtle differences" (p.28).

Hence, it does not come as a surprise that the empirical evidence on capital grants is controversial. For example, the Italian government has implemented several national programs specifically targeted to reinforce firm investment activity, such as, the incentives under Law 488/1992 and Law 388/2000 aimed to increase firm capital investment. Besides the fact that the first two programs were successful in increasing firm capital investment in general, these incentives were unsuccessful in reinforcing additional investment meaning that the program did not push firms to make investment that would not have been possible to make without incentives (D'Aurizio and De Blasio, 2008).

The debates on the necessity of capital grants raise the question of why this kind of incentives can result in government failures and wasting of public money. First, the industrial policy scheme should be based on well-designed selection that is aimed to solve obvious and ambiguous market failures (Santarelli and Vivarelli, 2007). Second, the policy effectiveness might be hampered by firm learning so that receiving public subsidies can be pursued as a goal by granted firms. If the public authority does not impose any restrictions on the amount of possible subsidy requests granted firms could learn how constantly to obtain subsidies. The latter issue is also important for evaluation purposes. Specifically, the results of the evaluation exercise of government intervention might be biased if the opportunistic behavior of firm is not taken into account.

A wide variety of incentive programs and their award procedures is a result of government attempts to improve the effectiveness of industrial policies. In order to develop policy design, an accurate evaluation of existing support programs should be undertaken. The impact evaluation of industrial policies raises many methodological challenges. Because it is impossible to create the same conditions that would have existed without government intervention, approaches need to be adopted to

give an approximate idea of what would have happened. More precisely, we need to compare groups of participants and non-participants and to identify the causal effect of the program on the outcomes, controlling for other determining factors of the outcome (Trivellato, 2009).

The number of studies that try to solve difficulties in policy evaluation has increased in the last decade and provided researchers with statistical methods that might be developed to concrete policy design. Besides the methodological issues in policy evaluation, data that include information concerning subsidies given to firms, main firm characteristics and firm performance are necessary.

The main purpose of this paper is to investigate the effect of incentives on micro firms' investment activities and their performance in the Province of Trento, Italy and to define what behavioral aspects can influence the likelihood of enrolling in the program. This paper addresses several questions by exploring a firm-level dataset. First, we determine whether the capital subsidies have a positive effect on firm propensity to invest in the years after policy implementation. Second, we evaluate the effectiveness of the policy in increasing the number of employees and improving firm performance. Third, by using self-assessed impact survey we test the additionality of investment, that is, whether investment financed by the subsidies would still have been carried out in the absence of government incentives. Fourth, we investigate how the owners of Trentino microenterprises evaluate the impact of the subsidies obtained on their investment activity, turnover and the number of employees. Finally, we compare the results derived from applying the econometrics approach to policy evaluation with estimates obtained from using self-assessed impact survey.

This study makes several contributions. First, our study is based on the population of micro firms that differ from their larger counterparts and often do not fit well with a conventional image of entrepreneurship. Second, our identification strategy revealed what behavioral features can make treated and non-treated groups to be different besides conventional characteristics commonly applied in similar studies. The policy design gave a chance to the existence of firm learning on how to receive subsidies due to the lack of restrictions imposed on the amount of possible subsidy requests and fixed eligibility criteria. Specifically, subsidized and non-subsidized firms differ in the amount of pre-

treatment applications for subsidy made before. Our third contribution is methodological. Since subsidized and non-subsidized firms are not fully comparable, the propensity score matching is not applicable on the total sample of firms. Thus, we restrict our analysis only to the subpopulation of micro firms belonging to the so-called common support and apply OLS estimation with the same set of controls included in the Propensity Score.

4.2 Literature review

The literature on evaluating the impact of industrial policies aims to identify a causal effect of government intervention on the performance of participating firms. Most studies investigate the direct effect of public subsidies on firms' performance. For example, many researchers have evaluated changes in terms of the number of employees, sales, average productivity, and investment. Some studies have found evidence that subsidies increase investment in firms (Bondonio and Greenbaum, 2006; Criscuolo, 2012). Others have concluded that the effect of subsidies on productivity is negligible or even negative (Harris and Trainor, 2005).

In the literature on impact evaluation, the direct effect of industrial policy has been investigated by comparing the performance of subsidized and unsubsidized firms. Since these groups have not been chosen randomly, it is a challenge for researchers to create a proper control group. If a control group is created in such a way that there are systematic differences between participants and non-participants, the results will be unreliable (Martini et al, 2006). These systematic differences may appear for two reasons: the external changes influencing program participants and selection bias (Bartik and Bingham, 1995). The first issue implies that some global changes happening in the world may affect policy outcomes. Selection bias occurs due to either self-selection by firms when the total group of eligible firms cannot be determined or authority selection arises from the fact that grants are available only for applications that meet selection criteria (Blanes and Busom, 2004).

In order to obtain reliable results, counterfactual analysis should be carried out by implementing proper evaluation techniques. One of the most investigated industrial policies in Italy has been the support program under Law 488/1992 that provides opportunities for researchers to develop methods and techniques of counterfactual analysis. For example, a non-parametric approach for the continuous treatment case implemented by Adorno, Bernini, and Pelligrini (2007) is based on the two-step matching method. As a first step, they matched treated and non-treated firms on the basis of a set of observable characteristics, and then as a second step, among previously matched firms, they

implemented the matching procedure for firms with the same treatment levels. The main advantage of this approach is the possibility to control firms' pre-intervention characteristics, which might be similar in one process but might differ in another.

There is a lack of studies on industrial policy evaluation that are focused on the continuous treatment case. The vast majority of such studies do not take into account the presence of heterogeneity among units and among treatment doses of treatment (Adorno, Bernini, and Pelligrini, 2007). Overall, the question of programme heterogeneity has been addressed by Imbens (2000), Lechner (2001), Hirano and Imbens (2004), and Imai and Van Dyk (2004). Imbens (2000) and Lechner (2001) have extended the PSM approach for estimation of average treatment effects with multiple discrete treatments, while Hirano and Imbens (2004) and Imai and Van Dyk (2004) have implemented the Generalized Propensity Score (GPS) approach for the continuous treatment.

Cerqua and Pelligrini (2011) have developed another statistical technique in evaluating the impact of subsidies provided by Law 488. Groups of treated firms were selected by exploring a mechanism of ranking and were divided according to their location in a particular territory. Each group had its own threshold and only firms with a score below this threshold in the same ranking group would be deemed an appropriate counterfactual. The regression discontinuity design was implemented in each ranking and the different estimates from the first step were integrated by a weighted structure, which was based on the proportion of treated units in each ranking.

Recent studies on evaluating the impact of public subsidies aimed to support firms often apply the non-parametric technique, Propensity Score Matching (PSM). For example, Duch, Montolio, and Mediavilla (2007) evaluated the impact of regional policies targeted to support Catalan firms (Spain) and found that the growth rate of value added in post-treatment period is higher for those firms that received subsidies. Gabriele et al. (2006) also implemented the PSM in order to evaluate the effectiveness of the regional subsidies in the Italian province of Trento and found that the subsidies were only effective in fostering investment activity and increasing labor productivity in the short run

but not in the long run. The authors challenge whether the investments of subsidized firms were optimal and argue that the subsidies led to anticipation of investments.

Subsidization of firms may cause a significant substitution effect. Criscuolo et al. (2012) propose that the substitution effect may appear within and between firms. It occurs "within" due to: time substitution (firms start projects that they would pursue in the future even without subsidies); substitution between plants (if some plants are located in an eligible area and others are not); and substitution between production procedures (instead of exploiting the most cost-effective procedure, firms might change the combination of capital and labor to maximize the likelihood of obtaining the subsidy). The last effect may appear between firms located in the same area (the advantages of investment would be taken by non-subsidized firms without government subsidies) or located in different areas (the development of eligible area may be achieved by decreasing growth of non-eligible one).

More recent empirical studies have evaluated an indirect effect that is more prevalent in local areas and sectors. For example, stimulation of some firms to invest might change behavior of untreated firms by biasing estimation results (Lee, 1996; Harris and Trainor, 2005). Bergstrom (2000) examined a long-run effect of subsidies on productivity of Swedish firms and found little evidence that the subsidies affected productivity positively. Furthermore, investment incentives can influence the price of capital in the short run. Goolsbee (1998) has shown that the price of capital increased immediately after providing firms with investment incentives, especially in low-competitive industries. The results obtained in this study do not support the necessity of investment tax policy. The evaluation of an indirect effect is complex because it requires capturing a lot of assumptions concerning market characteristics and can only be applied if the results from micro level analysis are positive (Venetoklis, 2002).

The evaluation of government subsidies at the micro level might be improved by considering not only the benefits but also the costs of subsidies. Bondonio (2012) evaluated the impact of large subsidies provided under Law 488 and small subsidies to SMEs in Piemonte. The impact was

measured by the difference between the average growth in employment, sales and investment observed between recipient and non-recipient firms by implementing counterfactual analysis. Additionally, Bondonio (2012) evaluated costs of achieving such results by exploiting information on the actual amount of subsidy.

Returning back to the literature on the evaluation of direct or indirect effects, it is worth mentioning that these studies focus only on the impact of government incentives on firms' behavior and on regional growth. Before investigating such issue the deadweight ― the degree to which investment projects are implemented ― might be also taken into account (Lenihan, 2004). If the investment project would not be undertaken without subsidies then the deadweight is equal to zero. Tokila, Haapanen, and Ritsila (2008) showed that in Finland the probability of implementing investment projects without government incentives varies significantly between different types of investment projects. The results differ between regions and between old and new firms. The difference between old and new firms may be explained by different access to finance for old and new firms.

4.3 Methodology and Results

This section focuses on methodological issues of impact evaluation of industrial policies. Since the decision about a choice of methods depends on the characteristics of the data, the section begins with a description of the dataset. Section 4.3.1 describes the policy design (the description of the Law6/99). Section 4.3.2 provides information on source of the data and explains the choice of the time-period for policy evaluation. Section 4.3.3 examines aspects of policy evaluation and provides five methods for analyzing non-experimental data. Section 4.3.4 explains identification and estimation strategies as well as the self-assigned results from the survey on microenterprises. Section 4.3.5 concludes and discusses future policy implications.

4.3.1 Design of "Law 6/99"

The main aim of the subsidies under Law 6/99 is to stimulate an investment activity of microenterprises operating in the Province of Trento. In this study we consider only fixed investment that includes investment in land and buildings, plants, machinery, equipment, infrastructure, and purchasing of patents. The support program was implemented in the form of a capital grant, which was given directly to microenterprises in one or several installments based on documentation provided by microenterprises. The amount of installments depends on the amount of investment made by firms as well its duration. The support program under Law 6/99 was conferred with the evaluation procedure implying that all decisions on the subsidies were based on the evaluation of investment projects of eligible firms by the public authority.

The eligible units were enterprises, consortium of companies, institutions and associations that were registered at the Chamber of Commerce and were not declaring bankruptcy. The eligibility rule also required beneficiaries to operate in such sectors as industry, retail trade, handicraft, and tourism. Enterprises operating in the province of Trento were exposed to the intervention according to the following criteria: the eligibility of firms in terms of the sector of activity and residence, the adequacy of the expected expenses for each investment (considering the administrative and technical aspects of investments), the importance of investment for the firm from an economical and financial point of view, the relevance of the amount of the subsidy request to firm size and performance. The misbehavior of firms was limited by the program design so that subsidized firms were not allowed to sell the "object of the investment" for the period of 3-10 years.[6] In the case of the violation of the program rule these firms could be obliged to return to the public authority the amount of subsidy received.

---

[6] The duration of the controlled time-periods depends on each particular situation.

4.3.2 Data

The empirical research has been implemented using the dataset that includes information on industrial and service firms operating in the province of Trento for the period 2007-2012. The main interest of investigation is whether or not firms benefit from the subsidies obtained in 2009 and 2010. During these two years 229 microenterprises received the public incentives under the evaluation procedure and 204 of them responded to the survey (the response rate is 89%). The term 'public incentives' includes direct subsidies under unique Law 6/99 provided by the public agency of Trento in the form of direct payments. In order to estimate the ATT, a control group made up 1544 microenterprises was used.

This study is based on the unique and rich dataset of microenterprises specifically targeted to evaluate the effectiveness of the subsidies given to microenterprises in Trento and to investigate their behavior. The data come from four different sources: the survey on microenterprises, the regional Tax Agency,[7] the APIAE database, and the archives from the Statistical Register of Active Enterprises (ASIA). The 'general entrepreneurs' questionnaire' survey on microenterprises was collected by the Statistical Office of Trento, Italy. The information used to perform matching procedure was mainly obtained from the survey of microenterprises that includes data on firm and entrepreneur characteristics such as age of the firm and the entrepreneur, sectors of economic activities, number of owners, motives for business establishment, and firm financial resources.

The survey on microenterprises includes two groups of firms: treated and non-treated. The survey on treated microenterprises represents the whole population of firms that benefited from the support program under Law 6/99 that was conferred with the evaluation procedure in 2009 or in 2010. It includes the same type of information as the survey on non-treated firms. The survey on non-subsidized firms is a representative sample of the population of micro firms operating in the Province of Trento.[8]

---

[7] The name of the Tax Agency in Italian is "Agenzia delle Entrate".
[8] For more information on the survey on non-treated firms, see Chapter 3.

The data from the regional Tax Agency contain information on sales revenue, production costs, and value added derived from the IRAP and the IVA declarations referring to years 2007-2011. The archives from ASIA contain information on the number of employees, which refers to a time-period from 2007 to 2011. The APIAE[9] database contains all information relevant to the process of subsidy requests that firms made during the period from January 1, 2000 to December 31, 2010. For instance, it includes administrative data on the number of subsidy requests, the date of making a request and obtaining the subsidy, and the procedure under which firms received the grants.

The survey on microenterprises contains a section in which firms indicate how their investment activities would have been carried on in the absence of the incentives and the self-evaluated effect of receiving subsidies on their performance. In order to perform the counterfactual analysis, firms in the control group were also asked to indicate what they would have done if they had received the treatment. Given the information from this questionnaire, the research analysis is expanded to comparing the results obtained from the impact evaluation of industrial policies with the results obtained from the questionnaire.

---

[9] APIAE is the provincial agency that is in charge of managing the granting process.

4.3.3 Approaches to policy evaluation

Firms' subsidization aims at increasing several outcomes such as investment, employment, and productivity. In order to conclude that a change in a firm's behavior was due to policy intervention, it is necessary to know how a firm would perform without receiving such support. The problem emerges from the impossibility to observe a single firm in both conditions at the same point of time. This issue was named by Holland (1986) as the fundamental problem of causal inference. A process of impact evaluation requires distinguishing treated and non-treated units for further comparison.

The Roy-Rubin Model (Roy 1951, Rubin 1974) is a framework for an empirical analysis of causal inference. This model has been expanded for a pair of potential outcomes allowing for general heterogeneity in the effects of the treatment. The model consists of the following components: individual firms, treatment, and potential outcomes (responses). A treatment status is defined by binary indicator D, showing whether actually firm i received a subsidy or not.

$$D_i = \begin{cases} 1 \; if \; firm \; i \; received \; subsidy \\ \quad\quad 0 \; otherwise \end{cases}$$

Each firm is characterized by a value of *potential* outcomes $(Y^1; Y^0)$, where Y^1 refers to the outcome the firm would experience in case it took part into the program while Y^0 is the outcome the same firm would experience at the same time in case it did not take part into the program. In order to complete the model specification, a set of exogenous covariates $X=(x_1, x_2,..., x_k)$ — firm characteristics *unaffected* by the treatment —is introduced.

The treatment effect for each firm i can be defined as the difference between its potential outcomes:

$$\Delta Y_i = Y_i^1 - Y_i^0 \; . \tag{4.1}$$

The fundamental problem of causal inference mentioned above can be described by using mathematical notation. The *observed* outcome for each individual is given by

$$Y_i = D_i \, Y_i^1 - (1 - D_i)Y_i^0. \tag{4.2}$$

The potential outcome Y^1 for a firm that participated in the program is observed and the potential outcome Y^0 for a firm that did not participate is observed, but both outcomes cannot be observed for a specific firm at the same point in time, resulting in the impossibility of evaluating the causal effect (4.2). In cases when Y^1 is observable, then the unobservable Y^0 is called counterfactual. The other way around when it is Y^0 to be observable.

Because of this causal problem, evaluation procedures should concentrate on the population averages of impacts from treatment. In the literature, the two most investigated treatment effects are the average treatment effect (ATE) and the average treatment effect on the treated (ATT). The first effect, ATE, which is the expected causal effect for the population, is given by

$$\Delta Y_{ATE} = E(\Delta Y) = E(Y^1) - E(Y^0). \qquad (4.3)$$

Researchers have concentrated more on evaluating the average effect on the treated that characterizes the average effect over a subpopulation of treated units. ATT can only account units that participated in the program and is given by

$$\Delta Y_{ATT} = E(\Delta Y|D = 1) = E(Y^1|D = 1) - E(Y^0|D = 1). \quad (4.4)$$

In order to obtain unbiased estimation results by contrasting participants to on participants, it must be that

$$E(Y^0|D = 1) = E(Y^0|D = 0), \qquad (4.5)$$

that is, the counterfactual expected outcome of treated must be equal to the factual expected outcome of non-treated. This assumption usually holds only in randomized field trials. With non-experimental data, this identifying assumption very often fails, thus resulting in selection bias, which arises when treated and non-treated firms operate differently even without receiving subsidies.

Depending on data available for researchers, the selection bias problem can be tackled by applying several statistical methods. Each method, described below, is based on assumptions. These methods can be divided into two groups: matching and the regression discontinuity design (RDD) that are based on the selection on observables assumption, and the difference-in-differences approach and instrumental variables (IV) that are based on the selection on unobservables assumption.

Matching technique

A control group in matching is built by picking units that have the same observable characteristics as treated ones. The matching estimator (Heckman, Ichimura, and Todd, 1997) is based on the assumption that treated and non-treated units are equivalent with respect to potential outcomes after conditioning on observable variables. This assumption is called the Conditional Independence Assumption (CIA) and is given by

$$Y^0, Y^1 \perp D|X .$$
(4.6)

If this condition holds then to estimate the impact of program participation a direct comparison of treated and non-treated units can be implemented because the only difference in outcomes existing between firms is due to program intervention.

An additional condition needed to apply the matching technique requires observing both groups —treated and non-treated — at each possible value of the observable characteristics. This is named Common Support condition and is given by

$$0 < P(D = 1|X) < 1.$$
(4.7)

The advantage of the matching technique is that it can be combined with other methods of impact evaluation, for instance with the difference-in-differences approach. In this case, units are first matched on the base of their observable characteristics and then the effect of subsidies is estimated by implementing the difference-in-differences approach. The joint use of the two methods is more likely to provide a valid estimate. However, a direct application of simple matching may cause some difficulties. For instance, matching treated units with non-treated might be too complicated if the number of characteristics is large.

Matching with propensity score

The most accepted technique for matching treated and non-treated firms is based on calculation of the so called propensity score *p(x)*:

$$p(x) = P(D_i = 1|X_i). \qquad (4.8)$$

A propensity score is an indicator, which represents the probability of being assigned to a particular treatment based on characteristics that can predict such an assignment. It was introduced by Rosenbaum and Rubin (1983), who showed that if CIA holds conditioning on x then it holds conditioning on *p(x)*:

$$Y^0, Y^1 \perp D|p(x). \qquad (4.9)$$

Using a probability model allows us to include many characteristics that affect the assignment process. After estimating a score for each unit of treated group, a subgroup of controlled units that have a similar propensity score can be identified.

Matching on the propensity score can be implemented in several ways that differ mainly in three aspects: the definition of the neighborhood for each treated unit, the assignment of weights to these neighbors and the way of handling the common support problem (Caliendo and Kopeinig, 2008). There are five main matching algorithms used in PSM estimation: Nearest Neighbor (NN), Caliper and Radius, Stratification and Interval, Kernel and Local Linear, Weighting (see Becker and Ichino (2002), or Caliendo and Kopeinig (2008) for the detailed description).

Regression discontinuity design

This technique was first introduced by Thistlethwaite and Cambell (1960) and can be implemented when the eligibility for a program is determined by whether an "assignment" variable goes beyond a cut-off point. One of the advantages of the RDD is that in the neighborhood of the threshold, the RDD presents some characteristics of a pure experiment. A limitation of this approach is that the mean impact can only be estimated at the threshold for selection. In the case of heterogeneous treatment effects, any conclusion about an impact on units away from the threshold for selection cannot be obtained. In this situation, only a local mean impact of the treatment can be identified.

The Difference-in-differences estimator

This approach requires longitudinal or repeated cross-sectional data both on participants and on nonparticipants for at least two time periods. Computation of a double difference produces estimates of impacts that are more credible than those based on a single difference. First, the difference in average outcomes in both treated and control groups before and after treatment is calculated. Then evaluation is carried out by comparing the difference before and after treatment in a control group with the difference in a treated group (Ashenfelter, 1978; Ashenfelter & Card, 1985):

$$\Delta Y^{DID} = (Y_{t1}^1 - Y_{t0}^0 | D = 1) - (Y_{t1}^0 - Y_{t0}^0 | D = 0). \quad (4.10)$$

The advantage of the difference-in-differences estimator (DID) is that it does not require complex data structures. In order to apply the DID, observations on policy outcome before and after the intervention are needed. A limitation of the DID is a crucial assumption required for its implementation: the parallel trend assumption that claims that the counterfactual trend for treated is the same as the factual one for non-treated firms. In order to test this claim, more pre-intervention outcome data are necessary.

Instrumental variables

Instrumental variables (IV) can be implemented in the presence of characteristics that influence participation decision but do not have direct impact on the outcome variables. The IV approach has similarities with randomized experiments (Heckman, 1997). An additional variable can be used as an instrumental variable if it satisfies two requirements: this variable should be strongly correlated with the decision rule (treatment variable) and it must not have a direct effect on, nor be correlated to, the outcome variable. A limitation of the IV approach is the complexity of finding a credible instrument.

4.3.4 Identification and Estimation strategy

Matching on the propensity score

The dataset consists of 204 treated firms and 1544 non-treated firms. In order to create a valid control group, the main characteristics that determine the probability to be granted a public subsidy must be identified. The choice of variables refers to the exiting literature in the field of industrial policy evaluation and to the information available from the dataset. Characteristics of treated and non-treated firms that were included to test the potential influence on receiving the subsidies are presented in Table 4.1. As can be seen from Table 4.1, the pre-treatment characteristics were not balanced between two groups before implementing matching on the propensity score (PS).

As for structural characteristics that can affect the probability to receive subsidies it is common to control for firm size and sectors of economic activity. Since our study is based on the population of micro firms, the variation in firm size measured by the number of employees is small. Nevertheless, the number of employees should be included in the model because this variable describes the amount of resources available for microenterprises and determines firm productivity. As firm level control variables, the following firm characteristics were used in the model: firm age in years, being a family firm or not, and having a business partner or not. Variables that describe whether the microenterprise belongs to a group of family firms and whether multiple owners manage it are included in the analysis because both of them define the amount of available resources like financial recourses, physical and human capital.

As for entrepreneur level control variables, the following entrepreneur characteristics were included in the model: entrepreneur's gender, age in years, and start-up motivations. Firm and entrepreneur age are important because they often determine the program eligibility. The start-up motivation describes why entrepreneurs chose to be self-employed and includes three categories: an entrepreneurial spirit, continuing a family tradition, and substituting a wage job. This variable was selected on the basis of related literature on entrepreneurship. Block et al. (2015) argue that start-up

motivations tend to be lasting ones. This implies that they can navigate the way entrepreneurs take different actions and affect each firm's future path.

One of the main arguments in favor of government intervention is the presence of credit constraints that can act as a barrier for firm investment. Credit constraints may determine the probability to be granted a subsidy mainly because of the following reasons: first, firms may prefer to seek additional funds in the public sector because it is more difficult to obtain them from the private one and, second, public incentives are targeted towards a group of firms for which certain activities are not feasible due to existing financial constraint (Duch, Montolio, and Mediavilla, 2007). Two variables, being a client of several banks and being a client of the Cassa Rurale bank, were used as proxies for credit constraints. Being a client of several banks describes whether the firm is a client of single or multiple banks. Given that our data do not include any start-ups, we expect that being a client of a single bank means that this bank has more information about its borrowers. Hence, the firm that has long-lasting ties with a single bank is less credit constrained. The Cassa Rurale bank is the leading cooperative credit bank in Trento that aims to help its clients and members to achieve mutual objectives. This implies that those firms that are clients of the Cassa Rurale bank might be less financial constraints.

Since the subsidies under Law 6/99 have been granted over an extensive period of time, it might be the case that the difference between treated and control groups exists because firms that received the subsidies in 2009 or 2010 have learnt much better how to ask subsidies in the previous decade. In order to control for this possible source of imbalance between two groups, we included in the model the number of pre-treatment subsidy requests made throughout the period from January 1st, 2000 to December 31st, 2008 as a control variable. The choice of the time-interval is explained by the fact that during this time-period the design of Law 6/99 has remained unchanged. Micro firms that have higher values of the number of pre-treatment subsidy requests would be deemed as units that have better knowledge on how to receive the subsidies than those that have lower values.

We performed propensity score matching with a kernel-based method. The results of the logistic regression estimation used to calculate the propensity scores are presented in Table 4.2. The dependent variable in the logistic regression model is a dummy variable for the receipt of the subsidy either in 2009 or in 2010. The explanatory variables included in the logistic regression model refer to year 2009 except the variables that define the dynamics of firm size and firm performance. These explanatory variables referring to years 2007 and 2008 are proxied by the number of employees, firm value added, firm revenues, and firm labor productivity respectively.

The validity of the matching estimator crucially rests on the assumption that treated and non-treated groups are similar in terms of unobservable characteristics, which can both affect participation decision and the outcome of the program. Gertler et al. (2011) suggest that in order to perform verification and falsification tests for the matching estimator, three conditions must be checked: first, it is necessary to justify that there are no unobservable variables relevant for program participation and correlated to the outcome; second, it is necessary to perform the balance tests, that is, to check whether the observed characteristics between treated and control groups are well balanced; third, it is necessary to check whether the common support assumption is satisfied.

The first condition on the absence of unobservable variables that determine program participation and are correlated to the outcome is not testable directly, for this reason, it is necessary to explore the relevant theory in order to understand whether such unobservable variables might exist. We make this condition less severe by controlling for the time-constant unobserved effects that might bias the evaluation results. This approach requires additional information on the outcome variables measured in the pre-intervention period. For this reason, we used outcome variables that refer to years 2007 and 2008 as covariates. In order to test whether the distributions of covariates between treated and control groups are equal we implemented a balancing test. Table 4.3 shows the results of a balance test for the vast majority of covariates between treated and control groups.

Since the average causal effect can be estimated only within the region of common support, it is important to test the overlap and the region of common support (Heckman, LaLonde, and Smith,

1999 and Caliendo and Kopeinig, 2008). In particular, it is necessary to verify that any combinations of characteristics observed among treated units can be also observed among controls (Bryson, Dorsett, and Purdon, 2002 and Caliendo and Kopeinig, 2008). For a visual analysis of the common support the density distribution of PS that is shown in Figure 4.1 and the PS histogram by treatment status that is shown in Figure 4.2 were used. As can be seen from both figures, the overlap is narrow for those firms that have the propensity score greater than 0.25. This implies that all business units with estimated propensity scores outside the interval (0, 0.25] need to be disregarded since there is no comparison unit comparable to them. Hence, the average causal effect can be estimated only for the subpopulation of microenterprises with estimated propensity scores less or equal to 0.25.

As discussed above, one of the potential sources of imbalance between groups might appear because of the differences in a number of pre-treatment subsidy requests between treated and control groups. Figure 4.3 shows the distribution of the number of pre-treatment subsidy requests in treated and control groups. As it can be seen, two groups differ in the number of subsidy requests made from January 1st, 2000 to December 31st, 2008. This implies that treated and controls firms are not fully comparable. Our finding that treated firm have learnt better how to receive subsidies under Law 6/99 identifies the source of selection bias.

The next step after testing and analyzing the differences in pre-intervention observable characteristics among treated and non-treated firms is estimation of the average treatment effect on the treated. Several firm characteristics were used as outcome variables to estimate treatment effects: whether or not firms invested in 2012, whether or not firms invested in physical capital in 2012, whether or not firms invested in human capital or marketing and advertising in 2012[10], the number of employees in 2011, firm revenues in 2011, value added in 2011, and labor productivity in 2011.

The outcome variables related to firm investment are dummies. One of the principal data limitations inherent in the research on microenterprises is lack of balance sheet information necessary to explore firms' investment behavior and their financial situation. Since microenterprises are not required to present all relevant financial information in the balance sheets, this kind of data limitations is not just a specific problem of our data sources and research but it is a major problem for studies focusing on microenterprises. Thus, the only possible information related to firm investment is obtained from the survey questionnaire.

As for firm investment, the data include information on whether the firm has invested or not in 2012 as well as information on whether the firm has invested in 2012 in each of the following types of investment - investment in machinery, in land and buildings, in training, in marketing and advertising, and in innovation. Since for some types of investment the number of observations is small, we differentiated investment categories into two groups: investment in physical and non-physical capital in 2010. The former includes investment in machinery, land and buildings, and in innovation, while the latter contains investment in training and in marketing and advertising. Investment in physical capital confides with one of the principal investment categories targeted by the support program under Law 6/99, while investment in training and in marketing and advertising is excluded from the target group of the policy.

---

[10] For convenience investment in human capital and investment in training were called as investment in non-physical capital.

As discussed above, the ATT can be estimated only for the subpopulation of firms with the PS values less or equal to 0.25. Formally, we need to estimate the treatment effect with the following regression:

$$Y_i = \alpha + \beta_0 D_i + \sum_{k=1}^{K} \beta_k X_{ki} + \varepsilon_i, \qquad (4.11)$$

where Y_i is a vector of the outcomes, D_i is the treatment status of the firm i ($D_i = 1$ for $treated$ $firms,$ and D_i =0, otherwise), X_{ki} is a set of K baseline covariates of the firm i (the set of covariates is the same with the one that was used for the PS matching), ε_i is the error term.

Table 4.4 reports the regression estimates of the treatment effect on the treated for the subpopulation of firms. The only significant result we found is a positive impact of the program on the propensity to invest in training or in marketing and advertising in 2012. These types of investment differ from those targeted by the program under Law 6/99 because one of the main objectives of the policy was to foster investment in fixed capital. These results can be interpreted twofold: first, firms pursue as a goal making compliment investment and second, they prefer to invest in training and in marketing and advertising but partially finance this kind of investment by a means of public funds. The former explanation implies that the positive outcome of investment can be obtained if investment in physical capital is complimented by investment in non-physical assets such as marketing and advertising or investment in training. On the other hand, granted firms can pursue as a goal making investment in training and in marketing and advertising but partially finance this type of investment by a means of saved internal resources. This might be the case if they substitute depreciated capital by new fixed capital subsidized by the public authority. Nevertheless, these hypotheses cannot be tested because of the lack of the data on firm performance in 2012 and 2013 as well as more detailed information on firm investment.

With respect to other outcome variables, we did not find any significant effects of granting subsidies to microenterprises.

Estimation of ATT for observations with p-score less than one

In order to assess how our results are sensitive to the limited overlap problem we estimate the ATT for the total sample of units. Table 4.5 shows the regression estimates of the effect of granting subsidies to micro firms in 2009 or 2010 with the same set of covariates controlled for in the PS matching. Similar to the previously found effect of the program for the subpopulation of firms, our results suggest that subsidized firms are more likely to invest in training and in marketing and advertising in 2012 than non-subsidized. However, the coefficient for the probability to make non-physical investment in 2012 for the total population is larger than those for the subpopulation (with the estimated propensity scores less or equal than 0.25). Furthermore, when we do not restrict our sample only for those units that have strong overlap the coefficient for firm revenues in 2011 turn out to be positive and statistically significant. This result indicates that the estimates for the total sample suffer from a substantial bias.

Comparing the econometrics results with the self-assessed results from the survey on microenterprises

In addition, the research analysis is expanded to comparing the results obtained from the impact evaluation of the public subsidies in Trento under Law 6/99 with the results obtained from the self-assessed impact survey on microenterprises. This survey is based on the questionnaire, which includes information on firms' subjective evaluation of the impact of the subsidies that they obtained in 2009 and in 2010. The structure of the questionnaire is similar to the one presented in the Bank of Italy's BIRD system's Surveys (Banca d'Italia, Survey of Industrial and Service Firms, 2005). Our analysis of the self-assessed impact survey is based on the work of Cannari, D'Aurizio, and De Blasio (2006), where the authors used the Bank of Italy' BIRD Survey in order to investigate the effect of subsidies given to Italian manufacturing firms. The analysis of the effectiveness of subsidies has been carried out by exploring information on firms' subjective evaluation of the incentives.

The survey was conducted by the Statistical Office of Trento in 2013 on the sample of 2291 entrepreneurs.[11] The respondents are the microfirms' owners. Because of the micro size of firms, the owner of the firm is the sole manager and strategist at the same time, meaning that the owner plays the main role in firm's decision-making process. This is essential condition for the reliable subjective evaluation since it ensures that the respondents of the questionnaire are those who have the direct responsibility for the firm's decisions (Cannari, D'Aurizio, and De Blasio, 2006). The results of the survey on the self-assessed impact of the policy are based on 204 subsidized firms and on 1349 non-subsidized firms.

First, we restrict our analysis of the self-assessed impact of the program to a group of treated firms. Table 4.6 shows the main sources of information on the program: merely 45 percent of subsidized firms knew about contributions from their business consultant, while 36 percent and 13 percent of beneficiaries received this information from their sectoral association and the APIAE information materials respectively. The vast majority of beneficiaries was quite confident that they would receive subsidies while applying for them. The results shown in Table 4.7 suggest that only 6 percent of respondents believed that the probability to be granted was small, while 20 percent of subsidized firms were certain that they would be subsidized.

Micro firms that received subsidies under Law6/99 have been asked whether the policy led the beneficiaries to invest more. Table 4.8 reports the respondents' answers. The vast majority of firms, 72 percent of the respondents, believed that the subsidies under Law6/99 push firms to invest more.

As regards the main motives for asking subsidies, only 47 percent of respondents participated in the program due to the lack of internal recourses, while all others have enough internal funds to make investment (see Table 4.9). This survey finding indicates that the program failed to allocate subsidies efficiently among micro firms. Probably, the selection rule should also take into account that monitoring of firms and their investment projects needs to reveal financially constrained participants.

---

[11] The complete questionnaires in Italian are available from the Statistical office of Trento or IRVAPP (Istituto per la Ricerca Valutativa sulle Politiche Pubbliche) upon request.

A similar finding emerges from the next question. In order to understand how firms that benefited from the program would invest in the absence of the public finance, the following counterfactual question has been formulated:

"Without incentives under Law 6/99, your firm would have made:

1) the same amount of investments in the same projects

2) the same amount of investments in projects at least partly different

3) a smaller amount if investments

4) no investment at all"

The answers to this question are presented in Table 4.10. Approximately half of beneficiaries would have made the same amount of investments in the same projects without incentives under Law 6/99. This suggests that for the majority of subsidized firms the program was not successful in reinforcing additional investment. As can be seen from Table 4.10, the program has pushed only 28 percent of subsidized firms to make some extra investment, while 13 percent of beneficiaries would not have made any investment without the subsidies.

In order to understand whether the program was effective in reinforcing additional investment when the strictest notion of additionality is used, firms that would have less or no investment without incentives have been asked the following counterfactual question:

"What reasons would have led you to reduce or eliminate investments without the incentives?

1) there would have been no return on the investment without the incentives

2) there would have been no resources to finance investment without the incentives

3) no response"

The answers to this question are reported in Table 4.11. The first answer defines how many firms more likely have invested inefficiently meaning that for this number of firms an increase in investment cannot be considered as the evidence of the effectiveness of the program. From our questionnaire, we found that 30 (15 percent) subsidized firms consider their investment projects would not have been profitable without incentives. The second answer reported in Table 4.11 aims to identify those

financially constrained firms for which the effect of additionality of the program is relevant. Among 204 firms that received subsidies under Law 6/99, only 40 of them (20 percent) would not have invested because of the lack of financial resources necessary for making these investments. These results suggest that a small amount of investment made by subsidized firms may be considered as additional investment if the strictest notion of additionality is used.

Hence, it does not come as a surprise that the vast majority of firms (approximately 65 percent on average) that received subsidies in 2009 or 2010 believed that the policy failed to increase firm turnover neither in 2009–2010 nor in 2010-2011 (see Table 4.12). With respect to the effect of the subsidies on the number of employees, results obtained from firms' subjective evaluation are very similar to those obtained from econometric analysis. For example, 67 percent of firms that received incentives in 2009 reported that they did not hire any employee in 2009-2010, while 74 percent of firms that received incentives in 2010 did not hire any additional employee in 2010-2011. Considering the longer effect of the subsidies on the number of additional employees, the results remain almost the same: 83 percent of firms subsidized in 2009 and 89 percent of firms subsidized in 2010 responded that they did not hire any employees in the following years. Finally, the subsidies prevented only 11 percent of subsidized firms from decreasing the number of employees.

Now our analysis of the self-assessed impact of the program is focused on the population of non-treated firms. Results of the hypothetical effects of the subsidies under Law 6/99 on firm investment and turnover of non-subsidized firms are reported in Table 4.13. The results suggest that for the 67 percent of nonsubsidized firms the program would not have created any additional investment in 2010 and for the 88 percent them the program would not have increased their turnover in 2010. The same results are hold for the potential effect of the subsidies on the additional number of employees in 2010 and on the number of employees being prevented from losing their jobs in 2010: the vast majority, 99 percent, of nonsubsidized firms responded that there would have been no effect of obtaining on the number of employees in 2010. In general, among firms that did not participate in

the program 63 percent claim that nothing would have changed in the case if they received the subsidies under Law 6/99.

One remaining aspect that should be considered is why non-subsidized firms did not ask for the incentives under Law 6/99. This information is also relevant because it can help to reveal main advantages and drawbacks of the policy design and its implementation. The results reported in Table 4.14 suggest that firms were well informed about existence of the program as only 9 percent of entrepreneurs responded that the main reason for non-applying was the lack of knowledge about the existence of the program. Another strength of the policy design is that the application procedure was simple enough since very few firms (2.6 percent) reported that the main motive for non-applying for the subsidies was that the procedure of documents preparation was burdensome. Concerning the program costs, it is beyond doubt that the program could be considered as not expensive one: only 0.3 percent of non-subsidized firms reported that the main reason for not asking for the incentives was the high cost of the services of an accountant or a syndicate.

Table 4.14 reports the main reasons for non-asking for contributions: the majority of firms (51.6 percent) from the control group did not ask for contributions because they had not invested, while 13.4 percent of the control group did not ask for subsidies because they had financed their investments by their own resources. As can be seen from Table 4.14, 14 percent of firms could not obtain the subsidies because the policy was not targeted to their category.

4.3.5 Discussion and conclusions

This paper estimates the effect of government subsidies given to microenterprises operating in the Province of Trento in 2009 and in 2010. The evaluation was carried out by using a nonparametric approach. First, treatment and control groups were constructed by implementing a propensity score matching technique. Comparing the propensity score distributions for treated and non-treated firms revealed that treated micro firms differ substantially from their non-subsidized counterparts in the number of pre-treatment subsidy requests. This means that microenterprises that asked subsidies more often in the previous years are more likely to receive the treatment. The main implication of this finding is that the program effect cannot be estimated for the whole sample of treated firms and must be confined to the sub-set of treated firms for which comparable untreated ones are available.

The results from econometric analysis suggest that subsidies have not been able to improve firm performance or increase firm size in 2011. However, we found a positive effect of subsidies on the propensity to invest in training and in marketing and advertising in 2012. Because of the data limitations we cannot examine whether investment required by the program and investment in non-physical capital compliment each other and whether they have a multiple effect on firm performance in the following years.

As for the major policy issue of "picking winners", the results obtained from the self-assessed impact survey on microenterprises suggest that about half of subsidized firms had their own internal resources necessary for financing investment. Furthermore, for the half of beneficiaries the policy was unsuccessful in reinforcing additional investment even if the least rigorous definition of additionality is used. When we restrict the definition of additionality only to those investments that would have not been feasible in the absence of the policy because of the presence of financial constraints, only 20 percent of subsidized microenterprises might be deemed as those that made additional investment due to receiving the subsidies. This suggests that the subsidies under Law 6/99 were easy enough to obtain and the policy had little effect on pushing entrepreneurs to start more investment projects.

Overall, the empirical evidence reaffirms that this kind of capital subsidies granted to the business sector in general are ineffective in improving firm performance. The main drawback of this policy scheme is the lack of the well-designed selection process that picks and monitors firm activities capable to reinforce additional investment. Rodrik (2007) suggest that, in order to improve the policy design, the public authority must define clearly the determinants of policy success and observable criteria for scanning and recognizing it. Otherwise, there is a large probability that beneficiaries will find a way to receive subsidies despite poor outcomes. In addition, providing firms by incentives constantly over time without changing the eligibility criteria or imposing restrictions on the amount of possible subsidy requests results in fixing financial recourses in activities with zero pay-off.

Appendix C

TABLE 4.1 DESCRIPTIVE STATISTICS FOR SELECTED VARIABLES

Variable	Description	Treatment		Control	
		Mean	Std. Dev.	Mean	Std. Dev.
Number of employees 2008		3,005	2,396	0,835	1,486
Value added 2008	in logarithms	11,734	1,076	10,673	1,118
Revenues 2008	in logarithms	12,942	1,073	11,651	1,236
Productivity 2008	in logarithms	10,389	0,712	10,065	0,925
Number of employees 2007		2,985	2,528	0,834	1,480
Value added 2007	in logarithms	11,637	0,990	10,609	1,083
Revenues 2007	in logarithms	12,882	1,136	11,536	1,298
Productivity 2007	in logarithms	10,314	0,595	10,038	0,848
Male owner	=1 if the owner is male, 0 otherwise	0,877	0,329	0,817	0,387
Family firm	=1 if the firm is a family one, o otherwise	0,630	0,484	0,484	0,500
Client of multiple banks	=1 if the firm is a client of more than one bank, 0 otherwise	0,549	0,499	0,260	0,439
Type of the main bank: Cassa Rurale	=1 if the principal bank is "Cassa Rurale", 0 otherwise	0,137	0,345	0,797	0,403
A membership in the association	=1 if the firm has a membership in one of the following associations:Confindustria, Confcommercio, Associazione Artigiani; 0 otherwise	0,828	0,379	0,710	0,454
Single firm owner	=1 if the firm is managed by one owner, 0 otherwise	0,559	0,498	0,722	0,448
Wholesale and retail trade*	Sector of economic activity	0,134	0,342	0,262	0,440

TABLE 4.1 (CONTINUED) DESCRIPTIVE STATISTICS FOR SELECTED VARIABLES

Construction	Sector of economic activity	0,274	0,447	0,227	0,419
Manufacturing	Sector of economic activity	0,296	0,458	0,086	0,281
Metallurgy	Sector of economic activity	0,156	0,364	0,060	0,238
Services and Transport	Sector of economic activity	0,140	0,348	0,364	0,481
Motive: Entrepreneurial spirit*	=1 if the main motive for business establishment is an entrepreneurial spirit, 0 otherwise	0,276	0,448	0,250	0,433
Motive: Family tradition	=1 if the main motive for business establishment is continuing a family tradition, 0 otherwise	0,417	0,494	0,270	0,444
Motive: Job substitution	=1 if the main motive for business establishment is job substitution, 0 otherwise	0,307	0,462	0,480	0,500
Young owner	=1 if the owner is younger than 48 years, 0 otherwise	0,554	0,498	0,521	0,500
Firm age <=10*	=1 if the firm age is less or equal to 10, 0 otherwise	0,330	0,471	0,260	0,439
Firm age (10; 40]	=1 if the firm age is more than 10 and less or equal to 40, 0 otherwise	0,640	0,481	0,701	0,458
Firm age (40; 181]	=1 if the firm age is more than 40 and less or equal to 181, 0 otherwise	0,030	0,170	0,039	0,193

Note: *Category excluded in regression (base category).
Source: Own calculations based on data from Servizio Statistica della Provincia Autonoma di Trento

Number of employees 2008	0.442
	(1.18)
Value added 2008	-1.222
	(-0.93)
Revenues 2008	1.422**
	(3.05)
Productivity 2008	1.344
	(1.01)
Number of employees 2007	-0.0967
	(-0.26)
Value added 2007	0.828
	(0.62)
Revenues 2007	-0.824
	(-1.72)
Productivity 2007	-1.141
	(-0.85)
Number of subsidy requests: 0	Ref.
Number of subsidy requests: 1	3.320***
	(8.55)
Number of subsidy requests: 2	3.021***
	(5.83)
Number of subsidy requests: 3	3.823***
	(6.41)
Number of subsidy requests: 4	1.465
	(1.61)
Number of subsidy requests: 5	4.823***
	(4.41)
Number of subsidy requests: 6	1.927
	(1.75)
Individual firm owner	-0.967*
	(-2.08)
Wholesale and retail trade	Ref.
Construction	0.393
	(0.83)
Manufacturing	1.047*
	(2.18)
Metallurgy	0.341
	(0.62)
Services and Transport	0.889
	(1.95)
Young owner	-0.071
	(-0.24)

Firm age [4; 10]	Ref.
Firm age (10; 40]	-0.685*
	(-2.09)
Firm age (40; 181]	-2.726**
	(-2.93)
Male owner	0.118
	(0.28)
Family firm	0.052
	(0.17)
Motive: Entrepreneurial spirit	Ref.
Motive: Family tradition	-0.377
	(-0.98)
Motive: Job substitution	-0.473
	(-1.38)
Client of multiple banks	0.295
	(0.97)
Type of the principal bank: Cassa Rurale	-3.617***
	(-11.13)
A membership in the association	0.316
	(0.88)
_cons	-6.991**
	(2.7)
N	1485

* $p<0.05$, ** $p<0.01$, *** $p<0.001$.
Note: t statistics in parentheses; the number of observations is 1366.
The dependent variable is 1 if the company receives a public subsidy either in 2009 or in 2010, and 0 otherwise.
Estimation carried out with a logistic regression model.
Source: Own calculations based on data from Servizio Statistica della Provincia Autonoma di Trento

TABLE 4.3 BALANCE TESTS IN MATCHED SAMPLE

Variable	Unmatched Matched	Mean Treated Control	%bias	%reduct bias	t-test t p>t
Number of employees 2008					
U		3.087 1.0249	102.3		14.42 0.000
M		2.6063 2.5906	0.8	99.2	0.06 0.954
Value added 2008					
U		11.775 10.759	100.6		11.86 0.000
M		11.593 11.633	-3.9	96.1	-0.32 0.752
Revenues 2008					
U		12.997 11.812	107.4		12.17 0.000
M		12.784 12.759	2.3	97.8	0.20 0.839
Productivity 2008					
U		10.419 10.104	43.5		4.72 0.000
M		10.362 10.418	-7.8	82.1	-0.71 0.481
Number of employees 2007					
U		3.0497 1.0299	96.1		13.92 0.000
M		2.5118 2.4999	0.6	99.4	0.04 0.965
Value added 2007					
U		11.658 10.768	91.5		10.76 0.000
M		11.486 11.527	-4.2	95.4	-0.33 0.742
Revenues 2007					
U		12.933 11.804	100.1		11.48 0.000
M		12.723 12.713	0.8	99.2	0.07 0.944
Productivity 2007					
U		10.326 10.11	32.4		3.48 0.001
M		10.287 10.336	-7.5	76.9	-0.62 0.535
Number of subsidy requests: 0			Ref.		
Number of subsidy requests: 1					
U		.3913 .08306	77.6		11.89 0.000
M		.30709 .29791	2.3	97.0	0.16 0.874
Number of subsidy requests: 2					
U		.12422 .03239	34.6		5.44 0.000
M		.13386 .11466	7.2	79.1	0.46 0.644
Number of subsidy requests: 3					
U		.1118 .01495	40.4		7.34 0.000
M		.11024 .08494	10.6	73.9	0.68 0.499

TABLE 4.3 (CONTINUED) BALANCE TESTS IN MATCHED SAMPLE

Number of subsidy requests: 4						
U	.02484	.00914	12.1		1.80	0.073
M	.0315	.01763	10.7	11.7	0.71	0.477
Number of subsidy requests: 5						
U	.03106	.00249	22.3		4.49	0.000
M	.01575	.03623	-16.0	28.3	-1.02	0.307
Number of subsidy requests: 6						
U	.03106	.00249	22.3		4.49	0.000
M	.03937	.01128	21.9	1.6	1.43	0.155
Individual firm owner						
U	.52174	.67359	-31.3		-3.83	0.000
M	.55906	.61329	-11.2	64.3	-0.88	0.382
Wholesale and retail trade			Ref.			
Construction						
U	.25466	.23007	5.7		0.69	0.489
M	.26772	.22035	11.0	-92.6	0.88	0.381
Manufacturing						
U	.27329	.09635	46.7		6.66	0.000
M	.23622	.18639	13.2	71.8	0.97	0.333
Metallurgy						
U	.14907	.07143	24.9		3.41	0.001
M	.13386	.118	5.1	79.6	0.38	0.705
Services and Transport						
U	.19876	.30897	-25.5		-2.88	0.004
M	.22835	.31593	-20.3	20.5	-1.57	0.118
Young owner						
U	.60248	.52575	15.5		1.83	0.067
M	.58268	.5634	3.9	74.9	0.31	0.757
Firm age [4; 10]			Ref.			
Firm age (10; 40]						
U	.6646	.72924	-14.1		-1.72	0.086
M	.66142	.66538	-0.9	93.9	-0.07	0.947
Firm age (40; 181]						
U	.03106	.0407	-5.2		-0.59	0.556
M	.03937	.02359	8.5	-63.7	0.72	0.473
Male owner						
U	.87578	.82226	15.0		1.69	0.091
M	.86614	.84235	6.7	55.5	0.54	0.593
Family firm						
U	.62733	.5407	17.6		2.08	0.038
M	.59843	.53779	12.3	30.0	0.97	0.331

TABLE 4.3 (CONTINUED) BALANCE TESTS IN MATCHED SAMPLE

Motive: Entrepreneurial spirit			Ref.			
Motive: Family tradition						
U	.41615	.30897	22.4		2.74	0.006
M	.37008	.31197	12.1	45.8	0.97	0.331
Motive: Job substitution						
U	.3354	.46844	-27.3		-3.19	0.001
M	.37795	.38899	-2.3	91.7	-0.18	0.857
Client of multiple banks						
U	.54658	.28405	55.2		6.84	0.000
M	.51181	.53305	-4.5	91.9	-0.34	0.736
Type of the principal bank: Cassa Rurale U	.15528	.81977	-177.6		-20.72	0.000
M	.19685	.19753	-0.2	99.9	-0.01	0.989
A membership in the association						
U	.87578	.72924	37.4		4.04	0.000
M	.87402	.90211	-7.2	80.8	-0.71	0.480

Source: Own calculations based on data from Servizio Statistica della Provincia Autonoma di Trento

TABLE 4.4 ESTIMATION OF AVERAGE TREATMENT EFFECTS ON TREATED FOR THE SUB-POPULATION OF FIRMS (P-SCORE ≤ 0.25)

Variables	(1) Propensity to Invest 2012	(2) Propensity to Invest in Phys.cap 2012	(3) Propensity to Invest in Non-phys.cap. 2012	(4) Employees 2011	(5) Value added 2011	(6) Revenues 2011	(7) Product. 2011
Treated	0.116	0.092	0.162***	0.129	0.154	0.100	0.103
	(0.080)	(0.078)	(0.057)	(0.150)	(0.117)	(0.099)	(0.113)
Number of employees 2008	0.076	0.054	0.029	0.654***	0.007	0.070	-0.018
	(0.050)	(0.048)	(0.036)	(0.093)	(0.072)	(0.061)	(0.070)
Value added 2008	-0.204	-0.157	-0.123	0.197	0.708***	-0.030	0.031
	(0.155)	(0.151)	(0.111)	(0.290)	(0.226)	(0.191)	(0.220)
Revenues 2008	0.071*	0.070*	0.032	0.182**	0.295***	0.788***	0.239***
	(0.039)	(0.038)	(0.028)	(0.073)	(0.057)	(0.048)	(0.056)
Productivity 2008	0.246	0.194	0.163	-0.140	-0.404*	-0.002	0.257
	(0.153)	(0.149)	(0.110)	(0.286)	(0.223)	(0.189)	(0.217)
Number of employees 2007	-0.051	-0.046	-0.020	0.231**	0.020	-0.074	0.052
	(0.049)	(0.048)	(0.035)	(0.092)	(0.071)	(0.060)	(0.069)
Value added 2007	0.194	0.191	0.153	-0.214	0.260	0.203	0.048
	(0.153)	(0.150)	(0.110)	(0.287)	(0.224)	(0.189)	(0.217)
Revenues 2007	-0.056	-0.058	-0.033	-0.057	-0.238***	0.045	-0.217***
	(0.040)	(0.039)	(0.028)	(0.074)	(0.058)	(0.049)	(0.056)
Productivity 2007	-0.191	-0.177	-0.178	0.145	0.095	-0.147	0.322
	(0.151)	(0.148)	(0.109)	(0.284)	(0.221)	(0.187)	(0.215)
Number of attempts: 0				Ref.			
Number of attempts: 1	0.018	0.035	-0.020	-0.001	0.112	0.053	0.109
	(0.048)	(0.047)	(0.034)	(0.090)	(0.070)	(0.059)	(0.068)
Number of attempts: 2	0.097	0.079	0.062	0.031	0.016	-0.004	-0.006
	(0.072)	(0.070)	(0.052)	(0.135)	(0.105)	(0.089)	(0.102)
Number of attempts: 3	0.089	0.097	0.073	0.019	0.043	-0.071	-0.011
	(0.111)	(0.108)	(0.079)	(0.207)	(0.161)	(0.137)	(0.157)
Number of attempts: 4	0.171	0.187	-0.010	0.100	-0.154	-0.036	-0.283
	(0.131)	(0.128)	(0.094)	(0.245)	(0.191)	(0.161)	(0.185)
Number of attempts: 5	0.748*	0.786**	0.813***	-0.204	0.094	-0.035	0.164
	(0.410)	(0.400)	(0.295)	(0.768)	(0.598)	(0.506)	(0.581)
Number of attempts: 6	-0.271	-0.271	-0.157	0.906*	0.405	0.050	0.043
	(0.285)	(0.278)	(0.205)	(0.534)	(0.416)	(0.352)	(0.404)
Single owner	-0.085*	-0.066	-0.004	-0.070	0.102	-0.001	0.188***
	(0.047)	(0.046)	(0.034)	(0.088)	(0.069)	(0.058)	(0.067)

117

Wholesale and retail trade				Ref.			
Construction	-0.029	-0.025	-0.041	-0.104	-0.007	-0.045	0.030
	(0.037)	(0.036)	(0.027)	(0.070)	(0.055)	(0.046)	(0.053)
Manufacturing	0.085*	0.102**	0.015	-0.042	0.017	-0.029	0.015
	(0.047)	(0.046)	(0.034)	(0.088)	(0.069)	(0.058)	(0.067)
Metallurgy	0.041	0.029	-0.024	-0.147	-0.088	-0.113*	-0.076
	(0.052)	(0.051)	(0.038)	(0.098)	(0.076)	(0.065)	(0.074)
Services & Transport	0.069**	0.056*	0.043*	-0.060	-0.071	-0.121***	-0.053
	(0.035)	(0.034)	(0.025)	(0.065)	(0.051)	(0.043)	(0.049)
Young owner	0.060**	0.050**	0.049***	-0.021	0.057	0.026	0.067*
	(0.025)	(0.024)	(0.018)	(0.047)	(0.036)	(0.031)	(0.035)
Firm age [4;10]				Ref.			
Firm age (10; 41]	-0.073**	-0.062**	-0.042*	-0.094*	-0.063	0.001	-0.042
	(0.030)	(0.030)	(0.022)	(0.057)	(0.044)	(0.037)	(0.043)
Firm age (41;181]	-0.161**	-0.135**	-0.097**	-0.083	-0.096	-0.013	-0.099
	(0.066)	(0.065)	(0.048)	(0.124)	(0.097)	(0.082)	(0.094)
Male	0.028	0.034	0.023	-0.004	0.031	0.002	0.040
	(0.032)	(0.031)	(0.023)	(0.060)	(0.047)	(0.040)	(0.046)
Family firm	0.014	0.017	-0.011	-0.027	0.045	-0.049	0.057
	(0.028)	(0.027)	(0.020)	(0.052)	(0.040)	(0.034)	(0.039)
Motive: Entrepreneurial spirit				Ref.			
Motive: Continuing family tradition	-0.003	-0.012	0.005	0.014	0.003	0.004	-0.004
	(0.036)	(0.035)	(0.026)	(0.067)	(0.052)	(0.044)	(0.050)
Motive: Substitution of a paid job	0.025	0.023	0.029	0.098*	0.106**	-0.012	0.073*
	(0.031)	(0.030)	(0.022)	(0.057)	(0.045)	(0.038)	(0.043)
Being a client of several banks	0.053*	0.050*	0.062***	0.034	0.032	0.000	0.011
	(0.028)	(0.028)	(0.020)	(0.053)	(0.041)	(0.035)	(0.040)
Cassa Rurale	-0.000	0.002	0.021	0.099	0.058	0.021	0.019
	(0.035)	(0.034)	(0.025)	(0.065)	(0.051)	(0.043)	(0.049)
Membership in the association	0.035	0.028	0.022	0.072	0.036	0.051	0.028
	(0.028)	(0.027)	(0.020)	(0.052)	(0.040)	(0.034)	(0.039)
Constant	-0.465**	-0.519***	-0.157	-1.196***	2.587***	1.604***	2.884***
	(0.194)	(0.190)	(0.140)	(0.364)	(0.283)	(0.240)	(0.275)
Observations	1,169	1,169	1,169	1,169	1,169	1,169	1,169
R-squared	0.086	0.081	0.082	0.790	0.682	0.823	0.478

*** p<0.01, ** p<0.05, * p<0.1

Note: Standard errors in parentheses. The outcomes (2) and (3) refer to firm propensity to invest in physical and non-physical capital respectively in 2012. Investment in physical capital includes investment in machinery, land and buildings, and in innovation. Investment in non-physical capital includes investment in training and in marketing and advertising.

Source: Own calculations based on data from Servizio Statistica della Provincia Autonoma di Trento

TABLE 4.5 ESTIMATION OF AVERAGE TREATMENT EFFECTS ON TREATED FOR THE TOTAL POPULATION OF FIRMS (P-SCORE < 1)

Variables	(1) Propensity to Invest 2012	(2) Propensity to Invest in Phys.cap. 2012	(3) Propensity to Invest in Non-phys.cap. 2012	(4) Employees 2011	(5) Value added 2011	(6) Revenues 2011	(7) Product. 2011
Treated	0.058	0.036	0.164***	0.089	0.079	0.105*	0.035
	(0.047)	(0.046)	(0.035)	(0.098)	(0.066)	(0.055)	(0.063)
Number of employees 2008	0.083**	0.067*	0.039	0.659***	0.000	0.035	-0.009
	(0.040)	(0.039)	(0.030)	(0.083)	(0.056)	(0.046)	(0.053)
Value added 2008	-0.216	-0.164	-0.155	0.084	0.704***	0.050	0.044
	(0.136)	(0.133)	(0.101)	(0.282)	(0.191)	(0.157)	(0.181)
Revenues 2008	0.063*	0.056	0.026	0.302***	0.291***	0.779***	0.202***
	(0.038)	(0.037)	(0.028)	(0.079)	(0.053)	(0.044)	(0.051)
Productivity 2008	0.276**	0.224*	0.201**	0.000	-0.376**	-0.073	0.259
	(0.133)	(0.130)	(0.099)	(0.277)	(0.187)	(0.154)	(0.178)
Number of employees 2007	-0.090**	-0.083**	-0.039	0.173**	-0.032	-0.046	-0.007
	(0.039)	(0.038)	(0.029)	(0.080)	(0.054)	(0.045)	(0.051)
Value added 2007	0.272**	0.253*	0.183*	-0.076	0.373**	0.121	0.156
	(0.133)	(0.130)	(0.099)	(0.277)	(0.187)	(0.154)	(0.178)
Revenues 2007	-0.048	-0.047	-0.021	-0.148*	-0.238***	0.059	-0.197***
	(0.039)	(0.038)	(0.029)	(0.080)	(0.054)	(0.045)	(0.052)
Productivity 2007	-0.286**	-0.262**	-0.214**	-0.008	-0.047	-0.087	0.200
	(0.131)	(0.129)	(0.097)	(0.273)	(0.185)	(0.152)	(0.176)
Number of attempts: 0				Ref.			
Number of attempts: 1	-0.003	0.017	-0.057*	-0.073	0.045	0.023	0.039
	(0.040)	(0.039)	(0.030)	(0.083)	(0.056)	(0.046)	(0.053)
Number of attempts: 2	0.080	0.087	0.019	0.067	0.099	0.039	0.045
	(0.059)	(0.058)	(0.044)	(0.123)	(0.083)	(0.069)	(0.079)
Number of attempts: 3	0.047	0.076	-0.060	0.049	0.143	0.012	0.106
	(0.075)	(0.073)	(0.056)	(0.156)	(0.105)	(0.087)	(0.100)
Number of attempts: 4	0.131	0.155	-0.018	0.313	-0.046	-0.002	-0.194
	(0.112)	(0.109)	(0.083)	(0.232)	(0.157)	(0.129)	(0.149)
Number of attempts: 5	0.307**	0.337**	0.299***	0.970***	0.390*	0.304*	0.151
	(0.151)	(0.148)	(0.112)	(0.314)	(0.213)	(0.175)	(0.202)
Number of attempts: 6	-0.027	0.009	0.129	0.846***	0.245	0.130	-0.035
	(0.150)	(0.147)	(0.111)	(0.311)	(0.211)	(0.174)	(0.200)
Single owner	-0.042	-0.020	-0.019	-0.098	0.147**	0.002	0.233***
	(0.043)	(0.042)	(0.032)	(0.089)	(0.060)	(0.050)	(0.057)

Wholesale and retail trade				Ref.			
Construction	-0.020	-0.014	-0.041	-0.084	-0.005	-0.054	0.034
	(0.036)	(0.036)	(0.027)	(0.076)	(0.051)	(0.042)	(0.049)
Manufacturing	0.097**	0.107**	-0.008	-0.015	0.008	-0.025	0.006
	(0.043)	(0.042)	(0.032)	(0.089)	(0.060)	(0.049)	(0.057)
Metallurgy	0.037	0.017	-0.012	-0.163	-0.137**	-0.116**	-0.105*
	(0.048)	(0.047)	(0.035)	(0.099)	(0.067)	(0.055)	(0.064)
Services & Transport	0.081**	0.071**	0.045*	-0.071	-0.076	-0.123***	-0.058
	(0.034)	(0.034)	(0.025)	(0.071)	(0.048)	(0.040)	(0.046)
Young owner	0.045*	0.035	0.049***	0.021	0.053	0.017	0.048
	(0.024)	(0.023)	(0.018)	(0.050)	(0.034)	(0.028)	(0.032)
Firm age [4;10]				Ref.			
Firm age (10; 41]	-0.048*	-0.040	-0.023	-0.154***	-0.076*	-0.012	-0.033
	(0.029)	(0.028)	(0.021)	(0.059)	(0.040)	(0.033)	(0.038)
Firm age (41;181]	-0.125*	-0.104*	-0.077	-0.072	-0.068	-0.011	-0.069
	(0.064)	(0.063)	(0.048)	(0.133)	(0.090)	(0.074)	(0.086)
Male	0.046	0.047	0.028	-0.061	0.007	-0.002	0.026
	(0.031)	(0.031)	(0.023)	(0.065)	(0.044)	(0.036)	(0.042)
Family firm	0.010	0.015	-0.011	-0.044	0.037	-0.041	0.048
	(0.026)	(0.026)	(0.019)	(0.054)	(0.037)	(0.030)	(0.035)
Motive: Entrepreneurial spirit				Ref.			
Motive: Continuing family tradition	-0.017	-0.022	-0.013	-0.021	-0.003	0.006	-0.010
	(0.034)	(0.033)	(0.025)	(0.070)	(0.047)	(0.039)	(0.045)
Motive: Substitution of a paid job	0.011	0.009	0.012	0.073	0.085**	-0.007	0.056
	(0.029)	(0.029)	(0.022)	(0.061)	(0.041)	(0.034)	(0.039)
Being a client of several banks	0.075***	0.082***	0.069***	0.102*	0.053	0.016	0.016
	(0.027)	(0.026)	(0.020)	(0.056)	(0.038)	(0.031)	(0.036)
Cassa Rurale	-0.011	-0.007	0.020	-0.010	0.042	0.002	0.032
	(0.030)	(0.029)	(0.022)	(0.062)	(0.042)	(0.034)	(0.040)
Membership in the association	0.045*	0.033	0.028	0.156***	0.073*	0.062**	0.042
	(0.027)	(0.026)	(0.020)	(0.056)	(0.038)	(0.031)	(0.036)
Constant	-0.521***	-0.543***	-0.198	-1.477***	2.682***	1.694***	3.029***
	(0.191)	(0.187)	(0.142)	(0.397)	(0.269)	(0.221)	(0.255)
Observations	1,365	1,365	1,365	1,365	1,365	1,365	1,365
R-squared	0.094	0.090	0.100	0.800	0.715	0.850	0.472

*** p<0.01, ** p<0.05, * p<0.1.
Note: Standard errors in parentheses. The outcomes (2) and (3) refer to firm propensity to invest in physical and non-physical capital respectively in 2012. Investment in physical capital includes investment in machinery, land and buildings, and in innovation. Investment in non-physical capital includes investment in training and in marketing and advertising.
Source: Own calculations based on data from Servizio Statistica della Provincia Autonoma di Trento

TABLE 4.6 MAIN SOURCES OF INFORMATION ON THE PROGRAM

	Number of firms	Percent.
Business consultant	92	45,32
Sectoral association	74	36,45
APIAE information materials	13	6,4
Other	23	11,83
Total	202	100

Source: Own calculations based on data from Servizio Statistica della Provincia Autonoma di Trento

TABLE 4.7 SELF-ASSESSMENT OF THE PROBABILITY TO RECEIVE THE TREATMENT

	Number of firms	Percent.
Small possibility	13	6,4
Some possibility	87	43,1
Large possibility	48	23,8
Certainty	41	20,3
No idea	13	6,4
Total	202	100

Source: Own calculations based on data from Servizio Statistica della Provincia Autonoma di Trento

TABLE 4.8 SELF-ASSESSED EFFECT OF CONTRIBUTIONS ON FIRM INVESTMENT

	Number of firms	Percent.
Yes	143	72,22
No	55	22,78
Total	198	100

Source: Own calculations based on data from Servizio Statistica della Provincia Autonoma di Trento

TABLE 4.9 MOTIVES FOR ASKING THE SUBSIDIES

	Number of firms	Percent.
Lack of internal resources	90	46,9
Had enough resources but wanted to try	102	53,1
Total	192	100

Source: Own calculations based on data from Servizio Statistica della Provincia Autonoma di Trento

TABLE 4.10 HYPOTHETICAL DECISIONS OF THE SUBSIDIZED MICROFIRMS WITHOUT INCENTIVES

	Number of firms	Percent.
Same amount of investment, in the same projects	115	58.67
Same amount of investment but in different projects	1	0.51
Less investment	54	27.55
No investment	26	13.27
Total	196	100.00

Source: Own calculations based on data from Servizio Statistica della Provincia Autonoma di Trento

TABLE 4.11 REASONS FOR REDUCING OR ELIMINATING INVESTMENT WITHOUT SUBSIDIES

	Number of firms	Percent.
Unsubsidized investment not profitable	30	42.86
Projects profitable but financial resources are unavailable	40	57.14
Total	70	100.00

Source: Own calculations based on data from Servizio Statistica della Provincia Autonoma di Trento

TABLE 4.12 SELF-ASSESSED EFFECT OF THE SUBSIDIES ON FIRM TURNOVER AND EMPLOYMENT

	Number of firms	Percent.
Turnover increased in 2009-2010		
Yes in 2009	1	1.18
Yes in 2010	11	12.94
No	55	64.71
Yes both in 2009 and 2010	18	21.18
Total	85	100.00
Turnover increased in 2010-2011		
Yes in 2009	2	1.74
Yes in 2010	15	13.04
No	77	66.96
Yes both in 2009 and 2010	21	18.26
Total	115	100.00
Additional employees in 2009-2010		
0	57	67.06
1	15	17.65
2	9	10.59
3	1	1.18
4	3	3.53
Total	85	100.00
Additional employees in 2010-2011		
0	86	74.14
1	18	15.52
2	9	7.76
3	3	2.59
Total	116	100.00
Additional employees after 2010		
0	70	83.33
1	11	13.10
2	2	2.38
3	1	1.19
Total	84	100.00
Additional employees after 2011		
0	103	88.79
1	11	9.48
2	1	0.86
3	1	0.86
Total	116	100.00

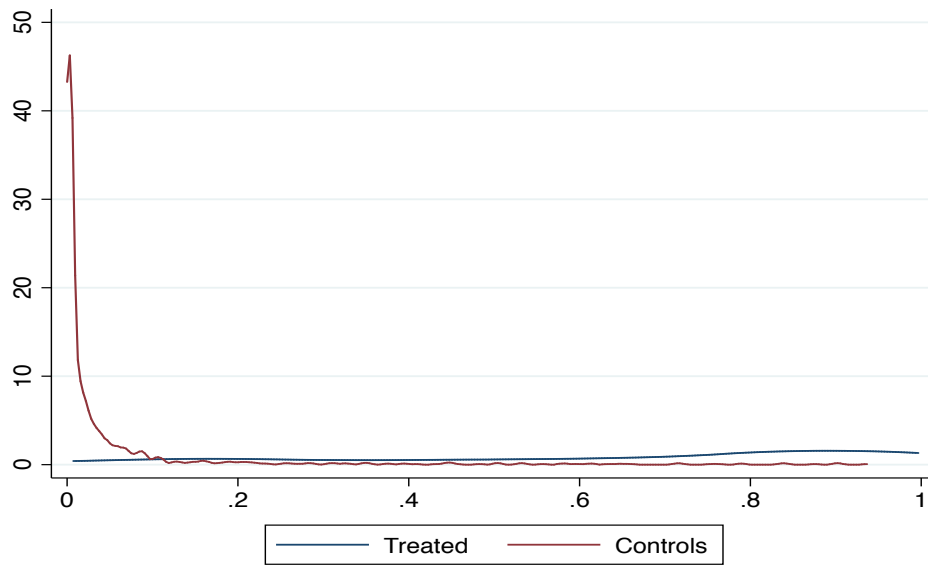| The potential prevent of employment decrease without subsidies		
0	173	88.72
1	12	6.15
2	8	4.10
3	2	1.03
Total	195	100.00

Source: Own calculations based on data from Servizio Statistica della Provincia Autonoma di Trento

Table 4.13 Hypothetical decisions of the non-subsidized microfirms in the case of receiving incentives

	Number of firms	Percent.
Investment increased in 2010		
Yes	439	32.54
No	910	67.46
Total	1349	100.00
Turnover increased in 2010		
Yes in 2009	166	12.31
No	1183	87.69
Total	1349	100.00
Improved financial situation in 2010		
Yes	176	13.05
No	1173	86.95
Total	1349	100.00
New employees in 2010		
Yes	63	4.67
No	1285	95.33
Total	1348	100.00
The potential prevent of employment decrease with subsidies		
Yes	16	1.19
No	1333	98.81
Total	8	100.00
Nothing changed		
Yes	504	37.36
No	845	62.62
Total	1349	100.00

Source: Own calculations based on data from Servizio Statistica della Provincia Autonoma di Trento

Table 4.14 Main motives for non-asking for the subsidies

	Number of firms	Percent.
Application procedure is time-consuming	39	2.55
High costs of the services of an accountant or a syndicate	4	0.26
Did not know	142	9.29
Did not invest	789	51.64
Self-financed investment	205	13.42
No contributions for my category	217	14.20
Asked for contribution in previous years	45	2.95
The application was rejected	19	1.24
Accepted but did not receive	13	0.85
Going to close the enterprise	14	1.92
Other	41	2.68
Total	1528	100.00

Source: Own calculations based on data from Servizio Statistica della Provincia Autonoma di Trento

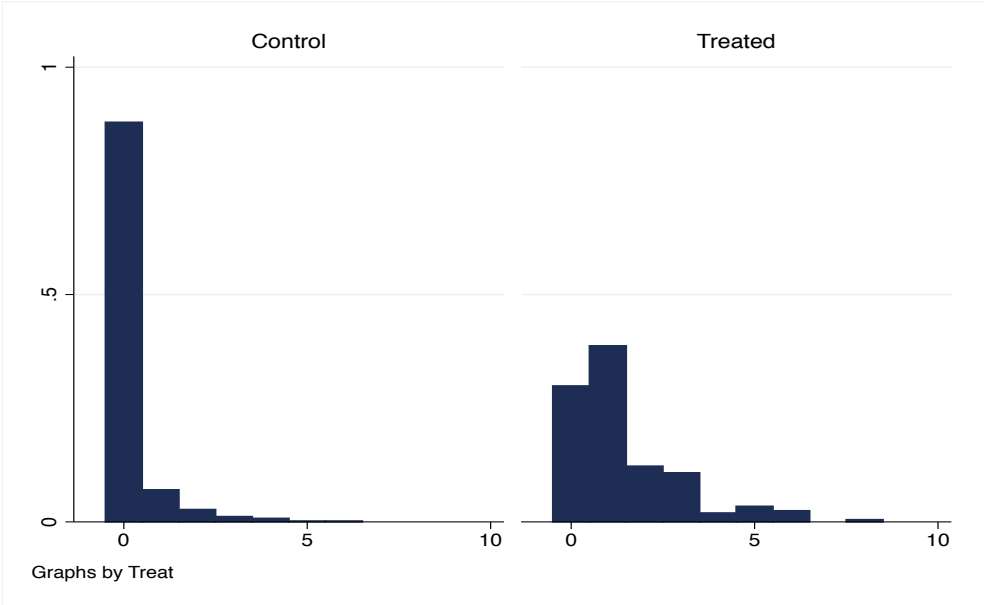***Figure 4.1 Propensity score distribution among subsidized and non-subsidized firms***

Figure 4.2 Propensity score histogram by treatment status

Figure 4.3 Distribution of a number of pre-treatment subsidy requests among subsidized and non-subsidized firms

Source: Own calculations based on data from Servizio Statistica della Provincia Autonoma di Trento

Chapter V

Conclusions

The preceding chapters of the doctoral thesis have investigated how entrepreneurial perceptions and learning can influence entrepreneur behavior and firm performance. Entrepreneurial perceptions are heterogeneous and evolving over time so that some entrepreneurs can have perceptions that are very close to the real values of some phenomena, while perceptions of others can suffer from substantial biases. Entrepreneurial learning might also be interpreted not only as a process of updating entrepreneurial knowledge about her business abilities from experience but also as a source of firm opportunistic behavior. Entrepreneurial perceptions and learning can evoke different types of actions and, consequently, these actions can influence firm performance in various ways.

The main objective of my the second chapter is to examine whether the effectiveness of the policy is altered by the behavioral assumption that entrepreneurs are overconfident about their entrepreneurial abilities and tend to be overoptimistic in the evaluation of future prospects. In order to test my main hypothesis, the chapter introduces the agent-based model that is a modified version of the financial fragility model of Delli Gatti et al. (2005). Entrepreneurs make decisions about future investment evaluating expected profits, which are also influenced by entrepreneurs' beliefs about their business abilities in such a way that the younger are the entrepreneurs, the more overconfident about their talent and the more willing to take the risky projects they must be. In this framework, since start-ups are more financially constrained than incumbents, the public authority intervenes by guaranteeing part of start-ups loans. The main goal of this intervention is to reduce the burden of their financing costs.

Overall, my simulation results suggest that the presence of misperceptions of entrepreneurial abilities influence the policy outcomes. Specifically, I found that, at the industry level, policy implementation had no effect on the average interest rate in the presence of overconfidence, while in its absence a positive effect has been detected. Furthermore, although the policy implementation had a

positive effect on firm investment in general, firm investment was much lower in the presence of overconfidence that in its absence. Finally, higher misperception pushed more firms to exit. This suggests, that the excess entry of too overconfident entrepreneurs resulted in a higher firm exit rate that at the same time had a negative affect on the aggregate credit supply and, consequently, led to creation of financial constraints for the most efficient firms.

The third chapter aims to explore what strategies microfirms adopt when they are faced with different levels of competition. The choice of revealed competitive strategy is based on three options: to follow cost leadership, to follow differentiation, or to decide not to take any action to competition. A microfirm strategy is deemed to be a cost leadership strategy if the firm owner evaluates as very important a possibility to offer prices lower than those of competitors. We assume that microfirms adopt a differentiation strategy if they invest at least in one of the flowing types of investment: investment in R&D, marketing and advertising, and training.

The results of the analysis presented in Chapter 3 suggest that perceived threat of competition pushes firms to take actions. The preferences for actions are explained by available resources. In particular, the preference for a differentiation strategy is determined by human capital and the age of entrepreneur, so that this kind of action is more likely to be taken by younger entrepreneurs with higher level of education and previous entrepreneurial experience. At the same time, the existence of previous entrepreneurial experience is negatively associated with the probability to choose a cost leadership strategy. In addition, I accomplish my analysis by testing whether the choice of certain strategy results in better firm performance measured by labor productivity growth in 2010 and 2011. I did not find any statistically significant effect of a preference for a certain competitive strategy on firm performance.

The main purpose of the fourth chapter is to investigate the effect of incentives on microfirms' investment activities and their performance in the province of Trento. The evaluation was carried out by using a nonparametric approach. First, treatment and control groups were constructed by implementing a propensity score matching technique. Comparing the propensity score distributions for

treated and non-treated firms revealed that treated microfirms differ substantially from their non-subsidized counterparts in the number of applications for subsidy made before. This means that microenterprises that asked subsidies more often in the previous years are more likely to receive the treatment. The main implication of this finding is that the program effect cannot be estimated for the whole sample of treated firms and must be confined to the sub-set of treated firms for which comparable untreated ones are available.

The results from econometric analysis suggest that subsidies have not been able to improve firm performance or increase firm size in 2011. However, I found a positive effect of subsidies on the propensity to invest in training and in marketing and advertising in 2012. Because of the data limitations I cannot examine whether investment required by the program and investment in non-physical capital compliment each other and whether they have a multiple effect on firm performance in the following years.

The results obtained from the self-assessed impact survey on microenterprises suggest that about half of subsidized firms had their own internal resources necessary for financing investment. Furthermore, for the half of beneficiaries the policy was unsuccessful in reinforcing additional investment even if the least rigorous definition of additionality is used. When I restrict the definition of additionality only to those investments that would have not been feasible in the absence of the policy because of the presence of financial constraints, only 20 percent of subsidized microenterprises might be deemed as those that made additional investment due to receiving the subsidies. This suggests that the subsidies under Law 6/99 were quite easy to receive and the policy had little effect on pushing entrepreneurs to start more investment projects.

Several policy implications can be derived from my thesis. First, the policy design should be based on highly selective mechanisms in order to avoid wasting of public funds. Without careful firms' scanning, policy implementation might distort the post-entry market selection of the most efficient entrepreneurs. Second, policy makers have to change constantly the eligibility criteria and need to impose restrictions on the amount of possible subsidy applications. Otherwise, receiving public

subsidies can be pursued as a goal by granted firms. Finally, my results suggest that policies aimed to foster entrepreneurship education can be considered as an essential instrument of government intervention. In particular, entrepreneurship education can prevent from excess entry of overconfident entrepreneurs by a means of reduction of talent misperception by individuals.

Bibliography

Adorno, V., Bernini, C., and Pellegrini, G. (2007). The impact of capital subsidies: New estimations under continuous treatment. *Giornale degli Economisti, Giornale degli Economisti e Annali di Economia, 66*(1), 67-92.

Aghion, P., Bloom, R., Blundell, R., Griffith, R., and Howitt, P. (2005). Competition and innovation: An inverted-u relationship. *The Quarterly Journal of Economics, 120*(2), 701-728.

Aghion, P., and Bolton, P. (1997). A theory of trickle-down growth and development. *The Review of Economic Studies, 64*(2), 151-172.

Angelini, P., and Generale, A. (2008). On the evolution of firm size distributions. *The American Economic Review, 98*(1), 426-438.

Ashenfelter, O. (1978). Estimating the Effect of Training Programs on Earnings. *Review of Economics and Statistics, 60*(1), 47-57.

Ashenfelter, O., and Card, D. (1985). Using the longitudinal structure of earnings to estimate the effect of training programs. *The Review of Economics and Statistics*, *67*, 648-660.

Astebro, T., Jeffrey, S. A., and Adomdza, G. K. (2007). Inventor perseverance after being told to quit: The role of cognitive biases. *Journal of Behavioral Decision Making, 20(3)*, 253–272.

Axelrod, R., and Tesfatsion, L. (2006). A guide for newcomers to agent-based modeling in the social sciences. In Tesfatsion, L., and Judd, K. (Eds.), *Handbook of computation Economics.II. Agent-based Computational Economics* (pp. 1647–1659). Amsterdam, NL: North Holland.

Balloni, V., and Iacobucci, D. (2004). Alcuni considerazioni sul "ritardo" dell'industria Italiana. *L'Industria, 4*, 639-653.

Bank of Italy (2005). Survey of Industrial and Service Firms (Year 2003). 55.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, *17*(1), 99-120.

Bartik, T, (2005). Solving the problems of economic development incentives. *Gatton College of Business and Economics, University of Kentucky*, *36*(2), 139-166.

Bartik, T., and Bingham, R. (1995). Can economic development programs be evaluated? (Working Paper No. 95-29) Retrieved from:

http://research.upjohn.org/cgi/viewcontent.cgi?article=1046&context=up_workingpapes.

Baron, A. R. (1998). Cognitive mechanisms in entrepreneurship: Why and when entrepreneurs think differently than other people. *Journal of Business Venturing, 13*, 275–294.

Beck, T., Klapper, L., and Mendoza J. C. (2010). The typology of partial credit guarantee funds around the World. *Journal of Financial Stability*, *6*(1), 10-25.

Becker, S.O., and Ichino, A. (2002). Estimation of average treatment effects based on propensity scores. *The Stata Journal, 2*(4), 358-377.

Bénabou, R., and Tirole, J. (2002). Self-confidence and personal motivations. *The Quarterly Journal of Economics, 117*(3*),* 871-915.

Bergstrom, F. (2000). Capital subsidies and the performance of firms. *Small Business Economics, 14*(3), 183-193.

Bianchi, P., Labory, S., and Pontarollo, E. (2010). Industrial policy in Italy viewed through the journal L'Industria. *Revue d'économia industrialle, 129-130*, 348-370.

Blanes J.V., and Busom I. (2004). Who participates in R&D subsidy programs? The case of Spanish manufacturing firms. *Research Policy*, *33(*10), 1459-1476.

Block, J.H., Kohn, K., Miller, D., and Ullrich, K. (2015). Necessity entrepreneurship and competitive strategy. Small Business Economics, 44(1), 37-54.

Boeker, W. (1988). Organizational origins: entrepreneurial and environmental imprinting at time of founding. *Ecological Models of Organizations*, edited by Glenn Carroll. Cambridge: Ballinger. p. 33–51.

Bondonio, D. (2012). Counterfactual impact evaluation of cohesion policy: Impact and cost-effectiveness of investment subsidies in Italy. Final Report to DG Regional Policy

"Counterfactual Impact Evaluation of Cohesion Policy. Work Package 1: Examples from Enterprise Support" Contract n° 2010.CE.16.B.AT.042.

Bondonio, D., and Geenbaum, R. (2006). Do business investment incentives promote employment in declining areas? Evidence from EU Objective-2 Regions. *European Urban and Regional Studies*, *13*(3), 225-244.

Bronzini, R., and De Blasio, G. (2006). Evaluating the impact of investment incentives: The case of the Italy's Law 488/1992. *Journal of Urban Economics*, *6*(2), 327-349.

Bryson, A., Dorsett, R., and Purdon, S. (2002). The use of propensity score matching in the evaluation of labour market policies (Working Paper No. 4). Retrieved from:http://eprints.lse.ac.uk/4993/.

Burke, A., van Stel, A., and Thurik, R. (2009). Blue ocean versus competitive strategy: Theory and evidence. EIM SCALES Research Report H200801, EIM: Zoetermeer.

Burmeister, K., and Schade, C. (2007). Are entrepreneurs' decisions more biased? An experimental investigation of the susceptibility to status quo bias. *Journal of Business Venturing, 22*(3), 340–362.

Busenitz, L., and Barney, J. (1997). Differences between entrepreneurs and managers in large organizations: Biases and heuristics in strategic decision-making. *Journal of Business Venturing 12*, 9-30.

Caliendo, M., and Kopeinig, S. (2008). Some practical guidance for the implementation of propensity score matching. *Journal of Economic Surveys*, *22*(1), 31-72.

Camerer, C., and Lovallo, D. (1999). Overconfidence and excess entry: An experimental approach. *American Economic Review 89*, 306-318.

Cannari, L., D'Aurizio, L., and De Blasio, G. (2006). The effectiveness of investment subsidies: Evidence from survey data. Bank of Italy Occasional Paper, 4. Retrieved from: http://dx.doi.org/10.2139/ssrn.1014556.

Cantner, U., and Pyka, A. (1998). Absorbing technological spillovers: Simulations in an

evolutionary framework. *Industrial and Corporate Change*, *7*(2), 369-397.

Carr, J.C., and Blettner, D. P. (2010). Cognitive control bias and decision-making in context: Implications for entrepreneurial founders of small firms. *Frontiers of Entrepreneurship Research, 30*(6), 272-284.

Carter, N.M., Stearns, T.M., Reynolds, P.D. and Miller, B.A. (1994). New venture strategies: Theory development with an empirical base. Strategic Management Journal, 15(1), 21-41.

Caves, R. E., and Porter, M. E. (1977). From entry barriers to mobility barriers. *Quarterly Journal of Economics*, *91*, 241-261.

Cerqua, A., and Pellegrini, G. (2011). Are the subsidies to private capital useful? A multiple regression discontinuity design approach (Working Papers No. 12). Retrieved from: http://phdschool-economics.dse.uniroma1.it/website/.

Chen, M-J., and Hambrick, D. C. (1995). Speed, stealth, and selective attack: How small firms differ from large firms in competitive behavior. *Academy of Management Journal, 38*(2), 453-482.

Chen, M-J., Smith, K.G., and Grimm, C.M. (1992). Action characteristics as predictors of competitive responses. *Management Science*, *38*(3), 439-455.

Chernatorty, L., De Daniels, K., and Johnson, G. (1993). A cognitive perspective on managers' perception of competition. *Journal of Marketing Management*, *9*, 373- 381.

Clark, B.H., and Montgomery, D.B. (1999). Managerial identification of competitors. *Journal of Marketing, 63*(3), 67-83.

Cohen, W. H., and R. Levin (1989). Empirical studies of innovation and market structure. In R. Schmalensee and R. Willig (Eds.), *The Handbook of Industrial Organization* (pp.1060–1107). North-Holland: Elsevier.

Cooper, A.C., Woo, C.Y., and Dunkelberg, W.C. (1988). Entrepreneurs perceived chances for success. *Journal of Business Venturing 3*, 97-108.

Covin, J.G., and Slevin, D.P. (1989). Strategic management of small firms in hostile and benign

environments. *Strategic Management Journal, 10,* 75–87.

Criscuolo, C., Martin, R., Overman, H., and Van Reenen, J. (2012). The Causal Effects of an
Industrial Policy (NBER Working Papers No. 17842). Retrieved from:
http://www.nber.org.

Daft, R.L., and Weick, K.E. (1984). Toward a model of organizations as interpretation systems.
Academy of Management Review, *26*, 207-224.

D'Amboise, G. (1993). Do small businesses manifest a certain strategic logic? An approach for
identifying it. *Journal of Small Business and Entrepreneurship, 11*(1), 8-17.

D'Aurizio L., and De Blasio, G. (2008). La valutazione degli incentive agli investimenti. In De
Blasio, G., and Lotti, F. (Eds.), *La valutazione degli aiuti alle imprese* (pp. 59-96)
Bologna, IT: Societa editrice il Mulino.

Davidsson, P., and Honig, B. (2003). The role of social and human capital among nascent
entrepreneurs. *Journal of BusinessVenturing, 18*, 301–331.

Dawid, H. (2006). Agent-based models of innovation and technological change. In
Tesfatsion, L., and Judd, K. (Eds.), *Handbook of computation Economics.II. Agent-
based Computational Economics* (pp. 1235-1272). Amsterdam, NL: North Holland.

De Bondt W.F.M., and Thaler, R.H. (1994). Financial decision-making in markets and firms: A
behavioral perspective (Working paper No. 4777). Retrieved from:
http://www.nber.org/papers/w4777.pdf.

Dean, T., Brown, R., and Bamford, R. (1998). Differences in large and small firm responses to
environmental context: Strategic implications from a comparative analysis of business
formations. *Strategic Management Journal*, *19*, 709–728.

Delli Gatti, D., Di Guilmi, C., Gaffeo, E., Giulioni, G., Gallegati, M., and Palestrini, A. (2005).
A new approach to business fluctuations: heterogeneous interacting agents, scaling laws
and financial fragility. *Journal of Economic Behavior & Organization, 56*, 489–512.

De Long, J. B., and Summers, L. H. (1991). Equipment investment and economic growth. *The*

Quarterly Journal of Economics, 106, 445-502.

Dess, G.G., and Davis, P.S. (1984). Porter's (1980) generic strategies as determinants of strategic group membership and organizational performance. *Academy of Management Journal*, *27*, 467-488.

DeTienne, D.R., and Cardon, M. S. (2012). Impact of founder experience on exit intentions. *Small Business Economics, 38(4),* 351-374.

DeTienne, D.R., McKelvie, A., and Chandler, G.N. (2012). The impact of motivation, innovation, and causation and effectuation approaches on exit strategies. Paper presented at Academy of Management Annual Meeting, Boston, MA.

Dosi, G., Fagiolo, G., and Roventini, A. (2006) "An evolutionary model of endogenous business cycles", *Computational Economics, 27*, 3-34.

Dosi, G., Fagiolo, G., and Roventini, A. (2008). The microfoundations of business cycles: an evolutionary, multi-agent model. *Journal of Evolutionary Economics*, *18*, 413–432.

Dosi, G., Fagiolo, G., and Roventini, A. (2010). Schumpeter meeting Keynes: A policy-friendly model of endogenous growth and business cycles. *Journal of Economics and Control*, *34*, 1748-1767.

Dosi, G., and Lovallo, D. (1995). Rational entrepreneurs or optimistic martyrs? Some considerations on technological regimes, corporate entries, and the evolutionary role of decision biases (Working paper No. 95-077). Retrieved from: http://webarchive.iiasa.ac.at/Admin/PUB/Documents/WP-95-077.pdf.

Duch, N., Montolio, M., and Mediavilla, M. (2007). Evaluating the impact of public subsidies on a firm's performance: a quasi-experimental approach (XREAP Working Paper No. 2007-7). Retrieved from: http://ssrn.com/abstract=1847600 or http://dx.doi.org/10.2139/ssrn.1847600).

EURACE 'An Agent-based Software Platform for European Economic Policy Design with

Heterogeneous Interacting Agents: New Insights from a Bottom Up Approach to
Economic Modeling and Simulation'. Retrieved from: http://www.eurace.org//.

Eurostat - Statistics Explained: Business economy - size class analysis (2013 ed.). Retrieved
from December, 2, 2014 Statistics http://epp.eurostat.ec.europa.eu/statistics_explained/

Federation of Small Businesses (FSB). (2011). Micro and small business in the EU: What's in it
for you? London, UK: Federation of Small Businesses. Retrieved November 3, 2014,
from www.fsb.org.uk.

Forbes, D. P. (2005). Are some entrepreneurs more overconfident than others? *Journal of Business
Venturing, 20*, 623-640.

Frank, M. Z. (1988). An Intertemporal Model of Industrial Exit. *Quarterly Journal of Economics,
103*, 333-344.

Fraser, S., and Greene, F. J. (2006). The Effects of experience on entrepreneurial optimism and
Uncertainty. *Economica, 73*(290), 169-192.

Gabriele, R., Zamarian, M., and Zaninotto, E., (2006, August). *The economic impact of regional
industrial policies: An empirical research*. Paper presented at the 33rd Conference of
the Association for Research in Industrial Economics, Amsterdam, NI. Retrieved from:
https://www.bancaditalia.it/studiricerche/convegni/atti/politiche_sviluppo_locale/caso_trentin
o/Gabriele.pdf.

Gatignon, H., and Reibstein, D.J. (1997). Creative strategies for responding to competitive actions.
In Day, G. S. and Reibstein, D.J. (Eds.), *Wharton on Dynamic Competitive Strategy* (pp.
237-255). New York, NY: Wiley.

Gertler, P.J., Martinez, S., Premand, P., Rawlings, L.B., and Vermeersch, C. M. J. (2011). *Impact
evaluation in practice*. Washington, DC: The World Bank.

Gibcus, P., and Kemp, R.G.M. (2003). Strategy and small firm performance. EIM SCALES
Research Report H200208, EIM: Zoetermeer.

Gilbert, N., Pyka, A., and Ahrweiler, P. (2001). Innovation networks – a simulation approach.

Journal of Artificial Societies and Social Simulation, *4*(3), *8*.

Goolsbee, A. (1998). Taxes, organizational form, and the deadweight loss of the corporate income tax. *Journal of Public Economics, 69*(1), 143-152.

Greenwald, B., and Stiglitz, J. (1990). Macroeconomic models with equity and credit rationing. In: Hubbard, R. (Eds.), Asymmetric Information, Corporate Finance, and Investment (pp.15-42). Chicago, IL: Chicago University of Chicago Press.

Greenwald, B., and Stiglitz, J. (1993). Financial markets imperfections and business cycles. *Quarterly journal of Economics, 108*, 77–113.

Grieco, D., and Hogarth, R. (2004). Excess entry, ambiguity seeking and competence: An experimental investigation (Economics Working Papers No. 778). Retrieved from: http://www.econ.upf.edu/docs/papers/downloads/778.pdf.

Grilli, L., Jensen, P. H., and Murtinu, S. (2013). The imprinting of founders' human capital on entrepreneurial venture growth: Evidence from new technology-based firms (Working Paper No. 14/13). Retrieved from http://www.melbourneinstitute.com/.

Gudmundsson, S.V., and Lechner C. (2013). Cognitive biases, organization, and entrepreneurial firm survival. *European Management Journal, 31*(3), 278-294.

Gysler, M., Kruse, B.J., and Schubert R. (2002). Ambiguity and gender differences in financial decision making: An experimental examination of competence and confidence effects (Working paper No. 02/23). Retrieved from: http://www.cer.ethz.ch/research/wp_02_23_paper.pdf.

Hancock, D., Peek, J., and Wilcox, J. (2007). The repercussions on small banks and small business of bank capital and loan guarantees (Working paper No. 07-22). Retrieved from: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=973976.

Harris, R., and Trainor, M. (2005). Capital subsidies and their impact on total factor productivity: Firm-level evidence from Northern Ireland. *Journal of Regional Science, 45*(1), 49-74.

Heath, C., and Tversky, A. (1991). Preference and belief: Ambiguity and competence in

choice under uncertainty. *Journal of Risk and Uncertainty*, *4*, 5-28.

Heckman, J. (1978). Dummy endogenous variables in a simultaneous equation system. *Econometrica*, *46*, 931 - 959.

Heckman, J. (1990). Varieties of selection bias. *American Economic Review, 80*, 313-318.

Heckman, J. (1997). Instrumental variables: A study of the implicit assumptions underlying one widely used estimator for program evaluations. *Journal of Human Resources, 32*, 441-462.

Heckman, J., Ichimura, H., Smith, J., and Todd, P. (1996). Sources of selection bias in evaluating programs: An interpretation of conventional measures and evidence on the effectiveness of matching as a program evaluation method. *Proceedings of The National Academy of Sciences, 93*, 13416-13420.

Heckman, J., Ichimura, H., and Todd, P. (1997). Matching as an econometric evaluation estimator: Evidence from evaluating a job training program. *Review of Economic Studies, 64*, 605-654.

Heckman, J., Ichimura, H. and Todd, P. (1998). Matching as an econometric evaluation estimator. *Review of Economic Studies*, *65*(2), 261-294.

Heckman, J., LaLonde, R., and Smith, J. (1999). The economics and econometrics of active labor market programs. In O. Ashenfelter and D. Card (Eds.), *Handbook of Labor Economics*, (pp.1865-2097). Amsterdam, NI: Elsevier.

Hergert, M.L. (1983). The incidence and implications of strategic groupings in U.S. manufacturing industries. Unpublished doctoral dissertation, Harvard University, Cambridge, MA.

Heller, Y. (2014). Overconfidence and diversification. *American Economic Journal: Microeconomics*, *6*(1), 134-53.

Hirano, K., and Imbens, G. (2004). The propensity score with continuous treatment. In Gelman and Meng (Eds.) *Applied Bayesian modeling and causal inference from missing data perspective.* Ney York, NY: Wiley.

Holland, P. (1986). Statistics and Causal Inference. *Journal of the American Statistical Association*, *81*, 945 - 960.

Honohan, P. (2008). Partial Credit Guarantees: Principles and Practice (Working Paper No.iiisdp244). Retrieved from:

http://www.tcd.ie/iiis/documents/discussion/pdfs/iiisdp244.pdf.

Hopenhayn, H. A. (1992). Entry, exit, and firm dynamics in long run equilibrium. *Econometrica, 60*, 1127-1150.

Hunt, M. (1972). Competition in the major home appliance industry. Unpublished doctoral dissertation, Harvard University, Cambridge, MA.

Hvide, H.K., and Panos, G.A. (2014). Risk tolerance and entrepreneurship. *Journal of Financial Economics*, *111*(1), 200-223.

Hytti, U. (2005). New meanings for entrepreneurs: from risk-taking heroes to safe-seeking professionals. *Journal of Organizational Change Management, Special Issue: Change in the Feminine: Women in Change, 18*(6), 594–611.

Imai, K., and Van Dyk, D.A. (2004). Causal inference with general treatment regimes: generalizing the propensity score. Journal of the American Statistical Association, 99(467), 854-866.

Imbens, G. (2000). The role of Propensity score in estimating dose –response functions, *Biometrika,* 87, 706-710.

Januszewski, S.I., Koke, J., and Winter, J.K. (2002). Product market competition, corporate governance and firm performance: an empirical analysis for Germany. *Research in Economics, 56*, 299–332.

Jovanovic, B. (1982). Selection and the evolution of industry. *Econometrica, 50*, 649-670.

Kacker, P. (2009). Essays on plant-level productivity, market structure, and enterprise growth (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (AAT 3357497)

Kamien, M. I., and Schwartz, N. L. (1982). Market structure and innovation. New York, NY: Cambridge University Press.

Kang, J., Heshmati, A., and Choi, G. (2008). The effect of credit guarantees on survival and

performance of SMEs in Republic of Korea. *Small Business Economics*, *31(4),* 445-462.

Kahneman, D., and Lovallo, D. (1993). Timid choices and bold forecasts: A cognitive perspective

on risk taking. *Management Science, 39*, 17–31.

Kahneman, D., and Tversky, A. (1979). Prospect theory: An analysis of decision under risk.

Econometrica, *47*, 263–291.

Kautonen, T., and Palmroos, J. (2010). The impact of a necessity-based start-up on subsequent

entrepreneurial satisfaction. *International Entrepreneurship and Management Journal,*

6(3), 285–300.

Kemp, R.G.M., and Hanemaaijer, J.J. (2004). Perception of competition: A measurement of

competition from the perspective of the firm. EIM SCALES Research Report

H200406, EIM: Zoetermeer.

Kemp, R.G.M., and Verhoeven, W.H.J. (2002). Growth patterns of medium-sized, fast-growing

firms: the optimal resource bundles for organisational growth and performance. EIM

SCALES Research Report H200111, EIM: Zoetermeer.

Keynes J.M. (1936). *The General Theory of Employment, Interest and Money*. London, UK:

Macmillan.

Kiesler, S., and Sproull, L. (1982). Managerial response to changing environments: Perspectives on

problem sensing from social cognition. *Administrative Science Quarterly*, *27*, 548-570.

Kim, W.C., and Mauborgne, R. (2005). Blue ocean strategy: How to create uncontested market

space and make the competition irrelevant. Boston, MA: Harvard Business School Press.

Kirzner, I. M. (1973). *Competition and entrepreneurship*. Chicago, IL: University of Chicago Press.

Kirzner, I. M. (1979). *Perception, opportunity, and profit*. Chicago, IL: University of Chicago Press.

Khosla, S., and Sawhney, M. (2014). *Fewer, bigger, bolder: From mindless expansion to focused*

growth. USA: Portfolio Hardcover.

Knight, F. (1921). *Risk, uncertainty and profit*. Boston, MA: Houghton Mifflin Co.

Koellinger, P., Minniti M., and Schade, C. (2007). I think I can, I think I can: Overconfidence and entrepreneurial behavior. *Journal of Economic Psychology*, *28*, 502–527.

Langer, E.J., and Roth, J. (1975). Heads I win, tails it's chance: The illusion of control as a function of the sequence of outcomes in a purely chance task. *Journal of Personality and Social Psychology, 32*, 951-955.

Larrick, R.P., Burson K.A., and Soll, J. B. (2007). Social comparison and confidence: When thinking you're better than average predicts overconfidence (and when it does not). *Organizational Behavior and Human Decision* Processes, *102*, 76–94.

Leask, G., and Parnell, J.A. (2005). Integrating strategic groups and the resource based perspective: understanding the competitive process. *European Management Journal, 23*(4), 458–470.

Lechner, M. (2001). Identification and estimation of causal effects of multiple treatments under the conditional independence assumption. In Lechner and Pfeiffer (Eds.) *Econometrics evaluations of active labor market policies in Europe.* Heidelberg: Physica/Springer.

Lee, J.W. (1996). Government Intervention and Productivity Growth. *Journal of Economic Growth, 1*, 391-414.

Leitner, K.H., and Güldenberg, S. (2010). Generic strategies and firm performance in SMEs: A longitudinal study of Austrian SMEs. *Small Business Economics, 35*(2). 169-189.

Lenihan, H. (2004). Evaluating Irish industrial policy in terms of deadweight and displacement: A quantitative methodological approach. *Applied Economics*, *36*(3), 229-252.

Lichtenstein, S., and Fischhoff, B. (1977). Do those who know more also know more about how much they know? *Organizational Behavior and Human Performance, 20*, 159-183.

Mathias, B.D., Williams, D.W., and Smith, A.R. (2014). Entrepreneurial inception: The role of imprinting in entrepreneurial action. *Journal of Business Venturing, 30*, 11–28.

Mettler, A., and Williams, A.D. (2011). The Rise of the micro-multinational: How freelancers and technology-savvy start-ups are driving growth, jobs and innovation. *Lisbon Council Policy Brief, 5*(3).

Milanov, H., and Fernhaber, S.A. (2009). The impact of early imprinting on the evolution of new

  venture networks. *Journal of Business Venturing, 24*, 46-61.

Nickell, S.J. (1996). Competition and Corporate Performance. *The Journal of Political Economy,*

  104(4), 724-746.

Pack, H., and Saggi,K. (2006). The case for industrial policy: a critical survey (World Bank

  Policy Research Working Paper No. 3839). Retrieved from:

  http://wwwwds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2006/01/31/0000

  16406_20060131160754/Rendered/PDF/wps3839.pdf.

Pelham, A.M. (1999). Influence of environment, strategy, and market orientation on performance in

  small manufacturing firms. *Journal of Business Research, 45*, 33–46.

Pelham, A.M. (2000). Market orientation and other potential influences on performance in small and

  medium-sized manufacturing firms. *Journal of Small Business Management*, *38*(1), 48-67.

Polanyi, M. (1967). *The tacit dimension*. New York, NY: Garden City.

Porter, M.E. (1980). *Competitive Strategy: Techniques for analyzing industries and competitors*.

  New York, NY: Free Press.

Porter, M.E. (1981). The contributions of industrial organization to strategic management.

   Academy of Management Review, 6, 609–620.

Porter, M.E. (1991). Towards a dynamic theory of strategy. *Strategic Management Journal, 12*,

  95-117.

Riley, S. (2011). Market valuation of firm investments in training and human capital management

  (Unpublished doctoral dissertation). University of Illinois at Urbana-Champaign, Urbana,

  IL.

Rodrigues, A.F., Da Costa, J.N., and Da Silva, S. (2011). Overconfidence and excess entry: A

  comparison between students and managers. *Economics Bulletin, 31*(3), 2549-2557.

Rodrik, D. (2007). *One economics, many recipes: globalization, institutions, and economic growth*.

  Princeton, NJ: Princeton University Press.

Rosenbaum, P., and Rubin, D.B. (1983). The central role of the propensity score in

observational studies for causal effects. *Biometrika, 70*(1), 41-55.

Roy, A. (1951). Some thoughts on the distribution of earnings. *Oxford Economic Papers, 3*,

135 - 145.

Rubin, D. (1974). Estimating causal effects of treatments in randomized and non-randomized

studies. *Journal of Educational Psychology, 66*, 666-701.

Russo, A., Catalano, M., Gaffeo, E., Gallegati, M., and Napoletano, M. (2007). Industrial dynamics,

fiscal policy and R&D: Evidence from a computational experiment. *Journal of Economic*

Behavior and Organization, 64(3-4), 426-447.

Salamouris, I.S. (2013). How overconfidence influences entrepreneurship. *Journal of*

Innovation and Entrepreneurship, 2(8), 1-6.

Santarelli, E., and Vivarelli, M. (2007). Entrepreneurship and the process of firms' entry, survival

and growth. *Industrial and Corporate Change, 16*(3), 455–488.

Schade, C., and Burmeister, K. (2009). Experiments on entrepreneurial decision making: A different

lens through which to look at entrepreneurship. *Foundations and Trends® in*

Entrepreneurship, 5(2), 81-134.

Scherer, F.M., and Ross, D. (1990). *Industrial market structure and economic performance*. Boston,

MA: Houghton Mifflin Company.

Schmolke, A., Thorbek, P., De Angelis, D., and Grimm, V. (2010). Ecological models supporting

environmental decision making: A strategy for the future. *Trends in Ecology and Evolution,*

25(8), 479–486.

Schumpeter, J. (1934). *The theory of economic development*. Cambridge, MA: Harvard University

Press.

Schwartz, G., and Clements, B. (1999). Government subsidies. *Journal of Economic Surveys, 13*(2),

119-148.

Simon, M., Houghton, S. M., and Aquino, K. (1999). Cognitive biases, risk perception, and

venture formation: How individuals decide to start companies. *Journal of Business Venturing, 15*, 113–134.

Shleifer, A., and Vishny, R. (2011). Fire sales in finance and macroeconomics. *Journal of Economic Perspectives, 25*(1), 29–48.

Shyti, A. (2013). Overconfidence and entrepreneurial choice under ambiguity (Working paper No. SPE-2013-982). Retrievd from: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2267968.

Slade, M.E. (2004). Market power and joint dominance in UK brewing. *Journal of Industrial Economics*, *52*(1), 133-163.

Snow, C.C., and Hrebiniak, L.G. (1980). Strategy, distinctive competence, and organizational performance. *Administrative Science Quarterly, 25*, 317–336.

Spanos, Y.E., and Lioukas, S. (2001). An examination into the causal logic of rent generation: Contrasting Porter's competitive strategy framework and the resource-based perspective. *Strategic Management Journal, 22,* 907-934.

Steenkamp, J-B.E.M., Nijs, V.R., Hanssens, D.M., and Dekimpe, M.G. (2005). Competitive reactions to advertising and promotion attacks. *Marketing Science, 24*(1), 35-54.

Taylor, S. E., and Brown, J. D. (1988). Illusion and well-being: A social psychological perspective on mental health. *Psychological Bulletin, 103*, 193–205.

Teach, R.D., and Schwartz, R.G. (2000). Methodology to study firms' strategies and performance over time. *Journal of Marketing Theory and Practice, 8*(3), 32- 40.

Tesfatsion, L. (2006). ACE: a constructive approach to economic theory. In Tesfatsion, L., and Judd, K. (Eds.), *Handbook of computation Economics.II. Agent-based Computational Economics* (pp. 832-880). Amsterdam, NL: North Holland.

Thiele, J.C., Kurth, W., and Grimm, V. (2014). Facilitating parameter estimation and sensitivity analysis of agent-based models: A cookbook using Netlogo and 'R'. *Journal of Artificial Societies and Social Simulation, 17*(3), 11.

Thistlethwaite, D., and Campbell, D. (1960). Regression-discontinuity analysis: An alternative to the ex post facto experiment. *Journal of Educational Psychology*, *51*(6), 309–317.

Tokila, A., Haapanen, M., and Ritsila, J. (2008). Evaluation of investment subsidies. When is deadweight zero? *International Review of Applied Economics*, *22*(5), 585-600.

Trivellato U. (2009). La valutazione degli effetti di politiche pubbliche: paradigma e pratiche (IRVAPP Working Paper No. 2009-01). Retrieved from:

https://irvapp.fbk.eu/sites/irvapp.fbk.eu/files/irvapp_working_paper_2009_01_0.pdf.

Van den Steen, E. (2011). Overconfidence by bayesian-rational agents. *Management Science, 57*(5), 884-896.

Venetoklis, T. (2002). Public policy evaluation: Introduction to quantitative methodologies (VATT Research Reports No. 90). Retrieved from:

http://www.vatt.fi/en/publications/latestPublications/publication/Publication_1345_id/4.

Waarts, E., and Wierenga, B. (2000). Explaining competitors' reactions to new product introduction: the roles of event characteristics, managerial interpretation, and competitive context. *Marketing Letters*, *11*(1), 67-79.

Walker, O. C., and Ruekert, R. W. (1987). Marketing's role in the implementation of business strategies: a critical review and conceptual framework. *Journal of Marketing, 45*, 15–33.

Zecchini, S., and Ventura, M. (2009). The impact of public guarantees on credit to SMEs. *Small Business Economics, 32*(2), 191-206.

Zhang, J. (2003). Growing Silicon Valley on a landscape: An agent-based approach to high-tech industrial clusters. *Journal of Evolutionary Economics*, *13*, 529–548.