The impact of hard and soft policy measures on new technology-based firms

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Abstract

Entrepreneurship policies in support of new technology-based firms fall into two main categories of intervention: *hard measures* (financial-type support such as loans and grants) and *soft measures* (counselling and business advice services). This study investigates the association between hard and soft support measures delivered to entrepreneurs, and the performance of the subsequently constituted new technology-based firms. The empirical framework analyses the outcomes of the Spinner Programme – a regional policy measure implemented in the Italian region of Emilia-Romagna during 2000-2006. The analysis finds that soft measures are positively related to a higher probability of exiting the market and to higher sales growth. The results also show that the magnitude of the effect of soft measures on growth is greater than the effect of hard measures.

Keywords: new technology-based firms; start-up; regional policy; entrepreneurship policy; soft measures; Emilia-Romagna.

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1. Introduction

The creation of new technology-based firms (NTBFs) – defined as new firms in the high technology sector (Storey and Tether 1998) – is considered important for economic growth. NTBFs can contribute greatly to a region's economic performance (Donckels and Segers, 1990; Baptista and Leitão, 2015). However, various factors can act as barriers to, and constraints on, both their formation and growth. These factors operate at both the contextual level (e.g. Klapper et al., 2006) and the firm level (e.g. Colombo and Piva, 2012). Whether or not public intervention to remove (some of) these barriers is needed is still much debated (Henrekson and Stenkula 2010). This paper addresses this issue with a firm-level investigation that considers the relationship between access to public support for firm creation and post-entry performance.

Policies targeted on the creation of new firms are often referred to as 'entrepreneurship policies', and they differ from general small and medium enterprise (SME) policies. The former focus on the entrepreneur and the team of firm founders prior to firm establishment; the latter support already-established small firms (Storey, 2005). Economic studies distinguish between two main types of entrepreneurship and SME policy measures, defining them respectively as *soft measures* and *hard measures.* Hard measures provide assistance in the form of finance (loans and grants), while soft measures include counselling for entrepreneurs before or during the firm start-up phase, access to technology, and mentoring and advice on issues such as design and business management (Rigby and Ramlogan, 2013, p. 7).

While investigations on the effectiveness of SME policies now abound in the literature, empirical evaluations of entrepreneurship policies are scarce. In particular, there is a lack of investigation on the role that measures helping potential entrepreneurs have in developing managerial skills and capabilities. This applies especially to the realm of NTBFs, where entrepreneurs can often be technicians rather than managers or entrepreneurs.

This study investigates the association between hard and soft support measures delivered to entrepreneurs and team of founders, and the performance of the subsequently constituted NTBF. It addresses the following questions: How does receiving hard- and soft-support for firm creation relate with firm post-entry performance? Which of these two types of measures, if any, exerts the largest positive effect?

We analyse data from the Spinner Programme, a policy measure implemented in Italy in the Emilia-Romagna (ER) region during the period 2000-2006. The Spinner Programme was the first Global Grant in Europe implemented by the European Social Fund. It provided support to potential founders of high-tech firms by integrating both financial aid (hard measure) and business advice in the form of mentoring services and access to specific consultancy services (soft measure). Awarded firms received services, such as training, within the same contextual framework.

This study contributes to the literature on entrepreneurship policy. First, we assess the distinct effects of hard and soft measures on firm performance measured as firm survival and growth. Only a few works analyse soft measures, and most of them refer to SMEs policies (Wren and Storey, 2002; Mole et al., 2009). Moreover, we are able to investigate how these measures relate to firms' post-entry performance in a longitudinal analysis that spans a relatively extended time frame. The empirical part of our analysis exploits an original longitudinal dataset. Through event history and panel firm-level fixed effects models, we estimate the relationship between having received hard and/or soft policy measures and the survival and growth of NTBFs. Our findings reveal that soft measures are positively related to firms' sales growth and negatively related to firms' survival. The paper is organised as follows. Section 2 reviews the literature on NTBFs. Section 2.1 analyses the factors considered to be correlated with higher NTBF performance, and how policies have attempted to overcome the various kinds of market failure relevant to the case of NTBFs. Section 2.2 describes the Spinner Programme in detail. Section 3 presents the empirical analysis, and Section 4 makes some concluding remarks and discusses some policy implications.

2. Policy support for NTBFs' survival and growth

2.1 NTBF policy

New-born firms generally exhibit high rates of failure (Bartelsman et al. 2005) and poor growth performance (Shane 2008; Mason and Brown 2013). However, NTBFs are found to outperform less innovative firms (Almus and Nerlinger 1999). Many NTBFs exit the market at the beginning of their life cycle, when they are still young and small organisations. Research shows also that there are several factors that act as barriers to the growth of NTBFs, and contribute to their exit (Clarysse and Bruneel 2007). Entrepreneurship policies generally aim to stimulate and support individuals in (successfully) creating their own businesses (Henrekson and Stenkula 2010). The rationale for their implementation is linked to problems derived from asymmetry of information (Rigby and Ramlogan 2013), and it specifically concerns the different attitudes of entrepreneurs and investors towards business ideas (Audretsch et al. 2007). This in turn restricts access by young and small firms to capital and thus hinders entrepreneurial performance (van Praag et al. 2005).

The fragility of NTBFs together with recognition of their high potential for innovation have stimulated economic research on the factors that affect their creation, survival and performance. Studies have identified the following factors: financial constraints generated by capital market imperfections (Carpenter and Petersen 2002a, 2002b; Colombo and Grilli 2005); the degree of entrepreneurialism and the individual characteristics of those starting a business (OECD 2010); firms' access to knowledge externalities (Audretsch and Lehmann 2005; Rodriguez-Pose and Refolo 2003; Varga 2000); local economic and social characteristics (Klapper et al. 2006); availability and

quality of support infrastructures (Di Gregorio and Shane 2003; Fini et al. 2009); the level of awareness among young people of the potential benefits of creating a venture (Storey 2005).

The difficulties that small firms face when searching for and trying to attract financial resources have been thoroughly analysed in the literature (Clarysse and Bruneel 2007; Shane 2004). The provision of venture capital to firms has been seen as the main solution for NTBFs trying to bridge the so-called 'equity gap' (Wright et al. 2006). In support for this contention, there is evidence that financial resources promote the growth of NTBFs, and that investment can have positive effects on employment and sales (Bertoni et al. 2011).

Although financial constraints represent a major barrier to firms' constitution and growth, evidence on the benefits of entry-supporting policy measures seems contradictory. For instance, Santarelli and Vivarelli (2007, p. 473) argue against the provision of entry subsidies because they would reduce "the intrinsic differentials between ex-ante less efficient and more efficient new born firms, therefore distorting both market selection and the learning process that new founders have to undertake". Empirical evidence also points to the absence of a relationship between entry subsidies and firms' performance (Norrman and Bager-Sjögren, 2011).

Another important element in determining firm survival and growth is human capital (Colombo and Grilli 2005; Storey 1994): firms endowed with high-quality human capital outperform other firms. Education and work experience are generally found to be positively related to the likelihood of survival for new firms (see Bates 1990; Bruderl et al. 1992; Gimeno et al. 1997), and the capabilities of founders, reflected by their human capital characteristics, are key drivers of NTBFs' growth (Colombo and Grilli 2005; Bonaccorsi and Giannelli 2010). Human capital is also important for NTBFs' networking activity, which is crucial for acquiring the resources necessary for firm survival and growth (Gulati 1998). Knowledge and resources have several sources including the market (Clarysse and Bruneel 2007): for example, having already-established companies as partners is an advantage in the effort to build the capabilities required to manage a firm (Wright et al. 2004).

Recently, soft measures have been among the main policy tools implemented to overcome start-up problems. Soft measures mainly consist of business advice to entrepreneurs. Only a few studies have empirically investigated their impact within entrepreneurship policy: that is to say, when the advice is provided to potential entrepreneurs intending to create a firm. Oosterbeek et al. (2010) argue that training in entrepreneurship strengthens (or weakens) the intention among academic students to create a new business and to become an entrepreneur. This applies for example to the case of academic spin-offs[1], an important class of NTBFs where the set of resources and competences important for developing and growing the business may be lacking because of the non-profit oriented nature of universities (Rasmussen and Borch 2010; Rasmussen et al. 2011). Von Graevenitz et al. (2010) find that entrepreneurship education increases the ability of students to evaluate their capabilities, with the beneficial outcome of reducing their entrepreneurial intentions. Peterman and Kennedy

(2003) and Souitaris et al. (2007) conversely find that entrepreneurial education increases the entrepreneurial intentions of high school and university students.

Entrepreneurial education has been studied mostly in respect of the provision of advice regarding the entrepreneurial intentions of individuals. Other policies focus on the provision of advice so as to foster entrepreneurial knowledge in the pre-start-up phase. Coaching is a source of advice and can help the entrepreneur to identify needs and focus on objectives (Lambrecht and Pirnay 2005; Wren and Storey 2002). According to Kutzhanova et al. (2009), the development of entrepreneurial skills is a major determinant of business success, and coaching can enhance business capabilities.

Among the few studies investigating the effect of soft policy measures, the majority of them focus on already-established firms. Wren and Storey (2002) find that the private business advice provided through the UK Enterprise Initiative exerted an overall positive effect on firm survival and sales growth, but with different effects according to firm size. Specifically, these authors found that the measure had no impact on small firm survival but some positive impact on their sales growth. For medium-sized and large firms this positive effect extended also to their survival. Similarly, Mole et al. (2008) found that external advice provided by Business Link in England tends to exert a positive effect on employment growth, although the effect on sales growth is less clear.

Rotger et al. (2012) investigated the effect of providing "guided preparation" to entrepreneurs in the process of venture creation. They found that the provision of knowledge and advice exerted a generally positive effect on both survival and growth; however, the study was conducted across a short period of at most three years of growth. Norrman and Bager-Sjogren (2011) investigated the effect of a programme implemented in Sweden that provided either financial support or business advice to young innovative firms. Although they did not disentangle the different effects of those measures, they did not find a positive additionality effect on the selected firms.

The evidence in the literature seems to engender uncertainty about the role of financial subsidies; yet it also suggests that soft policy measures have a positive impact on firm performance. However, empirical evidence on the impact of soft measures on start-up performance is rather scarce; and in particular, to our knowledge, there are no studies that investigate the issue at the level of entrepreneurship policies targeted on promoting the creation of NTBFs. The present study takes a step toward filling this gap by investigating the effect of both soft and hard measures provided in the pre-start-up phase of an NTBF on its survival and growth performance.

In light of the arguments set out above, our analysis investigates the effect of a regional entrepreneurship policy programme implemented in Italy that provided both soft and hard support. Policy support for NTBFs is especially important in the case of Italy because studies have stressed the lack of policies encouraging technology transfer (ProInno-Europe)[2], and initiatives to support entrepreneurship/start-ups/spin-offs are rare in Italy compared with other industrialised countries (EC 2007). In 2001 the Italian Constitutional Law reform introduced the principle of subsidiarity (established in EU law by the 1992 Treaty of Maastricht), which gave regions formal legislative autonomy in several policy areas including innovation, technology transfer and scientific research. Since the reform, NTBF policy has been mostly a regional responsibility.

2.2 The Spinner Programme

The ER region of Italy is an innovation follower according to the Regional Innovation Scoreboard classification (EC 2014), and it is one of the richest regions in Europe based on GDP. Within Italy, ER is a leading region on all the main innovation indicators such as intramural R&D expenditure and personnel involved in R&D functions (MSE 2009), and also in terms of government quality (Rodríguez-Pose and Garcilazo 2015). ER also ranks high for technology transfer from university to industry as measured by numbers of university patents and licenses, and spin-offs created (Netval 2011; Rizzo, 2015). Under the third objective of the European Social Fund (ESF), in 2000 the ER region launched the Spinner Programme to promote employment in research and technology (Ramaciotti et al. 2011).

The ER regional administration created a Spinner Consortium to manage regional funds to support the development of human capital in research- and technology-intensive sectors (POR 2007). The objectives of this initiative were to increase the number of well-qualified human resources working in R&D and technology transfer, and to enhance the region's entrepreneurial culture and knowledge economy. The aim was to exploit the region's research infrastructure and technological potential to increase regional competitiveness and encourage networking among universities, public research centres and the business sector. A key aspect of the initiative was the creation of strong networks of research organisations and a regional network of eight 'Spinner Points' staffed with dedicated personnel. The responsibility of the Spinner Points was to act as 'one-stop shops' providing an integrated supply of financial aid services (scholarships, financial incentives), advice and assistance, tutoring in business ideas development, and training to improve human capital by upgrading skills. Spinner Points benefited from a pool of external specialists whose role was to provide bespoke advice to the teams of founders.

The Programme invested over 8 million euros to support NTBF creation, with around 5 million euros used to provide financial subsidies and 3 million euros allocated to firms for coaching, training and consultancy services (Spinner 2007). The Programme was designed in two steps: a first step in which all proposals were evaluated; and a second one in which Spinner Points, together with the external specialists, assisted the awarded teams of founders in developing their ideas for the market. The Programme received 367 business ideas, 197 of which were awarded and 80 developed into a firm (Spinner 2007). Figure A1 in the appendix depicts the Spinner process.

In Italy the exploitation of job opportunities via new venture creation is not a common practice (Impresa Lavoro 2014). Italy lags behind other countries in the number of initiatives supporting NTBFs (Colombo and Grilli 2006) owing to a lack of both direct financial support and soft support measures.

The Spinner Programme supported the creation of new ventures by providing direct monetary grants and specific complementary services in the form of mentoring to firm founders. Monetary grants were intended to provide the team of founders with an income for a period of at most one to two years, so that they could conduct a feasibility study of the business idea. The purpose of these financial subsidies was not to substitute

private investments or venture capital funding, but instead to cover the labour costs during the pre-start-up phase, and thus allow the team of funders to assess the viability of their business idea.
Mentoring services consisted in the provision of business advice to the team. Through this measure the team received vouchers to spend on the acquisition of various advice services delivered by specialists accredited by the Spinner Consortium. Such services involved advice on, for instance, intellectual property rights, market surveys, technical and commercial training, and network-related activities.
The distribution of the financial support was determined on the basis of the business needs identified by the founding team together with a Spinner tutor and the Spinner-accredited external specialists. On this basis, the team selected the type of services to acquire, and how many resources to allocate to those services. The team of founders received both types of supporting grants for one or two years, depending on the project's specificities. Within the same one or two-year period of policy support the team also constituted the firm. In other words, the policy support occurred in the pre-start-up phase, and continued at most for two years after the firm's constitution.

3. Empirical analysis

3.1 Data

The empirical analysis seeks to investigate the relationship between hard and soft measures provided by the Spinner Programme and the firms' post-entry performance. The population of firms supported by Spinner consists of 80 firms established during the period 2000-2007.[3] Since 53 out of these 80 firms are academic spin-offs, we created a comparison group of non-recipient firms by selecting all the academic spin-offs established in the same region and in the same time frame without support from the Spinner Programme. Firms in the comparison group were established in the same region and in the same time frame, and had the possibility to apply for the Spinner support but either did not do so or were not chosen to receive support. Rigorous matching is often hampered by a lack of specific data, a problem that is especially present in the context of NTBFs. In light of this high proportion of academic spin-offs in the new ventures supported by Spinner, we rely on the remaining population of spin-offs to create the group of non-recipient firms. Data on the population of academic spin-offs were obtained through "Spinoff-Italia", a database created in 2014 to map Italian academic spin-offs (Netval 2015), and managed by the Italian Network for the Valorisation of Public Research (Netval).
We collected firm survival and performance data from the year of the firm's constitution to 2012. The problem of missing observations was addressed by retaining only those firms for which we were able to observe significant 'years of good data', following suggestions in the literature (Coad and Rao 2011: 263). The final dataset is an unbalanced panel of 94 firms: 63 start-ups supported by Spinner including 53 academic spin-offs, and 31 academic spin-offs created without Spinner support.

3.2 Method and variables used in the analysis

In line with previous studies on NTBFs, we measure their performance using three main indicators: employment growth, sales growth (Clarysse et al. 2011; Colombo and Grilli 2010; Wennberg et al. 2011) and survival (Wennberg et al. 2011). To measure the influence of the Spinner initiative on firm survival, we use 'event history' analysis: EXIT is a dummy variable equal to 1 if firm *i* at time *t* ceased its activity. Following studies on similar issues (e.g. Wennberg et al. 2011), we employ a Cox regression (Jenkins 2005). This specification does not require the ex-ante imposition of a 'hazard function'; however, it does require the model to be adjusted to take account of the presence of tied events. To address this issue, we applied the traditional Breslow adjustment (Jenkins 2005).[4] In order to assess the relationship between sales and employment growth and hard and soft policy measures, we rely on estimation of a panel data model with firm-level fixed effects. Adopting a fixed effect model makes it possible to mitigate the endogeneity problem arising from the presence of time-invariant unobserved heterogeneity that may derive from firm-specific unobservable characteristics, such as entrepreneurial ability. More formally, we are interested in estimating the following relationship:

$$Growth_{it+1} = \beta_1 SoftMeasure_{it} + \beta_2 HardMeasure_{it} + \gamma \boldsymbol{Z}_{it} + \eta_i + \delta_t + \varepsilon_{it}$$

where $\boldsymbol{Z}_{it}$ is a vector of firm-specific control variables; η_i denotes the time-invariant unobserved firm-specific effects, δ_t are time dummies and ε_{it} is the error term. The parameters we are interested in estimating are β_1 and β_2 and represent the coefficients underlying the relationship between the two different policy measures and firms' growth.

Data on sales were collected from Bureau van Dijk database and the Chamber of Commerce Business Register; data on employees were gathered from the ASIA database produced by the Italian National Statistical Office (ISTAT), which reports the annual number of full time employees.[5] Growth of sales and employees are calculated as the difference between the logarithm of sales/employees at year *t+1* and the logarithm of sales/employees at year *t* (Coad and Rao 2006; Coad 2010; Wennberg et al. 2011). Data on firm exit were collected from the ASIA dataset. Among the sample of 94 firms, 12 firms had ceased to exist by the end of 2012. We controlled for mergers and acquisitions by checking the Chamber of Commerce Business Register, which provides information on exit paths. We found no evidence of this activity for our sample.

A description of the variables used in the analysis is presented in Table 1. The main variables of interest for our empirical analysis are those controlling for the effect of Spinner on firm survival and growth. We use two continuous variables to control for the amount of financial subsidy (SUBSIDIES) and grants for services (MENTORING). These two continuous variables represent the monetary amounts that the teams of founders, in consultation with a Spinner tutor, decided to allocate as direct monetary subsidies, or as payment for the provision of external consultancy and coaching services. The former subsidises the team's labour costs to conduct a feasibility study of the business idea; the latter, MENTORING, represents the monetary allocation that each team of founders

decided to spend on the acquisition of coaching, training and specific external consultancy services of various types.

Financial and mentoring subsidies, as detailed in the previous section, were provided before the firms' constitution and lasted for a period of one or two years, during which the team of founders constituted the firm. Given the nature of SUBSIDIES to represent an income-substitution grant for one or two years, we construct a variable that takes the value of the entire amount of funding in the first year after constitution, half the value in the second year and becomes zero from the third year onward.

Conversely, the amount of money invested in mentoring services can be considered as an acquisition of know-how that exerts its effect also once Spinner support is terminated, because it can be associated with the training of human capital. Training is considered to be subject to high levels of depreciation, also due to changes in skills needs within companies: as a consequence its rate of depreciation is estimated at around 50% per year (Carriou and Jeger 1997; Greenhalgh 2002). We therefore apply a depreciation rate of 50% a year to the MENTORING variable; however, we also tried applying different depreciation rates (of 20% per year) and the results hold.[6]

This construction of the variable proxying mentoring services makes it interesting to investigate whether the effects of these services may be moderated by the age of the firm, also conceptualised as the temporal distance between the acquisition of the mentoring and the growth performance of the firm. For this reason we run our model including the interaction effect between the variable 'age' and the mentoring variable.[7]

Other variables are included in the model to control for factors that, according to the literature on the topic, may influence firm performance. These are meant to proxy technological capital, human capital and contextual characteristics (e.g. Colombo and Grilli 2010; Wennberg et al. 2011). To measure technological capital we collected data on the number of patent applications to the European Patent Office (EPO) by priority year. These data were collected from the Orbit Portal. Patents are important means to enable the protection and exploitation of technology in high-tech sectors, and academic spin-offs are often based on a patented invention (Mustar et al. 2008; Shane 2004). Drawing on various empirical works adopting patents as an exploratory variable, we constructed a variable of patent stock (PAT_ST) by applying a perpetual inventory method with a 15% depreciation rate, as suggested by Hall et al. (2005).[8] For human capital we consider the size of the firm's founding team and the size of the firm measured by the number of employees. A large founding team is associated with more competences and related to higher performance in NTBFs (Visintin and Pittino 2014; Ucbasaran et al. 2003), while the number of employees controls for the size of the firm (Coad and Rao 2010). Thus, we include in the specification the number of individual in the founding team (data source: Chamber of Commerce Business Register) and the number of employees (data source: ASIA, ISTAT).

In relation to NTBFs' social capital, there is evidence that having a firm as a shareholder has a positive influence on the capacity of the start-up to grow and develop (Wright et al. 2004). We gathered information on the participation of firms in our sample of NTBFs from the Chamber of Commerce Business Register. We constructed a dummy variable

(EQ_COMP) taking the value of 1 if shares of the firm in a certain year were held by other companies and 0 otherwise.
Finally, we control for the context in which the firm is embedded by including a variable reporting the number of patent applications per inhabitant to the EPO at the NUTS III territorial level. We also control for year differences by adding year dummies. In the event history analysis we also control for firms' industrial sector. Table 1 reports the variable descriptions. Tables 2[9] reports the descriptive statistics, while the correlation matrix is shown in Table A2 in the appendix.

<INSERT TABLE 1 HERE>
<INSERT TABLE 2 HERE>

3.3 Results

Before commenting on the results of the event history analysis presented in Table 3, it is worth noting that 10 of the 12 ceased firms received Spinner support. We may therefore expect Spinner to have had an impact on firms' exit. Moreover, the expectation that mentoring is positively associated with firms' exit seems to be confirmed by the fact that all of these 10 firms acquired some mentoring services.
The results of the event history analysis (Table 3) confirm this relationship. Given the fact that only two firms ceased within their first two years of life, we are not able to estimate the coefficient for the SUBSIDIES variable, which is present only for the first two years after firms' constitution. Therefore, we only test the specification with the MENTORING variable.
Given the low number of firms' exits, we first test the model by including in the specifications only the policy variable and the sectoral and time dummies (specifications 1 and 2 of Table 3). Then, in specifications 3 and 4, we add the other variables of interest. Moreover, we test each specifications first only on the Spinner Sample group of firms (specifications 1 and 3), and then on the full sample, which comprehend also the comparison group of non-recipient firms (specifications 2 and 4). The results show that MENTORING has a negative effect on firm survival. Thus, larger amounts of money spent on coaching services are related to a higher propensity to exit the market. In line with empirical works on similar topics, we note that exit is negatively related to the team size (Geroski et al. 2010), sales (Wenneberg et al. 2011), and the presence of equity companies. Patenting activity of the NUTS III region is conversely positively related to exit, and this may be due to higher levels of competition for NTBFs.
The negative relationship between MENTORING and survival receives similar evidence in Oberschachtsiek and Scioch (2015), who examine the effect of an entrepreneurship policy implemented in Germany and find that "training and coaching" support leads to a decrease in the recipient group's survival. They argue that: "external expertise may have tended to improve the ability to critically assess the business's future economic prospects (e.g., to avoid running into debt)" (Oberschachtsiek and Scioch 2015, p. 16). In other words, coaching services can lead the business team to acquire awareness of the

non-achievability of the business objectives. These results are also in line with those of studies that have found a negative relationship between entrepreneurial education and individual entrepreneurial intention (e.g. Von Graevenitz et al. 2010).

<INSERT TABLE 3 HERE>

The results for the effect of the Spinner initiative on firm growth are presented in Tables 4 and 5, which respectively report the results of the regressions testing the effect of MENTORING and SUBSIDIES on sales and employment growth. The coefficient of the variable MENTORING is positive and significant in respect to the growth of sales, while it is negative, though very close to zero, but not significant in relation to the growth of employees. Conversely, the sign of the variable SUBSIDIES is positive in respect to both the dependent variables, but emerges as significant only in specifications (2) and (5) of Table 4, that is, when regressed on sale growth and not in conjunction with the MENTORING variable. These results indicate that while the Spinner initiative seems to have no influence on employment growth (Table 5), mentoring services are a robust predictor of sales growth (Table 4), whereas the positive effect of financial incentives is significantly weaker. This result is also confirmed on comparing the magnitude of the two effects: with reference to the Spinner sample (specifications 1 and 2), an increase of one thousand euros in the MENTORING variable is associated with a 19 percentage point increase in the growth of sales, while the effect of SUBSIDIES is equal to only a 4 percentage point increase in growth sales. To be noted is that the financial support that we are analysing does not concern the provision of financial capital for the firm to start the business. It therefore does not aim to fill the financial constraints gap of NTBFs' early stages (Parker, 2009). It is important to bear this point in mind when reading our results, and the non-significance sign is to be expected given the type of financial incentives analysed.

Taking specification (6) of Table 4 as reference, we observe that increasing by one thousand euros the amount allocated by the team of founders to buying services leads to an average 17 percentage point increase in sales growth. This association is confirmed also when taking only Spinner Supported firms into consideration (specification 3). We also tested and rejected the null hypothesis of the two coefficients being equal (p-value of 0.07 in specifications 3 and 6): this indicates that once the team of founders has joined the Spinner Programme, having invested more resources in the acquisition of mentoring services leads to higher growth rates than those recorded if only subsidies have been received.

<INSERT TABLE 4 HERE>

<INSERT TABLE 5 HERE>

The results of the regressions on the two growth variables in which we interact the mentoring variable and the AGE variable are presented in Table A2 in the appendix. With respect to the growth of sales, there is no moderating effect of age on mentoring, and the MENTORING variable remains positive and significant independently of the age of the firm. Conversely, the effect of age moderates the relationship between mentoring and employees growth (specifications 3 and 4). More specifically, we can see that mentoring alone, when age is equal to zero, does not exert any significant effect.

Conversely, age negatively moderates the effect of mentoring on employment growth, indicating that the effect of mentoring on employment growth decreases over time.
Finally, in order to strengthen the validity of our results, we replicate the main specifications taking into consideration the population of regional academic spin-offs, in which 53 firms were supported by the Spinner Programme, and 31 were not. This allows us to conduct the regressions on a sample of overall 84 firms, in which there is a group of recipient firms and a consistent comparison group of non-recipient firms. The results are reported in Table A3 in the appendix and confirm the findings found in the previous specifications.
As a further robustness check we run our main specifications under alternative models. More specifically, we repeated our main specifications adopting two different models: first a generalised least square with random effects, and then a pooled OLS. These specifications are presented in Table A4: the results corroborate our findings.
Mentoring services are intended to enable an NTBF to acquire external knowledge on how to organise and manage its business. Accessing services from the market place can on the one hand reduce the costs of developing those services in-house and, on the other, contribute to developing entrepreneurial and managerial capabilities to be successful in the market place. Having invested higher resources in the acquisition of such services is robustly reflected in an average higher probability of exiting the market, and an average higher growth of sales. Its relationship with the growth of employees reveals that, on average, there is no significant correlation between having invested higher resources in mentoring services and this performance measure.
The negative relationship between receiving mentoring and firm survival may be interpreted in various ways, and further research is needed to gain better knowledge on how this relationship operates. Although it may be argued that these mentoring services do not work as expected given this relation with survival, their robust and positive relation with the growth of sales lead us to argue, following Oberschachtsiek and Scioch (2015), that exiting the market earlier in order to avoid resources waste is an efficient policy outcome.
It must be also said that mentoring services were not intended to support the firm to remain in the market, but to help it achieve initial successful product introduction. This may bias the acquisition of knowledge towards an initial positioning in the market, rather than supporting teams in reorganisation of the business once the firm has already entered the market (on the importance of this issue see e.g. Vohora et al., 2004). As said, further research could shed light on this important policy-level research question. However, the evidence provided in this study recognises the benefits that the Spinner Programme brought to supported firms in their early stages of development.

4. Concluding remarks

This study contributes to the scant empirical literature on the relationship between policy support and firms' performance. The objective of the policy studied – the Spinner

Programme implemented in the Emilia-Romagna region of Italy – was to increase the number of regional entrepreneurs through the valorisation of highly-qualified human capital in the R&D sector. This work has studied the distinct role of hard and soft policy measures within the Spinner Programme in relation not to its capacity to create entrepreneurs but instead to the post-entry performance of firms supported by the policy. This distinction is important because this study does not represent an evaluation of the Spinner programme *per se*; rather, it consists in an investigation of the post-entry performance of firms that have received the policy support. It importantly sheds light on the usefulness of hard and soft policy measures provided to potential and nascent entrepreneurs of high-tech firms.

Exploiting an original longitudinal dataset on NTBFs located in the Emilia-Romagna region, which participated in the Spinner Programme, we found that soft policy measures in the form of coaching and training, on the one hand, increase the probability of exiting the market, and on the other, contribute to higher sales growth. The results obtained therefore point to a positive relationship between the investment of more resources in mentoring services acquisition by the team of founders and the firm's post-entry performance. We also find a weak influence of financial support on the firm's performance. However, the financial support that we investigated was intended only to cover the one or two years of time spent on a feasibility study by the founders, not to resolve the firm's financial constraints. Moreover, an important finding of this study arises from the comparison between the role of soft and hard measures: our results show that soft-type support leads to growth rates higher than those yielded by hard-type support. Our results therefore add to the literature on entrepreneurship policies by showing that new ventures are likely to benefit more from support for potential entrepreneurs, and advice and training in how to run a business, than from an income-substitution monetary grant provided in order for the team to create a business.

Our analysis has various limitations. First, better data availability for a rigorous comparison group of non-recipient firms would have increased the strength of the results. Although our findings are robust to various specifications, analysis based on a randomly constructed control group derived from the population of regional NTBFs could provide further support for the results presented in this paper. Another limitation of the empirical analysis, which may have caused a bias in the results, concerns the sample of NTBFs analysed: unavailability of data for the full population of recipient and non-recipient firms constrained the analysis to 94 out of 117 firms (and 63 out of 80 policy-recipient firms).

However, our analysis is a first step in investigating the relationship between having received coaching services and firms' performance. Further research would add value to our findings, first of all by investigating in more detail the effects of the various types of services accessed by start-ups. It would be useful to know what types of counselling services proved more beneficial, and how they affected start-up performance. Moreover, regarding the negative relationship between receiving soft support and firm survival, it would be useful to investigate how soft-support measures influenced the decision processes that induced a team of founders to exit the market.

Finally, some words of caution are required in regard to the generalisability of our results. The Emilia-Romagna region's institutional framework is largely grounded on the presence of formal and informal relationships (Putnam 1993; Bianchi and Giordani, 1993). Moreover, this region, on the one hand, has for long been active in supporting SMEs and R&D activities (Bianchi and Ramaciotti 2005), and on the other, studies have shown the positive outcomes of those policy actions (e.g. Bronzini and Piselli 2016; Marzucchi et al. 2015, Antonioli et al. 2014). Although this paper argues in favour of the benefits of directing entrepreneurship policy intervention to providing potential entrepreneurs with the skills and capability to create and run a business, the recognised influence of good-quality government on policy outcomes (Rodríguez-Pose and Garcilazo 2015) calls for caution concerning the effectiveness of similar policies in different contexts.

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[1] Academic spin-offs are identified here as either firms in which the university retains an equity share or firms created by at least one permanent academic staff member (Netval 2011).

[2] http://ec.europa.eu/enterprise/index_en.htm

[3] As stated above, the Programme supported potential entrepreneurs for the period 2000 - 2006. However, some of the entrepreneurs who benefited from the support in 2006 constituted their firms in 2007.

[4] As a robustness check, we conducted a complementary log-log regression adopting various hazard rate functions (by including the log, square and cubic polynomial of time) which allowed us to model tied events in discrete time analysis (Jenkins 2005). The results were very similar to the Cox model; they are not reported here.

[5] The variable that we use is the total number of workers in the firm, given by the employees plus self-employed working in the firm. This variable is preferred to the employees one because it is (almost) never equal to zero, and this allow its transformation into a logarithm in order to construct the growth variable. This variable and the employees variable are correlated to a value of 0.98.

[6] The variable SUBSIDIES was also calculated in the same way as MENTORING: that is, by applying a depreciation rate of 50% (and of 20%) a year from the second year after the firm's constitution onward. Adopting this different calculation of the variable does not change the results that we present in the following section.

[7] We also tested for the presence of a combined effect of the two forms of policy support, MENTORING and SUBSIDIES, but did not obtain any significant result.

[8] Using the perpetual inventory method, we calculated patent stock by adopting the following formula: $K_t = K_{t-1}(1 - \delta) + P_t$ where K_{t-1} is the stock of patents at year *t-1*, δ is the depreciation rate assumed at 15% and P_t is the number of new patents in year *t*.

[9] Given the considerable presence of zeros in our continuous variables we were not able to transform our independent variables into logarithms without distorting their distribution. We however also ran the regressions transforming our independent non-dummy variables into logarithms: in order to avoid generating missing values in this transformation process, the continuous variables MENTORING and SUBSIDIES were transformed into logarithms plus 1, while variables PAT_ST and TEAM were transformed into logarithms plus a negligible value (0.00001). The results are very similar to those reported in the next section.

References

Acs, Z. J., Audretsch, D.B. (1992). *Innovation and small firms*. Cambridge, MA: MIT Press.

Almus, M., Nerlinger, E.A. (1999). "Growth of New Technology-Based Firms: Which Factors Matter?", *Small Business Economics*, 13, 141–154.

Antonioli, D., Marzucchi, A., Montresor, S. (2014). "Regional Innovation Policy and Innovative Behaviour: Looking for Additional Effects," *European Planning Studies*, 22(1), 64-83

Audretsch, D.B., Lehmann, E.E. (2005). "Does the knowledge spillover theory of entrepreneurship hold for regions?", *Research Policy* 34, 1191–1202.

Audretsch, D.B., Grilo, I., Thurik., A.R. (2007). *Handbook of research on entrepreneurship policy*. Cheltenham: Edward Elgar.

Baptista, R., Leitão J. (2015). *Entrepreneurship, human capital, and regional development..* Springer International Publishing Switzerland

Bartelsman E., Scarpetta S., Schivardi, F. (2005). "Comparative analysis of firm demographics and survival: evidence from micro-level sources in OECD countries", *Industrial and Corporate Change* 14, 365-391.

Bates, T. (1990). "Entrepreneur human capital inputs and small business longevity" *The Review of Economics and Statistics* 72, 551-559.

Bertoni, F., Colombo, M.G., Grilli, L. (2011). "Venture capital financing and the growth of high-tech start-ups: Disentangling treatment from selection effects" *Research Policy* 40(7), 1028–1043.

Bianchi, P., Giordani M. (1993). Innovation policy at the local and national levels: the case of Emilia-Romagna. *European Planning Studies* 1(1), 25-41.

Bianchi, P., Ramaciotti, L. (2005). Relationship between universities, research centers and district firms: the Italian case. In A. Quadrio Curzio & M. Fortis (Eds.), *Research and technological innovation. The challenge for a new Europe*. New York: Physica-Verlag.

Bonaccorsi, A., Giannangeli, A., (2010). "One or more growth processes? Evidence from new Italian firms", *Small Business Economics*, 35:137–152.

Bronzini, R., Piselli, P. (2016). "The impact of R&D subsidies on firm innovation", *Research Policy*, 45(2), 442-457.

Brüderl, J., Preisendorfer, P., Ziegler, R. (1992). "Survival chances of newly founded business organizations", *American Sociological Review*, 72, 227–242.

Carpenter, R.E., Petersen, B.C., (2002a). "Capital market imperfections, high-tech investment, and new equity financing", *The Economic Journal*, 112, F54–F72.

Carpenter, R.E., Petersen, B.C., (2002b). "Is the growth of small firms constrained by internal finance?", *Review of Economics and statistics* 84, 298-309.

Carriou Y., Jeger, F. (1997) "La Formation Continue dans les Entreprises et son Retour sur Investissement", *Economie et Statistique*, 45-58

Clarysse, B., Bruneel, J. (2007). "Nurturing and growing innovative start-ups: the role of policy as integrator", *R&D Management*, 37, 139–149.

Clarysse, B., Wright, M., Van de Velde, E. (2011). "Entrepreneurial Origin, Technological Knowledge, and the Growth of Spin-Off Companies" *Journal of Management Studies* 48:6, 1420-1442.

Coad, A., (2010). "Exploring the processes of firm growth: evidence from a vector autoregression", *Industrial and Corporate Change* 19 (6), 1677–1703.

Coad, A., Rao, R. (2006). "Innovation and market value: a quantile regression analysis", *Economics Bulletin* 15, 1-10.

Coad, A., Rao, R. (2011). "The firm-level employment effects of innovations in high-tech US manufacturing industries", *Journal of Evolutionary Economics* 21, 255-283.

Colombo, M.G., Grilli, L., (2005). "Founders' human capital and the growth of new technology-based firms: A competence-based view". *Research Policy* 34, 795–816.

Colombo, M.G., Grilli, L., (2006). "Supporting high-tech start-ups: Lessons from Italian technology policy", *International Entrepreneurship and Management Journal* 2, 189-209.

Colombo, M.G., Grilli, L., (2010). "On growth drivers of high-tech start-ups: Exploring the role of founders' human capital and venture capital", *Journal of Business Venturing* 25, 610-626.

Colombo, M.G., Piva, E., (2012). "Firms' genetic characteristics and competence-enlarging strategies: A comparison between academic and non-academic high-tech start-ups", *Research Policy*, 41(1): 79-92

Di Gregorio, D., Shane, S. (2003). "Why do some universities generate more start-ups than others?", *Research Policy* 32, 209-227.

Donckels, R., Segers, J.P. (1990). "New Technology Based Firms and the Creation of Regional Growth Potential", *Small Business Economics* 2(1), 33–44.

EC (2007). INNO-Policy TrendChart – Policy Trends and Appraisal Report: Italy

EC (2014). European Commission. Regional Innovation Scoreboard 2014. DG Enterprise and Industry. European Commission, Brussels. http://www.proinno-europe.eu

Fini R., Grimaldi R., Sobrero M. (2009). "Factor fostering academics to start up new ventures: an assessment of Italian founders' incentives", *Journal of Technology Transfer* 34, 380-402.

Geroski, P.A., Mata, J., Portugal, P. (2010). "Founding conditions and the survival of new firms", *Strategic Management Journal* 31, 510-529.

Gimeno, J., Folta, T., Cooper, A., Woo, C. (1997). "Survival of the fittest? Entrepreneurial human capital and the persistence of underperforming firms". *Administrative Science Quarterly*, 42, 750–783.

Greenhalgh, C. (2002). "Does an employer training levy work? The incidence of and returns to adult vocational training in France and Britain", *Fiscal Studies* 223–263

Gulati, R. (1998). "Alliances and networks" *Strategic Management Journal*, 19, 293-317.

Hall, B.H., Jaffe, A., Trajtenberg, M. (2005). "Market Value and Patent Citations." *Rand Journal of Economics* 86: 2418–2427

Henrekson, M., Stenkula ,M. (2010). "Entrepreneurship and Public Policy" in Acs and D.B. Audretsch (eds.), *Handbook of Entrepreneurship Research. International Handbook Series on Entrepreneurship 5*, Springer 595-637.

Impresa Lavoro (2014). "Imprenditorialità: Italia ultima nella classifica europea" Nota, http://impresalavoro.org

Jenkins, S.P. (2005). *Survival Analysis*, https://www.iser.essex.ac.uk

Klapper, L., Laeven, L., Rajan, R. (2006). "Entry regulation as a barrier to entrepreneurship", *Journal of Financial Economics*, 82, 591–629

Kutzhanova, N., Lyons, T.S., Lichtenstein, G.A., (2009). "Skill-Based Development of Entrepreneurs and the Role of Personal and Peer Group Coaching in Enterprise Development" *Economic Development Quarterly*, 23, 193-210.

Lambrecht, J., Pirnay, F. (2005), "An evaluation of public support measures for private external consultancies to SMEs in the Walloon Region of Belgium", *Entrepreneurship and Regional Development*, 17, 89-108.

Marzucchi, A., Antonioli, D., Montresor, S. (2015), "Industry–research co-operation within and across regional boundaries. What does innovation policy add?" *Papers in Regional Science*, 94(3), pages 499-524.

Mason, C., Brown, R. (2013). "Creating good public policy to support high-growth firms", *Small Business Economics*, 40, 211–225.

Mole, K., Hart, M., Roper, S., Saal, D., (2008). "Differential gains from Business Link support and advice: a treatment effects approach", *Environment and Planning C: Government and Policy*, 26, 315 334.

MSE (2009). "Migliorare le politiche di ricerca e innovazione per le regioni. Contenuti e processi di policy." Dipartimento per lo Sviluppo e la Coesione Economica, http://www.dps.tesoro.it

Mustar P., Wright M., Clarysse, B. (2008). "University spin-off firms: Lessons from ten years of experience in Europe", *Science and Public Policy*, 35: 67–80.

Netval (2011). VIII Rapporto Netval sulla Valorizzazione della Ricerca nelle Università Italiane. Potenziamo la catena del valore. www.netval.it

Netval (2015). XII Rapporto Netval sulla Valorizzazione della Ricerca Pubblica Italiana Protagonisti dell'ecosistema dell'innovazione? www.netval.it

Norrman, C., Bager-Sjögren, L., (2011). "Entrepreneurship policy to support new innovative ventures: Is it effective?", *International Small Business Journal*, 28, 602-619.

Oberschachtsiek, D., Scioch, P., (2015). "The outcome of coaching and training for self-employment. A statistical evaluation of non-financial support schemes for unemployed business founders in Germany.", *Journal for Labour Market Research*, 48, 1-25

OECD (2010). "Entrepreneurship Skills", in OECD (ed.), SMEs, Entrepreneurship and Innovation. Paris: OECD.

Oosterbeek, H., van Praag, M. Ijsselstein A. (2010). "The Impact of Entrepreneurship Education on Entrepreneurship Competencies and Intentions". *European Economic Review*, 54 442-454.

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

Peterman, N., Kennedy, J., (2003). "Enterprise education: influencing students' perceptions of entrepreneurship". *Entrepreneurship Theory and Practice* 28, 129–144.

POR (2007). "Programma Operativo Regionale 2007-2013", Regione Emilia-Romagna

Putnam, R. (1993). *Making Democracy Work*. Princeton, NJ: Princeton University Press

Ramaciotti, L., Consiglio, S., Massari, S. (2011). "Competenze, innovazione, imprese" Il Mulino, Bologna

Rasmussen, E., Borch, O.J. (2010). "University capabilities in facilitating entrepreneurship: A longitudinal study of spin-off ventures at mid-range universities", *Research Policy* 39, 602–612.

Rasmussen, E., Mosey, S., Wright, M. (2011). "The Evolution of Entrepreneurial Competencies: A Longitudinal Study of University Spin-Off Venture Emergence", *Journal of Management Studies* 48.

Rigby, J., Ramlogan, R. (2013). "The Impact and Effectiveness of Entrepreneurship Policy", NESTA Working Paper 13/01.

Rizzo, U. (2015). "Why do scientists create academic spin-offs? The influence of the context", *Journal of Technology Transfer*, 40: 198-226

Rodríguez-Pose, A., Refolo, M. (2003). "The link between local production systems and public and university research in Italy", *Environment and Planning A* 35: 1477–1492.

Rotger, G.P., Gørtz, M., Storey, D.J., (2012). "Assessing the effectiveness of guided preparation for new venture creation and performance: Theory and practice", *Journal of Business Venturing*, 27, 506–521.

Santarelli, E., Vivarelli, M. (2007). "Entrepreneurship and the process of firms' entry, survival and growth" *Industrial and Corporate Change*, 16, 455–488.

Shane, S. (2004). Academic entrepreneurship: University spin-offs and wealth creation, Edward Elgar, Cheltenham.

Shane, S. (2008). The illusions of entrepreneurship, Yale University Press.

Souitaris, V., Zerbinati, S., Al-Laham, A., (2007). "Do entrepreneurship programmes raise entrepreneurial intention of science and engineering students? The effect of learning, inspiration and resources", *Journal of Business Venturing* 22, 566–591.

Spinner (2007). “Rapporto di monitoraggio 2007”. Regione Emilia-Romagna

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

Storey, D.J., (2005). “Entrepreneurship, Small and Medium Sized Enterprises and Public Policies”, in Z.J. Acs and D.B. Audretsch (eds.), *Handbook of Entrepreneurship Research*, Kluver 473-511.

Storey, D.J., Tether, B.S., (1998). “New technology-based firms in the European union: an introduction”, *Research Policy*, Vol. 26, No. 9, pp.933–946.

Ucbasaran, D., Wright, M., Westhead, P. (2003), “A longitudinal study of habitual entrepreneurs: starters and acquirers” *Entrepreneurship and Regional Development* 15, 207 –228.

Van Praag, M., de Wit, G., Bosma, N. (2005). Initial capital constraints hinder entrepreneurial venture performance. *Journal of Private Equity*, 9(1), 36–44.

Varga, A. (2000). “Local Academic Knowledge Spillovers and the Concentration of Economic Activity” *Journal of Regional Science* 40, 289–309.

Visintin F., Pittino, D. (2014) “Founding team composition and early performance of university-based spin-off companies”, *Technovation* 34, 31–43.

Vohora, A., Wright, M., Lockett, A. (2004). “Critical junctures in the development of university high tech spin-out companies”, *Research Policy*, 33, 147–175.

Von Graevenitz, G., Harhoff, D., Weber, W., (2010). “The effects of entrepreneurship education”, *Journal of Business Venturing*, 76, 90-112.

Wennberg, C., Wiklund, J., Wright, M. (2011). “The effectiveness of university knowledge spillovers: Performance differences between university spinoffs and corporate spinoffs” *Research Policy* 40, 1128– 1143.

Wren, C., Storey, D.J. (2002)., “Evaluating the effect of soft business support upon small firm performance.” *Oxford Economic Papers* 54(2): 334-365.

Wright, M., Vohora, A., Lockett, A. (2004). “The Formation of High-Tech University Spinouts: The Role of Joint Ventures and Venture Capital Investors” *Journal of Technology Transfer* 29, 287–310.

Wright, M., Lockett, A., Clarysse, B., Binks, M. (2006), “University spin-out companies and venture capital”, *Research Policy* 35, 481-501.

TABLES

Table 1 Variable descriptions

Variable name	Description
$EXIT_{it}$	Dummy variable equal to 1 if the firm *i* ceased at time *t*
GR_EMP_{it}	Employment growth [log(EMP_{it+1} /EMP_{it})], for firm *i* at year *t*
GR_SALES_{it}	Sales growth [log($SALES_{it+1}$ /$SALES_{it}$)], for firm *i* at year *t*
$MENTORING_{it}$	SPINNER funds allocated for mentoring services, for firm *i* (thousands of euros) at year *t*
$SUBSIDIES_{it}$	SPINNER funds allocated for financial subsidies, for firm *i* (thousands of euros) at year *t*
AGE_{it}	Age of the firm *i* at year *t*
$SALES_{it}$	Sales for firm for firm *i* at year *t* (thousands of euros)
EMP_{it}	Number of employees for firm *i* at year *t*
$TEAM_{it}$	N. of individuals in the NTBF team of founders, for firm *i* at year *t*
EQ_COMP_{it}	Dummy variable equal to 1 if there is at least one companies in equity, for firm *i* at year *t*
PAT_ST_{it}	Patent stock for firm *i* at year *t*
$PATPROV_{it}$	N. patents per inhabitant in the NUTS III region where the firm is located, for firm *i* at year *t*

Table 2 Descriptive statistics

	Obs	Mean	Std. Dev.	Min	Max
EXIT	619	0.019	0.138	0	1
GR_EMP	565	0.081	0.402	-3.219	1.792
GR_SALES	577	0.150	1.904	-12.296	12.206
MENTORING[a]	577	1.175	2.624	0	20.16
SUBSIDIES[a]	577	3.338	7.797	0	42.118
AGE	577	3.893	2.427	0	11
EMP	577	2.375	2.889	0	19
TEAM	577	4.600	3.112	1	17
EQ_COMP	577	0.289	0.454	0	1
PAT_ST	577	0.498	1.174	0	6.909
PATPROV	577	213.272	73.120	49.848	332.814

[a] thousands of euros

Table 3 Event history analysis (Cox regressions)

	Spinner sample	Full sample	Spinner sample	Full sample
EXIT	(1)	(2)	(3)	(4)
MENTORING	2.043***	1.164	2.066**	1.557**
	(0.702)	(0.715)	(0.858)	(0.782)
TEAM			-1.485***	-0.364**
			(0.489)	(0.168)
EQ_COMP			-2.900	-1.674**
			(3.352)	(0.724)
PAT_ST			-2.883	-0.301
			(3.672)	(0.690)
EMP			2.300	-3.091
			(1.617)	(3.441)
SALES	-0.0927*	-0.0634**	-0.140***	-0.0783*
	(0.0503)	(0.0255)	(0.0419)	(0.0416)
PATPROV	0.0148**	0.0267***	0.0400***	0.0203**
	(0.00587)	(0.00945)	(0.00967)	(0.00845)
Sector dummies	Included	Included	Included	Included
Year dummies	Included	Included	Included	Included
chi2	3266.6***	2758.6***	51016.04***	12088.86***
Firms	63	94	63	94
Exits	9	12	9	12
N	418	619	418	619

Firm-level clustered standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4 Sales growth (firm-level fixed effects). Spinner Sample and Full Sample

	Spinner sample			Full sample		
GR_SALES	(1)	(2)	(3)	(4)	(5)	(6)
MENTORING	0.194**		0.180**	0.180***		0.166**
	(0.0737)		(0.0835)	(0.0674)		(0.0785)
SUBSIDIES		0.0423**	0.0103		0.0412***	0.00804
		(0.0160)	(0.0177)		(0.0148)	(0.0161)
AGE	-0.109**	-0.0424	-0.0842	-0.0922*	-0.0868	-0.0863
	(0.0440)	(0.0479)	(0.0541)	(0.0553)	(0.0577)	(0.0591)
EMP	-0.0157	-0.0273	-0.0185	0.0230	0.0185	0.0218
	(0.0526)	(0.0463)	(0.0501)	(0.0810)	(0.0804)	(0.0808)
TEAM	0.0821	0.0261	0.0799	0.0738	0.0472	0.0735
	(0.106)	(0.110)	(0.105)	(0.0628)	(0.0679)	(0.0626)
EQ_COMP	-0.285	-0.403	-0.246	-0.241	-0.326	-0.215
	(0.585)	(0.557)	(0.596)	(0.595)	(0.567)	(0.603)
PAT_ST	0.251	0.199	0.252	0.0649	0.0306	0.0633
	(0.252)	(0.234)	(0.252)	(0.142)	(0.134)	(0.143)
PATPROV	0.000343	-5.21e-05	0.000305	0.00277	0.00226	0.00276
	(0.00273)	(0.00274)	(0.00274)	(0.00249)	(0.00249)	(0.00249)
Year dummies	Included	Included	Included	Included	Included	Included
R-sq	0.11	0.08	0.11	0.06	0.04	0.06
Firms	63	63	63	94	94	94
N	389	389	389	577	577	577

Firm-level clustered standard errors in parentheses

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

Table 5 Employees growth (firm-level fixed effects). Spinner Sample and Full Sample

	Spinner sample			Full sample		
GR_ EMP	(1)	(2)	(3)	(4)	(5)	(6)
MENTORING	-0.00680		-0.00873	-0.0129		-0.0110
	(0.00673)		(0.00860)	(0.00824)		(0.0117)
SUBSIDIES		0.000475	0.00185		-0.00350	-0.00138
		(0.00364)	(0.00423)		(0.00301)	(0.00415)
AGE	0.0190*	0.0218*	0.0231*	0.00240	0.000866	0.00103
	(0.0109)	(0.0126)	(0.0125)	(0.0223)	(0.0223)	(0.0229)
EMP	-0.120***	-0.119***	-0.120***	-0.124***	-0.123***	-0.124***
	(0.0308)	(0.0314)	(0.0301)	(0.0214)	(0.0228)	(0.0215)
TEAM	-0.00411	-0.000964	-0.00344	0.0110	0.0125	0.0108
	(0.0276)	(0.0274)	(0.0269)	(0.0224)	(0.0225)	(0.0225)
EQ_COMP	0.0960	0.113	0.105	0.0866	0.0887	0.0812
	(0.0918)	(0.0915)	(0.0930)	(0.0925)	(0.0881)	(0.0913)
PAT_ST	-0.0873**	-0.0795**	-0.0870**	-0.0453	-0.0396	-0.0451
	(0.0383)	(0.0371)	(0.0386)	(0.0359)	(0.0335)	(0.0360)
PATPROV	-0.00107	-0.00108	-0.00107	-0.000303	-0.000310	-0.000314
	(0.000848)	(0.000868)	(0.000852)	(0.000842)	(0.000834)	(0.000825)
Year dummies	Included	Included	Included	Included	Included	Included
R-sq	0.249	0.247	0.249	0.202	0.200	0.202
Firms	63	63	63	94	94	94
N	392	392	392	565	565	565

Firm-level clustered standard errors in parentheses

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

APPENDIX

Figure A1. The Spinner process

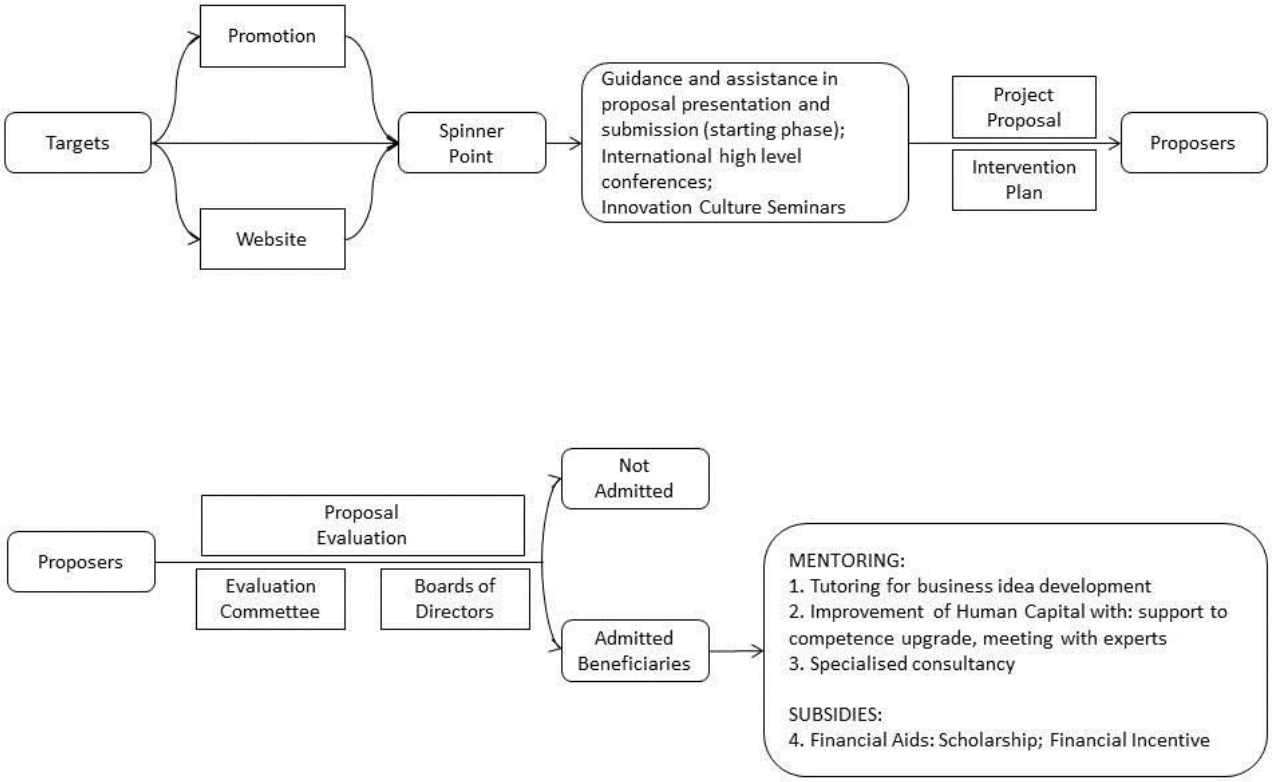

Table A1. Correlation matrix of transformed variables

	GR_EMP	GR_SALES	MENTORING	SUBSIDIES	AGE	EMP	TEAM	EQ_COMP	PAT_ST
GR_SALES	0.0216								
MENTORING	-0.0462	0.1691*							
SUBSIDIES	-0.0529	0.1585*	0.683*						
AGE	-0.0484	-0.1246*	-0.4706*	-0.5446*					
EMP	-0.0808	-0.0157	-0.156*	-0.1654*	0.2726*				
TEAM	0.0159	-0.0079	-0.0446	-0.0557	-0.0765	0.1233*			
EQ_COMP	-0.0389	-0.0462	-0.0779	-0.1179*	0.0787	0.1902*	0.0281		
PAT_ST	0.0305	-0.0566	-0.0224	-0.0956*	0.15*	0.2904*	-0.0536	0.2522*	
PATPROV	-0.0056	0.0585	0.1219*	0.2008*	-0.2974*	-0.116*	0.0496	-0.0699	-0.1303*

** $p < 0.05$*

Table A2. Age moderation effect on sales and employees growth (firm-level fixed effects). Spinner sample and full sample

	Sales Growth		Employees growth	
	Spinner Sample	Full Sample	Spinner Sample	Full Sample
	(1)	(2)	(3)	(4)
MENTORING	0.191**	0.181**	-0.0124	-0.0126
	(0.0870)	(0.0838)	(0.00875)	(0.0114)
AGE	-0.135**	-0.0987*	0.00636	-0.00529
	(0.0598)	(0.0559)	(0.0116)	(0.0227)
MENTORING*AGE	-0.0994	-0.0837	-0.0374***	-0.0398***
	(0.0811)	(0.0813)	(0.0125)	(0.0133)
SUBSIDIES	-0.00217	0.000859	-0.00210	-0.00390
	(0.0184)	(0.0168)	(0.00360)	(0.00366)
EMP	-0.0347	0.0101	-0.125***	-0.129***
	(0.0531)	(0.0866)	(0.0277)	(0.0188)
TEAM	0.120	0.0887	0.00550	0.0188
	(0.107)	(0.0671)	(0.0277)	(0.0225)
EQ_COMP	-0.222	-0.166	0.105	0.0992
	(0.586)	(0.603)	(0.0991)	(0.0966)
PAT_ST	0.263	0.0692	-0.0894**	-0.0465
	(0.252)	(0.143)	(0.0364)	(0.0376)
PATPROV	0.000323	0.00259	-0.000938	-0.000308
	(0.00276)	(0.00247)	(0.000805)	(0.000796)
Year dummies	Included	Included	Included	Included
R-sq	0.12	0.07	0.22	0.06
Firms	63	94	63	94
N	389	577	392	565

Firm-level clustered standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A3. Robustness check: Estimations on regional spin-off population

	EXIT Cox	GR_SALES FE	GR_EMP FE
MENTORING	0.777**	0.159*	-0.0102
	(0.386)	(0.0812)	(0.0132)
SUBSIDIES		0.0107	-0.000456
		(0.0168)	(0.00453)
AGE		-0.0941	0.00460
		(0.0663)	(0.0234)
EMP		0.0384	-0.123***
		(0.0914)	(0.0243)
TEAM		0.0571	0.0112
		(0.0677)	(0.0241)
EQ_COMP		-0.192	0.0852
		(0.612)	(0.0912)
PAT_ST		0.0958	-0.0398
		(0.152)	(0.0371)
PATPROV	0.0258**	0.00439*	-0.000268
	(0.0120)	(0.00252)	(0.000915)
Sector dummies	Included		
Year dummies	Included	Included	Included
chi2	49.88***		
R-sq		0.07	0.19
Firms	84	84	84
Exits	9		
N	555	522	506

Firm-level clustered standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A4. Robustness check: Generalised least square random effect (GLS RE) and Pooled OLS

	Sales Growth				Employment growth			
	GLS RE		Pooled OLS		GLS RE		Pooled OLS	
	Spinner Sample	Full Sample	Spinner Sample	Full Sample	Spinner Sample	Full Sample	Spinner Sample	Full Sample
MENTORING	0.114**	0.0897*	0.121**	0.0949*	0.00232	0.000198	0.00238	0.000191
	(0.058)	(0.0541)	(0.0597)	(0.0553)	(0.00462)	(0.00431)	(0.00445)	(0.00424)
SUBSIDIES	0.0181	0.0101	0.0143	0.00691	-0.000541	-0.00152	-0.000678	-0.00145
	(0.0150)	(0.0129)	(0.0148)	(0.0129)	(0.00266)	(0.00211)	(0.00265)	(0.00212)
AGE	0.0435	-0.0481	0.0495	-0.0464	-0.0146	-0.0177	-0.0144	-0.0175
	(0.0385)	(0.0318)	(0.0384)	(0.0334)	(0.0186)	(0.0109)	(0.0186)	(0.0110)
EMP	-0.00262	0.0348*	-0.00172	0.0331*	-0.0269**	-0.0128**	-0.0263**	-0.0127**
	(0.0221)	(0.0197)	(0.0225)	(0.0196)	(0.0128)	(0.00646)	(0.0127)	(0.00642)
TEAM	-0.00730	-0.0129	-0.00459	-0.0110	0.00354	0.00424	0.00376	0.00448
	(0.0185)	(0.0185)	(0.0198)	(0.0188)	(0.00760)	(0.00484)	(0.00773)	(0.00484)
EQ_COMP	-0.0799	-0.0958	-0.0932	-0.112	-0.0397	-0.0281	-0.0422	-0.0320
	(0.158)	(0.113)	(0.162)	(0.113)	(0.0429)	(0.0383)	(0.0431)	(0.0380)
PAT_ST	-0.0225	-0.0733	-0.0152	-0.0709	-0.0192	0.0185	-0.0189	0.0184
	(0.0529)	(0.0683)	(0.0529)	(0.0663)	(0.0156)	(0.0218)	(0.0153)	(0.0215)
PATPROV	-0.000304	0.000559	-0.000418	0.000552	-8.64e-05	-0.000116	-8.68e-05	-0.000129
	(0.000801)	(0.000750)	(0.000903)	(0.000783)	(0.000266)	(0.000191)	(0.000269)	(0.000194)
Sector dummies	Included	Included	Included	Included	Included	Included	Included	Included
Year dummies	Included	Included	Included	Included	Included	Included	Included	Included
chi2	48.13***	68.56***			35.4**	41.8***		
R-squared			0.1	0.1			0.1	0.1
Firms	63	94	63	94	63	94	63	94
N	389	577	389	577	392	565	392	565

Firm-level clustered standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$