Marina van Geenhuizen*
Mozhdeh Taheri**

Patent Strategies of Small High-tech Firms in a Broader Context: the Case of International Learning

Introduction

In the development of the regional knowledge-based economy, universities are recognized as a main source of new knowledge and innovations. By introducing commercialization of knowledge among others through their spin-off firms, universities have claimed a new role in regions' and countries' economies since the early 1980s and even more strongly since the early 2000s (Shane 2004). Spin-off firms not only develop university inventions towards application in the market, they also contribute to a wider diffusion of university knowledge into the business community in the region, to the enhancement of entrepreneurship in the region, and to an improvement of infrastructures supporting high-tech entrepreneurship. Moreover, if connected with 'global pipelines' they help introducing global knowledge to enter the region, and increase diversity and opportunities for innovation.

Internationalization of young high-tech firms has been addressed extensively in the literature. There are two models, the Uppsala model that assumes an interplay between gradual acquisition of knowledge and commitment to international operations. Knowledge is primarily gained from experience related to specific markets and is gradually embedded in activities and capabilities of firms. This model acknowledges that international operations (including learning and collaboration) require resources that newly founded ventures find difficult to identify and acquire. These may include the ability to connect with foreign partners and overcome language and other institutional barriers, like regulation and different business cultures. This situation may particularly hold for academic spin-offs, because – apart from technology knowledge – they tend to lack many other resources (Lockett et al. 2005). In contrast, the born-global thesis contradicts the influence of constraints from resources, and assumes

* Professor of Innovation and Innovation Policy in Urban Economies at the Faculty of Technology, Policy and Management, Delft University of Technology, Delft, The Netherlands
** PhD candidate at the same faculty and at Delft Entrepreneurship Centre

that new ventures start to act and trade in foreign markets immediately or soon after their start (Andersson and Wictor 2003; Rialp 2005). Just through personal networks and international contacts, and experience gained in education of the management team, born globals overcome these constraints more easily.

One of the constraints to international learning may be an insufficient protection of newly developed knowledge. There are two sides here, first, the firm feels uncomfortable with dealing with novel knowledge with partners abroad because it's knowledge is not protected and can be used for free; second, the lack of patents gives a wrong signal to potential collaborators, making the firm less attractive as a partner. Usually, patents give positive strategic signals and are indicators of value, and ultimately strengthen the negotiation position (e.g. Andersen 2006). To date, the relation between international learning and patent position has never been addressed explicitly for small high-tech firms. Against this background, this study attempts to answer the following question: which are the characteristics of patenting behavior among academic spin-off firms and to what extent is not patenting new knowledge hampering the adoption of learning abroad?

The paper draws on a sample of 100 spin-off firms from two universities, Delft University of Technology in Delft, The Netherlands, and National Technical University of Norway in Trondheim, Norway (Soetanto 2009). It is structured as follows. The relevant literature on why small high-tech firms apply for patents and others do not is discussed in section 2. Section 3 is devoted to other knowledge related factors that might influence the propensity for international learning. In section 4, the features of the empirical study are discussed, including data description, and in section 5 the model outcomes on international learning are presented. The paper closes with a summary and a brief indication of further analysis.

Patent strategies of small high-tech firms

In a knowledge-based economy, the sources of competitive advantage have largely shifted to intangible assets making patents an increasingly appreciated component of business strategies (Andersen 2006; Teece 2000). This development has attracted a growing attention of researchers and policymakers, focusing on the strategic value of patents and industry differences in patent effectiveness and importance. However, most studies are concerned with large firms, and if small firms are subject of research, only a few studies have examined how small firms use patents in the context of their larger innovation strategy (e.g. Arundel 2001).

In this section, we base our analysis of backgrounds to patenting and non-patenting on rather new results reported in the literature, and we attempt to connect this with strategies of international learning. Table 1 shows various reasons why small high-tech firms prefer to protect their new knowledge by means of patenting (Andersen 2006). These are protection against imitation, establishment of a legal basis for cooperation in terms of license negotiations, and using patents as strategic signs towards competitors and as value indicators towards potential investors. Many of the connected strategies seem to be favorable in the context of international learning. There are two sides here. First is that the firm - through patent protection of its novel knowledge – may feel more secure in starting and maintaining learning relations abroad, particularly with competitors, but also with suppliers, customers, and knowledge institutes. Second, the firm may have a stronger position due to 'objective criteria' (patent portfolio) in negotiation situations, like concerning licensing and concerning investment by other parties.

However, the patenting process is rather inflexible, time-consuming and costly, and particular products and processes cannot be patented, even if these are new worldwide (Table 2). In addition, the patenting process may also inhibit some risks, particularly after the publication of the patent application: the free availability of the details of the invention. An invention to be patented must satisfy a set of strict criteria, which makes a patent essentially a standardized business tool, which is not necessarily compatible with a small firm's focus and approach to innovation.

Table 1.
Potential reason to take out patents

Reason	Explanation	Potential implication for international learning
Protect against imitation	Prevent competitors from imitating one's products/processes Block competitors in their R&D activities	Allows for international learning without fear for imitation
Establish legal basis for cooperation	Earn royalties Obtain strong patent portfolio to strengthen one's position in licence negotiations	Makes the position stronger as a partner (in negotiation) in licence-based international learning
Patents as strategic signals, particularly indicators of value	Signal to competitors that one's technology is protected Strengthen one's negotiation position in connection with potential disputes on ownership (patents) Makes attracting capital from external investors more easy Gives an indicator of one's R&D results	Makes the position stronger as a partner in international learning Clarifies the R&D output position and makes the position stronger as a partner in international learning, and as a partner in investment-based relationships

Source: adapted from Davis (2006).

Among potential reasons for small high-tech firms not to patent new knowledge, we also find circumstances through which an invention cannot be patented, high costs of application and maintenance, time consuming character of these processes, as well as high difficulty to determine and pursue patent infringement. In addition, small firms may prefer to use other ways of protecting intellectual property assets, depending on the type of invention, i.e. copyright, trademarks, secrecy, and employee non-disclosure or confidentiality agreements. In general, we assume that not having patented inventions might make small high-tech firms vulnerable for imitation and therefore reluctant in establishing learning relations in foreign countries, because part of the alternative protection measures may not work, like secrecy and employee non-disclosure and confidentiality agreements.

Table 2.
Reasons not to take out a patent

Reason	Explanation
Problems connected with the application process	Particular products or processes cannot be patented Costs of applying and maintaining are too high and the process is time-consuming
Problems related to preventing imitation	The firm must reveal too much information in the patent application form (secrecy gone) Competitors can 'invent around' the invention
Problems with patent infringement	Infringement is too difficult to determine To pursue infringing firms is too expensive
Patents are not suitable given the nature of the inventions concerned	Technology develops so rapidly that patents are irrelevant More advantageous to publish the information
Preference to use other means to appropriate value	More advantageous to keep the invention secret More advantageous to use other strategies to appropriate value

Source: adapted from Davis (2006).

Other factors influencing international learning

In this section, we examine a set of factors that is increasingly forwarded as influencing the adoption of the strategy of learning abroad. Most of these factors refer to absorptive capacity of the firms (Sedoglavich et al. 2009). The idea is that international learning, e.g. with customers and competitors, is dependent upon the 'investments' in absorptive capacity and related capabilities already done by the firm and its managerial team (de Jong and Freel 2010). Cohen and Levinthal (1990) perceive a firm's absorptive capacity as its ability to value, assimilate and apply external knowledge. In this vein, prior knowledge will facilitate new knowledge acquisition, assimilation and later exploitation. In learning processes of start-ups and young firms, therefore, several characteristics of founding entrepreneurs (or teams) like amount of previous working experience, and level and mix (multidisciplinary) of education, seem important as dimensions of absorptive capacity in the role of prior knowledge accumulation.

In addition, Zahra and George (2002) define absorptive capacity as a set of organizational routines and processes through which firms acquire, assimilate, transform and exploit knowledge to produce a dynamic organizational capability. The authors distinguish between two dimensions, i.e. potential absorptive capacity and realized absorptive capacity. In the first, the firms acquire and as-

similate external knowledge. In the second, the firms are capable of leveraging their knowledge to transform and exploit it for innovation or profit generation. In the literature, most studies have reflected on a firm's realized capacity, comprising knowledge transformation and exploitation while focusing on innovative outcomes.

In dealing with potential absorptive capacity of spin-off firms in this study, we include R&D expenditure (as a percentage of income) as an indicator of acquisition of new knowledge. We also include various indicators representing the state of knowledge accumulation and capabilities in acquiring new knowledge at start of the firm: number of founders, their previous working experience, mix of education of founders (mono- or multidisciplinary), and presence of PhD level in this education. In this context, we assume that the more and the richer the available knowledge is, for example, through R&D spending and a multidisciplinary background, the larger the demand is for international knowledge and the larger the capabilities are to effectively establish learning relations abroad thereby crossing cultural and institutional boarders. Particularly the presence of PhD level in the education profile, providing experience in international research collaboration at university, may improve the capability to establishing international learning relationships. We summarize these factors as 'available knowledge and learning capability'.

We take three additional factors into consideration, i.e. firm size and firm location, and strategy of international market orientation. The size of the firm is generally connected with the amount of internal resources and with capabilities to access external resources. Larger firms in general have overcome the liability of smallness and face better conditions, including in establishing international learning relations. Further, in spatial innovation studies, much attention is paid to available knowledge in urban places. High-tech firms benefit from a location in large cities in metropolitan areas due to a relatively large availability of new and diverse information and knowledge (knowledge spillovers), and a large pool of specialized workers and talented people (e.g. Capello 2006); this as opposed to small cities and rural and peripheral places. Given these ideas we include location of the firm in our analysis and assume that 'supply of knowledge' like complementary knowledge to the core invention and knowledge from launching customers etc. differs between places with different levels of urbanization. It is plausible that firms in peripheral or isolated towns feel urged to go abroad more quickly than firms in large cities in metropolitan regions endowed with a larger knowledge supply.

In one of our exploratory models we also take international market orientation of the spin-offs into account. Previous research has revealed a strong and positive relation between this orientation and spatial reach in learning (De Jong

and Freel 2010). The factors firm size and firm location, and the factor of international market orientation will be used as control variables in the model.

Methodological aspects of the empirical study

We made use of an existing database of 100 spin-off firms of two universities of technology (Soetanto 2009) (note 1). The *dependent* variable in our study is *adoption of the strategy of international learning.* We measure this as a dichotomous variable indicating whether the spin-off has adopted learning activity abroad, e.g. through customers, suppliers, competitors and knowledge institutes, etc. Most of the spin-off firms (61%) have established learning relations abroad, but a substantial part has not (39%).

The control variable firm size is measured as number of employees. The control variable location is measured in two classes: Delft and Trondheim (dummy variable). Delft represents a city in a large metropolitan area close to the urban heartland of Europe, whereas Trondheim represents a city in an isolated region in the periphery of Europe, but with a quite high position in the national urban hierarchy (Soetanto 2009). The control variable international market orientation is measured in two classes (presence/absence).

Our explanatory variables are measured as follows (Table 3): (1) R&D expenditure, as percentage of turnover or other income; (2) previous working experience as the sum of years of experience among the founders, using two categories (small experience and larger experience); (3) size of founding team in two classes (one and more than one member); (4) mix of education (disciplinary background) in two categories, i.e. single technology and multiple technology or multidisciplinary, and (5) PhD level of education in two classes (presence/absence).

The innovation and patent strategy is measured using three classes (high level and patent protection, high/medium level without patents and relatively low innovation level) and included in the model as two dummy variables. Measurement and descriptive statistics can be found in Table 3.

Logistic regression analysis

Since we take the dependent variable – adoption of international learning - as a dichotomous variable, we use logistic regression analysis. Accordingly, our regression model will predict the logit that is the (natural) log of the odds of having one or the other decision (here, adoption of internationalization of learning). In general, in a simple logistic regression with one predictor variable (X): Ln (ODDS) = Ln (Y/1-Y)= a+bX (where Y is the predicted probability of the event and X is a predictor variable). With the aim to check for multicollinearity,

correlation between the independent variables has been checked. The reported correlations (most are below 0.50) do not indicate serious concern for multicollinearity (Hair et al. 1995).

Table 3.
Measurement and descriptive statistics (core variables of model)

Variables	Measurement a)	Frequency
Adoption of international learning	Two categories (yes/no) based on relations with knowledge institutes, customers, suppliers, competitors and participation in fairs/exhibitions	No adoption: 39.0% Adoption: 61.0%
Explanatory variables		
R&D expenditure	Percentage of turnover or income b)	Mean: 38.6 (s.d. 21.2) Min-max: 0-100
Previous working experience	Sum of years of working experience of founders in two categories: small experience (<=3 years) and larger experience (>3 years)	Small experience (54.5%) Larger experience (45.5%)
Size of founding team	Number of members in founding team in two categories	One member (21.2%) Two or more members (78.8%)
Mix of education	Two categories based on disciplinary background (single technology, and multiple technology or multidisciplinary)	Single technology (64.6%) Multiple technology or multidisciplinary (35.4%)
PhD level of education	Two categories based on presence of knowledge on the PhD level	No PhD (61.6%) PhD level (38.4%)
Innovation and patenting strategy	Three categories based on the level of innovation (breakthrough and/or new to the sector, or not), and on involvement of patent protection	High level with patents (43.5%) High/medium level without patents (35.5%) Low level (21.0%)

a) Measures and categorization have been tested on robustness.
b) Average in the last three years.

Results and model estimation

Patent strategy and international learning in more detail

Table 4 shows the patent strategy of the spin-off firms in more detail. 50% of the spin-offs are involved in protection of inventions through patents, either granted or applied. This situation means that the knowledge is protected, but it does not necessarily mean that the spin-offs have applied for patents by themselves. A part of the spin-off firms work with university knowledge patented by the university or by the subsidizing institute of the research project that preceded firm establishment. Further, for about one third of the spin-offs (31%) patenting is not possible or not an adequate protection, and for a small minority (18%) patenting could have worked but was not done. Altogether, 50% of the firms are not involved in protection of their knowledge through patents.

Although the reasons behind these patent strategies have not been the major subject of the current study, often heard reasons behind decisions of not patenting are connected with the following circumstances. First, the limited resources of spin-off firms, i.e. high costs of application and maintenance of the application, and difficulty in determining of infringement and pursuing infringing firms; and secondly, the reluctance to reveal key information in the application form (which strongly reduces secrecy). In addition, not applicability of patenting is mainly connected with software inventions of medium or minor newness.

Table 4.
Patent strategy of the spin-off firms

Patent strategies	**Share**
- Involved in applied/granted patents	50.5%
- Patents are not applicable/adequate to the subject matter	31.3%
- Not involved in applied/granted patents	18.2%
Total number of spin-off firms (N=99)	100%

With regard to international learning, a majority of the spin-off firms in our database (61%) has adopted this strategy. Among these firms, 16% have expanded their reach in learning merely in a neighboring country, while most of them (44%) have internationalized globally. Concerning the type of sources in international learning, customers and exhibitions/fairs/conferences are the two most important ones.

Model estimation

We now proceed with the exploration of influences on international learning using logistic regression analysis (Table 5). The interpretation of the outcomes of Model 1 is as follows. Regarding the control variables, the coefficient of firm size is significant, indicating the influence of resources and capabilities, but the coefficient of location is not significant. Apparently, for firms to go abroad the size of the urban area and its location within the country does not matter in the need to connect with learning partners abroad.

Among the five variables under 'available knowledge and learning capability', three turn out to have coefficients that are significant. These are R&D expenditure, size of founding team, and PhD level in education profile. Apparently, these contribute most to taking the step to establish learning relations abroad. Size of founding team, surprisingly, shows a negative sign, meaning that a larger team faces a smaller chance for international learning. Such a negative influence of size of the founding team may be explained by a strategy among small firms to quickly compensate for small size by learning abroad and among larger firms to postpone this step and first utilize all internal and local sources of knowledge.

With regard to 'innovation and patent strategy', we observe a significant coefficient and a negative sign for the strategy of high/medium level of innovativeness without patents. In more detail, for firms with this strategy the log odds of having adopted international learning decreases by 1.39. This outcome may indeed indicate a trend that firms facing a high-to-medium level of newness feel hampered in international learning due a lack of patent protection and danger of losing secrecy in sharing new knowledge with partners abroad. Surprisingly, the strategy of high innovation level with patents seems also to have a negative influence (but the coefficient is not significant). Our guess is that the mechanism is different here: highly innovative spin-offs tend to remain strongly connected with the primary source of their knowledge and that is the local university, thus feeling a small need to establish learning relations abroad.

In Model 2 (Table 5) we have removed all variables with coefficients that are not significant (except the strategy of high innovativeness and using patents), and added one, namely international market orientation as a control variable. The coefficient of international market orientation turns out to be significant and the sign is positive. For the remaining, not much has changed with respect to the sign and the significance. Model 2 also suggests an important positive influence of R&D expenditure and PhD level in the education profile, and an important negative influence of size of starting team, as well as the strategy of high/medium level of innovativeness without use of patents.

Table 5.
Results of model estimation of adoption of international learning

Variables	Model 1	Model 2
	Logit coefficient (standard error)	*Logit coefficient (standard error)*
Control variables		
Firm size	0.93 (0.53)†††	0.80 (0.51)
Firm location (dummy)	0.40 (0.53)	-
International market orientation	-	0.99 (0.56) †††
Available knowledge and learning capability		
R&D expenditure	1.17 (0.63) †††	1.29 (0.64) ††
Previous working experience	0.21(0.54)	-
Size of founding team	- 0.67 (0.27) ††	-0.62 (0.25) ††
Mix of education	0.31(0.58)	-
PhD level of education	0.66 (0.33) ††	0.63 (0.32) †††
Innovation and patent strategy (dummy variable)		
High/medium level of innovativeness without patents	-1.39 (0.66) ††	-1.51 (0.68) ††
High level of innovativeness with patents	-0.66 (0.74)	-1.13 (0.80)
N	99	99
LR Chi square	26.23*	28.01†
Pseudo R Square	0.197	0.21
Log likelihood	-53.26	-52.37

*P<0.005, †P<0.01, ††P<0.05, †††P<0.1

Overall, the models are statistically significant but the explanatory power is rather weak. Four explanatory variables show, however, consistently a significant coefficient in the two models. With these results, our study confirms outcomes of some recent empirical studies (e.g. de Jong and Freel 2010).

Concluding remarks

This study is concerned with the first results of an exploration of the extent and background of international learning among technology-based spin-off firms, with a focus on the role of patenting and potential blocking influence of not patenting on international learning. The study is relevant because the high levels of specialization in technology inventions call for highly specialized knowledge, most probably not (all) available in the local environment of spin-off firms. As theory indicates, spin-off firms have different needs for international learning dependent upon their product-market strategy, and different capabilities for learning, the latter connected with absorptive capacity. The idea is that firms must first 'invest' in their absorptive capacity before they are able to coordinate and learn from knowledge partners abroad, and this 'investment' is reflected in the amount of accumulated knowledge, experience and capabilities. Thus, aside from the influence of patent strategies, this study also explored a set of influences summarized under 'available knowledge and learning capability'.

Using two slightly different models, we observed an important positive influence of R&D expenditure and PhD level in education profile, and we observed an important negative influence of two other factors, i.e. size of the founding team and the innovation strategy targeting at a high-to-medium level of newness without the use of patents. The last one confirmed our expectations in the sense that a small high-tech firm tends to be reluctant to go abroad with novel knowledge that is not protected (or not well protected), and that this firm – without patents (patent portfolio) may not be seen as an interesting or strong potential partner through the eyes of firms and institutions abroad. Improving the patent position of small high-tech firms, particularly of young university spin-offs, is thus necessary. Support measures, e.g. taken by incubation organisations and/or universities, or local governments, may include reducing costs and time-investment, and also legal support in case of patent infringement.

The relative weakness of the model outcomes has implications for further research. First, some of the variables could be examined in more detail of measurement (refinement), in particular those concerning absorptive capacity, and secondly, we could continue our research to identify the role of the industry sector in patenting (see e.g. Davis 2006) and the role of other ways of protecting if patenting is not possible or not suitable for small high-tech firms.

Note 1

The population of spin-offs from TU Delft and NTNU Trondheim was delineated using the following criteria. First, the firms needed to satisfy the condition of commercializing knowledge created at the university. Further, the firms had to satisfy the condition of "survived in 2006", not older than 10 years, and enjoy at least one type of support from the incubation organization/university. With regard to survival, a previous study – on the basis of simulation studies – indicates that firms that have died do not differ significantly from the ones that survived in the main respects (Soetanto 2009). Having "survived in 2006" is thus no serious source of bias. All firms in the population (150) were approached leading to an overall response rate of 66.7% (100 firms). Data were collected using a semi-structured questionnaire in personal face-to-face interviews with entrepreneurs. If necessary the information was supplemented by website analysis.

References

1. Andersen, B. (ed) *Intellectual Property Rights: Innovation, Governance and the Institutional Environment*, Edward Elgar, 2006.
2. Andersson, S. and I. Wictor, *Innovative Internationalisation in New Firms – Born Globals- the Swedish case*, Journal of International Entrepreneurship 2003, 1 (3): 249-276.
3. Arundel, A., *The Relative Effectiveness of Patents and Secrecy for Appropriation*, Research Policy 2001, 30: 611-624.
4. Best, M., *The New Competitive Advantage*. Oxford: Oxford University Press 2001.
5. Capello, R., *Regional Economics*. Taylor & Francis 2006.
6. Cohen, W.M. and D.A. Levinthal, *Absorptive Capacity: A New Perspective on Learning and Innovation*. Administrative Science Quarterly 1990, Vol 35: 128-152.
7. Davis, L., *Why Do Small High-tech Firms Apply for Patents, and Why Not?* [In:] Andersen, B. (ed) "Intellectual Property Rights: Innovation, Governance and the Institutional Environment", Edward Elgar 2006.
8. Geenhuizen, M. van, *Knowledge Networks of Young Innovators in the Urban Economy: Biotechnology as a Case Study*, Entrepreneurship and Regional Development 2008, 20 (2): 161-183.

9. Geenhuizen, M. van, and D.P. Soetanto, *Academic spin-offs at different ages: A case study in search of obstacles to growth*, Technovation 2009, 29 (10): 671-681.
10. Hair, J.F., R.E. Anderson, R.L. Tatham, W.C. Black, *Multivariate Data Analysis*, Prentice Hall, New Jersey 1995.
11. Jong, J.P.J. de, and M. Freel, *Absorptive capacity and the reach of collaboration in high technology small firms*, Research Policy 2010, Vol. 39: 47-54.
12. Kafouros, M., P. Buckley, J. Sharp, C. Wang, *The Role of Internationalization In Explaining Innovation Behavior*, Technovation 2008, Vol. 28: 63-74.
13. Kelley, D.J. and M.P. Rice, *Leveraging the Value of Proprietary Technologies*, Journal of Small Business Management 2002, 40 (1): 1-16.
14. Lockett, A., D. Siegel, M. Wright and M.D. Ensly, *The Creation of Spin-Off Firms at Public Research Institutions: Managerial and Policy Implications*, Research Policy 2005, 34 (7): 981-993.
15. Pittiglio, R., E. Sica, V. Villa, *Innovation and Internationalization: The Case of Italy*, Journal of Technological Transfer 2009, Vol. 34: 588-602.
16. Rialp, A., J. Rialp, G.A. Knight, *The Phenomenon of Early Internationalizing Firms: What Do We Know After a Decade (1993-2003) of Scientific Inquiry?* International Business Review 2005, 14 (2): 147-166.
17. Sedoglavich, V., M.E.M. Akoorie, K. Pavlovich, *Absorptive Capacity and the Internationalisation Process Of High-Tech Companies*, World Review of Entrepreneurship, Management and Sustainable Development 2009, 5 (2): 149-165.
18. Soetanto, D.P., *Entrepreneurial Networks of University Spin-Offs: How Social Networks Affect the Growth of Firms*. Delft 2009, PhD-thesis.
19. Stuart, T.E. and O. Sorensen, Strategic networks and entrepreneurial ventures, Strategic Entrepreneurship Journal 2008, Vol. 1: 211-247.
20. Teece, D.J., *Managing Intellectual Capital*, Oxford University Press, Oxford/New York 2000.

Streszczenie

Artykuł porusza istotną rolę ochrony patentowej firmach technologicznych. Autorzy stawiają pytania: Jakie są przesłanki wnioskowania o ochronę patentową w małych firmach? Dlaczego jedne firmy starają się działać w oparciu o ochronę własności przemysłowej a drugie nie?, na które starają się udzielić odpowiedzi w oparciu o badania. Ważnym zagadnieniem poruszanym w rozdziale jest międzynarodowy proces uczenia się firm ochrony własności intelektualnej.

Generalna idea publikacji podkreśla niechęć małych firm technologicznych w aplikowaniu o ochronę patentową. Jednakże można wyraźnie zauważyć, w przypadku braku strategii ochrony patentowej, utratę atrakcyjności inwestycyjnej małych firm ukierunkowanych na rynek międzynarodowy. Artykuł opiera się na analizie źródeł wtórnych i pierwotnych. 100 firm akademickich zostało zbadanych by zidentyfikować wpływ strategii ochrony patentowej na zachowanie się na rynku międzynarodowym. Analiza oparta jest o model wykładniczy uczenia się na rynkach międzynarodowych. Połowa małych firm technologicznych chroni swoją własność przemysłowa patentem a wśród nich trzy na pięć firm adoptuje wiedzę z rynków międzynarodowych. Te firmy, które nie stosują ochrony patentowej niewątpliwie blokują sobie możliwości uczenia się na rynkach zagranicznych.

Abstract

The current paper explores the patenting behavior of small high-tech firms in a wider strategic context. It particularly addresses why small high-tech firms apply for patents and what makes them not to do so, and connects this with international learning. The general idea is that small high-tech firms suffer from shortage in resources causing them to be reluctant in application for patents. However, not having protected their inventions by patents may weaken their position in attracting investment capital and in establishing strategic relationships, including learning relationships abroad. Drawing on the literature and on survey data of 100 academic spin-off firms, the influence of patent behavior (among other factors) on adoption of international learning is estimated. It appears that half of the spin-off firms works with inventions protected by patents and that a slightly larger share (60%) has adopted the strategy of international learning. Our explorative analysis using a logit model of international learning indicates that not having protected inventions through patents tends to block learning in international networks.