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# EXPLORING THE PREREQUISITES FOR LONG-TERM SURVIVAL OF INTERNATIONALISING AND INNOVATIVE SMEs

The case of the Swedish life-science industry

*Sara Melén Hånell, Emilia Rovira Nordman and Daniel Tolstoy<sup>1</sup>*

## Introduction

Europe's innovation performance needs to be enhanced to master the challenges ahead in a fast-changing global climate (European Commission 2013). There is a specific need to support innovative firms because Europe is suffering from poor productivity performance (Timmer et al. 2010) and its innovation performance has also declined over recent years in comparison to other geographical regions such as the United States and parts of Asia (European Commission 2011). In addition, taken as a share of GDP, venture capital investments in the United States are four times higher than in the European Union (EU) (European Commission 2011). Moreover, the European Commission considers that European investments tend to be spread too thinly as European venture capital funds invest in twice as many companies as their counterparts in the United States (European Commission 2011). If European companies are to remain competitive in the global economy, scholarly literature argues that public policies should focus on creating an environment that promotes innovation, especially for internationalising firms (Nordman and Tolstoy 2016). Increasing the possibilities for innovation is also placed high on the agenda for Europe's leaders and the members of the European Parliament, via the Horizon 2020 initiative which aims to secure Europe's competitiveness. New policies that are being implemented are geared towards increasing the international competitiveness of innovative firms, for example by creating internal markets for venture capital which may enable firms to bring products to international markets sooner (European Commission 2013). One group of firms that often encompasses the innovative features that lay the foundation for export success is international small and medium-sized enterprises (SMEs). This group is defined in this study in accordance with the European Commission definition as enterprises with fewer than 250 employees, with

a turnover not exceeding 50 million euros and/or an annual balance sheet total not exceeding 43 million euros (European Commission 2003; Suder 2011). SMEs are particularly important for the growth of the EU region, because they encompass the vast majority of the total number of exporting firms and represent a third of the total export value (Cernat et al. 2014). The EU's dependence on successful innovative and internationalising SMEs is also strong in comparison to other regions of the world. For example, the share of SMEs in US manufacturing activity – and total US exports – is smaller than the share of SMEs in EU manufacturing activity and exports (United States International Trade Commission 2010). Exporting SMEs are often characterised by higher levels of productivity (Adlung and Soprana 2017) and job-creation than other SMEs (European Commission 2010).

Building on these results, the arguments for SMEs to export and internationalise are strong, both from the perspective of individual firms and whole countries. Policy-makers and academic scholars have directed much effort to support and enhance the survival of innovative and exporting SMEs. European policy-makers have in particular highlighted the need to improve the conditions for these SMEs to survive economic downturns and thereby flourish from a long-term perspective (Wehinger 2014). Innovative SMEs often suffer from scarce financial resources, particularly in the time period between the stage of developing a new technology, process, product or service and the stage of exploiting it commercially. Moreover, the European market for financing innovative companies from the pre-seed to expansion stages is still underdeveloped (Lilischkis 2011). The lack of resources during their infancy can affect the long-term economic development of SMEs and the job-creation possibilities within EU. For example, Eurostat (2016) reports that in 2014, there were about 4 million new jobs created from 2.6 million newly born enterprises, whereas 3.5 million jobs were lost due to 2.3 million businesses dying. The one-year survival rate for enterprises created in 2013 was about 80 per cent, whereas the five-year survival rate of enterprises born in 2009 and still active in 2014 was a staggering 44 per cent (Eurostat 2016). Similar numbers, indicating a low long-term survival rate, are reported about newly born firms from the United States, where seven out of ten new firms survive at least two years, half at least five years, and only a quarter stay in business after 15 years or more (Nazar 2013).

The purpose of this study is to contribute to the understanding of how innovative and international SMEs grow and survive from a long-term perspective. To do so, we draw on prior research within the emerging field of international entrepreneurship, which typically focuses on innovative and international SMEs. While previous research within this field has given much attention to small firms' abilities to initiate an expansion abroad, few studies have investigated their survival and development from a long-term perspective. This study contributes to international entrepreneurship literature by presenting a longitudinal study based on data of 26 innovative SMEs in the Swedish life-science industry.

## Literature background

International entrepreneurship has emerged as an international business perspective that can capture the subversive elements of internationalisation, i.e. the proactive pursuit of niche business opportunities in foreign markets. International entrepreneurial firms typically internationalise early on in their life cycles and often expand rapidly in the pursuit of growth opportunities by taking advantage of their abilities to innovate (Sapienza et al. 2006). International entrepreneurial firms are typically founded by individuals who are experienced in conducting international business from their previous jobs (Crick and Jones 2000) and have international market experience (Nordman and Melén 2008). Another means by which internationally entrepreneurial

firms can overcome the lack of critical resources is to use their existing networks, at both the personal and firm levels (Lindstrand et al. 2011; Nordman and Melén 2008). Collaborative business relationships can enable these small firms to extract value from internal and external resources, which enable them to initiate internationalisation already from inception (McDougall et al. 1994). Even though these firms tend to have limited funds to use for research and development (R&D) or to speed up production processes, their flexibility, rapid decision-making and highly motivated employees can give them an advantage over larger firms (Allocca and Kessler 2006).

Many observations of innovative firms that manage to expand abroad at a relatively rapid pace have been made in previous studies about life-science firms (e.g. Lindstrand et al. 2011; Nordman and Melén 2008). The high degree of innovation in such firms often entails high risks and high costs (Koumpis and Pavitt 1999). One of the largest challenges for these firms has to do with the cost of innovation. Contrary to what might be expected, Raynor and Panetta (2008) suggest that R&D investments made by pharmaceutical firms often do not lead to increases in their innovation pipelines. Research has also demonstrated that life-science firms often experience problems in delivering on their initial promise of launching new products to the market within a reasonable time frame (Pisano 2006).

## **Method**

To conduct this study, a qualitative, longitudinal, multiple-case-study approach was used. The sample was chosen from life-science firms in the Stockholm-Uppsala life-science district. The chosen firms had to satisfy the following criteria: (a) categorised as SME, (b) currently employ their founders, (c) sell at least one product in a foreign (i.e. non-Swedish) market and (d) conduct their own R&D. By serving as sampling criteria, innovativeness is treated as an endogenous variable in this study. Innovative firms face specific challenges e.g. pertaining to short product life cycles and high product development costs, which makes it particularly interesting to study their long-term performance.

Based on these criteria, we chose to contact qualified candidate case firms randomly and stopped after 26 firms had been contacted and visited by members of the research group. More information about these anonymised case firms is shown in Table 21.1.

## **Data collection**

We interviewed the founders and managers who were responsible for each firm's internationalisation process. From 2003 to 2015, a total of 74 face-to-face semi-structured interviews were conducted. To corroborate the tentative results of the study, five final interviews with respondents were conducted in 2016. All interviews ranged from 40 to 160 minutes in length, with an average duration of around 120 minutes. To achieve external validity, we adhered to interview guides. However, we asked follow-up questions when interesting topics arose during the interviews. After the 26 companies had been visited (see Table 21.1), the empirical saturation point had been reached (i.e. the interviews conducted at the last few firms provided us with narratives similar to those we had previously heard).

We used methodological triangulation in our data collection so as to strengthen confidence in the accuracy of the findings and the construct validity of the study (Jick 1979). Thus, multiple data sources (e.g. interviews; annual reports etc.) were used, and data were collected at different points in time. The cross-checking of different data sources increased the reliability of the study. Another test involved receiving feedback on drafts of cases from informants.

Table 21.1 The 26 case companies in the Swedish life-science industry

<i>Firm</i>	<i>Business area</i>	<i>Founded</i>	<i>Number of interviews</i>	<i>Growth*</i>	<i>Survival in original form</i>
1	Detection and monitoring of viral diseases	1984	2	No	No (bankruptcy), product portfolio transferred to another organisation
2	Biological control/plant growth stimulation	1996	2	No	Yes
3	Biochemicals	1995	7	Yes	Yes
4	Bioceramic technology	1987	2	No	Yes
5	Animal vaccine development	1999	3	No	No (takeover)
6	Veterinary medicine and food safety	2001	5	No	No (bankruptcy), product portfolio transferred to another organisation
7	DNA identification and quantification	1990	1	No	No (bankruptcy), product portfolio transferred to another organisation
8	Arthritic diseases	1998	1	Yes	Yes
9	Genetic analysis	1997	6	Yes	Yes
10	Microfluidic solutions	1999	7	No	Yes
11	Microsystems	1998	12	No	No (takeover)
12	New drugs and dosage forms	1995	3	Yes	Yes
13	Medical devices	1988	2	No	No (takeover)
14	Immunological reactions	1991	1	Yes	Yes
15	Respiratory devices	1997	6	Yes	No (takeover)
16	Bio-detectors	1998	2	No	Yes
17	ECG systems	1999	3	No	Yes
18	Engineered antibodies	1986	4	Yes	Yes
19	Bacteria cultures	1999	2	Yes	Yes
20	Cardiac monitors	1985	2	No	Yes
21	Healthcare products	1987	1	No	Yes
22	Healthcare products	1994	1	No	No (takeover)
23	Biopharmaceuticals	2004	1	Yes	Yes
24	Medical technology devices	1968	1	No	No (takeover)
25	Drug delivery devices	1996	1	Yes	Yes
26	Equipment for microvascular diagnosis	1978	1	Yes	Yes

\* Increase in number of employees (between 2003/2004 and 2015).

### **Data analysis**

In analysing the data of the 26 cases, our focus was on the firms' survival. In this study, we conceptualise firm survival as sustained firm autonomy by avoiding takeovers and bankruptcies. While takeovers certainly can be beneficial for firms by providing economies of scale and exit opportunities for entrepreneurs, they do also end firm autonomy. Firms that survive these events are therefore assumed to possess certain qualities that make them capable of using their own

funds or attracting external capital to stimulate sustained growth and increase the probability of long-term survival. Takeovers are likely to occur when an external actor sees the potential for future revenue generation from products, services or technologies that are developed by a firm, but when it is not likely that the firm itself can generate further revenues (without new organisational and/or financial investments being made). Moreover, bankruptcies occur when costs are larger than incomes and the financiers have lost the inclination to make further investments in a business.

Based on longitudinal analyses of the 26 cases, we determined that the firms could be divided into two groups: survivors and non-survivors. Although the two groups of firms are rather small and unevenly distributed (i.e. 17 survivors and 9 non-survivors), there is still a sufficient number of observations that enable us to make qualitative assessments about them. Statistical assessments are more challenging since groups are small and uneven to fit with parametric statistical tests such as independent samples t-tests. Hence, the analysis of the data in this study is more geared towards observing and finding associations between variables rather than suggesting generalisable relationships.

To provide a more in-depth illustration of the long-term development of survivors and non-survivors, we describe the development of two case firms, where one case firm represents the surviving firms and one case firm represents the non-surviving firms. Single cases can serve as typical or representative cases when they stand as an example of a wider group of cases (Yin 2003). We selected companies 9 and 6, because these firms provided a good representation of the group and could not be considered extreme cases.

### **Company 9 – a survivor**

Company 9 was founded in 1997 around the idea to develop, manufacture and sell tools for genetic analysis on an international market. Since Sweden is such a small market, Company 9 had an international focus from the start. The firm made its first foreign sale within two years from foundation. With the help of investment-capital, the firm could open sales subsidiaries in the United States, the United Kingdom, Germany and the Netherlands soon after its inception.

In 2000, Company 9 was introduced onto the stock market, which generated about 900,000 KSEK. These funds were used to acquire other firms in the life-science industry, which also contributed to broadening the product portfolio of the firm. In 2008–09, the board decided to sell the entire business area in which Company 9 was originally anchored. Sales in this business area had not been as profitable as was first anticipated. In 2010, the CEO said: ‘We will never again be so dependent on one segment’ (pers. comm., 13 October).

By broadening the product portfolio, the firm also came to focus relatively less on new research innovations and pay more attention to enhancing the pure business aspects of its products. For example, Company 9 shifted to focus increasingly on producing and selling income-bringing consumables. By changing its focus, Company 9 has built up a strong international customer base of industry and academic partners, which include the world’s top 20 pharmaceutical companies. Looking back at the firm’s international development, the CEO relates that: ‘The hardest thing for businesses today is not about developing new ideas or to innovate, but to develop international sales’ (pers. comm., 17 May 2016). The group has grown significantly from the start, now employing over 293 people worldwide. With the exception of one year, the firm has been able to make a profit every year since 2006.

### Company 6 – a non-survivor

Company 6 was founded in 2001 and was built around research developed within a university-based project. The company was first started with the financial support of a university-based venture capital company. Company 6’s business idea was to develop test kits for animal diseases that could speed up test procedures. The tests became popular on the market and the firm started to export within two years of start-up. Because the test kits were user friendly, the employees could manage most of the international sales through email and telephone.

In the beginning, Company 6 experienced an organic growth of about 5–10 per cent per year. Company 6 made a profit for the first time in 2005. The profit was reinvested in new staff and new processes. In 2009, the financial crisis had a negative impact on the firm. In an interview from 2010, the CEO relates that: ‘our largest markets are in Eastern Europe today. The animal health programmes that were going on in Eastern Europe were cancelled and the market suddenly died’ (pers. comm., 26 October).

Company 6 did not have any significant monetary margins and had to make major cuts in their costs. The management initially tried to cut the employees’ work-time down to 80 per cent, but eventually had to start firing people. This was not enough, however, and the firm filed for bankruptcy in 2011. In the aftermath of the bankruptcy, a German multinational took over Company 6’s product portfolio. Today the portfolio comprises over 30 different tests that are still supplied to more than 70 countries worldwide.

### Survival analysis of the total sample

#### *A majority are survivors*

Analysing the total sample of 26 firms, Figure 21.1 empirically demonstrates that during the investigated 13-year period (2003–2015), most firms had survived (17 firms). Six firms have been taken over by other companies and three have been forced to file for bankruptcy.

Figure 21.2 displays the number of surviving firms during the timeframe for our study. We can see that there is no specific time where the hazard of going bankrupt or being taken over by another firm is particularly augmented. Extrapolating from this data, it would not be unreasonable to expect that this hazard rate will continue at a similar pace in the coming years. Even though the firms belong to the competitive life-science industry the survival rate is not alarmingly low.

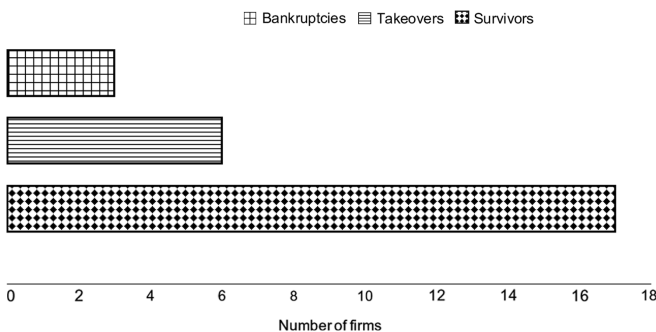


Figure 21.1 Firm survival status per 2015 of case firms in Swedish life-science industry

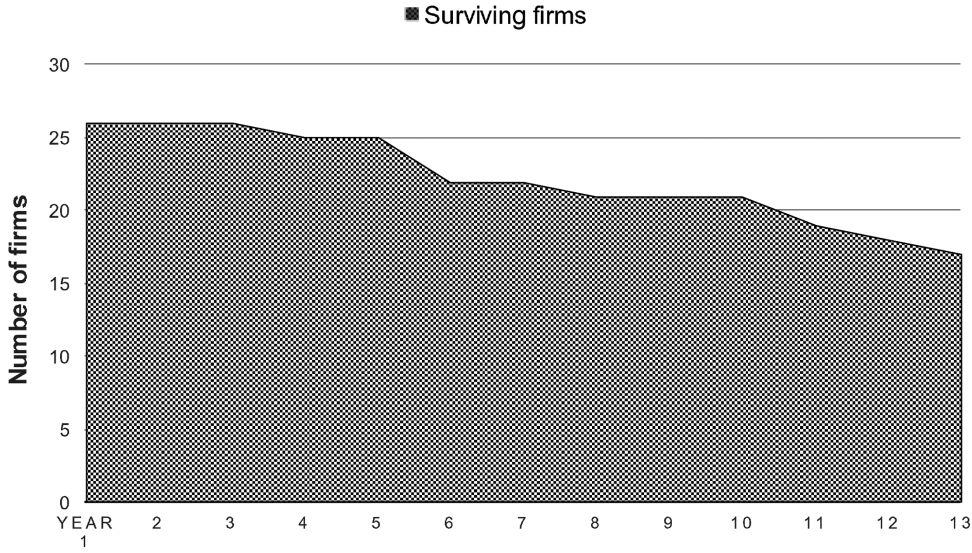


Figure 21.2 Hazard rate of going bankrupt or being taken over by another firm for case firms in Swedish life-science industry



Figure 21.3 Growth of surviving case firms (number of employees) in Swedish life-science industry

Figure 21.3 displays the growth of the surviving 17 firms in our sample. We can see that the growth rate fluctuates over time. Nonetheless at the end of the time-span, firms have grown considerably (by 32 per cent) and have on average moved from the small firm category (with 50 or fewer employees) to the medium-sized firm category (with more than 50 employees). This means that the growth trend is positive among the surviving firms in the sample.



Table 21.2 General comparisons between survivors and non-survivors in Swedish life-science industry

	<i>Survivor (mean)</i>	<i>Non-survivor (mean)</i>	<i>Mean difference</i>
Founding year	1988	1991	2.57
Year of first international sale	1997	1997	-0.66
Number of employees 2003	40	30	-10.373
Size of turnover	38,121	52,292	14,170
Geographical diversification of sales 2003	3.8	4.1	0.287
Revenue 2003	-11,616	-11,420	195.78
Revenue change 2003–2007	39,687	-6,350	-46,038*
Export size 2003	4.1	4.25	0.116
Number of patents 2003	1.765	3.3	1.568

\* Statistically significant at the 10 per cent level.

### ***Mean comparison between survivors and non-survivors***

To analyse further the presumptive differences between surviving and non-surviving firms, we analyse the data presented in Table 21.2. Judging from the data, mean differences are usually small and insignificant between the two categories of firms regarding organisational traits such as age, time in foreign markets, size and international strategies (i.e. geographical diversification of sales). There are some noteworthy differences between the two categories of firms in regards to revenue change and number of patents (comparisons are based on the baseline year of 2003). Firstly, the average revenue development is notably higher (and also significant in an independent sample t-test) among survivors. Although this result is intuitive, it confirms that lack of capital and own funds will severely decrease internationalising SMEs' chances of survival. Firms that are able to grow organically, i.e. based on their accumulated profits, will be able to maintain autonomy and present funding for future expansion efforts. We can also see that survivors on average possess fewer patents than non-survivors. This is counter-intuitive since innovative firms are generally hailed as the future of business. The number of patents also influences the possibilities for the non-survivors to either be taken over by another party or be forced to file for bankruptcy in times of economic distress. A comparison between firms that are taken over and firms that file for bankruptcy shows that the bankrupted firms generally held fewer patents than the firms that were taken over. One explanation for this is that access to patents makes firms more attractive to be acquired by an external actor.

### ***Mean comparison between patent holders and non-patent holders in international strategy***

Because of the striking differences between number of patents held by surviving and non-surviving firms we probe deeper into the international behaviour of patent holding (patents >0) versus non-patent holding SMEs (zero patents). Table 21.3 compares export volumes and geographical diversification of exports between these categories of firms in the baseline year 2003. It also accounts for changes in these international performance dimensions regarding these two groups of firms over a four-year period (2003–2007). The data reinforces our previous findings by indicating that non-patent holders seem to perform better in their internationalisation endeavours than patent holders. Non-patent holders on average operate on more markets

Table 21.3 Comparisons in international behaviour between patent holders and non-patent holders in the Swedish life-science industry

	Patent holder (mean)	Non-patent holder (mean)	Mean difference
Geographical diversification of sales 2003	3.21	4.75	1.54
Geographical diversification change 2003–2007	0	-0.5	-0.5
Export size 2003	3.91	4.45	0.54
Export size change 2003–2007	0.167	0.636	0.469

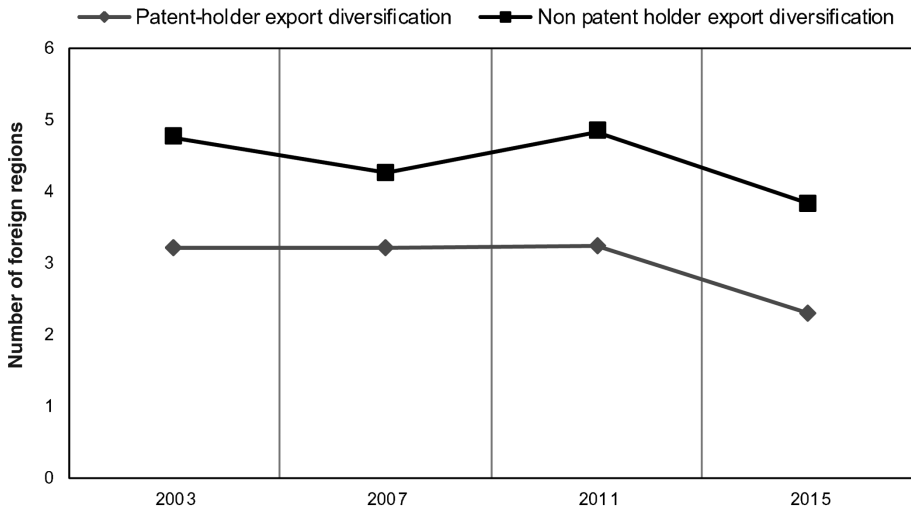


Figure 21.4 Change in geographical diversification\* of international sales of case firms in Swedish life-science industry

\* Measured in eight regions according to Statistics Sweden’s categorisation: 1) Scandinavia; 2) EU; 3) Europe apart from EU; 4) West Asia; 5) Far East; 6) North/Central America; 7) South America; 8) Africa.

than patent holders. In absolute terms, they also sell larger volumes of goods and services to foreign markets.

Figure 21.4 and Figure 21.5 give an overview of the development of export size and diversification of international sales of patent-holding and non-patent-holding SMEs, covering the entire time frame of our study. It is clear that both groups of firms over time move towards a greater level of geographical concentration.

Among patent-holding firms, one reason for this concentration may be that international patent application processes are generally expensive and cumbersome for SMEs (Van Pottelsberghe 2009). Even though firms have the possibility to apply for patents in a number of countries at once (Suder 2011) (at the European Patent Office, which has 35 member states), granted patents still need to be validated (and translated) in each member state, leading to increasing costs (Van Pottelsberghe 2009). Besides this, patent-holding firms need to pay renewal fees in every country where protection is to be prolonged (Van Pottelsberghe 2009).

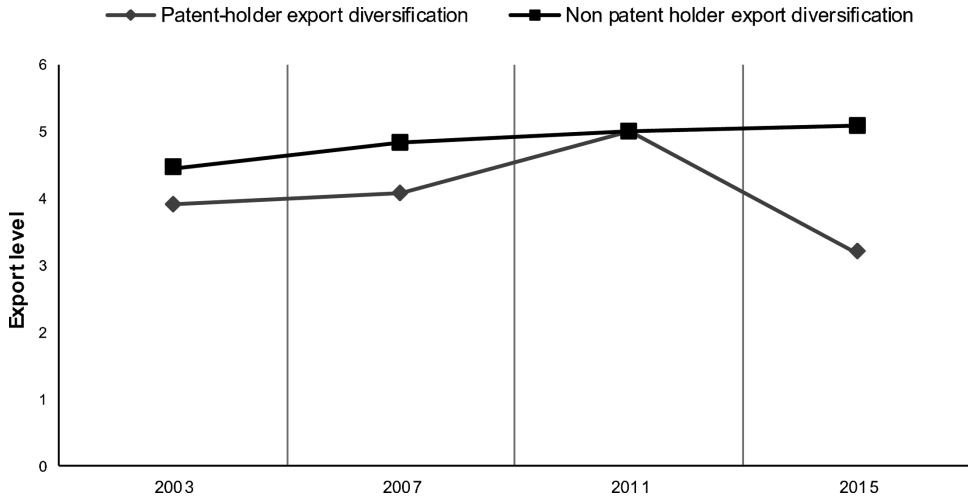


Figure 21.5 Change in export volumes (eight-level scale<sup>+</sup>) for case firms in Swedish life-science industry

+ Measured in eight intervals: 1= $\geq$ €1; 2= $\geq$ €2,500; 3= $\geq$ €100,000; 4= $\geq$ €200,000; 5= $\geq$ €500,000; 6= $\geq$ €1,000,000; 7= $\geq$ €5,000,000 8= $\geq$ €10,000,000.

Figure 21.5 shows that even though patent-holding firms are catching up with non-patent firms in regard to international sales at one point in the diagram (2011), they are unable to operate at these levels long term. Besides the expense of prolonging patents, this might be explained by other consequences of patent and product life cycles. At the beginning of their life cycles innovative products are protected by intellectual property laws and can be sold at premium prices. However, patents will either expire or the technology on which they are based will be made obsolete by new offerings made by competitors. Hence, dependence on patents and technology are likely to make these firms less able to continually adapt to customers' changing needs, leading to gradually diminishing sales.

### Discussion and conclusion

One key result of our longitudinal analysis of 26 SMEs is that most firms in the sample could be classified as survivors. One explanation for so many firms surviving (in comparison to the Eurostat data presented earlier) is that many of the firms that were included in our sample were older than five years at the start of this study (see Table 21.1). These firms had therefore overcome the first critical hurdles that may lead to bankruptcies for newly started businesses. Moreover, the life-science firms in our sample build on technology that was generally well received on international markets. Among the investigated firms we find that the average revenue development is notably higher among survivors than non-survivors. Among the non-surviving firms, we could not find any common explanation for their decline other than that these firms have suffered from a lack of necessary resources. Unlike extant research in the international entrepreneurship research field, this study is not limited to the initial growth patterns of innovative SMEs but instead captures their longitudinal international growth. By doing so, our results can contribute to extending knowledge within the field of international entrepreneurship and European business studies. Extant research has proven that small, innovative firms are able to initiate an international expansion (despite their lack of resources) by using foreign

business relationships as gateways into foreign markets (Crick and Jones 2000; McDougall et al. 1994; Nordman and Melén 2008). Even though this study supports these results, its longitudinal perspective highlights that the firms' inability to accumulate necessary resources over time severely decreases the firms' internationalisation and chances of survival. Looking at the case descriptions of Companies 6 and 9, they illustrate that small, innovative firms can internationalise early and yield a profit rapidly by finding and cooperating with customers in foreign markets. However, both firms eventually experienced severe challenges that forced them to adapt to new market conditions. Company 6 suffered losses due to a recession and was not able to accumulate necessary resources to endure the decline in international sales. The managers of company 9 discovered that the original product-portfolio did not bring sufficient income, but that the firm's resources could be used to make changes in the product portfolio and turn business around. In the long term, it was damaging to focus too much on specific customer groups (in the case of company 6) and product areas (in the case of company 9). Company 6 did not have the margins to endure a decline in international sales and change its strong focus on Eastern Europe. Company 9, on the other hand, succeeded in reacting rapidly to changing market conditions, because the firm had the funds to endure the consequences of a disappointing product area. Summarising these findings, SME survival in international markets is greatly influenced by timing and the access to enduring resources.

Our longitudinal case analysis points to two important issues related to the firms' long-term growth and survival. First of all, limited resources continue to be a key challenge for small, innovative firms throughout their internationalisation processes. Second, to manage the situation of scarce resources, it is crucial that these firms are able to stay alert, access and manage new market conditions that emerge and be responsive to a wide array of potential market opportunities. As pointed out by John et al. in chapter 23 of this book, firms and the environments in which they operate influence each other. By being flexible, strategic and adaptive to new environments and new market conditions, firms can make the best use of resources invested in specific market settings. Hence, flexibility, lack of bureaucracy and rapid decision-making are critical prerequisites for innovative SMEs to manage their long-term international growth and survival. Looking specifically at the case of Company 9 (from the group of survivors), it illustrates a firm that focuses on growing organically, and has managed to do so in the long run. The firm was able to change its strategy from focusing less on developing new innovative ideas, to focusing more on developing the pure business aspects of their products to increase international sales.

Another key result from the 26 case firms (measured on an aggregated level), is that the surviving firms on average possess fewer patents than non-survivors. In addition, our results highlight that non-patent holders seem to perform better (sell larger volumes of goods and services) in their internationalisation than patent holders. Moreover, non-patent holders, on average, operate on more markets than patent holders. These findings are counter-intuitive since innovative firms, often measured by their number of patents, are generally hailed as the future of business. Company 9 can give an explanation for these findings. Company 9, which started its internationalisation without holding any patents, eventually decided to focus fewer resources on R&D and instead put more effort into producing and selling more income-generating consumables. This strategy indicates that firms that focus too much on developing patents and new technological innovations may become too product oriented and thereby lose track of foreign customers' needs. Previous studies of life-science firms have highlighted the high risks and high costs involved in accomplishing innovation processes within these firms (Koumpis and Pavitt 1999; Raynor and Panetta 2008). Applications for patents are a time consuming and costly process which balances the efforts of the firm towards engineering and technology. Hence, one reason why non-patent holders are able to internationalise on a larger scale and scope than

patent-holders can be explained by the fact that they are not locked in by technology when making strategic decisions related to market selection and pace of internationalisation. On the one hand, firms that have used vast resources to acquire patents can make market decisions centred on this technology. On the other hand, non-patent holders arguably can be more responsive to new market needs and will be more inclined to act on opportunities wherever they emerge.

International entrepreneurship research describes how knowledge about how to do business with foreign customers and partners constitutes the main driver of firms' internationalisation (Crick and Jones 2000; Nordman and Melén 2008). Our study illustrates how critical such knowledge is for the ability of innovative SMEs to survive and achieve long-term international growth. Our study concludes that surviving SMEs are firms that can stay alert and cater to various customer segments throughout their internationalisation, being responsive to a wide array of potential market opportunities. Our study also demonstrates the importance for an innovative SME not to become too reliant on single customer segments and/or product areas, as this can impede the firms' abilities to adapt quickly to environmental changes. Finally, the results highlight the risks involved with investing too many resources in new innovation activities, i.e. developing patents. Too much dependence on patents and technology can negatively affect firms' potential to continually adapt to customers' changing needs, leading to gradually diminishing sales. If the process of taking out international patents was less cumbersome and less expensive, patent-holders would have more incentives to expand their business. Ideally, resource-constrained SMEs should be able to apply for a 'one-stop-shop' patent for any given jurisdiction where protection is sought: national, European or global. With the exception of purely national patents, there is no such one-stop shop at present (Van Pottelsberghe 2009).

### **Policy implications**

A key result of our longitudinal case study is that a vast majority of the investigated firms that we have followed since 2003/2004 still exist in their original form and still contribute tax revenue and create jobs. This result points to the importance for policy-makers within Europe to support internationalisation initiatives, since European national markets are small and successful export is critical (see Mikhaylov, Chapter 18 of this book). To support internationalisation among innovative SMEs, more EU policy initiatives should be directed towards existing, maturing firms and offer support to those firms that have shown they can be internationally successful. Similar to other studies (Lilischkis 2011), we can see that specific policies need to be designed for these 'hampered winners', i.e. firms that need support to grow substantially and overcome temporary market failures. One way to do this is to provide an integrated support system to put entrepreneurs and managers in contact with venture capitalists that can supply both capital and well-founded advice and guidance (Lindholm et al. 2010). This development could be supported by the realisation of a single EU market for venture capital firms. Internationalisation for European firms could also be increased by further movements towards an even more integrated Single Market in the EU and an enhancement of the EU's Enterprise Europe Network (Lilischkis 2011).

New science-based industries (such as life-sciences) were regarded as particularly promising before the turn of the millennium. After the financial crises that followed the dot-com boom, the high expectations for the success of these kinds of firm were significantly lowered, partly due to the high risks and high costs involved in the innovation processes in these firms (Koumpis and Pavitt 1999). Even though the results of this study have highlighted that life

science is indeed a risky business, a vast majority of the investigated firms that we have followed since 2003/2004 still exist in their original form. Thus, the long-term survival rate in our sample of investigated firms (of about 65 per cent) is testament to their survival skills. The study highlights the benefits for policy-makers in supporting life-science firms in general, because these firms can create value and enhance the common good. Even those firms in the sample that have not survived have still created value to the new knowledge economy by generating products that are sold by other organisations. Policies aimed at supporting new-science firms are therefore successful not only at the firm-level but also at a national level.

In general there is a lack of scientific work on how to evaluate policy implications (Lindholm et al. 2010). The ideas presented in this chapter may build a basis for how future public policy instruments can be earmarked to support innovative SMEs in Europe, and possibly elsewhere, thus promoting innovation, entrepreneurship and economic growth. Future research needs to explicitly identify what exactly those instruments should be and how public policy can best be deployed to promote these kinds of firm.

Other studies on innovative SMEs have investigated the role that different kinds of SME play in innovation in the environmental sector (Triguero et al. 2016) and the role that family SMEs play in the innovation generation (Classen et al. 2014). This chapter complements previous empirical research, highlighting that aspects such as network access (Nordman and Tolstoy 2016; Triguero et al. 2016) and access to financial resources (Triguero et al. 2016; Classen et al. 2014) also impact the choices that innovative SMEs in the life-science industry make during their internationalisation. However, the scope of this chapter, focusing on life-science SMEs from one European country, does not yet permit broad generalisations to be made. Further research is needed to provide a better understanding of the motivations for innovative and international life-science firms to grow and survive. It would be interesting to extend our analysis using quantitative data, covering larger samples of life-science firms collected from a wider geographical scope. It would also be interesting to investigate the growth and survival patterns of other innovative and international groups of SMEs from a longitudinal research perspective (for example SMEs active in environmental sectors and family-driven SMEs). Such studies could be used to complement and possibly validate the results implicated in this chapter.

### Note

1 The authors have contributed equally to the manuscript.

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