Whose child?
Koster, Sierdjan

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Chapter 5. Experience, networks and innovation

5.1 Introduction

On the population level, new firm formation is an important generator of economic dynamism and rejuvenation (Carroll and Hannan, 1999). New firms introduce products and new forms of organization. They contest the current state of affairs and force incumbents to rethink and re-evaluate their business operations. Firms that are unable to live up to the challenges posed by the newcomers may disappear (Schumpeter, 1912). Given these effects, new firm formation is surrounded by an aura of progress. This is not always justified, however. Although new firm formation, by definition, entails the establishment of a new organization, it does not necessarily involve the introduction of new products, new production processes, or new production routines. Most new firms are in reality followers in the market and duplicate existing organizational structures and products (Aldrich, 1999). The findings in Chapter 3 agreed with

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this observation. Most entrepreneurs continue the same daily activities they carried out as an employee. In the light of Chapter 4, this may be understood as part of a survival strategy. New firms take existing resources and skills, which have proven their merit, and use these to establish a well functioning new firm. Relying on existing resources and skills increases survival chances, but the impact on economic renewal (or innovation) may be limited. On the one hand, experienced entrepreneurs may deploy their industry-specific knowledge about production processes and markets to identify the need for new products and processes. On the other hand, innovative behaviour needs a certain thinking outside-of-the-box attitude, which could be difficult for firms based on previous experiences.

Innovation has always been an important element in explaining economic development, and its influence is still increasing. Baumol (2002) even goes as far as to state that it has replaced price as the name of the game in some industries. Understanding the innovative behaviour of firms is one of the major challenges in contemporary economic research. Despite the generally accepted link between new firm formation and progress, the innovative performance of young firms has so far received little attention. Innovation has mostly been studied mostly in the context of large, established firms (see for example Chandler et al., 1998; Pavitt, 1999; Dosi et al., 1998). Although the scale of analysis differs, the theoretical ideas that apply to large firms can be transferred to the context of smaller units. In the resource-based perspective, the innovative performance of firms is contingent on the resources and capabilities of the firm (Pavitt, 1998). For new firms, the resources and capabilities are acquired through the prior experiences of the entrepreneurs and through the networks in which they operate (see also Chapter 2). As shown in the previous chapter, this line of thought is commonly used in assessing performance of new firms. However, the possible effect on the innovative performance of the new firm has received much less attention (Agarwal et al., 2004). This chapter tries to fill this research gap by examining the relationship between the skills and support available to new firms and their innovative output.

The chapter starts with a brief introduction to the concept of innovation and how it can be addressed in the light of the theoretical framework of Chapter 2. This leads to several testable hypotheses. Sections 5.3, 5.4 and 5.5 introduce the dataset and the results of the empirical testing. Section 5.6 summarizes and draws conclusions.
5.2 Theoretical framework and hypotheses

5.2.1 Innovation

Currently, innovation is a popular research topic, both on the firm level and on the regional level, for example in cluster research. The surge in research has resulted in a myriad of innovation definitions. A thorough discussion of innovation definitions is beyond the scope of this chapter, but those interested can consult Weterings (2005), Gordon and McCann (2003), and work of Teece and Dosi (for example Dosi et al., 1998). In this chapter, the concept of innovation is used similar to that of Gordon and McCann (2003): innovation alludes to newness, improvement, and uncertainty. With regard to newness and progress, the distinction between innovation and invention is important. Innovation not only involves the discovery of new possibilities (invention), but also their economic implementation. In order to be successful economically, the new proposition has to contain elements of progress or improvement. Further, the process leading to innovation has many elements of uncertainty, making the outcome of the process hard to predict. Agents in the innovation process have to assess and cope with the uncertainty involved.

The issue of uncertainty leads to an important feature of innovation: its path dependency at the firm level. The innovative performance of a firm is determined to a large extent by its previous innovative activities (Pavitt, 1984; Chiaromonte et al., 1993). In order to limit the uncertainty in the innovation process firms rely on their previous experiences and build upon the capabilities they have accumulated (Teece, 1998). These capabilities are firm specific, and cannot be acquired freely on the market (Fransman, 1998). In line with the general theoretical framework of Chapter 2, experiences are the key in describing and understanding the driving forces behind innovation. The innovative performance of new firms is assumed to be related to the previous experiences of the entrepreneurs involved and the ways in which they can tap into other pools of specific knowledge in order to innovate. The following sections discuss the links between internalised skills, networks and innovation.

5.2.2 Inter-firm knowledge transfer through job mobility

Most relevant skills and knowledge are established during daily working activities and contacts with colleagues (Power and Lundmark, 2004). As a result, job mobility is an important mechanism for inter-firm knowledge transfer. Employees take some of the ‘tacit’ knowledge, acquired as an employee, to
another firm (Almeida and Kogut, 1999). Labour mobility is a particularly important source of knowledge spillover in industries where a large part of the knowledge base is integrated in human capital, such as business service firms. The most explicit transfer of knowledge between firms occurs when an employee decides to start a new firm. In new firms, entrepreneurs can freely use their experiences. In moving to an existing firm, a knowledge base is already in place and the transfer of knowledge is restricted by the absorptive capacity of the existing firm (Cohen and Levinthal, 1990).

The previous experiences of founders lead to the accumulation of operational skills, organizational skills and skills for interacting with the business environment (Chapter 3). Skills are internalised in entrepreneurs, and constitute the founders’ human capital. In line with Chapter 2, a distinction between industry-specific experience and entrepreneur-specific experience is seen as relevant (Brüderl et al., 1992; Brüderl and Preisendörfer, 1998; Helfat and Lieberman, 2002). Industry-specific experience is specific to certain technologies and industries (‘how to develop a product’), whereas entrepreneur-specific (or organizational) experiences relate to the organizational part of business (‘how to run a business’).

Industry-specific experience is prominent in the literature on spin-offs. Spin-offs are often defined as companies started by former employees of incumbent firms in the same industry (Dahl et al., 2003; Garvin, 1983; Klepper, 2001a). In this study, foundings based on industry experience are called spin-outs as proposed by Agarwal (2004). Spin-off firms also require the direct support of parent firms (Figure 2.3). Compared to firms established by founders lacking industry-specific knowledge, spin-outs can have several competitive advantages. The analysis in Chapter 3 identified knowledge about production and operations as the most relevant skills type related to industry experience. The entrepreneurs know how to make the product, and how the production process can be shaped. However, there are other possible advantages. Prior working experience at related firms provides founders with information about future business opportunities or niche markets (Shane, 2000). Further, these companies are the main source of potential employees (Sorenson, 2003). The founder may also have established a reputation in the industry which increases the chances of obtaining founding capital from investors (Stuart and Sorenson, 2003). Especially knowledge about developments within specific markets can form a good basis for successful innovation. Combined with technological knowledge, the identification of opportunities and niches in the market can be
seen as likely to induce successful innovation of the product or production processes.

As noted earlier, industry-specific skills are not necessarily exclusively available to employees that have worked in the industry. Very specific skills can also be obtained from other sources. This is the main reason why spin-off definitions based on the industry background of entrepreneurs are incomplete. At least two other sources of industry-specific knowledge are relevant. First, industry-specific knowledge can be built up while working in a related industry. Klepper and Simons (2000) showed how the Television receiver industry developed largely from the related radio industry. The experiences gained with the technology of developing radios could easily be applied to the new technology, giving firms that came from the radio industry an advantage over other entrants. Using the industry background definition, these new television firms would not qualify as spin-offs. However, largely the same learning effects apply. Specific technological knowledge about producing radios facilitated the step to the production of television sets. Second, specific experiences can also drive ‘user entrepreneurs’ (Shah and Tripsas, 2004). Users of products and technologies are considered to be an important source of innovative ideas (Von Hippel, 1988). Although most users will simply inform suppliers about their ideas on how to adapt a product to improve its functional and technological performance, in some cases users will decide to start a new firm in order to exploit their valuable insights. These, so-called, ‘user entrepreneurs’ have relevant industry-specific experiences because they have a good understanding of emerging consumer preferences. Especially in rapidly evolving and volatile markets, user knowledge can give a competitive advantage. In the initial phases of a product lifecycle, user needs are constantly changing and manufacturers can have difficulties in determining the most successful product design or niche market. Compared to other entrants, user entrepreneurs may be able to estimate demand for products or services more accurately. This means that innovative efforts can be directed more precisely and, as a consequence, the innovative performance of the firms can be higher. This observation that different backgrounds can render the same industry-specific skills once again stresses the view that it is not the background that makes the difference: it is the skills generated as a result of this background that are relevant.

In contrast to industry-specific experiences, entrepreneur-specific experiences are the result of working experience in a certain position rather than in a particular industry. Important indicators of relevant entrepreneur-
specific experience are previous self-employment spells and management functions occupied (Brüderl et al., 1992). Organizational experience provides founders with skills such as delegating authority, designing incentives, and controlling results. In general, this experience is likely to positively affect firm performance, because a large proportion of the work of an entrepreneur involves organizing and managing the firm and its employees (Brüderl et al., 1992). With respect to innovative performance, industry-specific experience is valuable when it comes to determining opportunities for innovation and working out the technical aspects of the process. However, the development of new products or processes can still fail if the founder is unable to coordinate and manage learning processes within and between firms (Penrose, 1959).

To briefly summarize the argument, there are three types of industry-specific skills: those associated with industry experience (as in spin-outs), experience from a related industry, and user experience. Entrepreneur-specific or organizational skills are applicable in all industries and relate to the management of a new firm. Founders can gain such experiences by prior working in two types of functions: as a manager or as an entrepreneur. Both types of experience are seen as necessary to become a successful innovator. These arguments lead to two testable hypotheses:

Hypothesis 1: The industry-specific skills of a founder (associated with spin-outs, working experience in a related industry, or as a user entrepreneur) have a positive effect on the innovative performance of the firm.

Hypothesis 2: The organizational skills of a founder, established either as a manager or as an entrepreneur, have a positive effect on the innovative performance of the firm.

5.2.3 External pre-established relationships

Another way in which new firms can benefit from knowledge transfer is through the founders’ relationships with other firms (Sorenson, 2003). Entrepreneurs are neither isolated nor autonomous. They engage in external relationships that develop through shared education, family or other personal connections, overlapping memberships, inter-firm mobility, joint ventures, or other collaborative agreements (Brüderl and Preisendörfer, 1998; Pennings et al., 1998). These, so-called, pre-established relationships help entrepreneurs to access relevant knowledge and other resources for innovation, possibly to
compensate for gaps in the internalised skills of the founder. Pre-established relationships can be vital for discovering business opportunities or for testing new ideas among customers (Brüderl and Preisendörfer, 1998; Lee et al., 2001). Consequently, the innovative performance of firms is expected to be greater when a firm can benefit from pre-established relationships.

The relationship between a founder and their previous employer is an important example of a relevant pre-established relationship. The founder and the previous employer are, by definition, connected and it may be easier to use this link than to establish new relationships. A continuing relationship with one’s previous employer is likely to affect the innovative output of a new firm. It is, however, unclear in what way. Continued contacts with a former employer can have both positive and negative effects on the innovative performance of the new firm (Granovetter, 1985). Innovation is affected positively because the entrepreneur may be able to use the link with the previous employer to provide easy access to resources for innovation. It can ensure a good resource base for innovation. However, the sharing of resources is neither automatic nor inevitable. Firms have very good reasons to hoard their resources in order to retain a competitive advantage. Nevertheless, resource transfer can occur. If the employee and employer part on good terms, a trust relationship may be in place, and based on this trust relationship, knowledge or other resources may be transferred (Boschma, 2005). Further, as discussed in Chapter 3, firms can have strategic reasons for helping an employee to set up a new firm. Employees who have parted on good terms with their previous employer can receive technological or organizational support. Innovative output is expected to be higher for such firms. Innovation can also be negatively affected. If the relationship between the new firm and the previous employer is too tight, the new firm can be locked into the structures and routines of the parent firm. This limits the ability to search for new ideas and could reduce the innovative output of the firm. A close relationship with the parent company may also result in a lack of autonomy or greater bureaucracy which reduces the new firm’s ability to adapt to changes in demand or technology (Agarwal et al., 2004).

Also empirically, the effects of pre-established relationships on performance are unclear. Brüderl and Preisendörfer (1998) found firms that performed better when founders continued contacts with their previous employers. This provides empirical validation of the resource-availability hypothesis: supported firms perform better because of their superior access to resources. In contrast, two other studies found negative performance effects for
affiliated (Brüderl et al., 1992) or incumbent-backed firms (Agarwal et al., 2004), supporting the lock-in hypothesis. These studies used legal arrangements to identify the pre-established relationships between previous employers and entrepreneurs. The new firms were, for example, franchise organizations or joint ventures. The focus on legal ties may favour the lock-in hypothesis since the firms are not fully independent of their parent firms. The legal ties ensure a continued influence of the parent firm. Independent firms with continued contacts may be less committed because there are no constraining legal obligations. As a result, they could exploit the benefits of a continued relationship with the previous employer without being hampered by legal dependency. In this chapter, the new firms considered are independent, and therefore the resource availability hypothesis is used:

Hypothesis 3: A continuing relationship with the founder’s previous employer after the start of the new firm has a positive effect on its innovative performance.

5.2.4 Spatial proximity and resource transfer

Both internalised knowledge and external relationships have spatial dimensions. In particular, the nature of external relationships is significantly affected by distance. Firstly, distance matters in maintaining relationships, especially if the transfer of knowledge is involved. Spatial proximity facilitates regular face-to-face interactions between firms, making knowledge exchange easier (Feldmann, 1994). Applying this idea to a continuing relationship with a previous employer, firms located near the former employer are more likely to benefit from knowledge exchange since relevant knowledge can be exchanged more efficiently. Secondly, firms are likely to perform better when they are established in the same region as where the founder used to work (Sorenson, 2003). Firms with entrepreneurs loyal to the region are more likely to benefit from the founders’ reputations and pre-established relationships than firms that are established further away. When a new firm is established outside the home region, the risks surrounding a founding increase (Stuart and Sorenson, 2003). Pre-established relationships and the founder’s reputation in the region can help a new entrepreneur in the development of innovations. Investors may be more willing to provide the required capital and customers may want to test the new product. A few empirical studies have shown that firms where the entrepreneurs
have working experience in the region do benefit more from pre-established relationships (Sorenson and Audia, 2000; Stuart and Sorenson, 2003).

Unlike with external relationships, space has no fundamental bearing on the transfer of internalised skills and routines. Skills and routines are embodied in the founder and are unaffected by distance (Klepper, 2002). They travel with the person and can be taken anywhere. However, in everyday life, internalised skills are localised in much the same way as external links. The underlying reason is the attachment of the founders to the environment in which they live. Social contacts tie people to a region, causing internalised skills to also be rather immobile. Note, however, that the application of the skills is indeed not affected by distance. The founder could take the skills to a different region and apply them there, but regional attractive forces keep the founder, and as a consequence the skills, in the region. Although internalised skills and knowledge can be transferred anywhere, this could involve costs. Some of the knowledge can have a local component. For example, information on markets and labour market population has a certain degree of localisation. Much as specific technological knowledge can be difficult to apply in a different firm, certain local knowledge can become less beneficial in other settings.

The above observations lead to Hypotheses 4 and 5:

Hypothesis 4: Establishing the firm in the same region as the previous workplace of the founder has a positive effect on the innovative performance of the firm.

Hypothesis 5: The expected positive effect of having a relationship with the previous employer is strengthened by spatial proximity between the new firm and its founder’s previous employer.

5.3 Data and research method

5.3.1 Data and research population

The data for the empirical analysis are derived from a telephone survey involving Dutch software firms. The survey was part of a larger study into the driving forces behind innovation, and more generally firm performance, within this industry (Weterings, 2005). A comprehensive account of the dataset can be found in this reference. This section describes those aspects of the data collection process which are most critical to this part of the research.
The data on the innovative performance of software firms was collected in three steps. In the first step, the total population of economically active software firms with two or more employees was identified using the business register of the Dutch Chambers of Commerce (CoC). In the second step, a screener survey identified an appropriate research population. At this point, the accuracy of the CoC data was also assessed and updated where necessary. Finally, in the third step, the firms, which met the criteria for entering into the research population, were questioned in more detail about their characteristics and innovation activities. This was achieved through a telephone survey. In order to progress to the third step, firms had to meet two criteria: they had to develop software with the aim of selling it commercially, and they had to be fully independent firms. The first criterion ensured that the main activities of the firms would be similar. This was important because, even within an industry, the actual product types of the firms can differ considerably. This can result in unobserved heterogeneity, leading to spurious empirical results (see also Brüderl and Preisendörfer, 1998; Lee et al., 2001). By including legally independent firms only, possibly intervening strategic considerations that influence the processes in subunits of larger firms are avoided. The entrepreneur and his or her new and independent firm form the units of analysis. Out of all the Dutch software firms, 617 firms met the criteria. The response rate to the telephone survey in Step 3 was 43%, resulting in 265 software firms in the final dataset. This sample was representative of the total research population in terms of size, NACE registration codes and location across the Netherlands.

5.3.2 Variables and research method

The empirical analysis revolves around two key concepts. The first concept is innovation itself. The second concept consists of the inputs into the innovation process. The inputs are assumed to be either internalised in the entrepreneur, or externalised in networks.

Innovation is the dependent variable in the analysis. It is measured as the 'innovation output' of firms. Here, this is defined as the percentage of the current output resulting from sales of a new product or new service. More traditional measures for the innovative performance of firms include R&D investment and patents. However, both indicators have an important drawback: they provide no information on the market success of the innovation. R&D investment only indicates the attempts of a firm to innovate and not the returns, while patents are not necessarily commercialised. Furthermore, most innovations
in the software industry are not protected by patents as large elements of the knowledge base of such firms are embodied in their employees. Innovation output offers the possibility of measuring the success of a firm’s innovation efforts (Kleinknecht, 1996). Measuring innovation in this way takes into account both the newness dimension of innovation and the associated progress. Unsuccessful innovations are unlikely to provide any significant market benefits.

‘Innovation output’ was based on two questions. In the first, respondents were asked whether they had introduced any products or services between 2000 and the date of the interview (June or July 2003). Of all the eligible firms, only 42 had not introduced a new product to the market in this period. These firms were dropped from the analysis. If these firms had been included in the analyses, the interpretation of zero-value in the dependent variable would be uncertain. A ‘zero’ could indicate a firm without a new product and therefore no innovative output, or it could indicate a firm with a new product that has not rendered any income. These are two distinct situations, and leaving both cases in the analysis could lead to spurious correlations. The second question assessed the share of total turnover due to sales of products introduced in the study period (see also Kleinknecht, 1996). This percentage reflects the innovative output of the firm.

Firms, started within the time period considered (2000 – 2003) were also excluded from the analysis (46 cases). New products introduced by these firms are likely to be their only source of income, which would put their innovation output at 100%. Accounting for missing values, 169 cases were carried forward to the analysis.

The internalised skills, i.e. the first group of independent variables, were measured by several dummy variables relating to the previous experiences of entrepreneurs. As noted earlier, these experiences are not seen as the distinctive features of entrepreneurs, rather it is their skills. In Chapters 3 and 4, the skills were entered directly into the analysis. The dataset used in the current analysis does not allow this approach. However, the backgrounds of the founders are classified more precisely than in much previous research. By distinguishing between several background types (and not only industry experience for example), the internalised skills can be identified more accurately. In some studies, the number of founders is included as an independent variable to account for the heterogeneity and complementarity of

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10 Although excluding the 42 cases removes ambiguity in the dependent variable, a selection bias may be introduced as a result. This problem is addressed in Appendix 5.1.
founders’ competences (Colombo and Grilli, 2005). Since this study includes information about the relevant working experience of all founders, the individual independent variables account for the multiple experiences in group foundings. A firm founded by a group of entrepreneurs can score a ‘1’ (i.e. present) for several different indicators of working experience. Consequently, it is not necessary to include the number of founders in the analysis.

Industry-specific skills are reflected in three variables. The first variable is ‘spin-out’. This is a unity variable indicating working experience by (one of) the founder(s) in the software industry. The term spin-out is used here because it is commonly used to indicate entrepreneurship involving industry experience (Agarwal et al., 2004). This makes comparison with other research easier. It should be kept in mind though that, while regarding resource transfer as the guiding element, other mechanisms may also be in place. The second variable, ‘related industry’, is one such possible mechanism. It measures whether (one of) the founder(s) used to work in the ICT industry, but not in the software sector. Finally, the potential effect of having experience as a user of software is represented by the variable ‘user entrepreneur’. Entrepreneur-specific skills are thus linked to the previous functions of the entrepreneurs. The variable ‘manager’ captures previous leadership experience of the founder, and the variable ‘habitual entrepreneur’ indicates whether the founder had previously been an entrepreneur before starting the current firm.

The second group of independent variables measure the potential access to resources through pre-established relationships. When one of the founders of the firm had previous working experience, respondents were asked whether the founder continued to have business contacts with their previous employer directly after the start of the firm. In a follow-up question, respondents were asked to characterize that relationship. Only firms with parent firms that are customers, suppliers, or providers of financial, technological, or organizational support received a value of ‘1’ for the variable ‘relationship with previous employer’. Firms whose founders did not have any prior working experience received a value of ‘0’ because they could not have benefited from such support. The variable ‘Location near previous employer’ indicates whether the new firm is located within a 50 kilometre range of the founder’s previous workplace. From previous empirical studies, one can expect most of the entrepreneur's daily routine to take place within this region, and this area also covers most of a firm’s labour market (Schutjens et al., 1998; Stam, 2003). The interplay between
geography and relations with previous employer is expected to be strongest in this range.

Finally, four control variables are included that have been shown to influence the innovative performance of software firms: ‘innovation input’, ‘radical innovation’ (indicating the type of innovation) and the ‘size’ and ‘age’ of the firm (Boschma and Weterings, 2006). A firm that invests heavily in developing new products and services is expected to have a higher innovation output. Innovation input is measured as the percentage of total employment dedicated to the development of new products or services. The type of innovation variable reflects the differences between an incremental and a radical innovation. Incremental innovations are assumed to have a greater beneficial effect on innovation output. In most cases, firms are more successful if they develop new products or services that build on their existing capabilities and experiences (Baumol, 2004; Tidd, 2001). Firm size, which is measured as the number of full-time employees, is expected to have a positive effect on the innovative performance of a firm. Company age is expected to have a negative effect as previous studies have shown that younger firms tend to be more innovative than older firms (Kleinknecht, 1996). The age of the firm may be especially important because the effect of working experience and pre-established relationships is likely to diminish over time as the production process standardises and the firm has gathered all the resources necessary for production. To account for this possible effect, interaction terms with age are included in the analyses.

The hypotheses formulated were tested using Tobit regression models for each set of independent variables. The dependent variable ‘innovation output’ cannot take a value below zero or be above 100. It is, therefore, a limited dependent variable. Consequently, the distribution of innovation output will be skewed since 12 firms score a 0 (7.1%) and 14 firms a 100 (8.2%). An OLS regression assumes that the dependent variables can take on any value and this can result in inconsistent estimators and predictive values below the zero limit (McDonald and Moffitt, 1980). Tobit models, fortunately, can handle dependent variables above (or below) limit values. The models were estimated using maximum likelihood estimation in LIMDEP. Tobit models do not include an R-square, but a modified version of the McKelvey-Zaviona statistic is used to calculate a pseudo R-square as recommended by Veall and Zimmerman (1994).
5.4 Previous experience and relationships

This section addresses the prevalence of previous experience and pre-established relationships in the Dutch software industry. First, the backgrounds of the entrepreneurs are indicated, showing the origins of the entrepreneurs and their previous experiences. Second, the occurrence of business relationships with previous employers is addressed.

5.4.1 Previous experiences of the founders

Figure 5.1 shows the relative occurrence of the various previous work experiences of the founders. The graph shows the percentage of firms in the total sample that potentially benefit from the founders’ previous industry-specific and organizational experiences. Note that the shares do not add up to 100%. Firms can be included in more than one category because of group efforts (58% of the firms have a founding team) and each of the founders can bring different experiences to the firm.

![Bar chart showing the percentage of firms by experience type](chart.png)

Figure 5.1: industry-specific and entrepreneur-specific experiences. Percentages indicate the share of firms by experience type (N = 265 firms)

While the entrepreneurs have diverse industry backgrounds, some pattern is apparent. First, the number of firms started by entrepreneurs with no working experience is low. Most entrepreneurs come from a position as an
employee. This was also found in the data presented in Chapter 3. Second, many firms are started by entrepreneurs that originate from within the same industry (i.e. spin-outs). Almost one-third of the Dutch software firms investigated are spin-outs with at least one of the founders coming from the software industry, either as an employee or as an entrepreneur. Although this result confirms Garvin’s remark that entrepreneurship backed up by industry experience is the most common type of entrepreneurship (Garvin, 1983), in comparison to other studies the share is rather low. Dahl and Reichstein (2005) found that 67% of all entrepreneurs come from the same industry. Chapter 3, which also concerned founding efforts across industries, had an equivalent percentage of 63%. The low entry barriers in the software sector could account for this difference: new entrants only need some programming experience and a computer (Haug, 1991). Most new firms are so small that they hardly need any founding capital or office space (Sivitanidou, 1999). The threshold to entering the software industry is thus low compared to other industries, leading to relatively many newcomers. The booming demand for computing services in the second half of the 1990s may also have encouraged entry by entrepreneurs from non-related industries. The finding that 26% of the entrepreneurs sampled come from a non-related industry provides some indirect evidence for this argument. The relatively low spin-out rate in the software industry is perhaps linked to the narrow definition of the industry used in the analysis. Because of the narrow definition, entrepreneurs have a greater likelihood of originating from outside the software industry. Only a limited number of activities are defined as part of the software industry, which makes the outside world larger, leading to more entries from outside the industry. When entrepreneurs from related industries (i.e. the whole ICT industry) are included, the share approaches the levels found in other studies. The third observation is that the impact of knowledge institutes and user firms is limited. Although user industries produce relatively few entrepreneurs, they could still provide a good background for innovation.

With respect to entrepreneur-specific experience, more than one-third of the founders have experience as a manager, and 18% of the firms are founded by so-called habitual entrepreneurs with previous entrepreneurial experience. In most cases, these founders were serial entrepreneurs who had ended their involvement in other firms before starting up the new one.
5.4.2 Relationship with the founder’s previous employer

Apart from the resources internalised in the entrepreneur, resources extracted from the entrepreneurs’ networks do play a role in the founding of new firms and their consequent behaviour. As suggested in the theoretical introduction to this chapter, the relationship with a previous employer implies straightforward access to a resource supply. In the software industry, observations support the theory: almost 40% of all software firms founded by an entrepreneur with industry experience (233 firms) have continuing relationships with the previous employer of at least one of the founders immediately after the start of the new firms. In most cases, the firms establish a supplier relationship in which the parent firm becomes one of the first customers of the new firm (73%). In another 14% of the cases, the entrepreneur is hired by the parent firm to advise or to conclude running projects. In the remaining 13%, parent firms actually give direct support to the new firm in the form of advice or financial, technological, or organizational support. These firms thus receive both internalised knowledge and direct support. In terms of the classification method defined in Chapter 2, these firms classify as spin-offs. Although the method differs from the measurements in Chapters 3, and 4, the resulting spin-off shares are comparable.

In most cases the relationship with the parent firm becomes less important over time. Almost half of all firms with initially maintained contacts indicate that the relationship was later terminated. Of the respondents with ongoing relationships, about 25% indicated that the relationship had strengthened over time. Most relationships lose their impact on the new firm over time. This supports the assumption that founders use the relationship with their previous employers to overcome a lack of resources when founding the firm.

5.5 Empirical results: regression analyses

The multivariate analyses assess the simultaneous effect on innovation of internalised experience of the entrepreneurs and their externalised network. The independent variables represent the previous experience of the entrepreneurs and their network contacts. Further, control variables are included. Some entrepreneurs did not answer all the questions relevant for the regressions. As a result, the number of observations in the analyses is reduced. The attentive reader will also notice that, as a consequence, the shares of experience types in Table 5.1, which presents the descriptive statistics of the variables used in the
regressions, differ slightly from those presented in Figure 5.1. However, the set is still representative of the whole population and there are no problems of multicollinearity since none of the variables have a correlation higher than 0.5.

<table>
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<th>Max</th>
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<td>0.41</td>
<td>0</td>
<td>1</td>
<td>169</td>
</tr>
<tr>
<td>User entrepreneur</td>
<td>0.08</td>
<td>0.27</td>
<td>0</td>
<td>1</td>
<td>169</td>
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<td>Management experience</td>
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<td>0.46</td>
<td>0</td>
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<td>Habitual entrepreneur</td>
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<td>0.35</td>
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<td>1</td>
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</tr>
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</table>

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<td>Relationship with previous employer</td>
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<td>Location near founder's previous workplace</td>
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<td>Radical innovation</td>
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<td>Age</td>
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<td>5.84</td>
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<tr>
<td>Size</td>
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<td>17.00</td>
<td>2</td>
<td>100</td>
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Table 5.1: Descriptive statistics of the regression variables

The hypotheses formulated in Section 5.2 are tested in four Tobit model specifications. Model A includes the control variables and the independent variables which reflect the industry-specific previous experience of the founders. In Model B, entrepreneur-specific experience is added. Model C includes the potential effects of having a relationship with the founder’s previous employer and being located near to that firm. Model D, finally, includes several interaction effects between the independent variables. Hypothesis 5 predicts that spatial proximity to one’s previous employer catalyses the positive effect of having continued contacts with the previous employer. The interaction effect between spatial proximity to the previous employer and the relationship with the previous employer effectively tests this hypothesis. The potential benefits of a combination of industry-specific and organizational experiences of several founders in one firm (Colombo and Grilli, 2005) are also captured in an interaction term. The model results are presented in Table 5.2.
Model A tests the first hypothesis, which predicts that any industry-specific working experience of the founders will have a positive impact on the innovation output of a firm. However, none of the three relevant variables (spin-out, related industry, and user entrepreneur) were found to have a statistically significant effect on innovation output. Therefore, the first hypothesis is rejected: industry-specific working experience of founders appears to be irrelevant in terms of innovative performance in the Dutch software industry. A possible reason for the absence of any experience effects is that the sample includes software firms of a wide range of ages and is not limited to recently established firms. It has previously been noted that experience of the founders...
may be especially important in the first years of operation. The interaction effect between spin-out firms and age should correct for this possible effect. However, the interaction effect is also not statistically significant, meaning that the impact of previous experience is independent of age. The initial conditions seem to last over time, as indeed predicted by Stinchcombe (1965).

In addition to industry-specific experience, entrepreneur-specific experience is often assumed to contribute to innovation output (Hypothesis 2). Model B tests this relationship. The evidence is mixed. Management experience is not a statistically significant predictor, but firms of habitual entrepreneurs do have a higher innovation output. Therefore, entrepreneur-specific experience does seem to play a role (confirming Hypothesis 2), but its impact is type dependent. A possible explanation for the positive influence of habitual entrepreneurship can be found in the uncertainty aspect of innovation. Founding a new firm, much like innovation, goes hand in hand with uncertainty management. Experienced entrepreneurs are therefore endowed with the skills to effectively deal with the uncertainty involved in innovation. Managers also have uncertainty to overcome, but this relates to procedural and control issues. In this sense, the results concur with the analysis on the founding process in Chapter 4. Management experience is not and asset in innovation, but entrepreneurial experience is. This result shows the importance of appreciating the different impacts of distinct backgrounds in terms of skills transfer. In order to get a good idea of which skills are relevant, the skills themselves should be addressed, or at least a set of background types that could represent specific fields of knowledge that entrepreneurs can have.

Models C and D address the network influence on innovation. Model C focuses on direct influence and Model D investigates the intermediary effect of geography. Hypothesis 3 predicts a greater innovation output by firms with good access to a relevant network, expressed in a continuing relationship with the founder's previous employer. Contrary to expectations, such a relationship proves harmful rather than beneficial. Having an ongoing relationship with a previous employer has a statistically significant negative effect on the innovation output of software firms in the Netherlands (Model C). In most cases, the respondents indicated that the previous employer became one of the first customers. However, instead of helping new firms advance, this seems to have limited the innovative performance of the firms. Perhaps the need to respond to changes in the market structure is not so urgent: the firms have a guaranteed demand for their products, and this reduces the need to develop new product
revenues. Another reason for the firms’ inertia could be in duplicating the organizational or technological structures of the parent firm. Firms can suffer from lock-in effects which reduce their awareness of developments external to the relationship with a previous employer. A general indicator of network accessibility is spatial proximity to a previous employer. Hypothesis 4 suggests that founders can benefit from social ties and other regionally-confined contacts in their innovation. However, there is no statistical evidence to support this prediction.

Finally, Model D investigates the possible intermediary effect of spatial proximity. It is anticipated that being located near one’s previous workplace positively influences the effects of having a continued relationship (Hypothesis 5). When a new firm and the previous employer are located in the same region, it is easier to maintain a relationship, positively affecting the innovation output of the new firm. Contrary to expectations, however, the interaction effect was negative. In other words, firms which maintain contacts with near-by previous employers have a lower innovation output than other firms. Since the direct effect of having a relationship with a previous employer is no longer statistically significant in Model D, it seems that firms located near a previous employer suffer from the negative effect of continued contacts. The accumulated impact of the main effects and the interaction effects indeed show that firms with a continued relationship with a nearby parent firm perform worst of all in terms of innovation output.

Including the interaction effect in the model renders an interesting additional result: the direct effect of a location near the previous workplace of the founder has become positive and statistically significant, in line with Hypothesis 4. Although firms appear limited by a relationship with a previous employer, being located in the same region as the previous workplace of the founder does involve other benefits that contribute to their innovative performance. As mentioned earlier, there is insufficient data to further explain this positive effect. It is certainly clear that the relationship with the previous employer does not account for this effect. Indeed, founders who stay in the same region and operate independently of a parent firm have the highest accumulated score (main effects + interaction effects) for innovation output. It seems beneficial to break free from the parent firm and to build upon other region-specific resources for innovation. For example, perhaps the founder has established a reputation in the region, making it easier to find potential customers for new products.
Model D not only includes the intermediary effect of distance. It also looks for possible positive effects of complementary skills. Lazear (2003) advocates a jack-of-all-trades view on entrepreneurship: the best entrepreneurs know a little bit of everything. This idea is tested by interacting industry-specific skills with entrepreneur-specific skills. However, none of the interaction effects between various types of working experience prove to be statistically significant (model D)\textsuperscript{11}. The results suggest that, in the Dutch software industry, industry-specific prior experience does not affect the innovative performance of firms, not even when combined with organizational experience.

The control variables act as expected: three of the four control variables included in the models have a significant effect on the innovation output of software firms. ‘Innovation input’ has the expected positive, and ‘radical innovation’ the expected negative, effect. Firms with a greater share of their workforce involved in the development of new products or services have higher shares of their overall turnover attributable to new products or services. The development of a radical innovation, a product or service that is new to the industry, on average leads to lower output, because of the high risks involved. Although other empirical studies have found similar results (see for example Kleinknecht, 1996), these results may simply reflect the characteristics of the dependent variable: the development of a radically new product takes time, and customers may be initially reluctant to accept the new product. Therefore, the initial share of such a new product in the total turnover may be small. The age of the firm has a negative relationship with innovation output: young firms have a relatively high innovation output. Finally, there is no significant of firm size on innovation. Similar results were found in an empirical study on innovation in the service industry (Tether, 2003).

5.6 Conclusions

Independence appears to be the key factor in explaining innovation output in the Dutch software industry. Innovative software firms have founders who have been able to break free from their previous employment careers. They discontinue relationships with their previous employers, and although they generally build on previous experiences and skills, they know how to adapt these to the current situation. Using previously acquired skills is a good way to

\textsuperscript{11} The effects of interactions between experience in a related industry or as a user entrepreneur, and working experience as a manager or habitual entrepreneur, were tested in two other models not presented here. These variables were also not statistically significant.
smooth the founding process (see also Chapter 4). Founding a new firm can be seen as a process in which uncertainty avoidance is pivotal. Building on previous experience that has proven its merit is an effective way of accomplishing this. Innovation, however, implies, by definition, dealing with uncertainty. Rather than regarding uncertainty as an obstacle, innovative entrepreneurs see uncertainty as an opportunity to outperform the competition. This calls for a mindset that is set on independence.

Entrepreneurs can draw from several sources in extracting relevant skills for the innovation process. The first source consists of internalised skills, established during previous employment spells. However, for innovation in the software industry, there seems to be few specific backgrounds. Only entrepreneur-specific experience has a positive effect on the innovation output of Dutch software firms. Knowledge of how to run a business not only seems to increase survival rates, but also contributes to the innovative performance of such firms. There could be a self-selection process reinforcing this process. People with an intrinsically innovative mindset may be more inclined to take the step to self-employment. Industry-specific experience of founders (established by working in the software industry, by working in a related industry, or by using products of the software industry) had no effect on the innovative performance of software firms. These results suggest that organizational skills and the ability to deal with uncertainty are more important for innovation in the Dutch software sector than sector-specific knowledge. Previous research has already shown that software firms have relatively good access to industry-specific knowledge due to the highly standardized nature of software programming (Boschma and Weterings, 2006). Industries in which specific product-related knowledge is harder to access may show a more significant impact of industry-specific knowledge types.

Contacts with relevant actors in the industry form a second source of skills and resources for the innovation process. Founders can use contacts established during previous jobs for tapping into knowledge pools relevant for innovation initiatives. However, at least in the Dutch software industry, continued relationships with previous employers do not appear to be important sources of relevant knowledge related to innovation. In fact the opposite occurs; firms with continued contacts with previous employers are less innovative than other firms. This effect is even stronger when the parent firm and the new firm are located in close proximity. Strong ties seem to hinder innovative progress. Other empirical studies also found negative effects of closeness on performance
Similar results are found here for innovation. In the Dutch software sector, a previous employer often became the first customer of a new firm. The software industry is, in this sense, a typical industry because support is generally given in the form of orders (Chapter 3). Such a guaranteed turnover may reduce the uncertainty surrounding the founding of a firm, but it also appears to result in firms being less motivated towards developing new products or services. These findings, in combination with the results of Chapter 4, warrant a more critical look at the effects of support during the founding process. It appears that support does not guarantee success. However, the reasons why firms may lose out from continued contacts with previous employers remain unclear. Describing the characteristics of the parent – new firm relationship may help us to understand how this affects a firm’s innovative performance. It may be that only firms that maintain a close relationship with their parent firms suffer from organizational inertia, a lack of flexibility, and an inability to embrace new initiatives, while firms that keep the parent at arm’s length may actually benefit from the continued contact with the previous employer.

Independence from previous contacts and established skills seems to encourage innovation. In terms of distance, however, innovation gains from loyalty. Spatial proximity to the one’s previous workplace positively affects the innovation output of software firms. In other words, firms that are established in the region where the founder used to work perform better. The data are too limited to fully explain this positive effect, but we can conclude that this does not result from continued contacts with the founder’s previous employer. Some studies have suggested that firms benefit from pre-established relationships with potential customers, employees or investors. However, these claims have not been tested at the firm level (Sorenson, 2003). Examining the potential causes of this positive effect requires detailed data concerning the relationships that the founder established before starting the firm and the location of these business partners. The effect of spatially bounded information networks on innovation deserves further attention.

A founder’s previous experience is considered to be a very important input for new firms and has been found to contribute to the performance of firms. However, the effect of previous experience on the innovation output of software firms appears to be more complicated. A better understanding of the transfer of knowledge through the establishment of new firms, either by
internalised experiences or pre-established relationships, requires further empirical analyses at the firm level.