The Evolution and Nature of Young Firm Networks: A Longitudinal Perspective

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ABSTRACT. This paper describes the evolution of networks during the first three years after start-up and puts forward explanations of the nature of networks of young firms after three years. We extend current research on networks by explicitly including both temporal change and spatial variation in our analyses of the longitudinal dataset. In this paper we define networks as: the main business relationships with respect to sales, supply, outsourcing and cooperation. The nature of these business relationships is specified by four main characteristics: type, number, source, and location. The longitudinal network analysis is therefore at the micro-level: the individual young firm and the characteristics of its most important business contacts are central. In contrast to the literature our analyses show that sales relationships become increasingly social in source during the first three years after start-up. We also find a persistent geographical concentration strategy in the main business relationships. It seems that extra-regional relationships are losing ground to intra-regional relationships over time: firms are narrowing their spatial scope in their first three years. In addition, we trace important effects of gender, education, innovative firm behaviour, region and sector on the nature of young firm networks three years after start-up.

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1. Introduction

Despite the increasing attention paid to business networks in economic geography literature (e.g. Cooke and Morgan, 1993; Dicken and Thrift, 1992; Yeung, 1994; Wever and Stam, 1999), studies on the spatial and temporal variation of networks are still rare. This is surprising since, especially in geography, the spatial variation of patterns and processes is a key subject. Furthermore, as networks are said to be highly dynamic (Butler and Hansen, 1991; Gibb and Davies, 1991), the lack of studies on network change is striking.

There is a consensus that a network approach is particularly useful in explaining the dispersion of production structures and their linkages (Cooke and Morgan, 1993; Dicken and Thrift, 1992; Yeung, 1994). Firms act in relational spaces rather than anonymous market spaces (Camagni, 1995; Storper, 1997). For small and young firms, the use of networks is a means of becoming competitive compared with big business. By definition, a network is a *closely linked group of people, companies, etc.* (Oxford Advanced Learner's Dictionary). For a firm, an essential network consists of all the relationships with other persons or businesses that influence the functioning of the firm in one way or another. Many studies have demonstrated the relevance of networks for young firms (e.g. Aldrich, 1999; Birley, 1985; Butler and Hansen, 1991; Larson and Starr, 1992) and some in particular for their spatial orientation (e.g. Johannisson, 1996). Other studies use network characteristics to explain the success of (new) firms (Brüderl et al., 1992; Brüderl and Preisendorfer, 1998; Donckels and Lambrecht, 1995; Hansen, 1995).

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It is however surprising that in many studies the network itself is regarded as a constant, fixed in time and place. To date, studies that focus on network change from a longitudinal view, as opposed to a cross-sectional view, are extremely rare. Gibb and Davies stated in 1991 that "[t]here is considerable evidence to demonstrate that the nature of the networks of the entrepreneur change[s] as the business develops: but there is little evidence as to how these [networks] change as the business grows and how the changes impact upon the potential for growth. This is a fruitful area for research" (Gibb and Davies, 1991, p. 295). In our opinion, business networks are changing rapidly, especially among young firms, since business contacts develop rapidly in the critical early years (cf. Littunen and Tohmo, 2000). More specifically, we claim that a cross-sectional approach, in which change is measured by the differences (of different groups or cohorts) between two moments in time lacks the detail of a longitudinal view in which networks are followed over a period of time.

We also argue that the location of business contacts within a network is an intrinsic, but often undervalued aspect of networks. A small geographical distance to a business contact enhances the potential value to the firm since the opportunity to meet and consult is enhanced, which is especially crucial in the early venture stages. Distance can also be related to the source of the business relationship – social, commercial, or both (multiplex) – and to its intensity, especially for those contacts that are vital for the firm. We therefore consider spatial proximity to be important even within networks, and we argue that the location of business contacts should not be disregarded in network studies.

This paper describes the evolution of networks during the first three years after start-up and puts forward explanations of the nature of networks of young firms after three years. We extend current research on networks by explicitly including both temporal change and spatial variation in our analysis. In this paper we define networks as: *the main business relationships with respect to sales, supply, outsourcing and cooperation*. The nature of these business relationships is specified by four main characteristics: type, number, source, location. The network analysis is therefore at a micro-level: the individual young firm and the characteristics of its most important business contacts are central.

We address two research questions: 1. *To what extent does the nature of young firm networks change in the first three years?* 2. *What is the nature of young firm networks after three years and which factors explain this nature?* In section 2 we present current network approaches and former research on (young) firm networks. On the basis of this literature we formulate expectations about the change and location of network characteristics that are tested empirically. Section 3 focuses on the data set, the operationalization of the network characteristics and their determinants. In section 4 our empirical findings with respect to the change in network characteristics over time are shown, followed by the variation and the explanation of business relationships in the third year of young firms (in section 5). Finally, we report our interpretations of the main research findings and present some suggestions for further research.

2. Entrepreneurial networks in time and space

2.1. *Entrepreneurship, new firms and networks*

Entrepreneurship studies have been concerned with the role of networks for a considerable time. In the 1980s the focus shifted from the analysis of the socio-psychological characteristics of entrepreneurs (traits approach, cf. Gartner, 1988) to the social and institutional context in which entrepreneurship is embedded (e.g. Aldrich, 1999; Birley, 1985). The role of cooperative networks in the entrepreneurial process is somewhat paradoxical. On the one hand entrepreneurs are seen as self-sufficient, independent sole persons (Beckert, 1999; Curran and Blackburn, 1994; Schumpeter, 1934; Shaw, 1997). On the other hand, entrepreneurship emerges at the junctions of social and commercial information networks that supply potential entrepreneurs with ideas, exchange opportunities and access to resources – for example, finance, potential customers, and collaborators (Baba and Imai, 1993, in Araujo and Easton, 1996, p. 97; see also Johannisson, 1995, 1996, 1998).

Entrepreneurial networks can often be characterized as a combination of ties that are social (affective), or commercial (instrumental or calculative) (Sjöstrand, 1992). In an entrepreneurial setting, commercial ties are primarily associated with business exchange, either commercial or professional; that is, the transfer of expertise (Johannisson, 1996). In contrast, shared values and mutual sentiments are said to build social ties, such as those originating in kinship and friendship. These social ties, just like commercial ties, are also necessary for the entrepreneur, since they add to the entrepreneur's self-confidence and the legitimacy of the firm on the market (Johannisson, 1996). In practice the commercial and social aspects of ties combine into entrepreneurial networks, so-called multiplexity.

Entrepreneurs starting a firm are particularly concerned with building personal networks because, in order to overcome the liabilities of newness (Stinchcombe, 1965; Aldrich, 1999) they have to mobilize all available resources (including social resources) to promote the emerging business (cf. Starr and MacMillan, 1990, in Johannisson, 1996). Entrepreneurs often mobilize different networks such as commercial contacts and social relationships, like family or friends, for knowledge or capital resources (e.g. funds, materials, space, and time). Sometimes different networks are also mobilized for symbolic support (endorsement, political backing, approval, and legitimacy) (see Johannisson, 1995). Different networks help entrepreneurs translate their visions and business plans into reality. But insight into the mixture of these networks and their changing nature is lacking.

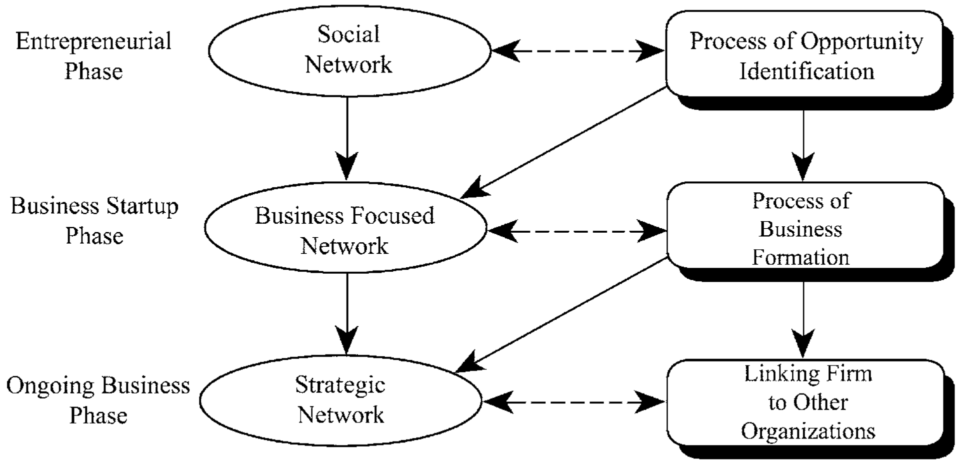
2.2. *Evolution of networks*

In the entrepreneurship studies reviewed we found two network models that could be of use to our focus on network change: one concerning organization formation (Larson and Starr, 1992) and another referring to the subsequent network evolution (Butler and Hansen, 1991). These two models explicitly treat the network in a longitudinal perspective.

The model by Larson and Starr (1992) explains the transformation of exchange relationships from a set of relatively simple, often single-dimensional dyadic exchanges into a dense set – a network – of stable, multidimensional and multi-layered inter-organizational relationships. The model describes three successive stages of entrepreneurial networking activity which are used to secure the critical economic and non-economic resources needed to start a business. A new firm results from "the crystallization of stable, committed, revenue-generating, inter-organizational exchange relationships which extend beyond the earlier idiosyncratic and personalized relationships of the entrepreneur" (Larson and Starr, 1992, p. 5). This crystallization can be measured by the successful mobilization of critical resources that generate revenues via the network. This network and the visible proof of successful mobilization also helps to mobilize new resources and establish new network ties, and induce further growth of the firm (cf. Garnsey, 1998).

The model by Butler and Hansen (1991) continues where that of Larson and Starr (1992) stops. Butler and Hansen recognize three stages of network evolution: the entrepreneurial phase, the business start-up phase, and the ongoing business phase (see Figure 1 below).

In the entrepreneurial or pre start-up stage, the social network of the (nascent) entrepreneur is extremely important. The social network assures the entrepreneur of a larger "opportunity set"[1] from which both intangible information and tangible resources can be drawn (Butler and Hansen, 1991, p. 3). During the start-up phase a more focused network begins to emerge reflecting links to individuals and organizations that directly serve the more immediate needs of the new business. This does not mean that the role of the social network has ended here, because "information about future business opportunities can still be communicated through it and some links can be extracted and included in the business focused network needed for the ongoing success of the firm" (Butler and Hansen, 1991, p. 4). The business network in this phase is a hybrid that includes individuals from the pre-existing social network together with new individuals and organizations with direct business links (e.g. with suppliers, customers, and capital providers). The newly developed business focused network is evolutionary, because it develops gradually and is influenced by the nature of the entrepreneur's social network ("path dependent", see Garnsey, 1998). Baines and Wheelock (1999, p. 31) state in



Source: Butler and Hansen 1991, p. 3.

Figure 1. Model of entrepreneurial network evolution.

this respect that "[o]wners actively pursuing and achieving growth are distinguished by readiness to seek out human resources beyond the family. They integrate the business closely into business networks and tend to remove it from family [social] influence . . ." and ". . . owners interested in growth were the most likely to form partnerships with people other than spouses." The final stage of network evolution is the development of a strategic network. At this stage the firm has been started and issues such as growth and profit making emerge. The entrepreneur becomes more aware of the strategic aspects of the networks and their impact on the success of the firm. Links with competitors or other important actors can result in shared assets, such as production knowledge and reputation.

Birley et al. (1991) also argue that entrepreneurs, at an early stage of enterprise development, rely heavily on an informal network of friends, family members and social contacts from the local neighbourhood to gather relevant data. At a later stage entrepreneurs rely increasingly on professional bankers, accountants, lawyers, suppliers, government agencies, etc. to gain access to requisite business information. However, their cross-sectional empirical research shows ". . . there is no direct evidence to support that older firms rely more heavily on business as opposed to social contacts" (Birley et al., 1991, p. 70).[2] The models described above are ideal types, and in practice some stages are never reached, or are left out, or appear simultaneously. For example, new firms that are spin-offs from existing organizations perhaps derive strategic relationships from the former work environment of the entrepreneur (Malecki and Veldhoen, 1993; Vaessen and Wever, 1993). Nevertheless, the Butler and Hansen network model in general holds for many new and young firms. Therefore, in assessing the changing nature of young firm networks, this model may form a useful basis.

2.3. *Networks and proximity*

In economic geography there is a long tradition of researching the role of proximity in business relationships in linkage studies (e.g. Taylor, 1975; Taylor and Wood, 1973; McDermott and Taylor, 1982). Recently there has been an upsurge in studies focusing on the role of proximity in trade relations. However, as modern modes of communication have extended the geographic boundaries and distance, and physical barriers have a less limiting effect on inter-organizational linkages than previously, proximity is no longer seen only in a physical sense. For example, the economic sociologist Granovetter (1993, p. 18) stresses that trade relations become less personalized and embedded in ongoing personal relations the greater the social, cultural, and geographical distance between the traders. Hausmann (1996) makes a distinction between social, organizational and spatial proximity, of which the latter is of major importance for this paper. Spatial proximity is "being on the spot", or in other words within short physical distance.[3] Spatial proximity facilitates the other two types of proximity as short distances favour information contacts and exchange among actors (Bramanti and Ratti, 1997, pp. 6–7). Meeting business partners in person gives information potential economic value, especially when the information is new. However, the perception and use of geographical space has been highly modified since the rapid progress in (tele)communication systems (ibid.). Spatial proximity is conducive to informal relationships and is relatively unimportant for formal relationships (Audretsch and Stephan, 1996, in Fritsch and Lukas, 1999, p. 161). And especially entrepreneurs may prefer informal to formal (exchange) relationships (Johannisson, 1996; Uzzi, 1996, 1997; Larson, 1992), for three reasons (Johannisson (1996):

1. Personal exchange is more potent, flexible and committing than legal agreements (increased flexibility).
2. Casual encounters may appear as opportunities that – by coincidence – initiate and direct the strategic development of the venturing process (elaborate business intelligence).
3. Entrepreneurs typically listen to and learn from business partners, such as peers, suppliers and customers, where long-term exchange has created a shared understanding and trust (cf. Lundvall, 1988; Romo and Schwartz, 1995).

For these reasons, personal, informal contacts at close geographical or cultural distance may be vital, especially for young entrepreneurs building business networks.

2.4. *Explanations of network change and network characteristics from the literature*

Ratti (1991) introduces some useful conceptual elements for identifying the strategic elements of the behaviour of firms facing the outside world. The concepts he uses are the "strategic spaces of the enterprise": market space, production space, and supporting space (Ratti, 1991, p. 72). In this paper we therefore distinguish four network types: sales relationships (market space), relationships with suppliers and contractors (production space), and cooperation with other firms with respect to marketing, sales, supply, and innovation (supporting space). As major characteristics we focus on the variation in network types, the number of contacts, the source, and the location of the contacts.

2.4.1. *Change in business networks*

Few studies concentrate on changing business networks with respect to variation, number of contacts, source, and spatial proximity. Often changes in the life course of new firms are only operationalized by growth (often as number of employees). In this respect, some authors have stated that international outreach and growth of the firm are related (OECD, 1999; Gorton, 1999; Koschatzky and Zenker, 1999). The importance of the local market diminishes as a business increases in size (Gorton, 1999; Taylor, 1975). Birley et al. (1991) foresee a shift from informal network contacts to formal, commercial business contacts during subsequent stages in the life-path of firms (see also Butler and Hansen, 1991). However, their empirical findings did not support this expectation, which may result from the fact that they used a cross-sectional analysis (Birley et al., 1991, p. 70). Counter-evidence is provided by Johannisson (1996) who found that social orientation in the firm's core network increased over time.

Based on these findings, we have formulated three hypotheses about dynamics in business relationships:

a. *Variation* (more different types) and *number* of relationships increase over time.
b. The *source* of relationships shifts from social to business over time.
c. The importance of spatial *proximity* to business relationships decreases over time.

2.4.2. *Explanations of network characteristics*

In the literature we found some empirical evidence of the impact of personal, firm and context factors on the four network characteristics which are central in this paper: variation, number, source, and location of business relationships.

Variation and number. The *size of the firm* can be important to the network type that firms use. Large establishments are more likely to cooperate than smaller establishments (Fritsch and Lukas, 1999, p. 167). Also the *innovation level* affects the variation of contacts, since innovative establishments more often have cooperative relationships than firms without innovation (Johannisson, 1996; Fritsch and Lukas, 1999, p. 165). With respect to personal characteristics it is shown that highly educated entrepreneurs of small firms have more different types of networks than entrepreneurs with only low *education levels* (Donckels and Lambrecht, 1995; Johannisson, 1996). The contextual or *regional effect* on network types is rather complex. Some authors state that urban firms tend to subcontract a higher proportion of their processing requirements than rural firms (Peck, 1985; Scott, 1988). Koschatzky and Zenker also found higher activity in horizontal networking (cooperation) of small and large firms located in central regions (1999, p. 22, cf. Keeble, 1997) than in rural regions. However, there were no significant regional influences on vertical networking activities (Koschatzky and Zenker, 1999, p. 29).

Source. Some authors assume that *industry type* (business activities) affects the source of networks. In manufacturing industry personal networking or social sources may be less important than in the business service sector, where sense making and image building make interpersonal skills a generic asset (Johannisson, 1996). Business service firms have more relationships with social origins than manufacturing firms. With respect to personal characteristics it is argued that female entrepreneurs make more use of relationships that are social in source than male entrepreneurs, since they are yet to be recognized as equals to men as independent entrepreneurs and will therefore have less access to institutional support: a *gender* effect (Johannisson, 1996). Different *regional contexts* may also affect network types and the proximity of network contacts. Firms in socio-economic contexts dominated by cosmopolitan values (metropolitan regions) are assumed to manage personal networks more flexibly than firms in contexts dominated by rural or small-town values (Johannisson, 1996).

Location. According to some authors *type of industry* influences the need for spatial proximity to business contacts. Business service firms are highly dependent on regional markets and their economic development. Proximity to clients is a precondition for most business service firms (Koschatzky and Zenker, 1999, p. 10). In manufacturing cooperative relations with customers are least regionally oriented (Fritsch and Lukas, 1999, p. 176). Firm size can also affect the location of business contacts since exporters are mainly found among larger firms (OECD, 1999; Gorton, 1999; Koschatzky and Zenker, 1999). Business contacts of small and medium sized enterprises for *innovative* activities most often take place on an extra-regional or national level in the Netherlands (see Wever and Stam, 1999; Prince, 2000). With regard to personal factors that affect the spatial proximity of networks it is shown that *highly trained* entrepreneurs' scope of action extends further nationally and internationally (see Donckels and Lambrechts, 1997). This finding can be related to the possibility that owner-managers have (inter)national contacts that have been built up in previous employment or education (Malecki and Veldhoen, 1993; Vaessen and Wever, 1993). Finally, with respect to contextual factors influencing the location of business relationships, Gorton focuses on the effect of the home region on the proximity of network contacts. On the basis of the literature he asserts that "[F]or firms [SMEs] operating in isolated peripheral areas with low levels of demand the ability to transcend restricted local markets appears to be vital for achieving significant growth" (Gorton, 1999, p. 39). But the evidence contradicts this, since he found that peripheral firms, on average, are more dependent on their own county as a geographical market. This relationship holds even when sectoral and life-cycle variations are controlled for (Gorton, 1999).

Based on these findings, we have formulated four hypotheses about the nature of business relationships after three years:

d. VARIATION: highly educated entrepreneurs have relatively many different business relationships.
e. NUMBER: Large firms have more cooperation relationships than small firms; innovative firms tend to cooperate with other firms more than non-innovative firms do; urban firms relatively often use suppliers or out-source services (although the empirical evidence is quite contradictory, see section 2.4.2); urban firms have more cooperative business relationships than rural firms.
f. SOURCE: Firms in business services have more business relationships that are social in source than manufacturing firms; female entrepreneurs are more focused on business relationships that are social in source than their male counterparts.
g. LOCATION: The networks of firms in business services are more regionally oriented than networks of manufacturing firms; large firms have more relationships outside the region than small firms; innovative firms are less focused on regional business contacts than non-innovative firms; highly educated entrepreneurs are less focused on the region than lower educated entrepreneurs; relatively many business contacts of rural firms are located outside the region.

3. Data collection method and operationalization: the Young Firm Panel

3.1. *Data and data collection*

Many empirical research studies on new firms and their external contacts have a retrospective character. Entrepreneurs are asked about their external relations or activities and the firm performance some years after the start of their firm. This leads to two problems. First, the causes for closure or migration of the new firms that did not survive can no longer be ascertained, since by definition the research population will only consist of entrepreneurs that did survive. The second problem is that memory problems can be quite substantial, especially when the firms are some years old. It may then be hard to remember the exact reasons for specific firm strategies. In order to avoid these problems and to analyse the major changes in the early life-stages of new firms, in July 1995 the Young Firms Panel was founded. This Panel contained 313 firms in manufacturing and business services that started activities in June–September 1995 in three Netherlands regions: the Greater Amsterdam region, the Province of Groningen, and the Twente-Salland region (see Figure 3 and Figure 4). In order to reach only genuine new entrepreneurs we have selected only entrepreneurs who did *not* have a new firm two years prior to 1995.[4] We started by telephoning all new subscriptions in the register of the Chambers of Commerce and selected only new entrepreneurs in manufacturing and business services. After completing a broad telephonic questionnaire concerning the start-up characteristics of the firm, its networks and the characteristics of its founder, the new firm and its owner[5] were followed closely every year, during five years. During this monitoring, each year the founder was asked to report major changes with respect to locational aspects of management, production processes, employment, networks, marketing, suppliers, cooperation, networks and so on. We used telephonic questionnaires and carried them out ourselves, with the help of research assistants. In preparing the interviews each questionnaire was adapted to the entrepreneurs' specific situation one year before. The telephonic interviews took 50 minutes on average.

At this moment, the Panel has yielded its first results, since the first three years of the new firms can be analysed (1996, 1997, 1998). Only half of the 313 firms at the start in 1995 were still active in our Panel in January 1999: 155 firms had either stopped activities, or could not be traced, or refused to cooperate, or had migrated abroad. The other half, 158 firms, are still active and participating in the Panel. Four firms only started activities in 1997, so 154 individual life-paths can be analysed longitudinally over three years (1996–1998). An overview of the Panel response through the years is depicted in Table I.

In using only the firms that were still in the Panel after the first three years for our analysis of the change in and the nature of the business relationships, we encountered the problem of Panel selection bias. It may be possible that the firms that remained in the Panel were selective in their business networks. In other words, by analysing

TABLE I
Young Firm Panel response 1996–1999

	Interview Spring 1997	Interview Spring 1998	Interview Spring 1999
Number of entrepreneurs	313	255[a]	198[a]
Economically active and remaining in the Panel	248	184	158
Not yet economically active, but remaining in the Panel	7	4	1
Stopped activities	35	31	21
Could not be traced back	15	30	12
Refusals	6	6	6
Moved abroad	2		

[a] Each year we started interviewing the active and not yet active firms of the year before. In the spring of 1999 however we could also trace back 10 firms that could not be found in 1998.

only the firms still in the Panel we may have had biased outcomes, since these firms could have significantly different business relationships compared with the firms that left the Panel (the 94 firms that stopped or could not be reached since their (economically active) first year: 248 minus 154). This seems logical, since many new firms that quit the Panel or did not survive were set up by entrepreneurs not primarily aiming at sales or firm growth, for instance entrepreneurs with full time jobs in addition to their new firm (see Schutjens and Wever, 2000; Stigter, 1998). As a consequence, it can be expected that these “low profile” entrepreneurs would not have invested heavily in their business contacts.

When controlling for this Panel selection bias, we found that the 154 firms still in the Panel differed from the other 94 firms with respect to the number of market relationships. The differences in outsourcing contacts however were not significant. We therefore conclude that our research sample is only slightly biased.[6]

3.2. *Operationalization*

3.2.1. *Dependent and independent variables*

As indicated above, following Ratti (1991) four types of business relationships were analysed:

- Sales relationships (four main buyers)
- Supplier relationships (four main suppliers, within the value chain)
- Outsourcing (service) relationships (four main contractors)
- Cooperation relationships (main cooperation with other firms)

We have chosen the most important sales relationship (in terms of share in total output): the average share (sales/output) of the most important customer was 56 percent (which corresponds with on average Dfl. 92,000).[7] Suppliers are firms that supply input (parts, units) needed for the product/service of the focal firm. Contractors are firms that deliver services not directly related to the product/service of the focal firm (accountants, cleaners, catering). With respect to cooperation we have focused on four different aspects: supply, innovation, marketing, and sales.

We collected data on the number, the source (social versus business), and the location (within or outside the province, based on information on municipality level) of these four business relationships of the firms in their third year. The variation in networks is based on the number of different types of business relationships. An overview of the sets of independent and dependent variables is represented in the matrix below (Figure 2).

In our research population business service firms are over-represented (see Figure 3). Most of the firms are quite small: 149 of the 158 firms have less than five employees. The largest firm has only 18 employees. The innovative behaviour variable is constructed on the basis of the Ansoff strategy categorization (Ansoff, 1984). Firms showing product development behaviour have adapted or innovated their products; firms showing market development behaviour actively searched for new (geographic) markets or market segments; firms with diversification strategies did both. There were 23 firms which did not actively adjust

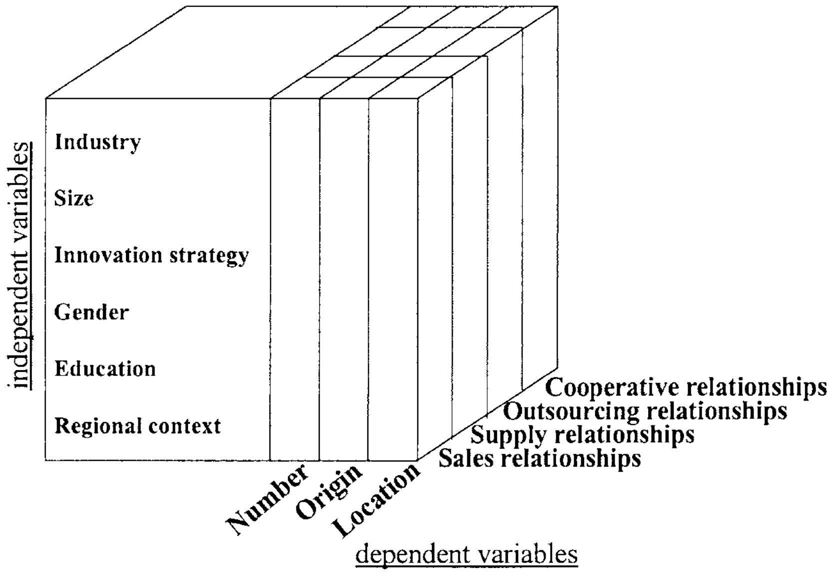


Figure 2. Independent and dependent variables.

Industry: - Manufacturing: 35 - Business services: 123	Gender: - Male: 115 - Female: 43
Size: - Self-employed: 111 - With employee(s): 46 - Missing: 1	Education: - Low (primary or secondary education): 40 - Medium (secondary vocational training): 27 - High (polytechnic, university): 91
Innovative behaviour: - Diversification: 36 - Product development: 45 - Market development: 20 - Market penetration: 14 - Static (no innovative behaviour): 23 - Missing: 20	Regions: - Groningen: 47 - Twente: 52 - Greater Amsterdam: 51 - Moved outside region of origin: 8

Figure 3. Description of the independent variables (at the end of the third year of young firms: 1998).

their products or markets; for 20 firms the innovative behaviour could not be assessed.

The regions of the firms involved in this research are indicated in Figure 4 (dark shaded areas). The extended black lines around these three research regions outline the geographical area in which business relationships are still classified as "regional".

3.2.2. *Method*

The method we use is a simple cross-tabulation, with the columns containing the dependent variables (the variation, number, source, and location of four types of business relationships) and the rows the determinants (firm size and gender, for example). We did not use asymmetrical statistical measures since the direction of the relationship is not always straightforward, especially in the relationship between firm behaviour and cooperation. Furthermore the small number of cases limits the range of logistic analysis applications. However, we did test all bivariate relations statistically. Only when statistically significant relations appeared, the statistical measures are given below the table.

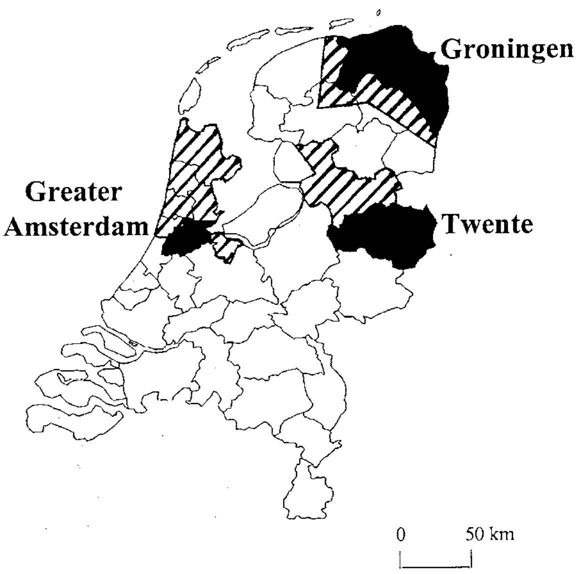


Figure 4. The regions.

4. Changing networks over time: a longitudinal perspective

As hypothesised, the network of firms changes over time. We consider that young firms are especially subject to those changes. As indicated above, the network nature is defined by the number, source, and location of the most important business relationships.

4.1. *Changing number of business relationships*

The number of different types of business relationships increases over time, as we expected (hypothesis a) (see Table II).

So the network of young firms expands, usually from only sales relationships to a combination of different types of relationships. Whereas in the first year only 29 percent of the firms had at least three different types of business relationships, in the third year this share had increased to 36 percent. In a cross-sectional view the relational space of the young firms seems to have become more differentiated during the first three years of existence. But in a longitudinal analysis a more complex pattern emerges. For example, 22 of the 48 firms with only two different types of business relationships in 1996 increased their scope to at least three different types in 1998 (19 firms stayed at two types). But of the 37 firms with three different relationships in 1996, 16 underwent a decrease in variation in 1998 (14 stayed at three types).

Surprisingly, the number of firms with three or more sales relationships decreased in the third year from 49 percent (75 firms) to 14 percent (22 firms) (see Table III). Young firms seem to concentrate on a smaller number of customers in the course of time. They become more selective and thereby narrow their market probably as a result of specialization, even in the first three years. The number of supplier and outsourcing relationships is more stable during the first three years. A relatively large number of firms (19, that is 44 percent of all cooperating firms in the third year) had no cooperative contacts with other firms in their first year.

TABLE II
Number of different types of business relationships in 1996 and 1998

		Number of different types of relationships in first year (1996)					Total
		0	1	2	3	4	
Number of different types of relationships in third year (1998)	1	7	24	7	3	–	41
	2	1	22	19	13	2	57
	3	2	4	18	14	2	40
	4	–	2	4	7	3	16
Total:		10	52	48	37	7	154

TABLE III
Number of business relationships in 1996 and 1998

		Number of relationships in first year (1996)						Total
		0	1	2	3	4	Missing	
Number of sales relationships in third year (1998)	1	11	10	17	12	31	6	87
	2	4	3	7	7	12	3	36
	3	2	5	2	3	4	1	17
	4	–	1	1	–	3	–	5
	Missing	3	–	2	–	3	1	9
Total:		20	19	29	22	53	11	154
Number of supplier relationships in third year (1998)	1	–	5	5	1	–	18	29
	2	–	5	1	2	–	8	16
	3	–	2	2	–	1	3	8
	4	–	1	1	–	1	3	6
	Missing	–	6	6	4	3	76	95
Total:		0	19	15	7	5	108	154
Number of outsourcing relationships in third year (1998)	1	–	28	9	6	2	21	66
	2	–	5	4	3	4	2	18
	3	–	2	3	–	–	1	6
	4	–	–	–	3	–	1	4
	Missing	1	14	5	1	–	39	60
Total:		1	49	21	13	6	64	154
Number of cooperative relationships in third year (1998)	1	–	4	4	1	–	19	28
	2	–	3	1	–	–	4	8
	3	1	1	–	–	–	1	3
	4	–	–	–	–	–	–	0
	Missing	7	9	6	–	–	93	115
Total:		8	17	11	1	0	117	154

4.2. *Changing source of business relationships*

We hypothesised that the source of relationships of young firms shifts from social to commercial over time (hypothesis b). In Table IV the empirical results of the analysis of dynamics in source of the four business relationships are shown (absolute numbers).

With respect to sales relationships, many firms that reported a commercial source in their first year mention a multiplex (both social and commercial) source two years later. So regarding sales, commercial relationships are increasingly intertwined with social aspects, quite contrary to our hypothesis (b). However, this trend cannot be found in the other three types of business relationships. In supplier, outsourcing, and cooperative relationships the most important change is from having no business relationship at all to having one with a commercial source. Generally, the dominant source is commercial and remains commercial in the third year. But there is also a surprisingly large group of firms whose outsourcing relationships shift from a social source to a commercial source.

4.3. *Changing location of business relationships*

Few studies have concentrated on the change in location of business relationships over time. Based on the impact of firm growth on the (international) geographical scope of firms (see Gorton, 1999), we expected that the geographical orientation would broaden during the life course of young firms (hypothesis c). However, we could not find any empirical evidence for our hypothesis. Again,

TABLE IV
Source of business relationships in 1996 and 1998

		Source of relationships in first year (1996)				Total
		No relationship of this type	Commercial	Social	Both	
Source of sales relationships in third year (1998)	Commercial	4	74	8	3	89
	Social	–	5	7	1	13
	Both	5	22	5	–	32
Total:		9	101	20	4	134
Source of supplier relationships in third year (1998)	Commercial	26	20	2	–	48
	Social	2	–	–	–	2
	Both	4	3	–	1	8
Total:	32	23	2	1	58	
Source of outsourcing relationships in third year (1998)	Commercial	18	20	17	2	57
	Social	4	5	4	3	16
	Both	4	10	4	4	22
Total:		26	35	25	9	95
Source of cooperative relationships in third year (1998)	Commercial	16	6	4	1	27
	Social	6	–	2	–	8
	Both	3	3	1	–	7
Total:		25	9	7	1	42

the difference between a cross-sectional and a longitudinal view on the data is substantial (Table V). A cross-sectional analysis might indicate a slightly larger percentage of firms with extra-regional sales in 1998 than in 1996 (32 percent and 29 percent respectively). But a longitudinal analysis demonstrates the opposite. Most important sales relationships have a quite stable location, as can be expected after only three years. Most of the firms with regional sales relationships in the first year remain regionally oriented. Also, many firms with extra-regional sales in their first year do not change their geographical orientation (see Table V). A longitudinal view even points to a decreasing geographical scope, since 39 percent of the extra-regionally oriented firms is narrowing their geographical market and only 18 percent of the intra-regionally oriented firms is broadening their market view. This pattern can also be found with respect to supplier, outsourcing, and cooperative business relationships. We should however keep in mind that the number of firms involved is only limited.

5. The nature of business relationships and explanations

What factors affect the networks of young firms after their first three years? To answer this question we look at personal, firm and context factors (see section 2.4.2 and section 3). In this section we describe the business networks of young firms in their third year of existence and we report our testing of our hypotheses about the effect of factors on both variation, number, source, and location of business relationships (hypotheses d–g).

5.1. *Variation in and number of business relationships*

Most firms have more than one type of business relationship; the largest group has two different types (36 percent). The type most often mentioned is of course the sales relationship; although six firms stated that they did not have any customers at all. Most firms have only one sales relationship;

TABLE V
Location of business relationships in 1996 and 1998

		Location of relationships in first year (1996)			Total
		Inside region	Outside region	No relationship of this type	
Location of sales relationships in third year (1998)	Inside region	70	13	16	99
	Outside region	15	20	11	46
	Location unknown	1	2	2	5
Total:		86	35	29	150
Location of supplier relationships in third year (1998)	Inside region	12	3	22	37
	Outside region	3	9	10	22
Total:		15	12	32	59
Location of outsourcing relationships in third year (1998)	Inside region	51	8	19	78
	Outside region	3	7	6	16
	Location unknown	2	–	1	3
Total:		56	15	26	97
Location of cooperative relationships in third year (1998)	Inside region	8	2	14	24
	Outside region	2	2	11	15
	Location unknown	–	2	2	4
Total:		10	6	27	43

only 14 percent mentioned three or more sales relationships. Outsourcing is more common than supply-relationships, since 62 percent of the entrepreneurs have outsourcing relationships. Just over one-third of the firms has supplier relationships and around a quarter cooperates with other firms (see Table VI).

5.2. *Explaining variation in and number of business relationships*

We could not find any evidence for our hypothesis that more highly educated entrepreneurs have more different types of business relationships than entrepreneurs with lower educational levels. Only industry type significantly affects the variation in types of business relationships, since manufacturing firms have relatively more types of business relationships than business service firms (86 percent of the manufacturing firms have more than one type of business relationship, while only 66 percent of the business service firms have more than one type).

There were no significant regional influences on vertical networking activities such as supplier relationships and outsourcing relationships, as we expected (hypothesis e). There was also no difference in the number of vertical business relationships between urban (Amsterdam) and rural (Groningen and Twente) firms. However we found a significant impact of education level and industry type on the number of supplier relationships (see Table VII). The education effect is probably caused by the strong interaction with industry (93 percent of the more highly educated entrepreneurs are active in business services).

We expected large firms to have more cooperative relationships than smaller firms, but we could not find any empirical evidence for this. As hypothesised, innovative firms have more cooperative relationships than non-innovative firms (see Table VIII).

In contrast with our expectations, the cooperative behaviour of urban firms does not differ significantly from their rural counterparts in the Netherlands, although at first sight it seems that Amsterdam firms have cooperative relationships more often than firms in Twente or Groningen (respectively 35 percent, 21 percent and 21 percent). Again, gender seems to matter in coop-

TABLE VI
Variation in and number of business relationships, 1998

		Number of business relationships					
		0 (No relationship)	1	2	3	4	Missing
Number of different types		3%	26%	36%	25%	10%	0%
Type of relationship	Sales	4%	56%	23%	11%	3%	4%
	Supplier	63%	18%	10%	5%	4%	0%
	Outsourcing	38%	42%	11%	4%	3%	2%
	Cooperative	73%	18%	5%	2%	0%	3%

TABLE VII
Industry and supplier relationships, 1998

Industry	Without supplier relationships (N = 99)	With supplier relationships (N = 59)
Manufacturing (N = 35)	49%	51%
Business services (N = 123)	67%	33%

Chi-square = 3.813; Cramér's V = 0.16; df = 1; p = 0.051.

TABLE VIII
Innovative behaviour and cooperative relationships, 1998

Innovative behaviour	Without cooperative relationships (N = 104)	With cooperative relationships (N = 34)
Diversification (N = 36)	61%	39%
Product development (N = 45)	76%	24%
Market development (N = 20)	70%	30%
Market penetration (N = 14)	79%	21%
Static (N = 23)	100%	0%

Chi-square = 11.845; Cramér's V = 0.29; df = 4; p = 0.019.

erative relationships. Male entrepreneurs have cooperative relationships more often than female entrepreneurs (29 percent and 14 percent respectively). This gender effect persists after controlling for industry type.

5.3. *The source of business relationships*

In Table IX the source of the different types of relationships are shown.

For most of the relationship types, for about a third the source is (also) social. The only exception is supplier relationships, of which only 17 percent has a social source.

5.4. *Explaining the source of business relationships*

We could find no empirical evidence of an effect of industry, gender, or region on the source of business types (hypotheses f).

5.5. *The location of business relationships*

In Table X the location of the different business relationships are shown.

Most of the relationships are located within the region, especially the outsourcing relationships. We have to be cautious here, since the propensity for having a cooperative relationship with a certain type of partner in a certain region depends – among other factors – on the supply of such partners in that region or the surrounding regions

TABLE IX
Source of (the most important) business relationships, 1998

Type of relationship	Source			
	Commercial	Social	Both	Unknown source
Sales (N = 152)	59%	9%	22%	11%
Supplier (N = 59)	83%	3%	14%	0%
Outsourcing (N = 98)	60%	17%	22%	0%
Cooperative (N = 43)	63%	21%	16%	0%

TABLE X
Location of (the most important) business relationships, 1998

Type of relationship	Inside region	Outside region	Unknown location
Sales (N = 152)	65%	31%	4%
Supplier (N = 59)	63%	37%	0%
Outsourcing (N = 98)	81%	16%	3%
Cooperative (N = 43)	56%	35%	9%

(cf. Fritsch and Lukas, 1999, p. 177). This of course also applies to other types of business relationships.

5.6. *Explaining the location of business relationships*

Business service firms have regional sales relationships less often than their manufacturing counterparts, contrary to our expectations (hypothesis g). The same applies to cooperative relationships. We found no evidence for the impact of either innovation or firm size on the location of sales relationships (hypothesis g). The latter can perhaps be partly explained by the relatively small size of the firms in our sample. Quite contrary to our expectations, firms in peripheral regions (Twente and Groningen) rely more often on regional sales relationships than firms in the Greater Amsterdam region (see Table XI). This is in line with the relatively large share of Amsterdam new firms exporting (40 percent: the average is only 24 percent). Also striking is the high share of firms that moved outside the region of origin with extra-regional sales relationships (outside their current home region). There is also a regional effect on outsourcing relations (see Table XI): relocated firms and firms in Twente are least regionally oriented with respect to outsourcing.

The expectation that more highly educated entrepreneurs have a spatially broader scope of action than less well educated entrepreneurs is confirmed with respect to sales relationships, outsourcing relationships and cooperative relationships (see Table XII). This education effect persists even when we control for industry type.

In addition to the significant impact of industry type and the educational level of the entrepreneur on the location of cooperative relationships, firm size also matters. Firms with employees more often have extra-regional cooperative relationships than one-man businesses (64 percent and 29 percent respectively).

6. Conclusions

In this paper we have described and discussed the changing nature of the business relationships of young firms over time and put forward an explanation for the variation in young firm networks. We posed two questions:

1. *To what extent does the nature of young firm networks change in the first three years?*
2. *What is the nature of young firm networks after three years and which factors explain this nature?*

Our first question addressed the changing nature of business relationships over time in a longitudinal perspective. This is a relatively new research

TABLE XI
Region (in 1998) and location of sales relationships, 1998

Region	Sales relationships			Outsourcing relationships		
	Inside region	Outside region	N	Inside region	Outside region	N
Groningen	77%	23%	43	96%	4%	28
Twente	80%	20%	49	77%	23%	30
Amsterdam	55%	45%	47	90%	10%	30
Relocated outside region of origin	14%	86%	7	29%	71%	7

Chi-square = 17.235; Cramér's V = 0.34; df = 3; $p = 0.000$.
Chi-square = 20.319; Cramér's V = 0.46; df = 3; $p = 0.001$.

TABLE XII
Education and sales, outsourcing and supplier relationships, 1998

Educational level	Sales relationships			Outsourcing relationships*			Cooperative relationships**		
	Inside region	Outside region	N	Inside region	Outside region	N	Inside region	Outside region	N
Low	81%	19%	36	96%	4%	28	88%	13%	8
Medium	83%	17%	24	80%	20%	15	100%	0%	5
High	58%	42%	86	77%	23%	52	46%	54%	26

Chi-square = 9.013; Cramér's V = 0.25; df = 2; $p = 0.011$.
* (2 cells (33%) have expected count less than 5).
** (4 cells (67%) have expected count less than 5).

field, since data is scarce and interviewing firms over time is rather expensive. In our analyses we could clearly identify the difference between cross-sectional and longitudinal interpretations of the changing source and location of business relationships. We may first conclude that the literature in this field fails to pinpoint the exact changes by neglecting the dynamics in individual firm life-courses. A second conclusion is that the shift from social to business contacts over time, as hypothesised in the literature, only holds for outsourcing, supplier, and cooperative relationships. This means that upstream contacts become increasingly commercial over time. In contrast, downstream contacts (sales relationships) become increasingly social in source. This might be related to the increasing importance of strong, stable customer and market contacts with increasing competition, specialization and changing market needs (Cornish, 1995). A third and final conclusion relates to a persistent geographical concentration strategy that can only be revealed when a longitudinal perspective is adopted. It seems that extra-regional relationships are losing ground to intra-regional relationships over time, and this pattern can be found in all four types of business relationships. From a regional economic point of view this micro-scale finding is interesting, because it supports the macro-scale idea that geographical concentration strategies may enhance increasing economic interaction and even cluster formation in the region.

In answering our second question, we found that the variation in types of business relationships is rather limited three years after start-up. Only a few firms have three or more main customers, suppliers, or outsourcing relationships. The number of firms that cooperate with other firms on outsourcing, research and development, marketing and sales is only small. This may result from the fact that many firms in the panel stayed small in their first three years: a meagre 29 per cent has one or more employees.

In investigating the nature of the business relationships we found some interesting results. We could not find any evidence for most of the hypotheses; only the positive impact of innovative firm behaviour on cooperation (see also the innovative milieu approach of GREMI, e.g. Camagni, 1995; Bramanti and Ratti, 1997) and the extra-regional orientation of highly educated entrepreneurs was found. In addition, we traced a persistent effect of gender on the number of cooperative strategies. In contrast with our expectations the impact of gender, industry type, and region on the source of relationships was not statistically significant. Irrespective of type of firm, entrepreneur or region, one-third of all young firms characterize their source of business relations as social. Quite unexpectedly, business service firms more often have sales and cooperative relationships outside the region than manufacturing firms. We did not find any relationship between size and regional orientation, except for cooperative relationships. This can of course be related to the relatively small size of the firms in the sample. The regional context appeared to be an important factor for the presence of extra-regional sales relationships, since relatively many firms in the metropolitan region of Amsterdam have sales relationships outside their region. The few firms that have moved outside their region of source showed extremely high numbers of extra-regional sales and outsourcing relationships. Many of these firms keep in touch with their old clients or suppliers in their region of origin. Another determinant of differences in the location of business relationships is the educational level of the entrepreneur, since highly educated entrepreneurs are relatively strongly oriented outside the region for all business relationships – with the exception of supplier relationships.

The reasons for the lack of empirical evidence for many of our hypotheses can be diverse. First, our panel is only small. Second, the panel is very young, and many firms are only growing slowly – if at all. As a result, we only have a few large firms. Third, due to data limitations our operationalization of region and industry differs from those used in other studies. And finally, the interaction between different factors, for example industry and education or gender, may have obscured our outcomes.

We conclude however that the networks of young firms must definitely be seen in a spatial and temporal context. Both space and time matter to the nature of firm networks, especially in the first stages of a firm's life path. In this sense our findings fit in the on-going discussion on the importance of firm networks. Birley (1985, p. 115) states that "[t]he choice of networks is key in understanding the nature of the subsequent firm, because it is during the start-up process that elements of the firm are set." MacMillan (1983, in Birley, 1985) even argues that building contacts and networks is the prime factor in determining the success of any firm, and Sedaitis (1997, p. 142) states that "the founding network reproduces itself in the organization it creates, facilitating a different type of organizational structure and strategy." If we assume that the firm is an open system interacting with others in its environment, an important issue is the way in which firms co-evolve in networks and their broader environment which create and respond to demand as they emerge and grow. This is for example encapsulated in the notion "temporal embeddedness" (see Berger et al., 1995, p. 199) that refers to the history of transaction relationships, and to associated expectations with regard to future transactions. It may be that the network relations in their abstract sense are placeless (cf. Hooimeijer and Van der Knaap, 1994, p. 180; Yeung, 1998). However, the realization of the network relations is often formed in a certain place (embedded in place). The ingredients and/or members of a particular network are highly place-bound, so networks and their relationships are (re)constructed in localities and spread over space (Dicken and Thrift, 1992; Yeung, 1994, 1998). When a locality is regarded as a nexus of "relational assets" (a "locale") (Storper, 1997) it is simultaneously a medium for, and a constraint on, business operations. Business organizations are not "placeless", but are to some extent embedded within locales. Summarizing, firms are intertwined with their (local) environment and their evolution is highly connected with the evolution of their surrounding environment in general and their closest business relationships in particular.

Our findings call for more detailed research on variations in business networks, their explanations and in particular the dynamics in business networks over time. In our future research we would particularly like to include the exchange of information about firm development (talk ties), to focus on export strategies, and to aim at more detailed industry classifications and eventually multivariate analyses. In addition, for a better view on network changes a longer time span needs to be analysed. Furthermore, in assessing the representativeness of our data we think that a comparison of young firm networks to the nature of networks of both older and fast-growing firms can be interesting. Finally, we would recommend in-depth analyses on the impact of a firm's relocation on the nature and particularly the location of its business networks. More insight in the nature and change of networks and in particular the changing location of business relationships may help to explain and eventually stimulate regional interaction and clustering.

Notes

[1] Cf. the concept of a firm's "productive opportunity set" (the opportunities that the firm's management team can see and can take advantage of) by Penrose (1959) and Kirzner's (1979) "opportunity recognition" (as he claims that entrepreneurs need to be alert to opportunities).

[2] In this research older firms are more than five years old.

[3] What is "short" physical distance? Sweeney (1987), for example, operates this as contacts which may be reached in a half hour's time. Such are contacts that can be used by entrepreneurs in their regular decision-making process.

[4] Because we only chose entrepreneurs that did not have a firm two years before, the representativeness of our data is hard to establish. Because of this qualitative selection criterion we cannot guarantee that our sample is a randomly drawn sample of all new entrepreneurs in the Netherlands. However, the analysis of another panel (EIM, 1994: see Schutjens and Wever, 2000) indicates that key characteristics of both firms and their owners are comparable.

[5] We assume that the relationship is upheld by the owner. Of all entrepreneurs who entered our Panel in 1995, 88 percent had no business partner. Three years later, this percentage had increased to 92 percent. Moreover, in the 13 firms in which a business partner was present, only in a few cases the business partner actively engaged in the firm (worked over 10 hours in the firm). In none of these firms, the business partner worked more hours per week than the owner. We therefore assume that in most cases the founder is the person who makes the strategic decisions with respect to sales, cooperation, outsourcing and suppliers and in reality upholds these external relationships.

[6] Analysis results are available from the authors upon request.

[7] Of all 152 firms in the panel in 1998 that actually delivered goods or services, 128 supplied other firms (average share in total sales is 75 percent); 73 firms supplied consumers (average share in total sales is 47 percent), and 46 firms supplied government institutions (average share in total sales is 48 percent). In 1998 total sales was on average Dfl 271,100.

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