



The Effect of Entrepreneurial Networks on New Technology-Based Firms' Growth: The Mediating Role of Growth Orientation

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Abstract. Small high-tech firms usually engage in networking to overcome their lack of resources. Entrepreneurial networks can provide valuable social capital resources that enhance the growth possibilities of new technology-based firms (NTBFs). In this context, entrepreneurs' growth orientation is crucial to explain the growth of new firms. This study determines the effect of entrepreneurial networks on NTBFs' performance under the mediating influence of growth orientation by analysing 241 NTBFs that were established during 2013 in Sweden. Furthermore, in 2014, the average size of NTBFs was two employees. Exploratory factor analysis of the questionnaire-based data on entrepreneurial networks and growth orientation and secondary business data on sales growth between 2014 and 2016 indicates that growth orientation partially and significantly mediates the relationship between entrepreneurial networks and the growth of small high-tech firms. Therefore, founders' or managers' growth orientation can have positive implications for NTBFs' future development based on the linkages established in the initial operational years.

Keywords: growth, growth orientation, entrepreneurial networks, new technology-based firms, Swedish firms.

1. Introduction

Beyond a new technology-based firm's (NTBF) start-up and subsequent survival phases lies the firm's growth potential. However, not all firms move along a successful growth path, and there are different explanations for why some firms grow whereas others do not. Researchers have highlighted the importance of the entrepreneur's growth orientation, wherein high-growth entrepreneurs have dominant goals and positive attitudes towards firm growth. Therefore, existing

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studies have used growth orientation as an important factor for high-growth firms, while using their sales as a performance measure (Gundry and Welsch, 2001; Löfsten and Lindelöf, 2002; Puumalainen et al., 2009; Wasilczuk, 2018).

Many new firms have low survival rates in their initial years (Audretsch, 1995; Löfsten, 2016a; Cressy and Bonnet, 2018; Rannikko et al., 2019). New and small firms find it difficult to obtain sufficient internal resources which may be a reason for the high mortality rates. A possible solution is to procure the necessary resources through external relationships, such as networks. Several studies have highlighted the importance of networks for newly established firms (Aaboen et al., 2013; Lassalle et al., 2020). Networks are defined as a set of individuals or organisations whose interactions are characterised by various linkages (Ostgaard and Birley, 1994).

An entrepreneurial network typically refers to the interconnections between entrepreneurs, both formal and informal (Das and Teng, 1997), which are beneficial for the business performance of new and small firms. An entrepreneurial network can provide the social capital that is necessary to increase a firm's performance (Smith and Lohrke, 2008). However, in this context, Lane and Lubatkin (1998) argue that networks and relations may vary across industry sectors. An important question is whether entrepreneurial networks are associated with growth orientation and business performance. In this context, different typologies help in comparing categories of entrepreneurs, their motivations, and entrepreneurial objectives. Several studies provide a better understanding of the behavioural patterns of entrepreneurs and firm performance (Robichaud et al., 2001; Naldi et al., 2007).

Researchers have argued that a firm's networks influence its innovation and entrepreneurial opportunities and facilitate resource mobilisation for growth. There is a growing interest in the literature on how these links influence a firm's behaviour and stimulate innovation, business performance, and growth orientation, thereby increasing competitiveness (Gulati et al., 2000; Cantner et al., 2010; Jiang et al., 2018; Rydehell et al., 2019a; 2019b; Vyas and Vyas, 2019; Fonfara et al., 2021). Empirical findings underline the centrality of entrepreneurial networks in the entrepreneurial process. Thus, networks involve cooperation to leverage external resources, given the NTBFs' lack of internal resources.

Several dimensions determine small firms' growth and capacity, namely, the founders' or managers' entrepreneurial orientation, strategic planning, competence and the firms' management of limited resources (Mazzarol et al., 2009). Growth orientation motivates the founders and managers to search for new business opportunities (Miller, 1983; Runyan et al., 2008). For NTBFs operating in hostile environments, growth orientation is crucial for firm performance (Almus and Nerlinger, 1999; Moreno and Casillas, 2008) and to drive their growth amid greater uncertainty (Yli-Renko et al., 2002). Yli-Renko et al. (2002)

demonstrate that growth orientation is positively related to international sales growth.

From the perspective of NTBFs in their early start-up phase, human capital, that is, resources related to the founder, and external relations, are important for the firm's business performance. However, existing research is somehow contradictory regarding the extent to which these resources impact the early firm performance during the first years of the start-up (Rydehell et al., 2019a). NTBFs are considered entrepreneurial, and accordingly, NTBF founders' attitudes can be assumed to have a positive impact on growth. An analysis of existing studies on entrepreneurial networks, growth orientation and business performance indicates a gap in the literature, as most studies do not consider small and young firms in the high-tech sector (< three employees and < three years old, respectively) (Zacca et al., 2015; Rubino and Vitolla, 2018; Wasilczuk, 2018; Burlina, 2020; Karami and Tang, 2019; Chakravarty et al., 2020; Wang, H. and Fang, 2022; Wang, D. and Schött, 2022).

This study determines the effect of entrepreneurial networks on NTBFs' business performance under the mediating influence of growth orientation, which has not been examined in the literature till now. The sample contains 241 NTBFs that were established during 2013 in Sweden; in 2014, the average size of NTBFs was two employees. Our research question is: How can small high-tech firms use entrepreneurial networks to achieve initial business performance under the mediation of growth orientation? The arguments recognise the nature of an entrepreneurial network as a resource that supports NTBFs' growth orientation, and consequently, the firms' actual growth. The study contributes to existing research by exploring how the founder's or manager's growth orientation mediates the relationship between entrepreneurial networks and sales growth, thereby providing a better understanding of environmental settings, entrepreneurship, and firm strategies. The results indicate that growth orientation partially and significantly mediates the relationship between entrepreneurial networks and the growth of small high-tech firms. The remainder of this study is structured as follows. Section 2 presents the hypotheses. Section 3 presents the methods, sample data, and variables. Section 4 includes the statistical analysis. Finally, Section 5 presents the discussion and conclusions.

2. Hypotheses Development

The hypotheses development is mainly building on contributions from the resource-based theory and the firm's growth perspective. It is well known in management research that the resource-based theory has a focus on business performance (Adegbile et al., 2020). Network theory has been gaining traction over the years, with network research conceptualising social structure as a pattern of connections among different actors such as individuals or organisations.

Bhattacharyya and Ahmad (2010) state that apart from economic theory, an efficient use of a network may create business or efficient business processes. The resource-based theory focuses on performance and also on intangible concepts, such as networks, which offer an opportunity to focus on technology and business performance where the resource-based perspective and network theory state that formal links support the development of firms and cooperative resources, such as *entrepreneurial networks*.

Informal ties can enable small firms to overcome the challenges of resource access in the earlier stages (Hite and Hesterly, 2001). New firms are less likely to be aware of opportunities and threats; therefore, it can be assumed that they use these informal ties because of their limited capabilities (Birley, 1985; Hoang and Antoncic, 2003). Amirahmadi and Saff (1993) identify six dimensions that proved to be crucial for the success of Silicon Valley where information exchange network is one of these dimensions. This has also been supported by Klotfsten and Jones-Evans (1996) and Autio and Klotfsten (1998). Löfsten (2016b) shows that networks with universities and consultants are especially important, and one way for small firms to solve resource problems is to build strategic alliances. Lindelöf and Löfsten (2004) argue that NTBFs working with universities in their surrounding area can increase the firm's competence, because proximity promotes the exchange of ideas through both formal and informal networks. However, based on the firm's changing internal and external conditions, the networks may not be able to provide crucial resources and new information (Gulati et al., 2000). According to Löfsten (2019), product similarity, internationalisation, and close relationships with customers enhance business performance in the initial stages of the NTBFs' lifecycle.

NTBFs are considered entrepreneurial firms with growth-oriented attributes (Miller and Friesen, 1982). In this context, 'entrepreneurial orientation'—one of the most-studied constructs in entrepreneurship literature for more than three decades (Covin and Wales, 2019)—refers to the 'processes, practices, and decision-making activities that lead to new entry' (Lumpkin and Dess, 1996, p. 136). Earlier studies have analyzed entrepreneurial orientation using three main dimensions: innovativeness, proactiveness, and risk-taking (Miller, 1983). Empirical findings also show that entrepreneurial orientation influences small- and medium-sized firms' performance (Rauch et al., 2009; Mahmood and Hanafi, 2013; Amin, 2015).

However, the mere presence of entrepreneurial orientation does not imply that the firms are actually growing. This is because the firm's growth need not be the founder or manager's main goal, especially in a micro-enterprise (Gilbert et al., 2006). Additionally, Hanks et al. (1993) indicate that small firms may not primarily seek to grow, but instead contain or 'cap' their growth, especially in the early stages before they become medium-sized firms and new and small firms also show differences in their growth ambitions (Birley, 1985). Thus, entrepreneurial orientation does not seem to be the best indicator of future growth

for small firms; in this context, scholars are exploring other drivers of the growth phenomenon (Wasilczuk, 2018). Some of them perceive the entrepreneurial orientation–performance relationship as a very narrow explanation (Zur, 2013). A suitable solution may involve a measure concentrated on growth, the *growth orientation*, which has appeared in earlier research as well (Wasilczuk, 2018; Rydehell et al., 2019a; Boz Semerci, 2020). Specifically, for small firms, founders' and managers' growth orientation are important for future development (Kirchhoff, 1994).

Cooperation within a social context requires that the entrepreneur creates value from entrepreneurial networks to benefit entrepreneurial ventures. Maintaining and developing network value involves the continuous development of networks, which implies the formation of new links. However, cooperation within the network is not without its constraints, because the value obtained by the entrepreneur can change over time. The growth attitude of the entrepreneur can also change over time as a result of being embedded in an entrepreneurial network. An active entrepreneur in entrepreneurial networks can receive a positive growth orientation. However, the importance of entrepreneurial network participation depends on its utility and the network conditions. Participation within a social context and being embedded in an entrepreneurial network structure, enables the entrepreneur to create value in an environment that influences entrepreneurial ventures. Therefore, Hypothesis 1 can be formulated as follows:

Hypothesis 1: Entrepreneurial networks positively influence growth orientation.

Research on entrepreneurship and firm growth has examined attitudes and motivations. Venture capitalists have reported that entrepreneurial characteristics are key for business performance (Mullins and Forlani, 2005). Motivation has also been researched in growth relationships with vision, growth objectives (Low and MacMillan, 1988), individual goals (Locke and Latham, 1990), willingness to grow (Davidsson, 1989), and practical intelligence (Baum et al., 2011). Miner's (1990) findings indicate that there are significant differences in motivation among growth-oriented entrepreneurs, in relation to business performance. Puumalainen et al. (2009) consider the increasing interest in the internationalisation of knowledge-intensive firms and develops an assessment tool for the international growth orientation of small firms.

Pajarinen et al. (2006) find that growth-oriented entrepreneurs are well-educated, have prior managerial and/or entrepreneurial experience, and are risk-takers. The proportion of growth-oriented businesses is also the highest in knowledge-intensive business services (Pajarinen et al., 2006). Growth firms are larger and have more initial capital, founders, and employees. These firms also engage in innovation activities, with a predominant orientation towards international markets. Despite the existence of studies that confirm the positive

relationship between growth orientation and firm growth (Wolff et al., 2015), it has not been conclusively established. Nonetheless, the motivation of the founders or managers is an important dimension for raising funds and achieving growth.

As the growth-oriented attitude of NTBF founders or managers tends to have a positive impact on business performance, those founders focusing on it tend to be more satisfied with their achievements (Rydehell et al., 2019a). Moran (1998) divides firms according to a criterion measuring high, medium, and low growth orientation. The findings show that the more growth oriented the owner or manager is, the more likely they are to be leadership-oriented, action-oriented, and decisive. These characteristics may also lead to a better understanding of the importance of entrepreneurial networks as a key resource to achieve actual growth. Piispanen et al. (2017) explore the business skills possessed by small and medium-sized entrepreneurs and their effect on growth orientation, using an entrepreneur–growth orientation framework. Their results show that growth orientation and business development are key factors in growth.

Profit and growth, and their respective outcomes, may cause the firm to utilise different types of networks (Garnsey, 1998; Terpstra and Olson, 1993), as financial performance is a common goal for entrepreneurial firms (Rauch et al., 2009). Financial performance measures are used more often compared with non-financial performance measures. However, Kiyabo and Isaga (2020) state that competitive advantage mediates the relationship between entrepreneurial orientation and small- and medium-sized firms' performance. Karimi et al. (2021) claim that entrepreneurial orientation significantly influences firm growth in small and medium-sized enterprises (SMEs), wherein entrepreneurial leadership and market orientation play mediating roles. Several other studies have also used entrepreneurship orientation or market orientation as mediating variables (Boso et al., 2013; Hunter, 2013; Aljanabi et al., 2015). Boso et al. (2013) use market orientation as a mediator between entrepreneurial orientation and business performance. Aljanabi et al. (2015) also use market orientation as a mediating variable to analyse the connection between entrepreneurial orientation and technological innovation capabilities. Hunter (2013) examines the mediating role of entrepreneurial leadership in examining the competitiveness of SMEs and analyses the connection between social capital, entrepreneurial leadership, and entrepreneurial activity.

The attitudes and motivations are important for firm behaviour and performance (Löfsten and Lindelöf, 2001). It is important to incorporate growth orientation of founders when analysing small firm growth (Autio et al., 2000). Attitudes towards growth have been highlighted by researchers as important determinants of small firm performance (Wiklund and Shepherd, 2003). In a study of 1,601 SMEs in Sweden, Isaksson et al. (2013) found that managers' attitudes towards growth have a positive relationship with growth. Accordingly,

the attitudes of NTBF founders and firm behaviour, such as growth orientation, can be assumed to have a positive impact on firm performance.

This study focuses on the characteristics of entrepreneurial network linkages and analyses how growth orientation can increase firms' early growth. It is hypothesised that growth orientation can explain the connections between the other factors in this study. In this context, mediation is defined as the intervention caused by the mediator - growth orientation. An entrepreneur who is active in entrepreneurial networks receives a positive growth orientation, because entrepreneurial networks lead to growth attitudes and actions. The present research model thus suggests a mediating role of growth orientation. Therefore, Hypotheses 2 and 3 can be formulated as follows:

Hypothesis 2: Growth orientation positively influences sales growth.

Hypothesis 3: Growth orientation mediates the relationship between entrepreneurial networks and sales growth.

3. Data and Methods

3.1. Sample and Research Design

This study includes a sample of Swedish NTBFs founded in 2013. Retriever Business² was used to identify the sample and gather business data on all Swedish firms, independent of size or form. The sample only includes firms that started as independent (not in a corporate group) and were organised as limited companies. The categorisation of NTBFs is based on the Eurostat categorisation of manufacturing and service industries according to technological intensity.³ The selection, based on the NACE revision with two codes, comprises high-tech manufacturing, medium high-tech manufacturing, and knowledge-intensive high-tech firms aggregated at the two-digit level to guarantee anonymity. Our categorisation of NTBFs is based on the categorisation proposed by Eurostat whose categorisations are based on NACE Rev. 2 at 3-digit level of the manufacturing industry according to technological intensity and based on compiling aggregates related to high technology, medium high-technology, medium low-technology and low-technology. The operationalisation of our definition is that a firm is an NTBF if it is within the high technology sectors according to Eurostat's categorisation and fits our other screenings (young independent firms).

2. <https://www.retrievergroup.com/>

3. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:High-tech_classification_of_manufacturing_industries

As a basic criterion, sampled firms must be active (not deregistered or liquidated) and responsible for tax prepayment or value-added tax payment. A practical indicator of firms' responsiveness and activity is the availability of updated contact information (phone number). The sample consists of 1,290 NTBFs which was the total population of firms that met our selection criteria.

To ensure sample validity, this study collected the questionnaire data telephonically, using one of Sweden's most established marketing research firms: TNS-Sifo (National Institute for Consumer Research). Justifiable responses have been received from 241 firms (see Table A1 in the Appendix). The largest category is knowledge-intensive high-technology services (205 firms), followed by the medium high-tech manufacturing sector (21 firms) and the high-tech manufacturing sector (15 firms). Table A1 shows the respondent characteristics and business measures from non-respondents. Non-respondents typically have lower levels of employees, sales, and assets, which indicates that this group might contain more firms that are inactive. The respondents exhibit very low employment (mean: 1.95 employees, in 2014). High-tech knowledge-intensive firms constitute 85 percent of the responding firms. Table A2 in the Appendix shows the sample with different two-level Swedish Standard Industrial Classification (SNI) codes where SNI is based on the EU-recommended standard NACE Rev.2 (Statistics Sweden, activity classification).

3.2. Data Collection—Survey

This study collected data using a two-step survey—an initial pilot study with 26 NTBFs, and the main study, which involves a discussion of the sampled entrepreneurs' perceptions of their firms. The survey questions pertain to the firms' initial conditions. The questionnaire has also been tested with six NTBFs telephonically for further refinement. The survey was conducted telephonically during the spring of 2016. Data reliability has been checked using several quality controls during data collection. All questions are measured using a five-point Likert scale.

Small high-tech firms usually have one person in a managerial position, which complicates accessibility. The common reasons for non-responsiveness include locational and time unavailability, firm policy, answering machines, wrong numbers, and managers who refuse to participate. An advantage of this meticulous process is that telephonic contact produces higher response rates and reduces misunderstanding because the interviewers are well-trained and can advise the respondents regarding the questionnaire. Other reliability-augmenting mechanisms used in this study include using randomly-selected and well-educated callers, and monitoring and taping the interview process.

3.3. Variables

Entrepreneurial networks can be either formal or informal (Birley, 1985), wherein formal networks comprise suppliers of capital, such as banks, creditors, venture capitalists, but also accountants and lawyers (Das and Teng, 1997). To capture the level of NTBF activities involving the use of external actors, respondents were asked, ‘To what extent have the following actors affected the development of your company?’, based on a Likert scale from 1 (to a very small extent) to 5 (to a very large extent). The nine actors that are listed (see variables 1-9 in Table 1) were drawn from a variety of sources and are considered important for the analysis of small firms, building on existing measures of business networks (Löfsten, 2015; Rydehell et al., 2019b).

Growth orientation is a crucial factor for growth because entrepreneurial firms are generally concerned about growth. The following three measures in this study measure growth orientation as an important firm objective: high growth - number of employees, high growth - sales, and rapid geographic expansion in new markets (for comparable measures, see Autio et al., 2000; Yli-Renko et al., 2002; Isaksson et al., 2013; Rydehell et al., 2019a). Respondents were asked to respond to statements regarding the three different growth orientations (1) rapid growth in employee numbers, (2) rapid growth in sales or (3) rapid geographical expansion ‘are a very important goal for our company’, based on a scale from 1 (strongly disagree) to 5 (strongly agree). See variable 10, 11 and 12 in Table 1.

Table 1. Variables in the study.

<i>Variables</i>	<i>Scale</i>	<i>Mean</i>	<i>Std</i>
1. Accountants	1-5	1.51	0.97
2. Banking institutions	1-5	1.49	0.90
3. Chamber of commerce	1-5	1.12	0.53
4. Consultants	1-5	1.85	1.21
5. Lawyers	1-5	1.41	0.84
6. Regional business partners	1-5	1.59	1.19
7. Patent advisers	1-5	1.22	0.72
8. Venture capital firms	1-5	1.18	0.70
9. Incubator network	1-5	1.50	1.08
10. High growth—employees	1-5	1.51	0.99
11. High growth—sales	1-5	2.94	1.54
12. Rapid geographic expansion on new markets	1-5	1.93	1.39
13. Patent	Number	0.15	0.99
14. Dum_industry sector	1/0 ¹	0.15	0.36
15. Industry work experience	Years	20.49	16.07
16. Management experience	Years	8.58	13.27
17. Dum_start-up experience	1/0 ²	0.61	0.49

Notes: ¹ high-tech manufacturing + medium high-tech manufacturing = 1; otherwise (high-tech knowledge intensive) = 0

² If the answer is yes, then this control variable = 1; otherwise = 0.

Control variables: Five measures are used: the number of patents, industry sector (manufacturing NTBFs or knowledge intensive NTBFs), industry work experience, management experience and start-up experience, where the three experience variables may correlate with both the network/growth orientation variables and realised growth, for example, the characteristics of startups' human capital. In this analysis, the control variables are used to distinguish the contributions of the control variables to sales growth. They deconstruct the sales growth of the NTBF based on the firm's individual context. The first control variable, *the number of patents*, is captured by an item in the questionnaire. The control variable is based on the question 'How many approved patents does your firm have today?'. The industry sector control variable (*Dum_industry sector*) is based on the NACE revision with two codes, wherein the firms are aggregated at the two-digit level. If the industry is high-tech manufacturing or medium high-tech manufacturing, the dummy was coded as 1; otherwise (high-tech knowledge intensive), it was coded as 0. Regarding the entrepreneur-level, one dummy was included in the analysis. *Industry work experience* is operationalised and based on the question 'How many years of work experience do the founders have (in total) in the same industry where your business competes at the start-up year?' On average, founders in the sample had 20.49 years of work experience in the industry. *Management experience* is operationalised and based on the question 'How many years of managerial experiences do the founders have (in total) at the start-up year?' On average, founders in the sample had 8.58 years of management experience. However, this control variable is not normally distributed, and hence, the variable is transformed into a logarithmic variable. The third control variable on the entrepreneur level is *start-up experience* (*dum_start-up experience*) and is based on the question 'Before this business was founded, did any founder have start-up experience?' If the answer is 'yes', then this control variable was coded as 1; otherwise, it was coded as 0. However, firm age can also affect the use of different types of networks; therefore, the firm age effect has also been tested, despite the fact that all sampled NTBFs were established in 2013. The firms have a maximum age difference of 11 months; thus, firm age does not have any effect on sales growth in this study.

Growth: Three performance measures are suitable for use in entrepreneurship research: profit, sales growth and employment growth (Davidsson, 1989; Delmar, 1996; Zahra, 1991). Several studies have used increased sales to measure firm growth (Ferreira and Azevedo, 2008; Stenholm et al., 2016). Issues related to measurement of small and young firms have also attracted academic attention because the measures of firm performance are highly skewed (Almus and Nerlinger, 1999; Coad et al., 2014; Törnqvist et al., 1985). Business performance is measured using sales growth between 2014 and 2016 for NTBFs that started operating during 2013. In this study, growth is measured as the log-difference of sales ($\ln [\text{Sales}_{2016}] - \ln [\text{Sales}_{2014}]$) in line with Törnqvist et al.'s (1985) approach.

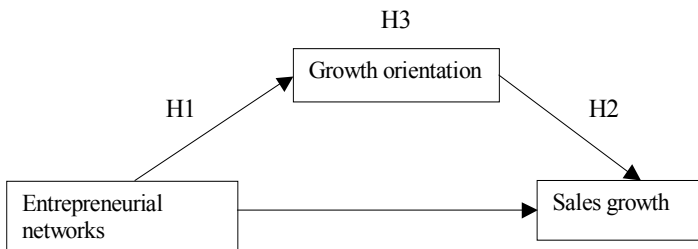
3.4. Econometric Methodology

The statistical analysis consists of: (i) factor analysis (principal axis factoring method) to convert potentially correlated variables into linearly uncorrelated factors, and to test whether the measures selected for each construct exhibit sufficient convergent and discriminating validity; (ii) a correlation analysis to identify the statistically significant measures; and (iii) four regression analyses to test the links between the factors and control variables. Multiple regression analyses are used to test the relationships (H_1 – H_3) and are based on the factors constructed from the aggregated means of the underlying single variables.

The subsequent statistical analysis focuses on factor growth orientation, exploring the characteristics of entrepreneurial networks and the role of firms’ growth orientation in increasing their sales growth during the early stages. It is hypothesised that growth orientation explains the relationship between professional network and sales growth, during 2014–2016. Perfect mediation is defined as the complete intervention caused by a mediator. Although it is challenging to empirically assess the mediation of growth orientation, statistics can be utilised to evaluate the present mediational model. Baron and Kenny’s (1986) four-step method for conducting mediational hypotheses, wherein a variable or factor is assumed to act as a mediator under specific conditions, is used to test the mediating effect of growth orientation.

First, the analysis explicitly focuses on the entrepreneurial network factor, and suggests that an entrepreneurial network fosters a fruitful entrepreneurial milieu and positively affects NTBFs’ growth orientation (H_1). Second, the study proposes that growth orientation positively impacts NTBFs’ early sales growth. Hence, the model hypothesises that growth orientation plays a mediating role. The arguments presented in H_1 – H_3 are illustrated in Figure 1, clarifying that growth orientation is a mediating link between an entrepreneurial network and sales growth.

Figure 1. Research model.



4. Analysis

4.1. Factor and Correlation Analysis

Exploratory factor analysis, involving a principal axis factoring method with varimax rotation, was used to identify the constructs underlying entrepreneurial networks and growth orientation. Different factor loadings were considered significant for different sample sizes, and a sample size of 241 requires a factor loading greater than 0.30–0.40 to be considered significant at the five percent level (Hair et al., 2006). In this context, scholars have differing opinions regarding the threshold of the Cronbach's alpha (α) measure. Some researchers state a required value of at least 0.900 (Nunnally and Bernstein, 1994), whereas others, such as DeVillis (1991) and DeVon et al. (2007), suggest that an alpha of 0.700 is acceptable. Hair et al. (2013) claim that the lower limit for exploratory research is 0.600. However, a Cronbach alpha below 0.500 is unacceptable (George and Mallery, 2003).

Three factors are identified in the analysis (See Table A3 in Appendix): 1) *professional network* ($\alpha = 0.699$); 2) *growth orientation* ($\alpha = 0.544$); and 3) *consultative network* ($\alpha = 0.472$). The factor 'consultative network' has been eliminated from further analysis because of the low Cronbach's alpha. H_1 in the research model (See Figure 1) is adjusted after the factor analysis in section 4.1, such that the entrepreneurial network is substituted by the professional network factor. Table 2 contains the descriptive statistics and Pearson's correlation coefficients at the single variable level for the professional network and growth orientation factors and their relationship to sales growth during 2014–2016. In Table 2, the variables *regional business partner*, *incubator network*, *high growth – employees* and *high growth – sales* are significant for growth. The measures generally show low interaction levels. The independent sales growth ambition variable has the highest mean (2.94; see Table 1). None of the control variables are significant for sales growth (see the last row in Table 2).

Table 2. Correlation matrix on the variable level.

Variables	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.
1. Accountants																	
2. Banking institutions	0.266**																
3. Chamber of commerce	0.159*	0.143*															
4. Consultants	0.100	0.300**	0.203**														
5. Lawyers	0.115	0.202**	0.164*	0.195**													
6. Regional business partner	0.103	0.193**	0.054	0.227**	0.288**												
7. Patent advisers	0.024	0.136**	0.047	0.199**	0.364**	0.464**											
8. Venture capital firms	-0.029	0.113	0.007	0.130*	0.300**	0.233**	0.326**										
9. Incubator network	0.054	0.047	0.103	0.199**	0.261**	0.429**	0.373**	0.264**									
10. High growth – employees	-0.068	0.004	-0.049	0.053	0.052	0.161*	0.024	0.091	0.002								
11. High growth – sales	-0.041	0.030	-0.077	0.060	0.074	0.151*	0.183**	0.238**	0.122	0.292**							
12. Rapid geogr exp new markets	0.053	0.156*	0.067	0.140*	0.192**	0.287	0.359**	0.175**	0.277**	0.170**	0.386**						
13. Patent	0.014	0.182**	-0.036	0.016	0.088	0.244**	0.225**	0.134*	0.127*	0.043	0.030	0.146*					
14. Dum_ industry sector	-0.003	0.136*	0.077	0.052	0.043	0.213**	0.315**	0.176**	0.051	0.138*	0.251**	0.264**	0.076				
15. Industry work experience	0.060	0.096	-0.021	-0.034	-0.052	0.030	-0.030	0.019	-0.133*	0.109	0.136*	-0.017	0.075	-0.171**			
16. In_Management experience	0.047	0.011	-0.030	-0.155	0.017	0.170*	0.100	0.018	-0.007	0.039	0.112	0.143	-0.015	-0.303**	0.432**		
17. Dum_start-up experience	-0.021	0.101	0.011	0.021	0.112	0.156*	0.127*	0.022	0.084	0.125	0.170**	0.219**	0.064	0.192**	0.199**	0.265**	
18. Sales growth	-0.079	0.007	0.049	0.098	0.121	0.179**	0.103	0.083	0.181**	0.193**	0.239**	0.083	0.055	0.009	-0.045	0.125	0.104

Notes: * p<0.05, ** p<0.01

4.2. Regression Analysis

Regression analyses was used to test the relationships (H₁–H₃) in the model and were based on the factors constructed from the aggregated means of the underlying single variables. First, the positive effect of professional networks on growth orientation was tested (H₁). The regression analysis (Model 1 in Table 3) shows a positive and strongly significant relationship (at the 0.5 percent level) between professional network and growth orientation. Therefore, H₁ is supported.

Second, the relationship between growth orientation and sales growth during 2014–2016 was tested (H₂). Model 2 in Table 3 shows that growth orientation has a positive and strongly significant effect (at the 0.5 percent level) on sales growth; thus, H₂ is also supported. Third, the positive effect of a professional network on sales growth was tested (Model 3). The results show a strongly positive effect on sales growth. Lastly, the mediating effect of growth orientation on the relationship between a professional network and sales growth was tested. Model 4 in Table 2, including both the independent variables, professional network and

the mediating factor growth orientation, was significant. Growth orientation was strongly significant (at the 0.5 percent level), whereas professional network was significant, but had inferior strength, with a weaker relationship than in model 3.

Table 3. Regression analyses. Unstandardized beta coefficients and standard errors (in parentheses)

	Model 1 ^a	Model 2 ^b	Model 3 ^c	Model 4 ^{d,e}
Professional network	0.306*** (0.057)		0.083*** (0.027)	0.058* (0.028)
Growth orientation		0.105*** (0.029)		0.084** (0.031)
Intercept	4.290*** (0.430)	-0.537** (0.202)	-0.442* (0.204)	-0.805*** (0.239)
Adjusted R ²	0.106	0.052	0.038	0.067

Notes: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.005$.

^a Sig. 0.000***, dependent variable: growth orientation.

^b Sig. 0.000***, dependent variable: sales growth.

^c Sig. 0.002***, dependent variable: sales growth.

^d Sig. 0.000***, dependent variable: sales growth.

^e Growth orientation as a mediating variable:

Sobel test: p -value = 0.0156 (* -significance).

According to Baron and Kenny (1986), the mediating effect occurs if the following four conditions are met: (1) professional networks affect growth orientation, (2) growth orientation affects sales growth, (3) professional networks affect sales growth, and (4) the effect of professional networks is reduced in the presence of growth orientation. To summarise, conditions 1–4 are all satisfied in this study. As shown in Table 3, growth orientation mediates the effect of professional networks on sales growth because when the mediation variable (factor) is introduced in the regression model, the effect of the independent variable weakens. The mediating variable (factor) is significant, as is the model. Thus, H_3 is supported, and it can be concluded that growth orientation partially mediates the relationship between professional networks and growth.

Models 1 to 4 exhibit differences regarding the adjusted R^2 scores. The adjusted R^2 in Model 1 is 0.106. An R^2 coefficient of 1.0 indicates that the regression is a perfect fit; consequently, Models 2 and 3 show a worse fit compared to Model 1 (adjusted R^2 of 0.052 and 0.038, respectively). Model 4 shows a somewhat better fit (0.067). Two further statistical procedures have been used to test the empirical findings. First, a Sobel (1982) test is used to verify the mediating effect. MacKinnon and Dwyer (1993) and MacKinnon et al.'s (1995) statistics-based methods enable the formal assessment of mediation (see also Sobel, 1982; Baron and Kenny, 1986). The Sobel test shows that the p -value is 0.0156 (p -value < 0.05), which indicates that there is a mediating effect at the five

percent level. An additional test shows no indication of multicollinearity in the model (Tolerance and VIF: Variance Inflation Factor).

5. Discussion and Conclusions

Several studies on entrepreneurial orientation, growth orientation and growth have been conducted to analyse both direct and mediated relationships. This study determines the effect of entrepreneurial networks on NTBFs' sales growth under the mediation of growth orientation, where sales growth is an indicator of NTBFs' business performance. The analysis contributes to the literature by providing empirical evidence on how growth orientation and professional networks influence small firm growth. Growth orientation partially mediates the relationship between professional networks and sales growth, confirming the three hypotheses. This understanding can enable small firms to segment their professional networks more effectively to leverage resources. In the present study, the consultative network has been excluded as a factor from the regression analysis. However, this does not pose a problem as the correlation analysis at the variable level shows that the variables that represent the consultative network factor (accountants, banking institutions, chambers of commerce and consultants) are uncorrelated with sales growth during the period 2014–2016.

The dynamic character of entrepreneurial networks indicates that professional network linkages in the future may be dependent on both firm age and growth. Environments in which social processes take place are also expected to become more integrated over time. However, growth itself is a time-related effect that may cause problems when small firms transform their organisational structures to become larger ones (Terpstra and Olson, 1993; Garnsey, 1998). Networks facilitate access to entrepreneurial opportunities, enable the testing of ideas and resource enforcement, and help in developing business knowledge and also opportunities in the different stages of firm development. The empirical analysis in this study shows that the linkages between NTBFs and external actors can generate valuable economic resources. Firm age is related to business problems in young firms, and entrepreneurial networks can be developed when firms are confronted with configuration problems regarding growth. Embedded linkages are assumed to be more dominant in the start-up phase than in the later stages of the firm's development. From a dynamic perspective, more mature firms tend to use consultative networks.

This study has implications for the knowledge on how entrepreneurial networks and growth-oriented firms add value to NTBFs and provide valuable insights for founders and managers, indicating a possible impact on business actions and firm policies. Growth orientation as a mediating variable may give the firm a competitive advantage in the future development of the firm. However, future studies, especially qualitative studies, may develop a deeper understanding

of the connections between entrepreneurial networks and firm growth through the mediating role of growth orientation in wider contexts.

According to Oakey (2007), much of the policy assistance for NTBFs over the years has been directed at encouraging the firms' R&D collaboration through local networking and technology transfer. There are several conclusions that have emerged from our study, which have implications for policy issues: (i) Networks are vital for the discovery of opportunities and resource enforcement. For example, no single accelerator, incubator or science park will provide a complete range of entrepreneurial networks required by localised NTBFs. (ii) These formal networks are often an effective way of reaching out to the public and regulators, which also may have implications for policy.

Some of the variables, such as accountants, banking institutions, chamber of commerce, consultants, lawyers and regional business partners, are more general than specific for high-tech firms. Nevertheless, some of these links are essential for NTBFs as well, and especially, patent advisers, venture capital firms and incubator networks. We define entrepreneurial networks as the interaction and linkages between actors in an entrepreneurial (newly established firms) setting. However, many actors in the network (e.g., accountants and banks) are present in all stages of a firm's lifecycle, whereas others may be more prominent in the very early stage, e.g., incubators and venture capital firms. We do not measure if the actors in the network have strong or weak ties *per se*, but rather if the actors have played a significant role for the NTBF. We selected organisations which are organised around NTBFs as formal networks. However, new firms are less likely to be aware of all the opportunities because of their limited ability. Thus, informal networks, such as an established set of relationships with family and friends, are likely to be created at earlier stages of a firm's business cycle.

This study's design has several limitations that provide scope for further research. Entrepreneurial networks develop through the interaction of processes, wherein time is an important dimension. This study's survey data are based only on a single year. Additionally, sales growth has only been measured for firms' initial three years of operation, including only the NTBFs established in 2013 that survived during 2014–2016. It is a limitation that only active and surviving firms are included in the study, which implies that some relationships may have been overestimated, such as the link between growth orientation and firm performance. The data collection time (March 2016) represents the end of the three-year-period, whereas the questionnaire itself reflects the NTBFs' initial perception of their relationships with external organisations, which may be potentially limiting. Only 241 firms out of 1290 are used for the analysis, and as described in the study, the firms that responded to the survey may have been in a better situation in several respects, compared to non-respondents. This means that there could be a selection bias in the analysis. Furthermore, there is little information on what intentions the founders had in the beginning before we surveyed them. Some managers might have started with a mindset focused on stable development, and when they

received external support or become more involved in entrepreneurial networks, might have switched to a growth mindset. However, our data does not capture this kind of development path. Thus, future studies may focus on extending this study in different contexts. The concept of growth orientation can also be further developed as the present measure only includes three dimensions of managers' perceptions regarding sales, employees and markets. Notwithstanding these limitations, our analysis contributes to the literature by providing empirical evidence on how growth orientation and professional networks influence small firms' initial growth. This understanding can enable small firms to segment their professional networks more effectively to leverage resources.

This study concludes that professional networks and growth-oriented NTBF leadership (founders or managers) together drive higher sales growth during the firm's initial three years, where growth orientation partially and significantly mediates this connection. If managers in small NTBFs promote a growth-oriented attitude, it can have positive implications for the firm's future development and offer a competitive advantage. The results indicate that if an NTBF can quickly identify a relevant entrepreneurial network and adopt a growth-oriented attitude, this is likely to spur its early growth. However, the dynamic character of networks indicates that professional network linkages can evolve with firm age, maturity and size as business milieus transform network structures and become more integrated over time.

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Appendix

Table A1. Descriptive statistics for the surveyed 241 new technology-based firms started in 2013, Sweden.

1. Sample and response rate (number of firms).

	<u>Sweden</u>
N (population):	1,290
n (response):	241
No response:	1,049
Response rate (%):	18.7 %

2. Non-response analysis based on the difference between respondents and non-respondents. Accounting data for sampling year of 2014.

		<u>Sweden</u>
Employees ^a	Respondents	1.95
	Non-respondents	1.24
	p-value	0.391 (n.s.)
Sales ^b	Response	240.37
	Non-respondents	160.53
	p-value	0.620 (n.s.)
Assets ^b	Response	152.20
	Non-respondents	89.28
	p-value	0.674 (n.s.)

3. Industry sector and innovation performance (responding firms), year 2016.

<u>NACE revision with two codes</u>	<u>Number of firms</u>	<u>Percent</u>
High-tech manufacturing	15	6.2
Medium high-tech manufacturing	21	8.7
High-tech Knowledge intensive	205	85.1
Sum	241	100.0

<u>Innovation performance - Patent^c</u>	<u>Mean</u>	<u>Std</u>
High-tech manufacturing	0.47	1.13
Medium high-tech manufacturing	0.24	0.63
High-tech Knowledge intensive	0.12	1.00

Notes:

^aNumber of employees

^b1,000 Euro

^cNumber

Table A2. NACE Rev.2 - sectors (responding firms).

Sweden	Sectors – frequencies (%)
Manufacture of chemicals and chemical products	0.4
Manufacture of fabricated metal products, except machinery and equipment	0.4
Manufacture of computer, electronic and optical products	2.6
Manufacture of electrical equipment	0.8
Manufacture of machinery and equipment n.e.c.	3.7
Manufacture of motor vehicles, trailers and semi-trailers	0.8
Other manufacturing	0.8
Wholesale of mining, construction and civil engineering machinery	0.4
Motion picture, video and television programme production, sound recording	11.6
Telecommunications	2.1
Computer programming, consultancy and related activities	58.1
Information service activities	7.1
Activities of head offices; management consultancy activities	0.4
Architectural and engineering activities; technical testing and analysis	2.9
Scientific research and development	7.1
Other professional, scientific and technical activities	<u>0.8</u>
	100

Table A3. Factor analysis – Varimax rotation of principal axis factoring^{a,b,c} – rotated factor matrix.

Variables	Factor 1	Factor 2	Factor 3 ^d
Factor names	Professional network	Growth orientation	Consultative network
Cronbach's α	$\alpha = 0.699$	$\alpha = 0.544$	$\alpha = 0.472$
1. Accountants	0.008	-0.045	0.394
2. Banking institutions	0.086	0.094	0.598
3. Chamber of commerce	0.083	-0.091	0.330
4. Consultants	0.256	0.057	0.427
5. Lawyers	0.458	0.040	0.303
6. Regional business partner	0.599	0.135	0.178
7. Patent advisers	0.694	0.116	0.082
8. Venture capital firms	0.417	0.192	0.043
9. Incubator network	0.597	0.032	0.062
10. High growth—employees	0.052	0.378	-0.030
11. High growth—sales	0.150	0.781	-0.079
12. Rapid geographic expansion on new markets	0.371	0.410	0.118

Notes:

^aCumulative variance = 31.65 %.^bCronbach $\alpha > 0.500$, factor loading > 0.300 .^cKMO = 0.753 and Bartlett's test of sphericity = 0.00.^dReliability too low.

