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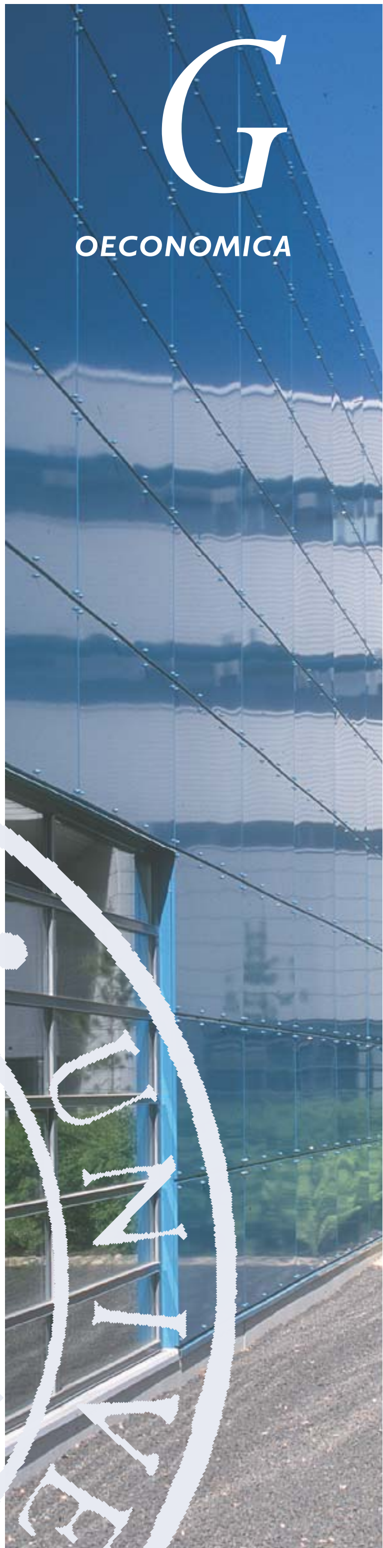

Sakari Sipola

UNDERSTANDING GROWTH AND NON-GROWTH IN ENTREPRENEURIAL ECONOMIES

ANALYSIS OF STARTUP INDUSTRIES AND EXPERIMENTAL WINNER GENERATION IN FINLAND, ISRAEL AND SILICON VALLEY

UNIVERSITY OF OULU GRADUATE SCHOOL;
UNIVERSITY OF OULU,
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DEPARTMENT OF MANAGEMENT AND INTERNATIONAL BUSINESS

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Analysis of startup industries and experimental winner generation in Finland, Israel and Silicon Valley

Academic dissertation to be presented with the assent of The Doctoral Training Committee of Human Sciences, University of Oulu for public defence in the Arina auditorium (TA105), Linnanmaa, on 5 June 2015, at 12 noon

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Abstract

The importance of high-growth firms for job creation is widely acknowledged and the promotion of such firms is a key area of industry policy in developed countries. However, despite the substantial development of firm growth research and the significant public investments, in many geographies the assumed good preconditions for high-growth entrepreneurship are not producing the desired results.

The purpose of this study is to increase understanding of the emergence of high-growth startups by taking a systemic view of firm growth. Instead of examining individual firms, a high-growth startup focused systemic economic actor, defined as the startup industry, is taken as the research object. The startup industry is given a certain function in economic development and resource allocation, and its processual activity in particular contexts is examined under the experimental winner generation process. Critical realism is used for systemic reasoning of firm growth.

The empirical study focuses on case startup industries of Finland, Israel and Silicon Valley. The emergence of startup-related actor structures and institutions, and their functioning is analyzed first from a cultural-historical and processual perspective. Second, the organization of the experimental winner generation process and its outcomes for each case are analyzed over a period of several decades, and a cross-case comparison is conducted between the cases.

The results of the study propose that each startup industry develops in time a particular target for its activities. This target, defined as the perceived winner, is the key for alignment and functioning of the startup industry as a whole. Examination of this concept enables us to understand the logics of the firm growth at the wider system level and on that basis to suggest some key determinants of the performance of startup industries in the long run. The discussion of policy maker implications concludes the study.

Keywords: activity theory, competence bloc, critical realism, experimentally organized economy, high-growth firm, venture capital

Sipola, Sakari, Kasvu ja kasvamattomuus yrittäjämäisissä talouksissa. Analyysi Suomen, Israelin ja Piilaakson startup-teollisuudesta ja kokeellisesta voittaja-yritysten rakentamisesta
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Tiivistelmä

Kasvuyritykset ovat tärkeitä uusien työpaikkojen synnyttäjiä, ja teollistuneissa maissa niiden tukeminen on teollisuuspolitiikan keskiössä. Huolimatta laajasta yritysten kasvun tutkimustiedosta, merkittävistä julkisista investoinneista ja oletetuista hyvistä lähtökohdista kasvuyrittäjyydelle ei monella maantieteellisellä alueella kuitenkaan synny panostukseen verrattuna tarpeeksi kasvuyrityksiä.

Tämä väitöskirja tutkii nopeasti kasvavien startup-yritysten syntymistä systeemisestä näkökulmasta. Yksittäisten yritysten sijaan tutkimuksessa määritellään tutkimuskohteeksi startup-teollisuus, kasvuhakuisiin startup-yrityksiin keskittyvä systeeminen talouden toimija, jolle annetaan tietty tehtävä talouden kehityksessä ja resurssiallokaatiossa. Startup-teollisuuden toimintaa eri konteksteissa tarkastellaan kokeellisen voittajayritysten rakentamisen prosessin avulla. Yritysten kasvua lähestytään lisäksi kriittisen realismin mukaisen kausaliteetin pohjalta.

Tutkimuksen empiirinen osuus on toteutettu tapaustutkimuksena, jossa analysoidaan Suomen, Israelin ja Piilaakson startup-teollisuutta. Tutkimuskohteiden startup-yrityksiin liittyvien toimijarakenteiden ja instituutioiden kehitystä ja toimintaa analysoidaan kulttuuri-historiallisesta ja prosessuaalisesta näkökulmasta. Lisäksi kokeellisen voittajayritysten rakentamisen prosessin organisointia ja lopputuloksia analysoidaan usean vuosikymmenen ajalta sekä tapauskohtaisesti että niiden välillä.

Tutkimustulokset esittävät kunkin startup-teollisuuden kehittävän ajan myötä tietyn kohteen omalle toiminnalleen. Tämä kohde, näkemys voittavasta startup-yrityksestä, linjaa koko startup-teollisuuden toimintaa. Tutkimalla tätä näkemystä voimme ymmärtää yritysten kasvun logiikoita systeemisellä tasolla, mikä mahdollistaa startup-teollisuuksien välisten rakenteellisten- ja suorituskykyerojen ymmärtämisen pitkällä aikavälillä. Tutkimuksen lopussa esitetään johtopäätöksiä poliittisen päätöksenteon kannalta.

Asiasanat: aktiviteettiteoria, kokeellisen talouden teoria, kriittinen realismi, osaamiskeskittymä teoria, pääomasijoittaminen, yritysten kasvu

To the change agents of the economy and society

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It is now finally time to end the dissertation process and use the opportunity to thank the many people for their support during this eventful journey.

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Oulu, April 2015 Sakari Sipola

Contents

1 Introduction

Nearly everyone in developed countries has heard or read of the importance of entrepreneurship and business growth to job creation and the economy broadcast widely by politicians and other stakeholders. Behind this view is a long-term structural change in economic and industrial activity that began to move incrementally from larger to smaller firms during the 1970s (Carlsson 1989). The on-going public discussion, in the European Union, for example, relating to the structural renewal of the economy and industry, thus has long roots, but due to the lengthy period of economic growth that has been enjoyed by many of its member countries, these issues have not risen to the top of the political agenda. However, the most recent economic recession, unemployment problems, and increased dynamism and uncertainty in the globally connected economy have at last brought the importance of economic growth and industrial renewal in general and of high-growth firms in particular into the spotlight.

The era of an entrepreneurial economy with institutions and policies aimed at facilitating growth through entrepreneurial activity has been emerging and has gradually become reality, first in the US and more recently across developed countries (Audretsch & Thurik 2010). Governments have been spending billions of euros to support struggling industries and in attempts to stimulate innovation and entrepreneurship. Policies and programs aimed at fostering the growth of new and small firms have received a significant portion of this money. Unfortunately, many of these initiatives have failed to boost entrepreneurship or the needed infrastructure, such as the domestic venture capital market (Lerner 2009). In numerous geographies, the organizations and institutions, such as the national innovation system (NIS), that are assumed to offer good preconditions for the generation of industry-renewing high-growth firms are not producing the desired results.

Consequently, the question of how to create the conditions for the emergence of startups that become winners by achieving leadership positions in international markets is strategically important for economic prosperity. The need for such firms is especially important in export-dependent open economies, such as Finland, where the size of the domestic market is limited and growth is to be sought through internationalization.

Firm growth research as a scholarly field is in a key position to contribute knowledge to support the attempts at solving the above issues. Growth is a key research topic in the area of entrepreneurship but it has also received significant contributions from other academic fields, such as industrial economics organizational theory, and strategy (Davidsson, Achtenhagen & Naldi 2010). A substantial pool of theoretical and empirical research covering different aspects of firm growth exists.

Overall, the findings of existing research include the specific importance of entrepreneurs for innovation, employment creation and productivity growth (van Praag & Versloot 2008), the crucial role of small firms as agents of economic change (Acs 1992) and the functioning of firm growth as an important mechanism for the viability of regional economies (Audretsch, Houweling & Thurik 2004, Robson & Bennet 2000). Growth is the vehicle that enables small businesses to expand and create jobs.

Firm growth research has further shown that a limited number of high-growth firms are crucial for job creation (e.g., Acs, Parsons & Tracy 2008, Birch & Medoff 1994). These so-called gazelles are rare, but they generate all or a large share of new net jobs (Henrekson & Johansson 2010). A tiny proportion of companies makes the largest contribution to job and wealth creation (Shane 2009), which is the most important finding to explain the interest in small firm growth. Inside this category are also high-growth startups that are the focus of this study.

However, despite the substantial development of entrepreneurship research since the 1980s (Cornelius, Landström & Persson 2006), when answers are sought to the question why some firms grow rapidly and others do not, the firm growth literature appears rather multifaceted and contradictory. A variety of factors that affect growth are known, but our knowledge of growth is limited, and essential questions relating to it remain unanswered (Wiklund, Patzelt & Shepherd 2009). The literature draws a confusing picture (Davidsson *et al*. 2010) and cannot be easily organized into coherent streams (McKelvie & Wiklund 2010).

Even the rationale of targeting job-creating high-growth firms through specific policies has been challenged by the recent findings (Coad *et al*. 2014), and the research-induced policy recommendations are not unambiguous (Mason & Brown 2013). We arrive at an important and persistent problem: firm growth remains somewhat of a black box. The current theoretical models are not adequate to explain entrepreneurial growth, and new approaches are called for to advance the field (Leitch, Hill & Neergaard 2010b).

1.1 Research questions and the purpose of the study

The overall purpose of this study is to increase understanding of the emergence of high-growth startups by taking a systemic view of firm growth and analyzing the startup-related economic activities in three entrepreneurial economies. The emergence of economic system actor structures and institutions and their functioning is analyzed from a cultural-historical and processual perspective. The main research question of the study is the following:

- How is growth created through the cultural-historical emergence of economic actor structures and institutions in entrepreneurial economies?

Answering the main question requires answers to the following two sub-questions:

- How can the emergence of high-growth firms be described as a contextually embedded systemic process?
- What are the systemic and institutional similarities and differences in generating high-growth firms in Finland compared with similar activities in Israel and Silicon Valley?

The nature of questions above is both theoretical and empirical. To answer them, the present study first analyzes the literature on small firm growth in order to provide an overview of what is currently known about firm growth. After this, building on the literature review, the theoretical framework and key concepts of the study are then developed to establish the systemic and processual view of firm growth and to answer the second question. This is followed by a thorough empirical analysis of systemic startup-focused economic activity and its evolution in the three entrepreneurial economies of Finland, Israel, and Silicon Valley that form the empirical contexts of this study. As a whole, this analysis answers the third research question. The policy perspective is important and closely related to the problem setting of the study, and the Finnish case is an illustrative example of an economic system in middle of its transition towards an entrepreneurial economy and suffering from a lack of high-growth firms and winners. Hence, from the policy perspective, the main question of the study is the following:

- Why has the Finnish economic system not generated more high-growth firms and winners in international markets?

1.2 The scope and significance of the study

As documented above, although various factors that affect firm growth are known, the explanatory theory, by which growth could be understood, is still lacking (Gilbert, McDougal & Audretsch 2006). Based on previous research, we are able to define, measure and model growth in many ways, using different indicators that relate to changes that occur when smaller firms grow in size (Delmar 1997) but cannot explain why certain firms grow and others do not. In particular, before any measurable growth has taken place, predicting the next high-growth firm is theoretically seen as almost impossible (Coad *et al*. 2014).

A significant part of prior firm growth studies has primarily approached growth with the objective to establish a single theory that would adequately explain firm growth (Leitch *et al*. 2010b). These studies typically focus on the firm and its owner-managers and make them their primary research objects. However, due to the limited conceptual development, more holistic views to firm growth are called for to include the roles of other stakeholders besides entrepreneurial firms (Gibb & Davies 1990, Clarke, Holt & Blundel 2014, Leitch, Hill & Harrison 2010a).

The present study suggests that the issues above can be examined by taking a systemic view of firm growth. Competence bloc theory is used to structurally consider other economic actors besides entrepreneurial firms (Eliasson & Eliasson 1996, Johansson 2010), and the theory of the experimentally organized economy is applied to give these actors a function in the economic system (Eliasson 1987, 1996). The cultural-historical activity theory is then applied to embed the economic system in a particular context (e.g., Engeström 2001). The contribution of this study to the firm growth discussion is thus systemic and responds to the call for more holistic perspectives.

Second, most previous studies have focused on measuring growth as a change in amount, and less attention has been paid to questions that relate to the firm growth process and how growth occurs (Iacobucci & Rosa 2010, McKelvie & Wiklund 2010). This change in amount focus is another key tenet of prior conceptual development, and more processual studies of firm growth are proposed to advance the field. The present study seeks to contribute to processual growth studies but differentiates itself by exploring the process as systemic instead of solely focusing on the firm perspective.

Third, firm growth research has primarily relied on natural science-based causality, and it has been recently suggested that studies should further elaborate on research philosophical matters and examining what type of questions are asked (Leitch *et al*. 2010a). In the present study, this suggestion connects to questions of how to include the current non-growth in various regions and the role of failure of high-growth-ambition ventures to the causality of the systemic and processual economic activity. Critical realist reasoning (e.g., Bhaskar 1975, Sayer 2000) is used to examine growth from a perspective through which the non-emergence of growth and failure can also be included in the systemic reasoning of firm growth. Thus, this study also offers a contribution to firm growth research from a philosophy of science perspective.

As mentioned above, firm growth and job creation have been an interest of academics and different stakeholders for decades. The recent economic and industry-related developments have made the topic more timely and acute in several countries and the European Union as a whole. In addition, many specific regions are struggling with non-growth, unemployment and changes in the division of labor in regional economies. Historically important employers have laid off employees and shut down sites, and new economic activity has not always filled in the gap. Hence, the problem and opportunity space addressed by this study is theoretically and empirically significant. In this sense, the Finnish case and the changes that Finland is experiencing are particularly relevant.

Finland is considered among the most innovative (fourth in 2014[1]) and competitive (fourth in 2014[2]) countries in the world, and it has consistently ranked high in different international comparisons. Top level investments in R&D and education, together with the NIS, are seen to provide good preconditions for the emergence of high-growth firms and winners (Veugelers *et al*. 2009a). However, despite diverse and substantial support mechanisms, the system has not historically generated as many high-growth firms and international success stories as the system inputs presuppose and the economic conditions call for. This situation is called the Finnish paradox (Autio 2009).

More recent changes in the traditionally central forest and metal industries, and particularly the consequences of Nokia's business difficulties, on one hand, and the slowly weakening age-population structure that increases the dependency ratio of Finland, on the other hand—have placed entrepreneurship and firm growth high on the political agenda. The question is essential for the national and regional economies and the Finnish welfare state and for other countries that are

[1] See https://www.globalinnovationindex.org/userfiles/file/reportpdf/GII-2014-v5.pdf
[2] See http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2014-15.pdf

dealing with the non-growth problem. The Europe 2020 strategy (European Commission 2010) signals this focus shift on the European level by having high-growth firms high on the list of political objectives.

In sum, the present study aims to increase both theoretical and empirical understandings of systemic high-growth entrepreneurship in different geographical contexts and to open the black box of firm growth.

1.3 Structure of the study

The study is written as a monograph that structurally consists of six chapters (figure 1). The first chapter is an introduction that begins by presenting the topic and purpose of the research. The scope, contribution and significance of the study are then discussed, and the key concepts defined.

The theoretical foundations of the study are described in Chapters 2 and 3. As the study relates to entrepreneurial and business growth, previous firm growth research is selectively reviewed and analyzed in Chapter 2 to present what is currently known about firm growth, especially high-growth firms. Against the findings presented in Chapter 2 and the purposes of this study, the competence bloc, experimentally organized economy and cultural-historical activity theories are discussed in Chapter 3, and these theories are then combined at the end of the chapter, where the theoretical framework of the study is developed. The central elements of the framework are the startup industry, the experimental winner generation process and its two main mechanisms, which together form the systemic and processual view of growth.

Chapter 4 presents the empirical research design of the study. The philosophical basis of this research and its relation to previous firm growth literature is discussed to establish the causality that is followed in the study. The presentation of methodological choices that relate to case study and processual research and research strategies in terms of the case selection procedure, data collection and data analysis conclude the chapter.

The empirical analysis of the three case startup industries in Finland, Israel and Silicon Valley is presented in Chapter 5. The analysis begins with an individual case analysis that first provides the reader with an overview of how each system structurally and institutionally took shape during the several decades until present. Second, the experimental winner generation process and its outcomes for each case are analyzed, and a cross-case comparison is then conducted. This comparison focuses on understanding the Finnish case against the two other cases, as outlined in the purposes of the study.

The study ends with Chapter 6, which summarizes the study and its findings, presents the proposed theoretical contributions and policy implications, and concludes by discussing the limitations of the study and suggestions for future research.

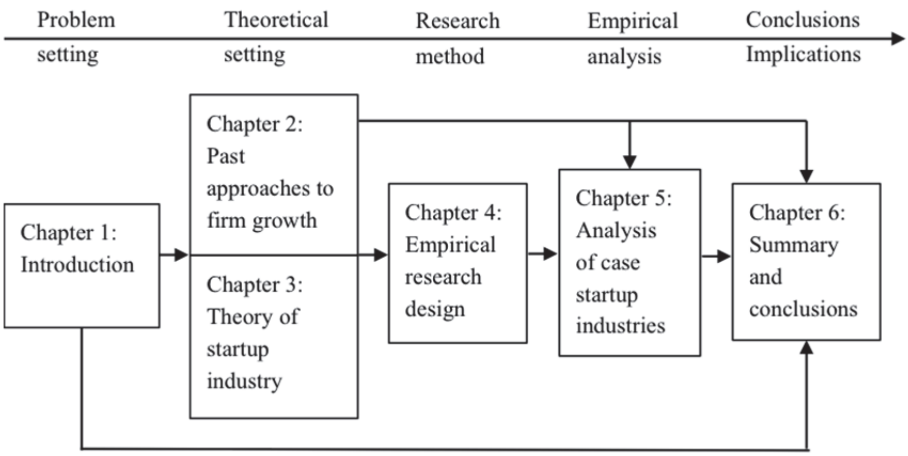

Fig. 1. The structure of the study.

2 Past approaches to firm growth

To grow or not to grow? How, when and where to grow? Why do some new and small firms grow and others do not? These aspects and questions that relate to entrepreneurial business growth are the tip of the iceberg of the vast amount of theoretical and empirical studies on new, small and medium-sized (SME) firm growth. The questions also reflect the advancements and long-standing challenges that relate to our knowledge of the causes and effects of small firm growth. Despite substantial development of the entrepreneurship field over past 25 years (Cornelius, Landström & Persson 2006) and the almost 50 years of sustained interest in entrepreneurial and business growth from academics, practitioners and policymakers (Leitch *et al*. 2010), the conceptual development and knowledge of growth are still considered limited and fragmented, and the fundamental questions that relate to growth have yet to be answered (Wiklund, Patzelt & Shepherd 2009).

At the same time, organizing related literature into coherent streams of literature is seen almost impossible (McKelvie & Wiklund 2010). In a recent review of small firm growth, Davidsson *et al*. (2010) conclude that even an in-depth reading of the firm growth literature easily leaves the reader confused and wondering. Consequently, it has been suggested that entrepreneurship researchers should question the conceptual frameworks that are used (Blackburn & Kovalainen 2009, Clarke *et al*. 2014, Davidsson, Low & Wright 2001, Macpherson & Holt 2007) and further elaborate on philosophical research matters and what type of the questions are asked (Leitch, Hill & Harrison 2010a).

Given this state of the prevailing paradigm of firm growth research in the following literature review, Kuhn's (1970) observation, which relates to evolution of science, is seen as instrumental. According to Kuhn, advances in science have characteristics, such as politics, through which established members in the discussion tend to further develop, rather than renew, the prevailing paradigm. The existing members of the current paradigm are influenced by its history, its scheme and the learned languages and patterns to which they have become accustomed. This situation provides an opportunity for a new entrant to the discussion to explore possible new approaches for constituting the phenomenon in question. This dissertation is seen to provide such a situation, and firm growth research is regarded as being in such a position.

Therefore, a historical overview of economic growth is provided for two reasons. On the one hand, it aims to describe the historically significant macroeconomic approach to economic growth and the conditions under which the interest in the importance of entrepreneurial small firms for economic development emerged. On the other hand, some schemes and long-standing dilemmas that relate to current firm growth discussion and theory can be established and discussed against this background.

The rest of the chapter proceeds as follows. First, the connection between different types of entrepreneurship and small firm growth is discussed (chapter 2.2.). Aspects that relate to firm growth measurements and high-growth firm definitions (chapter 2.3) are then covered before the documentation of different theoretical approaches (chapter 2.4.) and the identification of drivers of and barriers to firm growth (chapter 2.5). A summary of the key findings about high-growth firms (chapter 2.6) illustrates the current state of the field. The conclusion of the literature review (chapter 2.7) discusses the findings alongside the purpose of the study and in terms of Kuhnian observations and shows the elements that contribute the theoretical framework of this study (chapter 3).

2.1 The path to the role of innovation, entrepreneurship and small firm growth in economic development

The research that examines the links between entrepreneurship, innovation and economic development was triggered by Joseph Schumpeter's pioneering work. In early Schumpeterian thinking (Mark I), firm growth and economic development are based on the creative destruction process, through which new entrepreneurial firms introduce new products and processes to the market (Schumpeter 1912, 1934). In this process, the entrepreneur is conceptualized as an innovator and conductor of continuous innovative entries into the market, which cause market disturbances and open up opportunities (demand) for entrant firms to grow. Markets are seen as the result of this dynamic process, through which firms use their new offerings to compete and become economic change agents by aiming to make current technologies and products obsolete. This idea serves as the foundation for subsequent theory and places innovative entrepreneurial activities as one key driver of growth, industrial dynamism and economic development (Audretsch, Coad & Segarra 2014, Thurik & Wennekers 2004).

Innovation was also found to be important for the growth of national economies, which was established through the contributions of Abramowitz (1956) and Solow (1957), who among other economists studied the role of technological progress in explaining economic development. Abramowitz found that only 15% of the increase in economic output between 1870 and 1950 could be explained by increased input, such as labor and financial capital. Solow's research then suggested that the residual 85% could be explained by examining how the inputs were used in the economic model instead of just documenting their increased amount. A relationship between innovation, as the creative use of the inputs, and economic growth was established (Lerner 2010). In relation to economic models, this relationship challenged the 200-year-old assumption that economic growth resulted from input increases (ibid). Subsequent theoretical (Romer 1986) and empirical (Nadiri 1993) work further established the link between innovation, output and productivity growth.

In Solow's neoclassical model, the coordination of agents was based on general equilibrium, and the influence of the model was significant, as in Aghion and Durlauf (2005); it set the research agenda for the field of macroeconomics for over 25 years. One related research stream began to turn Solow's exogenous variables into endogenous variable (Mankiw 1992), and examinations of growth as endogenously determined started to increase. Unlike in Solow-like exogenous growth models, innovation was seen as endogenously determined through the intentional activity of rational, profit-maximizing agents, along the lines of Schumpeterian thinking (Wong, Ho & Autio 2005). Knowledge and human capital were seen as essential elements that could explain growth (Krugman 1991, Romer 1986), and economies could increase their productivity by investing in education and science to drive technology development. The limitations of neoclassical theory were also addressed in studies that developed the first evolutionary theories (e.g., Dosi 1982, Nelson & Winter 1982) that use the Schumpeterian framework as the main element behind increases in productivity and economic growth (Audretsch *et al*. 2014).

According to Alcouffe and Kuhn (2004), this development has led to several so-called Schumpeterian models in the establishment of endogenous growth theory (e.g., Aghion & Howitt 1992, 1998, Dinopoulos 1996, Grossman & Helpman 1991, Romer 1990). Although influential, the development of a formal theory that is based on Schumpeterian ideas has not been easy because of their descriptive nature and lack of mathematical elegance (Kirchhoff & Greene 1998), which make them difficult to formalize and capture econometrically (Audretsch *et al*. 2014, Wong *et al*. 2005).

However, although the important role of innovation and technological progress is acknowledged, endogenous growth models do not recognize the role of entrepreneurship in economic growth. Profit-maximizing firms' investments in new knowledge inputs, such as R&D, human capital and patented inventions (Aghion & Howitt 1992, Romer 1990, Segestrom, Annant & Dinopoulos 1990) are seen to endogenously create a set of technological opportunities, but the role of entrepreneurial activity was long seen only by having exogenously assumed firms as the unit of analysis (Acs, Braunerhjelm, Audretsch & Carlsson 2009).

The relationship between entrepreneurship and economic growth became a topic of interest among academics and other stakeholders during the 1980s and 1990s. Behind this interest was a change in the economic and industrial activity that had begun to move from large firms to smaller firms during the 1970s (e.g., Carlsson 1989, 1992) and then confronted stagflation and high unemployment during the 1980s (Wennekers & Thurik 1999), along with significant societal changes worldwide, such as oil crises, technological progress and the internationalization of economies (Cornelius *et al*. 2006). In particular, the attention paid to small firms emerged because David Birch (1979, 1987) showed that smaller firms created most of the new net jobs in the US. This finding was unexpected at the time because large firms were perceived to be the job creators, and economies of scale formed the basis of economic development for the first 75 years of the 20th century (Chandler 1990). Until the early 1970s, governments in European countries thus favored policies that allocated the bulk of public support to large firms and national "flagship" companies; smaller firms received minimal support (Rothwell 1989). During this industrial era, known as the "managed economy", the importance of entrepreneurship and small businesses faded, and their role in economic development was not recognized (Audretsch & Thurik 2000, Carree & Thurik 2006). This stance was also reflected in the later work (Mark II) of Schumpeter (1943), in which innovation is seen as performed best by large firms as a routinized process that combines R&D and economies of scale (Malerba & Orsenigo 1995).

In the aforementioned Kuhnian (1970) sense, the results of Birch challenged the historically dominant paradigm of economic development. Therefore, many economists dismissed these findings, and several job generation studies that aimed to verify these results emerged (Brown, Medoff & Hamilton 1990, Davis, Haltiwanger & Schuh 1996, Storey & Johnson 1987, Haltiwanger, Schuh & Davies 1994). Some of these studies found Birch's methodology and application of data controversial and criticized them (e.g., Brown *et al*. 1990, Davis *et al*. 1996). Notably, the conflicts among job creation researchers were characterized by methodological issues, such as how small businesses were defined and measured and what type of databases were used for comparisons, and did not address the underlying theory of growth that was tested with this methodology (Kirchhoff & Greene 1998).

Consequently, the small business job creation hypothesis of Birch represented a paradigm shift and triggered the entry of entrepreneurship and SMEs into the economic growth research agenda. Birch's hypothesis resonates with the Schumpeterian Mark I theory (1912, 1934), which was originally developed under conditions through which the role of entrepreneurship and small businesses was still seen central to economic development, before large companies with economies of scale (Carree & Thurik 2006) and the Solow-like neo-classical growth models dominated discussion on economic development. The important role of small businesses also came to the attention of governments in most European countries in the early 1980s, and public policies that supported smaller firms began to emerge (Rothwell 1989). At that time, new technology-based firms became the specific target of such policies, which were based on the examples in Silicon Valley and Boston's Route 128 in the US, where such firms prospered and renewed the economy (ibid.) A shift from the managed economy towards an "entrepreneurial economy" took place first in the US and has emerged more recently in Europe (Audretsch & Thurik 2004). This shift marks the place in the continuum where entrepreneurship and small firm growth research enter the picture.

2.2 Entrepreneurship and small firm growth

Entrepreneurship is a widely used concept, and a significant amount of literature has examined the contribution of entrepreneurs to society. The studies that have been motivated by economic benefits show that entrepreneurs have a specific and important role in the economy by producing and commercializing innovations and participating in employment and productivity growth (van Praag & Versloot 2008). Small firms are seen as important agents of change in the economy (Acs 1992) and seem to be more innovative than large firms in many industries (Acs & Audretsch 1993).

Although the link between entrepreneurship and economic growth has been generally established (Acs 1996, Acs, Carlsson & Karlsson 1999, Audretsch & Thurik 2000, Carree & Thurik 1999, Storey 1994), entrepreneurship and small businesses, while closely related, are not synonymous (Thurik & Wennekers 2004). The various types of new and small firms and their business owners are great, but they cannot all be labelled as entrepreneurial. In practice, most small business owners do not want to grow or innovate (Hurst & Wild Pugsley 2011), and empirical studies have shown that most firms do not grow (e.g., Daunfeldt & Halvarsson 2014).

Consequently, the link between entrepreneurship and small firm growth is multifaceted and depends on the chosen perspective (Davidsson *et al*. 2010). For some scholars, growth is at the core of entrepreneurship (Sexton 1997), while other scholars have argued that owner-managers who seek growth are more entrepreneurial than those who choose the opposite when given both options (Davidsson 1989). If the creation or emergence of new organizations is understood as entrepreneurship, as Gartner (1988) suggested, then growth is not directly linked to it. When entrepreneurship is instead seen as the study of how opportunities to develop future goods and services are discovered and exploited, by whom, and with what consequences (Venkataraman 1997; Shane & Venkataraman 2000), firm growth becomes an element of entrepreneurship, assuming that the introduction of new products or services leads to growth (Davidsson, Delmar & Wiklund 2002).

Of the different types of entrepreneurship, small businesses and growth aspirations, high-growth-ambition startups are the focus of this study. These startups are young and emerging ventures that pursue business opportunities that are risky but have both high-growth and high-reward potential. Due to their youth and the risks involved, these new ventures often face funding difficulties, which is why venture capital is considered later in this study as a specialized mechanism for financing the innovative entries of such companies (e.g., Gompers & Lerner 2001). This topic is discussed in detail in Chapter 3.

2.3 Measuring and defining firm growth

Firm growth is a complex research subject, as it includes both a change in amount and the process that generates it, which makes growth a difficult term to unambiguously define and measure (Davidsson *et al*. 2010). Combined with the socially constructed nature of growth (Buss 2002, Gibb 2000) and different stakeholders' increased interest in the topic, many different meanings are attached to growth, which may lead to confusion and misunderstandings in the discourse (Leitch *et al*. 2010b). A gap between scholarly interest and entrepreneurial practice has been identified (Achtenhagen *et al*. 2010), and all key stakeholders have called for a clear and explicit definition for entrepreneurial and business growth (Gartner & Shane 1995, Hite & Hesterly 2001). For instance, there is no consensus about how to identify and define high-growth firms (Henrekson & Johansson 2010).

Recent studies have proposed that too much attention has been given to firm growth as a change in amount (a measurement of how much) instead of examining the growth process and how growth occurs (Iacobucci & Rosa 2010, Leitch *et al*. 2010b, McKelvie & Wiklund 2010). The focus on amount changes has resulted into several different measures of firm growth that have impaired knowledge accumulation and comparisons of results (Delmar 1997, Murphy, Trailer & Hill 1996, Weinzimmer, Nystron & Freeman 1998). As there is no consensus about these measures, scholars have focused on issues that relate to defining and identifying the growth firms from their data sets. The interest has been on investigating methodological and epistemological aspects and making results comparable (cf. Kirchhoff & Greene 1998).

Delmar and Davidsson (1998) and Delmar *et al*. (2003) organize the scattered literature on high-growth firms and summarize four issues that need to be addressed to measure firm growth: (1) the indicator of growth, (2) the measurement of growth (absolute vs. relative change), (3) the period studied, and (4) the process of growth.

The indicator of growth relates to the variable that is used to observe growth. Reviews by Ardishvili *et al*. (1998) and Delmar (1997) list assets, employment, market share, physical output, profits, and sales as possible growth indicators. Out of these sales and employment measures are the most used (Delmar 1997) and are typically exploited in high-growth studies (Daunfeldt *et al*. 2015). The most preferable measure should be sales, as it indicates product or service acceptance in the market. However, it is not suitable for all purposes; for example, the asset value and employment of a startup can grow before any sales (Delmar, Gartner & Davidsson 2003). Employment growth indicates organizational complexity better than sales and fits managerial implication (Churchill & Lewis 1983, Greiner 1972) and knowledge- and resource-based perspective (Kogut & Zander 1992, Penrose 1959) focused studies of firm growth (Delmar *et al*. 2003). The other indicators have some limitations that hinder their applicability outside special contexts (see ibid).

The measurement of growth concerns the choice between absolute (the change between two time points) and relative (i.e., percentage) growth criteria and is important for the relationship between size and growth (Delmar *et al*. 2003). It has been shown that factors that positively affect absolute growth can be unrelated or negatively related to relative growth, which has a substantial impact on results (Delmar 1997) and leads to fractional insights into high-growth firms (Delmar & Davidsson 1998). High-growth firms that are defined with absolute criteria tend to be larger than those that are chosen based on relative growth (Almus 2002, Daunfeldt, Elert & Johansson 2014).

The period studied relates to the chosen time frame that is used to observe firm growth, which is important because firm growth fluctuates significantly over time; hence, the choice of a time period to observe growth is relevant (Delmar *et al*. 2003). Most studies use a time horizon of a few years to correct for one-off expansions and to reduce the amount of statistical noise (Coad *et al*. 2014). Henrekson and Johansson (2010) report that the typical time period used in recent high-growth studies is three or four year; shorter and longer time periods are used less often.

The process of growth concerns the variation in the process that leads to firm growth and focuses on how growth occurs instead of the amount of it (Delmar *et al*. 2003). Typically, this process relates to dividing growth into organic growth, acquisition-based growth, or a hybrid combination of the two. Organic growth refers to new internal employment for the firm, whereas employment gains take place externally in acquisitions or mergers (Coad *et al*. 2014). From a societal perspective, organic growth has more potential for genuine job creation than acquisitions-based growth, in which jobs move to a new organization (Delmar *et al*. 2003). Penrose (1959) suggested that organically growing firms show a smoother growth pattern over time compared with firms that mainly grow by acquiring other firms, and larger and older firms are more likely to be acquisition-based growers. McKelvie and Wiklund (2010) suggested that how firms grow instead of how much they grow could be better understood by examining the differences between these growth modes.

2.3.1 High-growth firms

The background for the aspects that relate to the measurement of growth is seen to provide the basis for defining high-growth firms. High-growth firms are often discussed as “gazelles”, which stems from the term that Birch used to label high-growth firms. This term also separates high-growth firms from the large number of small businesses that run around but do not grow, the “mice”, and large and slow-moving companies that are not terribly innovative, the “elephants” (see Landström 2005: 170).

First, high-growth firms are defined by their growth rate (e.g., at least 50% of sales growth), either as growth between selected years or as annualized growth over a chosen number of years. The widely-used Eurostat and Organisation of Economic Co-operation and Development (OECD) definition of high-growth firms sets the bar at a minimum of 20% annualized employment growth for a three-year period for companies that have at least 10 employees at the beginning of the period (Ahmad 2006). In their study of firm growth in Canada, Halabisky, Dreessen and Parsley (2006) categorized employee growth over a four-year period as hyper growth (over 150% growth), strong growth (between 50% and 150%), slow growth (positive growth under 50%), or declining growth (negative growth). Overall, the variation between definitions across studies is significant.

The second way to define high-growth firms is to simply evaluate their percentage share of a particular population during a given time period. Henrekson and Johansson (2010) summarize the field and show that 1%, 5% and 10% are among the typically used population shares that correspond with high-growth firms. The authors conclude that there is no generally agreed-upon definition for high-growth firms or gazelles. In practice, the definition by the OECD is used most often.

These two approaches are relevant for studies in which a data set of companies is available, and the used criterion can be exploited for selecting the growth companies from the data for hypothesis testing and knowledge creation. In the aforementioned Kuhnian (1970) sense, this approach has some similarity with the noted assumption of firms as exogenously assumed, as with endogenous growth models. Instead of firms, growth is taken as a given. This idea indicates how measuring growth and finding the proper growth indicators have been deeply embedded in the current firm growth paradigm (cf. Clarke *et al.* 2014). However, in reality, high-growth-ambition startups are especially difficult to recognize among the vast number of new and small companies before growth has taken place and market winners have emerged.

2.4 Theoretical perspectives of firm growth

Understanding the processual side of growth is another important perspective of firm growth research. The firm growth process is perceived to be complex, and it must be better understood, especially in theoretical terms (Shepherd & Wiklund 2009). In previous studies, attempts to illustrate and capture the growth process through different stages or life cycle models and as an evolutionary process have been common, and the co-evolutionary process perspective is more recent. Such representations are based on a long tradition of using natural sciences in general and biology in particular as sources for metaphors that help to understand economic phenomena, such as growth (Clarke *et al*. 2014).

In what follows, three processual perspectives are discussed in detail because they inform the later processuality-related decisions of the study. Second, stochastic, deterministic, resource-based and learning perspectives are summarized to provide an overview of the scope of the theoretical background in firm growth research.

2.4.1 The stages of growth perspective

Levie and Lichtenstein (2010) recently found a total of 104 different stages of growth models in the management literature, making it the most used theoretical approach to entrepreneurial business growth. In these models, organizational development is assumed to mirror the developing organisms (Tsoukas 1991) through specific periods, such as birth, youth, maturity, decline and death (Stubbart & Smalley 1999).

This metaphor is used to make three propositions about organizational development, which are applied as an analogy for the growth of companies and create the theoretical foundation for the stages of growth models (Kimberly & Miles 1980, Levie & Lichtenstein 2010): First, as with a growing organism, distinct stages of development are identifiable in a growing organization. The studies in question investigate what such stages are, and the identified stages serve as the core constructs in theory building. Second, the order and sequence of the identified organizational growth stages are seen predetermined and hence predictable. The organizational development through the identified stages is seen as linear and indicates the logic of how these stages are connected in theory. Third, all organizations, similar to organisms of the same species, are seen to develop according to the same (genetic) program and prefigured rules. The scope and growth potential of an organization is hence seen to be encoded as latent within its original form and is realized, as Van de Ven and Poole (1995) describe, through a prefigured program or rule that is regulated by nature, logic or institutions, which explains why growth happens.

The identified stages are theoretically and empirically connected to different managerial decisions, problems, and strategies that a firm is likely face as the business and organization grows. When management addresses a one set of issues, another stage with new difficulties appears in the later development of the company. Different models then try to propose and explain the mechanisms or processes by which the transition between stages takes place and, in this way, contribute to the knowledge of firm growth. However, these models are descriptive by nature and relate to the ways in which a small business adapts internally to continue its growth; therefore, they do not directly attempt to explain what causes a business to grow (Dobbs & Hamilton 2007). The most common stage attributes and categories that are used in stage model research relate to the outcomes of growth (age, size, and growth), management characteristics, strategy, organizational structure and use of formal systems, and growth is typically modelled by dividing the growth process into three, four or five stages (Levie & Lichtenstein 2010).

Of the vast number of growth model stages, in what follows, Greiner's (1972) model is reviewed as an example because it is one of the early contributions, is extensively cited and is used as a foundation for subsequent models. This model (figure 2) approaches firm growth through a managerial and leadership perspective by illustrating five phases of organizational growth that a young, small firm encounters as the business and organization grow. According to Greiner, each phase of growth (evolution) has a dominant management style that results in a set of organizational and managerial challenges (revolution) that must be addressed to continue growing into a mature and established company.

In the first phase, growth is driven by the founders' creativity and activities that relate to getting the business off the ground. The management style is loose, and communication among the small team is frequent and informal. However, with business and employee growth, the informal management style becomes insufficient, and more structure is needed. This need leads to the first revolution stage, a leadership crisis, which can be solved by a stronger business manager who can possibly come from outside the company, as Greiner suggests.

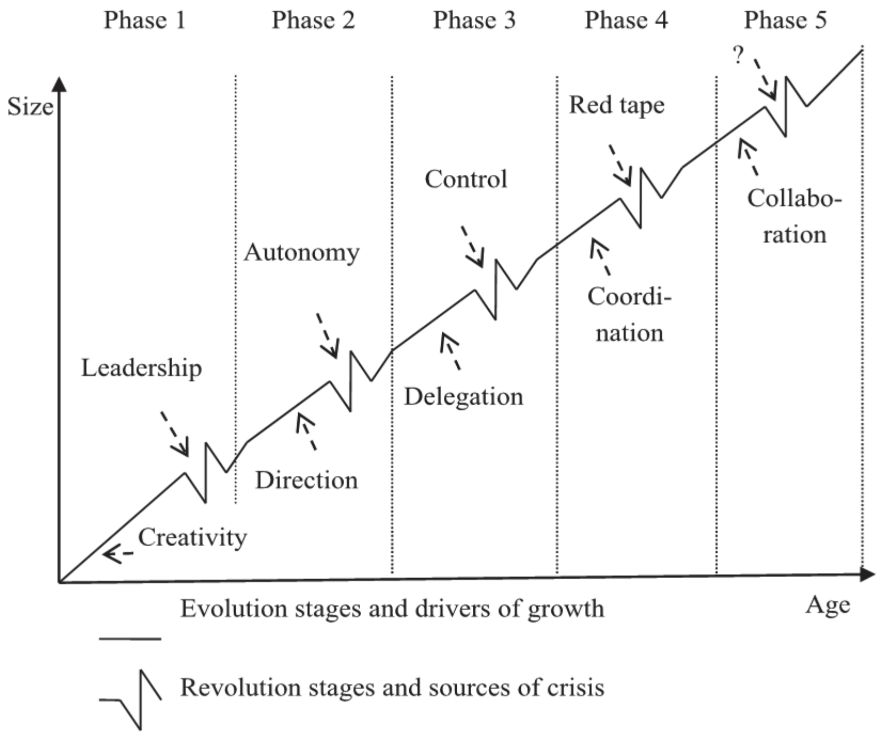

Fig. 2. The five phases of growth (Greiner 1972). Reprinted with permission from "Evolution and Revolution as Organizations Grow" by Larry E. Greiner. Harvard Business Review, July-August, 1972. Copyright (c) 1972 by the Harvard Business Publishing Corporation; all rights reserved.

Companies that are able to bring in competent managers are assumed to continue their growth by entering the direction phase. In this second phase, companies have a functional organizational structure with specialized employee tasks. In time, the decision-making gap between management and lower-level supervisors evolves and leads to the next crisis of autonomy. The crisis is solved by increasing delegation and decision-making more broadly in the decentralized organizational structure. Notably, during this phase, the assumed size of the business and organization is rather large. Greiner mentions that plants and market territories have more responsibility and acquisitions are in use in business development.

Due to this delegation, top management senses that it is losing control of the diversified operation. This third crisis of control can be solved by increasing the coordination and use of formal systems and by making top management responsible for the initiation and administration of the new systems. The systems are assumed to make resource allocation more efficient and contribute to the firm's growth. However, the extensive exploitation of systems and programs starts to gradually create a lack of confidence inside the diversified organizational structure. Eventually, the utilization of formal systems and management results in a bureaucratic red-tape crisis. The change in leadership culture—towards more spontaneous management and teams that are organized around quick problem solving—and the simplification of the formal systems are seen as crucial for movement into the last stage of collaboration. As each phase is an effect of the last stage and a cause for the next phase, Greiner assumes that the sixth revolution phase will emerge after the collaboration stage, but he does not specify what this stage will be.

Overall, the contribution and usefulness of these stages of growth and life cycle models and their inherent assumptions, as relates to growth and organizational development, have been questioned and, after 40 years of research, there is no dominant model or agreement about model features (Clarke *et al*. 2014, Levie & Litchtenstein 2010, Stubbart & Smalley 1999). A firm's development is not seen to follow the same prefigured rules and laws as organisms in nature (Penrose 1952, Van de Ven & Poole 1995). Therefore, more recently, studies have shifted their attention towards understanding the firm growth process from an evolutionary perspective (Aldrich 1999, Aldrich & Martinez 2001, Hannan & Freeman 1977).

2.4.2 The evolutionary perspective

A key argument behind the shift towards the evolutionary approach to organizational change, such as growth, is based on its potential to combine the outcomes of entrepreneurial processes and strategies with the characteristics of the environment that makes the processual outcomes possible. The basic concepts in and explanations of evolutionary growth models are based on principles of biological evolution and natural selection, such as variation, adaptation, selection and retention (Aldrich 1999, Clarke *et al*. 2014, Hodgson 2013). Aldrich and Martinez (2001) define these concepts and the focus of evolutionary studies. Variation is related to the study of new organizational structures and populations; adaptation reflects the ways in which entrepreneurs modify their organizations and use knowledge, networks and resources to survive in dynamic environments; selection refers to the specific circumstances that enable entrepreneurs' organizational arrangements to translate into survival and success; and retention captures how other entrepreneurs imitate and perpetuate successful arrangements.

Whereas linearity and predictability assumptions of growth in stages of growth models imply that growth occurs through planning and design, in the evolutionary perspective, more of a role is given to chance, unintentionality and emergency to explain growth (Aldrich 1979, Cambell 1969). The environmental forces and selection mechanisms play an important role in this growth, and the ways in which they affect the firm growth process depends on the nature of the venture and the status of the surrounding population. Innovative firms are often seen as pioneers in new or emerging populations, whereas reproducers or imitators, who copy routines, structures and goals from established organizations, appear within existing and relatively stable populations (Aldrich & Martinez 2001). As highly innovative firms cannot copy existing organizations, they must prove their legitimacy in faced environment, are at a higher risk of failure, and potentially lack the entrepreneurial and organizational knowledge to adapt to the competition with usually scarce resources, which affects their ability to survive and grow (Aldrich & Fiol 1994).

The connection between the individual adaptation processes of entrepreneurial firms and competitive selection by the environment eventually results in the selection (and survival) of the fittest new firms or existing organizations that are capable to retain and resist competition (Hannan & Freeman 1977). Therefore, the role of the environment is crucial in determining which firms will succeed and grow and which firms will fail. The growth and survival of entrepreneurial firms hence depends on their ability to acquire an adequate supply of resources to sustain their existence (Clarke *et al*. 2014). However, what selection actually means and what is being retained often remains unanswered, and these questions are still debated in organization studies (Hodgson 2013).

The characteristics and institutions of the environment in which the selection process and inter-organizational interactions occur form a central element of evolutionary research, which is discussed, for instance, in terms of government policies and political actions (Dobbin & Dowd 1997), social and cultural norms (Aldrich 1990), emerging and established populations and the communities therein (Aldrich & Martinez 2001), interactions between different internal and external forces (Clarke *et al*. 2014), and strategies and collaboration between entrepreneurs and the environment (Eisenhardt & Schoonhoven 1996). Compared with the stages of growth approach, in the evolutionary view, certain stages or growth model do not exist, but specific ecological circumstances affect the nature and timing of a firm's growth (Vinnell & Hamilton 1999).

2.4.3 The co-evolutionary perspective

The most recent stream of research in the biological metaphor that stems from studies of the firm growth process takes a co-evolutionary perspective. Co-evolution is understood in biology as the simultaneous development of adaptations in two or more populations, species, or other categories that interact so closely that each is a strong selective force on the other (Raven & Johnson 1986). According to this perspective, entrepreneurial firms are seen as a part of a mutually constituted and complex ecosystem in which one population exists alongside other populations (Clarke *et al*. 2014).

Therefore, the environment is not just a separate repository of resources for a distinct firm under binary relationships (Clarke *et al*. 2014); it instead involves, by definition, interacting entities that serve as selective forces on each other, and any related changes enhance the survival of each entity or the whole system (Cairns 2007). This perspective is different than the survival of the fittest, as underlined by natural selection, and shows that one entity or population is needed for the survival of other parts in a complex and connected whole (Janzen 1980).

Therefore, a co-evolutionary view expands the firm growth process from a firm to a wider set of other entities that exist within a complex ecosystem. The study of the firm growth process thus requires that the co-evolution of firm's systemic relationships with different entities in the environment, such as suppliers, markets, employees, local and international communities, and competitors, is also considered (Clarke *et al*. 2014). This consideration implies that the firm growth process can be better understood by not simply observing the entrepreneur, the evolving and growing firm or the environment; instead, observing the entire co-evolving ecosystem becomes the research subject.

There are only few studies of the firm growth process that follow co-evolutionary principles. Therefore, Clarke *et al*. (2014) discuss the potential of the suggested approach alongside its use in studies outside the firm growth literature. First, a co-evolving metaphor allows one to understand the role of multiple sub-components, such as perceptions, institutions, actions, behaviors, environments and technologies in entrepreneurial growth, which increases the meaning of the surrounding ecosystem and makes this part more active in facilitating and constraining firm growth, thus causing the bridge between agency and structure to disappear.

Second, this perspective understands entrepreneurial activity as more collective than individualistic or entity-based. The nature, extent and type of networks and networking of entrepreneurs and other actors are crucial and provide all actors with easier access to needed resources, improve the functioning of the system and become an important aspect of growth (Clarke *et al*. 2014, Hite 2005). Although competition is an important aspect of organizational life in the co-evolutionary perspective, "survival of the fittest" and collaboration are emphasized to a greater extent (Morgan 1980). The survival and growth of firms should not only be seen from the firms' perspective but also in relation to the evolution and advancements of the larger system to which they belong.

Third, Clarke *et al*. (2014) use the co-evolutionary view to explore the multidimensional aspects of firm growth. This multidimensionality primarily relates to non-economic aspects in the study of firm growth (Wiklund & Shepherd 2003) and expands the focus to political, socio-cultural and creative areas alike. The knowledge of how these dimensions affect and enable entrepreneurship is considered important, which inherently suggests that growth must also be understood in non-economic ways. Therefore, typical indicators of growth that have been discussed above are likely to miss the point, as value is created at a different level and scope (Korsgaard & Anderson 2011).

2.4.4 The stochastic perspective

The stochastic perspective has its roots in Gibrat's law (1931) and the economics literature. The "law of proportionate effect" predicts that some small, independent change forces act randomly, in the sense that there is no tendency to favor or impede firms of any particular size (Lee 2010). A firm's size in the future is independent of its present size, and a firm's past growth cannot be used to predict future growth (Dobbs & Hamilton 2007); many factors thus affect growth, and there is, in turn, no dominant explanation for it (O'Farrell & Hitchens 1988). The simplicity of Gibrat's law has led to waves of studies that are difficult to compare because they vary in both the samples used and the methodologies applied (Santarelli, Klomp & Thurik 2006).

Many studies provide diverse and often conflicting empirical results of firm growth patterns with little support for Gibrat's law (e.g., Goddard, Wilson & Blandon 2002), and the factors that underlie the pattern of firm growth remain unexplored (Lee 2010). Marsili (2001) concludes that despite the empirical evidence of a firm growth process and firm- and industry-level factors that affect this process, growth can be primarily seen as an effect of stochastic shocks.

2.4.5 The deterministic perspective

The deterministic perspective takes the opposite standpoint of the stochastic view (Becchetti & Trovato 2002) and represents the largest portion of previous research that has focused on the search for a comprehensive theory of firm growth (cf. Leitch *et al*. 2010b). Deterministic studies aim to identify a stable set of entrepreneur, firm, industry and management strategies that are related explanatory variables (Smallbone & Wyer 2000), which are assumed to provide an explanation for business growth rate variations and causes of growth (Dobbs and Hamilton 2007). The aforementioned measurements and definitions of firm growth are closely related to the deterministic approach. Deterministic studies typically have large cross-sectional data sets and use multivariate analyses to test whether significant associations between numerous determinants and growth rates of small businesses can be established (ibid). The lure behind this type of study is the possibility of discovering systematic determinants of growth that would diminish the share of random effects and stochastic shocks of growth.

Dobbs and Hamilton (2007) found over 30 independent variables that were used as the determinants of small firm growth studies since mid-1990s and noted that the complexity of the resulting models has caused scholars to question the attempts to develop such a comprehensive model of firm growth (Barnes & Hershon 1994, Barringer & Jones 2004, Delmar & Davidsson 1998, Leitch *et al*. 2010b). In similar fashion, Richard, Devinney, Yip and Johnson (2009) reviewed 213 studies and identified 207 different measures of organizational performance, which is typically measured in different forms of growth (March & Sutton 1997). A wide range of determinants and measures has been used in prior studies.

2.4.6 The resource-based perspective

The resource-based perspective stems primarily from Penrose's seminal work, *The Theory of the Growth of the Firm* (1959). It is the most comprehensive, adequate and popular theory of firm growth and still continues to dominate or have a strong foothold in firm growth research (MacPerson & Holt 2007, McKelvie & Wiklund 2010). Besides Penrose, notable contributions to the theory include those of Barney (1986, 1991), Nelson and Winter (1982), Teece (1980, 1982), Rumelt (1984) and Wernerfelt (1984).

The theory emphasizes the firm's internal strengths and gives the resources that contribute to entrepreneurial and managerial knowledge a key role in firm growth. Entrepreneurial resources relate to innovation and opportunity recognition; managerial resources enable the exploitation of opportunities by providing the necessary systems and processes (MacPerson & Holt 2007). Growth is thus seen as processual and unfolding over time. According to Penrose (1959), sales growth indicates output increases, which reflect the firm's performance, whereas employment growth relates to the firm's increased resource stock. In the context of small firms, growth is seen to depend on the managerial resources that are available over time to plan and manage growth, and to maintain current operations (Orser, Hogarth-Scott & Riding 2000). Hofer and Schendel (1978) suggest a resource classification of six categories: financial resources, physical resources, human resources, technological resources, reputation and organizational resources. A basic assumption of the theory is that resource bundles and capabilities are heterogeneous across firms (Barney 1991), form the basis for a competitive advantage, and enable growth to emerge.

2.4.7 The learning perspective

The learning perspective underlines the importance of examining the ways in which entrepreneurs and decision-makers learn and how they apply knowledge and develop a firm's absorptive capacity, which allows the business to grow (Bessant, Phelps & Adams 2005, Dobbs & Hamilton 2007). To evolve, firms cannot stand still and must acquire and develop additional knowledge resources (Chandler & Hanks 1998, Tsoukas 1996); learning that is situated in the social and collective context of day-to-day activities is thus a key activity that contributes to a firm's growth (MacPerson 2005).

Related research approaches learning from multiple perspectives and as an continuous process in which knowledge transfer and management skills can be gained, for instance, through experience (Andren, Magnusson & Sjolander 2003), failed and successful activities (Rae & Carswell 2001), professional, specialized and peer networks (Fuller-Love & Esyllt 2004), customers (Blundel & Hingsley 2001), and mentorship and coaching (Deakins, Sullivan & Whittam 2002). MacPerson (2005) argues that firm growth is ultimately dependent on access to different knowledge resources, learning from past and current activities and linking them together to solve the crisis of "knowing" what to do with future activity.

2.5 The drivers of and barriers to small firm growth

In this section, the different drivers of and barriers to growth that have been identified in previous studies are examined. Due to the vast amount of related research, the drivers can generally be divided into internal and external factors. These drivers are covered first, and the identified barriers to growth are discussed to close the section.

2.5.1 Internal growth drivers

In what follows, the internal growth drivers are approached from the perspective of the entrepreneur, the firm and the strategy, based on the categorization of Storey (1994).

In small firms and new ventures, the role of the entrepreneur or founder is typically more important than it is in larger firms. The founders have an important role in establishing the firm's early DNA, which influences its culture and behaviors (Mullins 1996). Therefore, several studies have strongly linked the characteristics of the entrepreneur to firm growth, and these characteristics are also one of the key areas that venture capitalists seek out in startup investments (Gompers & Lerner 2001). As most companies start, live and die small (Aldrich 1999) and most founders have only modest growth aspirations, the motivation to grow and move beyond this pattern has been studied. The owner-manager's willingness and motivation to grow and his or her established vision and communication of these goals have been shown to directly affect firm growth (Davidsson *et al*. 2010).

Other well-established characteristics that are seen to directly affect firm growth include entrepreneurs' prior experience in a related industry (Baum, Locke & Smith 2001, Cooper, Gimeno-Gascon & Woo 1994, Eisenhardt & Schoonhoven 1990), prior entrepreneurial or startup experience (serial entrepreneurship), which develops tacit knowledge (Cooper *et al*. 1994) and helps them launch and manage new ventures and avoid typical mistakes (Baum *et al*. 2001, Singer 1995), higher education (Sapienza & Grimm 1997), broad social and professional networks, which enable them access to critical resources (Barringer *et al*. 2005), and the size and background heterogeneity of the founding team

(Barkman 1994, Eisenhardt & Schoonhoven 1990). Several personality-related factors have also been considered, but most of these factors are seen to have an indirect rather than direct effect on firm growth (Baum & Locke 2004, Baum *et al*. 2001).

Second, an articulated growth-orientated vision establishes the importance of the firm's growth and aligns decision making with growth in mind (Kim & Mauborgne 1997). This vision is one key firm-level growth driver, together with the firm's commitment to grow by executing a growth-orientated strategy (Barringer *et al*. 2005). In addition, active participation in inter-organizational relationships, such as joint ventures, networks, consortia, and alliances (Barringer & Harrison 2000), and being geographically located in a region that facilitates the absorption of relevant external knowledge (Cooper & Folta 2000) and knowledge spillovers (Audretsch & Feldman 2003) are seen to affect growth at the firm level. In addition, there is a set of human and financial capital-related resources that have been frequently studied and found crucial for new venture growth (Gilbert *et al*. 2006). The execution of strategy requires the right human resources (Chandler & Hanks 1998), which changes in quality and quantity as the firm grows (Birley 1987, Thakur 1999). The firm's financial resources are known to influence sales and employment growth in new firms (Cooper *et al*. 1994, Lee, Lee & Pennings 2001) and support the firm's strategic activities by providing flexibility (Zahra & Bogner 2000).

Regarding the strategy and business practices, the following attributes are found to be positively connected with firm growth. First, the ability to create unique value for customers is crucial for achieving and sustaining high growth (Kim & Mauborgne 1997). Barringer *et al*. (2005) discuss how unique value can be provided through product superiority or quality (Harrison & Taylor 1997) and innovation (Deeds, DeCarolis & Coombs 1999) and R&D (Chakrabarti 1990) investments. Strategically high-growth firms are found to target niche markets in which they can take exploit the advantages of their offerings (Storey 1994). Moreover, entrepreneurial orientation (EO) and its components (e.g., innovativeness, proactiveness and risk taking) are found to have a positive effect on business performance (Davidsson *et al*. 2010, Rauch, Wiklund, Lumpkin & Frese 2009).

Certain human resource management practices, such as selective hiring and the ability to attract and retain skilled employees (Rich 1999), performance-based incentives and both stock options and employee stock ownership plans are also becoming more important in high-growth firms (Barringer *et al*. 2005). These factors are important because compared with mature firms, startups can demand more skilled employees with specific expertise, and staffing is typically done before expansion (Cardon 2003). Therefore, the attraction of the needed resources for the new venture is one of the most important tasks for the entrepreneur, especially if he or she lacks a reputation and relevant track record (Brush, Greene & Hart 2001). The latter elements relate to the question of ownership and fundamental decisions regarding the entrepreneur's willingness to give ownership to outsiders against external financing for growth. In the high-growth studies reviewed by Storey (1994), the willingness to share or actual sharing of equity was found to positively affect growth compared with the growth of companies that were against such measures.

2.5.2 External growth drivers

The role of external firm growth drivers is typically discussed in terms of industry-related and environmental factors. Hawawini, Subramanian and Verdin (2003) found that the performance of a particular industry's average firms is largely impacted by industry-related factors, but for the few industry leaders, firm-related factors are more important, and their high performance is based on the exploitation of a deep understanding of the industry. The role of external growth drivers may thus affect various firm types differently.

On the other hand, the natural selection-based approaches, such as population ecology (Hannan & Freeman 1977), explain that organizational change is primarily based on the environment, its nature and the distribution of resources that makes growth a function of environmental/industry-related selection (Dobbs & Hamilton 2007, Kangasharju 2000), which can be seen to decrease the role of firm-related factors.

Industry-related factors range from specific to more general characteristics of the industry. The former includes, for instance, the nature of competition in the market place and its effect on the availability and cost of resources on the supply side (Smallbone & Wyer 2000, Storey 1994), the discussion of the influence of the role and market position of large companies on the smaller companies in the industry (Dobbs & Hamilton 2007), and the importance of the decision about which environment to compete in and how that decision can enable the firm to drive growth and benefit the most from market growth (O'Gorman 2001).

Regarding the environmental factors, it has been found that high-growth firms tend to compete more often in geographies and industries that show higher dynamism (Carrol & Hannan 2000, Davidsson & Delmar 2006). Many firms also grow because the industry's growth pushes or enables them to grow (Capon, Farley & Hoenig 1990), and in the case of stagnant industries, growing firms are found in the dynamic growth niches of these industries (Storey 1997). In the case of high-growth-ambition startups, the potential size and stage of the market that a startup enters are acknowledged to be key pillars when investing in startups (Gompers & Lerner 2001). Overall, it is clear that external factors also influence small firm growth (Davidsson *et al*. 2010).

2.5.3 Barriers to growth

In terms of the so-called barriers to growth, the literature approaches small firm growth by assuming that a portion of small businesses wants to grow and aims to identify barriers that prevent their growth (Storey 1994). The barriers are discussed from a broader institutional and more firm-centric perspective. The studies that examine the institutional arrangements support the importance of institutional conditions for firm growth, but how different growth barriers function depends on the country and changes over time (Davidsson *et al*. 2010). Institutional questions are also related to political development, but as North, Wallis and Weingast (2006) discuss, economics and politics are not often theoretically connected.

From the firm perspective, Carlsson (2002) found that a greater available pool of business angel, seed and especially venture capital finance largely explained the higher growth rates of startups in Ohio in the US compared with their Swedish industry peers. The initial capital, which typically comes personally from entrepreneur(s) or is borrowed from relatives (Berger & Udell 1998), is often not enough to finance business development and growth (Gilbert *et al*. 2006). Hence, the lack of available capital can become a barrier to growth, and access to external capital from banks, venture capitalists (Lee *et al*. 2001) or different government financial instruments (Storey 1994) is important for firm growth.

This topic brings up the link between an assumed market failure in venture capital and a growth barrier that is used as the basis for public actor venture capital initiatives in many countries. Storey (1994) examines the issue in detail and shows that the concept of general market failure is not as obvious or straightforward as is generally assumed.

Other barriers to growth for high-growth firms, besides the lack of access to capital, include more recruiting-related challenges, such as access to skilled employees in management, marketing and sales (Storey 1994), tax level- and exchange rate-related concerns (Orser, Hogarth-Scott & Riding 2000), access to network and managerial support, other service firms and the limited number of experienced entrepreneurs (Carlsson 2002).

These aspects relate to growth barriers that stem from the firm's geographic location, as new ventures' operations are highly dependent on locally available resources (Romanelli & Schoonhoven 2001). Rural areas are seen to be weaker in terms of providing financial capital for local firms (Green & McNamara 1987), whereas dynamic clusters are more capable of providing both sufficient financial support and a supply of workers with various relevant skills (Feldman & Florida 1994, Saxenian 1994).

2.6 What do we know about high-growth firms?

Thus far, we have examined the elements that relate to measuring growth and defining high-growth firms, different theoretical and metaphorical aspects of firm growth research, and the identified drivers of and barriers to firm growth. In what follows, the lens of the review turns to summarize the knowledge or "stylized facts" that the different studies that measure and study high-growth firms have cumulated.

2.6.1 The age, size and share of high-growth firms

The original job creation hypothesis of Birch (1979, 1987) claimed that small and young businesses were the most significant net job creators in the US. A vast amount of research on high-growth firms has since provided empirical evidence that shows that a small number of high-growth firms, or gazelles, are indeed crucially important net job creators in many other countries (Acs 2011, Acs & Mueller 2008, Birch & Medoff 1994, Brüderl & Preisendörfer 2000, Davidsson & Henrekson 2002, Delmar *et al*. 2003, Halabisky, Dreessen & Parsley 2006, Henrekson & Johansson 2010, Littunen & Tohmo 2003).

The share of high-growth firms and their job contributions compared with those of non-high-growth firms varies among studies, depending on the growth measure used, the high-growth firm definition, the industry, and the time period under observation. Birch and Medoff (1994) found that between 1988 and 1992, 4% of firms created 60% of the new jobs in the US; Kirchhoff (1994) found that 4% of firms produced 75% of the employment in the US in the 1977 and 1978 cohorts. A review of job creation studies in the UK by Storey (1994) showed that approximately 4% of firms created approximately 50% of the new jobs over a decade; more recently, 6% of firms were found to correspond 49.5% of the jobs created in the UK between 2002 and 2008 (NESTA 2009). Daunfeldt *et al*. (2015) came to the conclusion that 6% of the fastest growing firms in the Swedish economy created 42% of jobs from 2005 to 2008.

The results are consistent; all or more than all of the net jobs (if employment shrinks in non-gazelle firms) are generated by gazelles (Henrekson & Johansson 2010). A tiny slice of companies thus makes the largest contribution to job creation out of the total entrepreneurial activity (Shane 2009). The importance of a small number of high-growth firms is one key point in the firm growth literature on which most researchers and policymakers likely agree, especially if the development of a large enough group of such ventures could be stimulated (Davidsson & Delmar 2006).

In terms of age, Henrekson and Johansson (2010) conclude in their overview of the field that high-growth firms are more often young and grow organically; nevertheless, the role of older firms that are capable of growing rapidly, often due mergers and acquisitions, is also important for job creation. Overall, most studies seem to share the view that there is an important subset of older high-growth firms (cf. Acs 2008), but high-growth firms tend to be younger than the average firm in the industry, regardless of the growth measurement used (Daunfeldt *et al*. 2014).

In terms of the size of high-growth firms, study results show substantial variation. Small firms are overrepresented, but larger gazelles are also important job contributors (Henrekson & Johansson 2010). Birch, Haggerty and Parsons (1995) found that out of all gazelle firms in their study, a 3.6% subgroup of larger gazelles—superstars, who started to grow rapidly from a 100-person employment level—was responsible for 53% of the jobs created by gazelles between 1990 and 1994. Some of these superstars were Fortune 500 companies, and others were growing towards inclusion on that list. Consequently, high-growth firms are likely young but not necessarily small.

In the case of startups, job creation by gazelle startups more than makes up for the lack of job and wealth creation by typical startups (Henrekson & Johansson 2010). Noting the small overall share of the high-growth firms documented above, a very small number of high-growth startups is thus responsible for a disproportionately large amount of wealth and job creation (Shane 2009). This imbalance makes a strong statement for the importance of the high-growth-ambition startup establishment and the gazelle-like rapid growth of a few of startups in terms of job creation.

However, there is also an alternative view that approaches job creation from the perspective of the aforementioned mice and emphasizes the overall volume of the new firm establishment as an important element of job creation, which has led to mice-versus-gazelle debate in relation to the dynamics of job creation (Davidsson & Delmar 2003, 2006). The main questions relate to whether the key role of small firms in job creation results from many small new firms and incremental expansions and whether the minority of small high-growth firms creates most of new employment (Davidsson & Delmar 2006).

Due to the high-growth startup focus of this study, it is not worth pursuing this debate in further detail. However, the volume of new firm establishments and mice are important for gross job creation, which is sometimes forgotten in high-growth discussion. Most new firms remain one-person businesses or are at least very small for their entire life cycle (Aldrich 1999, Reynolds & White 1997), but inclusion in the high-growth firm definition can require a particular number of employees (the OECD requires a minimum of 10 employees), which most mice never have. Consequently, many surviving firms and their job contributions are excluded. In the study of Daunfeldt and Halvarsson (2014), these numbers included approximately 95% of the surviving firms and 40% of all new jobs created in Sweden from 2005-2008.

Second, because companies do no evolve like biological organisms, the role of mice is important for fostering the transformation of mice into gazelles. As Acs (2008) noted, it takes a relatively long time for some companies to become gazelles; all are not established as such at an early stage. Some firms require more "mice time" to find business opportunities for growth and to organize around executing on them.

Henrekson and Johansson (2010) claim that the two views should be seen as complementary and relate the discussion to the continuous entry of new firms, which is needed for the creation of business opportunities and the achievement of net job creation in relation to the broader creative destruction process with functioning entry, expansion, decline and exit mechanisms. This process creates necessary dynamism in the economy, which also enables gazelles to gain market shares and resources that are needed to fuel their growth.

2.6.2 The industrial position of high-growth firms

From the 1960s to the 1980s, the rapid growth and job creation of startups in Silicon Valley and Boston shone the spotlight on high-technology industries and grabbed the attention of policymakers and researchers in the US and later in Europe (Rothwell 1989). High-growth firms are thus often assumed to exist within high-technology industries, and innovation potential is associated with such firms. Accordingly, a view exists among policymakers that the high-technology sector is the main generator of potential high-growth firms (Mason & Brown 2013). Given this view and endogenous assumptions of economic growth, public R&D and innovation support typically target small and larger firms in high-technology industries.

However, the results of high-growth firm research indicate that these assumptions are not supported. Studies find no evidence of high-technology industries showing a disproportionately large share of gazelles; instead, gazelles can indeed be found in all industries (Acs 2008) and are more likely to be found in the service industry (Henrekson & Johansson 2010). Brown and Mason (2014) conclude that the economic significance of technology-based firms is not as significant as is generally assumed, and the myths associated with new technology-based firms are actually high-tech "fantasies" (Massey, Quintas & Wild 1992).

2.6.3 The nature of firm growth and high-growth firm policies

Among the most agreed upon aspects of firm growth are its complex, heterogeneous and dynamic nature (Delmar *et al*. 2003); hence, high-growth firms can show significant qualitative differences in how they achieve their growth and do not grow in the same ways (McKelvie & Wiklund 2010). These conditions and the knowledge of different aspects that relate to the nature of firm growth create contradictions regarding policies that aim to foster high-growth firms.

First, high growth seems to occur in periodic events and is not persistent or linear over time. Delmar *et al*. (2003) describe seven growth patterns that show how high growth can be achieved in many ways. Parker, Storey and Witteloostuijn (2010) conclude that gazelle-like growth is fragile, as their data show that the gazelles cannot keep up persistent growth. Coad and Hölzl (2009) find that small high-growth firms are unlikely to show sustained growth, and the results of Hölzl (2014) indicate that the growth of high-growth firms is non-persistent. Daunfeldt and Halvarsson (2014) claim that a high-growth firm has a 0.01 chance of repeating its rapid three-year growth over the next three years.

In addition to the lack of persistence, the difficulty of predicting the next high-growth firms is seen as another problem that complicates the policies that target high-growth firms. Because growth is not persistent, it cannot be predicted, which makes it difficult to target the next high-growth firms ex ante their growth event (Hölzl 2009, Storey 1994). The firms that are able to grow quickly are even characterized as one-hit wonders, and these results are seen to question the value of policies that focus on high-growth firms (Coad *et al*. 2014, Daunfeldt & Halvarsson 2014, Hölzl 2014). On the other hand, some scholars take the opposite view and argue that policies should focus on high-growth-potential firms (Acs *et al*. 2008, Shane 2009, Lerner 2010, Storey 1994). Mason and Brown (2013) suggest that both typical new ventures and high-growth-potential startups should be covered by policies but with specific forms of intervention. There is a gap between our understanding of the need for entrepreneurship policies and of how such policies should be designed when needed (Karlsson & Andersson 2009: 127).

The issues above are thought-provoking in relation to different policies, such as the Europe 2020 strategy (European-Commission 2010), that place high-growth SMEs high on the list of political objectives. It seems that despite the ability to model, measure and analyze data sets of grown firms using increasingly advancing methods, firm growth research and our knowledge of the determinants of high-growth firms remain limited. Geroski (2000) concludes that, based on econometric studies on small and large firm growth, the most elementary "fact" about growth is that firm size follows a random walk.

2.7 Conclusions

Based on the conducted literature review, it can be said that the observations that relate to the state of firm growth research from the beginning of the chapter hold. The field of research is indeed difficult to coherently organize, and the study outcomes, in the form of theoretical and empirical findings, create a confusing and contradictory picture. From the perspective of primary aims of this study, a theory that explains the noted emergence and growth of high-growth firms is still lacking.

The results of the review suggest that, in a Kuhnian (1970) sense, the dominant firm growth paradigm has adopted the embedded scheme of things and pattern from the documented macroeconomic growth origins, in which one or a few dominant theories are used to explain economic growth. Subsequent research is then based on these generally accepted theories, and the advancement of the field is driven by this pattern of activity and typically applies positivist methodologies.

This path dependency and institutional position of economics were strong when entrepreneurship as a scholarly field emerged and are seen here to mediate these studies and manifest themselves in the present discussion. The decades of research dedicated to the search of a single theory of firm growth (Leitch *et al*. 2010b) and the continuous debate around definitions, measures, variables and growth as a change in amount imply this strong desire. It can be seen that scholars have aimed to develop a theory that would explain the job creation hypothesis from an entrepreneurial and small firm perspective and contribute to the literature by connecting this theory to a broader discussion of economic development.

The two documented "stylized facts"—the non-predictability of successful high-growth firms and the non-continuous and non-linear nature of growth over extended time periods—particularly illustrate an important way in which growth is viewed. Instead of taking them as a part of the nature of firm growth and including them in a particular theory, these "facts" are seen as important findings but also problems that challenge the importance of high-growth firms and related policies overall. This idea reveals a great deal about the ontological assumptions of entrepreneurial firm growth. It has been assumed that knowledge of growth can be created as in natural sciences (cf. Leich *et al*. 2010a). The positivistic view of causality that is based on the quest of natural law-like factors to open the "black box" of firm growth is insufficient, as it cannot reason through the non-predictability and non-continuous nature of firm growth and simultaneously explain successes and failures.

At the same time, the current situation provides many insights into theoretical and empirical research. First, in terms of theory, the calls for new approaches steer researchers toward a more holistic view of firm growth and question how other stakeholders understand entrepreneurship and firm growth (Gibb & Davies 1990, Clarke *et al*. 2014, Leitch *et al*. 2010a, Leitch *et al*. 2010b). Researchers have attempted to interpret the black box of firm growth too narrowly, based on the firm- and owner-manager-focused lens, and this narrow approach should be addressed in theory by including other economic actors in the entrepreneurial environment. Currently, these actors are not given much room in the theoretical frameworks documented above.

Second, it can be observed that the previous literature does not account for the role of history and contextual embeddedness in firm growth and economic development. This historical-contextual role is an important element to acknowledge in relation to the call for a more holistic view as growth is socially constructed (Buss 2002, Gibb 2000), and the views of different stakeholders are not universal and static but evolve over time. Especially in the case of high-growth firms, geography matters (Mason & Brown 2013). Previous studies have approached the environment mainly from industry-related characteristics, strategic decisions and environmental selection perspectives and touch on institutional arrangements and their important roles in entrepreneurship and firm growth. However, the emphasis on positivistic and econometric-type explanations has not shown significant interest in society and its structural and institutional evolution history; society is instead viewed as a rather anonymous structure. It is suggested here that the role of the past should be more often considered and be examined thoroughly. The co-evolution perspective supports this approach, as it enables us to examine not only the firm and its successes but also to extend reasoning to include other actors.

In terms of empirical observations, it can be concluded that part of the firm growth literature has come full circle. Birch's observations shone the spotlight to high-growth firms; Gibb and Davies (1990) then concluded that the evidence of small business growth was not sufficient to provide a basis for policy development, and the recent arrival of views that support and undermine policies that target high-growth firms closes the loop. Regarding the research questions and goals of the study, the advancement of firm growth literature thus provides rather inconsistent results and support for studies that focus on the lack of high-growth firms in a particular context.

Finally, when the theoretical situation in the field is combined with the empirically supported important roles of mice and gazelles in job creation and the differences between these firm types are acknowledged, the need for more detailed theoretical division can be addressed. We have two empirically derived firm types that play important roles in new job creation and economic growth, but, as discussed above, previous theories have attempted to capture both firm types in a single theory of firm growth.

The theoretical approach of this study is developed against these observations and focuses on establishing a systemic view of high-growth firms. The following chapter presents the theoretical framework in detail.

3 The theory of the startup industry

In this chapter, the theoretical framework of the study is developed. The aim is to create a conceptual lens that enables the research of a high-growth startup focused part of the economy from a systemic, processual and contextually embedded perspective. In addition to elements taken from previous firm growth research, the experimentally organized economy, competence bloc and cultural-historical activity theories are applied to establish the aforementioned desired position by the end of the chapter. The startup industry is introduced as a systemic economic actor, and the principles of its activity are defined through a discussion of matters that relate to their empirical observation.

3.1 Establishing a systemic focus on startups in the entrepreneurial economy

The evolution in political and economic systems has led to the emergence of an entrepreneurial economy. Previously important economic growth factors in the era of the managed economy, such as firm size and scale economics and routinized production and innovation, were gradually replaced with distributed innovation and the creation and growth of new innovative firms (Audretsch & Thurik 2001, 2010). These innovative firms became an important driver of economic growth.

Second, as documented in the second chapter, previous firm growth research has shown that both mice and a small number of rapid growth gazelles are particularly important job creators among new and small firms in the entrepreneurial economy. However, larger gazelles in the form of established firms were also noted to contribute considerably to job creation. Because these companies are different in many ways, they also have varying resource needs at different stages, for instance, from policy perspective. They cannot be addressed as one entity from a systemic perspective; therefore, a more detailed division of the entrepreneurial economy is needed. In what follows, this study focuses on the high-growth-ambition startups, and the entrepreneurial economy in which these companies operate is divided into conceptual segments, namely economy 1 and economy 2. These segments are closely linked but distinct parts of the economy.

Kenney and von Burg (1999) define economy 1 as consisting of current established companies and incumbents in the markets: corporations with their R&D laboratories and resources, universities, various established companies, and, as Saxenian (1994) notes, a dense network of specialized suppliers and subcontractors aligned to support their needs. Economy 1 is where Birch's established mice and elephant companies (see Landström 2005: 170) and the aforementioned large gazelles operate. Different public sector actors with policy-based interventions and development instruments also relate to this part of the economy, as they aim to foster economic growth through productivity increases and incumbents' innovations.

Economy 2 focuses on the creation of different types of new firms, along with the infrastructure and institutions needed to support their growth (cf. Tödtling 1994). Kenney and von Burg (1999) see new growing firms as the actual products of this part of the economy, in much the same way that computers and microprocessors are products of the first economy actors. However, as this study is interested in high-risk and high-growth-potential startups that seek to win in large international markets, the needs of such ventures—in terms of the competencies and resources of actors in the surrounding entrepreneurial environment—are different than those of new mice or firms that have been established for self-employment, lifestyle business or other means. As a concept, economy 2 is thus further divided to include the startup industry as its own distinct part. The institutions and infrastructure[3] of the startup industry focus on generating high-growth-potential startups and scaling them into market winners—the "product" and targeted processual outcome of their activity. The firm's mere survival is not sufficient. Similar to their role in economy 1, the public sector actors intervene in the functioning of these two parts of economy 2 as well and attempt to foster economic growth and employment creation in entrepreneurial firms.

From the economic growth perspective, the function of the startup industry and its products, as a part of the entire economy, can be defined by applying Saviotti and Pyka (2004). This function involves creating new sectors or markets (variety growth) and enhancing efficiency in existing sectors (efficiency growth). This activity concerns qualitative changes in economic development and the economic system that endogenously generate the evolution of the system itself, thus affecting its future development (ibid). The creation of winning startups in markets that, at best, create new industries and become one of the rare and

[3] In related discussions, the startup industry is also approached as a startup ecosystem (Mason & Brown 2014), a startup community (Feld 2012), a part of an innovation system, and an entrepreneurial environment (e.g., Lerner 2010) or a high-tech cluster.

enduring companies is therefore a fundamental factor in sustaining long-term economic development in the era of the entrepreneurial economy. Productivity and efficiency growth and problems, such as industry maturity or unilateral structures, within the economy 1 can be complemented by the startup industry's products and activity.

Indeed, the importance of new winners is likely increasing, as global competition for economic growth is tight among developed and developing economies, and struggling large incumbent companies are causing significant economic structural change. In the era of integrated open economies and markets and increasing economic activity online, the ability of the contextually embedded economic system to generate new international winners or its own economic change agents is therefore critical.

In practice, the aforementioned parts of the economy are closely linked with some overlapping areas, but they are still distinct conceptually and in terms of outcomes. For instance, mice can develop into high-growth firms, and established incumbents are a source of spin-offs that can be commercialized in the startup industry. In fact, the startup industry has to be competitive to attract people from good positions in established companies without prior entrepreneurial experience to start new ventures under high opportunity costs. Second, these different parts of economy are important to acknowledge in research and policymaking. For example, the employment growth among the first economy actors does not correlate with the performance of the startup industry; careful evaluations of initiatives, actors and results need to be separately conducted for both economies.

Finally, as entrepreneurship and entrepreneurial finance are becoming more international (Lerner 2010), knowledge of different initiatives that seek to boost entrepreneurship spreads quickly through the Internet, which results in increased startup-related activity in many countries. Overall, entrepreneurs today have access to more information and resources than what was available previously. On the other hand, more venture capitalists are seeking international investment opportunities, as potential winners are emerging from these new geographies. Hence, an international startup industry can be seen to conceptually exist; it connects and complements the functioning of startup industries on the national and regional levels at different stages of their systemic evolution. The research of Saxenian (2006), which illustrates how entrepreneurs outside the advanced core of the world economy build successful ventures using external or global search networks to access resources and competencies, serves as a good example of an examination of such activity alongside cross-border investments.

3.2 An experimentally organized economy and startups as business experiments

The theories of the experimentally organized economy (EOE) and the competence bloc (section 3.3) were originally created to study industrial dynamics and development as the competitive selection process for innovations and firms. Gunnar Eliasson's research (e.g., Eliasson 1987, 1991a, 1996) created the foundations of the EOE, and competence bloc theory (Eliasson 1995, Eliasson & Eliasson 1996) was developed later to complement it. Johansson (2010) proposed their integration into a single theory, as they were long treated as separate theories, and further expanded this theory from explaining competitive selection to theorizing resource allocation.

The theory has strong Swedish roots (Johansson & Karlson 2002), with Austrian and especially Schumpeterian (1912, 1934) ideas about economic development. The work of Eric Dahmén (e.g., Dahmén 1994) and his concept of the development bloc were especially important for Eliasson's later research. This theoretical branch provides the basis for developing a framework that studies how the growth or non-growth of firms occurs through systemic economic activities and mechanisms.

The EOE defines economic growth as an endogenous process. Essentially, it is a matter of experimental project creation and selection that occurs in dynamic markets and hierarchies; the economic system's capacity to capture winners and remove losers is a part of this process. In other words, economic growth is essentially a matter of the decentralized endogenous allocation of human-embodied competence in the economy. (Carlsson & Eliasson 2003) Johansson (2010) approaches this issue as a problem of resource allocation: How to efficiently produce the most desired goods and services using scarce factors of production, and how do the EOE and competence bloc theories define this issue as a problem of coordination, knowledge use, competence, and institutional set-up. These factors are discussed in greater detail below.

Consequently, the emergence of winners or non-growing startups as an outcome of startup industry activity is mainly a question of understanding the organization of the related institutions and economic actors, their competences, their incentives and their resource coordination to create and select the winners and remove losers. The generation of new winners becomes a core problem for the overall economy (Eliasson 2003). Therefore, high-growth-ambition startups can be seen as their own competence area.

Sustainable and rapid growth at the micro level is achieved through the four investment and divestment mechanisms of the Schumpeterian (1912, 1934) creative destruction process (table 1), which creates dynamism in the economy. Innovative entries by new firms (or products) are the prime determinants of competition and challenge existing firms by forcing them to improve themselves through reorganization and rationalization or else succumb to competition and exit the market (Eliasson 2003). Here, a high-risk and high-growth-potential startup is an agent for the Schumpeterian creative destruction with, at best, a disruptive (see Christensen 1997) impact on the incumbents. The creative destruction process progresses through the innovative entry, but the exit (bankruptcy) process is also critical, as it releases resources and space for the successful and growing firms and thus activates growth and dynamism at the macro level (Eliasson & Taymaz 2000). The exit can happen not only through non-competitive incumbents but also through startups that enter the market unsuccessfully, which causes the business experiment to eventually fail. This dynamism is an important engine for endogenous, micro-level growth.

Table 1. The four investment and divestment mechanisms of Schumpeterian creative destruction and economic growth (Eliasson 1996: 45).

Mechanism	Function of the mechanism
1.	Innovative entry
	Enforces (through competition)
2.	Reorganization of existing firms
3.	Rationalization of existing firms
4.	Competitive exit (shut down)

The perception of economic decisions as experimental in nature is fundamental to the EOE. The knowledge-based information economy (Eliasson 1990b) forms a foundation for the assumption of an enormous set of technical possibilities and business opportunities that (1) is completely non-transparent to all actors in the modern economy including central governments, (2) includes business solutions that are far superior to all known business solutions (Eliasson 1998), (3) features a set of business opportunities that are constantly expanding through learning or research, and (4) constantly leads to business mistakes (Carlsson & Eliasson 2003).

Actors often make premature decisions by relying on scant and unreliable information, and they have to be ready to constantly change their minds (Eliasson

& Eliasson 2009). Under such conditions business mistakes are normal and a standard cost of learning and economic development, as no actor, being rationally bounded (Simon 1955, 1990), can survey the entire set of dynamic business opportunities and eliminate the risks of failure in advance.

Therefore, the theoretical possibility of optimizing and maintaining the assumption that ex ante plans equal ex post outcomes is removed (Eliasson 1992). The business decisions that startups and other economic actors make are more or less well-prepared business experiments that often fail on a different scale; it is thus impossible to evaluate the startup's success or the innovation's profitability with any certainty until its exposure and execution in the market. The entrepreneurial process does not always take place in an ordered or strategic way (Venkataram & Shane 2000, Shane 2012). Thus, the only way to value new knowledge and commercial competence of the startup and related stakeholders is through market experiments. Every business activity can accordingly be seen as an experiment or a business hypothesis that is tested in the market—thus the name "experimentally organized economy" (Johansson 2010).

Therefore, a high-risk and high-growth-potential startup can be defined as a business experiment that tests a set of hypotheses about the assumed customer value, business potential and model, among other things, and learns from them in connection with market. As Hayek (1937, 1978) argued a long time ago, goods are not well defined, and consumers and producers never have complete information about preferences and technology, among other things; therefore, actors must discover what works. This process is experimental in nature, especially when the risks, uncertainty and goals are as high, as in the case of startups that aim to become winners in international markets. In relation to firm growth, natural law-like causality does not apply.

This understanding is crucial because, due to various risks, a significant portion of startups fail or do not meet the expectations of the entrepreneurs, customers, investors or other stakeholders. Failure is a natural part of trials and experimentation, which is the only way to truly enter the market and see if the assumed business potential can be executed in practice. In this way, business mistakes, misunderstandings and related learning also contribute positively to economic development (Eliasson 2003). If startups with innovative market entries that aim to build something potentially significant or disruptive fail, they contribute to the human-embodied tacit knowledge and increase the long-term competence levels of the economic actors involved.

Analyzed from the prior firm growth research perspective (Chapter 2), when a startup begins to enter into dialogue and interact with different stakeholders in the market, it must be noted that there is no such thing as measurable growth yet—not in terms of sales, the number of employees or other often-used variables of growth. Future growth is only embodied as the perceived value-creation potential of the business hypothesis and the competence of the team that is organized to test it and learn how to capture its market value. It is important to notice that this aspect of growth is not centrally present in firm growth research, as researchers often need growth to have already occurred and apply variance-based methods to data sets of grown firms.

3.3 Competence bloc theory and the startup industry

Competence bloc theory explains the organization of the competitive selection of innovations and firms via the assumptions of the EOE. The key idea for economic growth—simultaneously a solution and a significant challenge for economies—is the question of how to organize diverse and distributed competencies in the economy to ensure that each innovative project and startup is exposed to the maximum competent and varied evaluation (Carlsson & Eliasson 2003, Eliasson 2003). Competence bloc theory can be used to analyze this process and related mechanisms, which are applied here as the building blocks for the structure and functioning of the startup industry.

The seminal article that outlines the theory (Eliasson & Eliasson 1996) defines a competence bloc as "the total infrastructure needed to create (innovation), select (entrepreneurship), recognize (venture capital provision), diffuse (spillovers) and commercially exploit (receiver competence) new ideas in clusters[4] of firms". In the theory, significant importance is given to human-embodied (tacit) competence capital that is gained through active participation in viable market competition against the best international competitors. In the process of gaining such capital, the market is the school, and closeness to the market is necessary for the successful acquisition of such competence (Eliasson 1996). The role given to competence is critical for the organization of institutions and hierarchies in the market and the economic activity of the competence bloc.

[4] Since the introduction of the theory in 1996, the market for startup business development has become more international and connected, which may complement the missing local parts of the cluster (see, e.g., Saxenian 2006). Hence, the cluster ideology is not emphasized in this thesis.

In other words, a competence bloc lists the configuration of supposedly competent actors who are necessary and work together to successfully create, recognize and exploit new business ideas in the market and to take the winning products and services on to industrial scale production and distribution for maximal value capture. The competence bloc includes the minimum tacit functional competencies and economic agencies needed to achieve efficient resource allocation (Eliasson 2003) and collectively initiate the generation of winners and, at best, the growth of new industries. Hence, rapid firm growth is a complex process that requires a number of different but complementary competencies, and it is clear that a study with a narrow focus on a single aspect is likely to be misleading (Henrekson & Johansson 2008).

The configuration of the competence bloc actors is described in table 2. Originally, it was defined to consist of six different actors and competence areas (Eliasson & Eliasson 1996); recently, Johansson (2010) proposed the inclusion of two additional actors to the structure (the second and eight actor). At the top of the list is the competent and active customer who defines the highest degree of product sophistication for which the most advanced customers are willing to pay (Eliasson 2003). No matter how advanced the technology, the products never get better than the level that customers are capable of appreciating. Therefore, competent customers who participate in competition in large or potentially large markets (customer receiver competence) are crucial in establishing long-term technical and market change (Eliasson 1990b). According to Johansson (2010), the competent customer is not an ordinary customer who solely buys the product; he or she is instead a strategic partner who takes an active part in product development and commercialization by serving as an information channel that informs the firm about the market and specific customer demands. These customers act as catalysts for innovation and have a decisive influence on the development and final design of new products (see also Blank 2005, Florida 1997, Osterwalder & Pigneur 2010, Ries 2011, Von Hippel 1998). In addition, they sometimes finance a part of the product development and share in the risks. The more advanced and radically new the product's technologies, the more important customer quality becomes (Eliasson 2003). Furthermore, recognized competent customers are valuable as references to support the sales, recruiting and fundraising of a startup.

Table 2. Competence bloc structure (Eliasson & Eliasson 1996, Johansson 2010).

Actors and competencies
1. Competent and active customers
2. Inventors who come up with novel ideas of new combinations
3. Innovators who integrate technologies
4. Entrepreneurs who identify profitable innovations
5. Competent venture capitalists who recognize and finance the entrepreneurs
6. Exit markets that facilitate ownership change
7. Industrialists who take successful innovations to industrial-scale production
8. Skilled labor carries out production.

Inventors are the second competence bloc element. Their function, based on the Schumpeterian theory, is to come up with novel ideas about new combinations to solve specific economic, organizational and technical problems (Johansson 2010). These new combinations are mainly seen as incremental technological developments.

Innovators[5], the third competence bloc element, fulfill a more advanced function than the inventors by solving more advanced technical problems and integrating large-scale technologies together (Johansson 2010). The innovative agency functions as an integrator of different technologies and finds new ways to create value, which is needed when creating and developing products or services (Eliasson & Eliasson 1996, Johansson 2010). Competence bloc theory defines the innovator mainly through technology and gives it substantial absolute value. Although it is important, from the perspective of the present startup entrepreneurship, technological innovation is not enough, as technology and its development has become an increasingly globalized, rapidly imitable, and at times easily accessible commodity. Hence, as is the case with services, innovations and business value creation may occur more frequently outside the technology, which is manifested by the advancements in and the increasingly important role of design thinking (Brown 2009), business design (Martin 2009), and the open innovation paradigm (Chesbrough 2003). Therefore, the innovator component can be seen also as an agency of value creation that is not restricted to technology.

Belonging to the fourth actor category, entrepreneurs create commercially viable innovations or select ones that they perceive to have market potential on

[5] Schumpeter (1934) described the innovators and entrepreneurs as synonymous. That is not the case with the EOE and competence bloc theory (Johansson 2010).

the scale of their economic and profitability criteria (Eliasson 2003). An entrepreneur who is looking to build a small business or to be self-employed views the opportunity or viable innovation and the related execution differently than an entrepreneur who aims to build a big business or raise venture capital. The main function of the entrepreneur is to move the innovation to markets (Eliasson & Eliasson 1996). The entrepreneur has the most critical economic function because he or she understands, selects and initiates the commercialization of innovations (Johansson 2010), although, in some cases, venture capitalists are known to initiate commercialization (Bussgang 2010). Furthermore, the entrepreneurial startup is suggested to be perceived as a competent team (Eliasson 1990a, Johansson 2010) that is not ready or complete on day one but needs to be completed, as the business experiment is moving forward at markets. Entrepreneurial skill and competence are critical components for success, as experienced serial entrepreneurs with successful track records are more likely to succeed than first-time entrepreneurs and those who have previously failed (Gompers, Kovner, Lerner & Scharfstein 2006).

One of the central mechanisms of the competence bloc is the tacit industrial and business-building competence that exists in the venture capital industry (Eliasson 2003), which is the fifth actor of in competence bloc theory. Venture capital is here defined as independent, professionally managed, and dedicated pools of capital that focus on equity or equity-linked for-profit investments in privately held, high-growth ventures (Gompers & Lerner 2001). Competent venture capitalists are significant factors in the successful identification of entrepreneurs and project filtering in the early stages of startup development. These competent actors evaluate startups as investment opportunities and make staged investments to the potential winners from the deal flow to which they are exposed. This process is critical for the final commercialization of the startup project and leaves the innovator and entrepreneur with a significant part of the gain[6] (Eliasson & Eliasson 1996). Ideally, the provided financing is not the most important factor; instead, "hands-on" support and competence in management, industry-specific knowledge and networks are key elements in the value added from venture capitalists acting as active owners. Many venture capitalists have significant industrial and startup board experience or successful serial entrepreneurial careers on which their competence is based.

[6] Among other things, the founding team size, the startup's success and venture capital market conditions affect this share, which is thus case-specific.

Without value-adding competence, venture capitalists will only function as financial risk diversifiers for the entrepreneurs (Eliasson 2003). Indeed, "incompetent money" can have a negative effect on firms because the financial capital then confers power and authority on actors who do not understand the business (Johansson 2010). Incompetent money and actors will be quickly outcompeted[7] in a well-functioning market economy (Eliasson & Eliasson 1996, Johansson 2010), and the only time large-scale misallocation can continue for an extended period of time is when the government intervenes in economic life and puts the market-exit mechanisms out of order (Eliasson 2003). Carlsson (1983) and Bergström (1998) provide examples of this type of intervention in the Swedish context.

Uncertainty and information asymmetry between entrepreneurs and investors make the financing of startups very challenging (Lerner 2002). Therefore, many industrially competent and diverse venture capitalists are needed (to form a true market); with only one venture capital firm capable of investing in the startup, there will not be much incentives for the startups due to the lack of negotiating power or the expectation of value added (Eliasson 2003).

In addition to venture capital firms, business angels and, to a lesser degree, corporate venture capitalists are other important sources of risk capital[8]. These sources are not addressed in the original competence bloc theory, but due to their importance to startups in different contexts, they are discussed here. According to Mason and Harrison (2004), business angels are high-net-worth individuals, who are typically successfully cashed out or disengaged (serial) entrepreneurs and senior managers from corporations. Although most business angels invest on their own or in small groups, an increasing number is joining organized angel syndicates or online platforms.

Typically, a business angels will invest a smaller amount at an earlier stage, and a venture capital firm will want to see more proof and invest a larger amount

[7] However, as venture capital funds are typically organized for a 10-year lifespan and often end up being 10+ years, the renewal through outcompeting does not happen so quickly in practice. For example, in the US, the funds that were raised just before the Internet bubble burst have been coming to the end of their lifespans in recent years, and now it can be seen that their performance has not been good (see, e.g., Mulcahy, Weeks & Bradley 2012). Still, some of these venture capital firms have already been able to raise subsequent funds. Naturally, incompetent venture capitalists are not the only reason for these weak performances, but the renewal cycle tends to be longer.

[8] In addition, different forms of crowdfunding has lately increased and offers new funding options for entrepreneurs, but these forms are not addressed in detail in this thesis (see, e.g., Belleflamme, Lambert & Schwienbacher 2014).

at a later stage (Freear & Wetzel 1990, Harrison & Mason 2000). Hence, business angels are important mechanism for creating investment-ready deal flow and demand for venture capitalists services. In recent years, the impact of so-called super-angels or micro-VCs, who run smaller funds, has increased significantly, as the lowered cost of building products[9] has enabled the angel money to bridge the startups further than what has been possible before (see, e.g., Peters 2009)[10].

Corporate venture capital refers to equity investments conducted by corporations or incumbent firms in independent entrepreneurial ventures that seek capital to continue their operations (Gompers & Lerner 1998). For the corporation, the primary logic behind making such an investment is to source new innovative ideas and external knowledge outside internal R&D (Dushnitsky & Lenox 2005). Besides financing, the startups can get feedback on the technology and the corporation's perspective on how they see that particular market category developing. Especially with early-stage companies, the corporate venture capital investment is made to establish partnerships with startups in areas in which technology is being developed and the winner remains unclear. The philosophy behind such investments is that entrepreneurial ventures are likely to be sources of highly valuable and innovative ideas (Kortum & Lerner 2000).

Sixth, large and deep exit markets are critical for the realization of rapid industrialization and the scaling of winners, often through venture capital financing (Eliasson & Eliasson 2005). The many actors in the secondary exit markets include portfolio investors in publicly listed companies, private equity (PE) firms, and management buy-ins (Henrekson & Johansson 2008). The liquidation of created value and business growth occur at exit, when offered shares are sold, but the most important point is to further finance the later business-scaling stages. The main exit channel is either a desired initial public offering (IPO) or a merger and acquisition (M&A), which has recently been the main exit channel, for instance, in the US because of the weak IPO market (see NVCA 2013). Even if the company is sold to a corporate acquirer, the option to take the company public helps to drive up the sale price (Gompers & Lerner 2001). Robust public markets are also important for the venture capital cycle (Gompers & Lerner 2004), but they are often a neglected part of the entrepreneurial environment (Lerner 2010). Indeed, a recent report (NVCA

[9] Open source software and on-demand cloud infrastructure services are the main reasons for the decreased startup establishment cost of, for instance, Amazon AWS.

[10] Recently, there has been much debate challenging the long-standing venture capital model and its future (see Mulcahy *et al.* 2012, Peters 2009, Griffith 2013).

2011b) suggests that most job growth in venture-backed young companies in the US occurs after their IPOs.

The desired level of value increase or growth by the venture capitalist is, on the one hand, bounded by the size of the investment and the fund from which the investment was made; a larger fund will need a larger exit to move the fund's needle and to achieve the desired investment return for their limited partners (LPs), whose money is invested of the fund. Business angels and smaller funds can perform with smaller-scale exits, which are often driven by the strategic needs of an industrialist or other growing and competing companies that need talent and technology. The volume of the latter type of deals has increased, and smaller acquisitions, approximately 12 to 30 million dollars, represent a significant portion of the exits in the US (Peters 2009).

Without viable exit markets, the abilities of and incentives for startup industry actors to build startups into large companies is drastically reduced. Exits are highly valuable and essential for the expansive development of the startup industry, as innovators and entrepreneurs, in addition to venture capitalists, gain experience-based competence and make money that they often reinvest in new startups; these actors also sometimes become serial entrepreneurs. This money is critical because it has not been completely wiped clean of the business competence that created it, as is the case with the taxed money with which government agencies operate (Eliasson 2003).

Indeed, the role of the exit markets for the entire incentive chain—aligning innovators, entrepreneurs and venture capitalists to take risks and aim high—is so critical that Eliasson and Eliasson (2005) further developed and discussed the idea as the market for strategic acquisitions. The authors state that the breadth of sophisticated competent industrial-scale customers who buy startups is the starting point of the market for strategic acquisitions. If there are not enough active industrialists/customers, there are no real incentives for sophisticated entrepreneurial firms to enter the market. In this case, the market for strategic acquisitions in the intersection of the venture capital and exit markets would not exist. Since the publication of the article, the market for strategic acquisitions has evolved and can be seen as actively present at the intersection of angel capital and early exit markets.

One of the key roles of the seventh actor, the industrialist, is taking the winning products and startups to industrial large-scale production and distribution (Eliasson & Eliasson 1996, 2005). This competence area relates to the ability to organize the later-stage commercialization into large-scale businesses after the introductory entrepreneurial phase (Henrekson & Johansson 2008). It is the most important growth-promoting property of the competence bloc and defines the economy's competitive advantage (Eliasson & Eliasson 2009). In the case of the startup industry, the industrialist has two roles. On one hand, there are separate industrial-scale actors present who are important business partners for startups and who provide access to their channels or platforms[11]. On the other hand, it can be understood as the competence of scaling the high-growth-potential startups into winning large businesses. Eliasson and Eliasson (2009) state that the formal role of the industrialist (e.g., the CEO, chairman of the board, or active owner) cannot be known in advance—he or she will figure this role out based on his or her capacity to contribute. In a sense, competence bloc theory thus shifts the focus from the entrepreneur to the industrialist competence (Johansson 2010), as the innovation has reached the market and achieved a product-market fit, and the business is at the scaling phase.

Lastly, Johansson (2010) added the skilled labor needed to carry out production as the eight actor of the competence bloc. Startups that are scaling and hiring rapidly must have access to a skilled and experienced talent pool to support their business growth; the organization structure needs to be built and staffed by competent professionals and executives. New rapidly expanding industries can be particularly hampered by a lack of individuals[12] with specific skills (Henrekson & Johansson 2008). In addition, access to experienced mentors, coaches, and professional service providers, such as lawyers, recruiting and design firms, from which startups can buy services, is an important factor for the startup industry.

These eight actors and agencies form a network of complementary competencies that are needed for the successful commercialization of innovations of startups. A competence bloc is considered structurally complete[13] when it has vertical completeness and horizontal variety and when a critical mass has been reached (Eliasson & Eliasson 2005). The process of generating, identifying,

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[11] For instance, large multinational high-tech companies have, depending on business type, tens of thousands of customers or millions of users who create a significant channel and an attractive platform for startups to tap into, such as the Apple AppStore or Facebook. These multinationals compete on these platforms which has led them to start platform-specific funds or accelerators to attract startups to develop products and services on these platforms.

[12] This lack recently led to a trend in the US where rapidly growing firms are buying startups to obtain talented employees. These types of acquisitions are called acquihires. See, for instance, http://www.bothsidesofthetable.com/2013/05/13/the-corrosive-downside-of-acquihires/.

[13] It is also noteworthy that large industrial scale firms can internalize almost entire competence blocs, as IBM did in the 1970s; it was even a competent customer for its own products (Eliasson 1996). In addition, a planned economy can contain all of these elements.

selecting, expanding and exploiting business ideas then functions well (Johansson 2010). The potential winners are exposed to a maximum of varied competencies and they can confidently pursue business development, and increasing returns to continued search for the next winners prevail on systemic level (Eliasson 2002, 2003). In this sense, the receiver competence of the economy in relation to the supply of innovations can be defined through the competence bloc (Eliasson 1990b, 2002).

The complete competence bloc becomes (acts as) an attractor for investments, innovators, aspiring entrepreneurs and advanced firms that both benefit from operating there and contribute to the competence bloc's further spontaneous development (Eliasson & Eliasson 1996, 2009). However, competence blocs cannot be copied or planned ahead, as they form spontaneously in markets (Eliasson & Eliasson 2005, Johansson 2010). For instance, Silicon Valley is a rare complete competence bloc that has continuously been copied since the 1960s without significant success (Miller & Coté 1985, Leslie & Kargon 1996).

In practice, most competence blocs are not complete. In different geographies the structural completeness varies, and the organization of actors is mediated by numerous factors, such as the economic, industrial and entrepreneurial history and past economic policies. These factors either foster dynamic capitalism and provide a favorable environment for the emergence of competence blocs and high-growth startups or lead to sclerotic capitalism by failing to produce such an environment (Henrekson & Johansson 2008).

If the competence bloc is not vertically complete and horizontally varied, there are considerable risks for earlier stage innovators and entrepreneurial startups in entering the markets (there might not exist an actor to understand the project) and for society in missing the gains from the scaling of potential winners (Eliasson 1986, 2000). Therefore, the main task of industrial policy is to ensure that the competence blocks are complete (Eliasson 2000). None of the actors of the competence bloc can be missing, or the entire incentive chain and structure fail to develop (Eliasson & Eliasson 2009).

The EOE and competence bloc theories are based on the institutional set-up of private economic actors whose incentives and existence are based on their competence and performance in competitive markets, which ensures that competence renewal is occurring and that non-performing actors will be outcompeted. Therefore, a clear distinction is made between centralized and politically led public actors and decentralized competitive market-based actors (Eliasson 2003). This distinction is important to consider in research; as the incomplete competence blocs are often the norm, some identifiable market failures exist and are addressed by policies and public actors. Hence, the public actors and their conceptual tools, such as NISs, often overlap in some parts of the competence bloc structure and activity.

3.4 The mechanisms of winner generation

The EOE defines two errors in the economy, whose incidence and economic consequences the competence bloc actors try to minimize through their activity and selectivity in resource allocation (Eliasson & Eliasson 1996). The errors also apply to the functioning of the startup industry (table 3). The first error is keeping the bad projects and startups alive for too long. As discussed above, high-risk and high-potential startups are uncertain and experimental in nature; thus, business mistakes and failures are normal. A critical competence element is thus the capability and incentives to identify and correct mistakes early and pivot towards new opportunities[14], but also be ready to shut down the business experiment if value creation, growth and progress are not there[15] (cf. Eliasson 2003).

Table 3. Errors of startup industry resource allocation (modified from Eliasson & Eliasson 1996).

Description of the errors
Error 1: Bad projects and startups are kept alive too long
Error 2: Winners are rejected or terminated prematurely

The second error relates to the missing or premature termination of winners. The most expensive mistake for society is a situation in which the potential winners, with radically new and profitable innovations, are not scaled in markets for maximal value creation and capture or when such ventures are terminated prematurely, as this premature termination deprives the economy of large future profits and resources (cf. Eliasson 2003, Johansson 2010). This error hampers, for instance, job creation, the emergence of successful serial entrepreneurs, business angels, and an independent and competent venture capital industry.

Therefore, a main concern and significant challenge for policymakers is addressing these two errors by organizing competence bloc actors and institutions

[14] See Ries (2011) for definition of a pivot in the lean startup context.
[15] This requires that on institutional level "the rules of the game" (North 1990) meaning that what the actors involved in the startup experiment are aiming for needs to be jointly defined and agreed.

to ensure that each startup is exposed to competent and varied evaluation (Eliasson 2003, Eliasson & Eliasson 1996, 2005) and efficient resource allocation with the correct incentives (Johansson 2010).

Based on the EOE and competence bloc theories, it can be suggested that (1) high-growth-potential startups that scale into winners and (2) startup industries aimed at minimizing the incidence of the two errors play a critical role in creating returns on the significant government investment to stimulate economic growth. These critical factors were discussed at the introduction of the study. Under the entrepreneurial economy, the role of the startup industry is here seen as the economic system that creates the conditions and provides the incentives for the creation of radically potential innovations; this system is organized and incentivized to scale innovations into maximum value capture in markets. In what follows, this function of the startup industry is approached through two mechanisms and their related activity: (1) the generation of potential winners and (2) the picking and scaling of the winners.

3.4.1 The generation of potential winners

Competence bloc theory underlines the importance of venture capitalists in the competitive selection of innovations and startups (Eliasson & Eliasson 1996), which implies a written-in assumption of the existence of a critical mass of potential winner startups (deal flow) that fulfill the investment criterion of venture capitalists[16]. However, this pre-condition for the selection in investor markets is not addressed in the original competence bloc theory. On a theoretical level, high-quality and high-growth-potential startups cannot be assumed to exist as a given; they instead must be addressed as critical antecedents for the functioning of competitive selection and market mechanisms. In this study, this theoretical gap is discussed under the investment readiness concept and generating potential winners mechanism.

[16] The emphasis on venture capital funding does not underrate customer money or revenue as a funding and validation mechanism. In fact, customer money can be seen as the best money for founders, as it is non-dilutive and does not take ownership, and numerous successful companies are built without external investors. In addition, investors can only finance a small fraction of all of the new businesses created annually (Lerner 2002). However, in reality, this type of financing does not suit all cases, nor is it always financially sufficient for the rapid scaling and growth of the startup.

Investability or fundability is the most fundamental element of assessing the startup's investment readiness and success potential[17] (Mason & Harrison 2004). Investability addresses the specific requirements for evaluating the potential startups as investment opportunities that different external investors use, depending on the type of the investor (business angel, venture capitalist, corporate venture capitalist), the investment stage (seed, early stage, expansion, later growth), and the investment thesis and size of the fund (De Clercq, Fried, Lehtonen & Sapienza 2006). For entrepreneurs, the investment readiness criterion provides a set of key issues to be addressed early on to improve the chances of the startup becoming an enduring company. Among the issues covered are the entrepreneur's/management team's credibility, the market and business opportunity size, the timing, the problem and its solution, the competition, the business model and the proposed deal structure[18]. How these issues are emphasized depends on the investment stage and the investor; while one investor might observe the company's technological position, others might consider the management team or the addressed market as the most important element to observe (Gompers & Lerner 2001).

In startup-active geographies, such as Silicon Valley, that generate a critical mass of deal flow, investors see numerous categorically investment-ready companies. The actual decision to offer a term sheet and make an investment after due diligence has significantly more to do with the case-specific details, funding stage and market conditions than with what the general investment-readiness categorization captures, which further highlights the importance of the venture capital market size to startups. On the other hand, private venture funds have also tended to concentrate (herding) on a few industries and so-called hot industries; thus, many promising firms in other industries might not be attracting venture capitalists' notice, whereas too many companies are funded in the hot areas (Lerner 2002, Gompers & Lerner 2004). Recently, the aforementioned increased role of business angels and especially the emergence of crowdfunding can be seen to complement this restriction, as startups, projects and ideas can be directly exposed to markets for testing and sales.

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[17] Other investment-readiness criteria include the entrepreneur's attitude towards equity finance, written documents and oral presentations (e.g., pitch talks, elevator pitches) of the startup as an investment opportunity (see Mason & Harrison 2004).

[18] Many known venture capital companies provide detailed information of the elements that they see as important. For instance, see http://www.canaan.com/resources/archives/entrepreneur-pitchbook.

Moreover, to account for errors 1 and 2, the investment-readiness elements can also be approached from an institutional or agency perspective. This approach refers to the institutional-level understanding of the rules of the game (North 1990) and the types of innovations, projects and business opportunities that different economic actors in the startup industry collectively perceive to seek and pursue; what is the perception of a winner startup for them and where the bar is set concerning the sought outcomes and results of the activity. From an agency perspective, investment readiness can be seen to function as an aligning collective force (lure) that mediates new venture creation to occur more often around business opportunities with significant growth and disruptive potential (assuming the investment readiness is perceived as the generation of high-risk and high-potential startups that aim to become international market leaders). The venture capital industry's mediating role is important in this connection and plays a central role in coordinating various high-tech agents: entrepreneurs and managers, professional employees, specialized suppliers, investors and capital markets, and product markets (Florida & Kenney 1988a).

The generation mechanisms for potential winners thus involve organizing the emergence of such perceived winner startups[19]. These startups are the high-risk and high-growth-potential innovative entries and change agents that increase dynamism and bring qualitative change to the economy by activating the Schumpeterian (1912, 1934) creative destruction process (table 1).

Although the role of universities, accelerators, business incubators and other startup-related activities are not the focus of competence bloc theory per se, their activities are related to the generation of potential winners and must be noted in empirical analyses. University and research institution technology transfer offices patent and license technologies/innovations, support spin-offs and collaborate with entrepreneurs, competent customers and investors. In addition, among other activities, entrepreneurial education and campus visits play an important role in the background building interest in entrepreneurship and startups. Incubators and accelerators, such as the Y Combinator[20], are organizations that are part of the early-stage selection process, and are later involved in the development of

[19] A critical mass and flow of investment opportunities is also the precondition for the formation of the venture capital industry and its function. A vibrant venture capital industry depends on a flow of investment opportunities capable of growing in value quickly enough to provide capital gains that justify the investment risks (Avnimelech, Kenney & Teubal 2004).
[20] See http://ycombinator.com.

business ideas, projects and startups, and thus participate in activities that relate to the generation of potential winners.

3.4.2 Picking and scaling the winners

The startup is the primary actor who needs the most competence to successfully initiate and scale the project in the markets. The corollary here is that the outside evaluators also need to be as competent as the entrepreneurs to understand and recognize the new venture's business potential (Eliasson 2003). An important role is thus given to the competent customers whose feedback and conducted business validates (picks) the startups in the markets and enables the business to grow. However, all startups do not have market access and may require and seek investments in product and business development. Hence, competent investors are important for picking winners among the new entrants and for the commercialization of the business experiment (Eliasson & Eliasson 1996, Eliasson 2003, Johansson 2010).

The startup's fundraising process is the activity that connects the two mechanisms from the supply-and-demand perspective of venture capital. The ability of the startup to find the most suitable investor relates to the scale and depth of the venture capital market and the availability of different sources of risk capital. Without a sufficient number of investors, the question is not about the competitive selection of innovations and startups.

Capital-demanding potential startups are really difficult to finance because they have short or no histories and have tremendous technological, product, market and management uncertainties, which create information asymmetry between the entrepreneur/startup and the investors (Lerner 2002). The venture capital industry and its tools for addressing these issues have specifically emerged around this task. Competent investors possess highly specialized knowledge about the industries that they support; they have access to vast networks of experts who can help them to evaluate people and obtain a sharp sense of markets and technology; and they know how to craft agreements that keep uncertainty at a manageable level, close information gaps, and reveal the most promising opportunities among the thousands that come their way (Gompers & Lerner 2001).

In these situations, tacit experience-based knowledge is an important knowledge input; the banker's logic or the analytical method of management can feed the incorrect inputs into decisions about and reactions to unusual events

(Eliasson 2003)[21]. Experienced venture capital companies and general partners can have board member experience—successes and failures—from tens of companies. Similarly, successful serial entrepreneurs likely possess experiences with multiple ways of building businesses.

Deal origination is the process through which deals from the deal flow are considered as investment prospects for venture capitalists (Tyebjee & Bruno 1984). Historically, there have been three typical sources in this process: referrals, cold contacts and technology scans (ibid); currently, these sources include incubator or accelerator demo days, pitching and startup competitions, and online resources. Evaluating the investment opportunities (picking the winners) involves several criteria, including the aforementioned investment readiness and the attractiveness of the startup as an investment opportunity. These criteria are geared towards controlling the uncertainties and information asymmetry between entrepreneurs and investors and managing the risks of the startup business experiment as a whole. The screening can be strict; in the past, only 1% of the business plans submitted to US venture capitalists has been funded (Fenn, Liang & Prowse 1995). This rate varies depending on the investor type, the investment philosophy[22] and the stage.

To control the risks, the investment[23] is often conditional on finding a syndicate partner who similarly sees the startup as an attractive investment and potential winner (Lerner 1994). The capital is supplied in stages to periodically reevaluate (milestones) the prospects of the startup and reduce the potential losses from bad investment decisions, as there is periodically the option to abandon the project (Gompers 1995, Gompers & Lerner 2004). As the size of the financing round generally increases in later rounds, the total venture financing and the number of financing rounds should be higher for successful projects than for failures (ibid). In this way, the incidence of error 1 is controlled through resource allocation to the potential winners.

After the investment(s) are made, the post-investment activities are crucial for the successful development and scaling of the business. As discussed above, money is the fuel for this process, but the competence of the management team,

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[21] For example, a frequent fault in public funding has been the presumption that technological criteria can be separated from business considerations when evaluating firms (Lerner 2002).

[22] See, e.g., the 500 startups founded by Dave McClure (http://500.co) as an example of an interesting new investment philosophy.

[23] There are many important details about the actual fundraising process and governance and the economics terms of the term sheet (deal structure) that are not covered in this thesis. Feld and Mendelson (2011) provide a comprehensive overview.

employees, board, and venture capitalists is critical. In the case of venture investors, the value-adding activities may include: (1) building the management team and providing help in recruiting, (2) participating in strategic and operational planning, (3) locating additional financing, (4) finding additional business contacts, such as customers and suppliers, and (5) replacing management personnel when appropriate (Tyebjee & Bruno 1984). Overall, venture capitalists state that their support to portfolio companies in the form of generated information and provided services are more important than the infused capital (Gompers 1995). In practice, this support varies greatly between investors.

The competence of the involved economic actors cannot be specifically defined in terms of content, but it is ultimately characterized based on results (Eliasson 2003). In the case of the startup industry, this results-based characterization means asking whether the actor has been able to generate winners. Success in scaling potential winners through staged financing and resource allocation can be evaluated first in terms of the actor's ability to get the startups to increase their value or revenue and to secure subsequent funding. However, in the long term, the most important factor is successful exits (IPOs and M&As). Financial resources and value added are startup inputs, and ownership is illiquid until an exit takes place. Successful exits are, hence, critical in ensuring attractive returns for investors and, in turn, in raising additional capital for new venture capital funds which enables investments in new startups (Gompers & Lerner 2004). Exits are extremely important for the health of other parts of the venture capital cycle (ibid) and for the removal of incompetent actors.

Even with these mechanisms, failure—or, at best, modest success—is the likely outcome of a venture-backed startup (Lerner 2002). This high failure rate underlines the discussed nature and risks of startup business experiments under EOE principles. Without the competence, accountability and incentives to turn the startups with the most potential into winners that continue to grow and achieve exits, the startup industry's efforts to minimize the incidence of error 2 are ineffective, and the value-creation potential of innovations and startups is not sufficiently captured for economic and societal benefits and industrial renewal.

3.5 The startup industry and its culturally-historically embedded activity

In different geographical locations, the structural completeness of the startup industry and the organization of its actors vary and are mediated by prior industrial[24], entrepreneurial and economic policies and cultural histories; the entire startup phenomenon can be a new object of work or something that actors have been working on and gaining competence from for a long time. Startup industries do not emerge from scratch but carry this type of history with them. Therefore, it is important to understand the economic actors and their behaviors as embedded in concrete, on-going systems of social relations and institutional contexts that affect the social construction of startups (perceived winner) and related activities. Next, cultural-historical activity theory is applied to enable the study of startup industry activity and actors as embedded in and mediated by these historically evolved cultural artifacts.

A theoretical concept involving a collective, artifact-mediated and object-oriented activity system (figure 3) is the central building bloc of activity theory and human activity research. Its motive-driven activity (Engeström & Miettinen 1999) and network relations to other activity systems are the prime units of analysis (Engeström 2001). The main idea is to integrate culture into our understanding of human functioning—to see humans as culturally-historically mediated by and embedded in some activity that has its own cultural artifacts, such as rules, tools, community, and division of labor.

The activity system concept expanded Vygotsky's (1978) basic triadic relationship (the small triangle at the top of figure 3) of mediational action between the subject, object, and mediating artifacts (technology, tools, signs, language); this expanded concept includes other people (the community), social rules (rules), and the division of labor (organizational structures) between the subject and others (Engeström 1987, Cole & Engeström 1993). Objects are especially crucial, as they provide direction for activities; they are the "lures" through which activity comes to life (Leont'ev 1978, Holt 2008).

[24] See, e.g., Markusen (1996) for a typology of industrial districts and structures.

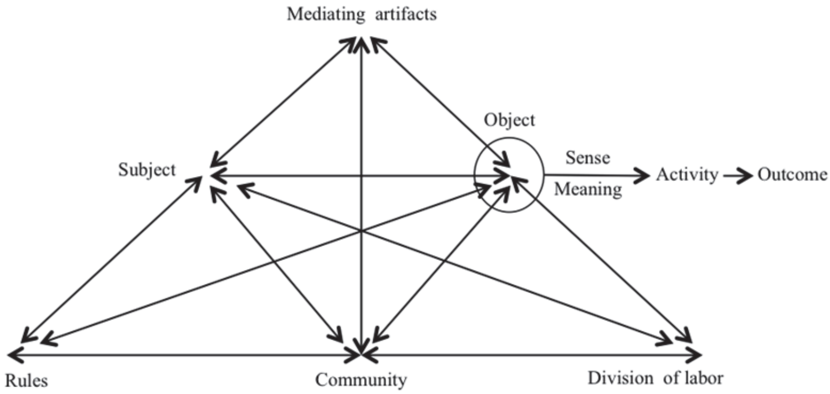

Fig. 3. The structure of the human activity system (adapted from Engeström 1987).

According to Sannino, Daniels and Gutiérrez (2009), the adoption of the activity system as a unit of analysis is the main innovation and contribution of this theory. This system retains the importance of subjectivity (e.g., the importance of startups and entrepreneurial teams in the analysis), but simultaneously integrates subjectivity with the embeddedness, cultural means and constraints that inescapably characterize human practices. This methodological innovation represents a challenge to traditional thinking in human and social sciences, which relies on deep-seated individualism and the notion of society as an anonymous and untouchable structure (ibid).

Activity theory consists of five principles: (1) the activity system, (2) historicity, (3) multi-voicedness, (4) contradictions, and (5) expansive transformation (Engeström 2001). In what follows, these principles are discussed in relation to the aforementioned theoretical elements of the startup industry to enable observations of its activity from a contextually embedded perspective.

First, a startup industry and its actors can be understood as an activity system from two perspectives. On the one hand, the structure and organization of economic actors create a geographically embedded activity system. On the other hand, the actors within this entity can also be seen as individual activity systems (organizations) that are inside and part of this larger system, as is the case with startup or venture capital companies. These actors have network relations with other actors who are geographically close or distant.

Second, as an activity system, the startup industry can be seen to have the startup as its shared-object of activity. This object is an open design that is produced with a range of outcomes in mind (Holt 2008) and to which a collective of community subjects (startup industry actors) contribute. Each actor has a different role and different reasons for their interest in and activity toward the startup object (e.g., the competent customer needs the offering; venture capitalists need to generate returns on investments in startups; skilled labor looks for job opportunities). However, the subjective importance of the startup as the primary actor remains, although it is seen to be embedded in the startup industry (cf. Sannino *et al*. 2009).

Historicity and multi-voicedness, two other activity theory principles, relate to understanding the cultural historical mediation present in the currently observable activity. Similar to startup industries, activity systems take shape and transform over lengthy periods of time. Prior generations and their accomplishments accumulate in the present outcomes and situation; in this sense, history affects the present (Cole & Engeström 1993). This historicity leads to multi-voicedness; in other words, an activity system is always a community with multiple interwoven perspectives, traditions and interests (Engeström 2001) that shape the present activity. There are either implicit or explicit development paths of activities that mediate current observations.

Especially relevant is observing historically developed activities that have become institutionalized. Such activities are rather robust and enduring, and once they gain the status of cultural practices (e.g., the perceived winner affects the rules of the game), they often have radically longer half-lives than do individual goal-directed actions (Cole & Engeström 1993). Such institutionalized and embedded social mechanisms that have become cultural practices in the everyday functioning of the activity system can have significant explanatory power in understanding the activity and outcomes.

As the fourth principle, contradictions act as an important source of change, development and learning in activity systems (Miettinen 2009). Each activity system has its own seeds of contradiction (Taylor 2009). According to Engeström (2001), these seeds are not the same as problems or conflicts; they are instead historically accumulating structural tensions within and between activity systems that can occur when a new element (e.g., a new technology) collides with some old elements (e.g., rules or division of labor). This collision can result in tensions and conflicts but can also introduce new innovative processes and activities (Hasu

& Engeström 2000). Activity systems are thus reconfigured as they address contradictions (Edwards 2009).

In the long term, expansive transformations (the fifth principle) can occur within activity systems. Expansion is the qualitative transformation and reorganization of the object of work that both retains and transcends the previous layers of the object (Engeström, Puonti & Seppänen 2003: 181-183.) An expansive transformation is accomplished when, due to contradictions, the object and motive of the activity are reconceptualized to embrace a radically wider horizon of possibilities than in the previous mode of the activity (Engeström 2001).

In addition to the five principles presented above, an important element of activity theory is the theory of expansive learning (Engeström 1987). The key point in expansive learning is that activity system of actors who are engaged in learning learn about something that does not yet exist and then construct a new object or concept for their collective activity and implement it in practice (Engeström & Sannino 2010). There is not a competent teacher to provide the relevant knowledge or facts, but the new forms of activity are learned as they are being created (Engeström 2001).

In this study, contradictions, expansive transformations and learning are seen as important concepts for understanding the processual activity of a startup industry over time. The continuous generation of winning startups is a moving target, and the collectively built startups attempting a Schumpeterian innovative market entry are not competitive due to stable and easy-to-acquire knowledge. Instead, the EOE's uncertainty, immense set of business opportunities and experimentalism push the startups to often learn something that is not yet known and cannot be defined and clearly understood ahead of time; the ventures are high-risk and high-reward by nature. Under such conditions, the new forms of activity and practices must be learned as they are created by the entrepreneurs and other stakeholders. Similarly, the assumption that ex ante plans equal ex post outcomes in high-growth venturing is eliminated (Eliasson 1992). Hence, it is essential to understand the expansive nature of the learning process as a part of the activity and highlight the role of competence and its renewal as human-embodied and tacit, as discussed above.

3.6 Summary and the theoretical framework of the study

A theoretical framework based on the EOE, competence bloc and activity theories enables to approach firm growth from a perspective that expands the focus from the firm/entrepreneur (see chapter 2) to include the historically evolved and embedded startup industry. As an activity system, the startup industry[25] is taken as the primary actor and unit of analysis (the triangle in figure 4) to explain the emergence or non-emergence of expected outcomes.

The theoretical elements from the EOE and competence bloc are integrated into the activity system structure. The importance of entrepreneurial teams as startup business builders is retained, but the role of the other economic actors (the community) available to startups is also considered. These actors are suggested to have a significant mediating role in the startup's business building process and in explaining the historical performance levels of particular geographies in the generation of winners.

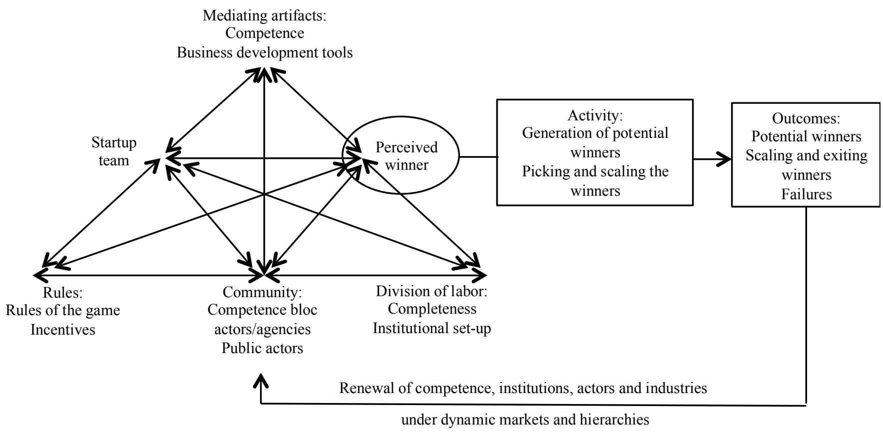

Fig. 4. The startup industry and the experimental winner generation process.

The perceived winner (the ellipse in figure 4) describes how different economic actors in the startup industry understand and perceive what a desired winner is for them, both on individual-actor and institutional levels. The perception of a winner is mediated by the rules, community and division of labor factors at the bottom of

[25]This definition is used to due to the focus on endogenous growth through the generation of winning startups, which does not include the contributions of incumbents or "mice", as is typically done with competence blocs (see Johansson 2010).

the pyramid, and this perception acts like a lure, giving sense and meaning to the activity and its direction. It is important to understand this mechanism as a socially embedded mechanism (Hedström & Sweberg 1998); it drives the startup industry's object-oriented and motive-driven activity and its division of labor.

Regarding the motives for generating actual winners, the actors' incentives and accountability need to be elaborated. Due to their industrial economic backgrounds, the EOE and competence bloc theories primarily discuss incentives as property rights, trade risks and transaction costs; these theories also discuss the role of these factors as a foundation for competition and an incentive for economic actors to act on business opportunities that fuel competition under markets and hierarchies (see, e.g., Eliasson & Eliasson 2009, Johansson 2010). However, in reality, complete competence blocs are rare, and public organizations intervene and conduct some of the competence bloc functions in order to solve market failures and to execute policies. The incentives and accountability in this case are not necessarily connected to the outcomes of the winner generation process or to these actors' abilities to contribute to or exit the markets. In this sense, the level of structural completeness and public intervention affect the overall systemic alignment of actors; the presence of each actor is not necessarily based on the ability to generate the winners at markets. Hence, the possible upside and downside and accountability regarding the contribution and outcomes of resource allocation are theoretically taken in account.

The activity of the startup industry is described through the two related mechanisms: (1) the generation of potential winners and (2) picking and scaling the winners. Combined with the structure and its winner perception, the mechanisms create the basis for the functioning of the startup industry and its main process of experimental winner generation. This process is spread over markets and hierarchies to continuously filter and recognize the most promising ideas, innovations and startups and to organize the economic actors (competence and other resources) for scaling the potential startups into desired winners. Competition for the winner-generated gains ensures that less competent non-contributing actors decline and exit the winner generation process (cf. Eliasson & Eliasson 2009). In this way, the incidence of the two aforementioned errors in startup industry resource allocation and the related consequences for the economy and society at large are addressed.

The experimental winner generation process is seen to produce three direct outcomes: potential winners, scaling and exiting winners and failures. The potential winners consist of early-stage projects and startups that are generated based on the characteristics of investment readiness and perceived winner; they thus have significant growth potential. Scaling and exiting winners are the startups that investors and/or markets have selected; in these startups, the business is growing and scaling rapidly (high-growth), and some of these startups thus eventually reach successful exits (IPO or M&A). Given the assumptions of the EOE and the high-risk and high-reward nature of startup business experiments, failures or unsuccessful exits (closure, bankruptcy, and non-growth) are natural and important outcomes of this process at all phases.

The outcomes and processual activity at markets act as renewal mechanism for the startup industry (the arrow from the outcomes to the startup industry in figure 4). The competence of the actors involved is gained and renewed through their involvement with startup business experiments and related learning in the markets. This learning is expansive (Engeström 2001) and drives the institutional renewal of the winner perception and the winner generation rules (cf. North 1990). Winner generation is hence not institutionally static; it is a moving and renewing object, as innovative entries push the market and actors to react. The big winners have the ability to trigger the emergence of new industries or to significantly disrupt and renew existing ones. The eventual exit of outcompeted, non-contributing actors causes the renewal of the startup industry structure. This renewal improves the competence, resource allocation and ability of the startup industry to remain or become more efficient in winner generation and producing of endogenous growth. Success and competence are defined in the long run based on the emergence or non-emergence of winners; the renewal is more difficult in centralized and politicized systems that experience more inertia (Eliasson 2003).

Lastly, based on activity theory and its notion of humans as culturally-historically mediated, the startup industry is embedded in its context and history. In this way, the economic and systemic evolution path behind current observable activity and outcomes can be considered, and the structure, winner perceptions, mechanisms and their mediating roles in experimental winner generation by startup industries can be examined in different geographies.

4 Empirical research design

The theoretical examination of firm growth above is supported by critical realism, which is adopted as the philosophical position of the study. There are few studies that apply critical realism to firm growth research (see e.g., Blundel 2002), although it is increasingly used in research overall. In the following chapters, the study aims to outline some of the key tenets of critical realism, mainly its ontological and epistemological assumptions, and discuss them in relation to this study and the philosophy of science bases of prior firm growth research. The chapter covers the critical realism explanatory framework and its implications for how firm growth can be conceptualized and analyzed based on the standpoint. The chapter concludes with a discussion of the research method, data collection and analysis.

4.1 The principles of critical realism

Critical realism is a particular version of realism; its basic claim is that there is a real world, including a real social world, which exists independent of our knowledge about it (Fairclough 2005). “Critical realism” is a combination of the terms “transcendental realism” and “critical naturalism”. The former relates to Bhaskar’s (1978: 24) argument about the realist conception of science as “a social activity whose aim is the production of the knowledge of the kinds and ways of independently existing and acting things”. Critical naturalism relates to the methodological question of whether it is possible to speak of “laws of society and of human behavior” in the same way one talks about the “laws of nature” (Bhaskar 1979). For this study, this question asks whether there can be such “laws of nature” in relation to firm growth, as touched on in the second chapter. Zembylas (2006) concludes that Bhaskar answers in the affirmative, but he situates his answer to account for the nature of the social sciences, such as the role of social institutions and human agency. Structures are not seen as static; they instead change based on continuous human agency (Bhaskar 1979).

Thus, critical realists have rejected naturalism by recognizing that the social world cannot be understood in the same way as its natural counterpart. Instead of stopping the search at the level of meaning, its interpretation is seen merely as a starting point for the pursuit of deeper causal explanations. Meaning has to be understood, but it cannot be measured or counted; hence, there is an interpretative element in social sciences (Sayer 2000: 16). Therefore, the impact of the intentionality of human action (such as our purposeful pursuit of perceived goals), the emergent nature of social structures, such as organizations, and the complex relationship between agency and structure should be considered. Whereas the causal powers of natural objects, such as weather systems, work without the human mind or any (self-conscious) sense of meaning, interpretation and intent, the causal powers of social objects, such as entrepreneurial activism, display these characteristics in abundance. (Blundel 2007) The perception and sense-meaning of social objects driving change is seen central.

Critical realism therefore criticizes the study of social domain as a “closed” system, which is typical of positivistic approaches in the social sciences, and opposes the idea that reality can simply be reduced to our interpretation of it (Castellacci 2006). This stance is relevant to firm growth research that is largely conducted using a positivistic approach. For instance, a key criticism argues that earlier forms of naturalism misunderstood science by only using it to study closed systems. Instead, reality is ontologically assumed to exist independent of observers’ perceptions and knowledge of it, and, in terms of epistemology, it can only be understood imperfectly and probabilistically through observations (Easton 2002, Järvensivu & Törnroos 2010). However, as Fleetwood (2005) reminds us, saying that entities (not only can, but do) exist independent of our identification of them does not mean they exist independent of human activity. It merely means that they are not dependent on the specific activities that are involved with identification.

The ontological (theory of being) and epistemological (theory of knowledge) difference between transitive and intransitive objects is a central concept to internalize to understand reality as it seen in critical realism. According to Bhaskar (1975), in the transitive dimension, knowledge exists as a social object, whereas in the intransitive dimension, knowledge is about real objects, such as ones in nature, which exist independent of humans and our knowledge of these objects.

Critical realism sees reality as stratified across three different domains: the real, the actual and the empirical (table 4). These domains drive our understanding of how things work from a realist perspective and provide ontological depth. The empirical domain is where actors experience events, which involves the level to which they have immediate access, and where their sensations, impressions, and perceptions of reality exist.

The domain of the actual is the domain of events, whether observed or unobserved. Such events can occur independent of the experiences and perceptions that actors may have of them. Events may occur, but they might not have been transferred to the empirical domain until human agency has correctly identified those events and transformed them into experiences (Bhaskar 1978).

Table 4. The three ontological levels of reality (Smith 1998, based on Bhaskar 1978: 13).

Domain of reality	Content
Empirical	Experiences, impressions, perception
Actual	Events, states of affairs
Real	Structures, mechanisms, powers/liabilities

The activation of causal powers of the objects and structures consisting on the domain of the real causes such events to occur (Leca & Naccache 2006). A critical realist explanation involves penetrating the surface of reality to access the domain of the real and identifying those structures and causal powers and the ways in which they act (Sayer 1992, 2000, Selboe 2002). From a realist viewpoint, the causal explanation is not about the deterministic or stochastic associations of patterns of events, nor is it about experiences; causal powers are instead ascribed to structures (Tsoukas 1989: 553). This view of causality is therefore not a (Humean) "constant conjunction" view, according to which a causal relationship between *x* and *y* entails a regular (and, in principle, predictable) relationship, such that where *x* appears, *y* will appear (Fairclough 2005).

According to the ontological view, reality can be divided into natural and social parts. Social structures and mechanisms are different from structures and mechanisms in nature. If the empirical and actual levels are collapsed via the assumption that it is impossible to distinguish between the things that we experience and the mental constructs that we use to understand the empirical level, a flat ontology is created that denies the existence of a deeper real level underneath (Smith 1998).

Bhaskar (1998: 42) describes how a social structure does not exist independent (1) of the activities that they govern or (2) of the agents' conceptions of what they are doing in their activities; in addition, these structures (3) may only endure in a relative sense (they are situated in a particular space and time), and they (4) are reproduced and transformed through social agents, which are, in turn, dependent on the relationship between structure and praxis (agency). The structure and agency are handled separately but seen as related. Further, critical realists use the term social structure to refer to configurations of causal mechanisms, rules, resources, relations, powers, positions and practices (Fleetwood 1995). They cannot be touched as can some of the entities in nature.

What then do critical realists actually focus on based on this ontology? According to Easton (2010), critical realists study events (effects) or outcomes (states of affairs), which can be external and visible behaviors of people, systems and things, as they occur or have occurred. Particular attention is paid to processes, especially those that produce and reproduce the ordering of events and social institutions (ibid).

Figure 5 presents one description of this critical realist focus area. The levels of the empirical and actual (events/effects) are not possible for a realist without the underlying realm of mechanisms and structures and their powers/liabilities (Smith 1998). The non-event/non-occurrence of an event when one is expected requires an explanation and may provide useful insights, as events occur as a result of mechanisms that operate in the real domain (Easton 2010). The contexts of events and object structures are seen as crucial, and any critical realist study must be contextualized because the way in which structures' causal powers will or will not develop depends on the contextual conditions (Leca & Naccache 2006).

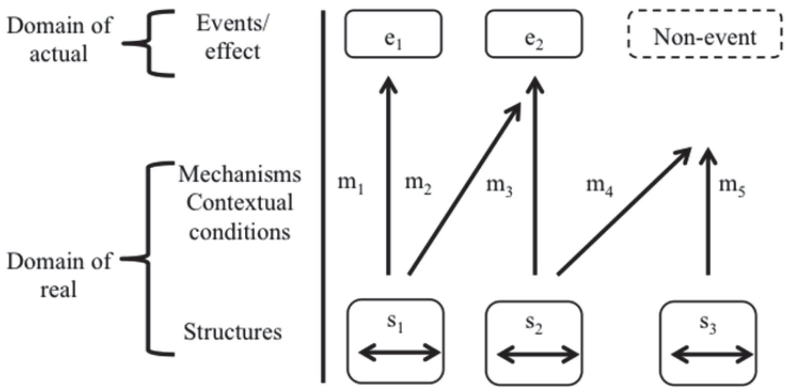

Fig. 5. Structures, mechanisms, events (modified based on Smith 1998) and causation in critical realism (Sayer 2000: 15).

According to Smith (1998), a realist view of causality (figure 5) enables to assume that there is something out there that activates the social structure that creates an event through a generative mechanism process. A mechanism can be described simply as the way in which an object's structure can, within defined conditions, generate an observable event (ibid) and a recognizable causal pattern. Depending on the contextual conditions, the same mechanism may sometimes produce different events; conversely, the same type of event may have different causes (Sayer 1992: 116).

A critical realist's world does not consist of events; thus, objects or entities with a structure (in this study, the startup industry) provide the basic theoretical building blocks for explanations, and these objects or entities can be organizations, people, relationships, attitudes and resources (Easton 2010). A causal explanation (1) identifies entities and (2) recognizes the mechanisms that connect and combine them to cause events/effects to occur. However, the term "mechanism" is a bit problematic because it implies a clear structure and invariance in operations, which is not in line with critical realism. Thus, deep generative processes and structures (see Tsoukas 1989) would be a better substitute for this term, but because "mechanism" has embedded itself in this discourse, it is used here (ibid).

Bhaskar (1998) emphasizes how science should not be content to study only what we can empirically experience; science should instead seek to discover (identify and describe) these hidden, or not readily observable, structures and objects that have causal powers to produce effects. The social world can be changed only if we are able to understand the structures at work that generate these events and discourses (Bhaskar 1998).

In this study, the prior firm growth research, as documented in Chapter 2, is seen as likely to benefit from this type of approach. To investigate the cause of something is to ask, "What makes it happen?". "What produces, generates, creates or determines it?", or, to a lesser degree, "What enables or leads to it?" (Sayer 1992: 104). These questions are at the core of realist causal explanations, in which entities, causal powers/liabilities and mechanisms play a key role. They allow us to explain and make tendencies visible, but they do not act as predictors (Elster 1998), as the system and its object of activity is seen as open-ended and evolving.

4.2 The ontological and epistemological considerations for firm growth

In this part, the aim is to analyze the discussed key tenets of critical realism against prior firm growth research and to harness critical realism for the purposes of this study. This analysis is conducted to better understand the field of firm growth research from a philosophy of science perspective. After all, ontological and epistemological considerations for firm growth and growth in general are somewhat lacking in the overall picture.

First, the basic ontological criticism and opposition of critical realism towards positivistic approaches is that they study the social domain as a closed system (Castellacci 2006). This distinction is important when comparing this study to prior firm research, in which most studies use positivistic approaches (see Leitch *et al*. 2010a). The view of firm growth causality in such studies is thus based on the aforementioned traditional (Humean) constant conjunction, where the causal relationship between *x* and *y* (figure 6) is in priciple a regular and predictable relationship (cf. Fairclough 2005). For instance, when the constructs of entrepreneurial orientation (*x*) are modeled to predict firm growth (*y*) (see e.g., Wiklund *et al*. 2009), such a view of causality is followed. As shown in the second chapter, this approach is typical in previous firm growth studies and is expressed through the discussion around the epistemological and methodological aspects of firm growth.

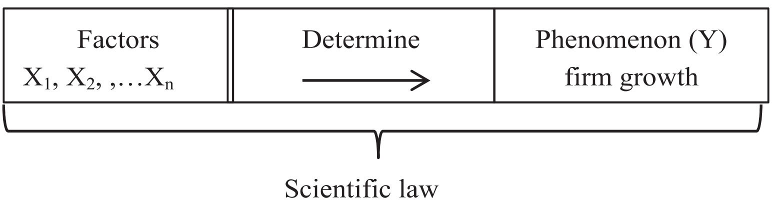

Fig. 6. The causality of a scientific law.

Ontologically, this approach can be seen to imply that the growth of the firm entity is seen as more of a noun or thing (see Van de Ven & Poole 2005). The use of variance-based methods is then typical and, according to Burrel and Morgan (1979), aims at explaining and predicting what happens in a social reality by searching natural law-like regularities and causality within a research phenomenon. However, as critical realism emphasizes, most phenomena in the social world occur in spatiotemporally open systems and open-ended processes, in which events do not follow a determined and recurrent pattern (Tsoukas 1989). Finding general causalities and patterns of firm growth that are applicable and predict growth at the firm level is therefore difficult. The findings of recent high-growth firm research seem to indicate a similar situation (cf. Coad *et al*. 2014). In the present study, this situation is seen as one of the reasons behind the problem of "tilting at the windmills" (Leitch *et al*. 2010) in relation to the quest for a comprehensive theory of firm growth.

In addition to variance-based methods, an alternative epistemological standpoint when firm growth is constituted as a thing is process methodology. Process methodology studies research questions of how change, such as growth, unfolds in organizational entities. It conceptualizes change as a succession of events, stages, cycles, or states in an organization's development or growth (Van de Ven & Poole 2005). This approach is well illustrated by the various stages of growth models that, for a long period of time, were the most frequent theoretical approaches for understanding firm growth (Levie & Litchenstein 2010).

In prior firm growth studies, a significant amount of bandwidth has been given to methods in terms of how growth should be reliably measured and which independent and dependent variables should be used for such measurements. The ontological stance that primarily sees firm growth as a thing, the two epistemological approaches above, and the historical economics-based research tradition partly explain the effort that goes into this discussion. Nevertheless, the actual ontological considerations of what firm growth is are somewhat lacking in most studies; the discussion of variables and measurements does not cover this aspect in detail. In fact, in many studies, growth has not been ontologically, either implicitly or explicitly, defined; it has instead been taken as temporally given, and if there are any definitions relating to growth, they are related to the measuring and modeling aspects of growth.

Based on critical realist argumentation, it can be suggested that a certain part of firm growth research suffers from what Bhaskar (1978) calls the epistemological fallacy—that is, the reduction of problems of ontology to problems of epistemology. The epistemological considerations have formed the discussion of the object in question, not the other way around. The use of critical realism should shift the discussion toward a more ontological and then an epistemological understanding of what firm growth is, how it exists, and how researchers should approach it as an object of study. Therefore, by utilizing critical realism, this study does not follow the mainstream ontological and epistemological path of firm growth research; it instead takes a different stance and approaches firm growth from a different viewpoint.

First, when we perceive growth as a thing, we potentially lock ourselves into studying growth that has already occurred. Grown firms are thus needed to test one's hypotheses and models. In other words, to exist as a thing and object of study, firm(s) need to have already emerged and grown. As a natural outcome of the entrepreneurial process, especially in the case of high-risk and high-growth-potential ventures, failure (a non-event) is therefore not accounted for in the reasoning. Indeed, in critical realism, the non-event or non-occurrence of something when expected (Easton 2010) is an important aspect of inquiry that cannot be considered if firm growth is approached as a thing.

Temporally, this approach means that our interest lies in a phase in which growth or non-growth (the non-event) does not yet exist. We are in a phase in which the startup business experiment is being considered (collectively) or has taken its first steps, which is why we can also view growth as future potential or latent. These aspects are captured in this study through the perceived winner concept. In terms of the domain of real, the entrepreneur or other startup industry actors cannot yet experience or access any growth event in the empirical domain. The observation is therefore based on the domains of actual and especially the real (see figure 5).

Sayer (1992, 2000) and Selboe (2002) are here seen to refer to this concept when they argue that the critical realist explanation penetrates the surface of reality (the actual) and accesses the domain of real, thus identifying structures and causal powers and the ways in which they act. The causal explanation of firm growth is not about the deterministic or stochastic associations of patterns of events, nor is it about experiences; this explanation is instead about ascribing causal powers to the structures (cf. Tsoukas 1989: 553) and mechanisms behind events and experiences.

In addition to considering the non-occurrence of firm growth, critical realist reasoning and its view of causation enables the expansion of the principal object of study from the entrepreneur/firm to include other actors and agencies that form the social structure (the startup industry in figure 4) with different causal powers; the firm/entrepreneur is just one part of this larger whole. We move ontologically towards firm growth as a verb, a process of organizing an emergent flux (Van de Ven & Poole 2005), and epistemologically towards an understanding of certain questions, such as how startup industries are organized in terms of structures, how processes and mechanisms produce the occurrence or non-occurrence of aimed outcomes, and how the perceived winner is defined.

Naturally, the structure and its causal powers and mechanisms do not function in the same manner as scientific law, and they therefore do not aim to predict firm-level growth, which is a principal difference between this study and prior firm growth research. The experimental winner generation process can produce the desired winner or a failed business experiment and is open-ended and evolving; instead of being (thing), it focuses on experiments (processual activity). Depending on contextual conditions, the same mechanism may produce different events (occurrence, non-occurrence); conversely, the same type of event may have different causes (Sayer 1992: 116). The principles of the EOE (Eliasson 1987, 1996) and critical realism are thus seen as ontologically aligned.

The focus is on understanding the social structures and mechanisms based contextual conditions in the domain of real and their role in increasing the potential of generating actual winners. For a process researcher, the question of firm growth is thus about "opening up the black box" of structures and mechanisms behind the occurrence or non-occurrence of winners in different contexts (cf. Hedström & Swedberg 1998). The search for mechanisms means that we are not satisfied with merely establishing systematic covariation between variables and events; a satisfactory explanation requires that we are also able to specify the social "cogs and wheels" (Elster 1989: 3).

Finally, the theoretical framework of the study and the critical realist approach is combined in figure 7. The view of causation is based on identifying and understanding social structures and mechanisms and the contextual conditions that connect them, which results in the occurrence or non-occurrence of the desired outcomes in the process. These equal to the structure and organization of the startup industry, the perceived winner mediated experimental winner generation, and the occurrence or non-occurrence of the desired outcomes in the processual activity. The square brackets indicate how these positions exist in the different domains of reality.

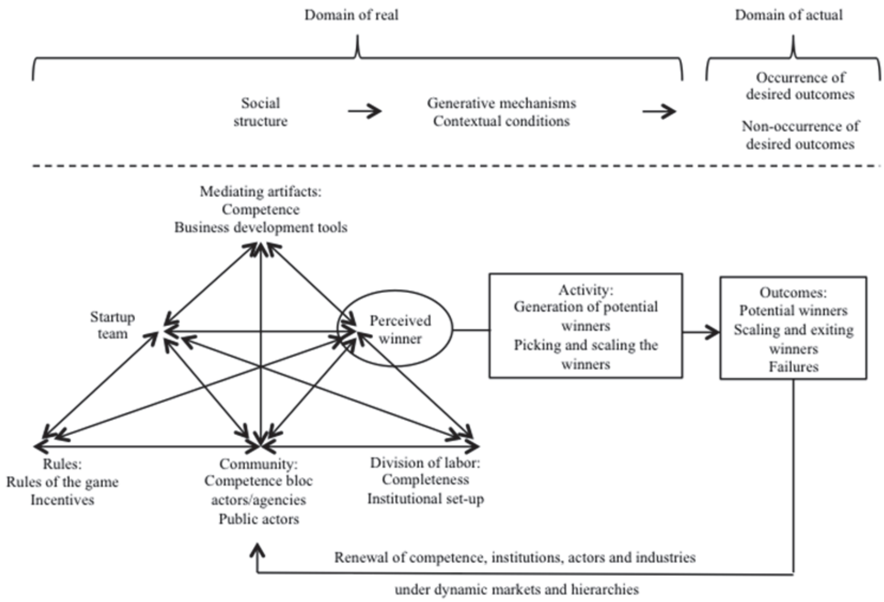

Fig. 7. Critical realism and the experimental winner generation process by the startup industry.

4.3 Methods

The methodological approach of a study should depend on the nature and circumstances of the phenomenon to be studied (Eisenhardt 1989, Glaser & Strauss 1967, Yin 1994) and on the adopted theoretical paradigm—that is, the basic belief system that guides the investigation (Guba & Lincoln 1994). In this study, the firm growth phenomenon, as defined via the theoretical framework and critical realism, is the basic belief system that guides the investigation. Critical realism, as the chosen methodology, endorses or is compatible with a wide range of research methods, but the nature of the object of study and what one wants to learn about should determine the particular choice (Sayer 2000: 19).

The object of study involves a comparison of three selected cases, Finland, Israel and Silicon Valley; therefore, a qualitative approach was chosen (Miles & Huberman 1994, Yin 2003, Silverman 2005). Such an approach can answer relatively broad questions of science (Beer 1998), such as the research questions of this study, and also supports theory building. Based on a well-defined methodology, qualitative research can provide the means to scientifically answer these broader questions and find new insights. Furthermore, the qualitative approach is combined with a case study, as an empirical research procedure, because it is consistent with critical realist ontology. Critical realism is also a particularly applicable companion to case research (Easton 2010). Second, as the object of study is approached using processual epistemology, a process research strategy is also applied due to its appropriateness for case studies (Eisenhardt 1989). These items will be covered next in greater detail.

4.3.1 Case study

The case study approach is seen suitable for this study, as it focuses on answering "why" and "how" questions, and the role of contextual conditions is seen as relevant in the studied phenomenon. According to Yin (1994), these two things are among the conditions for which case study research is preferred. In addition, reliance on theoretical concepts to guide the design (Lincoln & Guba 1985, Miles & Huberman 1994, Yin 1994) and data collection is one of the most important case study strategies (Yin 2003), which supports its selection for this study.

Case studies are particularly well suited to new research areas or those for which existing theory seems inadequate. This type of work is highly complementary to incremental theory building in normal science research. The former is useful in the early stages of research on a topic or when a fresh perspective is needed, while the latter is useful in the later stages of knowledge development. (Eisenhardt 1989: 548-549) The level of depth allows for the creation of theory-building insights.

Different types of case studies can be classified, first, based on the decision to have a single- or multiple-case study, and, second, depending on whether the case study is exploratory, descriptive, or explanatory (causal) (Yin 2003). According to Yin, multiple cases should be selected so that they replicate each other by either predicting results (literal replication) or producing contrasting results for predictable reasons (theoretical replication). This study falls into the category of a multiple-case study that is explanatory (causal) in nature, and while building theory also conducts theoretical replication by comparing the three cases.

The case study method is particularly well-suited for studies in which data are collected from cross-border and cross-cultural settings, as is the case in this study. Another relevant element is that the case study method is quite similar to a historical review, as existing historical material and records are reviewed in addition to the interviews; however, we have the possibility of direct observation and interaction (Ghauri 2004). The role of historicity in human activity can therefore be taken considered.

A case study can be quantitative and qualitative; it is both the process of learning about the case and the product of our learning (Ghauri 2004). A particular case is chosen with the expectation of advancing our understanding of the research phenomenon (Ghauri & Gronhaug 2002), and the analysis may include numerous levels (Yin 1994). The explanation is not based on a positivistic view of causality, but when the causal mechanisms underlying the dynamics in the observed events are searched for, it is given at the theoretical level. Case studies are thus capable of contributing to theory building and the development of propositions (Eisenhard 1989, Glaser & Strauss 1967, Yin 1994), and the ability to provide a basis for acquiring a holistic view of the phenomenon is one of the key advantages (Gummesson 1991: 76).

According to Easton (1995), the weaknesses of case studies may include the following: (1) they remain simply rich descriptions of events; (2) they are just examples of data that are used in a quasi-deductive-theory testing way; and (3) they aim at some type of statistical generalization by employing multiple case studies.

4.3.2 Process research

Viewing firm growth as a dynamic process and social reality as a continually changing state requires a processual research approach (cf. Pettingrew 1997). This approach reflects an understanding of the world as existing in constant flux and in perpetual motion; organizations are viewed not as “things made” but as processes “in the making” (Hernes 2008). As discussed, high-growth startups and their scaling into winners do not just happen; in this study, they are seen in as processually and experimentally built with collective intention.

Becoming, change, flux, creativity, disruption, and indeterminism are the main themes in a process worldview (Langley & Tsoukas 2010). In this study, they are also seen as essential themes in startup industries and their activity. Becoming, change and flux are central elements in startups, particularly in the early stages, when they are envisioning and working towards a future. Creativity, disruption and indeterminism describe the processual spirit of startups that are conducted collectively. Behind this processual organizing are the structures and mechanisms needed to generate the desired winners, or as Easton (2010) describes, the occurrence of expected events in the process.

The existence of events, states, or entities is not denied, thus the fundamental importance of processuality fits with the critical realist ontology. Actually, processuality insists on unpacking them to reveal the complex activities and transactions that take place and contribute to their constitution (Langley & Tsoukas 2010). We can see that processuality is also leading our reasoning deeper into the domain of real. Indeed, if a processual conceptualization of the object of research wants to call itself "theory", it needs to be grounded in some underlying logic or generative mechanism that produces the temporal patterns that are described or observed (Van de Ven 1992), which is thematically close to the critical realist view of causality that was discussed earlier.

Research based on process epistemology therefore searches for necessary causality, generalization based on versatility and flexibility of explanations, temporal order and discontinuations of explanations and layers of causalities (Langley 1999, Van de Ven & Poole 2005), which requires conceptual frameworks that address context, incidents, activities, actions, sequences, and time, all in a way that is dynamic (Hinings 1997). Recently, Bizzi and Langley (2012) noted that process research appreciates and theorizes about the temporal patterns of examined events, activities and choices as they emerge and sequence themselves over time, rather than focusing on covariation between independent and dependent variables, as is the dominant approach in firm growth studies. The theoretical framework, the main process and the two mechanisms intend to capture these patterns.

Conducting process research requires that the researchers immerse themselves in the context and case so that an in-depth understanding and perception of connections between different things, contexts, and means and their development over time can be gained. Multiple methods, such as observations, interviews, and documents, are needed in such a process. (Dawson 1997) The terrain around the change process that shapes the field of events and is, in turn, shaped by them is a necessary part of the investigation (Pettigrew, Woodman & Cameron 2001). This necessity underlines the importance of context and embeddedness in process research.

A process researcher can deploy a repertoire of different strategies for making sense of the substantial amount of collected data[26]. It is becoming more typical that various sense-making strategies are used in a single study (e.g., Mainela & Puhakka 2008). The research process in this thesis is abductive. The empirical starting point for the thesis was the problem encountered in Finland: a lack of high-growth firms or the non-occurrence of desired outcomes as the norm, despite assumed good preconditions. This problem first led to the exploration of firm growth research within entrepreneurship literature, the approaches used and the results found in relation to the topic (Chapter 2). However, this exploration led to a double bind in relation to the experiences and data collection in Silicon Valley; the firm growth literature could not explain what was seen in practice there or the related data.

Second, this continued questioning and consistent demand for other perspectives on this research problem led to the discovery of the EOE and competence bloc theories. They enabled to build a theoretical picture of the economy in which startups exist and operate and to include the role of the surrounding economic system and its actors. However, there was much more in the data that these theories could not explain. For instance, the role of past activities and the established infrastructure that provides the preconditions for high-growth venturing could not be captured in the present. Hence, the cultural-historical activity theory was brought into the theoretical framework to enable more in-depth data analysis.

4.4 The selection of cases and data collection

The empirical focus of this study involves understanding the startup industry and the experimental winner generation process in three geographies: Finland, Israel and Silicon Valley (US). The reasons for choosing Finland were already discussed above. First, it is empirically interesting to study why Finland, which has long been globally ranked among the most innovative and competitive countries, does not produce more high-growth firms and startup success stories. Second, the need to generate more high-growth firms is among the important problems to be solved in the Finnish economy and to be investigated in academic research. Further, there are many other countries in similar situations; thus, there is a broader

[26] Langley (1999) and Bizzi and Langley (2012) provide comprehensive sense-making strategy overviews.

discussion to participate in and contribute to. Third, I am a native Finn, and Finland is my current home country; thus, I have the best access to its resources in many ways.

Israel and Silicon Valley were chosen for the following reasons. Israel is currently considered a startup nation (Senor & Singer 2009), and its historical performance in producing successful startups, taking them public, and attracting venture capital and foreign multinationals is among the best in the world. However, the starting point of the process and its evolution to the present state has been challenging, and its success has been supported with the right policies (see section 5.2). Israel has succeeded in an area in which many countries have failed and spent billions in aggregate.

Silicon Valley is recognized as the leading startup industry in the world. Its historical performance in generating global leaders, such as Hewlett-Packard, Genentech, Apple and Google, is evident, and this success has continued for decades and thus does not require much more elaboration. The startup industry in Silicon Valley has evolved over many decades, is structurally complete and provides the most advanced case from which to learn.

These two latter cases enable to study the best startup industry in the world (Silicon Valley) and a country (Israel) that has succeeded through the policy-supported creation of a startup industry that is capable of generating the desired outcomes in the form of winners. Finland can therefore be compared with the historically best startup industry and a rare example in which the performing startup industry has been successfully created with the support of good policies despite a demanding starting point.

It might have been interesting to observe another Scandinavian country, but these countries are not as advanced as the two selected cases. As discussed, this study emphasizes how building startups, entrepreneurship and entrepreneurial finance have become global. Hence, we should aim to compare the top performing startup industries and dive deep into the domain of real in an attempt to understand what is under the hood in the process of experimental winner generation.

The selection of research subjects and organizing access to them was not straightforward, especially considering at-times complex process of conducting international interviews. When the theoretical framework and nature of high-growth ventures are considered, the question of who to interview is not trivial. The theory implies that there are many actors who are relevant in the startup industry; in addition to entrepreneurs these include venture capitalists, competent customers, and different public actors who execute policies and address market failures. Some of these actors represent venture capital agency in terms of their function, but they are not venture capitalists per se. For example, the public officials in the Finnish system make funding decisions under a mandate to boost growing firms.

It is difficult to quantify the interviews on a one-to-one basis, as one interviewee can, for example, present the competence and experience of an entrepreneur and a venture capitalist and play the role of a limited partner who is investing in venture capital funds, as is the case with one interviewee. As this study is focused on the whole startup industry as its unit of analysis, this policy definition was made. Moreover, I wanted to also highlight the role of other actors, besides startups, in the process of experimental winner generation, as the literature is underdeveloped in this area. Compared with prior firm growth studies, the other actors are emphasized in the analysis, as startups are exposed to their competence, incentives and goals as a result of the organization of competent and varied selection.

The main data collection period was between November 2010 and August 2011. The interviews outside Finland were mainly conducted in intensive data collection trips to Israel in May 2011 and to Silicon Valley in June to July 2011. In total, 54 interviews were conducted in the three cases (table 5), out of which 26 interviews concerned the Finnish case, 10 concerned the Israeli case, and 18 concerned the Silicon Valley case. Combined, these interview resulted in 52 hours 11 minutes of recorded data. Two persons, Marika Iivari and Pasi Sorvisto, helped conduct the interviews. In addition to the research interviews, three startup-related events in Silicon Valley were recorded and transcribed. In one of the interviews in Silicon Valley, there were two interviewees representing the same organization; all the other interviews had only one interviewee. All interviews were recorded and transcribed verbatim. In addition to their experience in Finland or Israel, some interviewees had experiences from Silicon Valley, and these interviewees were categorized as representing the native startup industry, although they could provide insights from both systems.

Table 5. Interviews conducted for the study

	Finland	Israel	Silicon Valley	Total
Interviews	26	10	18	54
Shortest	19 min	18 min	20 min	
Longest	1 h 58 min	1 h 49 min	2 h 12 min	
Average	59 min	52 min	54 min	
Total length	26 h 29 min	9 h 31 min	16 h 11 min	52 h 11 min

The interviews were conducted as thematic interviews. Interviewees were asked to talk about four key themes: (1) open up and describe the activity and purpose of the organization you represent; (2) provide your professional work history and present job; (3) describe your views on entrepreneurship, startups, growth, and entrepreneurial finance; and (4) explain the state of affairs in relation to building startups in your context. In a few interviews, there was no time to cover all of these themes due to time constraints. The emphasized themes varied slightly from interview to interview, depending on whether the interviewer was open to subjects that the interviewees brought up. The interviewees were usually talkative, relaxed, and willing to share their opinions and concerns. Notes during the interview and post-interview reflections afterwards were done either in writing or as voice memos with a recording device.

In addition to the interview material, a significant element to draw from was the year that I spent at Stanford University from 2007-2008. I had the opportunity to gain knowledge and closely observe how startups are perceived and built in Silicon Valley. I gained interactional expertise to be used in the interviews (Langley, Smallman, Tsoukas & Van de Ven 2013). This experience enabled me to call on informal contacts and have many discussions with professionals in different companies in the region. I also had numerous informal discussions with different industry contacts in Finland, and other contacts, either Israeli or Finnish, who knew the Israeli case well.

In addition to interviews, observations in different startup-related events were conducted. In Israel, I participated twice (2011, 2012) in the High Tech Industry Association (HTIA) conference that attracts Israeli and international startups, investors, corporations, and other relevant high tech industry actors to one event. In Silicon Valley, I participated in different startup-related events, in which startups were giving pitch talks, investors were presenting, and networking was possible. I attended similar events in Finland alike.

Third, some extensive documentation relating to the themes of this study was gathered for each case. Secondary data sources are incredibly important, as they enable to draw a picture of the research object in terms of outputs, historical performance and the organization of actors and resources. Therefore, secondary data play a significant role in the analysis by reflecting the events and non-events generated over time. These data include reports and statistics from different public and private organizations, such as the Finnish Venture Capital Association (FCVA), the Israel Venture Association (IVA), the National Venture Capital Association (NVCA) in the US, the Finnish Funding Agency for Technology and Innovation (Tekes), the Finnish Ministry of Employment and Economy (TEM), Deloitte's Fast 50/500 listings of high-growth firms, the Global Innovation Index, the Kauffman Foundation, and the Global Entrepreneurship Monitor (GEM). In addition, websites, videos, presentations and other online material regarding the cases were collected.

4.5 Data analysis

The theoretical framework and collected data of the three startup industries as units of analysis provide many potential avenues for conducting data analysis to answer the research questions of the study. Due to the systemic and processual approach, multiple data sources and the sheer length of the research process, the analysis has parallel processes and did not take place in clear chronological stages, which is normal in qualitative studies, as there are no clear rules for conducting the analysis due to the uniqueness of each research and analysis process (Patton 2002).

The processual data may consist of many events, be rich in detail and create itself one of the main challenges in process data analysis (Langley 1999). In making sense of a substantial amount of data, the researcher is challenged to balance between simplification and richness and between objectivity and sensitivity (Strauss & Corbin 1998, Langley 1999, Patton 2002). Objectivity and research quality comes from data immersion and multiple data sources and types (triangulation), not from the construction of and controlling variables (Strauss & Corbin 1998). Sensitivity means having insight into and being able to give meaning to the events and happenings in the data, which lead to the discovery of something new, not something obvious (ibid). Sensitivity also relates to the central role given to interpretation in qualitative analysis (Ghauri 2004).

Data analysis is not necessarily an isolated process with a definite phase of data analysis (Miles & Huberman 1994, Ghauri & Gronhaug 2002), but it still involves some distinct stages. Ghauri (2004) covers six analysis techniques and proposes the use of mixture of these techniques to conduct the analysis (see also Langley 1999): (1) chronological storytelling that aims to write a time-anchored narrative of the objects under study, which is particularly important in attempts to understand longitudinal explanations that track a phenomenon over time; (2) the sorting and coding of data according to concepts and themes; and (3) the clustering of data based on common characteristics. These techniques help to organize the data into more conceptual than chronological categories, which enables to interpret the data and to relate the information to the research questions and frameworks. (4) It is also important to explain the interrelationships between the important factors identified. (5) Decision tree modelling provides a description of real-world decisions and actions, and (6) pattern matching compares empirically based and theoretically predicted patterns. These techniques enhance our understanding to explain under which conditions the propositions/model work and under which conditions they do not (Ghauri 2004), and they also support the identification of causal mechanisms that drive the flow of activity (Buttriss & Wilkinson 2006: 162).

Although the individual interviews were transcribed at the same time, the analysis of each interviewed actor and the particular startup industry started before the actual transcripts were received. The notes, memos and diagrams made during and immediately after the interviews were already the beginning of the analysis, similar to the theory building phase and secondary data collection. Some key insights started to emerge while the data collection and analysis continued. A typical analysis tool was a voice memo immediately after the interview to record the key insights from the interview, both empirically and theoretically. This interwoven data collection and analysis is considered the best policy by Miles and Huberman (1994), as it enables the theory to develop alongside the growing volume of data, which allows for a simultaneous reconsideration of the research problem.

As the interview transcripts arrived, the raw data were first read and then sorted into individual categories of texts or "meaning units", which contained specific meanings for the study (Giorgi 1985, Ghauri 2004). These units consisted of a single sentence, part of a sentence or many connected sentences. Interviews in the three cases were categorized based on the theoretical framework of the study. The basic coding categories consisted of the described theoretical elements, the experimental winner generation process and its mechanisms (figure 4). This categorization was done to discover meaningful insights from the data. The memos, notes and diagrams from each interview were also utilized at this stage to support the analysis by including the reflections. Some of the interviewees asked for a copy of the transcript, and these copies were delivered to them. In some cases, this correspondence led to further discussions in meetings, through email and/or on Skype. Iterations to the theory were also introduced at this stage, based on the analysis and these discussions.

The historical evolution process of each startup industry was written after the first data analysis. Such evolutions are based on the narratives and chronological storytelling (Langley 1999, Ghauri 2004). Time was used as the key anchor point, which enabled to describe the historical case development in different time periods. As the entire startup industry, not an individual organization or person, is the unit of analysis, the narratives were written from the systemic perspective with an emphasis on understanding the key events of the structural and institutional evolution path until the time at which the interviews were conducted. As the theoretical base of the study indicates, startup industry structures (completeness) vary across geographies, and change and evolution occur over a long period of time; hence, the narratives are several decades long. These narratives were an important organizing mechanism for further analysis (Pettigrew 1997), and notes from the researcher's thoughts and references to certain parts of the interviews were made at this stage, as the past and present began to interweave.

From time to time, the analytical focus was either solely on the interview data or narratives, and, on other occasions, the analysis jumped back and forth in an effort to explore the data in-depth. This analysis was supported by the decades-long professional history of some interviewees, which enabled a review, for instance, of some events that took place in the 1980s, based on secondary material and primary data. After the interview, interviewees were contacted several times to ask questions about context-specific elements at a certain time. In addition, the narratives led to some questions that could not be answered based on the data collected; hence, two new interviews were conducted to understand the role of two public organizations in the Finnish startup industry.

This analytical strategy is one that Strauss and Corbin (1998) propose to check assumptions and hypotheses with respondents by explaining what you think you are finding in the data and asking them whether these interpretations match their experiences with that phenomenon—and if not, why. The data collection and analysis occur in an alternating sequence; interviews, observations, and analysis follow each other, with the analysis playing a central role in driving the data collection.

Third, a thorough within-case analysis of each startup industry was conducted based on the outcomes of interview data analysis and narratives. The final part conducted a cross-case analysis of the Finnish case against the Israeli and Silicon Valley cases, which enabled a discussion of the findings in relation to the research objectives of the study.

As the main findings started to take shape and the first compilation of findings was ready, the authenticity of the produced interpretation (Ghauri 2004) was enhanced through two trips to Israel and Silicon Valley at the end of 2012. The purpose was to meet some of the interviewees (not all had time to meet face-to-face) and to discuss the interpretations about the startup industry functioning in that context. Some iterations were made based on the feedback.

5 Analysis of case startup industries

In this chapter, the case startup industries of Finland, Israel and Silicon Valley are analyzed. As previously discussed, startup industries evolve over long periods of time and have a case-specific historical path leading to what we observe in the present. The chapter therefore begins by creating a time-anchored chronological narrative of each case with a focus on the establishment of central agencies and other key events affecting the structural evolution; it identifies the socio-economic, industrial and institutional conditions affecting the process at different points. The section draws on secondary data analysis and is completed with a description of the key events in each case.

Secondly, the perception of a winner for each startup industry is described in relation to the documented structural and institutional evolutionary path. The creation and role of rules, community, division of labor and mediating artifacts are covered so that we can understand how they jointly shape the perceived winner and give sense, meaning and direction to the activity of the startup industry. The findings from the primary data are elaborated in this section.

After the startup industry structure and perceived winner are described, the third section of analysis shows how they are manifested through the actual processual activity of each startup industry. By looking into the two mechanisms of experimental winner generation based on primary and secondary data, the nature of competent and varied evaluation and the related resource allocation to startups is illustrated. Then, the outcomes of the described organization for experimental winner generation are discussed based on the generated or non-generated winners, namely IPOs and M&A transactions.

Fourth, the outcomes from the structural renewal of competence, institutions, actors and industries are examined to understand the level of inherent market dynamism within each case. Finally, the Finnish startup industry is compared to its Israeli and Silicon Valley counterparts on the analyzed levels to draw conclusions regarding the research objectives of the study.

Overall, the case evolution is analyzed chronologically by proceeding through the main events that occurred over several decades in the areas of interest to this study. Within each of the main events are many different forces and multiple voices, having simultaneous effects. Even though, for example, the mentioned governmental agencies are established in a certain period, there are longer development paths affecting these events in the background. Therefore, it is sensible to comprehend them as imbricate rather than linear stages of evolution.

The following periodization is in many ways discretionary, relative and by no means complete, but contains enough depth and width to provide a perception of how the systems have become what they are today.

5.1 Finland

Finland is among the countries that were successful in achieving rapid structural change and technological catch-up; this success primarily became evident during the 1980s and 1990s. After rapidly recovering from a deep recession in the early 1990s, Finland established its position as one of the top countries in different innovation- and competence-related rankings. In this process, the traditionally strong forest and metal industries were the primary economic drivers; later, the ICT industry started to grow, spearheaded mainly by Nokia and its global success, which is said to have pulled the country out of the recession in the early 1990s.

The historically strong state and industry relationships within the forest and metal industries traditionally drove exports and evolved gradually towards a NIS[27]. In its emergence, science, technology and subsequent innovation policies aimed to make Finland a knowledge-based economy and played an important role. For this study, the organization of the innovation system's actors and the science, technology and innovation policies from the economy 1 and startup industry viewpoints are essential. This path to the present infrastructure and organization is discussed next.

5.1.1 Historical evolution to the present startup industry structure

Pre 1960s: Post-wartime as a trigger for the investment-driven industrialization of Finland

The forest product industry is among the oldest and most important industries of the Finnish economy. Its history goes back over two centuries and is characterized by exports and close industry and government relationships. The forest industry played a central role in the early industrialization of Finland because from 1917, when Finland gain independence, until the 1950s, up to 80-90% of export earnings were based on forest industry products (Lilja ed. 24-25). This importance established the basis for a solid industry and government relationship,

[27] The NIS is covered with relation to the startup industry because it includes many of its functions in Finland and significantly affects the actors and competencies confronted by entrepreneurs and startups.

as the latter was needed to open doors to new markets such as the former Soviet Union and other countries in Eastern and later Western Europe. In particular, the relationship with the Soviet Union in the early 1920s created the basic guidelines for bilateral trade relationships; these guidelines lasted decades until the 1990s and were a significant factor in trade to the east (Sabel & Saxenian 2008).

Industrialization after the World War II and two wars in Finland, the Winter War (1939-1940) and the Continuation War (1941-1944), was affected by Finland's war reparations to the Soviet Union. Finland agreed to pay significant reparations worth 300 million gold dollars over eight years, until 1952, that included, for instance, electrical equipment, machinery, locomotives, different types of vessels, and forest products. The reparations led to Finland basically becoming a planned economy during that time regardless of the preferences of politicians or industry leaders. Although they were expensive for the war impoverished nation, the reparations also helped, and at the same time forced, some industries such as the metal industry to grow to meet the magnitude of necessary production. As a result, Finland had the most modern shipyards and foundry and machine industries in Scandinavia as of the late 1940s, and companies earned reasonable compensation for the reparation products from the state as defined in the order of reparations. (Vesterinen 2012) The metal industry in particular was supported by the establishment of a governmental special credit organization, Export Credit Ltd. (Vientiluotto Oy in Finnish), in 1956 to support exports that were seen as being critical for maintaining international industrial competitiveness (Herranen 2009).

The reparation deliveries were a key event that helped to create new forms of industry in Finland, and some of these proved to be viable even upon the return to normal conditions after the war (Konttinen 1963). Important industrial pillars and competencies of the Finnish economy for decades to come developed significantly during this time period until the 1960s. The progression contributed to the transition of the economic structure from agriculture towards industrialization and related urbanization. This further strengthened the base for the industry and government relationship to advance exports, which are important to a small country.

1960s and 1970s: Foundations of the Finnish science and technology policy and establishment of key governmental agencies

The first phase in building the basic structures of the NIS (that currently affects the functioning of the startup industry) began in the early 1960s and lasted for two decades. During this period, five important background condition-creating events took place (Lemola 2002, Georghiou *et al*. 2003): First, (1) the policy doctrines covering the fundamental concepts of the science and technology policy were created, and (2) the Science Policy Council (SPC) was established in 1963. The council's role was to formulate and coordinate guidelines for science and technology policy. Imitating the Swedish model, (3) a nationwide university network[28,29] and mechanisms for planning, coordinating, and financing university research were created. This included establishing the Academy of Finland in 1969 in its current form as the institution responsible for guiding national research spending and defining science policy in addition to financing high-quality scientific research.

The conditions for the, at that time, low level of industrial R&D also gradually improved (4) because economic growth was historically driven by investments in physical factors of production such as machines and equipment (Pohjola 1996) in slow-growth mature sectors. Lastly, (5) the importance of the general development of higher education was acknowledged because the level of education after wartime was among the lowest in the OECD countries. These policies were motivated by economic reasons because Finland needed to diversify its production structure and promote industrial renewal (Lemola 2002). Overall, the catch-up position of Finland compared to the more advanced economies at the time was evident and a central factor driving the organization of future activities.

The forest industry became globally competitive in the 1990s, but it was not considered to be a serious competitor internationally in the most demanding segments of the industry during the mid-1960s. Sabel and Saxenian (2008) describe how the industry started to successfully invest in building products with higher added value. The Finnish government was a significant owner of the key corporations, and by organizing access to cheap capital, it enabled the industry to grow and contribute significantly to economic growth during the subsequent decades. The strong relationship between the government and established corporations continued.

It was seen in the early 1960s that Finland had an economic position with much potential for industrial development, but the undeveloped capital market resulted in a lack of capital in smaller industries and for new businesses and

[28] The Technical Research Center of Finland (VTT), the largest of the government research institutes, was established in 1942 during WWII partly for military research purposes (Murto *et al.* 2006).
[29] The establishment of universities reflects the relatively strong regional dimension to the science and technology policies, which lasted until the 1990s (see Edquist, Luukkonen & Sotarauta 2009).

entrepreneurs without established credit relations and the ability to offer good securities (Konttinen 1963). The financial market of Finland was strictly regulated and stagnant, with the government bank, the Bank of Finland, playing a central role and the banking sector acting as the only source of capital. In 1962, an important decision was made to reorganize the Industrialization Fund (Teollistamisrahasto Oy), a special credit institution established in 1954, to enable it to allocate more capital to SMEs and entrepreneurs in Finland.

Five years after this development, the first Finnish venture capital firm, Sponsor Ltd, was established in 1967 by the Bank of Finland. This was a milestone event for the structural evolution because the government entered the venture capital market and addressed venture activity for the first time. The Bank of Finland became the majority shareholder of Sponsor by providing 60% of the initial FIM 10 million in capital (Seppä 2000). It is noteworthy that Sponsor was not established using the limited partnership (LP) structure[30] as a for-profit venture capital company but was a governmental development company (kehitysyhtiö in Finnish) with the additional role of fostering the renewal of the Finnish financial system and some social objectives as a well-meaning venture capital company[31] (Seppä 2000, Luukkonen 2006).

According to Rosenlew (1982), these development companies[32] invested risk capital to target companies in industries that were seen as nationally important by the government. In addition to the capital, they aimed to offer value-adding services and were meant to secure the continuity of the target companies' business operations and not aim to exit per se. The focus was not only on technology-intensive new ventures but also included the financing of well-established companies, participating in the restructuring of mature companies and industries and organizing changes of generation of management. This was a policy definition that had far-reaching consequences for the perception of venture capital activity.

In addition, another key event was the establishment of the Finnish National Fund for Research and Development (Sitra) in 1967 with FIM 100 million (16.8

[30] The LP model was relatively new at the time. For instance, the first venture capital firm to use the LP structure in Silicon Valley was Draper, Gaither & Anderson (DGA) at Palo Alto in 1958.

[31] By the late 1970s, Sponsor had moved to for-profit investing in later-stage companies that were profitable, competitive, had good growth prospects and had grown out the entrepreneurial stage of development; it was successful in these investments during the 1980s (Seppä 2000).

[32] The second development venture capital company at the time was Mancon Oy, which was established in 1978. It was the first privately owned actor in the industry, and it did not have regional- or industry-specific restrictions (Rosenlew 1982).

million euros) in endowment capital. Like Sponsor, Sitra was positioned first under the supervision of the Bank of Finland, which originated the idea based on a Swedish example (see Waris 1992). Sitra's purpose was to be the leading institution to support industrialization by financing technological product development, research and projects with a social and economic benefit (Vihko *et al*. 2002). Sitra was, and still is, unique in the sense that while it is a public organization, it is also independent of governmental control, thus capable of taking initiative and acting as a forerunner for new institutional or organizational innovations (Edquist, Luukkonen & Sotarauta 2009). Furthermore, Finland joined the OECD in 1968.

In 1971, a new special credit institution, the Fund for Developing Regions Ltd[33] (Kehitysaluerahasto Oy in Finnish), was established and controlled by the government, together with the Bank of Finland, as a part of its regional economic policy (Vartiainen 1998). Again, the adopted model came from Sweden, where a similar fund had been operational since 1961 (Murto, Niemelä & Laamanen 2006). The role of the fund was to allocate financing and subsidies to different actors in rural regions, for instance, for R&D and market surveys, and the fund could invest in companies in developing regions if necessary for the development of the company (ibid). These were companies that had established neither operations nor a market position and were therefore too risky for the traditional banking sector. The Fund for Developing Regions was not considered to be a development company like Sponsor because it did not operate as an active investor (Seppä 2000). In addition, nine regional industrial parks were also established in 1973-1974 to support SMEs (Vartiainen 1998, Murto *et al*. 2006).

The market failure in the financing of early stage SMEs and entrepreneurs that prevailed during the early 1960s was now addressed by the increase of loans, grants, subsidies, and in some special cases, equity investments. However, as documented above, these instruments were geared towards making the companies fundable by the banking sector and fulfilling regional development, employment and other policy goals – the perceived winner at the time was not a high-risk and high-growth potential startup aiming for an exit[34]. Moreover, the government also had a separate large-scale industry- and project-focused investment fund, the Government Investment Fund (Valtion investointirahasto), which was operational

[33] Later known as Kera Ltd. and, since 1999, as Finnvera Ltd

[34] The Helsinki Stock Exchange had a turnover level in 1970 similar to that in 1950, and the regulated capital market in Finland together with the inactive stock market made IPOs only a dream (see Seppä 2000).

from 1975 to 1987. It also had the Export Credit Agency (Vientitakuulaitos) from 1962, which supported the deals of international customers in Finland (Herranen 2009).

These early stages of financial market development were affected by a few individuals in the Bank of Finland such as the president Klaus Waris, Jaakko Lassila and Heikki Valvanne, who brought the idea of investing risk capital in prospective young enterprises to Finland in 1966 (Rosenlew 1985 via Seppä 2000). Together, these individuals analyzed events in the US and Sweden and came to the conclusion that the Finnish SME sector had three basic problems: (1) innovation activity for new product development was poor, (2) management skills were also poor, even in good companies, and (3) there was no venture capital available. Through the establishment of the above-mentioned institutions, the Finnish government and the Bank of Finland created some of the basic agencies and seeds of the perceived winner, which are still present in the startup industry encountered by entrepreneurs and innovators in Finland today.

In the mid-1970s, Finland faced a recession like many other industrialized countries. First, forest industry exports plummeted in 1975, and the metal industry experienced the same a bit later. This suppressed the growth of the economy, and the unemployment rate grew to almost 8% in 1978, which was the highest it had been since the war. An essential issue highlighted by the recession years was Finland's weak industrial renewal capability and technological gap: Finland could not create new technologically sophisticated industries as the old established industries matured. (Lemola 2001a) These observations were somewhat similar to those ones made by the personnel of the Bank of Finland in 1966. Government policies and programs had focused mainly on supporting the historically strong industrial actors (economy 1) and more recently the non-high-growth-orientated SMEs – a focus on new winners aiming to grow to industrial scale to counter the maturation of existing industries was yet to come.

1980s: Focus on technology policy, emergence of various venture capital actors and the liberation of financial markets

Finland was still a relatively closed economy with the above-described unilateral production structure in the beginning of the 1980s. Exports came from the forest and metal industries, the bilateral trade to the Soviet Union was an important base for the economy, companies needed a permission from the Bank of Finland for operations with foreign exchange (Korhonen 2008), and the level of R&D investment and investment in high-technology industries was low. Under these and the above-mentioned circumstances, the second phase of science and technology policies took place with a focus on strengthening Finland's technology orientation.

Lemola (2001b, 2002) discusses how Finland's technology policy was influenced by the success of Japan in the economic and technology frontiers. Japanese institutions and organizations and the integration of science, technology and industry under the Japanese "national system of innovation" (see Freeman 1987, Salomon 1987) provided an example imitated by Finland and other OECD countries. They started to stimulate and support industrial innovation and to orchestrate and fund large national cooperative programs for new technologies. An additional trigger for these activities in Finland was the fact that Sweden was well ahead in R&D investment levels.

The new orientation towards technology and innovation policies did not come without contradictions. Lemola (2001a) discusses how, for instance, the labor movement [35] demanded a thorough investigation of the opportunities and especially threats relating to the ongoing information technology "revolution". There was a fear that an increase in automation technologies could result in mass unemployment, and it was even proposed that government should restrict new technology development and exploitation and support labor-intensive industries and companies instead, as had been done in the past. The committee investigating the issue (Komiteamietintö 55, 1980) came, however, to an opposite conclusion; it legitimized science and technology policies that placed importance on the use and development of technology as a key concept in raising the low technology and renewal level of Finnish companies. This was a significant event, as it led to the establishment of the Finnish Funding Agency for Technology and Innovation (Tekes) in 1983 under the Ministry of Trade and Industry (now the Ministry of Employment and the Economy) as a key responsible institution of the new technology-oriented policy[36].

This marked the beginning of a period of investing in the growth of R&D as a fraction of GDP (figure 8). Finland started catching up from approximately the 1% level prior to the early 1980s, well below the average of OECD countries. The real growth rate of R&D expenditure was approximately 10% annually in the 1980s, the highest in the OECD countries, and resulted largely from the increased

[35] This event reflects the corporatism of Finnish decision making, where employee and employer representatives affect decision making with the government (see Lemola 2001a).

[36] Hyytinen and Väänänen (2002) see the establishment of Tekes as ending the first wave of establishing institutions providing SME financing that started in the 1960s.

R&D spending of enterprises (Vuori & Vuorinen 1993, Georghiou *et al*. 2003). As an outcome, Finland significantly narrowed its technology gap with older industrialized countries[37,38].

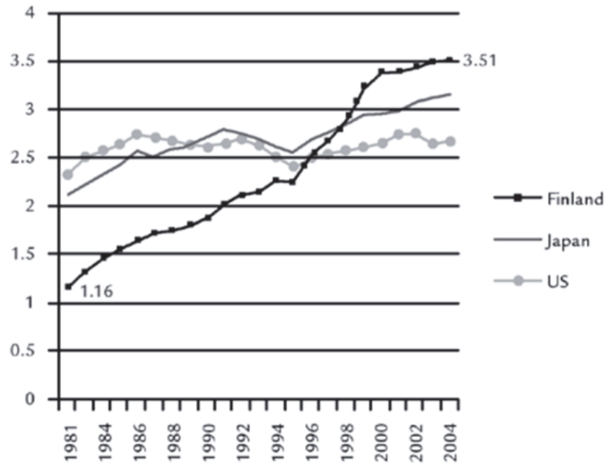

Fig. 8. R&D expenditure growth as a share of GDP in Finland, Japan and the US 1981-2004 (OECD Main Science and Technology Indicators 2007, Sabel & Saxenian 2008).

Tekes controlled R&D activities and thereby increased cooperation between universities, research institutes and firms under national technology programs[39]. A significant portion of the research spending was targeted for ICT and mobile technology projects: approximately 40% annually in the 1980s and 1990s (Lesser 2008: 21). This had an important role in the later growth of Nokia and also benefitted the Finnish economy, as Nokia was a key beneficiary of Tekes projects tailored to its needs (Ali-Yrkkö & Hermans 2002, Sabel & Saxenian 2008). The increased investments of Nokia contributed a majority of the private R&D spending growth illustrated in figure 9 (Dahlman *et al*. 2005). Indeed, the R&D investment level of Finnish industry grew from 4.5% in 1990 up to 9.2% by 2003

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[37] The science and technology policies within the OECD countries, since the early 1960s, had aimed to bridge the technology gap between Europe and the US and its high level of R&D expenditure to GDP (see Lemola 2001b).

[38] The former Science Policy Council (SCP) changed its name to the Science and Technology Policy Council (STPC) in 1984 to reflect the importance of technology and R&D promotion. In 2009, the name was again changed to the Research and Innovation Council to signal the role of innovation.

[39] It is noteworthy that in the 1970s, university-industry collaboration was not allowed and required an exception permit from the Ministry of Education under the so-called Lex Sundqvist.

when Nokia's spending is included, but without its share, the 2003 investment level remained almost stagnant at 4.7% (Ali-Yrkkö *et al*. 2004: 43). One-third of gross R&D expenditure in Finland and 47% of total private sector R&D spending were accounted for by Nokia in 2003 (Lesser 2008: 21). Hence, the role of Nokia is significant and biases the whole.

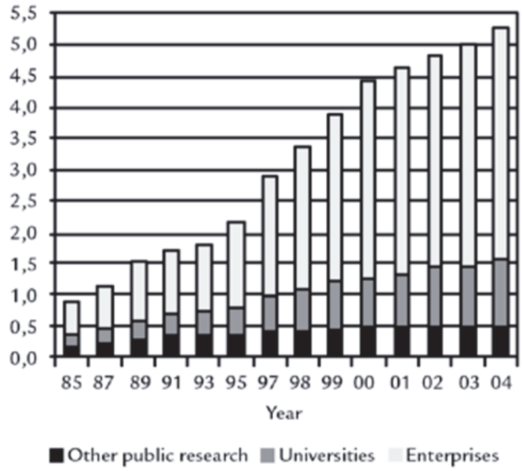

Fig. 9. Total domestic R&D expenditure (billion Euro) in Finland between 1985-2004 (Sabel & Saxenian 2008).

Because the economic development of Finland had strongly relied on the industrialization of traditional and mature slow-growth industries with relatively low R&D intensity, Finland also started to foster technology transfer, diffusion and commercialization in the 1980s. At that time, countries such as the UK and Sweden (Sitra 1987) again provided an example to follow. Auer (1990) discusses how universities and research institutes had not originally systematically focused on these matters and had only recently started to encourage faculty to take the entrepreneurial route.

This change triggered development that lead to the establishment of a large number of organizations and extensive infrastructure such as the nationwide network of technology parks (Tekel), technology transfer companies (VTT Technology was the first), centers of expertise and incubators to initiate spin-off projects and commercialize university and research institute research (Lemola 2001a, 2002). These activities were nationally created and funded together, with municipalities forming the basis for local and regional development. In many regions, a real estate company offering the office space and services and an incubator or a technology transfer company (many partly owned by Sitra) collaborated together in creating technology parks to nurture new ventures. In 1982, Oulu region-based Oulun Teknologiakylä Oy (later part of Technopolis Plc) became the first Finnish science park and an important facilitator of this activity nationwide. The above developments were an important event in the long run and resulted in extensive infrastructure that is still present, affecting entrepreneurs and the winner generation.

In addition, regionally focused government development companies were established in different parts of Finland based on economic and employment policy. The purpose was to compensate for the structural changes in the 1980s in regional economies that were historically dominated by large-scale industry and one or few anchor companies, such as a paper mill, that employed a substantial share of employees locally. As an example of this development, a significant Finnish-Russian construction project at Kostamus in Russia, close to the eastern border of Finland, was coming to an end, and employment was likely to take a downturn at the Kainuu region close to the border. A regional development company, Keraspo Ltd., was established in 1981 as a daughter company of the Fund for Developing Regions to invest in new and established firms in the region to both foster new job creation and secure current jobs (Rosenlew 1982). At least six similar organizations were established in other regions through the Fund for Developing Regions and municipality funding. Cities and counties hence entered the Finnish venture capital markets, which in 1983 consisted of 10 companies, out of which only one was controlled by the private sector[40] (Seppä 2000). This was a central time period during which a significant part of the long-standing regional business development culture and actor structure was created. Koskenlinna (2005) estimated that the number of regional development companies had grown by 2005 into 100, or 160 if industrial parks are included. As private venture capital actors were generally missing, innovators and entrepreneurs interacted with these actors, whose policy-based goals shaped the view of a perceived winner and this way affected winner generation in Finland.

[40] Sponsor ceased being government controlled when the Bank of Finland sold its shares in 1983, making it a private firm. In 1984, it was listed on the Helsinki Stock Exchange and was delisted in 1990 (see Seppä 2000).

Rosenlew (1982) states that the development companies with regional and employment targets had more problems with profitability compared to the development companies operating on business grounds without these restrictions. Overall, it was recognized that the development companies had to balance between higher risk and reward and lower risk and more predictable, mature cases. This balance was affected by the non-profit-making nature of the funds and the regional policy doctrines steering the development companies. The desired winner was a company that became profitable, bankable, and created jobs regionally.

On the financial market level, deregulation progressed in the 1980s and the terms of trade were improved due to the international market and credit boom (Hyytinen & Väänänen 2002, Georghiou *et al*. 2003). Foreign banks were allowed to enter Finland in 1982, and from 1986 onwards, firms could access foreign loan financing without approval from the Bank of Finland. These changes supported growth and allowed the Finnish economy to catch-up more quickly than most other industrialized countries in the 1980s (Vartia & Ylä-Anttila 1996).

Auer (1989) notes that even though entrepreneurship and risk taking was more appreciated and the rate of new firm establishment was internationally at a good level, the entrepreneurial culture in the late-1980s was still not suitable for venture capital. Despite the earlier initiatives, the newness of venture capital was evident: the nature of the industry was rather unclear to entrepreneurs and investors alike, and its role in business development was not yet fully recognized. Common practices were missing, the syndication of investment was just starting to occur and, most importantly, it was difficult to differentiate between actual venture capital companies and the above-mentioned development capital-orientated firms, which usually did not meet the definition of a for-profit venture capital firm.

Rosenlew (1982) notes that at the time, management competence was a key weakness in new and established SMEs. The SMEs were typically fully owned and managed by the entrepreneur or family, and the business competence was often insufficient for managing rapid growth (Auer 1990). Although entrepreneurship was respected, the entrepreneurial culture was geared towards SME ownership, and goals regarding growth and exits were not aligned with "outside" owners such as venture capitalists (ibid).

Indeed, at the time, venture capital was understood differently in Finland than in the US. Seppä (2000) discusses how in the latter case, venture capitalists had a face and were also entrepreneurs; in Finland, they were faceless institutions and had a bit of a social worker image during the early years, following the example set by Sponsor. It had become clear that the development company model in venture capital had not been able to solve the financing and competence needs of early stage SMEs in Finland; no private venture capital company was actively financing high-tech startups, and the image of venture capital—understood as the activities of the development companies—was poor at the end of the 1980s (ibid).

The matters discussed above were one of the key reasons why in 1987, Sitra shifted its focus away from product development project financing and towards the promotion of venture capital investment and technology commercialization (Vihko *et al*. 2002). Sitra started several projects that focused on fixing the development company-stigmatized venture capital industry and fostering risky capital investments in small technology-based firms. Sitra published reports and initiated the annual venture capital industry review in 1989, developed new financial instruments, supported the creation of new venture capital firms such as Tekinnova Ltd (see Mykkänen 1989), later made direct investments in target companies, and established the Finnish Venturing Association (FVA, later Finnish Venture Capital Association, FVCA), which accepted only risk capital investors and not the development companies. Among the first Finnish limited-life LP funds involving outside limited partners was the FIM 66 million (11 million euros) Finnventure Fund 1, established in 1989 by Capital Management Ltd (CapMan).

To summarize, the reports on the Finnish venture capital industry and startups by the turn of the 1990s (Ahdekivi 1989, Auer 1989, 1990, Jänkälä 1990, 1991, Mykkänen 1987, 1989) made the following observations. First, the venture capital industry was young, very small, and most of the actors did not solely focus on venture capital but had other operations or employment and regional policy priorities. Actors who organized around markets and shared the upside gains (of an exiting winner) and downside risks (exit by failure) with the portfolio companies were practically non-existent. By 1990, the only fully private and independent fund was Euroventures Nordica, a Sweden-based fund with a Nordic scope. The venture capital-providing companies also made investments broadly across seed, startup and growth stages to MBOs, generation changes and turnarounds – there was no distinct difference between venture capital and other private equity funds and companies.

Second, there was a lack of high-growth potential winners (mechanism 1) and deal flow, first due to the long-standing low R&D levels but later mainly due to the lack of competence in turning ideas into viable products and growth businesses; a pool of such competent actors did not exist in Finland[41]. Approximately 250 companies were located at the seven science parks at the time, and there was no shortage of technologists (Auer 1990). The typical portfolio company showed only moderate growth, which was considered to be adequate. Companies had an initial domestic market focus, and over half of the companies were internationally orientated, with 50% aiming at the Swedish market. However, international growth was generally acknowledged to be difficult in Finland. One part of this problem was significant underfinancing (error 2) compared internationally; for instance, in the United Kingdom, a competitor could obtain 3-7 times more financing than the FIM 500 000 (84 000 euros) that represented the maximum investment in 70% of Finnish deals. The typical portfolio company received FIM 1.2 million (202 000 euros) of venture capital in total and had an average age of seven years (Ahdekivi 1990: 14). As the typical business angel investment at the time was estimated FIM 400 000 (67 000 euros) (Lumme *et al*. 1998), the investment in and scaling of potential winners was not aggressive.

The other part of the internationalization challenge came from the value-added of venture capitalists. The strong areas for Finnish venture investors as identified by the portfolio-entrepreneurs were the organization of additional financing and the development of board activities; the weak areas lay in value-added growth-supporting areas: international networks, experience, investment syndication (the first cross-border syndication investment was in 1988), industrial knowledge and support in recruiting. There simply was no pool of competent managers or entrepreneurs that could provide such value-added as venture capitalists.

Third, the orientation and nature of the venture capital industry is described by the observation that the importance of exits was not evident: investors and portfolio companies had often not agreed upon or discussed exit strategies at all. Additionally, the domestic exit market was not developed, and not a single venture-backed startup had yet conducted an IPO. Still, the importance to economic development and industrial renewal of growing, small technology-based companies was generally acknowledged together with the need for an environment that supported them - an industrial structural change and the internationalization of the operating environment was taking place.

[41] The lack of sufficient investment opportunities for business angels at the time was also documented by Lumme, Mason & Suomi (1998).

Auer (1989) estimates that by 1988, there were 18 private equity and venture capital investors, out of which 14 had been established after 1984. These had invested a total of FIM 335 million (56 million euros) in 189 companies (table 6), and the total capital under management was FIM 646 million (108 million euros). Approximately 28% of investments were made in high-technology firms (Ahdekivi 1990: 22). Likewise, the number of venture-backed startups and both the total and the average investments at the early stages were small.

Table 6. Private equity and venture capital investments (M€) by stage in Finland in 1988 and cumulative by 1988 (calculated from Auer 1989: 14).

Year	1988			Cumulative by1988		
Investment stage	Number of investments	Amount (M€)	Average (M€)	Number of investments	Amount (M€)	Average (M€)
Seed	9	0.42	0.047	23	1.05	0.046
Startup	16	1.20	0.075	44	4.20	0.095
Expansion	27	6.64	0.246	81	30.31	0.374
Transition	2	0.36	0.181	4	1.22	0.306
MBO	7	2.60	0.372	8	2.72	0.340
Turnaround	9	1.15	0.127	29	16.87	0.582
Total:	70	12.38		189	56.37	

In conclusion, by 1990, the Finnish venture capital landscape was a mix of government and regional development actors, development capital companies, technology parks, bank-related investors, and corporate venture capital investors (Ahdekivi 1990: 9). The view of venture capital, the perception of a winner and the rules of the game were multifaceted and contradictory, with regional, employment and technology policies mediating the activity. There was a small number of private and independent venture capital that did not offer a competent market for innovators and entrepreneurs.

1990s: Severe recession, second take on venture capital and ICT driven economic growth

The next decade started with severe economic turmoil between 1990-1993. The economic growth triggered by the liberation of the Finnish financial markets and the lending boom was followed by the most serious cyclical downsizing faced by any industrialized country since the Great Depression in the 1930s. The GDP dropped over 10%, and unemployment rose from 3% in 1990 to 17% by 1994

(Kiander & Vartia 1996). The collapse of the Soviet Union in 1991 further fed the crisis, as it accounted for 15-20% of Finnish exports.

Under this economic climate, the third phase of science and technology policies began with an era of building a knowledge-based society and a NIS (Lemola 2002). The NIS was an important concept in science and technology policy-making and rhetoric, as Finland had started to move away from being an investment-driven catch-up economy towards emphasizing the knowledge-based innovation-driven economy. During the previous two decades, Finland had managed to increase its technological level and the diffusion of existing technologies considerably and had started to shift its innovation system focus towards research-based industrial development (Vuori & Vuorinen 1993). The increased prosperity rested on latecomer advantages and advantages from catching up: Finland could exploit technologies developed elsewhere to modernize key industries in which the state-owned corporations had a crucial role (Jalava & Pohjola 2002, Oinas 2006). Hence, the development targets set in the earlier science and technology policies were mainly achieved. Notably, Finland was the first country to adopt the NIS as a concept in nationwide science and technology policy-making (Miettinen 2002), and the Science and Technology Policy Council played a central role in this. However, the main organizations comprising the NIS had already been created, as described above.

Another parallel macro-level building block, the concept of a knowledge-based society, was launched in 1996 as a core science and technology policy strategy of the late 1990s. It stemmed from the OECD Jobs Study (OECD 1994, 1998) and acknowledged the importance of knowledge-intensive growth requiring different innovation policy measures relating to R&D, education, competitive conditions, intellectual property laws and regulations, networks for national and international cooperation, and technology transfer and exploitation. (Lemola 2002) Information and communication technologies (ICT) were widely considered to be a key factor for economic development and a critical component of the knowledge-based society. In this sense, Finland was positioned well, with its strong and growing ICT and forest industries and increased patenting in the US (mainly because of Nokia[42]). Finland was even labeled the "Japan of the North" (see Lemola 2001b), and large Finnish companies in selected industries became technological leaders, no longer catching up (Jalava & Pohjola 2002), and were

[42] Nokia accounted for approximately 40% of Finnish company patents issued in the US in 1997 and 70% by 2002 (Daveri & Silva 2004).

copied by others (Oinas 2006). In retrospect, the success, R&D investments and example set by Nokia were a significant contributor to this.

The severe recession affected new ventures and SMEs through an extensive banking crisis that took place at this time and led to a complete reorganization of the Finnish banking sector with heavy government intervention. The financial landscape became difficult for SMEs, and a significant number of companies declared bankruptcy. As the banks had been the major source of SME financing for decades, Finnish industrial policy focused especially on SMEs and their financing in the early 1990s (Hyytinen & Väänänen 2002). In this context, entrepreneurial and innovative startups, the venture capital sector and their above-mentioned weaknesses were just one part of a larger SME financing dilemma, and from the policy makers' perspective, they were not the most acute problem to be solved.

However, because the banking sector was also an important limited partner for Finnish private equity and venture capital funds, the fund-raising volume was affected. Just 11 and 14 million euros were raised in 1991 and 1992, respectively (table 7). Between the strongest recession years 1991-1993, banks and insurance companies invested only 3 million euros in total to new funds. The government's role as a limited partner through Sitra and Kera started to increase, and by 1994, 65% of new funds came from public sources, as cities and municipalities increased their investments as well. The overall situation triggered new venture capital interventions by the public sector and increased its role.

Table 7. Limited partner types and total capital raised (M€) by Finnish private equity and venture capital companies 1989-1994 (calculated from Jänkälä 1994:15).

	1989	1990	1991	1992	1993	1994	Total
Government	16.8	3.4	7.1	12.1	28.3	36.2	103.8
Banks	3.7	4.4	1.5	0.3	0.7	8.6	19.2
Insurance companies	1.0	3.4	-	-	0.5	5.6	10.4
Other companies	2.4	8.1	2.0	1.3	1.2	7.9	22.9
Pension funds	-	-	-	-	0.2	-	0.2
Cities, municipalities	-	0.5	-	0.3	1.5	4.7	7.1
Private individuals	-	-	-	-	-	0.3	0.3
Capital raised (M€)	24	20	11	14	32	63	164

First, a new high-tech focused fund, Start Fund of Kera, and a new management company for it, SKF Finance Ltd[43], were established in 1990 as an initiative of Kera[44]. The fund was capitalized by the government, starting with FIM 30 million (5 million euros) in 1991 and FIM 35 million (5.9 million euros) in 1992. Then, in 1991, Sitra was moved under the supervision of the Finnish Parliament as an independent fund, and the original founding capitalization from the Bank of Finland by 1992 was raised to 84 million euros[45]. Among other goals, Sitra was given permission to make direct venture capital investments and to invest in venture capital funds[46].

A second key event was the creation of eight regional venture capital funds[47] by Kera and Sitra for the major university cities and their technology centers between 1991-1995, with a strong regional policy link (Herranen 2009: 323). Three of the funds were managed by existing regional development companies (Pikespo Invest, Savon Teknia and Wedeco) that had been created in the early 1980s. Furthermore, the first venture-backed IPO in Finland took place in 1995, when Ponsse Ltd listed to the OTC-list of the Finnish Association of Securities Dealers in Helsinki. Before the IPO, an MBO had taken place in Ponsse, in which Start Fund of Kera was one key actor.

These government activities aimed to address the risk capital market failure in three ways (PK-yritystoiminnan neuvottelukunta 1990): (1) channeling government financing directly to companies through a government fund (this led to the establishment of Start Fund of Kera), (2) government-shared financial risks by providing loan guarantees to companies, and (3) government-supported risk taking for venture capital firms by providing guarantees.

Third, the Finnish Industry Investment Ltd (FII, Teollisuussijoitus in Finnish), another government-owned investment company, was started in 1995[48].

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[43] An MBO took place in SKF Finance Ltd later in 1997. The next year, the Start Fund was sold to a pioneering European venture capital company, Investors In Industry (3i) of the UK in 1998 - around this time, Nokia's success started to draw the attention of foreign investors towards Finland.

[44] The establishment of the Start Fund of Kera meant that the government had decided to address the early-stage venture capital market failure with its own direct investment vehicle and not by creating private LP-model funds to trigger the emergence of a private venture capital market.

[45] See http://www.sitra.fi/sitra

[46] See http://www.finlex.fi/fi/laki/ajantasa/1990/19900717

[47] Indekon Oy (Lappeenranta), Innoventure Oy (Helsinki), Midinvest Oy (Jyväskylä), Pikespo Invest Oy (Lappeenranta), Savon Teknia Oy (Kuopio), Spinno-Seed Oy (Espoo), Teknoventure Oy (Oulu), and Oy Wedeco Ab (Vaasa)

[48] Hyytinen and Väänänen (2002) call the above developments as the second wave of establishing governmental actors with a focus on SME financing.

The Government Acts in 1994 and 1999 created the ground rules for FII's activities (Hyytinen & Väänänen 2002: 15-17, Maula & Murray 2003: 47-49): it also had the purpose of promoting the domestic private venture capital market and thus improving the potential for companies to grow, internationalize, and go public with stronger financing[49]. An important policy element affecting FII's activities was the requirement that it be profitable in its operations - it was, and still is, an investment company and not a program established to create a private venture capital industry.

With FII, Finland again followed the example set in other Nordic Countries, which had created similar vehicles during the previous five years (Hyytinen & Pajarinen 2001). The specific objective of FII was to accelerate the availability of risk capital for high-potential SMEs, especially at the early stage (seed and startup), where market failure existed despite prior initiatives, by investing in venture capital funds, private equity funds and directly in target companies. In addition, FII had a role in channeling some EU financing to Finland (Hyytinen & Väänänen 2002). The initial capitalization of 53.8 million euros came from the proceeds of the privatization of state-owned companies, and by 2000, the government had invested a total of 186 million euros to FII[50].

FII started to operate primarily as a fund of funds and invested in private venture capital funds as a limited partner, often as the lead or cornerstone investor. By the end of 2001, FII had invested 92.4 million euros in 14 venture capital funds in Finland, with an average investment of 6.7 million euros and an average fund size of 46.8 million euros[51]. However, Maula and Murray (2003) observe that not all of the funds made early stage investment by default, and later many of the funds moved to later development-stage investments. The government prioritization also required FII to be involved in the development and financing of a network of regional venture capital funds initiated by Kera and Sitra. Therefore, from 1996 until the end of 2001, FII invested 26.9 million euros in 15 of these funds with an average fund size of 8 million euros. In addition, FII was also allowed (secondary) to make direct venture capital investments to ventures requiring large investments and long-term risk taking. The scope of this

[49]The number of active business angels at the time was approximately 1500, and their role was significant at the seed, startup and early stage investments in complementing the weak venture capital market (Lumme *et al.* 1998).

[50]See http://www.industryinvestment.com/about-us/history

[51] The focus of this study is on VC market activation. See Maula & Murray (2003) for a broader view of FII's activity, including the private equity investments for balancing risk and required profitability.

activity was found to be surprisingly significant given the secondary role: by 2002, FII had made 10 direct investments in companies, with two exits and 26.4 million euros invested at the time in 8 portfolio companies. There were also signs of a further increase in direct investments (Maula & Murray 2003).

Considering the market conditions, the timing of FII's activities provided all the ingredients needed to create a private venture capital market in Finland. The above-cited reports of startup and venture capital activity in Finland prior to 1990 provided insight into the problems that needed to be addressed, mainly the amount of financing and internationally competent value-added from venture capitalists that did not exist domestically. At that time, the international market conditions for generating winners were among the best ever: in Silicon Valley, Netscape's IPO in 1995 had triggered an Internet and high technology startup building and investing boom with lucrative exit markets for years to come (see section 5.3). The growth of Nokia was taking off, and Finland was considered to be one of the top countries in ICT and mobile areas. Third, Finnish banks and insurance companies returned to venture capital investments as limited partners after the recession, and pension funds started to invest into the asset class for the first time due to a change in laws. A market opportunity existed to build competent fund management teams and funds to attract the best innovators and entrepreneurs for experimental winner generation.

Due to these conditions, the international venture capital market grew rapidly towards the end of the 1990s, and the Finnish private equity and venture capital market started to follow this trend as well (table 8). Venture capital investments grew from 15 million euros and 80 investments in 1995 to 71 million euros and 176 investments in 1999. However, the majority of growth in euros focused on buyout funds, as the difference between total private equity and venture capital investments illustrates.

Table 8. Total private equity and venture capital raised (M€) and number of investments in Finland 1990-1999. Numbers include investments to foreign companies (calculated from FVCA yearbooks).[52]

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Private equity										
Investments, total M€	14	19	16	27	28	38	84	136	192	285
Companies, total	77	77	80	82	105	110	137	165	201	236
Deals, total	87	102	90	98	115	122	137	205	265	325
Venture capital										
Investments, total M€	10	14	9	16	14	15	27	57	59	71
Deals, total	55	77	54	67	77	80	88	108	146	176

FII was one of the key limited partners, providing 6-8% of the committed capital annually (Maula & Murray 2003). During the decade, the number of private equity and venture capital actors grew from 18 in 1990 to 32 by the end of 1999. Despite the creation of a few new venture capital funds towards the millennium, innovators and entrepreneurs at the early stage (seed and startup) still primarily confronted public venture capitalists (figure 10).

The role of private venture capitalists increased periodically, mainly represented by startup and later-stage investments towards the peak of the Internet boom, when the opportunities attracted private actors to the seed and startup stages. Based on the increased role of public actors in the startup stage by 2005 onwards this lasted the funds' initial investment period and was not followed by subsequent fundraising or the establishment of funds by new management teams – a sufficient number of new early stage-focused funds were not raised to fill the gap.

[52] The FVCA statistics do not include corporate venture capital investments and include foreign PE/VC investments only if actor who made the investment has an office in Finland. Hence, the actual numbers are bigger mainly after 1996 when syndicate investments with foreing investors started to grow.

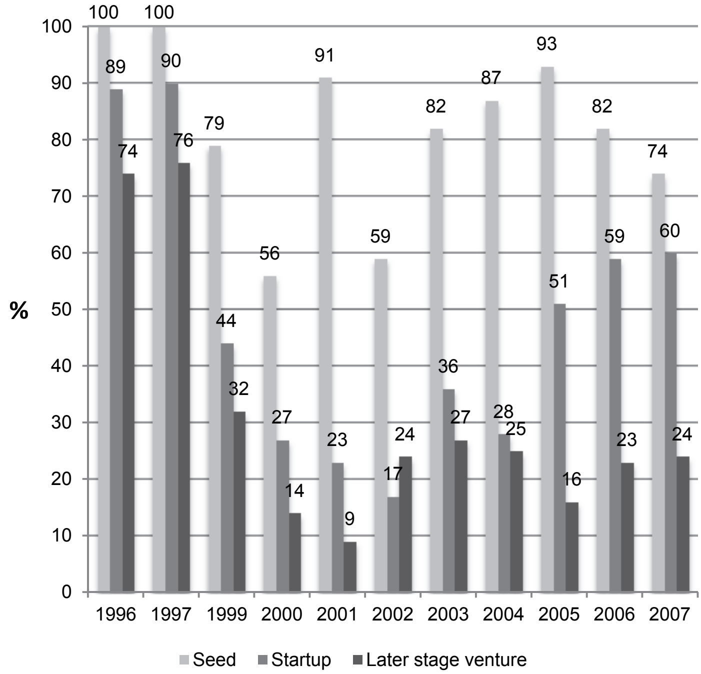

Fig. 10. Share (%) of public venture capital funding of Finnish startups by stage 1996-2007 (calculated from FVCA Yearbooks).

Further, figure 10 captures the documented shift of many private venture funds towards less risky later-stage investing, where they represented an important source of financing after the Internet bubble burst. This move was likely also driven by the need to finance current portfolio firms when the economic landscape became more challenging after the Internet bubble burst in 2001-2002.

In 1999, a new government-owned special finance company, Finnvera, was created by merging Kera and the Finnish Guarantee Board. Behind this move was the recent development of the domestic financial market, which created a need to analyze the role of public special finance organizations both between and in relation to private actors to eliminate possible structural overlaps and inconsistencies[53] (Herranen 2009). For instance, Kera granted credit to companies that could have raised financing from private banks, and in venture capital, public

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[53] Finland's EU membership in 1995 affected this process as well.

and private actors sometimes competed and sometimes cooperated. The whole was unclear, and Finnvera was established to clarify the situation and supplement the financial markets. Finnvera provides loans, guarantees, export finance instruments, venture capital investments (through three affiliates), and business development services and advice mainly to SMEs to promote the development of enterprises, exports and government regional policy targets. Finnvera is also the official Export Credit Agency (ECA) in Finland and handles some EU financing programs for domestic SMEs.

In addition to the private equity and venture capital initiatives, a change in the regional development policy towards a program-based approach took place in the 1990s. A greater role was given to regions, which turned them from objects in prior regional development to subjects with greater responsibility (Vartiainen 1998). At the time, regionalization had become a keystone of science and technology policies in EU member countries and in some OECD countries (Kuhlmann *et al.* 1999). This implied closer collaboration with companies and other actors regionally and the entry of the EU's regional and structural policy- (cohesion policy) based programs to catalyze and complement national policy (Vartiainen 1998, Lemola 2001a). For new and established companies, this meant that many projects emerged to offer different ways to collaborate on various matters.

This further led to the definition of regional development programs (see Paasivirta 1991). Among them, the Centers of Expertise Program in 1994 (CoE, Osaamiskeskusohjelma or OSKE in Finnish) by the Ministry of the Interior was one of the most substantial and relevant to this study. It was originally a continuation of many local development efforts and was geared towards strengthening regional innovation capabilities and technology diffusion; it formed the national instrument to channel EU project funding for regional development (Miettinen 2002, Edquist *et al.* 2009). This was a fundamental change, as prior regional policies were focused on supporting weaknesses and regional equality (Ahola & Kortelainen 1997), for instance, in the form of the above-covered regional development companies and funds.

The purpose of the CoEs (8 centers until 1999, 22 by 2013) was to increase the preconditions for the development and location of internationally competitive knowledge-intensive companies and businesses (regionally) and to support regional specialization and division of labor between the CoEs [54] (statute

[54] Author's own translation

1315/93). This was accomplished by pooling the already existing actors - universities and polytechnics, research institutes, companies, cities and local authorities - to collaborate and form development projects in the selected focus areas defined in the program. The projects further aimed to boost the productivity of companies, strengthen and improve regional expertise, create new businesses and promote the creation of new innovation environments (Ottaviano, Kangasharju & Malinranta 2009). In reality, the existing leading companies such as Nokia were in a central role, and the other actors were geared to fulfill their needs through the projects under the CoE program (Wallin & Laxell 2013).

The CoE program ran over three periods (1994-1998, 1999-2006, and 2007-2013); of these, the first two were clearly focused on regional development policies whereas the third connected to national innovation policy (Edquist *et al.* 2009). Between 1999 and 2006, the projects associated with CoEs attracted 113 million euros of competitive R&D financing and 465 million euros of other financing, aggregating a total of 578 million euros (Kanninen *et al.* 2007: 9); from 2007 to April 2013, this number rose to a total of 341 million euros (Wallin & Laxel 2013). The total including the first years exceeds one billion euros.

Regional Employment and Economic Development Centers[55] (TE-Centers) were established under the Ministry of Trade and Industry (Ministry of Employment and the Economy since 2008) in 1997, three years after the CoEs were established. The role of these centers, located in 15 regions under ministerial supervision, was to influence general regional development by promoting business activity and employment. The centers were organized into different departments, of which the tasks of the business departments are relevant to this study. The purpose of their public servants was to support SMEs at different life cycle stages, advance technological development in firms, and provide assistance in export and internationalization activities based on a variety of business development services and financing (Hyytinen & Väänänen 2002). The financial tools included different types of grants and subsidies for investment and development projects and entrepreneurship grants targeting unemployed people for self-employment.

In addition, the Finnish cluster program was also launched in 1997. It consisted of eight selected cluster areas under five ministries and over 100 million euros in financing to projects, out of which 60% was public (Pentikäinen 2000).

[55] TE Centers were reorganized under the new organization of the Center for Economic Development, Transport and the Environment (ELY-keskus in Finnish) in 2010.

The Science and Technology Policy Council (1996) defined the focus of the program as generating growth, improving industry competitiveness and productivity, increasing employment, generating new innovations and improving social welfare. Before the program, a separate study of Finnish clusters[56] based on Porter's (1990) cluster theory and the related economic discussion was conducted in 1995. The programs were designed to run from 1997 to 1999, but in practice lasted until 2001, with results that were difficult to evaluate (Pentikäinen 2000).

Finally, among the oldest actors promoting export and the internationalization of Finnish startups and SMEs is the Finnish Export Association[57], founded in 1919, which since 1999 has been known as Finpro. It is a public-private partnership under the Ministry of Employment and the Economy, with 60% government funding of its approximately 40 million euros budget. It is staffed by 375 experts (over 250 abroad) located in 69 posts such as the Finnish Innovation Centers (FinNode) in nearly 50 countries[58]. The provided services are both free and invoiced and include internationalization-related consulting, market reports and studies for companies and public innovation support organizations. Finpro is closely integrated with public innovation actors and, in addition to direct government funding, generates as much as 30% or over 10 million euros of its invoiced revenues from them – for instance, over 3 million from Tekes (Aiginger, Okko & Ylä-Anttila 2009: 133). Their clients are over 4500 Finnish businesses, which are to a large extent the same as those served by the other innovation organizations (ibid).

Meanwhile, in the background, Nokia's revenue had grown from 6.5 billion euros in 1996 to 31 billion euros by 2001[59,60] and had a significant impact on the Finnish economy and the results of the policies and programs mentioned above. In 1995, Nokia's share of Finland's GDP was 1%, but it grew to 4% by 2000 (Ali-Yrkkö 2010). For instance, out of the 5.6% GDP growth for the Finnish economy in 2000, Nokia contributed 1.7%. Between 1995-2000, Nokia paid 2.9 billion euros of corporate taxes and 1.2 billion of employee social security payments, and its employees paid 2.6 billion euros of income and option taxes, bringing the total to 6.7 billion euros (Ali-Yrkkö & Hermans 2002). Further, Nokia's share of Finnish exports was close to 25% without taking into account the 300 "first tier"

[56] Advantage of Finland – The Future of Finnish Industries (Hernesniemi, Lammi & Ylä-Anttila 1995)
[57] See Remes (2009) for an extensive historical account of Finpro.
[58] According to the Finpro website as of 15.6.2013
[59] See http://www.nokia.com/fi-fi/tietoa-nokiasta/tietoa-meista/tarina/nokian-tarina/
[60] This growth was organic, without major acquisitions, and includes Nokia Siemens Networks (NSN).

and other partner exports, which raise the number even higher (ibid). Combined with the traditional forest and metal industry corporations, this comprised almost all of the exports of Finland.

In summary, the matters above cover the key events and developments that took place in the 1990s. The startup industry was structurally incomplete, and public infrastructure compensated for and complemented it; hence, innovators, entrepreneurs and startups worked with government officials more than with actors organized over markets. Due to the needed government interventions and the strong economic growth after the recession, the size of the innovation system infrastructure grew further. By the turn of the millennium, the current set of innovation system actors had been created, and any changes that have taken place have been inside this structure in the form of new programs, initiatives and reorganizations in the division of labor.

2000s to present: Crisis and change reveal the performance of the national innovation system and startup industry in winner generation

Similarly to the European and US startup industries, the beginning of the millennium was marked first by the Internet bubble and then by its burst, which took place in Finland in 2001-2002. The record year in venture capital investments was 2001, when 171 million euros was invested in 284 deals[61] (table 9). The early stage (seed and startup) venture capital market failure improved periodically between 1998-2004; this covers the five-year initial investment period for most of the new funds raised (see also figure 10).

The total capital under management of the Finnish private equity industry grew from 102 million euros in 1990 to 5.3 billion euros by 2007 (Jänkälä 1991, FVCA 2007). The entire private equity industry was largely created during this time period; however, the majority of growth in terms of capital occurred through buyout funds and later-stage investing. The non-growth-orientated owner-manager controlled SME pool provided a good market for many of these funds to make investments and merge companies. The exact share of venture capital funds and capital available for new and follow-on investments to startups is not available from this time period. Nevertheless, it can be estimated that the total number of startups through or within the experimental winner generation process

[61] Data on the number of venture-backed startups are not available until 2008 onwards.

in Finland by 2007 exceeded one thousand companies[62] (tables 8 and 9) - enough to generate a substantial number of winners by competent actors.

Table 9. Total private equity and venture capital raised (M€) and number of investments in Finland 2000-2007. Numbers include investments to foreign companies (calculated from FVCA yearbooks)

	2000	2001	2002	2003	2004	2005	2006	2007
Private equity								
Investments, total M€	397	340	391	328	369	313	350	877
Companies, total	315	294	259	252	249	247	284	291
Deals, total	418	449	462	435	419	423	454	468
Venture capital								
Investments, total M€	154	171	97	69	76	87	78	72
Deals, total	263	284	285	245	235	233	229	297

Despite the overall growth of the private equity and venture capital industry, the conditions for experimental winner generation remained challenging. The Internet boom as an exogenous factor periodically drove the interest of private actors to early stage companies (figure 10), but the competence and financial gaps already recognized by 1990 persisted regardless of the above-covered initiatives to address them. A case in point is Sitra's startup portfolio in 2002: the technological competence and innovativeness of the startups were considered to be "state-of-the-art", but the major problem areas still were commercialization, financing, and a lack of professional management to turn the startups into winners (Vihko *et al.* 2002: 12). The startup teams consisted mainly of engineers and researchers, and the competence to manage, build and market startups did not exist in the needed quantity. Neither the public actors, nor the business development tools nor the venture capital industry were able to offer the value-added needed to scale these potential winners into actual winners on the international markets. The exit values at the time are not well documented, but the 230 million euro acquisition of a Finnish startup called Iobox by Telefonica in 2000 was likely the biggest exit during the Internet boom (see section 5.1.4).

Without a critical mass of winners, it was difficult to raise new early stage funds after the Internet boom, so the market failure in early stage financing persisted. When compared internationally, the Finnish venture capital market was

[62] Venture capital investments in Finland are rather small on average, and as early stage startups can receive more than one investment per year, the total number of firms is substantially fewer than the total number of investments.

still small and under-developed by 2003, especially when the high-knowledge intensity of the Finnish economy is taken in account (Maula & Murray 2003: 20). The role and activities of FII are somewhat contradictory in this regard. The Government Act of 1999 and government decisions in 2000 sharpened the operational focus of FII on solving the remaining market failures at the early stage (like already in 1995) and in regional venture capital markets by using a fund of funds structure. However, despite this focus, on an aggregate level, only 17% of the money from FII-backed funds went to seed and startup stage ventures in 2001, whereas funds without FII-backing targeted 33% of investments to ventures at these stages (Maula & Murray 2003). FII sought profits from later-stage funds to meet its profitability requirements and was not able to solve the early stage venture capital market problem.

Given the mandate to fix the early stage problem, FII next established a nationwide 50 million euro seed investment fund, Start Fund 1 Ky, in 2004 (the fund size was raised to 65 million by 2012[63]). This fund focused on investments in seed, startup and early growth phase companies as a co-investor with other venture capital funds, development companies and business angels. FII's maximum investment size is defined along the same sizes and terms as other private investors. At the end of the 2012 account period, the fund had made investments in 32 startups of a total of 60.9 million euros.

A second governmental early stage finance initiative was started by Finnvera and its daughter company Veraventure Ltd[64] one year later in 2005 by establishing the Seed Fund Vera Ltd (Aloitusrahasto Vera in Finnish, Avera hereafter). Avera's investment focus was also on early stage technology companies and technology-intensive or innovative service companies with the potential to develop into growth companies (Finnvera 2005). By the end of 2012, Avera had made initial investments in 196 companies of a total of 52 million euros and 42.5 million euros in follow-on investments to 117 companies[65].

It must be noted that the Nokia story also has an important mediating role in this picture. Whereas the conditions for the success of venture capital interventions by FII, Sitra and other public organizations were good in terms of market timing, as discussed above, it did not automatically mean that Finnish students, inventors, innovators and potential entrepreneurs were attracted to

[63] FII's financial statement 2012
[64] Veraventure Ltd is Finnvera's venture capital company established in 2003.
[65] Finnvera's financial statement 2012

building startups and winners. There were few examples of successful startups. Instead, the potential brainpower to innovate at startups was largely attracted by Nokia and its subcontractors from the mid-1990s onwards. Nokia's growth was mainly organic, and it required at least 6 500 technically skilled people between 1997-2000 alone, which was approximately two-thirds of all Finnish graduates in the fields relevant to Nokia (Häikiö 2001, Ali-Yrkkö & Hermans 2002). A significant part of the rest was further employed by Nokia's 300 "first tier" partners, which had approximately 18 000 to 20 000 employees around the millennium (Ali-Yrkkö 2001). The opportunity cost between a risky startup business experiment and the market pull of a career in a rapidly growing future global market leader was too high for the majority or employees, and the startup industry did not have the track record or resources to attract these people into experimental winner generation under such an economic climate.

One positive implication of this condition for the future of the startup industry was that Nokia employees gained important experience, competence and networks on an international scale in many fields that did not previously exist in Finland. This talent pool became more accessible both to established companies and the startup industry when Nokia’s cluster growth started its downturn in approximately 2007, when the Apple iPhone was introduced. At this point, Nokia employees started gradually to look for new opportunities, among which entrepreneurship and startups had become more attractive. The wave of layoffs and dismissals by Nokia and its subcontractors fueled this phenomenon and peaked in 2012, when 3 700 Nokia's employees were fired (a record in Finland), many with significant severance pay, and the number of Nokia employees in Finland dropped from 24 500 in 2000 to 15 900 by 2012[66]. The financial crisis of 2008 had already started prior to these layoffs, along with the structural change in key Finnish industries to cut jobs from existing companies, and these further steered interest toward entrepreneurship and startups - the other options were, in many regions, limited. With this development, the historical performance of the Finnish innovation system and startup industry in fostering the emergence of new winners was also being challenged. For instance, Autio (2009) described the underperformance in high-growth entrepreneurship despite world-class premises as the Finnish paradox.

The startup phenomenon started to gain more grass roots attention, especially from 2007 onwards, driven by success examples such as Hantro Products

[66] See http://fi.wikipedia.org/wiki/Nokia_(yritys) cited at 25.3.2014

(acquired by On2 for approximately 100 million dollars in 2007) and MySQL (acquired by Sun Microsystems in 2007 for one billion dollars). The exit of MySQL was pioneering and represented the first international big winner from Finland in the US markets and Silicon Valley[67]. The success of Rovio's Angry Birds and Supercell's over 1.5 billion dollar exit (for a 51% stake, giving the company a 3 billion dollar valuation) in 2013 have further fueled this trend.

More entrepreneurial and startup-focused spirit and activities started to take place from the bottom up. University students began to organize around startups triggered by active students first at Aalto University and soon in other Finnish universities and polytechnics. The Internet enabled access to what was happening internationally around entrepreneurship and startups, and activities that had been pursued for years in Silicon Valley and other entrepreneurial hotspots found their way to Finnish campuses in the form of pitching and business plan competitions, startup-related events and programs, and trips to entrepreneurial regions and venues in different countries. These initiatives and developments were further supported by the decreased cost of building products, which enabled startup business experiments to be conducted at a dramatically lower cost than previously (see also 5.3.1).

At this moment, the many initiatives to foster entrepreneurship and startups within the covered Finnish institutions since the late 1980s appeared to gain real traction for the first time. To illustrate the historical non-performance in these areas, the total commercialization revenue of Finnish research institutions and universities was less than 3 million euros annually and there were fewer than 10 spin-off startups established (see Roine, Ruohonen & Sorvisto 2010). This area had not been addressed despite the fostering of technology transfer, diffusion and commercialization started in the 1980s or by the development of significant infrastructure and programs such as technology parks, centers of expertise and incubators. On the contrary, Nokia-driven ICT cluster growth was also counted as an important result for many of these actors and programs, and only Nokia's downturn enabled to recognize the non-performance on new winner generation.

These combined circumstances led to the establishment of new startup-focused initiatives. Among the most recent to address the still-existing early stage venture capital market failure and competence gaps are the Tekes-operated Young Innovative Companies (YIC, Finnish abbreviation NIY) program founded in 2008

[67] The MySQL story has strong Swedish roots as well.

and the Accelerator Program (Vigo) launched by the Ministry of Employment and the Economy in 2009[68]. The organization of these programs is discussed next.

According to Tekes[69], the YIC program aims to speed up the growth, internationalization and investment attractiveness of those startups with the most potential and consists of three components: (1) the planning for growth phase, with a 75% subsidy of eligible costs up to 50 000 euros focused on scoping the growth potential of the business case for a maximum of six months; (2) the prerequisites for growth phase, with a 75% subsidy of eligible costs up to 250 000 euros for startups under six years in age that have typically operated for a few years and have a proven business case and customer revenue; and (3) the accelerating growth phase, which increases the 75% subsidy of eligible costs to a maximum of 750 000 euros[70] for companies that have achieved the goals set in the second phase. The second and third phases include the use of an external evaluation board, which provides a statement for each company that Tekes uses to support decision making. The Vigo program (below) and YIC programs are connected, so that startups accepted to the Vigo program can access the YIC program at an earlier stage than the non-Vigo startups. At the end of 2012, 42 companies in total had been accepted to the YIC this way.

The Vigo program aims to bridge the gap between early stage technology firms and international venture funding[71,72]. The program's concept is to use public sector stimulus to attract entrepreneurs and executives with international experience to form accelerator companies and to use this competence to support the business growth and investment readiness of the selected high-potential startups. In addition to experience, each accelerator is required to have an industry focus, the ability to make small seed investments (10 000-25 000 euros), a self-sufficient and profitable company, and over 10 years of experience among the managers. Currently, there are 11 selected Vigo accelerators,[73] with each allowed

[68] The more established SMEs are addressed by the Growth Track Program (Kasvuväylä in Finnish), in which companies need to have at least 10 employees and net sales above 500 000 euros. The Growth Track is not addressed in more detail in this study, as the focus is on startups.
[69] Based on Tekes' website description of the YIC program and its results, accessed in 20.6.2013. http://www.tekes.fi/about/niy
[70] Companies located in areas eligible for regional aid can receive an additional 25% of funding on top of the 750 000 euros.
[71] Http://www.vigo.fi/program1
[72] See also Puttonen (2010) for a description of the Vigo program and Autio *et al.* (2013) for the mid-term program evaluation.
[73] Http://www.vigo.fi/accelerators

to have at most 10 accelerated startups at a time for a maximum of a two-year period per firm[74].

In the program, the accelerator makes a small seed investment to the startup and receives a certain share of company ownership (e.g., 10%). Depending on this share, the accelerator company can charge a monthly management fee[75] to the startup against the provided services. The startup can use YIC funding from Tekes to cover this fee. The accelerator presents the chosen potential startup to Tekes and Veraventure (daughter company of Finnvera). Tekes then makes the decision to approve the startup for the first phase of YIC or one of its other R&D or loan financing instruments. Veraventure makes a decision typically in the amount of 400 000-500 000 euros seed funding, similarly from its Seed Fund Vera. Altogether, a Vigo-accelerated startup can receive between 1.6 and 2.2 million euros of financing through these programs and instruments. Public funding for the programs is 99% (Tekes 66% and the Seed Fund Vera Ltd. 33%)[76].

The establishment of these programs was an important event in Finland because for the first time, the competence of experienced managers and entrepreneurs was sought and systemically exposed to potential winners at the pre-seed or seed stages onwards. In addition, the role of Tekes as a financier of innovators and startups was further strengthened in 2012 with the decision to end the venture capital investments of Finnvera by 2017 and give that mandate to Tekes; this decision enabled Tekes to start venture capital investments in 2014 under a new company called Tekes Pääomasijoitus Ltd. The investment company is non-profit and can distribute up to 20 million euros of investments annually[77].

Before the Vigo and YIC programs, the FII established its first fund-of-funds, FoF Growth (Kasvurahastojen Rahasto in Finnish), in 2008 to invest 135 million euros in private equity funds investing in growth companies. For the funds, 60% came from Finnish Pension Insurance Companies and 40% from the government through FII investment. The target funds include both venture capital and buyout funds investing in non-listed growth companies. By 2013, the fund had invested

[74] The Vigo program emulates the Technological Incubators Program in Israel, which is generally considered to be successful.

[75] The monthly management fee is 9 000 euros for under 10% ownership, 4 500 euros for 10-20% ownership, and zero for over 20% ownership.

[76] Ideally, the accelerator companies should also raise venture capital funds that would allow them to invest in the startups they accelerate, but this is challenging because the accelerator teams did not have a track record from successful venture capital investing. However, recently, at least two (LifeLine Ventures and Vendep) have been able to raise funds.

[77] Http://www.tekes.fi/PageFiles/2800/Pääomasijoitus_HeSa_254x150_pdf.pdf

70 million euros in seven venture capital funds and 57 million euros in four buyout funds, for a combined 127 million euros in total. Then, in 2013, a second similar fund, FoF Growth II, was established to invest 130 million euros with the same mandate during 2014-2018[78].

Parallel with the increased interest in startups and winner generation, the activity of business angels has gained increased momentum through formal organization[79] and investment tracking. The capital efficiency of startups in many industries has lowered the market-entry bar for new angels, enabling the investment of smaller amounts and getting them involved with experimental winner generation.

The outcomes of the described CoE program and, later, the Invest in Finland-labeled initiative goals to foster the location of knowledge-intensive international companies and their R&D centers to Finland have been modest. One study evaluated that in 2006, there were 5-6 such units (Ruohonen 2007). The number has likely grown since; most of these firms came to cater to Nokia and after its downturn, a few competent international actors opened new sites in Finland to recruit talent that worked for Nokia or its subcontractors. However, the overall number of competent multinationals, especially active serial startup acquirers, is low[80]. In addition, the corporate venture capital activity of Finnish industrial companies has decreased significantly since the early 1990s, and statistics for this activity are not compiled. Nokia Growth Partners[81] is the biggest actor in the field.

In summary, the above-covered activities after the mid-2000s can be considered to form the third large attempt to foster the emergence of the private venture capital market in Finland. The first took place in the 1980s and early 1990s, the second began in 1995 with the establishment of FII, and now the third phase can be seen to consist of FII's, Finnvera's and Tekes' more recent activities and the internationalization support related initiatives. However, many of the problems that were documented in 1990 still exist. The recent evaluation of FII (see Saarikoski, Roine, Ruohonen, Halonen, Sulin & Lebret 2014), for instance, shows that market failure in venture capital remains despite the over-20 years that FII and other public actors have been attempting to fix it. This is the case despite

[78] Http://www.industryinvestment.com/news-and-publications/news?id=51151096

[79] See, for instance, www.fiban.org and https://ssl.businessangels.fi

[80] In addition, on the exit market side, the NASDAQ OMX HELSINKI (Helsinki Stock Exchange until 2007) has not attracted a significant number of venture-backed IPOs.

[81] Http://www.nokiagrowthpartners.com

significant government investment in these activities: FII alone had received 560 million euros from the Finnish taxpayers by 2014 and Finnvera another 182 million euros for venture capital investments by 2013. Overall, the public investments in the area are much larger when the high number of different initiatives with a touch point on startups, internationalization and growth are taken in account.

Second, the size of the public system supporting entrepreneurs and firms has grown to become very large, considering Finland's 5.4 million population. The findings from Saapunki, Leskinen and Aarnio (2004) and Paasivirta and Saapunki (2005) enable a picture of the scope of the infrastructure: the core of public support service organizations consists of 20-30 organizations that offer advice, development, financing and business services to established firms and new entrepreneurs in up to 1 200 service points across Finland. These organizations include, for instance, enterprise agencies, incubators, technology and expertise centers, and regional development companies. They provide over 200 different services, including 54 different financial services and instruments alone. In addition, there are thousands of EU-funded projects offering services to companies. The entrepreneurship- and firm-focused service points employ approximately 13 000-16 000 persons in total, out of which 4 500 work directly with customer firms.

The numbers are accurate today and result in a substantial infrastructure cost: together, the government and municipalities pay up to 700 million euros annually in salaries and fixed costs (Pietarinen 2012). Moreover, in 2012, there were over 50 incubators and 30 technology centers (ibid).

This stable structure of resource allocation represents the entire decision- and policy-making infrastructure for growth entrepreneurship and startups; thus, the overview is important to internalize. As discussed, out of the public sector actors, the most relevant for winner generation are Tekes, Finnvera (Avera and Veraventure), FII and ELY-centers, located under the Ministry of Employment and the Economy (TEM), and partly Sitra and Finpro. These organizations specifically employed almost 2 700 persons in 2010 (table 10), out of which over 800 are serving and financing customer firms with over 160 million euros in operational expenses. The numbers have not changed significantly in 2014.

Table 10. Key figures of firm finance and service organizations at TEM-concern 2010 (edited from Puttonen 2010).

	Personnel, total	Firm finance and service personnel	Operational expenditure (M€)
Finnvera	438	317	41
FII	23	15	4.7
Tekes	382	280	33
ELY-Centers	1 841	228	86
Total	2 684	840	164.7

Finally, the identified key events, contextual conditions and outcomes of the structural and institutional evolution process of the Finnish startup industry are summarized by a timeline (figure 11) covering from the 1960s until the present.

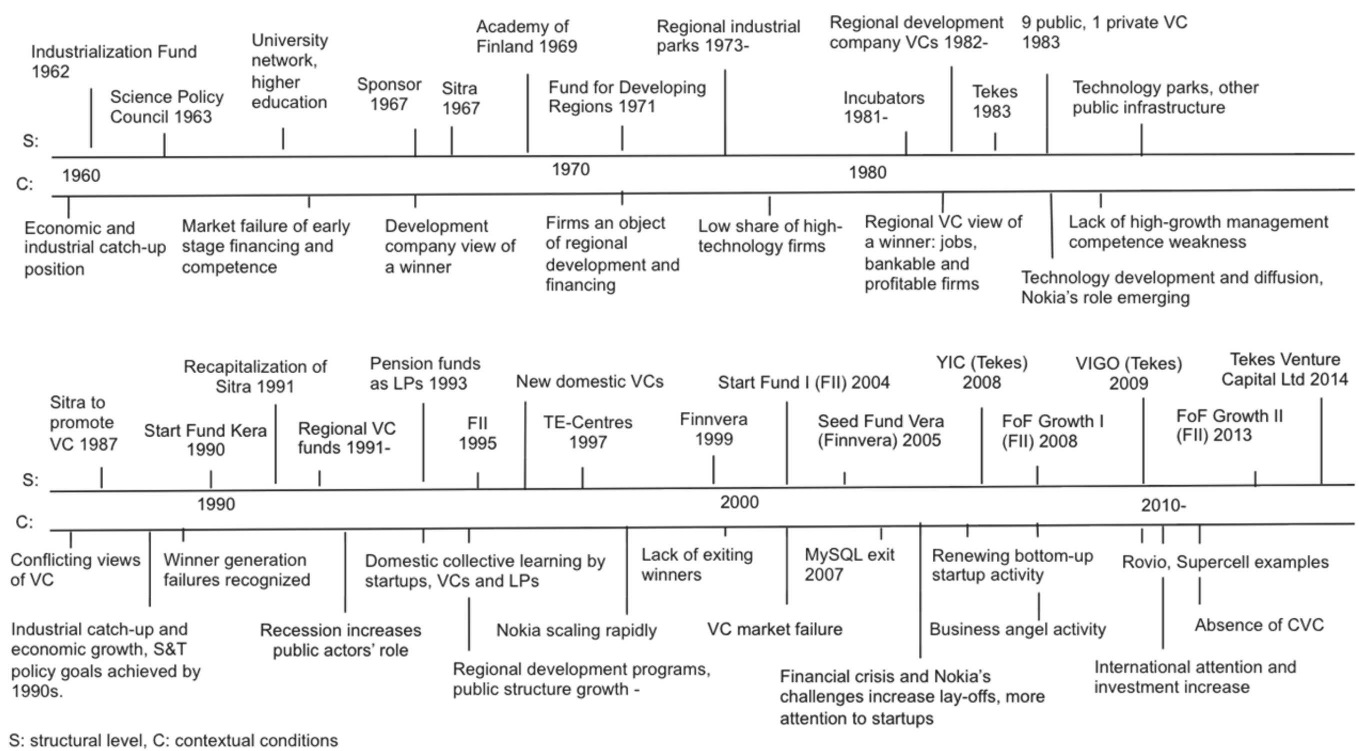

Fig. 11. Timeline of structural and institutional evolution process in Finland 1960-2014.

5.1.2 Perceived winner

The path of historical evolution covered above has resulted in a situation that lacks a clearly aligned and institutionalized view of a winner. Instead, the data show that unsuccessful attempts to resolve the early stage venture capital market failure and the long-standing dominant role of public actors complementing a structurally incomplete startup industry cumulate in a multi-voiced and contradictory perception of a winner. Most of the public actors have multiple objects of activity across both economies simultaneously, do not solely focus on startups and are not directly accountable for the outcomes in startup-related activity.

Under such rules and division of labor, startups as objects of activity are strongly mediated by market failures and the variety of policies as discussed above. The following comment from a director in a large regional development company (approximately 60-80 public officials) describes the organization's main goal, which includes pursuing startups among other objects of activity:

> *"We aim at creating 5 000 new jobs for different business fields regionally…our operations are divided on the basis of this goal."*(Director, regional development company)

This type of public organizations work widely with different actors within economy 1, such as universities and established companies, but often also spearhead initiatives around different types of entrepreneurship, including high-growth venturing and startups. There is interest in startups and growth because of the known positive implications of the success stories, and there is no contradiction in pursuing this area from the experimental winner generation perspective per se. However, the mediating role of the rules, community and division of labor provide a basis for understanding the inconsistent and multi-voiced perceived winner.

First, an important lure attracting interest in the entrepreneurship-focused activity of many public actors is the possibility of creating new firms, specifically the Business Identity Code[82], and the number of jobs[83] associated with them. These are among the most important measures of these activities and are followed

[82] A Business ID is given by authorities to identify businesses and organizations. See http://www.ytj.fi/english/business-id.

[83] The use of public business development tools creates a strong subvention to these jobs, especially at the early stage.

and reported as results in aggregate, for example, in annual reports. Therefore, the public officials confronted by innovators and entrepreneurs, in addition to the offered financial support and business guidance, have the incentive to get a business legally formed so that a Business ID is created. Hence, one significant element defining a perceived winner is the formation of a new firm. A new firm is an important result that subsequently meets other goals of activity such as the creation of a certain number of jobs regionally to fulfill employment policy targets.

Second, a perceived winner is thus not understood by the strict investment readiness criteria used by business angels and venture capitalists because these are not consistent with the short-term volume goal of creating Business IDs and jobs. Here, the different (non-dilutive) public grants, loans, subsidies and development projects enter the process as business development tools used to generate the perceived winners. Indeed, it is the eligibility criteria set in these different financial instruments (54 alone in 2005) that largely define the perceived winner.

In addition, an embedded social practice exists within the public structure to perceive a winner through aggregated results. Another incentive of public actors is to connect the entire variety of new and established firms of both economies to public business development tools, startups included. This is well illustrated by the following comment from a former head of a growth entrepreneurship team within one of the key innovation system organizations regarding the measured results of the organizations' activities:

> *"It is based on measuring volumes. There are other indicators in the growth entrepreneurship services like revenue growth...so the indicators are ok. Or we started to develop them then [a few years ago]. However, it is in my opinion more about how many reports are done."* (Former head of growth entrepreneurship team, public innovation financier)

There is no accountability regarding what happens to object firms: the incentives and accountability basically end with getting them to use the offered services and business development tools from a systemic perspective. The generation of individual winners is second to the public good mandate of these activities. This activity is further strengthened by the (annual) budgets of different programs and actors, which create pressure to deploy the given resources to firms that make the selectivity criterion, which may be adjusted so that enough companies are taken into the programs. The perception of a winner can therefore change based on such situational practices as well.

A third element affecting the perceived winner and non-accountability in the generation of winners is the aggregation of results between economy 1 and the new-firm-focused economy 2, the startup industry included. This originates with the multiple objects of work and the not-specifically winner-generation-focused goals of actors and the policies behind them. An illustrative example is the above-documented Centers of Expertise program, which reports (see Ahola & Kortelainen 1997, Kanninen *et al.* 2007) results and impact using different measures such as the number of new firms, innovations and jobs but also by the number of jobs maintained, implemented projects, people trained and companies participating in the program activities (see also 5.1.3). These measures show how the established incumbents of economy 1 and the new firms of economy 2, regardless of their goals and ambitions, are placed in the same basket: the aggregated numbers are the result and the outcome instead of the generated or non-generated winners in the markets.

Findings from the data show how this broad aggregation of results and impact can be a double-edged sword in the long run and against the experimental winner generation process. The macroeconomic growth from the 1990s recession until the recent financial crisis, and especially the central role of leading companies such as Nokia and its cluster, were strongly driving results on a systemic level. At the same time, there was no accountability regarding the generation and scaling of the next potential winners into actual winners in the markets. The following comments provide perspective on these conditions:

> *"This is mean to say, but the fact is that during the boom years, if you had a functioning fax machine to print out an order from Nokia, you could make a living if you found employees [engineers] and office space...The other problem was that companies did not need to think about their own products or services*[84] *because of the fax machine and these orders...Only really few companies thought about their own products."* Program director, incubator program)

> *"There was a five-year period after Nokia's hiccup in 1993-1994 when we did not need to do any sales operations...all the employees we managed to get*

[84] Nokia incorporated SME products into its own products, which led to a situation in which some subcontractors did not create their own brands or own intellectual property rights or products that could be marketed outside of Nokia (see Ali-Yrkkö & Hermans 2002).

> *hired went there [Nokia orders]...this continued until approximately 1998-1999; if you had competent people, you could sell them to Nokia [projects].”* (Serial entrepreneur)

Thus, for a long period of time, companies that were perceived to be winners in the eyes of the public actors did not need to develop their own products and the competence to market and sell them to other customers internationally. In other words, companies did not need to address the business-building and scaling competence gaps that were documented above. A significant share of both the new companies and the jobs reported, e.g., in the CoE program, were in fact Nokia's partner companies operating under the conditions described in the quotations. The non-accountability on an individual winner-level and the aggregation of results created a biased perception of the public systems' performance and importance for the creation of the measured numbers and results. As the results were good on a macro-level and the economy was growing, the innovation system could grow bigger and obtain more resources annually, leading to its substantial size.

It can be even questioned whether the innovation system activities and its actors were the actual perceived winner, and the growing economy and both established and new ventures were just mediating tools for achieving the results, rather than firms being the main objects with subjective importance as primary actors. This notion is further supported by the high positions of Finland in various international rankings for several consecutive years. The following comment notes the opportunity provided by Nokia’s success and how this opportunity was missed due to non-accountability in the area of generating the next new winners:

> *”About ten years ago, we really had an opportunity, resources to start to do these things [build high-growth ventures], because Nokia was growing fast and employment was secure in the region. Then this [startup] mode and competent actors could have been built on the side [by now], but the resources were mainly geared towards the Nokia phenomenon, as things were fine. Now, the situation is tough.”* (Expert, regional development company)

Of course, this is not to say that more ambitious startup-related thinking does not exist in Finland. The above-documented bottom-up activities and a few recent success stories indicate that quite the opposite situation could be emerging. In the following, a comment from one of the most successful Finnish startup CEOs first describes the challenges of the historically embedded thinking in Finland, followed by a comment from an internationally experienced Finnish venture capitalist representing a more ambitious perception of the desired outcome defining a winner- one that no Finnish startup has achieved so far:

> *"In my opinion, the challenge is that Finland as a country is linearly progressing. That inflation is some percent and population grows some percent: everything is linear there. However, this area that we are now talking about, VC funded or VC-funded ICT companies, is exponential and requires a totally different mindset in which you think, like, in 10x-models, and think that "how I can improve this 10 times" and "how I can grow 10 times."* (Experienced startup CEO)
>
> *"A NASDAQ IPO."* (Advisor of venture capital funds, former venture capitalist)

The key triggers for the emerging, more ambitious thinking regarding the perceived winner are not in the public system per se but are driven by external factors. These include Nokia's difficulties and their consequences, the restructuring of historically dominant Finnish industrial sectors, an aging population structure and the recent financial crisis, which together have accelerated unemployment and other macro-level industrial and economic developments. This has resulted in a situation in which there are fewer avenues for economic growth, causing increased political and public discussion around entrepreneurial ventures and startups. However, the most significant enabling drivers from the startup industry perspective have been grass-roots activities, the example set by competent startups such as MySQL, Rovio and Supercell, the increased capital efficiency of startups, the Internet and mobile-enabled access to large markets, and changes in the behavior of international venture capitalists. The following comment describes the latent potential:

> *"We have had programs where entrepreneurs are exposed to competent actors in and from the US, and I have seen how people can change. There is latent potential among entrepreneurs with the talent and capability to adapt, but they have not seen the "light", and lived and breathed that world."* (Expert, regional development company)

These latter developments have created contradictions at the startup industry level. The historically rooted view of a winner and the embedded social practices contrast with the emerging perception of a winner as an international market leader and the activities mediated by this from outside the system adopted new object of activity, causing structural tensions. This has created a secondary contradiction between the centralized public structure, including its rules, and division of labor resulting in more startup-related discussion and activities such as the covered Vigo program and a few reorganizations of early stage public finance instruments. Still, the public structure is institutionally dominating, though there is a small and growing breed of successful serial entrepreneurs, accelerators and financiers that have the needed competence and perception of a winner and can serve as role models.

In conclusion, a qualitative expansive transformation regarding the definition of a perceived winner is occurring. The recent changes and examples show a deviation from the embedded historically perceived winner-mediated activity as individual actors have started to collaborate, learn and envision an alternative view of a winner and the direction of the necessary activity. This deliberate collective change effort is gaining more institutional attention and, together with the covered external triggers and enablers, is likely to continue and redefine the perceived winner one actor at a time.

5.1.3 Winner generation

The corollary of the structural and institutional evolution of the Finnish entrepreneurial environment is that it lacks a sufficient number of actors organized over markets to competitively select and add value to the scaling of most potential ideas, innovations and startups. Startup-relevant business-building competence has been a systemic gap since the Bank of Finland first noted it in the mid 1960s, although the pool of competent actors has recently started to slowly grow. Together with the inability to solve the over 20-year-old venture capital market failure, the outcome is that a critical mass of competent actors who live and die by their ability to contribute to generating winners has not developed. Hence, the prevailing institutional set-up and division of labor places the centralized structure in a power position in relation to innovators and entrepreneurs - they cannot access a competent, vertically complete and horizontally varied startup industry. The functioning of the two mechanisms of winner generation and organization, which should minimize the incidence of the two errors and of failures in resource allocation to new ventures, are analyzed next against these premises.

First, the mediating role and institutional voice of the venture capital industry (cf. Florida & Kenney 1988a) has historically been weak, and the understanding of venture capital has been under-developed and conflicting. The ambition level, criteria for venture capital-backed innovation and scaling of startups did not institutionalize to shape the perceived winner and to coordinate startup industry actors' activities. Finland failed to develop an antithesis to the culturally strong SME owner-manager and modest growth ambition view of entrepreneurship, and to the public actors' perceived winner on a scale that would align the startup industry actors' motivation and direction of activity at large towards opportunities based on investment readiness and high-ambition winner generation[85].

Instead, because of the centralized structure, a predominant share of the actors working with innovators and entrepreneurs are neither instrumented nor incentivized to search for potential big winners and lack accountability for turning them into success stories. While the amount of available public finance is substantial, almost all of it is non-dilutive, and the private risk capital market is small; these conditions create incentives for innovators and entrepreneurs to approach public actors. Consequently, the selection and generation of potential winners (mechanism 1) is placed more on the shoulders of public actors and guided by their above-discussed policy-based characteristics of a perceived winner.

Due to the absence of an institutionalized venture capital voice and industry, the criteria of eligibility (basis of selection) in the different public instruments have been a defining factor in setting the requirements for what receives funding. In most cases, the criteria are rather loose, far from the investment-readiness used in competent investors' selection, and dispersed to meet the more specific requirements of different public support instruments. This causal power affects the economic actors in the surrounding environment: they see which projects and startups obtain funding and compare their own cases against them. Thus, the ambitious search for potential big winners that can be scaled on the international markets has not directed the functioning of the Finnish startup industry and its mechanisms of winner generation. The following comments illustrate how these analyzed factors manifest as embedded in activity:

> *"When I was a steering group member in [one public financier's] technology program [a few years ago], the startups that talked about aiming to achieve*

[85] As discussed, the expansive transformation in this area is recent and ongoing.

tens or a hundred million in revenue instead of millions were always "laughed at" as too unrealistic…Most of the Finnish VCs also play a smaller-scale buy-out game; only a few aim at big successes…To many actors, plain growth is enough; 5-20 percent is growth." (Expert, regional development company)

"Growth needs to be controlled…one element in high-growth firms is that often the entrepreneurs have to take risk finance and they lose ownership…It is not in the interest of anyone to lose ownership; when you grow the firm, you end up with nothing in hand." (Program director, incubator program)

"There has been a culture that entrepreneurs want to do it themselves, without sharing the ownership." (Key account manager, regional development company)

In other words, experimental winner generation, as defined in theory, has not been a shared object of systemic activity or a primary driver for a significant share of the Finnish startup industry actors. Startups are not a shared object of work in the process of winner generation for public actors per se but are more like one object of interest among multiple objects of activity and targets for the allocation of public funds as defined by different policies. A case in point is that despite the many covered policy initiatives aimed at addressing innovation, entrepreneurship, and growth through internationalization, for a long period, there were no specific policies targeted at high-growth entrepreneurship and startups[86]. The latter were treated alongside other forms of new and established firms within the public support system until very recently. Indeed, as the amount of public finance annually is between 1-2 billion euros (see 5.1.4), its allocation has become a key driver in the hierarchy and a goal of public structure activity. The following comment captures how this affects the rules of the game and the direction of players' activity:

"Most of the actors are in this national and regional paradigm… involved in this regional system, and do not understand that they should serve the region by connecting to the core-players in the growth-venturing field internationally… Instead, the word "high-growth firm" is just taken as terminology because it is currently fashionable, but the activity itself remains

[86] Only during the last 5-8 years have more specific initiatives such as the Vigo program been implemented. These were driven by external factors as discussed above. See also Luukkonen (2010).

the same as before with some modifications to fit the growth theme." (Expert, regional development company)

The initial filtering of innovative ideas, projects and startups and the selection of potential winners (mechanism 1) emphasizes quantity, and in many case, the actual selection is pushed later to the firm's evolution in the markets. For instance, with the incubators that started to develop in the mid 1980s, the practice has been to take in many different types of companies (the incentive to create Business IDs), to connect them to different public business development instruments and services (secondary result), and to a lesser extent expose those with apparent potential to the private business angel and venture capital actors – collaboration with them has not been consistent. So, controlling the incidence of error 1 is not the focus from the outset, as creating new firms and jobs are the important result[87]. In this sense, the innovators and entrepreneurs are entering a game played by public players without necessarily realizing their role. Exposure to competent and varied evaluation and resource allocation with the right incentives for those startups with the most potential is not systematic. The following comment describes the selection criterion used by one of the many regional incubators and provides an example of the requirement level and ambition:

"In our incubator, the companies must aim to at least employ five persons in the future, so the self-employers are cut out." (Director, regional development company)

The number of companies within the incubator process indicates the importance of fostering quantity in the overall generation of potential winners. Out of the current estimate of 50 different incubators, the Finnish Science Park Association (Tekel) and its member incubators provide an extensive manifestation of this process in practice. The 24-26 Tekel incubators had approximately 2 400[88] companies within the incubator process in 2006, with as many as 30-40% of applicants being accepted (see Ruohonen 2007). Consequently, the filtering of weak projects at the very early stage has been loose. At the other end, the survival rate of the incubated companies is high, and the firms grow somewhat faster than

[87] Many early incubators were real estate connected, so when a new firm is established or taken in, it represents a potential tenant whose rent is, in many cases, publicly subsidized. This further biases the filtering of bad or losing projects.

[88] It can be estimated that given the recent emergence of different incubator and accelerator initiatives in Finland and the decrease in firm establishment cost, the number has at least not decreased from this.

their non-incubated peers in similar industries in Finland, but the difference is not significant (Hytti & Mäki 2008). The defined perceived winner that is giving sense and meaning to the activity signals low risk, low-growth ambition, and a lack of pressure to control for errors 1 and 2. Indeed, the logic for the incubators has been not on high-risk and high-potential startups and accepting them into the incubator process but to balance a high number (more Business IDs and, in some cases, tenants) knowing that the bad projects will be filtered out over time (cf. ibid). Most of the actors making the selection lack the upside incentives and accountability for the outcome.

The orientation towards lower-risk business experiments and moderate execution is also supported by the failure rate of Tekes-funded companies, among which startups are also included. Out of its 5 000 customers annually, only 1% declare bankruptcy every year, for instance, 67 companies in 2013[89]. The rate is similar to the bankruptcy rate of all Finnish companies annually. This number is ambiguous, however, as Tekes also operates at the idea stage, which is also the most risky; hence, the failure rate could be assumed to be higher if high-risk and high-reward cases were clearly targeted[90].

In addition, with the quantity emphasis, the number of companies per incubator manager (typically with limited startup-relevant experience) becomes so substantial (10-15 per manager) that the ability to contribute to the development of an individual case is limited in practice (cf. Ruohonen 2007). This situation is contradictory from the winner-generation perspective, as the importance of exposure to competence and value-added at the early stages is particularly emphasized with first-time entrepreneurs, who are often competent in other areas such as technology while lacking entrepreneurial competence. The following comment from one of the most successful Finnish startup CEOs discusses related professional career experiences that also include a failed venture-backed startup:

> *"When I was younger and a less experienced CEO, I would have needed someone [investor] who had been hands-on and helped. Now when I have experience, I do not need them. Now I need those that are smart and have wisdom of life and business wisdom that know to ask the right questions of*

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[89]This number represents established economy 1 and new firm customers that have received financing during the last five years or have received loans from Tekes. See http://www.tekes.fi/Global/Tekes/Tekesin_tunnusluvut_2013.ppt

[90] The bankruptcy ratio is suggestive and must be viewed with discretion, as the pool of funded companies is vast and specific information for the failed companies is not available.

me, but are not in any way involved with any concrete thing...However, when I was younger, it would have been beneficial, but I dealt with investors who did not provide any concrete benefit." (Experienced startup CEO)

This comment underscores that the startup-relevant competence gap and small private risk capital market must also be acknowledged here. They create preconditions in which competence should be instrumented in the actors working with innovators and startups, such as the incubators or accelerators. For experienced startup entrepreneurs and managers, the lack of coaching is not a substantial problem, but as their number is limited, incubators and public actors become relevant in this role. Historically in Finland, it has been difficult to find a network of competent mentors and actors with various relevant backgrounds organized to deliver mentorship, coaching and value-added at the early stages to entrepreneurial teams.

Second, the historically prevailing lower risk and ambition level selection, the available access to various public business development instruments and the lack of accountability for the outcome for public actors have led to conditions where the competitiveness and systemic pressure to execute, to progress or exit markets has not been an embedded causal power affecting to entrepreneurs in winner generation. The vast amount of public support instruments and programs offer, in many cases, new vehicles for funding a part of firm's activities even without progress in the business experiment (keeping bad or losing projects alive); there is no demand for rapid execution at markets[91]. This is another area where a competent venture capital market could play a critical role, as the basic venture capital cycle already requires focus on accountable, staged execution and embeds a forward-directing pressure in all activity. The experiences of a Silicon Valley-based entrepreneur and startup executive working with Finnish startups illustrates the embedded elements of winner generation in Finland in this regard:

"Right after the company was funded [by Finnish VCs], they went into vacation for a month, I thought that was a working vacation because they were in a startup…the product was not done, we needed to set up office in the US and ship the product in four months…I could not get in touch with anybody for the first two weeks, and nobody thought that was important…so,

[91] In fact, it has been recently noted that some public actors have "regular customer" companies receiving public support with regularity against temporary market failure or inefficiency[91] (cf. Koski &Ylä-Anttila 2011). A related series of research reports on subsidies in Finland can be found at http://www.etla.fi/en/category/publications/.

> *the sense I had was that there was a very different sense of what a startup was. There was no understanding of what is a funded startup. People worked nine to five, normal hours…The employees had no ownership of the company, so they did not have any upside, and many threated to leave the company when asked to work late because of the time zones."* (Silicon Valley entrepreneur, startup executive)

Due to the small domestic markets of Finland, scaling needs to be directed toward international markets in the majority of cases, which raises the competitiveness and demand level. This is likely to increase further in the future, as more startups are launched and funded globally. The importance of high ambition levels, a sense of urgency and accountability in executing, and scaling potential winners (mechanism 2) toward international markets is manifested in the following comments of a Finnish venture capitalist and, again, the Silicon Valley-based entrepreneur and startup executive:

> *"It is really rare for a startup to have an idea that nobody else has not invented somewhere in the world. Many come to us telling us they have a unique thing. We do still find a somewhat similar invention from the US, Israel or elsewhere. So, it is more about the execution that defines success. Which team gets the business going fastest, finds the customers, and has the contacts in the world."* (Venture capitalist)

> *"I met the board [of the Finnish company to be merged with] and talked about what Silicon Valley was like and what the opportunities in the US were…the fact that it is a large multi-billion dollar market with many competitors, dynamism…and how we want to build this company fast and big quickly…They send me out for ten minutes, and after that I heard the deal [merger] was cancelled because they just wanted to build a nice, solid company. That was a clear cultural clash; I did not realize that was general to Finland…In Silicon Valley, we have to do it that way, otherwise there is no point."* (Silicon Valley entrepreneur, startup executive)

On the whole, these discussed characteristics of winner generation are somewhat analogous with the notion of the Finnish welfare state. Finland's policies treat everyone equally and aim to give everyone a fair chance and have not been historically focused on identifying the best individuals and selecting them. Combined with the industrial and economic growth elements that were discussed in the structural evolution analysis, the organizational emphasis on quantity in the creation of new ventures can be understood when embedded into this socio-economic context. Indeed, the key public actors state that they are not picking winners or industrial growth sectors; instead, their role is to create conditions that support entrepreneurship and growth[92].

Hence, the organization of the Finnish startup industry due to the strong complementing role of public actors produces many potential winners (mechanism 1) that are, however, defined mainly based on the perception of a winner by the public actors. On one hand, this is good, as many entrepreneurs get their chance to experiment. On the other hand, typically public instruments require private funding from the entrepreneurs; they are not 100% covered and, in most cases, are paid after expenses have occurred. This sets some restrictions and creates inertia and bureaucracy that slow the execution of business experiments. However, more importantly, the lack of competent and incentivized strict evaluation prior to the decision to allocate public resources pushes more entrepreneurs to invest their own money in low-quality business experiments, which is counterproductive for controlling the error 1 and not a desirable societal situation despite the positive intentions.

Against this historical continuum, the Vigo accelerator program was indeed a deviation and was the first time that startups were exposed to experienced teams of Finnish entrepreneurs and managers at the early stage. This line of winner generation is emerging and organized differently than the socially embedded, public-actor mediated activity and is hence analyzed here as a separate track. However, even in the Vigo program, the final funding decisions are made by public officials who are informed by the accelerator teams' recommendation. Nevertheless, the Vigo program can be considered to be institutionally positioned to act as the primary instrument for generating investment-ready companies (mechanism 1). While it screens deal flow nationally, the accelerator companies are physically located mainly in the Southern parts of Finland, especially in the Helsinki region.

Combined with the characteristics of the perceived winner, these elements form the embedded causal powers affecting the mechanisms of winner generation within the Finnish startup industry. In the following, the analysis shifts to understanding how the mediation of these mainly qualitative elements is

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[92] E.g., Prime Minister's Office Publication 20/2013 http://vnk.fi/julkaisukansio/2013/j18-vn-tuse-fi-19-sv-20-en/PDF/en.pdf

manifested in the mechanisms' functioning in quantitative terms to understand the selection and volume of resource allocation to winner generation.

First, the number of high-growth-ambition startups out of the pool of new firms is difficult to estimate accurately. According to Statistics Finland, there were over 31 000[93] new firms established in Finland overall in 2012, which is in line with the long-term annual firm creation numbers. This is the macro picture of new venture creation for economy 2 as a whole. Out of the nascent firms, the number of startups seeking early stage venture financing (deal flow) is estimated to be from 800-1 000 per year (Maula *et al.* 2006) to 300-600 estimated by Fiban and Finnvera[94]. The increased grass-roots activity and startup discussions and the described external drivers give reasons to suggest that more than 1 000 startups are aiming for high growth, depending on the stage and ambition level considered. In comparison, Tekes as the primary public financier of startups has approximately 500 new customer companies from both economies annually.

The data of Vigo accelerators, business angel and venture capital investments enable the detailed capture of how many startups out of this pool are picked under mechanisms 1 and 2 by stage[95]. It can be assumed that these companies, especially the venture-backed ones, have a more ambitious winner-generation mindset. The high number of companies under the Tekel incubators as such, while illustrative in many ways, is not representative of these firms because the acceptance filter is rather loose and not targeted to select only the highest-potential firms.

Regarding the Vigo program, by June 2012, Vigo accelerators had cumulatively screened over 4 800 proposals, out of which 53 accelerator agreements were eventually signed (cf. Autio *et al.* 2013). Consequently, the selectivity and logic of winner generation is different than that described for the Tekel incubators and illustrates the emerging, more ambitious perception of a winner. According to the program website, there are currently 80-90[96] accelerator portfolio companies at different stages of the program. The total venture capital

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[93] See http://www.stat.fi/til/aly/2012/aly_2012_2013-10-24_tie_001_en.html. In addition, 64% of Finnish entrepreneurs were self-employed and did not have any employees in 2011; see https://www.tem.fi/files/37613/TEMjul_25_2013_web_07102013.pdf.

[94] See http://www.slideshare.net/FiBAN/fibans-angel-network-for-entrepreneurs.

[95] Naturally, there are many growing and expanding companies outside of the angel- and venture-funding mechanisms, but these are rather difficult to capture at a systemic level, and their development tends to be longer term and their risk level lower than is the case with venture-backed startups.

[96] See http://www.vigo.fi/companies. Visited 2.4.2014

raised by the accelerator companies recently exceeded 220 million euros, enabling the program to achieve its initial 200 million euro target[97]. Out of this, 160 million euros came from foreign private investors and business angels; Supercell's 100 million euro investment is included in the figures. The activity around the Vigo program represents the focal point of the ongoing qualitative transformation of the perceived winner and the process of winner generation.

The quantity and quality of deal flow to Vigo accelerators was recently considered to be slightly positive (slightly over three on a one to five scale) in quantity and quality terms (see Autio *et al.* 2013). This indicates how the need for competent value-added for nascent startups is critical at the early stage of the winner generation process. An experienced venture capitalist commented on the deal flow as follows:

> *"We see hundreds of startups annually. Their quality has increased during the ten years I have been screening them. There is education available… people, even first-timers, have a relatively good hunch of what this is about, especially the few serial entrepreneurs, who have either exited companies or gone bankrupt. Volume is high and quality is reasonable… So, the attitude has improved. It is an acceptable career choice to be a startup entrepreneur… It is not a crazy choice anymore."* (Venture capitalist)

In addition, another example of an accelerator is Startup Sauna[98], which is built on top of the grass-roots entrepreneurial activity at Aalto University in Helsinki and represents high-growth-ambition focused winner generation. The program has graduated over 100 companies since 2010 that have raised over 25 million euros of financing (public and private), and it has built a network of competent advisors and mentors who operate without direct compensation. The emergence of different types of incubators and accelerators appears to be timely, as a variety of them have been recently established in different areas of Finland. This tendency appears to be following international trends and is at a rather early stage for outcome assessment.

Second, the role of business angels and networks in the generation of potential winners has increased during recent years. Business angel activity has been slowly building and organizing in Finland and can be considered to be active on a European level. The number of investing angels has especially grown

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[97]See http://www.vigo.fi/press-release/-/view/5620
[98]See http://startupsauna.com

because the lower capital need of startups has enabled more people to become business angels. It is estimated that there are circa 500-1 000 business angels in Finland investing approximately 50 million euros annually[99]. For instance, in 2013, the Fiban business angels saw 380 companies (deal flow) and invested 11 million euros in 169 companies, out which 99 (59%) were initial investments (14 million euros to 69 companies with 34 initial investments in 2012). There were a few larger investments (below 500 000 euros), but the typical investment size varied between 10 000 and 50 000 euros (median 25 000 euros), 57 companies (35%) received sweat equity investments. Most of the investments were made at the seed and startup stages (early stage): in 2012, seed firms received 23% and startups 38% of investments by stage, while in 2013, the distribution was 13% and 47%, respectively. The private capital from business angels, entrepreneurs and venture capitalists alike enables startups to obtain more financing by leveraging public business development instruments (see table 15).

Third, the venture capital investments illustrate the current investment volume and the number of venture-backed startups under the experimental winner generation process during recent years. In 2008-2013, Finnish startups attracted between 80 (2012) and 129 (2013) million euros in investment annually, with the majority coming from domestic venture capitalists (table 11). The number of funded companies has varied from 127 (2011) to 204 (2008), out of which were 53 initial investments and 103 follow-on investments on average for the five-year period. It must be noted that due to strong public intervention, a significant number of investments by public venture capital actors are represented within the domestic venture capital figures. Their share has varied from 35% (2008) to 55% (2012) during the same time period. The statistics show that government initiatives have not led to the emergence of a proper domestic venture capital industry.

[99] Out of the 50 million euros, 10 million is public money. This estimate is based on a survey by Fiban and Finnvera; see http://www.slideshare.net/FiBAN/finnish-business-angel-activity-2013-finnish-business-angels-network-fiban. See also https://www.fiban.org/about.

Table 11. Total venture capital invested (M€) and number of invested startups 2008-2013 (calculated based on data from FVCA).

Venture capital	2008	2009	2010	2011	2012	2013
Investments M€	120	91	105	86	80	129
Share of domestic VCs	105	84	86	60	70	90
Public venture capital share of domestic VC	35%	42%	47%	55%	55%	44%
Initial investments M€	-	38	39	27	32	32
Follow-on M€	-	47	60	51	51	71
Initial investment, firms	-	66	49	34	47	71
Follow-on, firms	-	108	112	94	89	113
Firms, total	204	169	158	127	134	174

The number of startups in Finnish venture capitalists' portfolios was estimated to be at least 262 by the end of 2012, but considering the investments in 2013, the number is likely to be close to 300. Combined with initial and follow-on investment and angel and accelerator statistics, it can be estimated that approximately 100 new startups were selected within mechanism 1 annually[100], with an approximate 400-500 within the entire winner generation process. However, the range can be lower or higher depending again on how a startup is defined.

The allocation of venture capital investments between the two generative mechanisms and between public and private venture capital actors can be analyzed in detail based on investments by stage (table 12). In addition to business angel investments, the generation of potential winners (mechanism 1) is examined by seed and startup-stage investments. The total seed-stage investment volume has varied between 3 (2011) and 9 million euros (2008, 2009). As a comparison, the record seed investment year was 2002, with 29 million euros invested in 95 deals. The number of seed companies funded by venture capitalists has been decreasing from 57 startups in 2008 to only 11 in 2013. The role of public venture capital has defined this trend as they have made almost all

[100] These estimates must be considered only as suggestive. For instance, (1) the angel investment community is getting organized, and the number of initial investments varies, (2) the investments are small on average and, given the historical context, vary in their perception of winners, and (3) many investments are not captured by the statistics.

investments; the 51%[101] share in 2013 is an interesting deviation because it represents an all-time low for the public sector.

Table 12. Domestic venture capital investment (M€), number of funded startups and share of public venture capital investors (PVC % M€) by investment stage 2008-2013 (calculated from FVCA data).

		2008	2009	2010	2011	2012	2013
Seed	M€	9	9	5	3	4	7
	Firms	57	49	20	12	15	11
	PVC % of M€	86%	93%	94%	100%	84%	51%
Startup	M€	64	50	62	52	62	70
	Firms	102	91	119	87	95	124
	PVC % of M€	47%	45%	59%	47%	51%	43%
Later	M€	47	31	38	31	14	52
stage	Firms	45	29	19	28	24	39
venture	PVC % of M€	7%	16%	22%	68%	61%	45%

The long-term low overall investment level and the minor role of private venture capitalists at the seed stage show how, in addition to non-dilutive public business development tools, startups have faced mainly public actors for equity-based financial instruments. Another element likely affecting the increase of private venture capital at the seed stage in 2013 is the increased activity of business angels, the Vigo accelerator and other grass-roots activity that have produced a better quality deal flow for venture capitalists.

At the startup stage, the total investment volume has varied from 50 (2009) to 70 million euros (2013), which is the record at this stage historically as is the 124 funded startups. The average has been 103 funded startups annually at this stage. The role of public venture capital actors is smaller (49% annual average), presumably because of the lower risk level than at the seed stage. Later-stage investments clearly represent the scaling stage (mechanism 2) and are critical for minimizing the incidence of error 2. The investment volume has varied from only 14 million euros in 2012 to 52 million euros in 2013, and the number of funded companies is smaller, varying between 19 and 45 in 2008 and 2009, respectively. Here the public sector's role varies significantly, representing 7% of invested capital in 2008 and 68% in 2011. Hence, Finnish private venture capitalists

[101] This is the third time in the history of Finnish venture capital that the public sector share of seed investments is below 74%; two other deviations based on FVCA data were in 2000 (56%) and 2002 (56%).

appear to be most active at the startup stage, as measured by the number of funded startups, which is normal for portfolio building. However, as measured by invested capital, they also invest the most at this stage rather than at the later stage, which is unexpected because the scaling of potential winners into winners at later stages presumably requires more capital.

Given the small domestic market and the need to scale on international markets, the average investment size by stage captures the resource allocation to individual potential winners and simultaneously illustrates the perceived winner and ambition levels (figure 12). Due to the small overall investment volume, the average investment sizes are also small, given that the variation between individual deals can be significant. The seed investment size has been growing from 0.16 million euros in 2008 towards 0.63 million euros in 2013 – the increased selectivity of private venture capitalists doing fewer deals can be seen in this. Surprisingly, the average startup investment size is not significantly larger, representing 0.59 million euros between 2008-2013. The average later-stage investment is slightly over 1 million euros, with the 2 million average in 2010 being an exception. This indicates the above-documented investment gap and the lower-ambition perceived winner in practice.

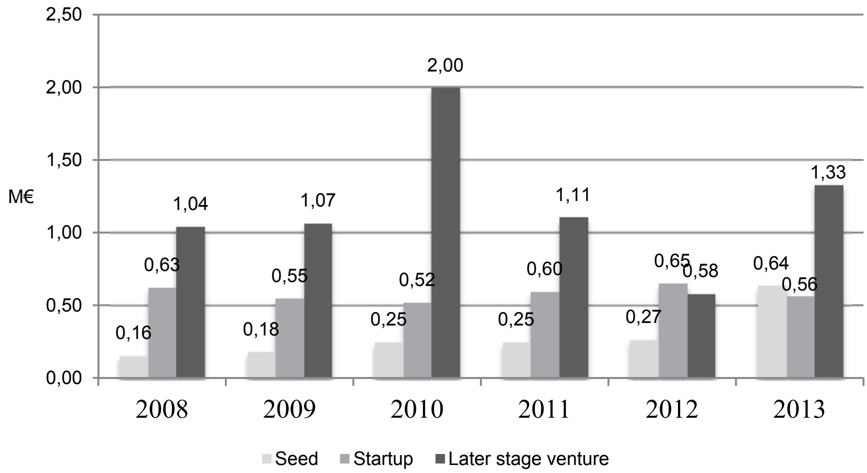

Fig. 12. Venture capital investment in Finnish startups by stage, number of startups and average investment size 2008-2013 (calculated from FVCA Yearbooks).

However, due to the increased internationalization of entrepreneurship and entrepreneurial finance potential, Finnish startups have attracted more international investments to compensate for the modest domestic venture capital activity. The example set by the success stories and changes in the environment have increased the interest and likelihood of attracting foreign venture investments. The following comment from the successful startup CEO discusses how this change is rather recent and new historically:

> *"Venture capital has changed in the sense that now there are, both in London and the US, investors that are ready to invest in Finnish companies. We did not have that during the early days of [the name of the previous startup], they would not have done that, but they do now. So in that sense, the weak venture capital field in Finland is a smaller problem currently because the establishment cost of a firm is really cheap without requiring lots of capital. On the other hand, when you get some momentum, then you can get venture capital from London or even the US."* (Experienced startup CEO)

The change is captured by the increase in foreign venture capital investments in 2010-2013 (table 13). The FVCA data do not cover all international investments in Finnish startups; hence the data from International VC Zone enable expanding the lens of inquiry on venture capital and business angel activity. Especially in 2011 and 2013, the large financings of Rovio (30.4 million euros) and Supercell (100 million euros) raise the total foreign venture capital amount significantly. This has been a crucial development in the winner generation process, especially among the startups within the scaling phase (mechanism 2).

Table 13. Estimated total investments in Finnish startups by business angels and domestic and foreign venture capitalists 2010-2013 (calculated from FVCA and International VC Zone[102] reported data).

Investor type	2010	2011	2012	2013
Business angels	7	8	10	21
Domestic VCs	86	60	70	90
Foreign VCs	21	64[1]	68	159[2]
Total M€	114	132	148	270

[1] Includes the 30.4 million euros investment in Rovio, [2] includes the 100 million euros investment in Supercell

[102] See http://www.vczone.fi/wp-content/uploads/2014/01/FINNISH-HI_FY2013_final.pdf and http://www.vczone.fi/wp-content/uploads/2012/05/VC_Zone_2011_Investment_Report_Finland.pdf

As the carrying capacity of domestic venture capitalists is limited, cross-border capital has started to play a role, compensating for this structural weakness in the Finnish startup industry by providing more opportunities for startups. In addition, the investments by Vigo accelerators and crowdfunding sources are estimated at approximately 20 million euros[103] in 2013, resulting in an estimated 290 to 320 million euros of investment in total when the latitude in angel investment estimates (10-50 million) is accounted for. This annual investment level for startups is at an all-time high, but the large Supercell deal biases the picture of the available market. It is also noteworthy that corporate venture capital activity practically does not exist and is not compiled in statistics or followed closely by the FVCA or other groups. The comment of an experienced venture capitalist captures the state of affairs in the domestic venture capital markets:

> *"I have to say that we do not have enough venture capitalists, so the whole does not work."* (Venture capitalist)

As the publicly supported R&D functions and education in universities and research institutes takes place broadly across disciplines, it is important to examine the horizontal scope of the winner generation process by dividing venture capital investments across industrial sectors. This way, the incentives of inventors, innovators and entrepreneurs in pursuing high-risk and high-growth-ambition startups in these different areas can be understood, especially in areas with a higher initial capital need than can be provided by the carrying capacity of business angels. The biggest sectors attracting investments in 2013 were computer and consumer electronics and life sciences, with 46% and 19% of invested capital, respectively (table 14). After this, the share of investments in other sectors is between 0-9%. The high-tech sector has a 40% share of investments.

[103]See https://www.fiban.org/sijoitukset-aikaisen-vaiheen-kasvuyrityksiin-kasvoivat-yli-280-miljoonaan-euroon

Table 14. Venture capital investment by industrial sector in Finland 2013 (based on data from FVCA).

Industrial sector	Investment (M€)	Investments	Firms	Share of total investments (%)
Business and industrial products	9	39	20	7
Business and industrial services	2	4	3	1
Chemicals and materials	12	11	4	9
Communications	7	30	23	5
Computer and consumer electronics	62	117	61	46
Construction	3	8	4	2
Consumer goods and retail	1	8	5	1
Consumer services: other	1	2	2	0
Energy and environment	12	25	10	9
Life sciences	26	66	41	19
Unknown	1	4	3	1
Venture capital, total	135	314	176	100
High-tech sector share	55	182	99	41

Last, the venture capital statistics are combined with some of the public business development tools available to startups, so that the proportions for the division of labor and resource allocation between public and private actors in winner generation can be captured in their entirety.

Table 15 shows the volume of Tekes' and Finnvera's funding instruments to under-six-year-old ventures in addition to venture capital investments in 2004-2013. During this 10-year period, the total annual public financing of startups has seen a more than twofold increase, from 80 (2004) to 175 million euros in 2013, and has climbed to 1.3 billion euros in aggregate. R&D loans is clearly the largest category with 486 million euros, followed by R&D grants (306 million euros), which are significant because recipients do not need to pay them back as long as the terms are followed. Compared to the size of public venture capital investments (381 million euros), the grant volume is notable. The NIY program, as the most recent initiative, has reached 141 million euros in financing to approximately 200 startups; this program particularly focuses on mechanism 2, as the recipients at the second phase of the program are starting to scale internationally and typically have venture capital financing as well. In addition, out of these statistics, Sitra made 5 direct and 9 follow-on investments, and 1 early stage venture capital fund investment in 2012. It had 82.6 million euros of direct investments and 91.7 million euros of fund investments on its balance sheet by 2012 (Sitra 2013).

Table 15. Total venture capital investment and public funding (M€) from Tekes and Finnvera sources to startups under six years in age 2004-2013 (calculated based on FVCA data)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
Public											
R&D loans	22	29	41	39	44	49	70	66	67	59	486
R&D grants	23	19	26	26	35	34	30	30	38	45	306
NIY, Vigo							4	11	9	6	30
NIY					6	18	17	22	22	26	111
Public VC	35	42	44	46	30	32	41	33	39	39	381
Total M€	80	90	110	111	115	133	162	162	175	175	1 314
Private											
Business angels					6	4	8	9	14	11	52
Other							2	3	9	20	34
Private VC	40	47	36	86	90	59	64	52	41	90	604
Total (M€)	40	47	36	86	96	63	74	64	64	121	690
Total (M€)	120	137	146	197	211	196	236	226	239	296	2 004
Public % of total	0.67	0.66	0.76	0.56	0.54	0.68	0.69	0.72	0.73	0.59	0.66

The amount of private financing varies from 40 (2004) to 121 million euros (2013) and does not show continuous annual growth similar to public venture capital, but it has a large annual range instead. In aggregate, private venture capital investments represent 604 million euros and when combined with business angel and other sources totals 690 million euros. The recent organization of business angels is also shown here, as the data begin from 2008 onwards with 2 million euros. The category "other" captures total Vigo accelerator investments and crowdfunding. Based on these statistics, the annual share of public support is still significant today, representing a 66% 10-year average ranging from 54% (2008) to 73%[104] (2012) annually.

Finally, the following comment from a founder-CEO of one of the high-growth startups currently at the scaling phase illustrates how the example set by the few pioneer startup success stories and recent grass-roots activities is manifested in the evolution of the perceived winner and the direction of activity among young entrepreneurs:

[104] The share of foreign venture capital documented in table 13 lowers the share of public financing for the last few years. However, although important, these investors are also opportunistic, focusing on the best individual deals and lacking presence and funds focused on Finland.

”It was very clear from day one that we would start in the US and build it there… And also entry into the market was important because we started seeing many competitors pop up right before and right after us. We didn’t want to be six months behind these competitors in the US. And the US market is definitely, in our opinion, the largest and has the biggest potential still…I always wanted to build a 100-million-plus dollar company in terms of sales. And now even more so.” (Founder-CEO of a high-growth startup)

The comment highlights the latent potential among nascent startups whose innovativeness and technological competence are considered ”state-of-the-art”. For instance, Red Herring’s recent list of 100 innovative startups in Europe 2014[105] contains 21 Finnish startups. The challenge is to turn them into winners in large markets; the outcomes of this part of the winner generation process are analyzed next.

5.1.4 The outcomes and renewal of the startup industry

In this section, the long-term results of the winner generation process by the covered startup industry structure, the functioning of the two generative mechanisms and the perceived winner-mediated activity are analyzed. The generated winners in terms of success stories and failures are discussed, including the public actors’ perspective, given their strong intervention and multiple-objects of activity. Thereafter, the review of competence, actor, institutional, and industrial renewal completes the Finnish case examination.

To begin, the startup industry’s long-standing perception of a winner and the purpose for existing is reflected in the communication of results in three interesting ways. Whereas in the other cases of this study, the longitudinal exit values of startup IPOs and M&A deals can be found (see sections 5.2.4 and 5.3.4), that is not the case in Finland. (1) The number of exits is reported in aggregate on the entire private equity industry level, hence the share of venture-backed startup exits is unavailable. The exit values are not reported or documented in the form of increased value at the time of exit, but (2) the amount of invested capital is reported – that is the input is recorded instead of the output. So, the actual outcomes for the billions invested by public and private actors into winner generation during the last 25 years, in terms of whether the exits have

[105] Http://www.redherring.com/events/red-herring-europe/2014finalists/

been successful, moderate or negative, cannot be clearly evaluated. In addition, (3) the number of both non-venture-backed and venture-backed startup IPOs, the most sought after outcome in the winner generation process, is neither known nor listed by the FVCA or identified by the National Association of Securities Dealers Automated Quotations (NASDAQ) OMX Helsinki out of all of the IPOs on its lists. The elements of the perceived winner and the weak institutional voice of the venture capital industry are manifested here in practice. The role of venture capital and the importance of exiting winners has not completely crystallized, even today, or otherwise the non-performing elements would be brought more clearly into the discussion to initiate changes –public actors, as key limited partners in many funds, are in position to address this.

The longitudinal listing of generated winners would therefore require a separate in-depth historical study and is not performed on this occasion. Some of the known bigger success stories include Iobox, MySQL, F-Secure, Supercell[106], Rovio and no doubt other ventures, including a few smaller or early exits and talent acquisitions. However, as noted, the valuations of most deals are not available, making it difficult to assess the scale of generated winners against the inputs. By comparison, Fiban reports that its members had 32 exits in 2013[107], out of which 18 (56%) were positive; in 12 exits, the angel lost everything (failure), and in 14, the exit was 2-times or more including 1-2 over 10X returns. However, the aggregate exit values in euros were not reported.

The number of venture-backed IPOs on the competitive NASDAQ and the New York Stock Exchange (NYSE) stock exchanges in the US is zero, so the winners have not exited on complementary markets[108]. Nevertheless, it is important to notice in this connection that a lack of IPOs has also been a problem in other Nordic countries. As a response to this concern, an alternative stock exchange for smaller companies, the NASDAQ OMX First North[109], was launched in Denmark (2005), Stockholm (2006), and Iceland and Helsinki (2007).

[106] The success of Supercell and Rovio illustrates the emerging perception of a winner because the stake of the key owners, the upside of employees and the value increase and exits are discussed more openly than before.

[107]Http://www.slideshare.net/FiBAN/finnish-business-angel-activity-2013-finnish-business-angels-network-fiban

[108] There are some exits on the Stockholm and London stock exchanges, but the volume or type of ventures is unavailable.

[109]The list is designed for small and growing companies with a less extensive rulebook compared to the primary market, and the listed companies cannot refer to themselves as public companies. See http://www.nasdaqomxnordic.com/about_us/firstnorth

Currently, there are a few listed Finnish companies, but the volume and market capitalizations are rather small and the activity has not increased as hoped. Cleantech Invest, one of the Vigo accelerators, raised 4 million euros with its offering on the list in June 2014.

Before reaching a positive or negative exit, the potential winners typically belong to the pool of high-growth firms that aim to grow in revenue or in other important case-specific metrics that will increase the company's value. This is the essence of mechanism 2, when potential winners are scaled in the markets. Out of the estimated 400-500 startups in the winner generation process, a significant number are at this phase, but the exact number is challenging to capture because many do not disclose they key metrics in this area. The annual Deloitte Fast 50[110] lists include a set of 50 rapidly scaling ventures, not all venture backed, with rapid revenue growth during the last five years, although the revenue rates at the end of the observation period vary greatly and can still be closer to 1 million euros at the low-end.

Some of these firms have fewer than 10 employees and are not included in the high-growth firm reports, which instead approach growth from a job, rather than a revenue, perspective and use 10 employees as an entry threshold. A study that examined the job growth of Finnish high-growth firms[111] between 2006-2009 found 691 high-growth firms (Ministry of Employment and the Economy 2011) among both economies defined in this study. Only in 23 (0.2%) of the firms did the number of jobs grow over 100% annually during this time period. The long-standing focus on domestic markets discussed in the historical analysis is still strongly present, as in this group, only 16% of firms in total had exports. Overall, the number of high-growth firms among both economies can be considered to be modest compared to the long-term public support allocated for innovation, growth and internationalization.

On a macro level, the estimates of how much public support (money) is allocated annually to firms within both economies varies across studies from 1.2 billion euros[112] in 2011 (Pietarinen 2012) to 1.8 billion in 2008 (Koski & Pajarinen 2010), depending on what support types are included. Regardless of the

[110] Http://www.deloitte.com/view/fi_FI/fi/ajankohtaista/technology_fast_50500/40e3295d8c892410VgnVCM2000003356f70aRCRD.htm

[111] Based on the OECD/Eurostat definition of a minimum employment of 10 at the beginning of the observation period and over 20% average employment growth during the next three years

[112] The amount does not include venture capital investment by Finnish Industry Investment nor Finnvera; hence, the total figure is higher.

study, the total amount has grown significantly with the increased economic and industrial challenges: Pietarinen (ibid) states 4.5% growth annually or 54% in total between 2000-2010; Koski and Pajarinen (ibid) estimate 44% growth between 2003-2008. The total amount indicates the strong institutional role of public support in the rules of the game among companies, and the total 1.3 billion euros allocated to startups during the last 10 years by public actors (table 15) is only a small portion of the whole.

The role of public actors' multiple objects of activity, and startups as only one of these objects, is shown by the substantial number of publicly supported companies: between 25 000 and over 30 000 companies, or approximately 10% of the entire Finnish company population, receive support annually (Koski & Pajarinen 2010, Pietarinen 2012). This has led to a significant number of customers for key public actors (table 16). Finnvera, FII, Tekes and ELY-centers had in total over 40 000 customers in 2009, out of which 2 500 were categorized as high-growth firms[113]. The numbers have not changed significantly since. This large customer base is one factor reinforcing and justifying the role of the significant public innovation structure.

Table 16. Number of total customers and total high-growth firms for key finance and service organizations at TEM-concern in 2009 (based on Puttonen 2010).

	Customers	High-growth firms
Finnvera	28 716	1 246
FII	439	299
Tekes	1 093	508
ELY-Centers	10 287	484
Total	40 535	2 537

The lack of accountability regarding the emergence of new individual winners and the opposing embedded social practice of perceiving winners based on aggregated results among both economies can be seen in the communication of outcomes in different publicly funded programs and projects. A case in point is the Centers of Expertise (CoE) program's impact and results: in the program period between 1999-2006, the reported impact was 12 900 new created jobs, 29

[113]The high-growth firm definition varies and is typically moderate. Finnvera, for instance, uses at least 10% annual revenue growth for three years on average as a definition. Hence, this number is larger then the 691 high-growth firms in the Ministry of Employment and the Economy (2011). This signals the low ambition level for perceived winners and the broad set of policies impacting the allocation of public support.

300 retained jobs, 3 800 new products, 1 300 new firms, and 91 000 educated persons (Kanninen *et al.* 2007: 9). However, at the same time, it was difficult to specify between the activities conducted by the CoEs and other organizations (ibid), so the division of labor and the contribution of different actors to outcomes remains unclear. Indeed, the program's relevant aspects from the startup-industry-evolution perspective, mainly internationalization, activation to growth, development of business competence, and attracting international companies to Finland, remained weak areas of activity, but due to the aggregation and the lack of accountability were not addressed.

The statistics above indicate how the dominant role of public sector actors has grown to such a scale that it crowds out private actors. Indeed, the case has been such for over two decades. Mykkänen (1989) discusses how public sector financing and support was already so large in the late 1980s that it made the market for private venture capital actors very small and unattractive. The situation has not changed; Puttonen (2010: 56) concludes that there are too many public instruments and support types available and that the number of regional entrepreneurship promotion programs and services is likely too large, preventing the development of private sector actors. The complex public support system has become difficult to access and administer, with overlapping programs in the same areas or focused on the same firms (Veugelers *et al.* 2009b).

The market failure behind the government intervention was recognized decades ago, but the attempts to solve it by introducing actors competent in markets have not been successful, and the performance in this has not been the primary criteria used for evaluating the outcomes of market interventions. When changes are made, such as the recent reorganization of early stage finance from Finnvera to Tekes, they typically take place within the public sector, but the division of labor between the centralized structure and the markets is not affected. In fact, the public actors' role at the present scale appears unquestioned and continuous, as there are no significant signs of decreasing its size or role. As shown, the public funding[114] to startups has been growing recently, and attractive non-dilutive grants and loans are applied by entrepreneurs. The outcome in the case of Tekes, for instance, is that it funded 49 out of the 50 fast-growth firms on

[114] This is a biased situation, as the grants and loans offered by Tekes are non-dilutive for entrepreneurs. Hence, these are typically very attractive compared to the dilutive forms of financing used by startups in most cases.

the Deloitte Fast 50 list in 2013[115]. Given the terms of financing and the under-developed early stage risk capital market, this situation is not surprising.

In addition, the NIY program can also be seen to conflict with markets and mechanism 2 because its support is targeted to strictly selected generated potential winners looking to scale internationally by offering non-dilutive public financing. With this program, the government is indicating that it also wants to be directly involved at this stage by financing companies that could possibly access different funding instruments in the markets. Market failure as a justification for public intervention is in some cases difficult to piece together. Further, under the discussed structural organization of the Finnish startup industry and the historical lack of competent venture capitalists and financing, the Vigo and NIY programs are skewed to attract both under-served (latent demand and deal flow) and high-potential new startups as targets, creating preconditions for program success.

Regarding the winner generation process outcomes, it can be concluded that the Finnish startup industry has not been able to systemically turn potential winners into actual scaled winners on international markets. The non-emergence of winners is the norm rather than the emergence of exiting winners when the historical timeline and allocated resources are noted - error 2 prevails, and not only within the startup industry. Against this situation, some of the recent success stories can be considered to be exceptions that prove the rule. The following comment aptly captures the difference between the covered actual outcomes and envisioned performance:

> *"If we could create a kind of an exit-factory here in Finland, this country would be in really good condition."* (Key account manager, regional development company)

In the following, the implications of these outcomes for the renewal process in different areas of the startup industry are analyzed. To begin with, the dominant role of public actors at the earliest stages of startup business experiments in particular results in a significant contradiction in the organization of competitive selection. Public actors are not under the dynamic competence check and the accountability to LPs that exists in private markets and in the venture capital cycle.

Indeed, when a new venture capital fund is being raised, private LPs carefully consider the competence of the general partners, the fund's proposed investment

[115] See http://www.tekes.fi/tekes/tietopankki/

focus and the opportunity, among other factors, when determining whether to invest in the fund. This is the first competence check, and it takes place before the fund is operational and initial investments are made. The person making the investment decision is accountable to the LP whose money is being invested. An entity is created to hold the venture capital company accountable, the performance of the fund is closely monitored, and exits become the key eventual objective - the market-exit mechanism on the venture capital side of the startup industry is based on this premise. Business angels invest their own money and answer only to themselves.

In the case of public actors, the LP is the faceless taxpayers, whose taxed money is first washed away from the competence that created it and then allocated to a public venture capital fund or to business development tools based on different policies, market failures or inefficiencies – neither the tax payer as an LP nor the public officials have any “skin in the game”. Therefore, the pre-operational and regular competence checks based on performance for these public officials are not as strict and selective. For instance, among the interviewed public actors, experience in high-growth-ambition venture-backed startups or in exits was a rare exception. Together with the discussed lack of incentives, lack of accountability and existence that is not based on generated outcomes, it can be concluded that the market-exit mechanism is out of order for a significant part of the Finnish startup industry. The organization of actors and the division of labor result in a contradiction because there is no market mechanism in place to ensure that startup business experiments are exposed to relevant and renewing competence and, above all, that non-contributing actors are eliminated through competition[116]. The following comment captures this inherent lock-in to the current structure:

> *“The challenge is that in a private company, people, customers and everything can be changed, but being a public actor…one cannot change anything…If the people have experience in doing other things, and they need to start to do something else [high-growth-ambition startups], how they can be good at it?”* (Expert, regional development company)

Consequently, under these circumstances, the experimental winner generation process has relied strongly on slowly expanding entrepreneurial competence. The

[116] In fact, due to the consolidation of municipalities that has taken place in many regions, public officials are given a five-year protection against dismissal. This covers, for instance, the regional development companies.

startup-relevant competence gap prevailed for decades, and only recently has a rather small pool of competent actors emerged, driven by successful pioneering startups. In fact, behind many of these companies are competent entrepreneurs and stakeholders who gained experience during the Internet boom and have been able to build and scale their businesses not because of the public support system, but rather despite it. The allocated public support, with good non-dilutive terms for successful companies, does not justify the existence, competence or historical inefficiency of the public actors per se given its wide and loose allocation and the alternative ways that many of its functions could be organized over markets.

Second, the missing track record on exits and winners has made fundraising difficult for venture capital companies. There are few venture capital partnerships running new funds based on successful previous funds and a full venture capital cycle. VNT Management's Power Fund III, which was raised in 2013, is likely the only third fund for the same management company. Inventure, Conor and Nexit Ventures are running their second funds. The young age of the industry partly explains this, but the performance of Finnish venture capitalists and their ability to provide competent value-added in the long run can be challenged based on the lack of exits and subsequent funds. In a way, non-performing actors have been driven out by competition in this area of the startup industry.

Indeed, the recent changes discussed above and a few big winners have enabled new competent management teams to raise funds, including MySQL-based Open Ocean Capital with a 45 million euro fund raised in 2011. Another new 30 million euro fund was raised by the Vigo accelerator Lifeline Ventures in 2013. The role of the new funds in the renewal of the venture capital market and winner perceptions is critical and creates more competition among venture capitalists. The relatively small fund sizes indicate the international trend of entrepreneurs' capability to do more with less capital at an early stage but, most importantly, allow the assumption that follow-on rounds are planned with cross-border syndicate partners. Between 2007-2013, the total new venture capital fund raising was 467 million euros (table 17) in estimate[117], indicating a positive development together with the documented increased cross-border investments to Finnish startups. In this sense, the incentives for innovators and entrepreneurs to initiate ambitious projects and startups have improved recently.

[117] Does not include FII's FoF Growth I and II. Also, a few micro funds are likely to be outside of these statistics.

Table 17. Total amount and number of new venture capital funds by Finnish venture capital companies 2007-2013.

	2007	2008	2009	2010	2011	2012	2013	Total
Venture capital fund raising M€	47	126	0	50	164	0	80	467
Number of funds	1	2	0	1	3	1	2	10

Some of the funds do not solely focus on Finland but also seek Scandinavian, Baltic and European investment targets, indicating an increase in startup related activities overall. Similarly, many international funds are looking into Finnish startup investment opportunities; none have yet opened a specific team or fund for Finland, but a few have venture partners screening Finnish deal flow. By the end of 2013, Finnish venture capital companies had 509 million euros of capital available for investment, of which 128 million euros were allocated for making initial investments to new potential winners (FVCA 2013).

However, a worrying element within this positive recent evolution is the almost total absence of corporate venture capital investments in Finland. Whereas the early venture capital industry reports covered the role of corporate investors during the late 1980s and early 1990s, it has since disappeared from the FVCA statistics and is not actively present in the public discussion. Nokia has its own corporate development arm, and Sonera had one during the early 2000s, but corporate venture capital has not institutionalized as a part of the startup industry. This is an important structural weakness, considering corporate ventures' increased role during recent years in particular (see 5.3.4).

In summary, this chapter presented an analysis of the Finnish case. First, the structural and institutional evolution of the startup industry was discussed, and a timeline of key events and contextual conditions was created. Second, it was shown how the identified case-specific factors are manifested in the perceived winner, the division of labor and the incentives of the actors. Thirdly, the perceived winner and the structure-based functioning of the mechanisms for generating winners were examined both in quantitative and qualitative terms. Fourth, the outcomes of the winner generation process were discussed in relation to the outlined activities and their direction. Lastly, the renewal of the startup industry structure, its institutions and its actors' competences were covered to finalize the analysis.

5.2 Israel

In the literature, the Israeli startup industry is treated as the development of an intensive high-tech cluster mainly in the 1990s with a strong focus on startups and venture capital. More recently, the successful outcomes in winner generation have led to the recognition of Israel as a startup nation. In the following, the evolution process that led to the present structure, institutions and organization of actors for generating winners is covered in detail.

5.2.1 Historical evolution to the present startup industry structure

The 1950s and 1960s: The drivers of S&T policy creation

During the 1950s and 1960s, Israeli society was at a stage in which the government was actively building basic infrastructure such as roads, water systems, ports, and electrical grids. These required large-scale investment, which kept GDP growing and fulfilled the greatest needs for economic development (Senor & Singer 2009). The political and economic system historically had a labor-socialist tradition that during certain periods even viewed entrepreneurship with hostility: entrepreneurs and small-business owners were perceived to be unproductive middleman exploiting industrial and agricultural workers (Gradus, Krakover & Razin 1993). The climate was unfavorable for entrepreneurship, and large corporations and non-profit organizations were favored (Greenwood 1990).

The government saturated the economy with infrastructure spending in the mid 1960s and infrastructure needs were largely fulfilled; economic growth was nearly zero. This created the first opportunity window for the emergence of private entrepreneurship to drive economic growth (Plessner 1994) and raised pressure for reforms to make the fundamental transition from central planning to entrepreneurship (Senor & Singer 2009). However, these pressures were staved off by the Six-Day War in 1967, which resulted in the capture of a significant amount of new land that again needed infrastructure built; hence, government infrastructure investments could begin again and provide stimulus for economic growth (ibid).

The continuing security threats, the Independence War in 1948, and the French military embargo of Israel after the Six-Day War resulted in a recognized need to channel large investments and R&D power into domestic military high-technology development (Breznitz 2005, 2007, Senor & Singer 2009). This was an important event, as military technology later became a fundamental building block of the Israeli startup industry[118]. Strategic decisions to build, for instance, an Israeli battle tank, fighter jet, and warship were made. This impacted the civilian industrial R&D policy as well and started to increase the total number of workers involved in R&D from a low level of 886 academically educated workers and 671 workers with some technical education in 1970-1971 (Bar 1990: 41).

By the late 1960s, Israel had an established academic research system. The Research Council of Israel was founded in 1949 and was headed by Prime Minister Ben-Gurion; many governmental research laboratories were founded in the 1950s, the National Council for Research and Development (NCRD) was founded in 1959, and the Israel Academy of Sciences was founded in 1961 (Teubal 1983). Hence, because of the already strong academic research system, the Kachalsky Committee Report in 1966 recommended the increase of industrial sector R&D and applied research to create science-based industries (ibid). This led to another important event: the establishment of the Office of the Chief Scientist (OCS, the Israeli equivalent of Tekes in Finland) in 1969 under the Ministry of Industry and Trade. The OCS started full-scale operation in 1973 and defined its objective as to fix market failures in civilian industrial R&D without targeting any specific sectors or technologies – this event started the state-industry co-evolution (Bretznitz 2006, 2007). The Industrial Research Fund established in 1967 by the Ministry of Commerce and Industry (Teubal 1983) was, and to some extent still is, the backbone of Israel's R&D, innovation, and technology strategy for the business sector (Avnimelech & Teubal 2004). It began by providing a flat 50% subsidy to civilian R&D expenditure for accepted firms in any industrial sector without explicit preferences for technology or product types (Teubal 1983).

1970s and 1980s: The birth of the Israeli IT industry

During the 1970s and 1980s, the high-technology industry emerged as a result of the continued R&D increases on the military and civilian side, mainly driven by electronics development for military purposes. This time period is called the R&D penetration period, when basic business sector R&D and innovation capabilities were created (Avnimelech & Teubal 2004), or the background conditions phase (Avnimelech, Martin & Teubal 2004); this period significantly affected the emergence of the Israeli venture capital industry later in the 1990s. Among key

[118] For example, alumni of the army's Unit 8200 have founded many leading Israeli IT companies.

events, the period witnessed the first IPO of an Israeli high-technology company on the NASDAQ in 1972 by Elscint.

The story of Elscint's path to its IPO reflects the role of pioneering entrepreneur-investor relationships and the emerging link to US venture capital and exit markets at a time when, according to Senor and Singer (2009: 116), the Israeli government had a monopoly on the capital market and banks and investment companies were restricted by government involvement. The Discount Bank Investment Group was the only firm providing private market finance for IT industry companies at the time (Breznitz 2007). At the beginning of the 1960s, Dan Tolkoswky from the Discount Bank met with Uzia Galil, the founder of a company called Elron. Their partnership subsequently generated a significant number of high-technology companies in addition to Elscint, including two other IPOs on the NASDAQ - Elron in 1981 and Elbit in 1996 (ibid) - and they impacted other success stories as well[119].

Important events and elements affecting the future development of the Israeli organization and startup development path stemmed from Elscint's financing in 1971. Tolkoswky realized that Elscint needed (1) more financing than Discount bank could organize and (2) specific experience and expertise that could not be found in Israel at that time. This led him to fly to the US to meet venture capitalists there and persuade them to invest in Israel. He met with Fred Adler, a prominent American Jewish venture capitalist in New York (Avnimelech *et al.* 2004), who after visiting Israel became involved with Elscint. Adler attempted to get US venture capitalists to invest in the company but found it futile; thus he decided to circumvent the entire process by skipping the venture capital stage and raising money through an IPO[120]. He assumed that the Israeli industry would look more inviting to US investors after several successful IPOs, hence solving the venture capital problem (see Breznitz 2007: 1471). These early international connections and the knowledge embodied by Adler and other Israelis living in the US were significant for the future development of the Israeli startup industry (Avnimelech *et al.* 2004)[121].

A structurally complementing connection to the US venture capital and exit markets was created and started to evolve at a time when domestically, these markets were non-existent. As indicated, there was no experience in building

[119] See http://en.wikipedia.org/wiki/Elron_Electronic_Industries
[120] The IPO prerequisites were different then than they are now, but this created the path for future IPOs.
[121] Currently, there are approximately 50 000 Israelis living in Silicon Valley alone.

venture-backed startups and organization, and competence and learning were taken from the US venture-backed startup model, in which an IPO could be conducted by a not-yet-profitable startup. It was understood that this type of startup needed specific competence that did not exist in Israel. This later became, as Breznitz (2006, 2007) also notes, the modus operandi of the Israeli IT industry: to more or less imitate the path through which US-based startups are built. The archetype of a perceived winner started processually to evolve and, according to Teubal (1983, 1993), was orchestrated by a collective learning process from building such ventures.

Another important event was the establishment of the United States-Israel Binational Industrial Research and Development[122] Foundation (BIRD) in 1977 (Avnimelech & Teubal 2004, Breznitz 2007, Senor & Singer 2009): its role, under the jurisdiction of the OCS, was to foster cooperation between new and risky Israeli ventures and mature US companies with a strong presence in global markets and to finance non-defense projects with R&D conducted in Israel and marketing in the US. The selected projects received up to 50% of R&D and product commercialization expenses funded with repayment only if commercial revenues were created as a direct result of the project. Failed projects did not need to repay. The governments of Israel and the US contributed equally to the endowment of 60 million dollars to the BIRD, which made its first investment in 1981 and had by 2009 supported over 780 projects with over 250 million dollars of investment, resulting in 8 billion dollars in direct and indirect sales. The BIRD became vital in sponsoring and helping startups to learn managerial skills and customer needs from competent customers in the US, building industrial links and Israel's high tech reputation in that market. As an organization, it ensured a critical window into the main market, the US, and enticed American MNCs to open R&D subsidiaries in Israel or to acquire Israeli startups and transform them into their R&D centers.

Among the first MNCs to enter Israel with R&D laboratories were Motorola (1964), IBM (1972), Intel (1974), and Hitachi (1978), and the first investments in semiconductor and electronics manufacturing facilities were made by Vishay (1965), National Semiconductor (1979), and Intel (1985) (Avnimelech *et al.* 2004). These companies became incubators for engineers and managers; their impact was to be seen later during the 1990s (Avnimelech & Teubal 2004). The

[122] The number of such binational and international R&D funds had grown to 27 by 2014. See http://www.science.co.il/International/Research-Funds.asp

establishment of MNCs in Israel at this stage was also partly directed by interest in the high quality academic research conducted in close relationship with industry and industrial R&D (Tuler & Rao 1979), indicating a focus on solving industrial problems.

It is notable that a significant percentage of the financial and managerial resources available to entrepreneurs through these programs could be accessed only if the entrepreneurs followed a business model based on R&D-intensive product development and American-controlled distribution channels. This substantially mediated how private R&D, especially startup formation and business strategy, evolved in Israel. (Breznitz 2007) The objective to create new products (or processes in some cases) directed to the export market was focused on creating marketable outputs and is not the traditional infrastructural R&D, which focuses on generating knowledge, capabilities, and components that are later exploited in other projects (Avnimelech & Teubal 2004). This is another key event that affected the development of the Israeli perceived winner and the startup industry-wide perception of winner generation and that aligned the organization and incentives of the winner generation process towards outcomes.

Government R&D spending continued, and military R&D was more than half of total R&D until the mid 1980s, when an economic crisis and a military alliance with the US, which started in the 1970s, lead to a downsizing of defense industry initiatives. A few thousand experienced engineers were let go, and many received redundancy packages that enabled them to focus on entrepreneurial activities. (Avnimelech & Teubal 2004, Breznitz 2007) This was a crucial event for deal flow generation because until the 1980s, the problem was not only a lack of capital for startups but also a lack of willing entrepreneurs (there were approximately 150 startups at that time, none of them VC backed), resulting in a situation in which the OCS had difficulty distributing its annual budget (Breznitz 2006). The government's long-prevailing negative attitude towards private entrepreneurship had created inertia.

Another important event was the 1984 R&D law that recognized software as an industrial branch in 1985 and enabled consistent increases in OCS R&D support. These changes contributed indirectly to the restructuring of the military-dominated electronics industry and the diffusion of its R&D and associated capabilities by funding and increasing the number of spin-offs focused on civilian R&D. (Avnimelech *et al.* 2004) This lead to the first round of external-investor-financed independent startups without links to already existing companies or business groups. The growth of this phenomenon was increased by a special ad hoc partnership program during 1980-1986 that channeled competent resources and approximately 40-80 million dollars from US investors to 54 startups (ibid). By the late 1980s, private IT entrepreneurs were becoming more common, active and successful (Breznitz 2006), hence the number of established startups increased from a few to several tens per year (see table 22) (Avnimelech *et al.* 2004).

More firms had IPOs on the NASDAQ in the early 1980s, reflecting the strong and reinforcing connection to US investment banks and exit markets. The importance of this connection is illustrated by fundraising: between 1984-1988, Israeli technology firms raised 300 million dollars on the NASDAQ while during the same period, the total capital raised by all Israeli firms on the Tel Aviv Stock Exchange (TASE) was only 500 million dollars. Moreover, the first formal Israeli venture capital firm, Athena, was established in 1985 by Fred Adler and Dan Tolkowsky, representing a major event for the local venture capital industry. The implementation of domestic stabilization policies and capital market liberalization further improved the business environment by the end of the 1980s. (Avnimelech *et al.* 2004) Around these years, private business angel investment activity also started to increase (Avnimelech & Teubal 2004). In addition, by this time, more ICT MNEs had established sites in Israel, such as Freescale in 1982, Lucent in 1986, BMC in 1988, and Microsoft in 1989, and their presence was strong.

1990s and 2000s: The emergence of the venture capital industry and rapid startup growth

In the early 1990s, the disintegration of the Soviet Union led to the last massive wave of several hundreds of thousands of Soviet Jewish immigrants flooding Israel. This influx created immense economic pressure which created preconditions for a large-scale policy shift towards promoting entrepreneurship (Gradus *et al.* 1993). This was an important event, considering the earlier conditions and attitudes towards entrepreneurship. According to Senor and Singer (2009), the government believed that the Israeli economy would need to create half a million jobs to absorb the immigrants, of whom one out of every three was a scientist, engineer or technician. This happened at a time when the defense industry was again laying off thousands of engineers, so these issues topped the political agenda (Bretznitz 2007).

Together, the events of the 1980s increased startup formation. There were examples of success, as 14 high-technology firms established after 1980 had already gone public in the US, mostly on the NASDAQ (Avnimelech *et al.* 2004).

The globalization of capital and asset markets enhanced opportunities for startups; for the first time, it was possible for non-US high-tech startups to float in the NASDAQ (cf. Avnimelech & Teubal 2004). However, a government report (JIM 1986) indicated that approximately 60% of new firms failed due to the inability to raise capital, the lack of follow-on capital and weak marketing competencies. These shortcomings related to the interpretation that while Israeli startups were competent at R&D, they were still weak in management, product marketing and growth despite the already completed exits (Senor & Singer 2009). At the time, according to Avnimelech *et al.* (2004), the feeling was that the OCS emphasized technology over marketability in the R&D grant approval process, and the successful creation and maturation of more startups was blocked by a market and systemic failure.

These developments led to initiatives by OCS that targeted the creation of a domestic venture capital industry. Senor and Singer (2009) discuss how the head of OCS became convinced that the private venture capital industry was the right antidote to the lack of capital and would further provide the needed competence to coach startups. Indeed, key here was the recognition that aspiring Israeli venture capitalists also needed mentoring in how to add value to startups - there was not enough competence and experience in building winning startups, navigating the funding process and coaching first-time entrepreneurs. In addition to the financial side, the role of competence was acknowledged. The needed competence was seen to exist in the substantial US venture capital industry, where the actors where deeply involved with building successful Silicon Valley startups (Senor & Singer 2009: 165-166).

The OCS responded by gradually shifting policy objectives from R&D promotion to supporting startup formation, survival and growth by launching many new programs (Avnimelech *et al.* 2004, Breznitz 2006, 2007). For the purposes of this study, the most relevant of these are the Technological Incubators, Inbal, and Yozma Programs. They were all planned and approved in 1991, although operations started gradually over the next few years (Breznitz 2006).

The Technological Incubators Program started in 1991 to address the problem of limited deal flow and to create demand for the services of venture capitalists. The program started with a 2 million dollar budget and the primary goal of filtering potentially valuable innovative technological ideas that were too risky for private investment and turning them into investment-ready startups; the expectation was that after the two year incubator period, these startups would be able to raise money from the private sector and operate on their own (Shefer & Frenkel 2002, Frenkel, Shefer & Miller 2008). This type of support was needed because startup founders, many of whom were immigrant scientists, often had an academic[123] and technical background while lacking the competence of successful entrepreneurs and the ability to find early stage financing for their ideas (Breznitz 2006). The secondary goals of the program were the promotion of R&D activity across the country including peripheral regions, technology transfer from research institutes to industry, and the creation of an entrepreneurship culture in Israel[124].

The incubator program was organized so that by 1993, there were 28 incubators distributed across the country; later, the number settled to 22-23 and has remained at that level since. The incubators were initially not-for-profit and funded with an annual 20-30 million dollar budget by the government and sponsors such as universities, municipalities and larger firms (Shefer & Frenkel 2002). Each incubator supported selected projects with space, financing, and most importantly, a staff of competent managers (serial entrepreneurs and those with a venture capital background) who provided professional business and management help and access to networks. The success criteria used for evaluation was the incubated startup's ability to raise a first round of investment after the incubation period.

The project selection process was tight; evaluation followed the investment readiness criteria and sought quality and high potential over quantity. Projects needed to be (1) product-oriented, (2) primarily export-oriented, (3) based on R&D, and (4) feasible with the available resources (Shefer & Frenkel 2002). For instance, out of 345 initial inquiries, only 18 (5%) of the most promising projects were approved into the program (ibid). Selection required a full-consensus decision made first by a committee that, in addition to the incubator manager, consisted of competent actors from academia, industry, business and financial sectors. This committee also monitored, consulted and guided the projects during the incubation period (Rouach, Louzoun & Deneux 2010). The Central Incubators Administration at the OCS then made a final decision based on the selected proposal. Each incubator received government grants of up to 175 000 dollars per year, and an accepted project received a grant of up to 150 000 dollars[125] per year

[123] Shefer and Frenkel (2002) found in their evaluation study that 63% of project initiators had a PhD.
[124] See http://www.incubators.org.il/category.aspx?id=606
[125] The OCS grants had some rules that hampered M&A deals before the mid 1990s and, hence, hampered startups applying to the Incubators program. For instance, a merger or acquisition could

(evaluation after a year) for two years. The maximum grant was 85% of the approved project budget; the remaining 15% needed to come from the entrepreneur or from an equity partner (Shefer & Frenkel 2002). Therefore, during this most risky phase, the government took a significant share of the risk.

The incubator program supported and complemented the venture capital programs (Inbal and Yozma) together with the Industrial R&D Fund by creating demand (deal flow) for venture capitalists. It contributed to the transformation of the high technology sector, especially in the early years of its operation. By 2000, approximately 130 startups were critically influenced by the program, and some already had a foreign IPOs or M&As (Avnimelech & Teubal 2004). The budget of the program had grown to 32 million dollars by 2002 (Frenkel *et al.* 2008).

An important event and the first significant effort to create a venture capital industry in Israel was the Inbal program in 1992. The idea was to stimulate the creation of publicly traded venture capital funds on TASE by a government-formed insurance company called Inbal that would guarantee the downside risk of these funds up to 70% of initial capital assets. Four funds of this type were created – Mofet, Marathon, Teuza and Sdot Mop. Neither they nor the Inbal program were greatly successful, and the four funds soon left the program for reasons such as an absence of relevant upside incentives (Achnimelech & Teubal 2004). In the US, similar mistakes had been made earlier with the Small Business Investment Company (SBIC) model, but advocates of Inbal had not learned from these (Avnimelech *et al.* 2004). This failure was part of an expansive collective learning and experimentation process by the government and the business sector. The actors shared the object of fostering successful startup emergence while learning what generating winners requires. Some of the lessons learned in Inbal contributed significantly to the formation of the succeeding Yozma program.

The Yozma (Initiative in Hebrew) program started operations approximately a year after Inbal in 1993. It became the most important of the programs, and its founding was a key event in the later structural evolution of the startup industry. It was structured to fix the identified lack of upside incentives for Inbal, and it particularly took the upside as the primary incentive for attracting professional investors by providing each private Yozma fund with a call option (exit conditions) on government shares at cost plus annual interest terms for a period of five years. This organization for the funds and the generated example IPOs

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penalize the startup because some R&D could be moved away from Israel. Later, these rules were changed (see Avnimelech & Teubal 2004).

stimulated the entry of established international professional venture capital firms and managers to the program, which further stimulated and encouraged learning based on their competence (Avnimelech & Teubal 2004). This expansive learning from competent actors can be seen as systemically structured, as each Yozma fund needed to include one foreign financial/investment institution with a well-established Israeli financial institution, ensuring that (1) the Israeli part learns and gains competence side-by-side with the foreign institution and that (2) portfolio companies could obtain access to new markets with the value-added of well-known foreign partners. Indeed, this structure further pushed startups to learn how to work with venture capitalists and appreciate their value-added beyond financing (Avnimelech & Teubal 2004).

When these conditions were met, the government invested up to 8 million dollars (approximately 40%) per fund. The total size of the government fund (called Yozma) was 100 million dollars, organized so that 80 million would go to private fund investments and 20 million to direct investments in startups (Yozma 1 Fund from 1993 until its privatization in 1997). This led to the establishment of 10 private Yozma funds (foreign partner(s) name and country in brackets): Gemini (Advent/US) Star (TVM/Germany and Singapore Tech), Concord (AVX and Kyocera/Japan), Polaris (CMS/US), Walden (Walden/US), and Inventech (Van Leer Group/NL) in 1993, JVP (Oxton/US-Far East), Medica (MVP/US) and EuroFund (Daimler-Benz and DEG/Germany) in 1995, and Vertex (Vertex International Funds/Singapore) in 1997 [126]. The funds raised in total approximately 250 million dollars (100 million in government capital) and invested in over 200 startups (Avnimelech & Teubal 2004). In addition, the Israeli Venture Capital Association was established in 1996.

Avnimelech and Teubal (2004) describe three phases from 1993 to 2000, during which the Yozma Funds evolved. During the first phase of the program from 1993 to 1995, exits where mainly low-value M&A transactions between 10-70 million dollars; these were seen as the easiest way to ”exit” and thus represent the approach adopted during this period. In the second stage (1996-1998), some funds grew larger and fund managers became more competent because they better understood the business; thus, the exit focus shifted to preferring an IPO whenever possible. This shift was supported by the development of strong links to the US financial markets, investment banks and top analysts, and by

[126] Based on the presentation of Yigal Erlich, Yozma program founder and former Chief Scientist of OCS.

understanding that it is more challenging to help companies to grow than sell them. The third stage (1999-2000) witnessed the growth of some venture capital funds to over 200 million dollars, more foreign limited partners especially from the US, and the leading funds opening offices abroad. Links to strategic partners such as Nortel, Cisco, Yahoo, etc. were emphasized, and efforts to understand the market continued. The focus was not only on the exit but also on building and growing the startups collectively into large indigenous companies even beyond the IPO.

The Israeli startup industry had reached a level (deal flow, capital invested, outcomes) where more foreign investors were making direct investments in domestic startups (some notable US venture capital firms such as Sequoia and Benchmark opened offices in Israel), startups were successfully competing globally, and good Israeli startups knew how to reach or access US investors independently or had an experienced mentor available.

Hence, the explicit objects of the Yozma program were met: to create a competitive private venture capital industry with critical mass, to learn competence from foreign venture capitalists and limited partners, and to build an international contact network. Avnimelech and Teubal (2004) conclude that after Yozma, the Israeli venture capital market made a quantum leap forward, triggering the cumulative growth and emergence of venture capital in Israel (table 18). The success of the Yozma funds and the venture capital industry expansion is further supported by the following facts: (1) most funds were able to raise follow-up funds managed by an expanding, but related, set of core managers and were not supported by the Yozma Program and (2) this group managed a total sum of 5 billion dollars of funds during early 2001, representing approximately 55% of the total venture capital under management in Israel at that time. The handsome profits obtained by the Yozma funds further attracted the rapid entry of non-Yozma related funds to Israel (ibid). The number of foreign investment banks with operations in Israel also increased to 26 by 2000 from just one in 1990 (Bar, Locomat & Nachmani 2001), and high-tech-focused professional service firms such as accountants, lawyers, and PR firms were established (Avnimelech *et al.* 2004).

Table 18. Growth of the Israeli venture capital industry by capital raised 1991-2000 (Avnimelech & Teubal 2004).

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Total
Private VCs	49	27	162	112	145	264	609	468	1 575	3 155	6 566
Public VCs	0	54	42	0	0	0	27	8	44	35	210
PE funds	0	45	128	242	6	110	66	74	40	26	737
Investment companies	9	34	40	20	5	23	25	125	93	72	446
Total capital raised	58	160	372	374	156	397	727	675	1 752	3 288	7 959

Indeed, with Yozma, the Israel government executed an idea that is rare among typical government programs - to get in but then to get out as soon as private actors could carry the venture capital industry forwards (Senor & Singer 2009: 167). This was a significant development from the negative attitude toward private entrepreneurship in 1970.

2000s to the present: Crisis and continuous renewal

The burst of the Internet bubble in early 2000 made exits difficult and significantly affected the winner generation process. The Israeli startup industry was influenced mainly by its close connection to the US capital markets and the collapse of high technology stocks. Venture capital under management decreased, some funds were closed, and early stage investing almost collapsed, forcing startups, in some cases, to take forced mergers to survive (Avnimelech *et al.* 2004). Venture capitalists supported existing portfolio companies and needed new winners to regain investor confidence; this motivated them to move from early stage investments, where the risks are higher, to later-stage investments. In consequence, the total capital raised by venture capitalists in Israel dropped to 69 million dollars in 2002 and 70 million dollars in 2003, until rising to 582 million dollars in 2004 (table 25).

The Israeli government reacted to the emerging market failure by establishing the Tnufa program in 2001 and a seed fund under the Heznek program[127] in 2002. The purpose was to incentivize venture capitalists to make seed investments and thereby support early stage companies and fix the funding gap. Private investment was matched by the seed fund for up to 1 million dollars (5 million NIS) and up to 50% of the costs for a two-year period. The investment was made against non-

[127] See http://www.moital.gov.il

voting rights shares, and private investors were given an option to buy the government out within 7 years at the initial price plus interest and cost-of-living adjustement. This was an important event because it was the first intervention in the venture capital markets by the government since the Yozma program.

A second key event in 2002 was the Technological Incubators privatization process, which could now start because the private market had developed in terms of available capital and competence but also because its success stories had increasingly attracted venture capitalists' interest toward the risky pre-seed stage (Frenkel *et al.* 2008, Kauffman & Schwartz 2008). A franchise system to license the incubators to experienced private sector venture management groups for an 8-year period was established to create more value for incubated startups with for-profit operations. The selected owners of incubator licenses included venture capitalists, private equity groups, super angels, and local and multinational corporations that had also invested in incubators. The overall incubator model[128] has evolved, and now the funds are directly allocated by the government to the startups, which repay the amount as royalties (3-5% plus interest) from revenues. Previously, government money went to the incubators, which allocated it to startups, but this model was too complex. An accepted project receives a budget of between 0.5 to 0.8 million dollars for approximately two years, out of which 15% comes from the incubator and 85% from the government as a grant to be paid back upon success. The annual program budget from the government has increased to approximately 50 million dollars.

Another essential event was the increased expansion of the private incubator and accelerator base, which started in 2000 (Frenkel *et al.* 2008). Currently, there are approximately 100 different accelerators in addition to the 22 OCS licensed incubators (IVC 2014). This development has been very rapid; for instance, 11 accelerators were established in 2011 (IVC 2012). This includes competent global companies such as Google and Microsoft, which opened their accelerators in 2012. However, as the pool of serial entrepreneurs and competent private actors in the startup industry has expanded, Avnimelech, Schwartz and Bar-El (2007) note that experienced entrepreneurs do not usually apply for incubators because they are able to leverage available resources on their own.

The increased ability and role of angel investors has led to better documentation of the business angel activity is Israel. There are more than 450 private business angels and angel groups active in Israel (IVC 2012) that are

[128] See http://www.incubators.org.il/category.aspx?id=606

central to the pre-seed and seed stages. IVC (ibid) also reports that well-known international ”super angels” (serial, well-connected early stage investors) have recently invested in Israeli startups and also lists 11 Israeli super angels of similar caliber.

The entry of competent multinational companies has continued, and currently there are over 250 R&D centers[129] for foreign companies. For instance, Apple has three R&D centers, and Microsoft, Oracle, Google, IBM, Intel, Facebook, and Samsung have at least one R&D center in Israel. Recent developments indicate that this trend is continuing, as such companies either open their own R&D sites directly or acquire Israeli startups and turn them into a local development site. These actors are an important part of the startup industry structure in Israel - globally competent actors can be accessed locally by startups and investors, and many engineers and managers gain relevant experience and networks through employment in these companies. These advantages support spin-off creation and deal flow in the winner generation process.

The venture capital market was affected for the second time since the Internet bubble by the recent financial crisis, and new fund raising dropped significantly. In 2009, Israeli venture capital funds raised 334 million dollars, but in 2010, no new funds were raised at all (table 25). The recovery took place in 2011 with 796 million dollars of raised capital (IVC 2012).

Finally, the identified key events, contextual conditions and outcomes of the structural and institutional evolution process of the Israeli startup industry are summarized by a timeline (figure 13) covering from the 1960s until the present.

[129] See http://www.investinisrael.gov.il

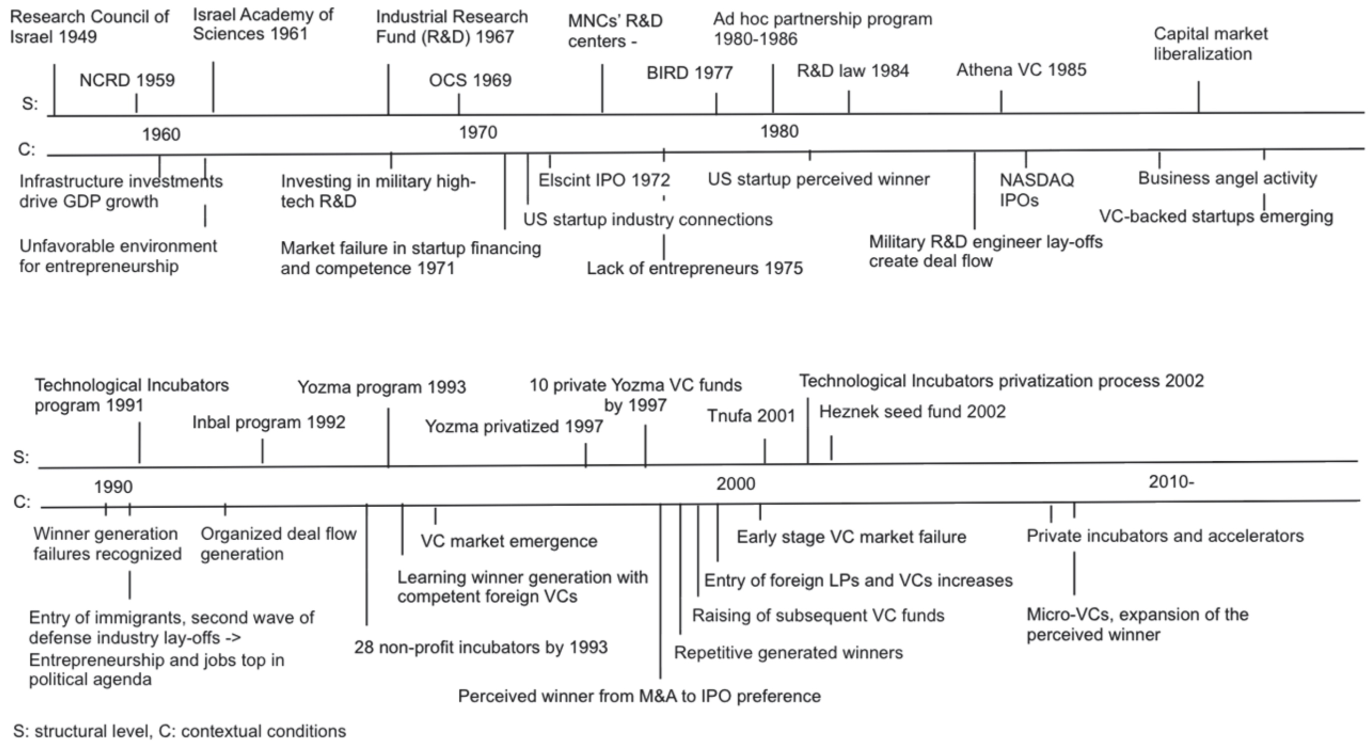

Fig. 13. Timeline of the structural and institutional evolution process in Israel 1950-2014.

5.2.2 The perceived winner

The historical evolution reviewed above is expressed today as a clear understanding of the type of winners sought and the rules for generating them. First, the perceived winner in Israel is built on the premise that the domestic market is not important because it is small. The seeds for this perception were sown in the 1970s and 1980s, when the US-based startup model started to mold the perceived winner. The following comments show how this manifests in the present:

> *"Absolutely. Rarely do I think that by doing a pay day in Israel, it could actually prove anything, especially in the consumer market."* (Serial entrepreneur, venture capitalist)

> *"Because the market is so small, it's almost by definition that you need to go out. Although in many areas, the market here is very advanced and the feedback that you'll get here will be good enough, but still, because the market is so small and maybe the culture is a bit different in some aspects, you need to verify the need across the ocean even at the very, very early stages and really fast."* (Serial entrepreneur)

> *"You don't have the market here, and you build companies, day one, for international collaboration. And you have no other way than succeeding internationally because otherwise you don't get return on the investment in research and development…Israeli companies are built, they want to be outbound."* (Venture capitalist, serial entrepreneur, central high-tech figure)

Secondly, another institutional outcome is that the perceived winner is a company that from day one aims to become a leader in its category in international markets. Historically, the US market has been an important target market for such startups, as shown by the 14 Israeli high-tech company IPOs on the NASDAQ by the early 1990s. This perceived winner, as a shared object, is the lure within the startup industry, which mediates how innovators and entrepreneurs evaluate opportunities and build startups, and how other actors such as venture capitalists evaluate them as investment opportunities and potential business partners. The comments describe this element of the perceived winner:

> *"I have come to realize that it is very important to build the company from day one as a big company…Otherwise no one big would buy from me. It was very clear that the biggest market was in the US (for the startup he founded*

and listed on NASDAQ), and we targeted the biggest customer there; this was very defined target for us." (Venture capitalist, entrepreneur)

"It's about being very small but thinking about how you conquer the world. At least in a certain niche, you want to be the best. You need to be the best, the best worldwide in a certain area. Again, not necessarily be the next Google or the next Microsoft, but in a certain market, you need to be the best." (Serial entrepreneur)

"We're not really looking for companies that will penetrate the Israeli market, but the global market from day one, the US market essentially. It's a market that we are familiar with." (Serial entrepreneur, venture capitalist)

A successful entrepreneur who later turned venture capitalist described the market situation in Israel at the time of his company's inception. The following comment underscores the institutional importance of the social rule of aiming to become the winner in international markets early on.

"I was playing big. There were 10-15 companies in Israel when we started (in 1996), and we did not had the best technology even…but they were bootstrapping, small investments, and had not gone big enough to build an organization that gives customers confidence to work with them. Once there was a big crisis, they went out of business. I grew the company really fast; once I was 300 people - a competitor in Israel was 70. They couldn't compete with us, they did not have the presence in the world, and so on. I raised 45 million dollars from VCs in total…and 100 million dollars in an IPO to NASDAQ." (Venture capitalist, entrepreneur)

Although the need to plan a future exit event is evident and embedded in the rules of the game, in the subsequent activity, it is not emphasized as the primary goal. The aim is to build and grow a big business, and exit comes after this in the hierarchy; an IPO is primarily a funding mechanism for further growth. The following comment illustrates this point:

"(The exit) is in your hands…it means that if you grow revenue, make a profitable company, you can decide one day to go IPO… when I was running (his startup), people asked me, what is your exit strategy. I said I don't have an exit strategy. I'm building a big company and building value in the investment, I want to be big. In order to be big and bigger, if no one is coming and buying me, and I don't agree to be acquired, I will go public and raise

> *more money and grow more…and maybe one day someone will come and say "I want to buy the company." But, it's not that you can make a decision when you establish a company, I'm going to build a company that will be acquired. It's not something that you can make. If you will make this announcement or definition, the company won't be good."* (Venture capitalist, entrepreneur)

The primary data do not depict this embedded view of a winner and the direction of activity as extending back to the pioneering activities of Dan Tolkowsky, Fred Adler and others – the situation in Israel was different during that evolutionary stage of the startup industry. Nevertheless, it is reasonable to assume based on the documented events in the 1970s and 1980s that the shared object of work in the Israeli startup industry has been based on this described winner perception since the early 1990s at the latest. An institutionally aligning factor behind this perception was the requirements of the BIRD and other R&D programs for the projects and startups that sought finance.

In addition, the international dynamism and change around the rules of building and financing startups still affects winner perception. Smaller micro-VC funds have been emerging (see section 5.2.4) and a new agency is becoming a part of the perceived winner. A younger generation serial entrepreneur who was in the process of raising a venture capital fund (the fund is now active) commented on this emerging agency versus the long-prevailing perceived winner described above:

> *"We're trying to create a fund that, even if you sell the company for 60 or 70 million dollars, it's okay for the fund. Because I think one of the big problems of typical funds today here, and in Silicon Valley as well, is that you have one success out of 20 investments, and I invest so much, so the end-game is that you need to sell the companies for a few hundred million dollars at least to be able to be okay with your model, which I think is a little bit crazy because it's, at least in today's market, very difficult to sell a company for 400-500 million dollars. Even if you reach 60 or 70 million dollars, it's a big challenge. You see many cases of companies getting offers to be sold, they're around those valuations, and the VCs would say no, let's continue. And then the company collapses. So, we're trying to create a model where even a sale of 30 to 50 million dollars is not just okay for the fund, but it's good for the fund."* (Serial entrepreneur)

An institutional cycle is perhaps again beginning where low-value M&A transactions are sought, such as during the first phase with the Yozma funds, before setting the goal via gained competence towards building companies post-IPO. The difference is that now the capability to build big winners co-exists with the smaller scale model. This underscores how the continuous experimental winner generation process, organized over markets and hierarchies, is changing, adapting and renewing in Israel. Indeed, entrepreneurial agency is not only for startups: the bulk of investors are also privately organized entrepreneurs in the markets, they also share entrepreneurial agency and they search for new ways to create value and make profits. The startup industry and the driving institutions are not static but evolve along the winner generation process. How the described perceived winner manifests itself in the mechanisms and activity of winner generation is discussed next.

5.2.3 Winner generation

On systemic level, the competence pool, experience and networks of actors generating the perceived winner type of success stories have been evolving and expanding for 20-30 years – a critical mass of competent actors in the markets is the corollary. There are competent actors to select and finance the successful startups, which is essential for minimizing the incidence of the two errors and failures in resource allocation.

Due to its organization over markets, the incentives of the Israeli startup industry actors are largely aligned with the outcome of the winner generation process. The legal formation of a startup company is not the result, and the ability to raise funding and obtain customers are just stepping stones in the process of growing a business to become the desired winner. This embedded competence and history are together affecting the two mechanisms of winner generation.

First, as indicated implicitly already by the defined perceived winner, the funding and building of investment-ready companies gives sense and direction to winner-generation activities. For this reason, the Technological Incubators Program was started. Across the interviews, the importance of venture financing and investment readiness as a part of the shared object of work became evident.

> *”I think that in most companies, if you want to take the company to the next level, you don’t have too many choices. There are very few companies that got to serious success a few years later down the road and did not take any*

money from VCs. So, I don't think you have a choice." (Serial entrepreneur, venture capitalist)

With the perceived winner and venture financing comes systemic pressure for startups to progress - the losers cannot stand still. Startups share their vision with other parties who are incentivized based on the outcome of the business experiment; hence, accountability for resource allocation and actions increases.

"Actual reality is you are in a startup, and you haven't proved your model that still doesn't work, you're a company that is losing money. And every day that it still doesn't work means that everything is at stake. And if you don't feel it day-to-day, then you are in trouble…you need to feel the pressure to move it from the red side to the blue side. Even though that you would say it's according to our plan to be losing money now, it's okay because we're a startup. But you need to have real pressure. This is not a stable situation. So you need as fast as possible to move it to the other side." (Serial entrepreneur, venture capitalist)

The fact that private venture finance plays such an important role means that resource allocation by staged financing creates this sense of urgency and accountability or generates selection based on the execution. Indeed, the basic venture capital cycle requires performance from startups. Finding the right balance between how much money is raised and how long it will carry the business experiment forward is important. A serial entrepreneur and early stage-focused venture capitalist comments:

"Timing in the sense of urgency is very important. I'm not a big believer in investing, even as an entrepreneur getting, let's say that you can now get ten million dollars, which would give you two or four years of operations, and now you could work easily without urgency because you know you have a clear mind for a few years. Which sounds great for entrepreneurs. I would argue that this is bad for the entrepreneur and also for the investor. The investor for sure but also for the entrepreneur because at the end of the day, a startup organization needs to realize that everything is at stake". (Serial entrepreneur, venture capitalist)

This shared sense of urgency and accountability benefits the entire startup industry and the mechanisms of the winner generation process. Startup teams building potential winners can obtain access to competent actors and their networks at different stages based on the needs of the business experiment either through an investment, a board seat or via informal advice. The following comments illustrate this:

> *"You have to take the market, to push it to get the market closer. Maybe you can do it on your own, but then it would take you six months or a year to find the right contacts, et cetera. So if we can present you with the right people even before we invested, to speed things up and try to condense time, then we are better off."* (Serial entrepreneur, venture capitalist)

> *"The fact that I was an entrepreneur and a CEO of a big public company make me relevant to different people…I like to help and work with people. It makes it possible (to be an outside mentor) because many times people don't like to work with experienced other people (inside the company) because they feel like they are threatening their position."* (Venture capitalist, entrepreneur)

> *"I had a great board…two of them were really experienced in our space. One of them actually, I took him with me to meetings…My biggest advice would be to pick a good boards that can assist you, use whatever you can to get them to help you. Especially if you are not experienced."* (Venture capitalist, serial entrepreneur)

> *"I know a lot of people say it, but I think it really cannot be overstated. The people are ultimately what make the business."* (Serial entrepreneur)

For entrepreneurs and top management teams, the institutional importance of international markets means allocating a substantial amount of time and resources toward cross-border markets. A comment of a serial entrepreneur (current venture capitalist) describes how they built the company after raising the first financing round:

> *"In 2001, I left. I basically moved with my family to the US to run the subsidiary American company that we established in order to take this operation to the global market."* (Serial entrepreneur)

Second, due to the successful evolution of the startup industry, Israeli startups face systemic conditions in which the broad scope of competent actors at markets create the incentive to "shoot for the moon" by discovering the right investment partner to competently evaluate the case and to help build and scale the business. The importance of this scope is highlighted by the following comments:

"There isn't anything like a typical VC. A VC is a story, and with each VC, you have different people…The first portion is about VC, whether this person is an ex-CEO or ex-VP something in a company, or he has come from finance or legal…Second is what is the nature of this person." (Venture capitalist, entrepreneur)

"I think at the end of the day, you need to choose the right partner for you. I don't think it matters which VCs specifically invest in you; it's which partner you end up working with and what support you end up getting from them. So, it's like, you know, we're talking about people, so it's important to know who is the person behind the money. It's true with angel investors and it's true with VCs." (Serial entrepreneur, venture capitalist)

Combined with the perception of a winner, these elements form the embedded causal powers affecting the two primary mechanisms of winner generation. It is more difficult to analyze how this is manifested in the mechanisms in qualitative terms on a systemic scale per se. Therefore, some numerical indicators in this regard are discussed next.

As startups emerged by the early 1990s, the amount of generated potential winners (mechanisms 1) started to increase significantly from over 100 towards 400-550 annually[130], peaking at 642 in 2000 at the height of the Internet boom (#SU in table 19). The widespread and social-practice-embedded history of generating investment-ready startups is shown by the high share of VC-backed startups (%VB): approximately 50% of startups were VC-backed in the 1990s. Since then, the share has settled to a still-significant over-20% level due to an increase in the deal flow and the emergence of a wider set of competent investors such as business angels, private equity and corporate investors to provide startup capital in addition to venture capitalists (Avnimelech & Teubal 2006). As an example, IVC (2012) lists 27 leading corporate venture capital funds investing in Israel.

Moreover, the high-ambition perceived winner, the venture-backing-fueled winner generation and the minimization of error 1 are described by startup closure rates (% SC). For instance, between 2003-2007, on average, 231 (41%) startup business experiments failed annually compared to the number of established startups. IVC (2011) data indicate the same, with an average 42% failure versus

[130] IVC (2012) statistics show that this annual rate of startups has remained the same, with 546 startups established in 2011.

establishment rate between 2006-2010. This rate underscores how the Israeli perceived winner and the organization of actors and their incentives over markets mediates the winner generation process. This process is manifested in very tight selection and further post-investment filtering of the winners – resources are allocated to startups that are able to progress and scale their business.

Table 19. Startup creation (# SU), closure (SC*, % SC) and VC-backed startups (% VB*) in Israel 1993-2007 (Avnimelech & Schwartz 2009).

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006E	2007E
# SU	124	140	175	231	260	312	573	642	357	347	404	565	499	520	540
% VB*	59%	61%	50%	51%	46%	48%	37%	58%	45%	59%	28%	25%	23%	23%	22%
SC*	0	0	0	0	0	7	13	160	373	437	239	229	241	229	221
% SC	0%	0%	0%	0%	0%	2%	2%	25%	104%	126%	59%	41%	48%	44%	41%

The Technological Incubators program-licensed incubators, and other recently emerged accelerators are among the first actors in the startup industry to evaluate potential innovations and early stage startups, select the high-potential ones and help them to develop further. The ambitious perception of a winner is expressed here by the tight filtering as well. As discussed earlier, only approximately 5% of projects are accepted to the OCS licensed incubators. This has two relevant implications for the mechanisms of winner generation.

On the one hand, institutionally (rules of the game), the bar is set high for potential inventors, innovators and entrepreneurs in terms of the projects they are working on. This high standard exists both inside academia and the research institutes that are closely associated (some by ownership) with the incubators and among the actors of economy 1 overall. The quality of projects is pushed higher in terms of their innovativeness, uniqueness and growth potential, and an early rejection urges founders to rethink and iterate the business case early on. Hence, the deal flow quality improves over the long term and an understanding of the desired types of projects and winners is widely diffused. This diffusion occurs on national scale, as the incubators are spread across the country, although there are central regions of activity such as Tel Aviv and Jerusalem.

On the other hand, in terms of the division of labor, circumstances in which the incubator's competent managers/executives can add value are created because the number of companies is limited. On average, there are currently approximately 200 customer companies for the OCS licensed incubators, which represents 3-4 companies per incubator executive[131]. Hence, there is time to understand the needs of each startup and organize the best available resources to support their development. The actors' interest to perform in this area is mediated by the outcome-orientated incentives and public monitoring of results.

Overall, the impact of the Technological Incubators program on the generation of potential winners (mechanism 1) has been crucial. OCS[132] describes the success of the program numerically: between 1991-2012, over 1 700 startups were initiated by the program, and it has been the primary startup generator in Israel with 70-80 new startups every year. Over 1 500 startups have matured and left the incubators; out of these, 60% have been able to attract private investment. In total, these investments cumulate into 3.5 billion dollars, which means that against one government dollar, the private sector has invested an additional 5-6 dollars. By the end of 2012, approximately 40% of these graduates were still operating.

Second, the scaling of potential startups into actual winners requires capital besides the human-embodied startup competence. This is especially important because the home market is not targeted and the scaling of winners is aimed at international markets from day one, which is more expensive. Therefore, some key financial statistics are analyzed next to discuss how resource allocation by the two mechanisms reflects the desired perceived-winner-aligned outcomes.

First of all, the total amount of capital invested continually into winner generation is significant - between 2004-2013, Israeli startups raised over one billion dollars annually (table 20). There occurs significant variation: for instance, in 2009, startups raised 1.1 billion dollars compared to over 2.3 billion dollars in 2013. The number of startups in the winner generation process receiving capital varies between 378 in 2005 and 622 in 2013.

Table 20. Total capital raised (M$) by startups, number of funded startups 2004-2013 (Calculated from IVC data).

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Capital raised (M$))	1 465	1 337	1 622	1 759	2 976	1 122	1 262	2 139	1 920	2 346
Startups	428	378	402	462	483	447	391	546	575	622

[131] Yossi Smoler, head of the OCS Technological Incubator Program, confirmed that these numbers are valid today.
[132] See http://www.incubators.org.il/category.aspx?id=606 cited at 13.11.2013

The capital is allocated to startups through the mechanism of picking and scaling the winners. Figure 14 describes how this takes place in share of investment between four stages[133] between 2002-2011, and table 21 shows the average amounts invested by stage in 2010 and 2011. The risky seed stage receives the smallest share of investments, ranging from 2% to 8.5%, with a 5.9% 10-year average. In 2010 and 2011, there were 45 and 105 seed-stage startups that on average raised 0.84 and 0.91 million dollars, respectively. Subsequently, as the business case evolves and startup performance is better understood, the volume of investment increases over the next two stages. Early stage startups attracted 30.8% of invested capital as a 10-year average, with a 3.3 million dollar average investment in 134 startups in 2010 and a 3.7 million dollar average for 152 startups in 2011. These numbers also indicate the importance of the OCS licensed incubators as a source of deal flow: the 70-80 annual graduates form a significant portion of the investment targets at the early stage.

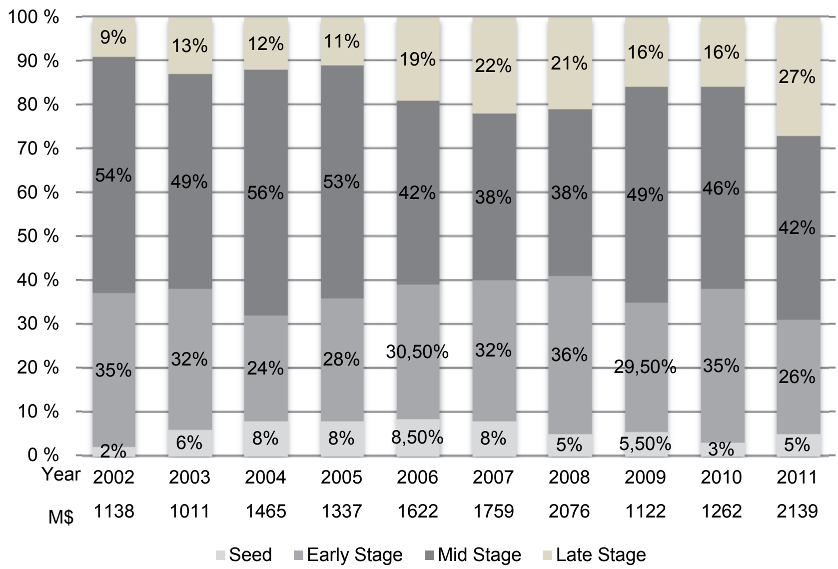

Fig. 14. Share (%) of total capital raised by Israeli startups by stage 2002-2011 (IVC 2012).

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[133] Based on IVC (2012) categories, in which seed and early stage are initial R&D, mid-stage companies have up to 10 million dollars in annual revenue, and late stage companies over 10 million dollars in revenue.

Mid-stage startups receive similar-sized average investments (3.23 and 3.93 million dollars), but as there are more of them, 180 in 2010 and 230 in 2011, they attract most of the total invested capital (46.7% 10-year average). At the late stage, the number of funded startups decreases significantly, 32 in 2010 and 59 in 2011, while the investment size increases two-three fold to 6.22 and 9.78 million dollars, respectively (16.6% 10-year average share of total invested capital). The largest private financing rounds are much above the average; for instance, in 2011, two companies raised 200 million dollars, and 9 startups raised between 40-50 million dollars each (IVC 2012).

Table 21. Capital raised by Israeli startups by stage 2002-2011 (IVC 2012).

	2010		2011	
	Number of startups	Average investment size ($M)	Number of startups	Average investment size ($M)
Seed	45	0.84	105	0.91
Early Stage	134	3.3	152	3.7
Mid Stage	180	3.23	230	3.93
Late Stage	32	6.22	59	9.78

The horizontal scope of the winner generation process is captured by the division of raised capital across startups in different industrial sectors between 2002-2011 (figure 15). The raised capital divides relatively evenly between the main sectors annually, ensuring incentives for early stage actors to initiate new projects in these sectors. Importantly, as new and interesting sectors emerge and others mature, resource allocation by sector changes over the 10-year period. The Internet sector, for instance, has grown from being the smallest sector (4%) in 2002 to being the largest, with 23% (492 million dollars) of investment in 2011.

In conclusion, these statistics indicate over one thousand startups selected under the two main mechanisms of the winner generation process operating in tandem[134]. Their creation is mediated by the perceived winner and filtered by competence, outcome-based incentives and organization over the stages based on their progress. Such a volume of properly financed startups enables the Israeli startup industry to build and scale internationally targeted startups early on, driven by the ideal of the perceived winner. Access to sufficient financial

[134] It must be noted that the numbers do not include all new ventures being established because there are companies that are bootstrapped, use other financial instruments or do not want to raise external capital although aiming for growth.

resources further makes it easier to recruit the needed talent and experience and to bring credibility when confronting different stakeholders such as customers. The high-risk and high-reward nature of these startup business experiments is indicated by the high relative closure rate discussed earlier.

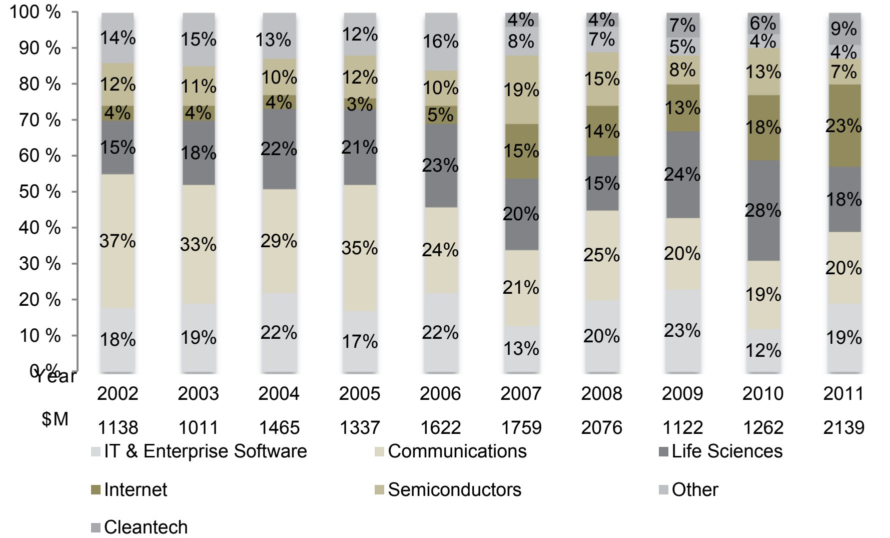

Fig. 15. Capital raised by Israeli startups by sector 2002-2011 (IVC 2012)).

Finally, table 22 shows the beginnings of the Israeli startup industry and winner generation - in 1991 and 1992, there were only 30 VC-backed startups. Triggered by Yozma and the OCS Technological Incubators program, the number of VC-backed startups started to scale, reaching 1800 in aggregate by the end of 2000.

Table 22. Number of all startups, VC-backed startups and the role of OCS Technological Incubators Program in the deal flow between 1991-2000 (Avnimelech & Teubal 2004)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Total
VC-backed startups	10	20	80	90	80	200	219	252	338	513	1 802
All startups	40	40	50	50	100	200	350	350	550	850	2 580
First time OCS startups	34	109	165	218	146	200	170	165	138	126	1 471

5.2.4 The outcomes and renewal of the startup industry

The outcomes of the winner generation process in Israel have been historically compelling, as indicated by the nickname "Startup Nation". The Israeli startup industry has generated and scaled internationally successful startups (winners) at a level that many countries cannot match. The most significant measure of this is likely the number of IPOs of Israeli companies on the NASDAQ and the NYSE, which was the third highest in the world already by 2000, with over 150 listed companies (Avnimelech & Teubal 2004). Since then, the number has grown to approximately 180 listings in both of these stock exchanges by 2013[135].

Behind these numbers is a constant flow of successfully generated winners, which began in the early 1990s after the government initiatives were implemented and startups emerged as a shared object of work shaped by the co-evolving perceived winner. The exits of Israeli companies via IPO and M&A indicate the scale of success. First, it is notable that before 1993, there were only three VC-backed IPOs (table 23). From this point, an annual flow of IPOs began that in total raised almost 4 billion dollars of capital by 2001, peaking in 24 VC-backed IPOs in 2000. The statistic from 2001 further shows how the bursting of the Internet bubble the next year significantly affected the startup industry, as the number of VC-backed IPOs dropped to just two, with three IPOs in total. Overall, the 1990s generated over 160 IPOs in the US and EU (mainly AIM in London) capital markets, out of which 80 were VC-backed (ibid). In addition, the volume of M&A transactions during the 1990s was even greater, with an estimated 20 billion dollars in total (Avnimelech *et al.* 2004).

The number of IPOs remained at zero until 2004[136] (table 23) and has not yet again reached the levels seen in the 1990s. Between 2002-2012, there were 14 VC-backed IPOs in the US, raising 1.1 billion dollars in total. At the same time, VC-backed IPOs in EU capital markets were lower in volume than those on the Tel Aviv Stock Exchange (TASE), which attracted 21 IPOs and raised 246 million dollars. This decrease in IPOs does not necessarily imply weaker performance in winner generation, however.

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[135] Not all of these are startups or VC backed.

[136] The Sarbanes-Oxley Act of 2002 and the overall hit taken by the public stock markets affected the number of IPOs, among other things. The more recent financial crisis affected IPOs from 2008 onwards.

Table 23. IPOs of Israel-based companies in the US and EU until 2001 (Avnimelech & Teubal 2004).

	All public offerings			VC-backed public offerings		
	Number of offerings[1]	Capital raised (M$) [2]	Number of IPOs	Number of offerings	Capital raised (M$)	Number of IPOs
Before 1993	~30	~1 000	~25	4	~60	3
1993	18	529	16	7	103	6
1994	10	336	8	5	35	4
1995	16	608	12	7	210	5
1996	31	1 037	24	13	535	12
1997	24	1 074	16	8	175	5
1998	14	907	14	5	144	5
1999	20	3 172	20	16	1 073	14
2000	36	2 842	31	29	1 530	24
2001	3	143	2	2	83	2
Total 1990s	~202	~11 200	~168	96	~3 950	80

[1] Including IPOs, secondary and debt offering of all Israeli and Israeli related companies (high tech and none high tech) that are traded or were traded in NASDAQ, [2]US capital markets only.

Indeed, the exit volume has shifted strongly toward M&A deals. Compared to the small number of IPOs in 2002-2012, there were 345 VC-backed M&A deals for Israeli high-tech companies, with a total volume of 16.9 billion dollars (table 24). From 2007 onwards, VC-backed M&A exits have achieved an average 2 billion dollars annually. Moreover, the total volume of all M&A deals at that time was a significant 43.5 billion dollars in 822 deals (IVC 2013).

Table 24. VC-backed M&A deals and IPOs of Israeli high-tech companies to the US, and the EU and IL between 2002-2012 (IVC 2012, 2013).

	VC-backed M&A	Volume ($M)	VC-backed IPOs US	Capital raised ($M)	VC-backed IPOs EU/IL	Capital raised ($M)
2002	27	660	0	0	0 / 0	0 / 0
2003	25	572	0	0	0 / 0	0 / 0
2004	33	793	4	295	1 / 2	2 / 8
2005	27	896	2	167	1 / 3	19 / 28
2006	47	2 747	2	118	1 / 3	13 / 18
2007	29	1 686	4	401	1 / 7	7 / 119
2008	34	1 504	0	0	0 / 0	0 / 0
2009	29	1 542	0	0	0 / 1	0 / 22
2010	26	1 245	1	62	0 / 3	0 / 35
2011	33	2 517	1	90	0 / 2	0 / 16
2012	35	2 790	0	0	0 / 0	0 / 0
Total	345	16 952	14	1 133	4 / 21	41 / 246

The following comment from a successful entrepreneur and venture capitalist highlights the positive side of M&A deals and their importance for the winner generation process in the long term. The comment was initiated by a discussion of potential negative views on exits.

> *"It's a big mistake (seeing exits as a negative thing). If people don't have experience from other places, they will see in their life just one big company…Maybe you were acquired by Intel. The fact that you became a part of Intel, you see, you are taking from the experience of business in Intel, you have people from Israel becoming big VPs in Intel. You have people from Israel becoming big managers in Broadcom, in Yahoo! in Google, in other places because people, companies were acquired. You got the experience, the knowledge, the connections because these people, the managers are coming to visit Israel. So, this makes money and people flow in, the market is open, and the communication. And then people who, you know, were acquired by Intel, stay two years with Intel, and then after they go out and they establish a new startup."* (Venture capitalist, entrepreneur)

The total number of successful outcomes and startups within the winner generation process show the ability of the Israeli startup industry to generate a critical mass of potential winners and scale the best into actual winners. This process has been active for over two decades and has many implications for the renewal and evolution of the startup industry.

First, exits create a track record of success that enables the recapitalization of winner generation by raising subsequent and new venture capital funds and by driving out non-competent funds. This is an essential factor in the venture capital cycle (Gompers & Lerner 2004) that started with the Yozma funds and continued with the others that followed their success. For instance, Israeli venture capital fund Pitango raised their sixth fund in 2012. In addition to subsequent funds, new funds in particular renew the actor structure. In 2011-2012, in total 12 venture capital funds managed by new partnerships were raised, among them 6 micro-VC funds that raised 83 million dollars. This means that competent actors with relevant backgrounds join new actors to compete in the winner generation process with the approximately 70 venture capital funds in Israel. Out of these, 14 are international venture capitalists with Israeli offices. In addition, there are many venture capital companies without an office in Israel but with a dedicated partner for Israeli investments from the main fund. Overall, new venture capital fund raising between 2002-2012 (table 25) shows the cyclical nature of venture capital; in 2010, no new funds were raised.

Table 25. Capital raised (M$) by Israeli venture capital funds 2002-2012 (IVC 2011, 2013).

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total
Capital raised (M$)	69	70	582	1 531	754	1 167	1 067	334	0	796	607	6 977

The attractiveness of the Israeli startup industry is further indicated by the share of foreign investors' capital within venture capital investments. During the last decade, over 50% of invested capital has origins outside of Israel, and the statistics show that this trend is growing stronger, reaching the 75% level in 2011 (figure 16). Tapping into cross-border resources complements domestic weaknesses, and startups can benefit from the delivered value-added[137].

[137] While this provides resources for winner generation, it also challenges the Israeli VC industry and fund raising.

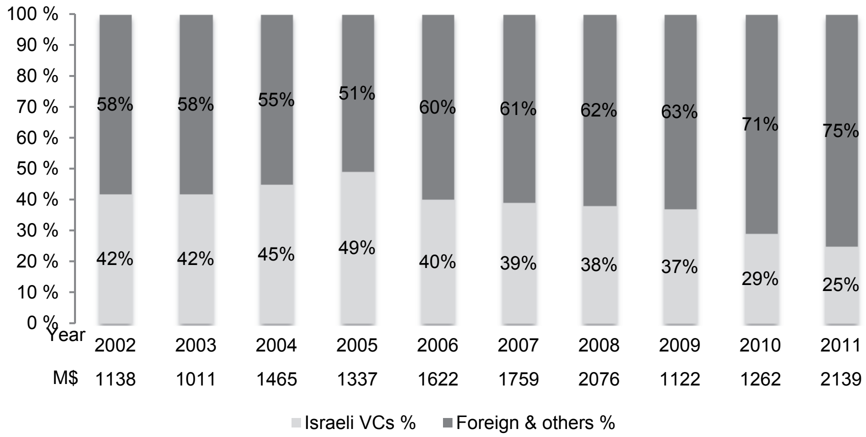

Fig. 16. Capital invested (M$) in Israeli high-tech companies by Israeli VC funds and other investors 2002-2011 (IVC 2012).

These successes have encouraged competent foreign customers to set their sights on Israeli startups. A significant number of the 250 R&D centers for the world's leading foreign technology companies in Israel started with an acquisition of an Israeli startup that was turned into an R&D site. As discussed in the previous section, the roots of competent high-tech multinationals in Israel go back to the 1960s and 1970s. Those companies were the bellwethers and brought credibility that encouraged others to join during a time when startups and winner generation did not exist as a shared object or within the startup industry structure. Their historical importance in the renewal and development of the Israeli startup industry is illustrated by the following comment:

> *"The role of the multinational corporations has always been interleaved with international funding. Because international funding came after there were Intel and IBM and Motorola and to some degree Microsoft, they were present here. So, they gave, certain credentials to Israeli potential. And they, if they were here, say the investors "there must be something good there."* (Venture capitalist, serial entrepreneur, central high-tech figure)

Together, these outcomes mean that the organization of actors, the perception of a winner and the conditions for winner generation evolve based on performance in the markets. Exits create more competent actors who can join the winner generation process because successful entrepreneurs become serial entrepreneurs, mentors, angel and venture investors, and new entrepreneurs are attracted by the successful examples. Human-embodied competence is gained both from the success stories but also through learning from failed business experiments and being outcompeted in the markets at the startup industry level. Hence, there are incentives and conditions for the early stage actors, namely inventors, innovators and entrepreneurs, to set the bar high and to aim to build a leading company internationally. The startup industry has the critical mass of variety, depth and embedded competence to generate new international winners and minimize the incidence of the two errors.

5.3 Silicon Valley

Silicon Valley in California, US, is the global leader in generating winning startups. It has remained in the lead after surpassing the East Coast and Route 128 in Boston during the 1970s. The rise of Silicon Valley implied that it was possible for a region without a prior industrial history to rapidly transform into a leading-edge industrial economy, bypassing the intermediate stages of development (Sturgeon 2000). The region's distinctive capability to generate highly successful companies and economic development has triggered a significant amount of research and a constant flow, as Miller and Coté (1985) note, of planning bodies and government agencies from all over the world who visit to search for ways to replicate this success in their own regions. Typically, attempts at replication have not been successful either within the US or internationally (Leslie & Kargon 1996), nor are these the purpose of this study.

The term 'Silicon Valley' was likely coined in 1971 by a computer journalist Dan Hoefler (Ante 2008), but it is used in this connection from the beginning of the historical analysis, including the discussion of the Santa Clara Valley and San Francisco Bay areas. There are some intersecting views and accounts of the evolution of this area[138], with the characteristics of Silicon Valley tracked as early as the 1910s to 1930s, with Sturgeon (2000) being a case in point. Silicon Valley is a region, not a nation as Finland and Israel, and in the analysis, some progressions and events elsewhere in the US that affected its evolution are

[138] Sturgeon (2000) links the role of radio industry development before WWI and the electronics and electric power industry before WWII to the later emergence of Silicon Valley as captured by Norberg (1976) and Williams (1987, 1990).

discussed. In addition, the co-evolution of venture capital as a critical component of the Silicon Valley startup industry is emphasized, and its origins are therefore discussed first.

5.3.1 Historical evolution to the present startup industry structure

Pre 1950s: Antecedent events set the scene for later Silicon Valley and venture capital emergence

It is often mistakenly thought that Silicon Valley has always dominated the startup landscape and the venture capital industry. In fact, the Northeast had the advantage in venture capital over the West Coast before World War II (WWII). New York was the global financial leader, and MIT and Harvard were the top universities in science and technology and business education, respectively (Ante 2008). Stanford University, the now-leading university in Silicon Valley aside from University of California Berkeley, was not then considered to be their equal, especially in technology.

In the US, wealthy families made the first venture capital-type investments in the late 19th and 20th century as they started to look for ways to invest in high-tech related business opportunities. These families, such as the Vanderbilts and Rockefellers, had made fortunes in railroads, steel, oil and banking ventures and were the first to finance Boston's nascent high-tech entrepreneurs (Lample 1989). During the 1930s and 1940s, the risk capital market was fragmented and disorganized, until some wealthy families hired professional managers to seek out investment opportunities in young potential ventures or startups (Gompers 1994).

The term 'venture capital' was used for the first time by Lammot Du Pont in 1938, but Boston academic circles may have already been using the term (Avnimelech *et al.* 2004). Indeed, the first modern venture capital firm, American Research and Development Company (ARD), was formed in 1946 in the Boston region by MIT's president, local financiers and bankers, and Harvard Business School professor Georges Doriot, who is considered to be the father of venture capital (Ante 2008, Gompers 1994). ARD itself was moderately successful and differed from present VC firms by being a public company[139].

[139] ARD's most successful investment, which created the concept of the "home run" in venture capital, was Digital Equipment Company (DEC), with a return on the original 70 000 dollar investment for a 77% stake in 1957 by a factor of 500 to 38.5 million dollars at the IPO in 1966. DEC's origins lay in MITs Lincoln Laboratory, where the first computers and later minicomputers were invented (Gompers 1994, Ante 2008).

The later emergence of the venture capital industry in the US and Silicon Valley was hence pioneered first before WWII by wealthy families acting as business angels and organizing managers to screen the deal flow, and secondly, as Ante (2008) notes, after the Allies won in 1945 by ARD and few other companies from the Northeast that further developed the industry during the following three decades. Boston was a central region because, due to the wars, the US military became convinced that it needed to invest in technology development, hence the top universities in the region became the epicenter of military R&D. MIT ran the Radiation and Lincoln Laboratories[140] (ibid) and Harvard had a secret Radio Research Laboratory[141] (RRL) that employed approximately 800 persons from 1942 to 1946.

The evolution created the foundation for both potential technologies from military R&D and investment opportunities in startups taking products based on those technologies to markets. This happened particularly around the Boston region[142], but it had broader implications for the future of Silicon Valley.

1950s and 1960s: the emergence of Silicon Valley and its entrepreneurial culture

Frederick Terman, who is considered to be the father[143] of Silicon Valley, was the director of the RRL in Harvard. Terman was a Stanford graduate who taught and studied electronics there until recruited to the East Coast to run the RRL at the start of WWII. During the war, he learned the electronics business hands-on and supervised all of the relevant aspects from basic research to the mass production of radar tubes and systems (Leslie & Kargon 1996). After the war, Terman returned to Stanford and started the Electronics Research Lab (ERL). It had a faculty recruited from the best wartime electronics veterans (many with a Stanford background) and a focus on technical niches where it had an edge: highly visible engineering research and training programs that could attract the best students, federal funding, and local industrial support (ibid, Ante 2008).

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[140] Lincoln Laboratory developed the first minicomputer. Dozens of Boston-region spin-off companies, DEC being the most successful, created a minicomputer industry that enabled the formation of the Boston venture capital industry (von Burg & Kenney 2000) and established the Northeast as the leading startup region at that time.

[141] See http://en.wikipedia.org/wiki/Radio_Research_Laboratory_(Harvard)

[142] The minicomputer industry in Boston changed the game so that established firms could no longer easily monopolize the new computer-related industries; instead, startups would commercialize numerous computer-related products fueled by venture capital funding (Avnimelech *et al.* 2004).

[143] See Sturgeon (2000) for coverage of early 20th century San Francisco Bay Area economic activity and the key actors, which include a few that can in all sincerity be called the ancestors of Terman, Silicon Valley and the way that this region operates.

Terman's return to Stanford was an event that seeded the later emergence of a technological trajectory based on semiconductors in Silicon Valley. This technological trajectory is highly relevant for the eventual development later of the East and West Coasts (Kenney & von Burg 1999: 68).

Terman and the new electrical engineering lab produced 67 doctoral degrees in the field between 1950 and 1954. At the same time, the University of California at Berkeley, although significantly larger than Stanford, produced 19. These PhDs were an important source of intellectual capital for the region. Terman used his military connections to bring Pentagon research and procurement funding to California and Silicon Valley. For instance, during the four-year period prior to 1954, 14% or approximately 13 billion dollars of this funding came to the state of California, and much of it particularly to Silicon Valley. (Shurkin 2006) Hence, the development of Silicon Valley benefitted significantly from WWII and subsequent Cold War military spending (Markusen *et al.* 1991, Leslie 1993), which created a wide technological competence pool in the region. At that time, there were no venture capital funds in the Valley to finance new ventures.

Instead, some informal business angel activity started to take place, mainly driven by a circle of friends called ”the Group”. In the early 1950s, these friends would meet emerging high-tech entrepreneurs at a local restaurant, hear their pitch talk and make an investment decision as a syndicate (Gupta 2000). This group made approximately 25 investments, and later some of its members, such as Reid Dennis, continued as venture capitalists. An exact moment for the beginning of business angel activity in the region is difficult to pinpoint because for a long time, angel investments were made informally by private individuals.

Wartime orders were a significant economic boost to the West Coast electronics companies for a long period of time. With subcontracts from GE and other East Coast giants, the California startups had large customers and their business grew exponentially. As an example, Hewlett-Packard (HP) had nine employees and 34 000 dollars in sales in 1940; after three years, this had jumped to 100 employees and 1 million dollars in revenue. Later, the Korean War drove the sales of Varian Associates, another startup founded by Stanford graduates, from 200 000 dollars in 1949 to 25 million dollars by the end of the 1950s. (Leslie & Kargon 1996) The smaller firms benefitted greatly because the US government and its prime contractors were willing to buy unique high-tech products at very high premiums (Avnimelech *et al.* 2004). Jobs were also created by large corporations establishing operations in Silicon Valley; for instance, Lockheed started to develop missiles in Sunnyvale in 1956 and grew to employ 20 000 people four years later[144].

Terman developed close ties within the Stanford community and among small and large local electronics companies and fostered collective learning and open networking between them. He encouraged the companies to cluster in the Stanford Industrial Park, which was established in 1951, organized industrial researchers to teach specific courses on campus, and supported faculty consulting with companies. Indeed, Terman strongly encouraged entrepreneurial culture in what he liked to call "the newly emerging community of technical scholars". This meant helping new venture creation by his students, including Bill Hewlett and David Packard, who in 1939 started the company that became Hewlett-Packard (HP) and one of the greatest success stories of the Valley[145]. Terman[146] also started the Honors Cooperative Program to enable corporate employees to earn degrees while holding full-time jobs. (Leslie & Kargon 1996) These were all activities igniting the emergence and evolution of Silicon Valley, as it is known today.

Blank (2008) describes how (1) the combination of Terman (who became the provost of Stanford in 1955) and Stanford research, (2) military funding and the need to develop solutions to problems stemming from the battlefield and the early stages of the Cold War, and (3) startups and a culture of open information sharing together became the first engine of entrepreneurship in Silicon Valley. Activities were largely driven not by profit seeking, but by needs (problems to be solved) stemming from crises and threats related to war.

Another key figure in Silicon Valley's evolution in addition to Terman is William Shockley. He was a physicist that grew up in Northern California with an extensive military background and was also a co-inventor of the transistor and a

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[144] Http://steveblank.com/2010/01/07/the-secret-history-of-silicon-valley-part-13-lockheed-the-startup-with-nuclear-missiles/

[145] The company was run with a style that became known as the "HP Way". It embodied a decentralized and open company culture that avoided hierarchy (contrary to East Coast companies), preferred an informal management and communication style or "management by wandering around", team-based problem solving, an entrepreneurial approach, and close ties to local companies. This approach was assimilated alongside with Intel's style during the 1960s and 1970s around Silicon Valley and sowed the seeds for the culture still present today. (Saxenian 1994)

[146] Interestingly, Terman spent a summer in the early 1920s at Federal Telegraph Company (FTC); FTC was founded by Cyril Elwell, a Stanford graduate, with support from the Stanford University president and the Civil Engineering Department head. Sturgeon (2000) notes this as an example of the heavy involvement of Stanford's administration and faculty in new venture creation and co-operation with local industry three decades before Terman helped with the founding of HP.

Nobel Prize winner in 1956. Shockley founded the first semiconductor company in the region, Shockley Semiconductor, in 1955 in Mountain View, California[147] as a division of Beckman Industries, which funded it. Terman wanted Stanford professors and students to be involved with semiconductors and their manufacture, which was Shockley's area of expertise (see Shurkin 2006) The region became the center of the semiconductor industry, thereby developing the fundamental component of every product with an electronics function (Kenney & von Burg 1999).

Later, the core people at Shockley Semiconductor became involved in a technical disagreement regarding what the company should build. This eventually led to eight "rebels" leaving the company in September 1957. Instead of going to work for another company, Bud Coyle and Arthur Rock (later a successful venture capitalist) convinced them to start their own semiconductor company. Soon the "Traitorous Eight," as they are called, started Fairchild Semiconductor with 1.5 million dollars in funding from Sherman Fairchild with an option to buy them out within two years. The company was successful, and Fairchild used the option and bought it in January 1959. After this event, several of the original eight started their own companies; among them were the founders of National Semiconductor in 1967 and Intel in 1968[148]. (Shurkin 2006, see also Braun & MacDonald 1982, Scott & Storper 1987) The semiconductor created the Silicon Valley[149] by name.

The first IPOs for startups that were founded under these circumstances took place in the mid 1950s: Varian in 1956, HP in 1957, and Ampex in 1958. These helped to attract the attention of institutional investors to the region. However, military and federal funding was dominant for a long time, and venture capital was just about to emerge pulled by the semiconductor companies.

The spectacular growth and profits of the semiconductor industry made many firm founders and early employees very wealthy during the 1960s (Tilton 1971). Overall, Blank (2008) notes that in total, 65 chip companies were established on

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[147] Without Shockley's involvement, the site would have been established in Pasadena, in Southern California, by Beckman Industries, and the story of Silicon Valley would have likely been different.

[148] Federal Telegraph Company (FTC) produced the first important spin-offs starting in 1910; this highlights the long history of spin-offs as a key element of economic development in Silicon Valley (Sturgeon 2000).

[149] The vacuum tube, which was perfected by Lee deForest in the FTC laboratory in Palo Alto in 1912, played a similar role as a technology trajectory (cf. Kenney & Burg 1999) pre-WWI, giving birth to the "age of electronics" (Sturgeon 2000) as the transistor did during the post-WWII semiconductor industry.

the legacy of Shockley and Shockley Semiconductor during the subsequent 20 years. Kenney and von Burg (1999) trace the origins of 124 startups by 1986 to Fairchild. These created a significant source of attractive deal flow for venture capitalists, and the success of startups was key to the local venture capital industry's evolution. In fact, later successful venture capitalists Donald Valentine and Pierre Lamond of Sequoia Capital and Eugene Kleiner of Kleiner Perkins started their careers at Fairchild as well (Kenney & von Burg 1999). The enormous capital gains for founders, key employees and investors of venture capital funds that resulted from the success of Fairchild spin-offs (and later their individual spin-offs) led to further investments in new startups and venture capital funds – a self-reinforcing process was set in motion and established during the next decade (ibid).

The government entered the venture capital market and supported its emergence in 1958 through legislation that allowed the Small Business Administration (SBA) authority to license new Small Business Investment Companies (SBICs) to focus on the early stage financing of startups and business expansion in various industries. The SBIC program was resourced by 250 million dollars from Congress (Ante 2008). There were three organizational ways to form a SBIC (in addition to a minimum of 150 000 dollars in committed capital) (Bean 1996): (1) a private individual operated and funded the SBIC, (2) a public stock offering financed the SBIC, and (3) the SBIC was operated by a financial institution (such as bank) with capital from one or more financial institutions. The number of SBICs grew fast – by the mid 1960s, there were approximately 700 SBICs controlling the majority of risk capital in the US. This created a mild venture capital ”boom” at the time (Gompers 1994). According to Avnimelech *et al.* (2004), the most significant for venture capital growth in the 1960s were the private and public stock offering-based SBICs.

The process of building technology-based startups was still a relatively new phenomenon and competence area. Gompers (1994) describes how SBIC managers typically lacked industry experience and networks, thus being unable to provide much beyond money to entrepreneurs. Further, the managers did not monitor the firms as active investors based on the upside, but focused on evaluating project success based on the repayment of loans because the SBICs needed to make periodic interest payments. This further led them to use debt instead of equity finance (thereby being different from ARD), and drove funding to more stable industries. (ibid) The fact that SBICs charged interest from moneyconsuming startups was the most important problem because the startups could not easily afford to pay them (Avnimelech *et al.* 2004).

However, due to the highly active IPO market of the late 1960s, many SBICs succeeded in listing companies. The problems came with the offered government guarantees and poor incentives: when managers of some financial institutions understood that government would bail out depositors if things went wrong, they lost their incentive to manage investments closely, and they took on more risk. Indeed, young SBIC-backed firms were hit and could not pay the loan interest when, during the oil embargo of 1973-1974, the IPO market activity dropped dramatically by 90%. This caused trouble for many SBICs, and many were forced to liquidate. (Gompers 1994) In summary, the SBIC program provided the opportunity for management teams to learn about venture capital investing and high-growth ventures at a time when such competence was not yet developed. Hence, in this thesis, the program is also seen as an investment in gaining competence in this area.

The venture capital industry in Silicon Valley started to take shape around the 1960s. The first Silicon Valley venture capital firm using the then-innovative limited partnership (LP) structure was Palo Alto-based Draper, Gaither & Anderson (DGA) in 1958. Bill Draper, one of the founders, describes the circumstances as the firm being ”the very first venture capital west of the Mississippi” (HBS 2010). A vital portion of the funds came through the SBIC program. DGA was followed by Thomas Davis and Arthur Rock (D&R) in 1961. They created a very successful fund (5 million dollar fund with a 100 million dollar return); some of the initial capital came from Fairchild entrepreneurs whose initial funding was organized by Arthur Rock in 1957. Sutter Hill was established in 1964, TA Associates in 1968, Mayfield Fund in 1969, Patricof & Co. in 1969, Kleiner Perkins in 1972, and Sequoia Capital in 1972. A recognized core group of active venture capitalists was formed, some of whom are still in the business today and considered among the best internationally.

1970s: Taking over the East Coast and the creation of industry-defining winners

The venture capital industry started to attract significantly more money, but it was still a boutique industry in the 1970s. The success of ARD stimulated private venture capital firm formation, and many former ARD members actually started their own firms to make investments. According to Gompers (1994), annual commitments to venture capital funds remained between 100-200 million dollars until the end of the 1970s, with the goal always focused on a ”home run” and a hands-on management approach providing services to entrepreneurs (unlike most SBIC managers).

But the economy was challenging: the Dow Jones index was almost cut in half between 1973 and 1975 due to inflation, economic recession and the oil crisis (Ante 2008). In 1974, severe pension fund frauds and the ensuing public debate caused Congress to pass the Employee Retirement Investment Security Act (ERISA), which extended the ”prudent man” rule to private pension funds and hence made fund managers liable for ”imprudent” behavior. Institutional investor commitments to venture capital funds almost ended under an already uncertain economic climate, as fund managers could now be held personally liable for investments in risky asset classes such as venture capital should the investments fail (Gompers 1994). To strike back, the newly formed (1973) National Venture Capital Association (NVCA) started to push for looser ERISA requirements using arguments including modern portfolio theory. This pushback worked, and by 1979, the ERISA was relaxed to a point where even public pension funds[150] began investing again in venture capital as limited partners[151] (Avnimelech *et al.* 2004, Gompers 1994).

The number of SBICs had grown to be substantial during the 1960s, and the variety of licensees increased. By the mid 1960s, young venture capitalists were accompanied, for instance, by real estate and product distributor industry peers, causing problems such as self-dealing, mismanagement, and fraud. The SBA reacted with regulation and increasing bureaucracy, which led, in the early 1970s, to almost all SBICs operating like venture capitalists relinquishing their licenses and either starting to manage their own personal wealth created during the really active IPO market of the late 1960s or to raise new funds using the LP model. At the end of the 1970s, the role of SBICs was significantly less relevant for startups in high-tech regions such as Silicon Valley. The venture capital industry had consolidated and was playing an important role in the US innovation system. (Avnimelech *et al.* 2004) By 1978, there were only 250 SBICs active in the US (Gompers 1994). These events again highlight how the SBIC program provided a hands-on training ground to build competence, a track record and networks for the individuals who later became venture capitalists.

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[150] This was highly important for the venture capital industry fund raising because pension funds controlled a 3-trillion-dollar capital pool at the end of the 1980s (Gompers 1994).

[151] Around the same time, capital gain taxes were also decreased, but according to Gompers and Lerner (1999), this was not as significant to venture capital industry growth as was the relaxing of ERISA.

Out of the numerous corporate R&D centers located in Silicon Valley, among the most important is the Palo Alto Research Center (PARC). Xerox Corporation established it in 1970 with the intention of developing the “office of the future”. The lab developed numerous important technologies, such as the mouse, the graphical user interface, desktop workstations and LANs (Ethernet), but it was not capable of commercializing them. However, local entrepreneurs and venture capitalists were able to turn many of these innovations into successful businesses, often with involvement of PARC personnel. (Kenney & von Burg 1999) For instance, Apple’s graphical user interface was influenced by PARC. Many similar R&D centers have provided a constant flow of technologies and business opportunities for the startup industry to exploit.

The relationship between venture capital-financed startups and the NASDAQ as a preferred exit channel was established in October 1971, when Intel listed. The NASDAQ was selected because it had less rigid listing requirements and was therefore a suitable vehicle through which young firms could raise capital and provide a liquidity event for owners. (Avnimelech *et al.* 2004) Sohl (1999) discusses how the NASDAQ needed to compete against the NYSE; the NYSE market was dominant and the NASDAQ had less than one-half of its trading volume in the late 1970s. With the help of technology company IPOs, the NASDAQ achieved a higher volume than the NYSE for the first time in 1994.

Overall, a large systemic transition in the US economy started to take place at the end of the 1970s from a declining industrial and manufacturing economy towards an innovation- and startup-driven economy. The magnitude of this change is illustrated by the Fortune 500 companies’ share of the Gross National Product (GNP) and employment (Sohl 1999): between 1954-1979, it rose from 37% to 58% and 16 million jobs in payroll, but since then, employment decreased steadily by 4 million jobs, and in 1996, only 10% of employment came from these companies.

Silicon Valley as a region was one of the leaders and big winners from this change. Blank (2008) aptly describes how at this stage of evolution, Silicon Valley gained its second engine of entrepreneurship – startups created with the ambition to change the world, funded by venture capitalists and geared towards profits.

1980s: The Silicon Valley startup industry becomes number one in winner generation

The above-mentioned changes in the ERISA in 1979 allowed pension funds to invest up to 10% of their capital in high-risk assets such as venture capital, which triggered an increase in the flow of capital during the 1980s[152]. As a result, annual commitments to venture capital funds increased from 100-200 million dollars in the 1970s to over 6 billion dollars in the mid 1980s (figure 17). Thus, the number of venture capital firms also increased from 225 in 1979 to 674 in 1989. The outcomes of this boost were mixed as, on the one hand, many successful firms received financing, which was followed by technology and employment growth. However, on the other hand, overinvesting occurred in certain industries such as the disk drive companies, inexperienced venture capitalists brought companies to the public market too early, and the monitoring of entrepreneurial projects deteriorated. In particular, the short-term focus of institutional (pension fund) investors created a mismatch between the time needed to increase the value of venture capital investments and investors' time horizon. (Gompers 1994)

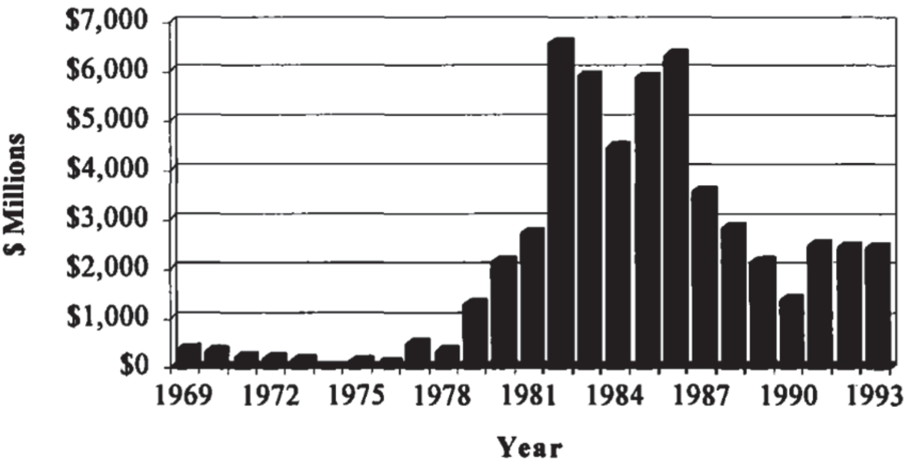

Fig. 17. Increase of annual commitments to venture capital funds in the US (Gompers 1994).

For Silicon Valley, the increase in asset allocation to venture capital meant that venture capital firms grew in terms of committed capital and the number of

[152] The Bayh-Dole Act in 1980 aimed to facilitate the licensing of government-funded university research, but its importance to venture capital as a source of deal flow is debatable (Mowery, Nelson, Sampat & Ziedonis 2004).

partners, and the region became free from dependence on investors in New York and Chicago (Florida & Kenney 1988a, 1988b). However, because venture capital is a tacit-experience- and competence-based industry, experienced partners were in short supply at a corresponding scale. Sohl (2003) notes how the new partners were faced with a learning challenge: to master venture investing and its minefields, often with the minefields winning.

In addition to venture capital, business angel investments in the US were estimated at 10 billion dollars annually in close to 30 000 startups (Sohl 2003). Silicon Valley took a significant share of this[153]. The startup industry was now structurally capable of supporting the winner generation process from the idea stage all the way to an IPO. Indeed, around the mid 1980s, more than 30% of venture capital investments in the US took place in this region, and a few San Francisco-based investment banks had developed specialized know-how to manage the offerings of venture-backed startups on the NASDAQ - this made the exit process more routine and later a self-enforcing virtuous circle of growth (Avnimelech *et al.* 2004).

Despite the significant increase in asset allocation to venture capital funds overall, the number of startups raising venture capital in Silicon Valley grew more slowly, from 323 in 1985 to closer to 400 towards the end of the decade (table 26). A one billion dollar annual investment level was reached for the first time in 1986, but the major growth in invested capital started to take place later in the mid 1990s.

Table 26. Total venture capital raised (M$) by startups (SU) and the number of funded startups in Silicon Valley 1985-1995 (NVCA 2013).

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
SU capital raised (M$)	759	1 016	850	986	917	914	781	1 120	903	1 074	1 808
Number of SU's	323	340	343	362	394	398	337	421	316	336	509

The first biotechnology company IPO, Genentech in 1980, was another important event in the evolution of Silicon Valley. The company raised 35 million dollars and during the first day of the IPO, the stock rose incredibly from 35 to 88 dollars

[153] Due to the successful startups, there was also a growing number of entrepreneurs, early employees, and executives in the 1980s that had money to invest and play an active role in early stage startups as business angels. The angel investing that had started in the 1950s became an important part of winner generation. Among academics, Wetzel (1983) was the first to note their important role.

(Ante 2008). The outcome of this event was that in addition to increased institutional investor interest in venture capital stemming from changes in the ERISA, public interest was now drawn to venture capital and startups, and rose significantly. The Genentech IPO further established Silicon Valley as the number one area in venture capital and startup-driven economic development: in addition to the biotechnology industry, the semiconductor industry was created, and Atari (founded in 1972) and Apple (founded in 1977, IPO in 1980) created the electronic video game and personal computer industries, respectively[154] (Ante 2008).

These IPOs were also essential in the sense that they (1) orientated US high-technology industries away from their dependence on military[155] and government markets towards civilian markets, and (2) at the time supported the important roles of venture capital in the US economy and of the venture capital industry as an interest group in politics (Avnimelech *et al.* 2004). Meanwhile, the role of SBICs had decreased significantly, as they accounted for only 7% of venture capital financing in the US in 1988, compared to providing 75% of investments 25 years earlier (Gompers 1994). A non-government-dependent private venture capital market had emerged in Silicon Valley.

In summary, at the end of the 1980s, the Silicon Valley startup industry was structurally complete. It had a critical mass of different actors organized over markets and could provide the incentives for innovators and entrepreneurs to build high-ambition-level startups in many industrial sectors. A growing pool of competent business angels and venture capitalists with a successful track record of generated winners in different industries existed to mentor and finance these startup business experiments. The experimental winner generation process was self-sustaining even during the worst cyclical downturns, and the startup industry had the ability and independence to self-correct, evolve and learn from its errors, such as the overfunding of startups in certain technological spaces. Indeed, in the mid 1980s, a startup boom emerged triggered by the significant expansion of venture capital, which created competing ”me-too startups” or copycat companies across almost all sectors of the high-tech industry (Florida & Kenney 1990).

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[154] In addition, the disk drive industry started to develop in the 1960s and was an important source of startups, a recipient of venture capital investments, and later an example of company overfunding leading to losses on public markets (Sohl 2003).

[155] For instance, the Silicon Valley Index (1992) notes that in the 1960s, defense procurement accounted for 55% of chip sales in Silicon Valley, and 25% of high-tech employment was in defense and aerospace fields. Therefore, the change to civilian markets represented a fundamental institutional change.

1990s to 2001: Growth approaching the burst of the Internet bubble

The beginning of the 1990s was not trouble free for Silicon Valley economic growth. Its historically strong regional economic development was considered to be at risk due to increased global competition, especially from Japanese electronics companies, and many felt that something was fundamentally wrong with the regional economy (Silicon Valley index 1992, Kenney & von Burg 1999). The Cold War ended in 1991, which led to defense expenditure cutbacks that impacted the region. Together with the recent startup boom and a weak IPO market between 1987-1990, the volatility of venture capital investment in Silicon Valley increased (table 26). However, the change was not as significant as in the US in total where, according to Sohl (2003), the number of venture-backed startups decreased from approximately 1 900 startups in 1990 closer to 1 000 by 1994.

The IPO market started to recover in 1991, and the first steps towards the Internet bubble and its subsequent burst were established by the emergence of Internet startups. In August 1995, Netscape had one of the first successful IPOs, achieving a market capitalization of 2.9 billion dollars[156]. One outcome of this event was that Internet startups and their commercial and exit potential started to attract the interest of entrepreneurs, venture capitalists and public markets. Sohl (2003) describes the remarkable growth of the venture capital market and venture capital firms from 1995 onwards: by 2000, there were 1 010 venture capital firms, which was more than double the 458 firms in 1996. The number of individual venture capitalists in these companies grew from 3 584 in 1996 to 7 051 in 2000. The number of billion dollar funds rose from four in 1998 to 19 two years later - this was more than the entire amount of venture capital industry investments in 1994, 1995 and 1996 combined.

Perspective on the scope of winner generation given the perceived winner at the time is offered by the following statistic from Sohl (2003): in 1997, there was one Silicon Valley IPO per week, which created close to 65 millionaires per day; in 2000, the number of IPOs peaked at 82. The hot IPO market (table 31) and the wealth of capital increased pressure to make deals faster and the time used for due diligence grew significantly shorter. Sohl (2003) discusses stories of under-10 day due diligences beginning to appear. In addition, the role of M&A exits started to grow along with the IPOs. According to Sturgeon (2003), Cisco as an example

[156]See www.en.wikipedia.org/wiki/Netscape, cited on 3.2.2014

made 73 acquisitions during the 1990s alone. Thus, Silicon Valley was able to recover and another significant growth phase began (Kenney & von Burg 1999) and continued until the burst of the Internet bubble in 2000-2001.

Table 27 describes this evolution in terms of venture capital investment: whereas 509 Silicon Valley startups raised 1.8 billion dollars of capital in 1995, by 1998, the number of funded startups increased twofold to 1 043 and raised capital increased over threefold to over 5.8 billion dollars. Two years after, in 2000, venture capital investment peaked at a record high 33 billion dollars in 2 159 startups. In total, approximately 2 600 high-tech businesses were born in 2000, and these added over 27 000 jobs to the local economy (Luo & Mann 2011).

Table 27. Total venture capital raised (M$) by startups (SU) and the number of funded startups in Silicon Valley 1995-2005 (NVCA 2013).

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
SU capital raised (M$)	1 808	3 418	4 632	5 878	17 802	33 452	12 599	7 243	6 756	7 999	8 116
Number of SU's	509	771	867	1 043	1 685	2 159	1 103	817	874	958	1 006

The business angel market also evolved and complemented both the venture capital market and experimental winner generation at the seed stage. At the end of the decade, there were over 100 venture capital clubs or business angel alliances in the US. These consisted of smaller under-10 person groups or 100 person-or-larger networks, and they provided periodic informal venues for meeting entrepreneurs and helping them with fund raising and business development (Sohl 1999). During the growth period from 1995 onwards, angel investments nationally grew significantly to reach approximately 40 billion dollars invested in almost 50 000 ventures by over 400 000 active angels in 2000 (Sohl 2003). The numerous exits and generated winners had to date created thousands of potential angel investors in Silicon Valley as well, but an exact number of active angels is not available.

2000 to present: Recovery and the evolution of the rules for winner generation

After the Internet bubble burst in 2000-2001, it became evident that the scale and perception of a winner, which were driving experimental winner generation at the time, was unsustainable. The hot IPO market drove many entrepreneurs, business angels and venture capitalists to build companies that were designed to exit rather than to exist first as a solid company and a business (Sohl 2003). The prior regular flow of exits turned into a steep decline. In 2002, the Silicon Valley high-tech industry as a whole lost 83 500 jobs, and between 2001-2004, it lost over 140 000 jobs in total (Mann & Luo 2010). At least 741 Internet companies alone shut down in 2000-2001 (Norr 2001) - among the most expensive failed startup business experiments was Webvan, a startup offering a grocery store online, that created approximately 830 million dollars in losses and laid off 2 000 employees. The number of venture-backed IPOs in the US dropped from 280 (1999) and 238 (2000) to 37 (2001), 24 (2002), and 26 (2003) (NVCA 2013) - the IPO market basically shut down.

Fund raising for new startups was very difficult during the next two to three years as venture capitalists focused on the follow-on financing of existing portfolio companies. Nevertheless, the vast number of startups in the experimental winner generation process also included great success stories such as Google. Google raised 25 million dollars of funding from angels and venture capitalists in 1999 and went public in 2004 with a market capitalization of 23 billion dollars.

The recovery started to take place in 2004 buoyed by a generally strong economy, and for the first time post-bubble, over 1 000 startups raised venture capital in 2005 (table 28). A new category of Web 2.0 startups was established that began to experiment with business opportunities around the development of the social Internet. At the same time, technological development in the areas of cloud computing, open source software, low-cost hardware, and broadband penetration started to decrease the capital needed to build software products - whereas during the Internet boom, millions were required for product development, this cost dramatically lowered first to hundreds of thousands and more recently even to thousands.

As a result, a new type of perceived winner and a new approach to building them started to emerge. The canonical traditional mode of building a startup based on progressing the business plan was replaced by agile engineering and customer dialogue. Widely spread customer development (Blank 2005) and lean startup (Ries 2011) methods for managing startup business experiments were born in Silicon Valley. When these methods were combined with increased capital efficiency, more startup business experiments could be launched with less capital and financial risk.

These developments began to seed a new and alternative perception of a winner. Because on the exit market side, lower valuation M&A transactions were increasing and representing a majority of the exits (Peters 2009), exiting winners could be generated with less capital in shorter time, in many cases by bootstrapping and angel funding without venture capital at all[157]. This trend started to challenge the embedded and institutionalized social rule of a big winner aiming at a high-valuation IPO.

The Silicon Valley startup industry reacted quickly to the opportunity, and a new type of financing emerged in the form of micro-VCs and super angels to generate winners with good returns even in the case of smaller exits. In addition, numerous business incubators and accelerator programs, triggered by the Y Combinator in 2005, were established to provide very early stage funding, mentoring and networks to support the startups[158].

On a macro scale, the recovery was stalled by the financial crisis of 2008, and venture capital investment levels dropped slightly in 2008-2009. Nevertheless, on a micro scale, more startups were being launched and funded. The continued growth of the Internet and broadband penetration, the introduction of Apple's iPhone (2007), App Store (2008), and iPad (2010), and Google's Android and Play Store later, together with the growth of smart mobile devices, social media platforms (Facebook, LinkedIn, Twitter), Internet search, and e-commerce, opened up compelling business opportunities for startups - experimental winner generation expanded and continued to be strong. The rules of winner generation evolved, and the smaller-exit perceived winner is now emerging alongside the historical venture capital-fueled perception of a big winner.

Lastly, these above-documented changes are supported by the large cash reserves of serial acquirers within the technology industry and increasingly outside of it as well - software is becoming a key component of innovation and competitiveness across industries[159]. This has resulted in an increasing number of competent non-technology industry companies such as Home Depot, Anheuser Busch, Unilever, Wal-Mart, Target, and Lego[160] choosing to locate their R&D

[157] CB Insight's recent data on 1 825 private technology company exits internationally (not only US) shows that 66% of exits had raised no institutionalized capital (VC, PE, growth equity) before the exit. Out of the disclosed exit valuations, 45% were less than 50 million dollars. See http://www.cbinsights.com/blog/trends/global-tech-exits-report-2013 cited at 28.2.2014.

[158] For instance, see http://techcrunch.com/2013/11/19/the-startup-accelerator-trend-is-finally-slowing-down/ cited at 28.2.2014.

[159] One widely discussed argument relating to this was made by Marc Andreessen. See http://online.wsj.com/news/articles/SB10001424053111903480904576512250915629460

[160] See http://www.mercurynews.com/business/ci_24651658/volkswagen-lego-and-beer-garage-big-corporations-rushing cited at 28.2.2014

sites in Silicon Valley both to work with local startups, to invest corporate venture capital in them and to acquire them.

In conclusion, the identified key events, contextual conditions and outcomes of the structural and institutional evolution process of the Silicon Valley startup industry are summarized by a timeline (figure 18) covering from the 1950s until the present.

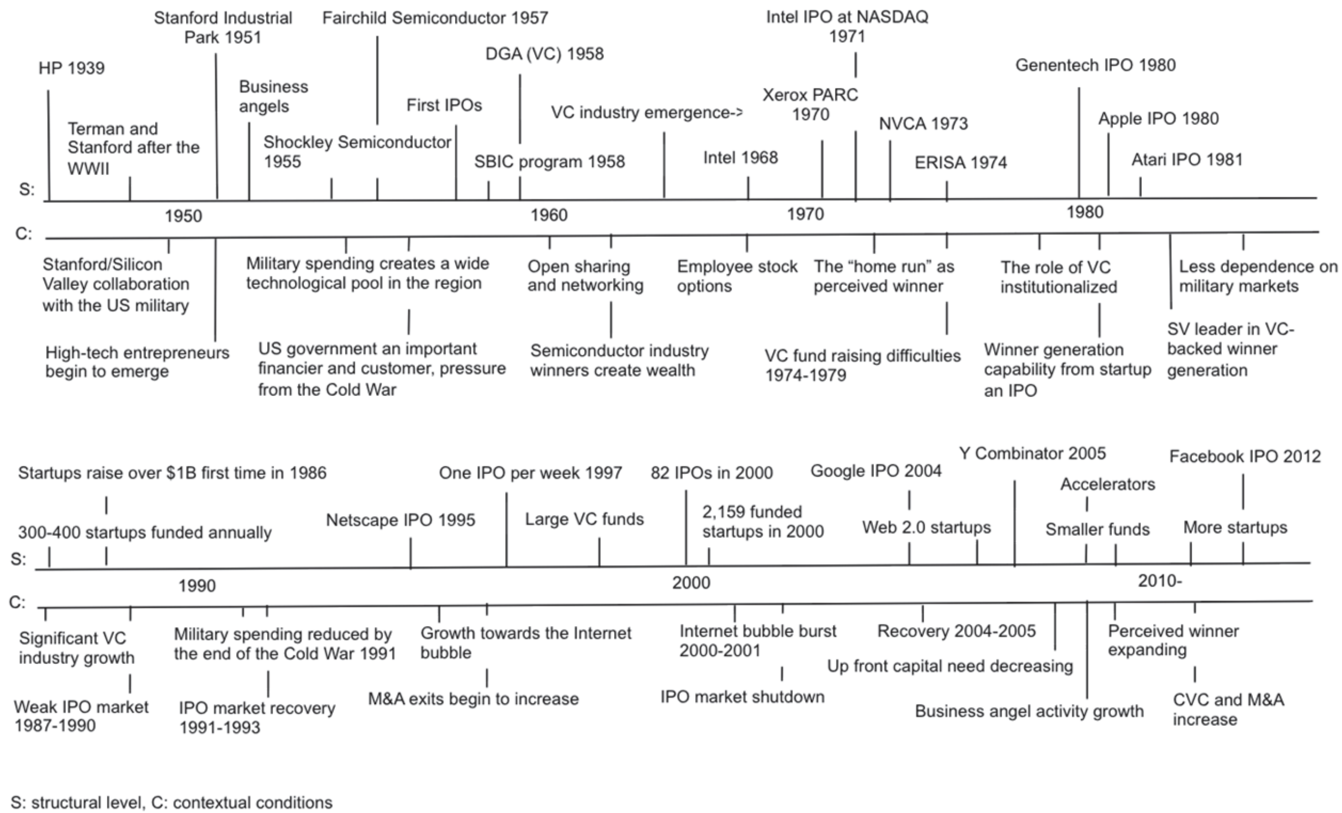

Fig. 18. Timeline of the structural and institutional evolution process in Silicon Valley 1950- 2014.

5.3.2 The perceived winner

Due to Silicon Valley's successful long history in winner generation (see also chapter 5.3.4), startups and the role of winners is deeply embedded in the community. In addition to the upside potential of winners for founders and investors, the culture of granting stock options to employees (Intel, for instance, paved the way for this culture with its IPO in 1971) has made the employees of numerous winners wealthy. Hence, a critical mass of skilled and experienced talent exists to join or build the growth of the next winner instead of seeking job security at established companies. This is a significant factor, as startups are usually profitless at the beginning, so the risks are high. Startups associated with winners are an attractive career option against similar opportunities in established companies in the region. The potential upside gain (incentive) associated with winners creates a strong institutional-level perception of startups as the big winners for the startup industry at large. The following comments from a lawyer working with some of the most successful startups illustrate this institutional perception and its causal power:

> *"I think in most places around the world, people would be excited to be working for Google, and here everyone is leaving Google now to go to places like Facebook and Twitter because there's no more upside at Google. So, it's a different way of looking at the world, and a different expectation about potential and growth."* (Lawyer)

> *"You go to a soccer game on Saturday morning to watch eight-year-olds play soccer, and what the parents are talking about, most of the time, is business ideas and technology."* (Lawyer)

The startup industry actors are organized over markets with their incentives and existence around on the ability to generate winners. Activity is aligned and organized based on this goal. The comment of a venture capitalist captures the role of exiting winners as an outcome and also reflects the role of revenue, profitability, and the number of jobs as a means to this end, not as the point itself (as opposed to the bulk of firm growth research). Startups as collective business experiments are evaluated by the outcomes.

> *"The value creation, the number of jobs, the number of the dollar revenues, the profitability, all those are components of the scoreboard, but the scoreboard is the exit value."* (Venture capitalist)

"Without big exits, the venture model doesn't work, and without having capital efficient ideas, the venture model doesn't work, so the recipe for continuation or even fostering or creating this type of ecosystem requires us to, requires many ingredients, but at the core of it, you have to have entrepreneurs who are not lifestyle companies, but are working on something that has a big potential and requires that, are hungry for that." (Director in startup- and VC-focused bank)

At the same time, the multi-voicedness regarding the perceived winner and especially the size of the desired exit emerge from the data in the case of business angels. Their target exit size and ambition level can be lower than those of venture investors, but the focus on exits is shared. Knowing these aspects of the perceived winner as a shared object is relevant for startups so that the targets of the particular business experiment are aligned with the goals of all stakeholders. A serial entrepreneur and business angel explains:

"I'm investing my money; ideally you come to me with a plan where you can get acquired within a three- to five-year period and you know right at the outset who your potential acquirers are...When you go into venture capital, it might be, we're gonna build a great company." Great company means it's gonna have a valuation of at least half a billion dollars if not more. "We're gonna build a big company." Because if you're gonna invest 30 million dollars, you need a valuation that's well north of half a billion to get a meaningful return. So, you don't talk about your exit there, so exit becomes a different deal. To angels, talk about the exit and who could be your acquirers, to VCs, you are going to build a big company." (Serial entrepreneur, business angel)

The focus on the generated winners as the processual outcome means that it is important for entrepreneurs to know that they are part of this winner-generation game if they raise venture capital or compete against venture capital-backed startups. It is important to understand the alignment of incentives between entrepreneurs and venture capitalists, as the latter's role in the community is historically extensive. A comment from a serial entrepreneur explains:

"You've got to understand that their business, we're a means to an end, their business is predicated on returning an investment or basically generating a return for their investment. Their customer is the limited partner, not us. We're just a tool that they use to get from point A to point B, but if you know

that in advance, then you can build healthier relationships." (Serial entrepreneur)

The Silicon Valley type of perceived winner has historically aligned startup industry actors to seek for projects and business experiments that are risky from the investment-readiness and startup-institution perspective but that have the potential to become a winner. Hence, it is understood that the likelihood of mistakes is high and the incidence of failure or the non-emergence of a winner is common. In this case, how the downside is handled and viewed at the startup industry level becomes critical. The following comment shows how failure is viewed institutionally in Silicon Valley:

"Having been part of three or four failed companies is, it's a badge of courage, it's like you've earned your stripes, there's absolutely nothing wrong. If I see somebody's resume and they've been with three or four bad companies, yeah, I'm going to ask the questions like "what happened and why?" And, "is your judgment really sound? It looks like you picked many losers there," and clearly you're going to question somebody's career choices, but no one's gonna hold that against you...Here, the concept of taking risk, even if you're not rewarded over and over, just, it's commonplace and it's accepted." (Serial entrepreneur)

The acceptance of failure as an outcome in experimental winner generation allows systemic risk taking and supports the perception of a winner where the bar is set high. The presence of the angel and venture capital market, where entrepreneurs can sell both the risk and the upside and buy finance and competent value-added, is one of the embedded causal powers and keystones of Silicon Valley. It enables expansive learning at the market on the front line of development.

While the role of winners as a social rule is evident, the perceived winner is not hierarchically associated with first making millions. The history of winner generation and the learned role of failure as an outcome have encouraged actors to pursue big opportunities, not primarily for the money but because they are driven by passion and a change-the-world mindset. The rules of the game in this type of entrepreneurship are institutionalized, and it is understood that the odds are against you. The role of the venture capital market is critical for enabling this mindset on an agency level, affecting innovators and future entrepreneurs, and on a practical level by funding. This is the ideological situation, but in reality, it is also coupled with the herd mentality, which is normal in human activity systems: the leading actors in the startup industry attract others to follow their lead. The following comments characterize these views, first in terms of passion then of entrepreneurship and the herd mentality:

> *"The entrepreneurs that I always talked to were great because they would always say that whatever we do, just be passionate about it and enjoy it because you're going to be doing it 24/7 and you're not going to make a lot of money out of it. You shouldn't assume; entrepreneurship really is not about making millions of dollars."* (Serial entrepreneur)

> *"Irrational insanity. Fighting against massive odds; trying to pull a rock up the hill in a team over a hump; it's difficult, it's extremely challenging. It takes a certain type of person, it takes a certain type of team to succeed, and it takes passion, it takes drive, it takes expertise, takes a little bit of your rationality to go against large incumbent vendors, but when it works, it's a thing of beauty."* (Venture capitalist)

> *"We had this frenzy of throwing money at ideas, and the herd mentality of, we're a venture fund, we've gotta have an investment in whatever NEA and Kleiner have an investment in, we gotta be in that segment. And, hence all this money was flowing in, the public got into the game."* (Lawyer with over 40 years of experience from working with VC-backed startups)

One social or human driver behind this perception of a winner is related to the high cost of living in Silicon Valley, where the housing market is one of the most expensive in the US. Along with the potential significant financial upside associated with being part of a winner, an element of "the American Dream" exists. Therefore, the concept of equity and stock options for employees are important, and knowledge of them is institutionalized. A comment from a serial entrepreneur illustrates this regional perspective and the culture of startups as a shared object of ownership:

> *"There's no salary great enough that is going to give you the 10 million dollar home in the hills. You do it on equity, you've got to own something...if you don't focus, don't worry so much about your slice of the pie, but just figure out the way to build as big a pie as possible. All of a sudden your slice is just fine."* (Serial entrepreneur)

Last, the so-called early exit phenomenon driven by capital-efficient startups and active smaller exit markets has been shaping the perception of a winner. The increased capital efficiency of building scalable startups and the enormous cash reserves of the locally present leading global companies have made smaller exits at an earlier stage more attractive and accessible to entrepreneurs. Google, for instance, made 86 acquisitions[161] alone between 2010-1/2014, ranging from deals of a few million dollars to deals over a billion dollars. Smaller exits were not possible at this scale because of the large fund sizes and the amount of capital required to build a product. Hence, with the emergence of smaller funds and the increased role of business angels, the Silicon Valley startup industry has the structure, competence and horizontal variety to support both perceptions of a winner - from smaller exits to huge IPOs. In addition, the direction of startup industry activity is becoming more international, both in screening of potential winners and in building them. The following comment from an entrepreneur and venture capitalist with 30 years of industry experience is representative:

> *"The U.S. isn't a market in itself any more, purely by itself. It is a market in itself, I shouldn't say that, but starting a new start-up company should be global in all its planning. And so, either from the customer side or supplier side or partnering side. And I think those ones that are internationally connected are gonna do much better than the ones that are only domestic, wherever they are."* (Entrepreneur, venture capitalist)

The continuous experimental winner generation process organized over markets and hierarchies is adapting and renewing on an institutional level. Accordingly, the newly emerging rules of the game and perceived winner are expanding, which is causing the contradictions that shape startup industry activity and leading to the emergence of a new type of activity. The different incubator and accelerator adaptations, such as 500 Startups,[162] illustrate this development. How the described winner perception manifests itself in the mechanisms and activity of winner generation is discussed next.

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[161] Http://en.wikipedia.org/wiki/List_of_mergers_and_acquisitions_by_Google referred at 23.1.2014

[162] See http://500.co referred at 23.1.2013

5.3.3 Winner generation

The historical documentation showed how competence, experience and the networks of actors involved in winner generation have a history several decades long, dating back to the 1960s. Hence, the winner generation process itself is also of long standing, institutionalized and the result of a long evolution process that includes the current capital- efficient startup and early exit phenomenon discussed above. It is evident that the Silicon Valley startup industry has a critical mass of competent actors and the right institutional mindset to create incentives encouraging early stage actors to initiate new ambitious projects.

To begin, the data show how a startup that meets the criteria of a perceived winner is the shared object of activity across the startup industry. For instance, at the very earliest stage of the experimental winner generation process, law firms and banks are among the first formal community actors exposed to new ventures. Their activity is also organized based on the perceived winner, and their focus is on evaluating the growth potential of the project or to-be incorporated startup. Here, the new startup is potentially a significant future customer on a path to becoming a billion dollar sustainable business, thereby needing more of their services and enabling them to grow the customer relationship. The elements of investment readiness and the rules of winner generation are known and act as a causal power when evaluating projects. The following comments from a banker and lawyer illustrate how the object of activity and the process of experimental winner generation is shared startup-industry wide:

> *"The type of companies that we look to work with are companies that, we have a reasonable expectation that they will be able to secure venture funding in the next 24 months, 12 to 24 months...I partly bring the companies into the bank, on the very early stage and then also help those companies connect with either angels, corporate venture arms or VCs on the funding side."* (Director in startup- and VC-focused bank)

> *"They'll (lawyers) allow the client (startup) to rack up 10 000 or 20 000 or 25 000 in legal fees and they don't have to pay it until they've had a funding event. So, the risk for the law firm is that they won't be funded, and so the firm will have to write off that time, and won't ever get paid...And it's kind of beneficial for the client because their interests are aligned, so the law firm is gonna help them try to get funded and make introductions to VCs and do what they can to try and help support the business."* (Lawyer)

Lawyers, bankers and other actors exposed to business ideas and startups at the early stage thus also participate in the generation of potential winners and are guided by the embedded perception of a winner. The data indicate that the uncertainty and risks associated with startup business experiments is internalized and controlled in the case of free services with the same portfolio logic used by venture investors. The concept of equity and the upside potential of a winner affects the activity, and some law firms and other actors take their fee as stock options. Traditionally, venture capital funding has been viewed as a validating signal of a potential winner. In addition, some well-established angels have also grown into a similar signaling role. The following comments capture these elements of experimental winner generation:

> *"Firms will take equity in the client, they'll take stock options in the company. And the theory is, if the company is funded and then becomes successful down the road, the stock options will be very valuable, and not only will the law firm be compensated for the risk they took on for that company, but they'll also be compensated for all the other companies, where they took the risk and they didn't get the payout."* (Lawyer)

> *"We've been catering to those super angels and have identified a list of folks that we think we would be comfortable lending to. Although they haven't secured VC funding, they may have a super angel that's their backer, and so we've started doing deals in that area where we're relying on that super angel."* (Director in startup- and VC-focused bank)

The association of investment readiness and venture capital backing with the perceived winner is so strongly institutionalized that the social practice for a critical mass of entrepreneurs and startups is to try to obtain funding from angels or venture capitalists. This is true even though there may be other sources of financing available to startups with more entrepreneur-friendly terms. For instance, in 2011, Silicon Valley's small businesses (fewer than 500 employees) received 194 Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) grants for a total of 91 million dollars (Silicon Valley Index 2013). This is only a small share of the total funding (see table 28). The following comments describe the alignment of the startup industry:

> *"I am thrilled to get government grants, love that, because it does not dilute our ownership; venture capital is very expensive... There is a smaller pool of*

people that are looking for that money and therefore the probability that you get it is much higher." (Business angel, serial entrepreneur)

"A lot of times we meet entrepreneurs that if they put some work and time in, they could get non-dilutive financing, they could go get grants, but they choose not to because they think it's easier to just come get venture money - or cooler." (Senior associate in early stage venture capital fund)

The experimental generation of potential winners itself is a combination of many tangible and intangible factors. On the one hand, the mechanisms are based on the historical competence to generate winners and on the varied actors necessary to support high-ambition projects and startups. The perceived winner is an embedded social mechanism, and it attracts the attention of innovators and entrepreneurs towards business ideas and startups from the actors in economy 1, students and immigrants - the role of the latter is especially important (see, e.g., Saxenian 2002). The startup industry attracts experienced professionals from good positions to start new ventures, and on the other end, students are encouraged as well. Venture capitalists, business angels and entrepreneurs are visiting university campuses, sharing their competence and experiences with students and staff, and enabling the generation of potential deal flow in the future.

Another more formal activity around the generation of potential winners are accelerators, and to some extent co-working spaces and different variations of them, that take cohorts of projects or startups and try to turn them into investment-ready potential winners. As discussed above, the number of these actors has grown significantly, and the demo days at the conclusion of the accelerator period attract great interest within the venture community. A similar phase of development took place at the end of the 1990s and has activated again on a larger scale, driven by Y Combinator since 2005. Acceptance into a recognized accelerator is very competitive and attracts startups internationally; hence, it is a signal of future growth potential to the venture community. An experienced entrepreneur and venture capitalist comments on the role of accelerators as follows:

"In some sense, they've institutionalized the best practices of raising money." (Entrepreneur, venture capitalist)

Taken together, the lawyers, bankers, accelerators, different events, special interest groups, and so on are acting as a networked system through which people share startups as an object of activity and help each other without necessarily a link to compensation. An entrepreneur can find a sponsor who is willing to leverage personal network connections and make introductions. Startups can leverage this willingness to find the collateral resources needed to support business building and scaling at different stages. This is a constant mode of activity not only among entrepreneurs but also across the entire startup industry, and it acts as an antecedent element. The dynamism, innovativeness and new frontiers of the startup industry are constantly expanding the object of activity and the rules of the game. The following comments capture these elements:

> *"Stay top-of-mind, and things happen, and things change so quickly in Silicon Valley that if you're not out meeting with people and going to events and talking with folks, you get left behind very quickly. If you settle in behind your desk and you say "I've met everybody I need to meet and I know what's going on now," then in about two to three months, you're already behind, and Silicon Valley's left you behind."* (Senior associate, early stage venture capital fund)

> *"You know, it's "how do we leverage our networks, our collateral resources, to help move what appears to be a great opportunity, and some clever founders, with an idea to build something?" This is not spreadsheets, this is insight into character and qualifications and experience and knowing what it takes to actually build a business."* (Lawyer with over 40 years of experience working with VC-backed startups)

The pool of competent actors that innovators and startups can gain exposure to in Silicon Valley is extensive and in aggregate consists of decades of expertize in various areas related to startups. The high number of exits has been the primary generator of this competence and specialization in the markets (see section 5.4.3) An illustrative example of this tacit operational experience are two serial entrepreneurs who are now business angels and startup mentors - both have entrepreneurial experience of eight startups and many exits. One describes his experience as follows:

> *"I'm a serial entrepreneur, co-founded eight companies over the last 35 years."* (Serial entrepreneur, angel investor)

There is a critical mass of similar competent actors organized across the markets and the startup industry structure, but this does not necessarily mean that the total size is actually large. The actual number of Silicon Valley startup industry actors could appear to be rather limited based on the data. It could also be that the density of the networks between those professionals with an interest in startups creates the perception of a small size - startups have such a central role, and different players are invested in winner generation. The following comments describe these aspects:

> *"There's tons of VCs here, but at the end of the day, probably a very small subset of folks that you really need to talk to."* (Director in startup- and VC-focused bank)

> *"The whole Silicon Valley ecosystem is extraordinarily small, and at the end of the day, it is all driven on personal relationships. And those relationships are with lawyers, they're with bankers, they're with PR firms, they're with advertising agencies, they're with the design firms, they're with the university, I mean there are a lot of people who participate in the ecosystem, but it's a really small...I mean when you add them all up, who are the players, it's still an amazingly small number."* (Serial entrepreneur, angel investor)

Further, the role of competent customers and potential exit channels appear in the data. The actual number of leading established technology companies such as Google, Apple and Cisco, together with the more recently generated winners such as Facebook, Tesla, Twitter and LinkedIn, is substantive. It is generally known that most of the globally important players that want to tap into Silicon Valley innovation and startups have a presence in Silicon Valley even if they are headquartered elsewhere. There is a critical mass of large technology and other companies as customers for startups and many that rely on acquisitions as a part of their strategy. The comment of a venture capitalist and of an experienced lawyer illustrates this:

> *"All of our exits have happened here, despite the fact that...were our companies located here or not, Silicon Valley has been the trigger point for the exits...You can locally access the relevant players here, all of them have presence here. This is one of the key factors of Silicon Valley."* (Venture capitalist)

> *"I mean, everybody's here. Every collateral resource you could possibly want is here within 50 miles of where we're sitting."* (Lawyer with over 40 years of experience from working with VC-backed startups)

These elements create the basis and antecedent activities that support the experimental winner generation process. A serial entrepreneur, business angel and the CEO of one of the leading non-profit associations in Silicon Valley dedicated to helping startups to build and grow successful businesses describes the approach they have taken to help startups. This quotation underlines the competence base that is available in the region and the view of hierarchy in the activity - operational experience of startups is valued and entrepreneurs are exposed to it systemically from day one:

> *"What (the organization) has done historically is to expose entrepreneurs to best practices, delivered by the people they most want to meet, which is angels and VCs. No consultants, no big company managers."* (Serial entrepreneur, angel investor)

The number of early stage actors and startups is difficult to capture for Silicon Valley. The following estimation from the data provide one view of this and enable a conception of the breadth of the experimental winner generation process at the pre-startup phase, when potential entrepreneurs are just thinking about business ideas and opportunities. The above-mentioned CEO of the non-profit association provides approximate or ballpark numbers for the region and underscores the nature of startup business experiments:

> *"What we see is around approximately 400 000 engineers and technologists in Silicon Valley. At any one time, that means there is approximately 20 000 wantrepreneurs - people who want become entrepreneurs. That results in around about 20 000 executive summaries. There is not a direct one-to-one correlation, but around about 20 000 executive summaries are floating around Silicon Valley annually."* (Serial entrepreneur, angel investor)

> *"It's a hit-driven game. And the big problem is, you don't know who's gonna be the winner." (Serial entrepreneur, angel investor)*

The potential and innovativeness of the business ideas within this volume naturally varies, and most ideas do not fall into the category of investment readiness or a potential winner at the beginning. In the data, approximately 12 to 24 months came up as the necessary time period for figuring out whether a startups' business experiment is viable or fundable. In some market categories, this happens faster. The following findings from an interview of a now-serial entrepreneur, who was then the founding CEO of his first startup (which later successfully went public), describes how the exposure to competence, the different actors in the startup industry and their perceived winner-mediated view of business opportunities and startups changed the path both for his startup and for him personally. First, entrepreneurs can start with more grounded ambitions or goals, and do not necessarily aim at building the next big winner per se. The origins of this subsequently public company are described by the entrepreneur:

> *"Can I create a business that is sound enough that I can stay alive, basically; can I make 60 grand a year, not to be sort of flip, but in some respect, the vision was as simple as "can I create something that is valuable enough that will support me and my family"."* (Serial entrepreneur)

The first idea that the entrepreneur and his co-founder started with was sports-related and totally different than the email-related software that the subsequently successful company was built on. The entrepreneur described how in the beginning, they started to talk about their first idea with different actors in the region including Apple, Cisco, HP, and other big companies. Through these conversations, they learned that one problem (opportunity) they had stumbled upon was actually a bigger problem than they had understood. This evolved into a vision for the startup that was not there from day one but that processually emerged through this dialogue within the startup industry and with competent customers. The size of these customers' need (industrial scale) helped to understand the business potential. The entrepreneur describes these as lessons learned, which he tells to the new entrepreneurs he is currently mentoring:

> *"Just come up with something that is clear enough in your mind, that you can go and have conversations with people, because if you have something to go to a conversation with, that leads to all kinds of other fascinating conversations."* (Serial entrepreneur)

> *"I often think that people love to rewrite history and once the big thing has happened, it's amazing how then everybody sort of assumes that big vision was always there and that somehow they just, they executed to it."* (Serial entrepreneur)

Once another potential opportunity emerged, the entrepreneurs' embedded perception of a winner shifted towards raising venture capital and pursuing the opportunity, not by aiming at 60 grand salaries but by trying to build a Silicon Valley winner. The competence and additional resources found in Silicon Valley then provided leverage to raise funding in 1997 and enter the experimental winner generation process, and the second mechanism of the startup industry. The value-added from investors and the board was important for scaling, although the cost of financing was expensive (the market situation was different, and venture capitalists were in a power position), as the entrepreneur comments:

> *"We raised 700 grand; we sold 40 per cent of the company for 700 grand...it's a living proof, I always tell entrepreneurs, speed over greed, that 700 000 was probably the most important investment we had because with 700 grand and true venture backing, it was almost like we had a seal of approval, it was when were finally able to sign those top engineers to the team to get some of the critical corporate accounts that we needed as beta partners."* (Serial entrepreneur)

> *"If you trace the roots of the rest of the executive team, kind of where they came from, over half came through either other Benchmark Capital [VC] portfolio companies or relationships with those venture partners, so I think that, I would absolutely give them credit for helping us recruit. Not just giving the stamp of approval, but literally knowing people that would be good additions to the team."* (Serial entrepreneur)

The startup example above highlights coachability as an important element for entrepreneurs and founders, especially for first-timers. The uncertainty, the need to be willing to change direction, and the different problems startup business experiments face requires a willingness to listen and learn from the surrounding community and its competent actors. One serial entrepreneur and venture capitalist with 20 years of early stage investing experience comments:

> *"There are a whole bunch of criteria that go into picking entrepreneurs, but the short form of it is that we pick entrepreneurs we fall in love with... they're truly dedicated to what they're doing and they're not gonna give up at the first bump in the road...their listening skills - sometimes we refer to it as their coachability... we're looking for superb athletes who can indeed be coached. As opposed to any sort of condescending sense that they should listen to us, it's that they need to be able to learn as they progress. And that's what we mean by coachability."* (Venture capitalist, serial entrepreneur)

Combined with the perceived winner, these culturally and historically embedded and evolved elements of the startup industry create causal powers that affect the mechanisms of winner generation in Silicon Valley. How these are manifested numerically is analyzed in the remainder of this chapter to capture the volume, functioning and outcomes of the mechanisms of this process.

To begin with, out of the above estimate of 20 000 executive summaries annually, the actual number of new startups and the percentage of angel- or venture-backed startups are somewhat difficult to capture. There are examples in Silicon Valley in which a business angel is ready to invest and write a check, but the entrepreneurs have not yet legally formed a company and do not have a bank account for the money - many startups are in this stage and trying to obtain funding. As the captions from the data indicate, legal formation is not the main point; the point is to try to get the startup business experiment funded and moving forward toward winner generation. It must be noted that the ability to bootstrap a cash flow-positive startup early on has become a more realistic option institutionally due to capital efficiency and Internet-enabled markets. Regardless, the number of funded startups is a relevant indicator for the mechanisms of the experimental winner generation process.

As discussed above, the object of activity for Silicon Valley has been startups for decades. Already during the 1980s, hundreds of startups were funded by business angels and venture capitalists annually, and the winner generation process has further grown to funding over one thousand venture-backed companies annually in the region. Lately, the number of startups raising venture capital has varied between a low of 990 in 2009 to 1 247 in 2013, and the total venture capital raised has varied from 8.2 billion dollars in 2009 to over 12 billion dollars in 2013 (table 28). These regional numbers also lead globally.

Table 28. Total venture capital raised ($M) by startups (SU) and number of funded startups in Silicon Valley 2006-2013 (NVCA 2013).

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
SU capital raised ($M)	7 243	6 756	7 999	8 116	9 816	11 554	11 436	8 221	9 302	11 656	10 907	12 126
Number of SU's	817	874	958	1 006	1 236	1 305	1 290	990	1 092	1 248	1 160	1 247

The above statistics do not include the angel investor market if a venture capitalist did not participate in the financing round[163]. For instance, in 2012, the US angel

[163] Angel, incubator, accelerator or similar investments are considered pre-venture by the NVCA if the company has received no prior qualifying venture capital investment.

investor market invested 22.9 billion dollars into 67 000 firms (not all scalable startups), out of which 35% or over 8 billion dollars were invested in seed and early stage investments (Sohl 2013). The exact share of Silicon Valley angel investments is not available, but it can be estimated that the contribution of the regions' business angels and angel networks is approximately 200 to 500 million dollars annually[164] (Angel Resource Institute 2012). Hence, the total number of seed funded startups at the pre-venture stage in Silicon Valley is in reality several hundreds higher than table 29 indicates, and the role of angel investors' money, competence and mentoring is thereby crucial to the generation of potential winners (mechanism 1). The following comment illustrates:

> *"Part of that relationship is that the venture funds will send deals to us if it's too early for the venture groups, so there's… I think there's an acknowledgment that angels serve a very specific part of the financing food chain and that they're able to help companies get to a point where they're venture fundable."* (Serial entrepreneur, angel investor)

Indeed, data from CB Insights (2013) indicate that the share of seed deals has increased from 7% in 2009 to 29% in both 2012 and Q3/2013. The increased capital efficiency and lowered capital need of early stage startups also means that the barrier to becoming an angel investor has lowered and that more people are conducting angel investments. The importance of angel and seed investment activity is highlighted when compared to the entire US venture capital industry: the industry made 1 174 first-time investments in 2012, out of which 950 (81%) were at the seed and early stages (NVCA 2013).

In addition, the emergence and growth of different accelerator programs also increases the number of potential winners generated. The number of applicants and acceptance rate to different incubators and accelerators is not available as they are for the OCS Technological Incubators in Israel - the Silicon Valley actors are individually organized over markets. Only a few accelerators discuss some of their numbers publicly. For instance, Y Combinator, which is the most successful accelerator in Silicon Valley, stated that their acceptance rate for the second cohort in 2012 was 2%[165] - the selection of potential winners is very tight. However, this number is not generalizable to other incubators and accelerators, as

[164] Total angel capital is spread to other types of businesses as well and not only to scalable startups.
[165] Http://techcrunch.com/2012/05/22/ycombinator-80-strong/ cited at 31.1.2014

there are so many of them, and they all have different backgrounds and operation modes.

However, the data for venture capital investments at different stages illustrate how the picking and scaling of winners (mechanism 2) and related resource allocation in the experimental winner generation process is organized in Silicon Valley (tables 33 and 34). During 2004-2013, the number of seed investments by Silicon Valley venture capitalists has varied annually from 61 (in 2004) to 163 (2008, 2011), with a 10-year average of 113 investments. The number of early stage investments averaged 338 investments until 2010 but has increased significantly during the last three years, reaching 652 investments in 2013. This illustrates how the deal flow coming from angels and incubators has increased the number of potential winners at this stage. The number of mid-stage investments has decreased recently from the 10-year average of 350 investments, and it reached a low in 2013 with 295 investments. Similarly, the late-stage investment volume has decreased from a 10-year average of 288 investments closer to 200 investments annually in 2012 and 2013.

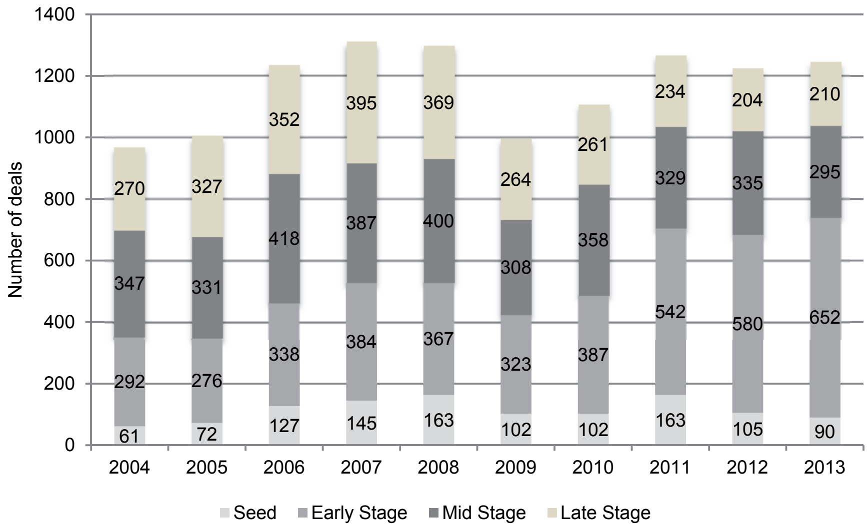

Fig. 19. Number of venture-backed startups by stage in Silicon Valley 2004-2013 (calculated from Thomson Reuters data).

The average size of venture capital investments in these companies during the same time period is illustrated in table 29. The 10-year average size for seed investments is 3.8 million dollars and for early stage investments is 5.8 million dollars. The most significant change has been the growth in mid-stage investments since 2007, which peaked at 15.3 million dollars in 2013 and resulted in a 10-year average of 11.5 million dollars. The late-stage investment size has varied from 9 to 15.5 million dollars, with a 10-year average of 11.7 million dollars. This means that although the number of mid- and late-stage investments has decreased, the amount of capital allocated at these stages has increased.

Table 29. Average venture capital investment (M$) by stage in Silicon Valley 2004-2013 (calculated from Thomson Reuters data).

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Seed	3.1	3.2	3.7	4.1	4.5	4.5	4.8	2.7	3.6	3.9
Early Stage	5.1	4.9	5.4	6.5	5.8	5.7	5.5	6.8	5.9	6.2
Mid Stage	8.5	8.8	8.8	11	11.9	11.7	11.9	13.5	13.7	15.3
Late Stage	12.5	11.1	10.9	10.7	10.6	9	9.8	13.8	13.9	15.5

It must be noted that variation outside of the investment averages is high: there are very substantial late-stage investments by large funds that in volume are equal to an IPO. For instance, between January 2010 and October 2013, a startup called Pinterest raised in total 562.5 million dollars of venture capital including a 225 million dollar series E round with a 3.8 billion-dollar valuation[166]. Thus, the average sizes must be observed from this perspective - the potential big and scaling winners receive substantial resources. In addition, this volume and scope of staged resource allocation places the 91 million dollars of public SBIR and STTR grants in 2011 in perspective in relation to the investments from actors organized over markets.

The increased importance of business angel activity at the seed stage is highlighted when compared to the venture capital allocation by stage (table 30). The total volume of venture capital investments in Silicon Valley to the seed stage has decreased since 2008 and was 350 million dollars in 2013. However, the growing number of capital efficient and angel-funded startups has increased the attractiveness of early stage investment opportunities, and the total investment volume has grown significantly to 4 billion dollars in 2013. At the mid and late stages, the total venture capital investment volume varies and is likely driven by

[166] Http://www.crunchbase.com/company/pinterest 1.2.2014

the number of large deals and exit market conditions, with a 10-year average of 3.9 billion dollars at the mid stage and 3.3 billion dollars at the late stage.

Table 30. Silicon Valley venture capital investments (M$) by stage 2004-2013 (calculated from Thomson Reuters data).

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Seed	192	228	467	591	728	462	492	435	378	350
Early Stage	1 492	1 365	1 841	2 499	2 127	1 854	2 128	3 689	3 415	4 013
Mid Stage	2 964	2 904	3 669	4 274	4 778	3 595	4 266	4 435	4 602	4 505
Late Stage	3 373	3 636	3 829	4 246	3 911	2 365	2 550	3 229	2 839	3 257
Total:	8 021	8 134	9 806	11 610	11 544	8 275	9 436	11 787	11 233	12 125

Corporate venture capital investments are included in the venture capital statistics and reported only on a national scale by NVCA. Between 2003-2012, corporate investors were involved on average in 16% of deals and accounted for 8% of total invested venture capital in the US, with a 3.3 million dollar average investment (NVCA 2013). The biggest corporate investments were significantly larger than the average, similar to venture capital. It can be estimated that the corporate venture capital activity in Silicon Valley is above these averages, as many of the most active corporate investors are located there: for example, Google Ventures and Intel Capital have both made over 80 investments in Silicon Valley startups from the beginning of 2009 until October 2013 (CB Insights 2013). This suggests that there are at least 1 billion dollars in annual investments by corporate investors in Silicon Valley (NVCA 2011a).

The horizontal scope of the experimental winner generation process can be analyzed based on venture capital investments across different industry sectors. Figure 20 illustrates how venture capital investments in the US divide across the key industries in 2012. These numbers are indicative for Silicon Valley as well because 41% of the investments were made in Northern California (NVCA 2013: 47). Software was the biggest sector, receiving 32% of invested capital. Almost all of these deals were in startups with Internet-related opportunities, and overall, Internet-related investments also have a major role in many industries outside of software (ibid: 46).

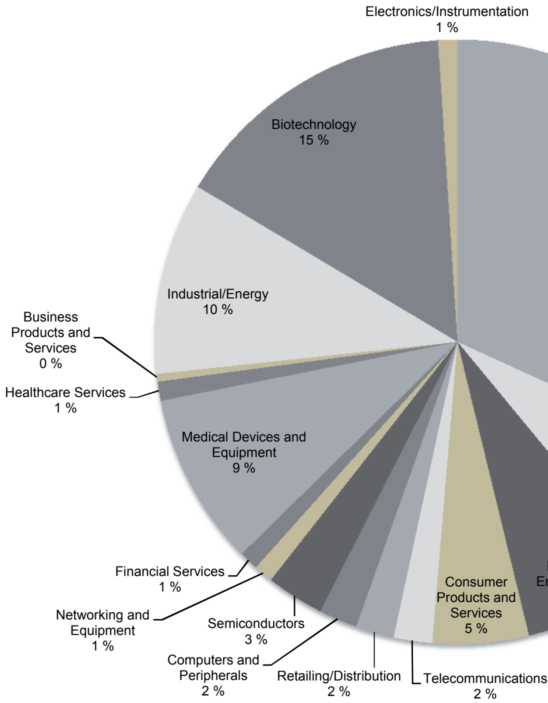

Fig. 20. Venture capital investments by industry sector in the US 2012 (NVCA 2013).

When the 12.1 billion dollars of venture capital invested in Silicon Valley in 2012 and the amount of total capital invested annually in the long run is taken in account and divided by the investment volume to different industry sectors, it can be concluded that the startup industry provides incentives and a true market for innovators and entrepreneurs to build new winners broadly across industries. Indeed, taken together, the different statistics presented above indicate that the Silicon Valley startup industry has, in estimate, between 2 000 and 3 000 selected startups in different stages of the experimental winner generation process and significantly more trying to enter it.

5.3.4 The outcomes and renewal of the startup industry

The outcomes of the experimental winner generation process in Silicon Valley have been unique in the world, as is touched upon in the historical analysis. The

Silicon Valley startup industry has generated and scaled winners on a level that no other region can match. Many of the generated winners have turned into household names and industry-defining leaders, creating a significant positive economic impact in the region and internationally. The competence to generate winners is captured aptly by Lee, Miller, Hancock and Rowen (2000), who note that the leader of every significant advancement in information technology since the integrated circuit began as a startup created in Silicon Valley. This path has continued until the present.

For instance, from 2009 to Q3/2013, the Silicon Valley startup industry generated 683 venture-backed exits in total, out of which 11 were valued at over 1 billion dollars at the time of the IPO (CB Insights 2013). The latest large IPOs include, for instance, Facebook, Twitter, Zynga, and LinkedIn; on the M&A side, among the largest deals in Q1/2014 are Google acquiring Nest Labs, a Palo Alto-based startup established in 2010, for 3.2 billion dollars[167]; and Facebook acquiring WhatsApp, a startup established in Mountain View in 2009, for 16 to 19 billion dollars[168], which is a record size for a venture-backed M&A deal.

The total number of venture-backed company exits in the US between 1985 and 2012 gives perspective on the scale of venture capital-fueled winner generation (table 31). Until 1997, the total number of IPOs (1536) was significantly higher than that of M&As (638) during the same period. From 1998 onwards, the number of exits through the M&A mechanism started to increase and IPOs decreased, excluding the Internet-boom years - in 2000, Silicon Valley alone generated 82 IPOs.

[167] Https://investor.google.com/releases/2014/0113.html
[168] Http://newsroom.fb.com/News/805/Facebook-to-Acquire-WhatsApp

Table 31. VC-backed M&A deals and IPOs of US-based companies 1985-2012 (calculated from Thomson Reuters data).

	VC-backed M&As (total)	VC-backed M&As (known)	Amount of known deals ($M)	VC-backed IPOs	Amount ($M)
1985-1997	638	496	29 445	1 536	53 710
1998	189	113	8 002	79	4 221
1999	227	154	36 688	280	24 005
2000	379	245	79 996	238	27 443
2001	384	174	25 116	37	4 130
2002	363	165	11 913	24	2 333
2003	323	134	8 241	26	2 024
2004	402	199	28 846	82	10 032
2005	443	198	19 600	59	5 113
2006	485	207	24 289	68	7 127
2007	488	200	30 746	92	12 365
2008	416	134	16 237	7	765
2009	350	108	12 365	13	1 980
2010	521	149	17 700	68	7 609
2011	488	169	24 093	51	10 690
2012	449	121	21 516	49	21 451
Total	6 555	2 876	394 792	2 709	194 998

Since 2010, the number of IPOs has increased, showing recovery from the previous financial crisis. Whereas there was only 1 IPO for a Silicon Valley-based company in 2009, the number grew to 11 (2010), 12 (2011) and 17 (2012) in the following years (SV Index 2013). Similarly, the share of IPO exits in Silicon Valley has increased from 4% in 2009 to 12% by Q3/2013 (CB Insights 2013), leaving M&A transactions still to play a major role as an exit channel. The increased public market interest in startups has also favored Silicon Valley - 52% of the top 50 venture-backed exits between 2012-Q3/2013 in the US were by Silicon Valley startups; these together created 86% of the aggregate exit valuation[169,170]. While the data for exits in total are only made available by the NVCA on a national level, the role of Silicon Valley startups is central in these statistics, as the above-mentioned historical and recent outcomes indicate. In

[169] Http://www.cbinsights.com/blog/trends/silicon-valley-venture-capital-domination

[170] This calculation does not include the Twitter IPO and does includes Facebook's mega IPO - without it, Silicon Valley startups still capture 54% of the aggregate exit valuation in 2012.

addition, numerous smaller valuation exits are not included in these listings and would further increase the total number of exits.

Temporally, the experimental winner generation process since 2007 has required on average 6-8 years to scale a winner that goes public (NVCA 2013: 51). When compared to the peak of the Internet-bubble in 1998-2000, it took only 3.1 to 3.7 years on average to reach an IPO. This change shows that current startups need to be scaled further as companies and businesses before attempting to raise additional growth capital at public markets, partly due to the larger venture capital fund size.

In summary, successful exits are the lifeblood of the experimental winner generation process in Silicon Valley. They create successful entrepreneurs and employees due to the culture of granting stock options, which enables the formation and funding of new startup business experiments - new entrepreneurs, angel investors and mentors for startups are created. The impact of this practice is not to be understated: consider the estimated over 2 000 new millionaires created by the IPOs of Facebook and Twitter alone. The scale is significant and, combined with the capital efficiency of conducting startup business experiments, significantly reinforces and expands the potential for the next winners to emerge. Furthermore, the generated winners subsequently become an important part of the startup industry by acquiring the new winners, both small and large, as the examples of Facebook and Google indicate.

Successful exits also enable returns for business angels and venture capitalists, allowing them to raise subsequent funds or establish new venture capital companies. This process is essential to the venture capital cycle (Gompers & Lerner 2004) and to the renewal of the venture capital market. The total amount of capital raised by California-based venture capital companies between 2002-2012 (table 32) shows the significant level of new capital raised annually to fund the experimental winner generation process. In 2012, over 13 billion dollars was raised by 64 funds. The exact share for Silicon Valley is not available, but it represents the majority: as indicated by statistics, in 2012, 71% of invested capital in California was invested in Northern California, where Silicon Valley is the most central region.

Table 32. Capital raised (M$) by California venture capital funds 2002-2012 (NVCA 2013).

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Capital raised (M$)	154	4 830	8 645	12 869	13 621	12 016	14 053	8 635	6 337	9 790	13 665

Despite the organization over markets, the elimination of non-competent venture capital actors through competition is relatively slow. Based on 2010 data, only 7% of funds were dissolved under a 10-year lifespan and 20% under the 11-12 years that is considered the norm (NVCA 2013:22). Almost half of the funds (49%) had a life span of 13-16 years, and 24% had a life span from 17 to 19 years. The median life span was 14.17 years. One reason for these results is the weak exit market, but from the perspective of non-competent actors being driven out by competition, this long life slows the startup industry's renewal of actors and the removal of non-competent actors in particular[171]. Data for venture capital companies that made initial investments during the last year would provide a better overview. Nevertheless, the number of venture capital firms and principals has been decreasing in the US from 1 089 firms and 14 541 principals in 2002 to 841 firms and 5 887 principals in 2012 (NVCA 2013:9). At the same time, the number of first-time venture capital funds raised has grown from 25 (2002) to 43 (2012), indicating that new actors are entering the markets (ibid).

Last, failure as a natural part of the experimental winner generation process is discussed. Although the role of failure is understood and embedded in the Silicon Valley startup industry, the closure rate or the number of failed startups is not explicitly available. Periods of over-investing led to more failed startups in the late 1980s and after the Internet bubble, as the historical analysis shows. One interviewed business angel and serial entrepreneur stated that, as a rule of thumb, 50% of series A-financed startups will not obtain a series B round, indicating tight selection and a significant number of failures or the non-emergence of winners. Because the cumulative number of startups in the winner generation process is substantial and the selection of winners is strict, the number of failed business experiments is high.

[171] Limited partners' investment strategies and monitoring are another part of the slow venture capital industry renewal. See, e.g., Mulcahny, Weeks & Bradley (2012).

The most recent discussion relating to failure has been around the so-called series A crunch[172]. As the number of bootstrapped and seed funded startups has increased, the series A funding available has not scaled to match the demand; competition has grown, and the bar to receive funding has been raised higher. As a consequence, there is more demand than capital, and it is likely that Silicon Valley has hundreds of startups (estimated at over 1 100 in the US recently[173]) that are not able to raise a subsequent financing round before reaching break-even, causing many of them fail.

From the perspective of the experimental winner generation process and startup industry renewal, this progression is not necessarily negative. Due to capital efficiency and the quick access to customers online, at the riskiest seed and early stages, less money is being allocated to business experiments for shorter time periods to see how they progress in the markets. Hence, the filtering of potential winners can become more efficient as the pressure of working with uncertainties is reduced by a developed product and feedback from the market.

This evolution has significant implications for startup industry renewal. First, in terms of the startup industry structure, business angels are more empowered than before. For long, the rules of the game in winner generation were such that business angels worked with the startups, and then the next financing rounds were raised from venture capitalists. Due to the higher capital needs to start business experiments, the startup industry was institutionally locked in to generate winners through the traditional venture capital mechanism or by "swinging for the fences," as it is called. The problem is not the venture capital mechanisms, but the large fund sizes, which from the mid 1990s grew rapidly from several hundreds of millions to over one billion. More capital needed to be deployed, and it required really big winners to earn returns for the fund. Because the venture capitalists were in a power position to negotiate with the entrepreneurs who needed the capital, the terms of the financing[174] could include, for instance, the right of veto to block an acquisition offer that could be profitable for the entrepreneurs and angels but not for the venture capital fund. The other corollary is that often, it turned out that the startup had raised too much capital ex ante compared to the

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[172] For instance, http://pando.com/2012/12/19/finally-actual-data-series-a-crunch-will-kill-1000-companies-1b-in-angel-money/

[173] Http://www.cbinsights.com/blog/trends/seed-investing-report

[174] The venture capitalists often have preferred shares with terms that, for instance, give them veto power that can be used to block or accept an acquisition offer.

discovered actual market size of the business opportunity or the potential exit size that the startup could achieve after execution at the markets.

This power position of venture capitalists in relation to entrepreneurs and angels has been balancing, and entrepreneurs have a better market for raising appropriate amounts of capital in stages based on feedback from conducting the business experiment in the market. This institutional and market change has, second, affected the startup industry with the emergence of micro-cap venture capitalists or micro VCs managing smaller funds (e.g., 20-50 million dollars). The number of these funds, which can generate returns from smaller exits, have been growing, and some of them have an accelerator tied to the operations to create a deal flow with smaller and shorter-period investments to the fund.

Third, taken together, the long-standing perceived winner is now expanding, and the discussion relating to startup industry activity and experimental winner generation is becoming more multi-voiced, resulting in contradictions. The smaller and earlier exit-perceived winner is a new element for the startup industry and contradictory to the large fund-venture capital structure and its related institutionalized division of labor in winner generation. This creates some disturbances but, more importantly, drives the renewal of the entire startup industry in terms of the rules of the game, actor structure and activity of winner generation.

As a result, both experimentalism and the volume of startup business experiments have risen. This reduces the ex ante risks, as the business experiments can get to markets cheaper and faster in non-capital-intensive industries[175]. Subsequently, the mechanism for picking and scaling winners can be more efficient in terms of resource allocation to the potential winners, and it is likely that the exit dynamism will continue to be strong and generate both smaller and larger winners. The attractiveness and incentives for entrepreneurs to build high-growth businesses and for the startup industry to support their experimental generation in Silicon Valley are possibly better than ever.

5.4 Cross-case analysis of the case startup industries

This chapter presents the cross-case analysis in which the Finnish case is compared to the Israeli and Silicon Valley cases based on the theoretical

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[175] However, the lean startup and customer development methods are also being used in capital-intensive industries to cut the longer development times shorter.

framework and findings of the individual analyses. The purpose is to discuss the reasons that high-growth firms and winners in the international markets have not emerged from Finland as stated in the research questions. Therefore, the main focus is on discussing the Finnish case against Israel and Silicon Valley.

5.4.1 The players, the rules of the game and the perceived winner in the making

The theoretical framework suggested that startup industries understood as activity systems are not started from scratch without history but evolve over long time periods carrying specific institutionalized patterns and perceptions resulting from prior activities. It was further suggested that, in a sense, history is embedded in present outcomes and contextual conditions and can play an important mediating role in the functioning of startup industries. By comparing the findings from the historical analysis of each case, it appears that these propositions hold.

In the following paragraphs, the explanatory power of historicity in understanding the present is elaborated by comparing how the case startup industries took shape over time in terms of the structural elements laid out in the theoretical framework (figure 4). Through this process, we can understand the key determinants of the evolutionary path towards the current structure of each startup industry (players), the deep-seated rules and patterns of activity (rules of the game) learned through membership in these industries, and how these are reflected in the process of experimental winner generation today. The results of the Silicon Valley case are discussed first, followed by the Finnish and Israeli cases.

With respect to the completeness of the startup industry actor structure (community), the results show that out of the three cases, only Silicon Valley is currently structurally complete. The Silicon Valley case analysis illustrates that the actor structure and history of winner generation started to develop during the 1950s and 1960s based on the pioneering role of individual persons, institutions, companies, macro-economic and societal conditions, and lucky incidents. At the time, it was not possible to recognize areas of structural incompleteness or market failures as is was later in Finland and Israel because Silicon Valley was a bellwether in startup-driven economic development and benchmarks were not available.

Therefore, with respect to organization of the division of labor and institutional set-up of the theoretical framework, the actors in Silicon Valley started early on to organize privately over markets, and the role of public actors in winner generation as a rule was limited. The structural evolution process and its outcomes were hence not planned or policy-led but happened spontaneously over time. However, the role of public actors, mainly the needs, funding and war-time execution pressure from the military along with public venture capital initiatives (SBIC program) played an important role in shaping the contextual conditions until the late 1960s. At that time, spearheaded by the success of semiconductor startups along with their founders, early employees and venture capitalists, a critical mass and structural variety of competent actors in the markets began to expand the startup industry structure and the division of labor in a winner generation process. The startup industry has since functioned under a market-exit mechanism with no direct public actor interventions.

In terms of the concept of a perceived winner and its role as a lure giving meaning and direction to activity, the results show that in Silicon Valley, a key institutional driver and rule of the game came from the parallel development in the understanding of startups. The historical analysis outlined how successful startup IPOs, mainly driven by venture capital investments, created a perception of a winner as being a venture-backed startup aiming to an IPO, the ”home run”. The view and role of risk capital as a business development tool was already institutionalized by the early 1970s. This emphasizes the length of the time period during which startup-related competence accumulated within the actors.

The above factors further relate to the development of rules and the importance of various factors linked to startups in the theoretical framework. The upside incentives of equity and stock options became a central motivating rule behind resource allocation to winner generation, and the emergence of successful startups with exits became the most important subject for creating and capturing the upside created by value and business growth. The primary data showed that startups are currently a widely spread object of activity in the region and stand high in the hierarchy.

Regarding the Finnish and Israeli cases, the results show the key determinants, which stem from history and mediate the current startup industry structure of both cases. Further, the results show the relation of these determinants to the theoretical framework, particularly in the area of organizing to address the missing structural (community) elements. The comparison of the structural evolution paths in time reveals that structural incompleteness was shared by both cases until the early 1990s, but after this point, Israel was more successful in compensating for the missing structural elements. The reasons for Israel’s success can be understood based on the results by comparing the evolution of the Finnish and Israeli cases over two time periods and taking approximately 1990 as a turning point. First, the findings from the pre 1990 period show how contextual conditions built towards 1990 (figure 21), and second, the post 1990 evolution shows their role in explaining the subsequent paths and winner generation-performance divergence between the two cases.

With respect to the structural completeness of the Finnish startup industry, the historical analysis results indicate that the initial market failures in entrepreneurship, venture capital and startup competence were already recognized in Finland in the mid 1960s and with the first venture capital company, Sponsor, established in 1967. During the following years and moving toward 1990, the Finnish startup industry-related structure started to grow and become established: the Fund for Developing Regions, the first industrial parks, incubators, regional development company venture capitalists, technology parks and Tekes were all created before 1990. Often Sweden and, to a lesser extent, Nordic countries, the UK and Japan were used as policy examples to follow.

This structural evolution had important implications for the development of the division of labor and the institutional set-up in the Finnish case. The division of labor started to develop to give public actors an importance in the markets justified by market failures and structural incompleteness. As the results show, a deep-seated rule of close industry-government relationship was in place much earlier, and the establishment of public actors prior to 1990 followed this logic during the period of economic and industrial catch-up. Hence, the institutional set-up of private economic actors with incentives and existence based on competence and performance in the markets underscored by the theoretical framework did not fully develop in Finland; instead, public actors served new ventures in a more active role with respect to establishing actors in the markets.

The results suggest that development of the definition of a perceived winner played a crucial role in determining the Finnish evolution process in the structural areas noted above. The instrumentation of Sponsor as neither a for-profit nor an exit-aiming venture capital company was the first institutional seed sown to influence the perceived winner, the desired outcomes and the division of labor between public and private actors. Sponsor's role as a financial market supplementing and well-being development company, its activities financing companies across economies 1 and 2 and some social objectives were later followed by the established actors prior to 1990 and evolved into deep-seated rules of activity. The importance of exits and the generation of exit-aiming startups did not emerge to characterize the perceived winner. The justifying premise of the actor structure during the late 1980s was different and institutionally defining because these actors were, in many cases, the only source of external financing for non-bankable business experiments and new ventures. The supply of venture capital was limited along with an understanding of venture capital's potential role. Within this structure, a perceived winner was a company that became profitable, bankable, did not aim for exit, and achieved moderate growth: these were all satisfactory outcomes.

The economic activity of the established actors started to define the rules of the game, the direction of winner generation and the development of actors' competence and networks. The focus was not on generating ambitious and risky startups that aimed to become winners in international markets or on learning the requirements of such activity. The actors, such as innovators and entrepreneurs, learned that public support instruments were important business development tools. Investment readiness as a rule and the development of investment-ready startups as pattern of activity were not widely accepted.

Consequently, the role of upside and downside incentives failed to develop and public actors had only indirect accountability for the outcome. Because regional development policies were high in the hierarchy, the culture supported more firms with smaller amounts of funding to enable short-term job creation. The startup's subjective role as an actor was essentially to be a job creator rather than attempt to win in the international markets.

Notably, at the time, there was minimal pressure for alternative conceptions (multi-voicedness) because the main goals had been achieved: rapid economic growth and Finland's successful industrial catch-up by 1990 indicated that the policies and activities had worked. The structure, the perceived winner, the direction of activity and the division of labor with the active national and regional involvement of public actors had been shown to work. Finland had over 20 years of experience of this activity and a multi-faceted structure in place and growing that organized deal flow generation based on the above-defined perceived winner. Hence, the players and the rules of the game further gained social legitimacy and were institutionalized as a causal power that supported this structure. This summarizes the contextual conditions present in the Finnish startup industry prior to 1990 (figure 21).

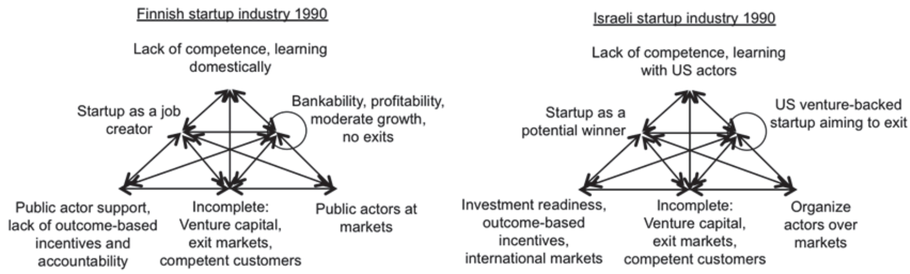

Fig. 21. The structure of the Finnish and Israeli startup industries by 1990.

With respect to the structural completeness of the Israeli startup industry, the historical analysis shows different contextual conditions during the time period before 1990. The initial market failures in entrepreneurship, venture capital and startup competence were recognized gradually during the 1970s, as the overall atmosphere became more entrepreneurship friendly. The first private venture capital company, Athena, was not established until 1985, 18 years after Sponsor was established in Finland. During this time period, the venture capital markets had grown and the development of venture-backed startups had become institutionalized in Silicon Valley and in a few other parts of the US. A leading benchmark was available, and the Israeli startup industry started to structurally adopt and learn from this benchmark. This series of events made a substantial difference in the future of Israeli startups.

The pre 1990s structural and institutional evolution in Israel hence followed a different path than that in Finland. In terms of the division of labor and institutional structure, the Israeli case does not show the establishment of as many different public actors with an active role in markets before 1990, unlike Finland. Instead, the pioneering activities relating to the IPO of Elscint in 1972, the BIRD Foundation-mediated exposure to competent foreign customers in the 1980s, and the ad hoc partnership program with US investors during 1980-1986, among other factors, frame a 10-20 year period of systemic learning and gradual adoption of the US venture-backed startup model.

The perceived winner in Israel began to take shape during this time based on the Silicon Valley and US market conception. The results show how a venture-backed startup aiming toward an IPO in the US started to institutionalize and become the perceived winner. The primary data showed the embeddedness of this view in the present. The rules of the game, the direction of winner generation, the competence, and the links to customer and professional networks, venture capitalists and exit markets in the US began to expand and build towards the 1990s. The process of complementing the areas of structural incompleteness in the domestic startup industry had begun.

To conclude, comparing the pre 1990 evolution of the Finnish and Israeli cases, clear differences were found in the theoretical elements of the startup industry structure. They are combined in figure 21 to summarize the contextual conditions by 1990. Out of the elements, the most important for the future was the difference in the perceived winner.

Consequently, when Finland and Israel started to address startup-driven economic development and venture capital market failures after 1990, they carried fundamentally different historicity and causal powers within. The subsequent differences in structural evolution and the organization of winner generation in the Finnish and Israeli cases become comprehensible when observed through the history-mediated structural lenses provided by figure 21.

With respect to the division of labor elements in the theoretical framework and the embedded assumption of the public actors' role in markets (institutional set-up), the results of a post 1990s structural analysis of the Finnish case indicate that the path carved in the 1970s and 1980s was still followed. First, figure 22 (line below) shows a pattern of establishing various public actors and public market interventions; these have continued to the present. This illustrates the continuation of the observed deep-seated division of labor rule in Finland: perceived winners are generated by placing public actors in a central role in the markets at the expense of limiting the emergence of private actors. The establishment of FII in 1995 as a publicly funded investment company followed this tradition because it could make direct investments in addition to fund investments, had a profitability requirement, and was there to stay and not to exit the markets; venture capital fund management teams were not offered an option to buy out FII's share.

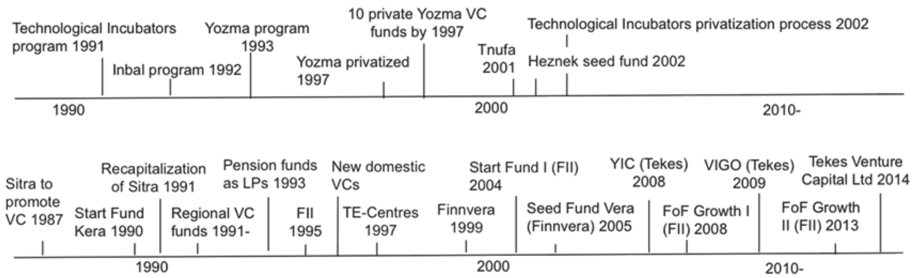

Fig. 22. Structural evolution of Finnish (below) and Israeli cases (above) post 1990.

On the contrary, the pattern of public actors' interventions in Israel (figure 22, line at the top) illustrates an embedded rule in the division of labor: actors are organized in the markets and the government is in the background. Unlike Finland with FII, the premise behind the venture capital policies (mainly Yozma in 1993) in Israel was that they represented a temporary part of the structure. Their purpose from day one was to solve the venture capital market problem and then to exit the markets, which happened through privatization in 1997.

These differences underscore how the pre 1990s evolutions in Finland and Israel created fundamentally different premises for success based on how they compensated for areas of structural incompleteness and created conditions for experimental winner generation. With respect to the amount and nature of cumulated startup competence, an analysis of a booklet covering the Finnish venture capital investors in 1995 (Suomalaiset pääomasijoittajat 1995) reveals an absence of foreign partners on the management teams. Combined with the pre 1990s results, it can be concluded that in Finland, learning about venture capital, investing in venture capital funds and allocating venture capital to startups was started by rather inexperienced domestic forces under conditions largely lacking competence, especially on an international scale. The funds did not require formal ties or links to competent venture capitalists, customer or exit markets abroad to address areas of structural incompleteness. This gap can be understood against the perceived winner and the goals and direction this set for winner generation. Moreover, analysis suggests that venture capital market failure was approached more from the financial side by making capital available to firms regionally without a deep understanding of or emphasis on the roles of competence and of international connections to customers, finance and exit markets.

In Israel, the role of competence and of a pool of available competent actors with international connections was emphasized. Despite the pre 1990 activities in connection with the US markets, startup-related competence in Israel was still considered to be insufficient, and its role was seen as critical along with the financial side and for-profit (exit) nature of venture capital. Thus, venture capital initiatives (mainly Yozma) evolved to offer a lucrative upside for professional investors and the fund rules forced promising potential Israeli venture capitalists to learn alongside competent foreign partners. Startups and the winner generation process benefitted significantly from this. Behind these differences lie different views on the perceived winner: in Israel, unlike in Finland, the perceived winner created more ambitious goals and demanded an international direction for winner generation.

The results of the post 1990s Finnish case analysis show the persistence of venture capital market failure and of the non-systematic generation of potential startups into scaled winners in international markets. The missing structural elements (community) in the startup industry identified by 1990 in figure 21 were not successfully complemented, and the startup industry remains structurally incomplete. Currently, startups cannot access a critical mass of competent actors in the markets, and the role of public actors remains significant. However, changes relating to the perceived winner as well as to the rules and goals of winner generation have been taking place recently as documented, and a small but growing pool of competent actors has been emerging, supported by the increased interest of international actors in Finnish startups. These developments are captured by table 33, which illustrates the current Finnish startup industry structure.

The results of the post 1990s Israeli case analysis show venture capital market emergence and the systematic generation of potential startups into scaled winners in the international markets. Compensating elements have been identified for the missing domestic pieces of the startup industry structure, and successful exits by M&As represent a primary mechanism complementing the final missing element: the lack of competent customers in Israel. The startup industry can be considered to be almost complete, not locally but through the role of international connections to replace the missing structural elements. Startups can currently access a critical mass of competent actors at an early stage and complement internationally at later stages. Table 33 describes the current structure of the Israeli startup industry and illustrates the documented recent advancements.

Last, table 33 also shows the Silicon Valley startup industry structure; here, the big picture has remained largely similar since the early days described in the beginning of this chapter. However, as the case analysis shows, the level of dynamism in the experimental winner generation process supported by this structural organization has been anything but stable. The endless appetite to build the next big winner renews the organization of players and the rules of the game, perceived winner-related expansion being the most recent example noted.

Table 33. Case startup industries at present.

	Finland	Israel	Silicon Valley
Community:	Incomplete, many public actors, startups cannot access a critical mass of competent actors. Failed to complement missing elements	Almost complete, startups can access a critical mass of actors. Success in complementing of missing elements	Structurally complete, a critical mass of needed actors accessible locally
Rules: Rules of the game, incentives	Public actor support, lack of upside/downside and accountability, aggregation of results. Investment readiness and international markets as targets emerging	Investment readiness, downside/upside incentives, international markets as a target	Incentives and rules based on investment-ready startups aiming to become international market leaders
Division of labor: Completeness, institutional set-up	Public actor interventions hinder private actor development, public actors in key role	Actors private and organized over markets, public actors in the background	Private actors organized over markets, minimal public actor role
Mediating artifacts: Competence, business development tools	Public subsidies in key role, lack of startup competence on systemic level, small pool of competent actors emerging	20 years of startup competence, risk capital in key role, public support in the background	Vast pool of specialized startup competence, risk capital and private money, public subsidies minimal
Perceived winner	Bankability, lower ambition and risk levels, no exit orientation. Expanding slowly toward US venture-backed startup and smaller exits	US venture-backed startup aiming to an exit, expanding to include smaller exits	Home run, a venture-backed startup aiming to an IPO, expanding to include smaller exits
Startup team	Startups seen more as a job creator than a shared object in winner generation. Expanding slowly toward a potential winner	Startup shared object of work as a potential winner	Startup shared object of work as a potential winner

5.4.2 Experimental winner generation

This section covers how the contextual conditions and structural characteristics of each case come together as causal powers giving sense, meaning and direction to the current generation of winners and its outcomes. Hence, differences in the functioning of the two mechanisms (the generation of potential winners and the selection and scaling of winners) and the resource allocation between the cases can be understood and examined in relation to minimizing the incidence of the two startup related errors in the economy. Second, the discussion of the implications for startup industry renewal and endogenous growth conclude the cross-case analysis.

Regarding the mechanisms of winner generation and their organization, the results show that in Silicon Valley and Israel, the mechanisms are organized somewhat similarly. This can be understood as stemming from similarities regarding the perceived winner and access to sufficiently resourced competent actors in the markets. The main details were described in both case analyses, but the key points regarding the generation of potential winners (mechanism 1) are as follows: (1) investment readiness and perceived winner-mediated business experiment generation and strict selectivity, (2) accountable execution and (3) the shut down of non-performing startups. The analysis underscored that there is a significant number of both failed startup business experiments and the non-emergence of winners out of the total startups within the winner generation process in Silicon Valley and Israel, indicating that error 1 is minimized. The risks and uncertainties of perceived winner-mediated startups often result in failure; failure is normal in the process, as noted in theory. Mechanism 1 is enabled by the organization of actors over a market-exit mechanism that has incentives and accountability aligned with actual outcomes.

In the Finnish case, the organization of mechanism 1 is different due to the differences in the perceived winner and the startup industry's structural characteristics. Compared to the two other cases, the selection process is not as tight or as competitive, and public actors play a central role. One key purpose and result is to legally form a greater number of new ventures and to connect them to public business development instruments and services. Pure selection by a private venture capitalist is a minority event in the entirety, and funding is allocated in smaller amounts to a wider pool of less risky and less ambitious ventures. Controlling for error 1 has not been instrumented in the system nor is it a focus from the outset, as suggested by the much lower failure rates in Finland than in

Silicon Valley and Israel. However, due to both technological and innovator competence and widely spread public support, there does exist a pool of potential winners in Finland, as the case analysis showed.

In terms of scaling the potential winners (mechanism 2) into actual winners, the biggest difference between the Finnish case and the two others is the amount of capital invested by stage and the execution pressure stemming from startup industry characteristics. This area in particular explains much of the absence of scaled winners in Finland. At the seed stage, the differences in investment size are not decisive because Finnish startups can access public financing to leverage smaller private investments. However, the differences in the perceived winner and the competence level of the Finnish startup industry are shown in the startup and especially later-stage investments. Based on the results of each case, Silicon Valley is in its own level in terms of the size of investments and the number of venture-backed startups, but the difference between Israel and Finland after the seed stage is sizeable. Whereas in Israel, the average investment size starts to shift closer to ten million dollars (9.78 million dollars in 2011) towards the later stages, in Finland, the later-stage venture investments have remained at approximately 1-2 million euros (1-2.5 million dollars[176]) over the last 10 years. This finding suggests that in Finland, error 2 has prevailed in the form of under-capitalized scaling.

Second, the difference between the venture capital market in Israel and the venture capital market failure in Finland becomes relevant here. In Israel, venture capital investments in 2013 were 2.3 billion dollars and have remained over the 1 billion dollar level since 2002. In Finland, the total amount of capital from business angels, domestic and foreign venture capitalists peaked at 270 million euros (including the 100 million euros to Supercell) or 331 million dollars in 2013. However, the typical venture capital investment volume has remained at approximately 100-150 million dollars annually. In practice, this is reflected in winner generation not only in terms of investment size but more importantly in the volume of high-growth companies at later investment stages. The data enable a comparison in the 2010-2011 investments: in Israel, 501 startups received venture capital at a later stage (mid and late stage) compared to 47 startups in Finland financed at a later stage (mid and late stage). Hence, the volume of

[176] Euro to USD conversions are calculated based on a Euro/USD average exchange rate of 1.2242 between 1999-2014 as provided by the European Central Bank.
http://www.ecb.europa.eu/stats/exchange/eurofxref/html/eurofxref-graph-usd.en.html

companies in the scaling phase is several times larger in Israel than in Finland, and they are substantially better financed. On the practitioner level, the signal sent to inventors, innovators and entrepreneurs in Finland regarding the scaling of potential startups is different than that for Israel or Silicon Valley and affects the incentives to pursue and execute startup business experiments.

Third, when differences in the competence, incentives and accountability of the actors who allocate financial and other resources to selected startups are taken in account, execution and scaling pressure as a causal power operate differently in the cases. The primary data analysis showed that in Israel, the different perceived winner manifests as sense of urgency and an international direction of activity, which is supported by substantial staged financing from private actors. Larger amounts of capital in Israel enable startups to attract talent and build an organization that can scale on competitive international markets, but it also creates a clear downside incentive and accountability to execution if progress is not there. This is the case with Silicon Valley as well.

In Finland, the pressure to execute and scale for the international markets is not as strong a causal power within the startup industry. As a significant part of the capital and the business development support comes through public actors, the amount of financing is not only smaller but is instrumented differently to meet the perceived winner-related characteristics. Due to (1) the non-accountability for the actual outcome, (2) the aggregation of results between economies 1 and 2, (3) a lack of upside incentives and (4) a lack of market-exit mechanisms among public actors, the selected companies do not feel similar pressure or a sense of urgency to progress or exit as they would in Israel or Silicon Valley. Instead of exiting markets, there is often another program or public funding instrument that can be exploited. These instruments are also used by venture-backed startups as the money is mostly non-dilutive and provides additional leverage. Therefore, resources and market space is not dynamically released to the successful and growing firms by removing losers and controlling for error 1. In other words, weak firms can remain in place much longer in Finland. It can be further proposed that this problem does not only apply to startups but is also true for companies receiving public subsidies across economies 1 and 2, as suggested by the low number of successfully internationalized companies and the high number of subsidized companies overall in Finland.

The relation to economy 1 is important to endogenous growth because when the mechanisms of winner generation within the startup industry are placed into the wider economic and industrial context in Finland, the result is lower economic dynamism in the startup industry, and to a certain extent in the economy at large, than seen in Israel or Silicon Valley. The tight selection of potential winners and the control of error 1 by removing the weak and non-performing startups from markets creates economic dynamism and is institutionally possible in Israel and Silicon Valley because of the high number of properly financed startups. In both places, it is more likely that another startup exists that is hiring people either at the early or at the scaling phase of the winner generation process; hence, mechanism 2 supports the removal of losers.

Here, the venture capital industry has a second important mediating role. The larger investment sizes in Israel and Silicon Valley mean more capital for hiring, which creates more openings at startups at any given time than in Finland. Due to the perceived winner-mediated direction and the goals of winner generation, many of these are high-upside jobs in potentially large winners. This upside enables the stakeholders in non-performing startups to call it quits and shut the firm down; the losers cannot stand still as people move on to other opportunities. The Silicon Valley primary data analysis showed that people leave public technology companies when there is a lack of upside and join emerging potential winners instead. Internal execution pressure and a sense of urgency among existing companies (economy 1) is created because the attractiveness of the winner generation process of the startup industry can start to draw people out of companies that are standing still.

The resources are therefore dynamically released from losing startups into other actors in Silicon Valley and Israel. The enabling key is a sufficiently resourced and aligned winner generation process that is constantly aiming to build the next big winners. An embedded driver for economic dynamism and endogenous growth is functioning in the background.

Due to both the small venture capital industry and the small average investment size in Finland, the number of properly financed startups that are rapidly scaling internationally is much lower. The number of openings is limited and the upside tied to these jobs is not as significant. Working for the upside has not yet been widely institutionalized as a social rule and is institutionally supported by a missing track record of generated large winners. Although, a new perceived winner-mediated direction of activity is emerging, it is not yet backed by a sufficient private actor pool with financing and the competence to scale businesses into an industrial scale. Hence, the re-allocation of resources from losers to potential and scaling winners has not been as dynamic and robust in

Finland as in the other cases. The large public actor structure maintains this situation.

The weaker dynamism in Finland hampers the potential for rapid endogenous growth at a micro level. Notably, the pull of employees toward Nokia and the economically lucrative employee options during its scaling phase provided a similar example in Finland together with a few companies during the Internet boom, but from the historical perspective, they are the exceptions rather than a sign of economic dynamism created by systemic winner generation.

Therefore, the innovative entries by startups in Israel and Silicon Valley have, on average, higher potential and higher pressure to have an impact because they have both the financing and the competencies needed to scale in large markets. Such startups also create economic dynamism among economy 1 incumbents and activate the creative destruction process. In Finland, the current startup industry's organization and the mechanisms of winner generation are not as efficient or capable of filtering out the best and highest potential cases and doubling down investments in the fastest growing companies to maximize the value capture and impact international markets and their incumbents. Instead, the economically and societally expensive error 2 has prevailed; for the reasons listed above, potential winners are typically undercapitalized and under-resourced, lack pressure to execute and have not been successfully scaled into winners in international markets.

Risky but high-potential startups can appear to be too risky, and are terminated because they appear to be outliers in relation to the historically embedded ways of doing things; alternatively, the initial amount of required capital may be too much for the domestic venture capital industry. Error 2 can thus also exist latent among industries where publicly funded R&D takes place but the commercialization is too capital intensive for the carrying capacity of the startup industry, as is the case with Finland, thus preventing such business experiments from entering the markets and scaling.

The important finding regarding the disappearance of corporate venture capital in Finland can also be partly discussed in terms of the lower economic dynamism and the documented increase and scale of public subsidies. Innovative entries by Finnish startups are not as aggressive, so they cannot rapidly start to gain market share and pose a competitive threat or opportunity for incumbents, pushing them to react through corporate venture capital or M&A. The role of corporate venture capital in business development among the industrial scale companies failed to develop and is minuscule compared to Silicon Valley and

Israel. Indeed, this gap was likely further supported by the growth of public subsidies for internal R&D for corporations and small firms and for subcontracting projects in which startups served as resource pools for the incumbents and did not need to develop their own products and market them internationally.

The analysis next turns to the winner generation outcomes defined in the theoretical framework. First, the long-term results that were partly touched upon above are compared in terms of generated IPOs and M&As. Then, the renewal of competence, institutions, actors and industries resulting from the organization of the startup industry and the mechanisms of winner generation conclude the results of the cross-case analysis.

By looking at the number and value of generated winners that achieve an exit through an IPO or M&A transaction, the performance difference when the Finnish case is compared to Silicon Valley and Israel is evident. In fact, Silicon Valley is at its own performance level and has continuously generated winners across existing and new industries since the 1970s, as the case analysis indicated. The documented total number of venture-backed startup IPO and M&A exits is in the thousands and includes the biggest winners in history. Therefore, when the history, structure and organization of the Finnish startup industry are taken into account, a direct comparison of the two is not useful here, but provides a valuable leading benchmark globally.

Instead, the Israeli startup industry is a more appropriate equivalent for the Finnish case, as its evolution began from a somewhat similar structural incompleteness. In Israel, during a ten-year period between 2004-2013, there were 45 venture-backed IPOs in which companies raised over 1.6 billion dollars. Following the development of the exit market, the number of M&A exits was higher, as 351 venture-backed startups were acquired with a total volume of almost 20 billion dollars. In addition, approximately 80 venture-backed IPOs had taken place already in the 1990s. The generation of winners is therefore constant and the total number of winners is at a top level internationally, demonstrating Israel's performance in winner generation. The perceived winner and outcomes are in line.

The comparison of these results against the Finnish startup industry not only reveals its weaker performance but also shows how differently the two cases have evolved since 1990. First, as mentioned in the Finnish case analysis, similar statistics for venture-backed IPO and M&A exits are not available in detail, and exits are not reported based on value at the time of the exit. This lack is consistent with the non exit-focused perceived winner and the other characteristics discussed that drive the long-term resource allocation within Finland. There are no venture-backed startup IPOs on US stock exchanges, and the number of venture-backed startup IPOs on the Helsinki stock exchange is not documented but, based on the estimate, is small. Regarding M&A exits, a handful of bigger winners during the last 10 years have occurred, for instance, MySQL and Supercell, but still their occurrence is rare and not systemic. The recent developments discussed in exits and winner generation, however, suggest an increase in deal making dynamism, but as the amounts are not disclosed as statistics, the overall picture remains unclear.

In summary, combined with the lower number of high-growth companies and startups in the scaling phase in Finland than in the other two cases, this evidence indicates that the non-emergence of internationally scaling winners has over the long-term been the normal outcome of the experimental winner generation process in Finland. This is not surprising because only a small portion of actors are tied to the emergence of winners in the markets and in the history of Finland; competencies in key areas of the systematic generation of winners have been missing.

These outcomes and the organization of winner generation are reflected in the structural renewal taking place within each startup industry (arrow back to the social structure in figure 4). The structurally complete Silicon Valley startup industry functions as an attractor that constantly pulls new actors into the region and under the winner generation process. This attraction is enabled by the generated winners and the dynamic removal of resources from losers to new startups, business angels, venture capitalists and other professionals. The sufficient resourcing of potential winners enables them to challenge incumbents, and due to the broad horizontal scope of winner generation, innovative entries affect the dynamism of many industries regionally, nationally and internationally. The documented recent developments around the expansion of the perceived winner, the rules of the game, the business angel and venture capital market, and the location of non technology-related industrialists are the most recent examples of continuous evolution and dynamism in the markets.

In Israel, the over-two decades of generated exit-achieving winners has created a track record that enables renewal and outcompetion in the markets. First, the exiting winners allow entrepreneurs and early employees to become serial entrepreneurs, business angel and venture capital investors, and experienced mentors to startups such as in Silicon Valley. This expands and renews the competence and actor base and is supported by the functioning removal of losers. The analysis showed that venture capital funds have successfully raised subsequent funds; however, the notable role of cross-border venture capital poses a competitive challenge to domestic venture capitalists at the same time. As in Silicon Valley, the number of smaller venture capital funds has increased and the perceived winner is expanding to include smaller scale exits as well.

The renewal taking place within the Finnish startup industry cannot be characterized with similar terms. First, dynamic structural and competence renewal is hampered in two ways. On the one hand, the lack of winners achieving positive exits has not created or widened the pool of competent serial entrepreneurs, mentors, business angel and venture capital investors with a scope similar to that in Israel. However, the level of competence has recently been growing in terms of activity based on a more ambitious perceived winner. The lack of exits and the 20-year old market failure in venture capital go hand in hand and are in line with the functioning of the basic venture capital cycle. It can be estimated that on a systemic level, Finland is approximately 10-20 years behind in competence and customer and professional networks relating to ambitious winner generation on the international markets compared to Israel. This is the new area of industrial catch-up for Finland.

On the other hand, another bottleneck for renewal and economic dynamism in Finland lies in the substantial size and role of the public actors in relation to actors in the markets. The documented high degree of public actor intervention makes it difficult to assess their competence because, unlike for private actors, there is no competence check before and after allocation of resources to startups. The following contradiction is therefore possible: a non-competent actor can be given financial resources from tax payers with no accountability or incentives regarding the micro-level outcomes generated by the allocated resources, as was shown in the Finnish case analysis. However, in the case of non-successful outcomes, the actor can gain new resources because a market failure remains and is addressed (again) by public actors based on different policies. In this setting, the non-emergence of winners is paradoxically equal to sales that generate more resources for the public actor. At the same time, if winners emerge, they can be included in the results because results are aggregated to justify the establishment.

By contrast, if the particular actor is organized over markets and does not achieve the desired results through the allocation of resources, competition should remove this actor from the markets and should open market space for new entrants. As the Finnish case analysis indicated, this is not the case for the majority of actors due to the significant public structure. In fact, Finland has created structural and institutional lock-in to conduct winner generation through the establishment.

This observation underlines the fundamental difference in terms of the division of labor (figure 21) that is embedded into the Finnish startup industry and the allocation of public subsidies at large compared to Israel and Silicon Valley. The economic growth that continued until 2008 and the macro level aggregation of results between economies 1 and 2 helped to sustain a status quo that included the non-emergence of winners instead of creating market-based renewal. The structure and organization of resource allocation was not subject to critical inquiry (lack of multi-voicedness) and no detailed justification was required along with the growth in subsidies to companies.

Consequently, the results propose that from the perspective of experimental winner generation, a large-scale misallocation of resources has been taking place in Finland for a long time. Based on the data, it appears that the economic and societal price for misallocated resources and missed scaled winners (error 2) in Finland is billions of euros compared to the value of outcomes in Israel. The situation has remained because Finland has a different perceived winner and significant government intervention in economic life; together, these resulted in a non-functioning market-exit mechanism.

Lastly, based on the cross-case analysis results, it can be further suggested that the Finnish startup industry historically organized, aligned and was incentivized to generate the systemic non-emergence of winners despite the opposite intentions. The found differences in (1) perceived winner characteristics and other contextual conditions behind the startup industry's structural evolution, (2) their functioning as causal powers affecting both mechanisms of winner generation, and (3) initiatives aimed to address recognized market failures and structural weaknesses combine to explain the weaker winner generation performance in Finland and its notable gap with Israel and, to a certain extent, Silicon Valley. In summary, the Finnish startup industry organized to play the game with different rules, goals and markets.

6 Summary and conclusions

In this chapter, the conclusions and implications of the study are presented, first by summarizing the study, then by discussing the implications for theory and policy, and finally by covering the limitations of the study together with suggestions for future research.

6.1 Summary of the study

This study has aimed to contribute to our knowledge of firm growth by analyzing three startup industries in different geographies from a systemic and processual perspective with a focus on high-growth startups. In addition, the cultural-historical evolution of the economic actor structures and institutions was an integral part of the analysis. The main research question of the study was as follows:

How is growth created through the cultural-historical emergence of economic actor structures and institutions in entrepreneurial economies?

From the policy maker's perspective, the study aimed to increase understanding of the reasons behind the lack of high-growth firms and winners in a certain country or region, particularly Finland. This choice was related to the described double bind or paradox faced by Finland and other countries with world-class educational systems, significant R&D and innovation spending and public support for firms to use as inputs but that lack an outcome in the form of emerging high-growth firms that grow into winners in the international markets. From the policy maker perspective, the main research question based on this reasoning was:

Why has the Finnish economic system not generated more high-growth firms and winners in international markets?

Because the study relates to entrepreneurial and business growth, in Chapter 2, the prior research on firm growth was analyzed. The analysis focused on discovering which types of approaches prior studies had used and how the main findings and suggestions for future research could support the problem setting of the present study. The literature demonstrated decades of interest in growth, with a vast amount of theoretical and empirical research. However, simultaneously, it was debatable whether it provided a holistic understanding of growth and knowledge about the growth process, its causes and effects. The key point for this study was the important role of economic gazelles or high-growth firms that contribute crucially to new job creation. The theoretical approaches used in the literature tended to focus on issues and challenges that should be taken into account when measuring, conceptualizing and explaining growth, and typically they had the firm as the focal actor. However, the mediating role of history and the context for the growth and activity of the firm was neglected in many studies. The most recent publications, indeed, indicated a move from measuring how much firms grow towards understanding how they grow and seeing growth as a co-evolutionary process with relations to the other actors present. The need to include the occurrence of failure and other stakeholders' views and roles in the more holistic examination of firm growth also appeared.

In Chapter 3, the theoretical framework of the study was developed in an attempt to answer the call for more holistic approaches to firm growth. The experimentally organized economy, competence bloc and cultural-historical activity theories were chosen as the basis for developing the conceptual lens of the study. They were seen to be appropriate because this study particularly concerns high-risk and high-reward potential startups, which can be understood as business experiments aiming to scale into market leaders and winners on international markets. Due to the risks, these startups also fail as a natural part of the process. The reasons for and importance of resource allocation to such ventures, their experimental nature, and the role of failure could be based on the principles of the experimentally organized economy theory. The various competencies and different economic actors needed to support the emergence of such winners lean on competence bloc theory and were supported by prior firm growth research. Cultural-historical activity theory was instrumental in accounting for contextual embeddedness, the mediation of prior actors' activities and the role of historicity in understanding the present situation of the research subjects.

By building on the key concepts of these theories, the research object was defined as contextually embedded economic actors that were seen as being object-orientated, motive-driven and culturally and historically mediated. The collective sense and meaning of startups was captured by the concept of the perceived winner, and the structure of involved economic actors was defined as the startup industry. The activity of the startup industry was seen through two generative mechanisms that simultaneously create both success and failure. This systemic processual activity by the startup industry was termed experimental winner generation. The developed theoretical framework answers the first sub-question of the study: *How can the emergence of high-growth firms be described as a contextually embedded systemic process?*

Chapter 4 described the empirical research design. Critical realism was chosen as a philosophy of science because its view of causality supports the theoretical approach and enables accounting for the simultaneous occurrence of both the success and the failure of startup business experiments. Due to the research objectives and selected approach to firm growth, the case study method and process research were chosen as the basic research strategies. They were seen as being suitable for studying the complex and not so easily observed contextual conditions behind startup industries; these affect the functioning of mechanisms and the processuality that generate observable events in the empirical domain. Then, the selection of cases, data collection and analysis methods were also discussed.

The actual empirical analysis was conducted in Chapter 5. The case analysis is a central part of the study because the aim was not to test any well-formulated hypothesis but instead to understand the social structure and mechanism-based contextual conditions and their role both in the emergence and in the non-emergence of high-growth firms and winners. The selected Finnish, Israeli and Silicon Valley cases were first covered as individual cases. The analysis started with a description of the structural and institutional evolution towards the current startup industry structure for each case and was followed by a discussion of the two generative mechanisms and the outcomes of the experimental winner generation process on a case level. Against this view, the last part of the chapter focused on comparing the Finnish case to the Israeli and Silicon Valley cases. The cross-case analysis answered the second sub-question of the study, stated as follows: *What are the systemic and institutional similarities and differences in generating high-growth firms in Finland compared with similar activities in Israel and Silicon Valley?* The major findings of the cross-case analysis are presented in section 5.4 and answer the main policy maker research question of the study.

Finally, by answering the two sub-questions based on the developed theoretical approach and on the conducted empirical analysis of three startup industry cases, the main research question of the study was answered.

6.2 Theoretical contribution

In this section, the theoretical contributions of the study are discussed. The key contributions are made to the firm growth literature and relate to the areas identified in the theoretical and empirical problem setting of the study: (1) the call for new approaches to studying firm growth and (2) the need to understand the reasons behind the lack of high-growth firms and winners in particular geographies despite apparently good preconditions.

First, as a whole, this study suggests taking a systemic view of firm and business growth. This means expanding the research object from individual firms to startup industries and their experimental winner generation process. The process is particularly interested in high-growth potential startups and in scaling them into winners in the international markets. Hence, the startup industry is a concept that enables a focus on this particular set of ventures instead of on all of the different types of small businesses. The proposed approach searches for reasons behind the growth or non-growth of firms from the structural and institutional setting of the industry and the activities of all involved economic actors.

Second, the approach emphasizes that structures, institutions and activities are culturally and historically mediated and emerge over time. Each startup industry carries its own diverse history and competencies; these renew and affect present outcomes and systemic conditions for high-growth venturing. Firm growth is thus conceptualized as being both systemic and context specific. High-growth startups can be a new object of systemic activity or an object that the economic system has worked on for decades. Historicity and the mediation of prior economic activities are thus connected to the reasoning behind high-growth firm and winner emergence in different geographies.

Third, the systemic view and historicity together define startups as a shared object of activity among startup industry actors. A concept of a perceived winner was developed and shown to act as an embedded social mechanism; this captures how startup industry actors perceive startups as an object of activity in time and defines the outcome that the startup industry is aligned to generate through its activity. Clarifying these conceptions and processes contributes to the question of how to define a high-growth firm and creates a co-evolutionary link between startups and the other economic actors. With an understanding of the perceived winner, a detailed understanding of the startup industry structure and institutions; the involved actors' incentives, rules and goals; systemic competence and business development tools; and the overall division of labor between public and private actors alike can be created. Such a view is missing from the prior firm-growth theory. Studying these factors through the perceived winner allows an understanding of the types of perceived winners that startup industries in different geographies are organized and incentivized to generate; further, it uncovers the reasons for both previous and current winner generation performance. With relation to the so-called ”equity gap” (e.g., Mason & Harrison 1995), the perceived winner-related analysis of the Finnish case proposes that an ”institutional gap” exists as a co-evolutionary component relating to the organization of venture capital-related initiatives and the reasoning that defines their success.

Fourth, compared to prior studies that call for theory advancement in studies of the growth process of the firm and of how firms grow (e.g., McKelvie & Wiklund 2010), the approach emphasizes the processuality on a systemic level. The experimental winner generation process is particularly defined by two generative mechanisms: (1) the generation of potential winners, and (2) the picking and scaling of winners. These capture how contextual conditions and the structural characteristics of startup industries come together as causal powers to give sense, meaning and direction to the observed winner generation activity. Expanding the processuality on the systemic level allows an illustration of how different startup industries processually generate winners and allocate competence and other resources to perceived winner startups and what the outcomes of these processes are.

Fifth, the startup industry is also given an important function in economic development. Considering the presumably good preconditions for high-growth venturing in many geographies, the function of the startup industry is to dynamically allocate resources to high-potential and high-performing startups and to be accountable for scaling them into winners in international markets. This enables reasoning about how different startup industries turn public innovation investments into success stories. The increased economic dynamism globally calls for the ability to scale local seeds into large companies. Hence, in addition to the entrepreneurs, other economic actors are also made accountable in high-growth firm related activities across geographies.

Finally, the suggested approach to firm growth does not seek universal or natural law-like explanation; it is not like a model of growth that can be copied and applied in new contexts with the same results. Critical realist reasoning is therefore suggested as a philosophy of science that is suitable for understanding causality in the described theoretical setting. It enables an ontological view of growth that moves causality from the firm to the generative mechanisms and causal powers residing in the social structure such as in the startup industry. Causality is then based on understanding the systemic structure and mechanisms that processually create both the occurrence and the non-occurrence of desired events, such as high-growth startups and winners. In this manner, failed startups and the non-occurrence and non-predictability of growth, which are normal in the experimental winner generation process, in all contexts can be taken in account.

In summary, the systemic approach to firm and business growth is seen to provide a foundation for the question of ”what” in firm growth research. Unlike in previous studies that emphasize questions relating to how and how much firms grow processually (Leitch *et al.* 2010b), the question of “what” is systemic. The suggested theoretical contributions first ask what the startup industry aims to achieve (perceived winner) and, second, shift to related questions concerning the structure, institutions, role of culture-history, processuality of the systemic activity and achieving of desired outcomes. The performance of the entire economic system can then be discussed against investments in the activity and in relation to economic development in an era of entrepreneurial economy.

6.3 Implications for policy makers

This study has illustrated how different actors in society have demonstrated significant interest in firm growth and job creation for a long time. Under the present economic climate and the increased unemployment in recent years, in Europe, for instance, debate has only accelerated and countries have poured tens of billions of euros into different initiatives to increase economic growth. A significant part of this money is directed toward instruments that target new and small firms and foster their growth. However, the non-growth of firms and non-emergence of winners has proven to be a difficult and persistent problem. Based on the developed approach to firm growth and the results of this study, the following policy implications are suggested.

To begin with, it appears to be appropriate to address the issue of the type of companies policy makers should target, as within prior research, a consensus regarding this issue is missing (e.g., Mason & Brown 2013). The startup industry and the experimental winner generation process underline the importance of focusing on high-growth-potential startups and the need to separate them into their own category in economic development policies. The case analysis results show that generating startups that scale into winners in international markets and achieve positive exits is crucial for economic growth and job creation, which are both key policy targets. It is important to acknowledge that such startups also require specific competence. It is therefore recommended that so-called mice and gazelles as well as established incumbents should be targeted with different policies.

Indeed, the present study next proposes that startup-focused policies should clarify the perceived winner, and its origins should be mapped. This is a key policy recommendation. Too often, the discussion addresses gazelles or startups defined by econometric job or sales growth at best. The results of this study highlight that both job and sales growth are a means to an end; defining that end state is of the essence and can be capture by the defined perceived winner. The insights of the case analysis illustrated how startups can be perceived in many different ways across startup industries and across the different actors that they contain. The findings further suggest that in some cases, the ambition level relating to the perceived winner must be significantly raised.

After the perception of a winner is understood and defined, a more detailed division of labor among public actors is proposed to support it. This division is particularly important if the new perception of a winner is historically different and more ambitious and thereby a new object of activity for most involved public actors. This study documented how the results of policies targeting various established firms without a clear perception of a winner can inadvertently be counted as results elsewhere among small or new firm-focused policies. The concept of aggregation of results was established and its occurrence between economies 1 and 2 examined to capture this activity. Policy makers should remove the possibility for such conduct; one way to achieve this is by clarifying the division of labor between instances of policy execution.

The inclusion of renewal mechanisms inside the public sector is a component of this reasoning. Based on the results, there can be public actors to whom the lack of high-growth firms and winners is not a burning problem to be solved, if incentives and accountability for the outcomes of their resource allocation is taken in account. Making these actors more accountable will increase systemic pressure and their sense of urgency to generate winners and can improve winner generation performance in the long term.

The renewal also includes the discussion of how to introduce market-exit mechanisms within this structure in the case of non-performance, and how to increase the number of startup industry actors in the markets. The case analysis illustrated how it is possible to create structural lock-in that generates activity through an established public actor-dominated structure; this can evolve over a long time period. Under political leadership, the needed restructuring may therefore be difficult, and this must also be acknowledged in policy making.

After the above-documented steps are taken, a more detailed evaluation of policies and their impact is possible, as is also suggested by Lerner (2009). If the ambition level regarding the perceived winner is raised and startup-focused actors are defined with increased accountability, the evaluation should also acknowledge that the number of failures may likely increase. Failure should be understood as an investment in systemic learning about winner generation on a new ambition level. Hence, for instance, the loss of jobs in the short term by startup failure should not necessarily be interpreted as negative in discussion.

Second, venture capital has been a central element of policy makers' initiatives for decades. The empirical analysis of the cases in this study provide many insights regarding certain systemic factors and preconditions that may play an important role in the successful emergence of a domestic venture capital industry. First, market failures in venture capital and startup competence should be addressed at the same time. Too often, approaches to venture capital emphasize the financial aspect and neglect the role of competence and the wider set of systemic connections that could compensate for structurally missing domestic components.

In this respect, the case analysis indicated that the activities and developments that took place 10-20 years before actual venture capital initiatives are important and create preconditions for the later emergence or non-emergence of the venture capital industry. The analyzed cases provided examples of both success and failure in this regard. Therefore, it is recommended that in the design of venture capital policies, the past should be thoroughly mapped to establish a picture of the perceived winner, the structural elements missing in the startup industry and awareness of them, and the direction of winner generation up to that point. This provides a basis for instrumenting venture capital policies including non-financial aspects to account for the value-added and systemic connections that venture capital companies must provide to expose startups to the needed competence and networks in the right markets. One crucial decision is whether to bring cross-border competence into the venture capital partnerships or to begin to learn collectively domestically.

Regarding the latter decision, it was shown that venture capital and exit markets have been in turmoil during the last ten years, and the level of cross-border investments has increased. Therefore, experienced venture capitalists with networks of key stakeholders are available, but potential nascent venture capitalists also have better access to knowledge of venture capital and syndicate partners. This further indicates there is room for other ways to solve the domestic venture capital dilemma beyond what was documented in this study. Nevertheless, a key component of designing policies is to understand the path to the present in the light of the discussed issues.

Finally, an important part of the picture and of looking forward is mapping startup related initiatives and their outcomes over the past decades and then asking whether a large-scale misallocation of resources has been taking place. This process provides background for a discussion of previous targets, structural organizations, incentives and accountability for winner generation and whether the actors can continue down this path. This type of systemic self-examination is likely to be needed in many cases, as the problem regarding high-growth firms has continued despite the significant investment of taxpayer money in solutions. With respect to the Finnish case, the question is where Finland would currently be with a different type of perceived winner and a different systemic organization.

6.4 Study limitations and suggestions for future research

As with all research, this study has certain limitations. First, as was documented in the theoretical sections of the study, prior firm growth research has emphasized the investigation of growth with the firm as an objective to develop a theory capable of explaining growth from that perspective. The systemic view of growth taken in this study retains the subjective importance of the firm but searches for the causes and drivers of firm growth more widely than just at the firm level. The approach thus limits the ability of the study to directly contribute to the firm-focused part of the firm growth literature.

Another limitation can be discussed in relation to entrepreneurship and other academic fields that have contributed to firm growth research. The vertical depth of different theoretical discussions within the different scholarly fields could be used to involve more theoretical elements. However, due to its theoretical approach and empirical research design, the present study has not relied on any single discipline such as economics. This can be seen as a limitation to the study's ability to contribute to any particular fields.

Third, the difference between an economic system structure that has developed over a long period of time such as a NIS and the startup industry is somewhat difficult to define theoretically. The former is organized to serve both established companies and research organizations of all sizes and to serve different types of new firms. The latter is focused on a particular type of business opportunity and new venture. In addition, a set of market failures, the startup industry's structural completeness and different policy factors are present and affect the role of public actors in the economic system. In this connection, the concept of the startup industry and its actor structure has some limitations at this stage of theory development.

Empirically, the study focused on startup industries in Finland, Israel and Silicon Valley. Although some comparisons across different geographies of experimental winner generation and startup industry structure could be made, the key element of the approach taken in this study is that the cases should not be evaluated without taking the contextual conditions and causal powers in account. This limits the use of the findings of the present study outside of these three cases.

Regarding future research, much remains to be done to improve the contribution of firm growth research toward solving the important growth- and job creation-related questions from different geographies introduced at the outset of the study. The following suggestions for future research are made to conclude the study.

Overall, more research exploring firm growth and non-growth in different contexts from the systemic and holistic perspective is needed. Currently, our knowledge of what different economic systems look like on the national and regional levels from startup industry- and experimental winner generation-related perspectives is limited. Researchers internationally and within their respective countries have the potential to contribute significantly to this effort by thoroughly mapping their own country's context and providing insights into why different countries show different rates for generating high-growth firms and winners. The above questions of ”what” the economic system is perceived to be doing and ”how” it is organized to do it are particularly relevant in this connection. Theoretical development should be an integral part of answering these questions and relates to the need to establish systemic entrepreneurship theories (e.g., Acs, Autio & Szerb 2014, Mason & Brown 2014).

Another issue in future studies is the dilemma of how to define a high-growth firm. A single definition is unlikely to emerge, and the importance of the topic ensures that attention around it will continue. In future studies, it would be interesting to see how scholars might combine the more qualitative and scheme of things-based concept of a perceived winner that was developed in this study with econometric definitions of high-growth firms. Additionally, the possibility that the perceived winner could serve as an integrative concept including different definitions of high-growth firms depending on the identified needs would be another avenue for addressing this issue. This could potentially include envisioned end states for the business from different stakeholders within the definition.

Then, with respect to the remaining challenges in high-growth firm research, Coad *et al.* (2014) note that not enough is known about the internal features of high-growth firms. The investigation of internal features could be improved by accounting for the wider economic system in which firms reside in the reasoning. The contextual or external conditions were shown to have significant explanatory power for the emergence of high-growth firms and winners in the analyzed cases of this study. It would be interesting to examine their roles in relation to the internal features of different contexts and to develop variables to capture them.

Finally, an interesting area for future research relates to public actors and improving the impact from the investment of taxpayers' money in fostering entrepreneurship, innovation and economic growth. Many of the suggested implications for policy makers need to be supported with more research that focuses, for instance, on questions of how to increase the accountability of public sector actors for the outcome of their resource allocation, how to introduce incentives that support competence and actor renewal, and how the division of labor across public actors and in relation to their size as compared to private actors could be improved. These are fundamental issues that need to be elaborated in the future.

In summary, if more studies take the contextually embedded and systemic view to exploring firm growth processes, at best, another research stream can emerge alongside the documented historically significant firm growth research paradigm. This could improve the dialogue between firm growth scholars across different disciplines and contribute to the growth-related challenges faced by practitioners in numerous geographies.

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