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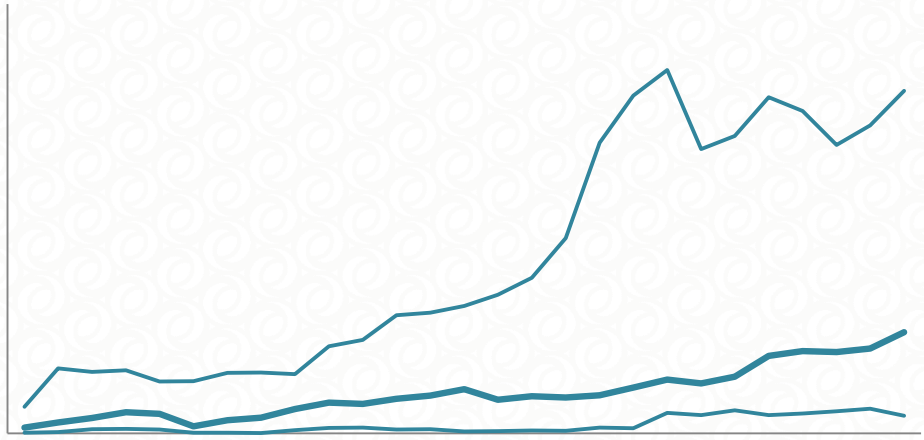
Coming of age: from start-up to expansion within environmental technology



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In cooperation with Mid Sweden University

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Preface

Scientists are warning us that the time we have available to move towards sustainable development is running out. Radical changes are needed to mitigate the effects on climate and the loss of biodiversity; indeed, in many parts of the world we can already see that the resources essential to society, such as clean water, are becoming scarce. At the same time there are market opportunities to grasp in the shift towards sustainable development. For example, the growth in investment in renewable energy has accelerated in Asia the last ten years. To maintain the competitiveness of their industries, it is important that the countries of the European Union keep pace with this market development. One obstacle to achieve this is the investment gap in the start-up phase of new enterprises developing environmental technology. This investment gap may slow down the commercialisation process. The role of state aid is to bridge this investment gap until these young enterprises reach their expansion phase. There are indications that state aid in the environmental technology segment may not be conducive to achieving this end. This is the starting point of this study conducted by IVL Swedish Environmental Research Institute (IVL) in cooperation with Mid Sweden University.

It takes a broad set of competences to conduct a study that provides new information that will help policymakers assess whether state aid helps bridge the investment gap relevant to the needs of the environmental technology market segment. We have therefore engaged a team with wide experience for this study. It has been led by Mr Andreas Englund, at IVL, who has twenty years of experience of start-ups in the environmental technology market segment. The co-authors have been Mr Haben Tekie at IVL (economics), Mr Johan Strandberg at IVL, (data analysis), Prof. Inga Carlman at Mid Sweden University (environmental science) and Dr. Kristina Lygnerud at IVL (business administration). The authors have had technical support from the staff at IVL: Dr. Håkan Fridén (statistical analysis), Ms Åsa Nilsson (processing and quality control of data) and Mr Magnus Rahmberg (data processing). Dr. David Bell (literatures in English) has provided valuable assistance in editing the report.

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Summary

The purpose of this study is to provide new information that will help policy makers assess whether the time restriction of eligibility for start-ups is relevant in the environmental technology market segment. The study investigates whether the five-year limit in Article 22 in the European Commission regulation No. 651/2014 is too restrictive. The purpose is met by validating two hypotheses. These hypotheses are based on an analysis of the current literature in relevant fields.

The literature indicates that there might be special conditions in the environmental technology market segment, which makes time to market longer for enterprises in this segment compared to enterprises in other industries. However, no study has been found to actually compare time to market for enterprises in the environmental technology market segment with similar start-up enterprises active in other segments.

The European Union State aid rules have several aims, two of which are relevant to this study: to bridge the investment gap/funding gap in the start-up phase until young enterprises reach the expansion phase, and to protect and improve the quality of the environment. There are, thus, twin objectives for aiding environmental technology enterprises in the early phases.

There is no exact definition of when the expansion phase begins. The threshold between micro-enterprises and small enterprises has, in this study, been used to define when an enterprise moves from the start-up phase to the expansion phase.

For this study 443 eligible limited companies still active in September 2016 have been chosen as the sample population. The statistical analysis shows that an average new eligible environmental technology enterprise, which succeeds in its growth, needs more than five years after registration to (i) go from start-up phase to expansion phase and to (ii) no longer fulfil the non-time related eligibility criteria of Article 22. In average it takes 13 fiscal years (i) and 13-15 fiscal years (ii).

For the most successful enterprises turnover and balance sheet total indicate that a distinct growth phase starts around the 9th and 12th fiscal year respectively. The growth accelerates around the 16th fiscal year. Later on, the growth seems to level out for turnover, but continues for the balance sheet total. These results are in line with other studies, which show that a growth phase among Swedish enterprises seems to start around the 8th year and that high-growth enterprises have a mean of 19.8 years when they start the high-growth phase. If the ambition of public funding is to bridge the investment gap to the expansion phase for the majority of the enterprises, this study indicates that the five-year time limit may not be adequate for this purpose when applied to environmental technology.

Further studies are needed to determine if there is a more appropriate time limit that would bridge the investment gap. The growth patterns also need to be analysed more in depth. It would be of special interest to analyse further the innovative enterprises, since there are indications in the data used in this study that they have lower growth. Also, it would be of interest to compare the growth of new environmental technology enterprises with other new enterprises. It is essential to investigate if more enterprises would be expected to reach the expansion phase, if state aid is given to enterprises older than five years. Such a study is not easy to carry out, but nevertheless of great importance. Such further analysis would give valuable information to policy makers. It would be

instrumental in designing the state aid system, so as to better promote the growth of start-up enterprises and the diffusion of environmental technology.

Sammanfattning

Syftet med denna studie är att ge underlag till beslutsfattare i deras bedömning om tidsgränsen för stödberättigade nystartade företag är relevant inom miljöteknikssektorn. Studien undersöker om femårsgränsen i artikel 22 i EU-kommissionens förordning nr 651/2014 är för restriktiv. Syftet uppfylls genom att validera två hypoteser, vilka bygger på en analys av aktuell litteratur inom relevanta områden.

I litteraturen förekommer uppgifter som tyder på att det tar längre tid för miljöteknikföretag än för andra företag att nå marknaden. Dock har inga studier identifierats som jämför tiden att nå marknaden för miljöteknikföretag med liknande företag som är verksamma i andra marknadssegment.

Europeiska unionens statsstödsregler har flera syften, varav två är relevanta för denna studie: (i) att dels överbrygga investeringsgapet i start-up-fasen till det att de unga företagen når expansionsfasen och att (ii) dels skydda och förbättra kvaliteten på miljön. Det finns med andra ord dubbla motiv att hjälpa miljöteknikföretag i de tidiga faserna.

Det finns ingen exakt definition av när expansionsfasen börjar. Gränsen mellan mikroföretag och småföretag har använts i den här studien för att definiera när ett företag går från start-up-fas till expansionsfas.

I denna studie utgörs stickprovspopulationen av 443 stödberättigade aktiebolag som fortfarande var aktiva i september 2016. Den statistiska analysen visar att ett genomsnittligt nytt stödberättigat miljöteknikföretag, som lyckas med sin tillväxt, behöver mer än fem år efter registrering för att (i) gå från start-up-fas till expansionsfas och för att (ii) inte längre uppfylla de icke-tidsrelaterade kriterierna för stödberättigande i artikel 22. I snitt tar det 13 verksamhetsår (i) respektive 13-15 verksamhetsår (ii).

För de mest framgångsrika företagen visar nettoomsättning och balansräkning att en tydlig tillväxtfas börjar kring det 9:e respektive det 12:e verksamhetsåret. Tillväxten accelererar omkring det 16:e verksamhetsåret. Därefter planar tillväxten ut för nettoomsättningen men fortsätter för balansräkningen. Dessa resultat är i linje med tidigare studier som visar att en tillväxtfas bland svenska företag börjar omkring det 8:e året och att företag med hög tillväxt har ett medelvärde på 19,8 år när de börjar tillväxtfasen. Om ambitionen med offentlig finansiering är att överbrygga investeringsgapet till expansionsfasen för majoriteten av företagen, tyder den här studien på att femårsgränsen kanske är för snäv för detta ändamål för miljöteknik.

Det behövs fler studier för att avgöra om det finns en lämpligare tidsgräns som skulle kunna överbrygga investeringsgapet. Tillväxtmönstren behöver också analyseras mer djupgående. Det vore särskilt intressant att ytterligare analysera de innovativa företagen, eftersom det finns indikationer i det dataunderlag som har använts i denna studie att de har lägre tillväxt. Det skulle också vara intressant att jämföra tillväxten för nya miljöteknikföretag med andra nya företag. Det är viktigt att undersöka om fler företag kan förväntas nå expansionsfas om statligt stöd skulle ges till företag som är äldre än fem år. En sådan studie kan vara krävande, men inte desto mindre viktig. En sådan analys skulle ge beslutsfattare värdefull information. Något som skulle kunna vara avgörande för utformningen av statsstödssystemet och därmed bättre kunna främja tillväxten av nystartade företag och spridningen av miljöteknik.

1 Introduction

This report concerns the five-year time limit on State aid to start-ups as determined by Article 22 in the European Commission Regulation No. 651/2014. Our intention is to investigate whether this limit on eligibility for aid is too restrictive to be efficient for enterprises within the environmental technology market segment. In this segement the limit may not be conducive to meeting the purpose of state aid, as this funding fails to help bridge the investment gap up to the expansion phase.

State aid for the development of enterprises is today directed towards the early phases: seed and start-up, where private venture capital is less readily available. However, when the expansion phase is reached private venture capital is generally more accessible. The role of state aid is to bridge the investment gap until these young enterprises reach their expansion phase. Another issue is the concern shared by many scientists, governments and a large section of the general public that society is overshooting the carrying capacity of the earth's ecosystems, depleting resources and creating environmental problems. In addressing this concern, state aid also has a role in supporting the introduction of technologies that have less impact on the environment than existing ones, when the market fails to do so. With this in mind, there are twin objectives for aiding enterprises within the environmental technology market segment in the early phases of their development.

1.1 Purpose

The purpose of this study is to provide new information that will help policymakers assess whether the time restriction of eligibility for start-ups is relevant to the environmental technology market segment. It investigates whether the five-year time limit in Article 22 in the European Commission regulation No. 651/2014 is is too restrictive (enterprises are eligible for aid for up to five years following their registration). This purpose is met by validating two hypotheses. These hypotheses are based on an analysis of the current literature in relevant fields and are introduced in section 3.1.

2 Setting the scene

To meet the purpose of this study and formulate relevant hypotheses, literature from different fields has been analysed. The literature gives different perspectives: that of the European Union legislation, that of venture capital, that of the research on high growth enterprises, and that of environmental science. From these perspectives different terminologies emanate. In section 2.1 the different terminologies are explained, with a focus on the classification of enterprises, definition of environmental technology and cleantech, and the meaning of the term investment gap. The literature indicates that there might be special conditions in the environmental technology market segment, which makes time to market longer for enterprises in this segment compared to enterprises in other industries. This will be elaborated on in section 2.2. The nature of the investment gap is examined in section 2.3 and the threshold between the start-up and expansion phases is discussed in section 2.4. The European Union State aid rules and the understanding proposed in this report that there are twin objectives of these rules when it comes to environmental technology is the topic of section 2.5.

2.1 Different perspectives, different terminologies

For this study the different perspectives, terminologies, and classifications concerning an enterprise are a challenge. If the issue to be investigated is whether the time limit on eligibility for aid is too restrictive, a certain amount of consistency in terminology and classification is needed so as to reach a consistent answer.

When defining eligibility, the European Commission regulation No. 651/2014 classifies an enterprise into four sizes: micro, small, medium and large, see table 2.1. This terminology describes the size of an enterprise regardless of the commercial development phase it is in, or how fast it grows. Also in regulation No. 651/2014, the term start-up is used, which is part of the venture capital terminology that describes different investment phases, see table 2.2. These phases are connected to size, but not only; how far the enterprise has come in commercial development and how fast it grows are considered too. Most importantly, venture capital is directed towards a specific type of enterprise that contains a high value of intellectual property and is expected to be a high-growth enterprise. This makes research on high-growth enterprises most relevant. The research on high-growth enterprises in turn uses other types of classifications mainly based on the pace of the growth (Daunfeldt and Halvarsson, 2011). These classifications do not consider whether the enterprise is knowledge or technology intensive and contains a high value of intellectual property. In table 2.3 one example of relevant definitions of high-growth enterprises is presented; Eurostat–OECD (2007) presents a similar one.[1]

[1] Eurostat–OECD (2007) definition of high-growth enterprise: ”All enterprises with average annualised growth greater than 20% per annum, over a three year period should be considered as high-growth enterprises. Growth can be measured by the number of employees or by turnover.” and ” A provisional size threshold has been suggested as 10 employees at the beginning of the growth period.”

Table 2.1: The European Commission regulation No. 651/2014 classifies an enterprise into micro, small, medium sized and large when defining eligibility.

Category	Staff headcount	or	Turnover	or	Balance sheet total
Micro enterprise	< 10		≤ EUR 2		≤ EUR 2
Small enterprise	< 50		≤ EUR 10		≤ EUR 10
Medium sized enterprise	< 250		≤ EUR 50		≤ EUR 43
Large enterprise	≥ 250		> EUR 50		> EUR 43

Table 2.2: The development of enterprises of interest to venture capital is often described in three different financial phases: seed, start-up and expansion. The Swedish Private Equity and Venture Capital Association has defined these phases.

Phase	Definition[1]
Seed	Finance being given to enterprises for research, together with the facilitation of evaluation and further development of an initial concept before the business operations have reached the start-up phase. In the seed phase the enterprise has been established and the first real interaction with the potential market has commenced.
Start-up	Finance being given to enterprises for product development and initial marketing. The enterprise has been operating for a short period of time, but has not yet sold its products commercially.
Expansion	Finance being given for growth and expansion of an enterprise that is actively selling to customers, but which has not necessarily generated a profit or positive cash flow.

(1) Berggren and Gretzer, 2006.

Table 2.3: A recent study of high-growth enterprises in Sweden defined six criteria in order to select high-growth enterprises for their study.

Criteria[1]	Definition[2]
Basic operational requirement to be considered	At least four full years of operations with a positive net result each year.
Basic turnover requirement to be considered	Total sales of more than SEK 10 million.
Basic staff headcount requirement to be considered	At least ten employees.
Growth	A doubling of sales in the past three years.
Commercial quality	"Healthy" finances.
Autonomous growth	Having grown organically (not through mergers or acquisitions).

(1) The names of the criteria are ours.

(2) Gabrielsson et al., 2014.

In figure 2.1 the different perspectives on an enterprise are illustrated and how this can result in categorising different subsets of enterprises is shown. It should be noted that for eligibility more aspects than size can be a determinant, see section 3.4. Figure 2.1 is a simplification to show that when using the different terminologies in this report, different types and subsets of enterprises within a population can also be referred to.

In this report the definition of environmental technology as formulated in the European Union Environmental Technology Action Plan (ETAP) is used.[2] The term cleantech is used when referring to environmental technology enterprises that are innovative and have high-growth potential (Alfredsson and Wannefors, 2012), i.e. enterprises containing a high value of intellectual property and are of interest for venture capital. The cleantech concepts in many aspects coincide with the subset described in figure 2.1 as "enterprises of interest to venture capital".

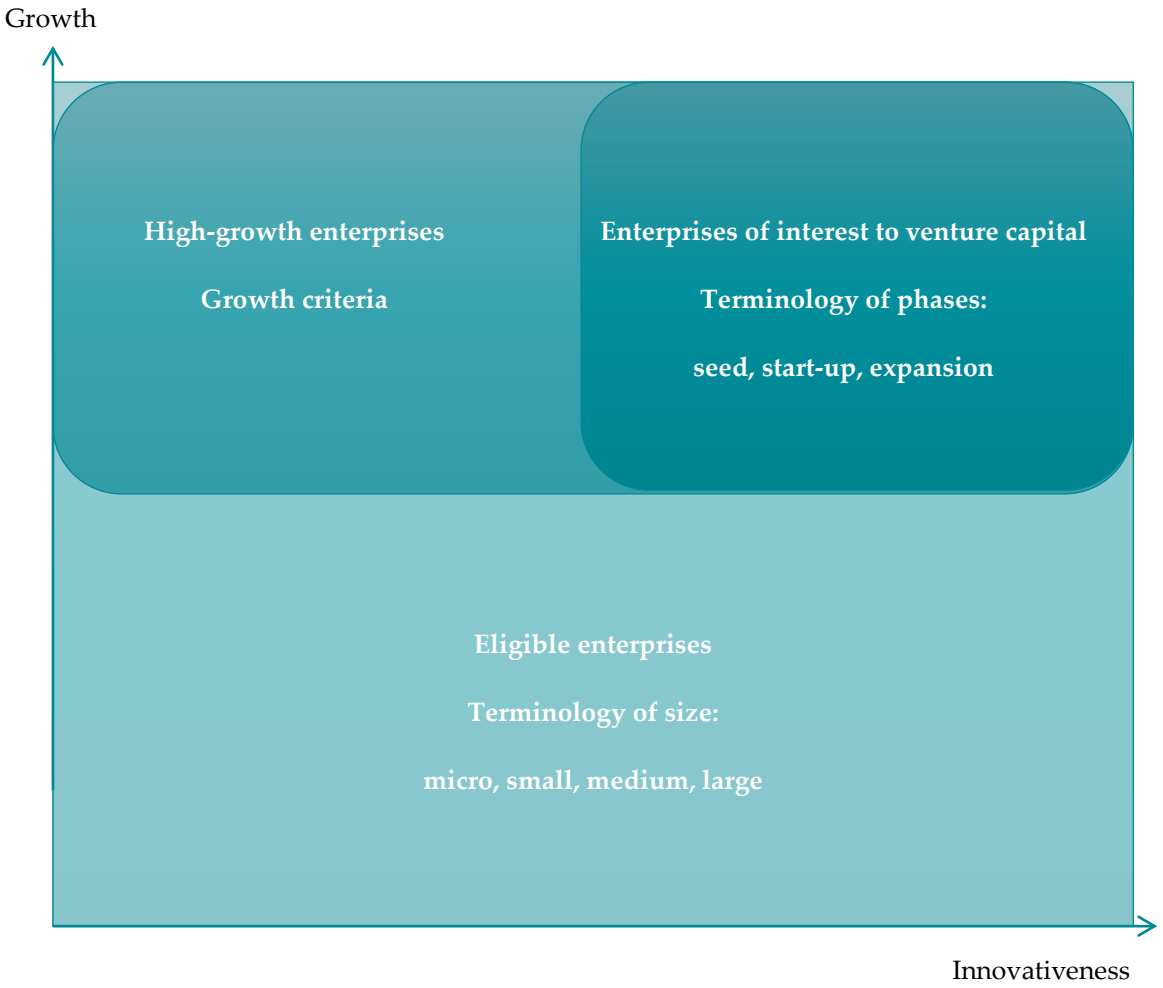

Figure 2.1: Different perspectives on an enterprise. From these perspectives different terminologies emanate and different subsets of enterprises can be identified.

[2] "Such products, systems, processes and services which provide clear environmental advantages compared to existing or alternative solutions, seen in a life cycle perspective. The approach shifts the focus from products to systems, resource efficiency and sustainable development."

Another important term used in this report is the investment gap, or funding gap, as it is called in The European Commission regulation No. 651/2014. For the purpose of this report we consider the terms as synonymous. An investment gap is defined as the imbalance between supply and demand for investment in the market segment under consideration. This could, also, be regarded as a market failure. The concept of market failure refers to non-functioning aspects of the market, which result in an inefficient allocation of resources and entail the underproduction or overproduction of certain goods and services (European Commission and European Investment Bank, 2014). The investment gap can occur in different financial phases of the development of an enterprise.

2.2 Special conditions for cleantech enterprises

The time to market for environmental technology enterprises that are innovative and have high-growth potential – cleantech enterprises – has been the attention of several studies in recent decades.

The literature analysed emphasizes time to market as a problem that is more articulated for cleantech compared to other innovative growth industries (Cumming et al., 2016; DealFlower et al., 2003; Dealflower et al., 2009; Ghosh and Nanda, 2010; Isaksson, 2012; Kemp *et al.*, 1998; Olofsson, 2009; Statens Energimyndighet, 2011; Steen and Frankel, 2003; Teppo, 2006; Tillväxtverket, 2014). However, little solid empirical evidence has been presented, which has actually measured the time to market. The empirical material is to a large extent based on the experience gathered from investors, surveys and interviews (Isaksson, 2012).

Cumming et al. (2016) provides a recent cross-country analysis of the determinants of cleantech venture capital investment with a data set of 31 countries spanning 1996-2010. The data show consistent evidence of a pronounced role for oil prices in driving cleantech venture capital deals, which is more important than other economic, legal or institutional variables. Cleantech media coverage is likewise a statistically significant determinant of cleantech venture capital investment and is as economically significant as other country level legal, governance, and cultural variables. Uncertainty avoidance has a negative impact on cleantech venture capital investment, as well as a moderating effect on other variables. A follow-up on all venture capital investments in the cleantech sector in the US between 2006-2011 shows that they did not preform as well as venture capital investments in the software and medical sectors (Gaddy et al., 2016). Also, there is a study from Halmstad University in which the difference in the commercial success of cleantech start-up enterprises and start-up enterprises from other market segments in Sweden has been measured. Although it is not a direct measurement of time to market, the study provides an indication of it, since time to market and commercial success are related. The study measures commercial success using three methods and shows that cleantech start-up enterprises are less commercially successful than start-up enterprises from other market segments (Halila, 2007; Hörte and Halila, 2006).

New technology always meets obstacles. Porter (1998) describes how this becomes especially pronounced in emerging markets. The main barriers, when introducing new products and services, are scale of existing suppliers, product differentiation that creates loyalty among customers, capital requirements for the development of the new product or service, the cost to customers of changing technology, access to distribution channels, and political and regulatory obstacles (Porter, 1998). Porter (1998) concludes that in new growth industries it is common that the customer must be informed and convinced of the basic functions of the innovation. Many of the markets for cleantech

are emerging markets, for example photovoltaics. Studies of cleantech enterprises in Sweden show that several of the barriers described above are pronounced among these enterprises, especially those obstacles that are related to the customers (Englund, 2010; Englund et al., 2014).

Barriers specific to cleantech innovations create a longer process from idea to market (Kemp *et al.*, 1998; Teppo, 2006; Tillväxtverket, 2014). This is partly due to technological complexity – new untested technology that gives rise to demonstration risks – combined with political and regulatory risks, lack of exit opportunities within five to seven years, and uncertainties about the knowledge and ability of the entrepreneurs and investors (DealFlower *et al.*, 2003; Ghosh and Nanda, 2010; Statens Energimyndighet, 2011; Tillväxtverket, 2014). Two studies by Tsoutsos and Stamboulis (2005) and Teppo (2006), both however more than ten years old, show that there is a low market acceptance of cleantech, which creates an additional barrier for market entry.

Regarding the technical risks, there is not much evidence that cleantech innovations require a longer product development period than other innovations (Isaksson, 2012). However, the cost of demonstration is significant in some cleantech segments. This generates large capital requirements and creates financial risk, thereby prolonging the time to commercialization (Ghosh and Nanda, 2010; Statens Energimyndighet, 2011; Zindler and Locklin, 2010). More specifically, Ghosh and Nanda (2010) provide a framework that describes how more traditional venture capital investments differ from cleantech venture capital investments by comparing clean energy subsectors according to their capital intensity, risk and exit requirements. The study finds that cleantech enterprises are more capital intensive and involve higher technological risk compared to traditional venture capital investments, which creates a longer time to commercialization. The level of cleantech investments can reach several hundred million US-dollars over a 5-10 year period; compared to the tens of millions US-dollars that venture capital investors typically use to invest in any given start-up (Ghosh and Nanda, 2010). Zindler and Locklin (2010) even argues that no existing class of financial institutions is effectively positioned to address this particular risk/return category. Venture capital enterprises have high technology risk tolerance but relatively limited capital, and they demand short-to-medium returns. Project finance funders and bank lenders, typically, have high levels of capital and can commit to longer-term investments, but they have little or no tolerance with regard to technology risk. The commercialisation, "valley of death", challenge is one that the private sector will not address on its own, according to Zindler and Locklin (2010); only public institutions have "public benefit" obligations and the associated mandated risk-tolerance for such classes of investments, along with the capital available to make a difference of scale. Johansson and Forssén (2010) show that in Sweden, generally, industrial activities (mining and quarrying, manufacturing and energy) are relatively capital-intensive activities that add high value and are dominated by large companies. Most service industries tend to be relatively labour-intensive activities, with a significant proportion of small and medium enterprises. Swedish cleantech enterprises are generally directed towards capital-intensive industries (Englund, 2010). This has implications regarding the diffusion of cleantech on the market. In several important sectors for cleantech in Sweden – real estate, energy, water, sewage and waste – the net investment equals over forty percent of the value added. In all other sectors net investment corresponds to less than twenty percent of the value added (Englund, 2010; Johansson and Forssén, 2010).

Cleantech is often dependent on public policy instruments to be profitable. The political risk in cleantech is based on an uncertainty about future policy decisions that may change the conditions under which the enterprise can achieve profitability. The regulatory risk is based on an uncertainty about how the authorities will interpret the laws (Ghosh and Nanda, 2010; Englund, 2010).

A general argument recurring in the literature and interviews is that many talented engineers and innovators are active in cleantech enterprises, but few of them are serial-entrepreneurs and they often lack business knowledge (investment readiness). The investor side, on the other hand, lacks industrial knowledge (investor readiness); in combination with other risks, described above, it creates barriers to investment (Tillväxtverket, 2014). A study of Swedish start-up enterprises shows that entrepreneurs in cleantech enterprises are less likely to emphasis customer focus and strategic planning with the company board, (Halila, 2007; Hörte and Halila, 2006). Other studies indicate that these two factors are important factors for commercial success (Dalenstam et al., 2008; Englund, 2008).

There are several indicators, which make it likely that the time to market is longer in the cleantech segment, even though no study has been found to actually compare time to market for start-up cleantech enterprises with similar start-up enterprises active in other segments. This may affect the environmental technology market segment as a whole.

2.3 The investment gap

The role of the young entrepreneurial enterprises as engines for economic growth has garnered attention during the last decades. In particular, fast growing entrepreneurial enterprises are considered to contribute disproportionately to innovation, the creation of jobs, and wealth in the economy as a whole. As a consequence, policymakers have directed attention towards finding direct or indirect methods to stimulate entrepreneurial efforts. One area of particular interest to policymakers is the nature and structure of the financial markets that fund small entrepreneurial enterprises. This interest is related to a general concern among policymakers that such enterprises often suffer from financial constraints due to investment gaps (Söderblom and Samuelsson, 2014).

In Sweden, there is an on-going debate concerning in which phases there are investment gaps due to market failures (Landström, 2017). Analysis shows that public venture capital, to a greater extent than private, directs its investments in the ranges of SEK 0-1 million and SEK 1-5 million (the typical range for the seed and start-up phase respectively), while the private sector, to a greater extent than the public, states that it operates in the range SEK 5-20 million and SEK 20 million or more, the typical range for the expansion and buy-out phases respectively (Tillväxtverket, 2014). Tillväxtanalys (2013) has shown that there is also a difference in Sweden between how private and public capital is invested in relation to size of the enterprise: the public venture actors invest the bulk of their capital (61 percent) in enterprises with 0-9 employees (micro-enterprises), compared to 46 percent of the private venture capital. Private actors tend to invest the bulk of their capital in enterprises with 10-49 employees (51 percent compared with 35 percent for public capital). Tillväxtverket (2014) argues that there is a trend in Sweden, where private venture capital moves to the later phases. In 2008, private venture actors invested close to SEK 3.7 billion in the early stages, compared to a little over SEK 1 billion in 2012, a decrease of over 70 percent; at the same time, public venture capital remained relatively constant at around SEK 1 billion per year during 2008-2011, although a decrease to approximately SEK 800 million can be noted for the year 2012 (Tillväxtverket, 2014). These analyses indicate that public venture capital plays an important role in the seed and start-up phases and that the trend is that this role is increasing in importance. Public venture capital plays an important role in bridging the investment gap until young start-up enterprises with growth ambitions reach the expansion phase. This is also the understanding of the

European Union. The role of the European Union State aid is to bridge the investment gap/funding gap until young enterprises reach the expansion phase:[3]

"The main source of market failure relevant to risk capital markets, which particularly affects access to capital by SMEs and which may justify public intervention, relates to imperfect or asymmetric information. It not only affects the provision of risk capital, but also hampers access to debt finance for certain SMEs. Consequently, risk finance measures which seek to attract private capital for risk finance provision to unlisted SMEs affected by the funding gap and which ensure profit-driven financing decisions and commercial management of financial intermediaries should be exempted from the notification requirement under certain conditions."

2.4 The expansion phase

There is no exact definition of when the expansion phase begins. We therefore need to discuss and argue for a reasonable definition. The Eurostat-OECD recommendation when high-growth enterprises are studied is that the enterprise has ten or more employees at the beginning of the observation period (Eurostat-OECD, 2007). The threshold of at least ten employees is also relevant since public venture capital invests the bulk of its capital in enterprises with 0-9 employees (Tillväxtanalys, 2013). The threshold of at least ten employees coincides with the threshold between micro-enterprises and small enterprises, see table 2.1.

There are two other parameters that define the threshold between micro-enterprises and small enterprises: annual turnover and/or annual balance sheet total does not exceed EUR 2 million, see table 2.1. It is of relevance to explore how well other definitions that indicate the expansion phase coincide with these two parameters that define the threshold between micro-enterprises and small enterprises. A recent study of high-growth enterprises in Sweden defined six parameters in order to select high-growth enterprises for their study (Gabrielsson et al., 2014), see table 2.3. This definition is in line with the threshold between micro-enterprises and small enterprises as discussed above when it comes to number of employees. However, when it comes to total sales/turnover it is lower: about EUR 1 million (depending on the exchange rate between SEK and EUR) instead of EUR 2 million.

Article 22 of the Commission's regulation (EU) No. 651/2014 states that aid to start-ups could take the form of loans of EUR 1-4 million, guarantees of EUR 1.5-6 million or grants of EUR 0.4-1.6 million, where EUR 1 million, EUR 1.5 million and EUR 0.4 million, respectively constitute the norm. For innovative enterprises the amount can be doubled to EUR 2 million, EUR 3 million and EUR 0.8 million, respectively. The higher amounts are reserved for undertakings established in assisted areas. Loans and grants affect the balance sheet total and therefore have a bearing on the definition of a micro-enterprise. In addition, state funding is expected to leverage additional finance from independent private investors, often by fifty percent. This means that the effect of the state funding on the balance sheet total is often doubled. Since the aid for start-ups is aimed at bridging the investment gap to the expansion phase,[4] it could be argued that the European Union has estimated that EUR 0.4-2 million is needed in state loans or grants to bridge this gap in non-assisted areas. The effect on the balance sheet total of this state aid may be doubled if the additional finance from independent private investors is included. Kroksgård (2016) shows that the average private venture capital investment in the start-up phase (enterprise start-up and launch of sale) in

[3] European Commission regulation No. 651/2014, introduction, paragraph 43.
[4] European Commission regulation No. 651/2014, introduction, paragraph 45.

Sweden was EUR 0.8-1.1 million in 2015. According to these estimates, the threshold between micro-enterprises and small enterprises based on an annual balance sheet total, that does not exceed EUR 2 million, reflects fairly well the point when the expansion phase may begin, even though the threshold might be a bit too high.

In conclusion, the threshold between micro-enterprises and small enterprises could be used to define when an enterprise moves from the start-up phase to the expansion phase. This definition should, however, be used with caution. Other studies of high-growth enterprises and the levels on loans and grants from European Union both suggest that the threshold might be set at a lower level when it comes to annual turnover and/or annual balance sheet total.

2.5 The European Union State aid rules

With its Communication on European Union State Aid Modernisation (SAM) in 2012 (COM(2012) 209 final, Brussels, 8.5.2012), the European Commission launched a wider review of the State aid rules. The main objectives of this modernisation were to achieve sustainable, smart and inclusive growth in a competitive internal market, while contributing to Member State efforts towards a more efficient use of public finances. The ambition was to focus aid measures on cases with the greatest impact on the internal market, while strengthening Member State cooperation in State aid enforcement. Another ambition was to streamline the rules and provide for faster, better-informed and more robust decisions based on a clear economic rationale, a common approach and clear obligations. The new revised State aid rules are supposed to define better the conditions under which certain categories of aid can be considered compatible with the internal market and to extend the scope of block exemptions. The eligibility time limit of five years for aid to enterprises, in accordance with Article 22 of the European Commission regulation No. 651/2014, was one of the revisions.

European Commission regulation No. 651/2014 provides a set of regulations to aid the development of young entrepreneurial enterprises with growth ambitions in the three different financial phases seed, start-up and expansion. In the early innovation and seed phase, Article 25 sets the rules for aid for research and development projects, while Article 22 sets the rules for aid for start-ups and Article 21 sets the rules for risk finance aid that are relevant both in the start-up and expansion phase.

In the regulations for aid for research, there is no time limit that the enterprise needs to relate to when it comes to eligibility. Instead there is a set of categories that governs the level of possible aid:

- fundamental research
- industrial research
- experimental development
- feasibility studies.

Also, the level of aid can be increased for medium-sized enterprises and small enterprises or in cases where SMEs and research and knowledge-dissemination organisations participate in the undertaking.

In the regulations for aid for start-ups a time limit is set that governs how long the enterprise is eligible for this type of aid. Article 22 of the European Commission regulation No. 651/2014 states:

"Eligible undertakings shall be unlisted small enterprises up to five years following their registration, which have not yet distributed profits and have not been formed through a merger. For eligible undertakings that are not subject to registration the five years eligibility period may be considered to start from the moment when the enterprise either starts its economic activity or is liable to tax for its economic activity."

Risk finance aid according to Article 21 is aimed at independent private investors and may take one of the following forms:

- equity or quasi-equity, or financial endowment to provide risk finance investments directly or indirectly to eligible undertakings;
- loans to provide risk finance investments directly or indirectly to eligible undertakings;
- guarantees to cover losses from risk finance investments directly or indirectly to eligible undertakings.

In the regulations for risk finance aid, a time limit is set that governs how long the enterprise is eligible for this type of aid. This time limit partly overlaps the time limit of aid for start-ups that is regulated by Article 22. Eligible undertakings that can be aided by Article 21 have to be undertakings which at the time of the initial risk finance investment are unlisted SMEs and fulfil at least one of the following conditions:

- they have not been operating in a market;
- they have been operating in a market for less than seven years following their first commercial sale;
- they require an initial risk finance investment that, based on a business plan prepared in view of their entering a new product or geographical market, is higher than fifty percent of their average annual turnover of the preceding five years.

The risk finance aid may also cover follow-on investments made in eligible undertakings, including those undertaken after the seven-year period, under certain conditions. The total amount of risk finance – equity, quasi-equity investments, loans, guarantees, or a mix thereof – shall not exceed EUR 15 million per eligible undertaking under any risk finance measure. The time limits and the level of financing indicate that risk finance aid according to Article 21 is aimed at the expansion phase, even though it can be used as an instrument in the start-up phase.

The focus of this report is on aid for start-up. This aid should, however, be seen in a context which is formed by an interplay between three types of aid – aid for research, aid for start-ups and risk finance aid – to support new eligible enterprises with growth ambitions.

In the above, the role of state aid to bridge the investment gap until young enterprises reach the expansion phase has been elaborated on. Another issue is the concern shared by many scientists, governments and a large section of the general public that society is overshooting the carrying capacity of the earth's ecosystems, depleting resources and creating environmental problems. Addressing these concerns is also part of the European Union State aid rules. European Commission regulation No. 651/2014 has as one of its points of departure the Communication from the Commission, "Europe 2020: A strategy for smart, sustainable and inclusive growth". Sustainable growth for a resource efficient, greener and more competitive economy is one of the main pillars of the Europe 2020. The European Commission concludes that sustainable development is based, amongst other things, on a high level of protection and improvement of the

quality of the environment.[5] A higher level of environmental protection can be achieved by investments that go beyond mandatory Union standards. In order to give undertakings the incentive to improve the level of environmental protection beyond these mandatory Union standards, State aid in this area ought to be covered by the block exemption.[6] The block exemption covers measures to promote energy efficiency, pursuing the overall objective of saving at least twenty percent primary energy in the Union,[7] measures to increase the energy efficiency of buildings,[8] aid granted to investments supporting energy from renewable sources[9] and operating aid to new and innovative small-scale, renewable energy technologies.[10]

In conclusion the European Union State aid rules have several aims, two of which are relevant to this study: to bridge the investment gap for start-ups, and to protect and improve the quality of the environment. There are, thus, twin objectives for aiding environmental technology enterprises in the early phases.

[5] European Commission regulation No. 651/2014, introduction, paragraph 55.
[6] European Commission regulation No. 651/2014, introduction, paragraph 56.
[7] European Commission regulation No. 651/2014, introduction, paragraph 58.
[8] European Commission regulation No. 651/2014, introduction, paragraph 59.
[9] European Commission regulation No. 651/2014, introduction, paragraph 60.
[10] European Commission regulation No. 651/2014, introduction, paragraph 61.

3 Method

This study is a quantitative study. Two hypotheses have been formulated and have been statistically tested on a selected sample population and sensitivity analyses have been conducted.

3.1 Hypotheses to be tested

Based on the characteristics of environmental technology enterprises, knowledge of investment gaps and the EU regulations on state aid for start-ups, two hypotheses have been formulated:

> ***Hypothesis 1***: It takes longer than five years from registration for the average new eligible environmental technology enterprise, which succeeds in its growth, to go from the start-up phase to the expansion phase (i.e. to go from the start-up phase to the expansion phase is defined as going from micro-enterprise to small enterprise in the main scenario).
> ***Hypothesis 2:*** It takes longer than five years from registration for the average new eligible environmental technology enterprise, which succeeds in its growth, to no longer be eligible according to the non-time related eligibility criteria of Article 22 (unlisted, micro- or small enterprise, not yet distributed profits and has not been formed through a merger).

The two hypotheses are based on the analyses made in chapter 2. They have been chosen based on the following assumptions:

- The threshold between micro-enterprise and small enterprise is a reasonable definition of leaving the start-up phase and entering the expansion phase. Since the studies referred to in chapter 2 suggest that the threshold might be set at a lower level, the definition should be used with caution and a sensitivity analysis is appropriate.
- An enterprise that is no longer eligible, according to the non-time related criteria, has either grown to a medium-sized enterprise and/or has an economy healthy enough to distribute profits and/or is listed and has been deemed to have the commercial strength to acquire capital on a stock market. These are indications that the enterprise is large enough and/or commercially strong enough not to need start-up aid to enter the expansion phase.

3.2 Selection of sample population

A sample population of environmental technology enterprises that represent the situation in the Swedish market has been identified. To be more precise a sample population of limited companies has been identified. A limited company is the type of business enterprise that is most commonly used in Sweden. A sample population of limited companies therefore well represents enterprises in Sweden. In a study by Strandberg et al. (2013) environmental technology enterprises representing one fifth of the total number of work places in the environmental sector in Sweden were selected (Constantino et al., 2016). This study contains 1,571 limited companies that were selected according to the same principles of environmental technology given in section 2.1 (Strandberg et al. 2013). These limited companies and relevant information about them have been the basis for the selection of an appropriate sample population for this study. The population from Strandberg et al. (2013)

has been complemented with limited companies from five other sources that fulfil the principles of environmental technology given in section 2.1. These are limited companies in the Swedish Energy Agency portfolio, finalists from the Environmental Innovation Contest (1998-2009), the Cleantech Inn portfolio, Swedish finalists in the Nordic Cleantech Open (2011-2014) and finalists in the WWF-Climate solver initiative. In total 1,769 limited companies form the basis on which to select a sample population and sub-sample populations, see figure 3.1. The selection has been made stepwise:

1. Based on reports in the literature of when a growth period could be expected to occur (Gabrielsson, et al., 2014) a time limit for the study has been set to 30 fiscal years of operation (1986-2016) for the enterprises selected for the sample population.[11] This time limit has been set to cover the possible spread in the population. In total 809 limited companies registered between 1986 and 2014 have been selected to assure at least one fiscal year of operation, that can be up to 18 months, in the studied sample population.
2. From the selection in the first step described above, 443 eligible limited companies still active in September 2016 have been chosen as the sample population, see the description of the process to determine if an enterprise is eligible in section 3.4.
3. The third step of the analysis has been to identify the range of the enterprises in the sample population. To be able to calculate correct values of mean and median for the testing of the hypotheses the whole range has to be covered. The range is 27 fiscal years, i.e. no enterprise in the 30-year period studied went from micro-enterprise to small enterprise or from eligible to non-eligible after 27 fiscal years. Based on this information a sub-sample has been chosen, which only consists of enterprises that have been operational for at least 27 fiscal years. This sub-sample consists of 28 limited companies that are 28-30 fiscal years old and is also used for the sensitivity analysis of where the threshold is set when an enterprise moves from the start-up phase to the expansion phase.
4. To make two of the sensitivity analyses three other sub-samples have been chosen, se figure 3.2. One sub sample contains non-eligible limited companies still active in September 2016 that are 28-30 fiscal years old. The two other sub-samples contain eligible limited companies still active in September 2016, which have been registered in the periods 1986-1990 and 2006-2010. The first sub-sample consists of 23 limited companies and is used to analyse how the exclusion of non-eligible enterprises affects the result. The two other sub-samples consist of 54 and 110 limited companies respectively, and are used to analyse if the pattern of growth changes over the 30-year period.

[11] A fiscal year for a limited company in Sweden can be shorter than a calendar year (no lower limit) and up to 18 months. Therefore, a fiscal year does not always correspond to a calendar year. The average difference between the number of fiscal years and calendar years in the sample population is, however, small over the chosen 30-year period: +0.26 years.

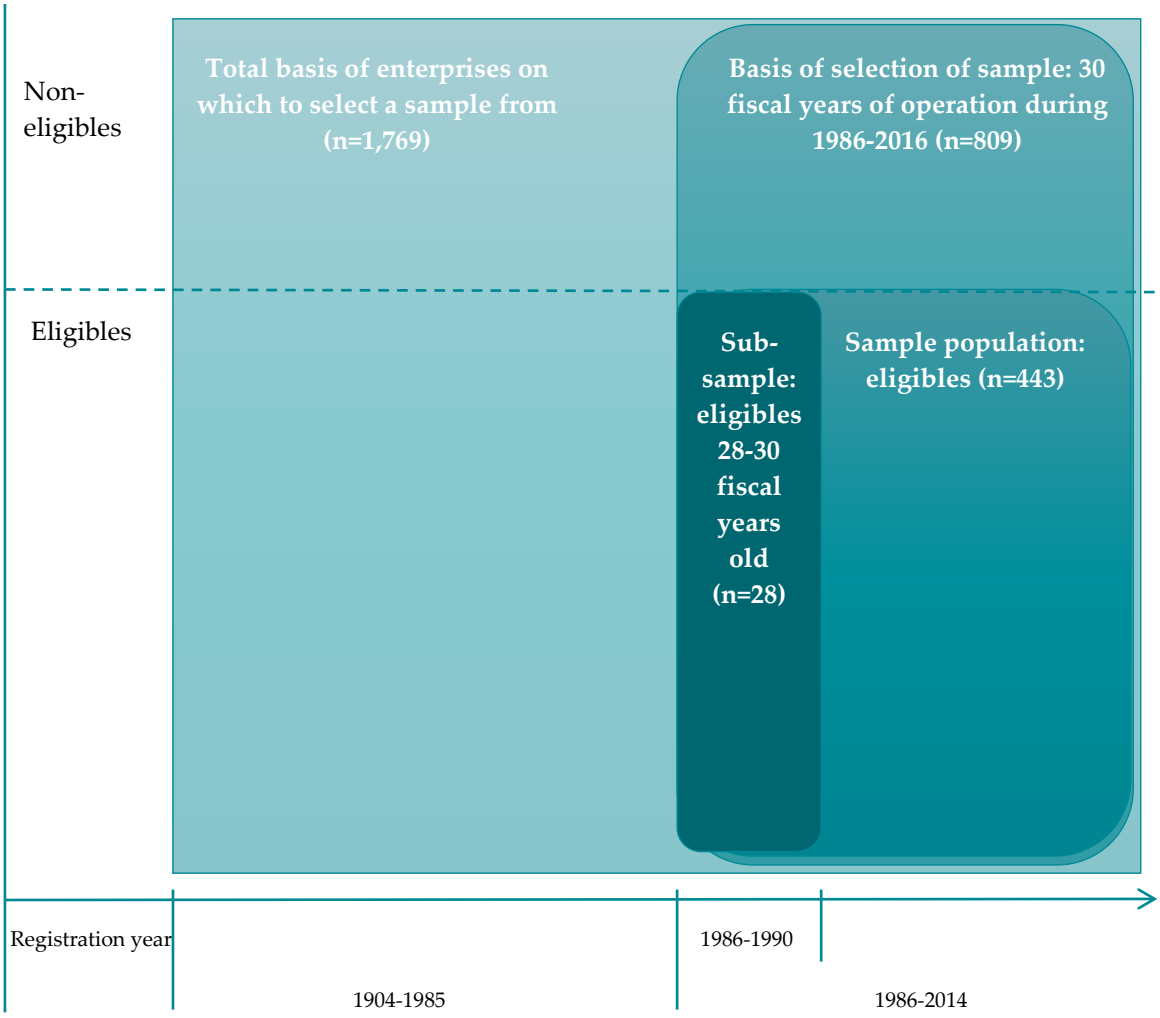

Figure 3.1: Selection of sample population and sub-sample for the test of the hypotheses, including sensitivity analysis of where the threshold is set when an enterprise moves from the start-up phase to the expansion phase.

3.3 Collection of data

Data for enterprises have been collected for the period 1986-2017 on the following parameters:

- active or non-active
- staff headcount
- turnover[12]
- distribution of profits
- balance sheet totals
- if the enterprise has been listed on an official list of a stock exchange.

[12] In Swedish annual reports there are two concepts related to turnover: "omsättning" and the more commonly used "nettoomsättning". The later has been chosen as definition of turnover in this report, since it corresponds to the Eurostat (2009) definition of turnover: "the totals invoiced by the observation unit during the reference period, and this corresponds to the market sales of goods or services supplied to third parties".

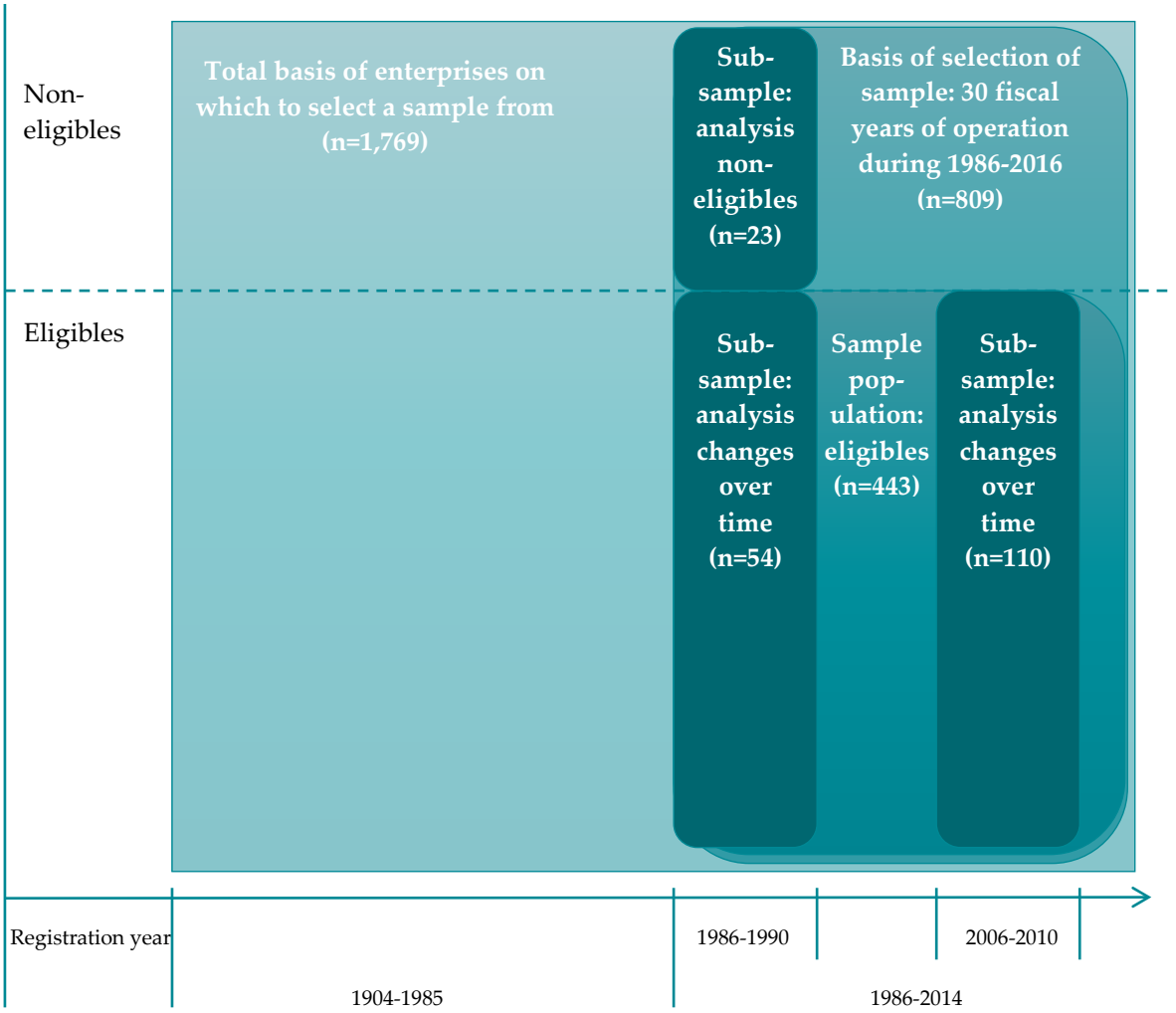

Figure 3.2: Selection of sample population and sub-samples for two of the sensitivity analyses: how the exclusion of non-eligible enterprises affects the result and whether the pattern of growth changes over the 30-year period.

The organisation numbers of the enterprises in the Environmental Innovation Contest, Cleantech Inn portfolio, Nordic Cleantech Open and from the WWF-Climate solver initiative have been identified manually, whereas organisation numbers of the enterprises from Strandberg et al. (2013) and the Swedish Energy Agency portfolio were already available. A compilation of a list of enterprises from all the above sources has been made. Several sources of data have been used. Data sets have been obtained from Upplysningscentralen for the period 1996-2015. For the period 1986-1995, relevant data have been collected manually directly from the annual reports of the enterprises, obtained from Bolagsverket (the authority in Sweden responsible for the registration of enterprises). Missing data in the data sets from Upplysningscentralen and data for the period 2016-2017 have been collected manually from the enterprise databases Retriever and Bisnode as well as

from annual reports obtained from Bolagsverket.[13] Data regarding if and when the enterprise was first listed on an official list of a stock exchange have been collected manually.[14]

3.4 Exclusion of non-eligible enterprises

New eligible environmental technology enterprises leaving the start-up phase are the focus of this study. The enterprises included in the sample population reflect, as far as the available statistics allow, the European Union´s definition of enterprises eligible for aid for start-ups. Enterprises that are not eligible even the first fiscal year ought, therefore, to be excluded from the sample population.[15] There are five criteria that determine if an enterprise is eligible:

- it is not older than five years;
- it has not been formed through a merger;
- it is unlisted;
- it has not yet distributed profit;
- it is a micro- or small enterprise.

The criterion, the enterprise should not be older than five years, is automatically fulfilled when an enterprise is assessed to be eligible the first fiscal year. Whether an enterprise has been formed through a merger can be determined from the annual reports. Since it has been possible to obtain data for the distribution of profits and if the enterprise was listed on an official list of a stock exchange, these criteria can be assessed from the data available for this study. Assessing whether an enterprise is a micro- or small enterprise, based on the data sets available for this study, is more of a challenge. According to annex I in the European Commission Regulation No. 651/2014 there are three types of enterprises (see the full legislative text in appendix 2):

- *linked enterprise:* a parent enterprise has a majority of the shares in the linked enterprise and/or the linked enterprise has a majority of the shares in one or more subsidiaries;
- *partner enterprise*: an enterprise that is not a linked enterprise, but where the parent enterprise or linked parent enterprises hold 25 percent or more of the capital or voting rights of the enterprise;
- *autonomous:* neither a linked or partner enterprise.

When the size of an assessed linked enterprise is calculated, the parent enterprise that holds the majority of the shares should also be included fully. Subsidiaries, where the assessed enterprise holds the majority of the shares, should likewise be fully included. This factor is considered in this study since linked enterprises have to be reported and the information is available in the annual reports and the databases Retriever and Bisnode. There are also a number of soft criteria regarding influence over an enterprise, even though there is no majority ownership, which should be considered when assessing whether an enterprise is linked or not. It has not been possible to consider any of these soft criteria in this study, since this would have required a deeper investigation of each enterprise over a period of 30 years.

[13] Data available in the enterprise databases Retriever and Bisnode as of 8 August 2017 have been included for 2016-2017.
[14] Data from the following official list of a stock exchange have been collected: Aktietorget, Nordic Growth Market (NGM Equity and Nordic MTF) and Nasdaq First North.
[15] For shelf corporations the first annual report that shows economic activity is used to assess if the enterprise should be excluded.

To calculate the size of an assessed partner enterprise one needs to know how many percent the parent enterprise holds, since the parent should be included in proportion to its holding. Based on the data sets available for this study, it has not been possible to identify and exclude partner enterprises from the sample population. There is no obligation to report partner enterprises to the Swedish authorities. Such an assessment would, therefore, be very time consuming, if at all possible, since each enterprise has to be contacted and documents have to be obtained up to 30 years previous to determine the ownership status the first fiscal year.

Regarding autonomous enterprises the data sets available for this study can be used since it is just the assessed enterprise that should be included.

Also, enterprises owned by more than 25 percent by one or more public bodies are not considered to be SMEs, with the exception of enterprises owned by universities or non-profit research centres, institutional investors (including regional development funds) and autonomous local authorities with an annual budget of less than EUR 10 million and fewer than 5,000 inhabitants. Since the 25 percent ownership and the exceptions have been impossible to verify within the data sets available for this study, all enterprises owned by public bodies have been excluded when identified, this is to avoid inclusion of "false eligibles".

To conclude, an enterprise has been excluded from the sample population when it is stated, in the first annual report or the web site of the enterprise that the enterprise is:

- formed through a merger, either through the take-over of activities in an existing enterprise or through a merger of two or more existing enterprises;
- listed on an official list of a stock exchange by the end of the first fiscal year;
- distributing profit by the end of the first fiscal year;
- founded by an enterprise that by itself or together with subsidiaries and/or a parent enterprise by the end of the first fiscal year is a medium or large-sized enterprise - all enterprises owned more than 50%, are counted as subsidiaries and/or parents, also called linked enterprise;
- owned by one or more public bodies by the end of the first fiscal year.

It has been important to, as far as possible, avoid including "false eligibles". Sometimes information in the first annual report or on the web page of the enterprise has been too thin to conclude whether the above criteria were valid the first fiscal year. Also, it has not been possible within the framework of this study to acquire data from other countries. Enterprises have, therefore, been excluded from the sample population when:

- it is stated, from the reporting of group affiliation in Bisnode in 2017, that the enterprise in the last annual report (2016 or 2017) together with linked enterprises is a medium or large sized enterprise;
- the enterprise is owned fully or partly by a foreign enterprise, even if this enterprise is situated within the European Union and could be an eligible parent.

3.5 Analysis

The hypotheses have been analysed using different statistical methods. To analyse whether the sub-sample population has a normal distribution the Kolmogorov-Smirnov test has been used. The hypothesis has then been tested with the parametric paired t-test and with the nonparametric

Wilcoxon signed rank test, if the sub-sample population did not have a normal distribution. The later test is not dependent on normal distribution and can be used on small samples. It should be noted that these statistical tests cannot verify that it takes longer than five years from registration to (i) go from the start-up phase to the expansion phase and to (ii) no longer fulfil the non-time related eligibility criteria of Article 22. They can only verify that it does not take a shorter time.

The mean and median have then been calculated for the number of fiscal years it takes for the average enterprise in the sub-sample to go from micro-enterprise to small enterprise and to non-eligibility. Five fiscal years has been set as a limit and it has been tested on a 95 percent confidence level to determine whether the mean and median values from the sub-sample population are representative of the general population.

The growth patterns of the three parameters – turnover, staff headcount and balance sheet total – that determine both the transfer from the start-up to expansion phase and the transfer from an eligible to a non-eligible enterprise have also been analysed. These parameters have been examined one by one looking at the development of the median over time as well as the development of the 90^{th} and 10^{th} percentile.

Three parameters have been identified to be major potential sources of error that could influence the result and the validity of the hypothesis:

- where the threshold is set when an enterprise moves from the start-up phase to the expansion phase;
- how the exclusion of non-eligible enterprises affects the result;
- whether the pattern of growth changes over the 30-year period.

A sensitivity analysis has been made of these parameters using the parametric paired t-test and the nonparametric Wilcoxon signed rank test.

4 Results

The purpose of this study is to provide new information that will help policymakers assess if the time restriction of five years for the eligibility of start-ups is relevant in the environmental technology market segment. Two hypotheses have been tested.

The statistical analysis validates the two hypotheses that it takes longer than five years from registration for the average new eligible environmental technology enterprise, which grows successfully, to (i) go from the start-up to the expansion phase (to go from micro-enterprise to small enterprise) and to (ii) no longer fulfil the non-time related eligibility criteria of Article 22 (see appendix 1 for detailed information about the statistical analysis).

It takes 13 fiscal years for the average enterprise (mean=13 years, median=13 years) to go from micro-enterprise to small enterprise. It is important to note that average refers to average among those enterprises that succeed in going from micro-enterprise to small enterprise. It is not the average enterprise in the sub-sample population. During the 30-year period studied, 32 percent of the enterprises from the sub-sample population never moved from being micro-enterprise to small enterprise These enterprises are not included when mean and median are calculated.

To go from an eligible to a non-eligible enterprise takes 13-15 fiscal years for the average enterprise (mean=15 years, median=13 years). As in the case above, average refers to average among those enterprises that succeed in transferring from an eligible to a non-eligible status. However, during the 30-year period studied only four percent of the enterprises from the sub-sample never transferred from an eligible to a non-eligible enterprise. This is virtually every enterprise. The reason for this is elaborated on in section 4.2. Another observation is that the mean is higher than the median. This suggests that there are outliers on the upper tail of the sub-sample population, i.e. that some enterprises are disproportionally successful.

In section 4.1 and 4.2 the different parameters that determine when an enterprise moves from micro-enterprise to small enterprise and from being an eligible to a non-eligible enterprise are examined. A sensitivity analysis is described in section 4.3 that is designed to investigate the robustness of the results.

4.1 To leave the start-up phase

The threshold between micro-enterprises and small enterprises is used to define when an enterprise moves from the start-up phase to the expansion phase in this study. This transfer, from a micro-enterprise to a small enterprise, is determined by three parameters exceeding a threshold: turnover (exceeds EUR 2 million), staff headcount (10 persons or more) and balance sheet total (exceeds EUR 2 million).[16] If any of these thresholds are exceeded the enterprise is no longer a micro-enterprise and thus no longer in the start-up phase. It should be noted that it is sufficient that the enterprise exceeds the threshold one year during the 30-year period studied. It is fully possible that an enterprise exceeds the threshold and falls back under the threshold again and is

[16] Exchange rate SEK/EUR=9,4704 is used based on Riksbanken average for 2016 (Jan-Dec).

still counted as an enterprise that has succeed in going from a micro-enterprise to small enterprise. In the sub-sample analysed only a few fell back permanently after having exceeded the threshold in their early years, but there are a number of enterprises that repeatedly reached the threshold only to fall back slightly.

When examining the parameters one by one over time, it turns out that the growth of the median for turnover is more or less linear over time (see figure 4.1). The balance sheet total shows a similar pattern, although a slight growth tendency starts the 7th fiscal year (see figure 4.3). The staff-head count shows a linear growth with variations between the years (see figure 4.2). The spread of the population increases over time for all parameters even though it is more pronounced for the turnover and balance sheet total.

The 90th percentile, reflecting the development of the most successful enterprises shows an interesting pattern. For turnover and balance sheet total, a distinct growth phase starts around the 9th and 12th fiscal year respectively. This growth phase is accelerated around the 16th fiscal year. Later on, growth seems to level out for turnover but continues for the balance sheet total a few more years. These results are in line with Krakowski and Bager-Sjögren (2016) that shows that a growth phase, after the initial growth phase the first few years, among Swedish enterprises seems to start around the 8th year and the spread between the mean and most successful increases. Rannikko et al. (2015) shows that only very few enterprises experience high-growth during their first seven years. Gabrielsson et al. (2014) show that high-growth enterprises in Sweden have a mean of 19.8 years when they start to have high-growth.

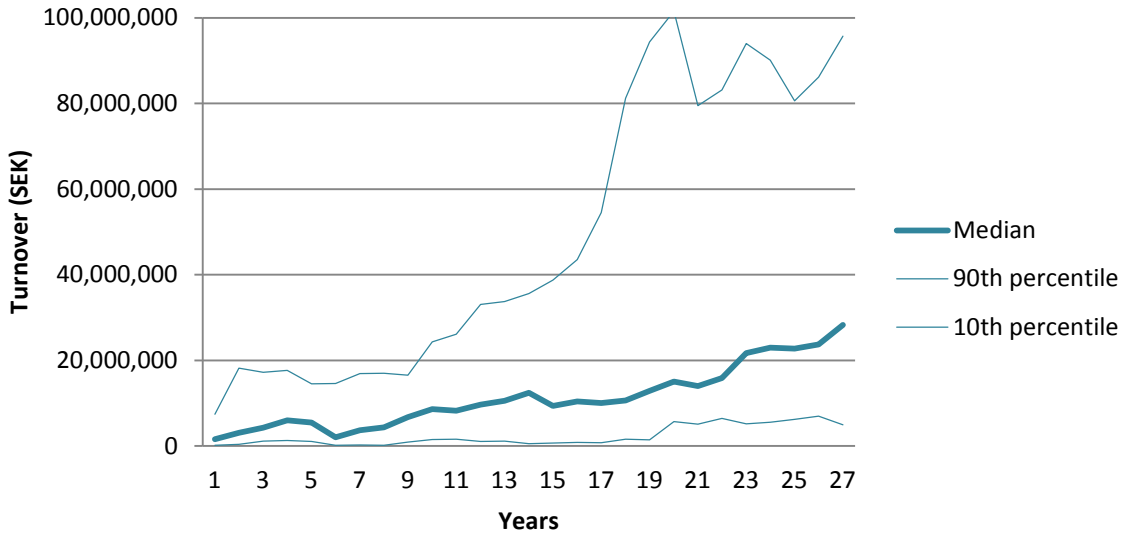

Figure 4.1: Development of turnover for the enterprises that succeed in going from micro-enterprise to small enterprise during the studied 30-year period (based on a sub-sample where all enterprises have been operational for at least 27 fiscal years). The amounts are given in 2016 prices.

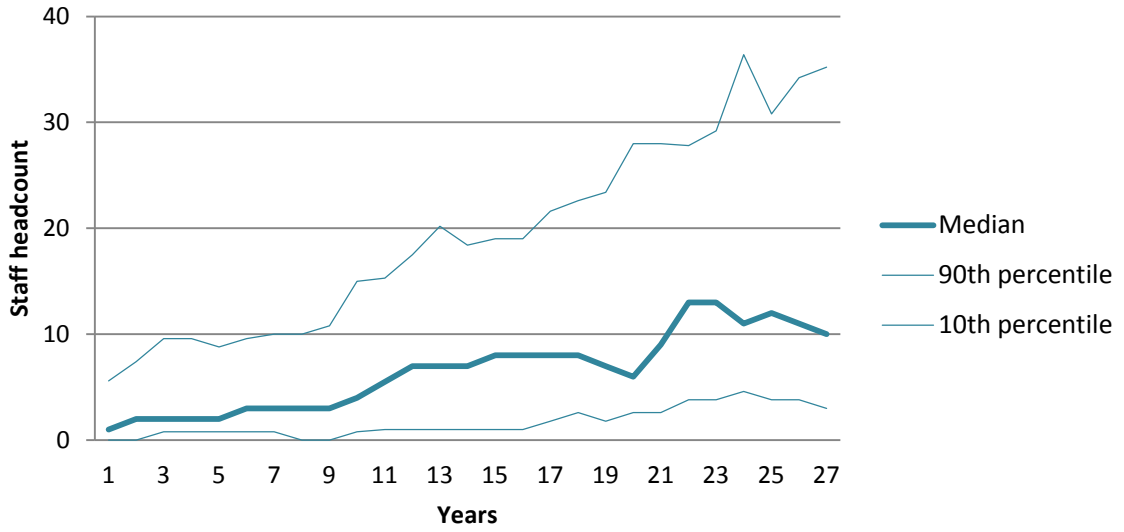

Figure 4.2: Development of staff headcount for the enterprises that succeed in going from micro-enterprise to small enterprise during the studied 30-year period (based on a sub-sample where all enterprises have been operational for at least 27 fiscal years).

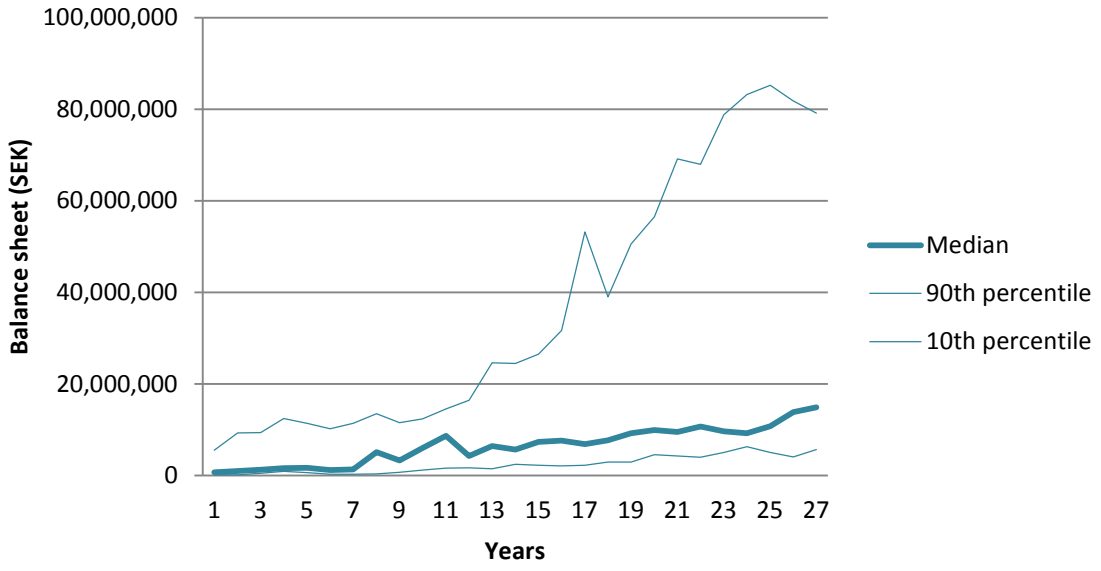

Figure 4.3: Development of balance sheet total for the enterprises that succeed in going from micro-enterprise to small enterprise during the studied 30-year period (based on a sub-sample where all enterprises have been operational for at least 27 fiscal years). The amounts are given in 2016 prices.

4.2 To no longer be eligible

An enterprise is no longer eligible when it has turned into a medium-sized enterprise, distributed profit or is listed on a stock market. According to the assumptions in this study this is an indication that the enterprise is large enough and/or commercially strong enough to no longer need aid for start-ups. This transfer from eligible to non-eligible is determined by five parameters exceeding a threshold: (i) distributed profit (exceeds EUR 0), (ii) is listed on a stock market, (iii) turnover (exceeds EUR 10 million), (iv) staff headcount (50 persons or more) and (v) balance sheet total (exceeds EUR 10 million).[17] If any one of these thresholds is exceeded, the enterprise is no longer eligible. As described in section 4.1 it is sufficient that the enterprise exceeds the threshold for one year during the 30-year period studied. Only two enterprises in the sub-sample became medium-sized enterprises and none was listed on the stock market during the period studied. The most common reason that an enterprise exceeds the threshold and becomes non-eligible is that it distributes profit. The distribution of profit often fluctuates for a single enterprise, some years a profit is distributed other years not. There are a large number of enterprises that repeatedly distribute profit and then fall back to zero again.

When examining the parameters one by one, the group of enterprises that transfers from eligible to non-eligible has a very similar growth pattern – but on a lower level – for turnover, staff headcount, and balance sheet total as the group of enterprises that transfer from a micro-enterprise to a small enterprise, see figure 4.4-4.6. Therefore the conclusions presented in section 4.1 are also valid for the enterprises that transfer from eligible to non-eligible.

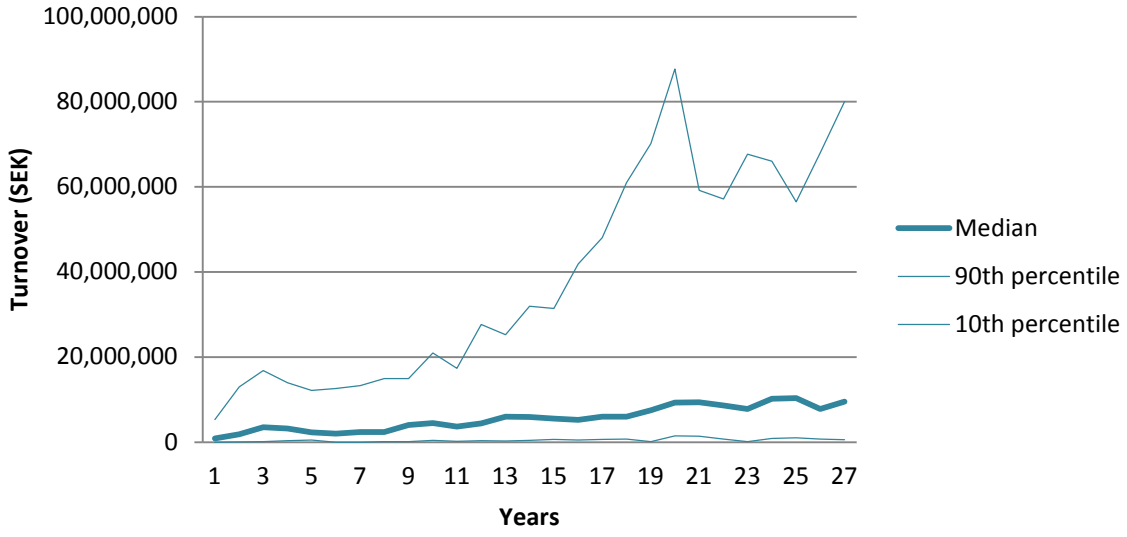

Figure 4.4: Development of turnover for the enterprises that succeed in going from an eligible to a non-eligible enterprise during the studied 30-year period (based on a sub-sample where all enterprises have been operational for at least 27 fiscal years). The amounts are given in 2016 prices.

[17] Exchange rate SEK/EUR=9,4704 is used based on Riksbanken average for 2016 (Jan-Dec).

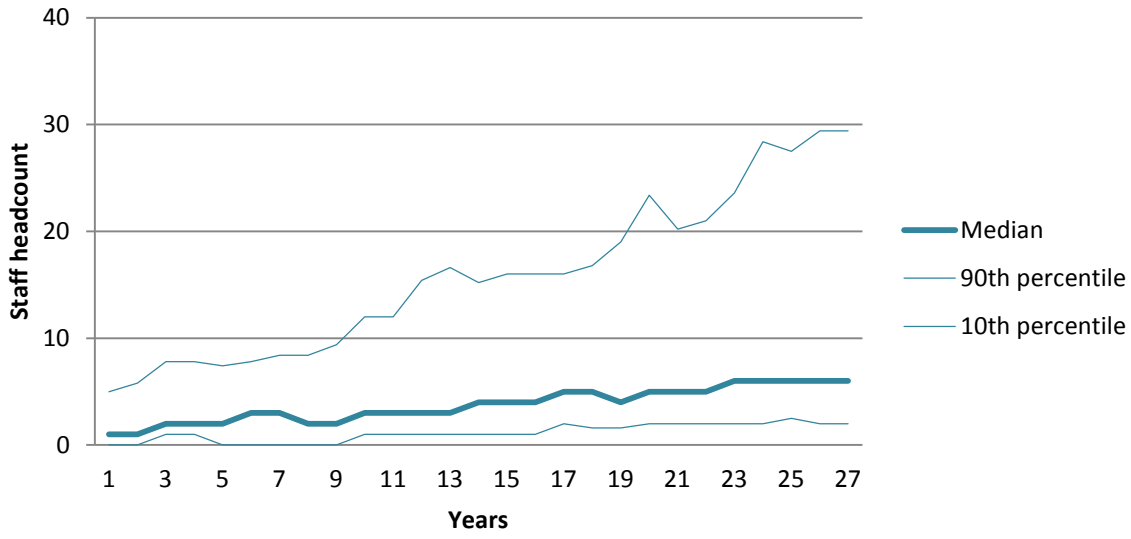

Figure 4.5: Development of staff headcount for the enterprises that succeed in going from an eligible to a non-eligible enterprise during the studied 30-year period (based on a sub-sample where all enterprises have been operational for at least 27 fiscal years).

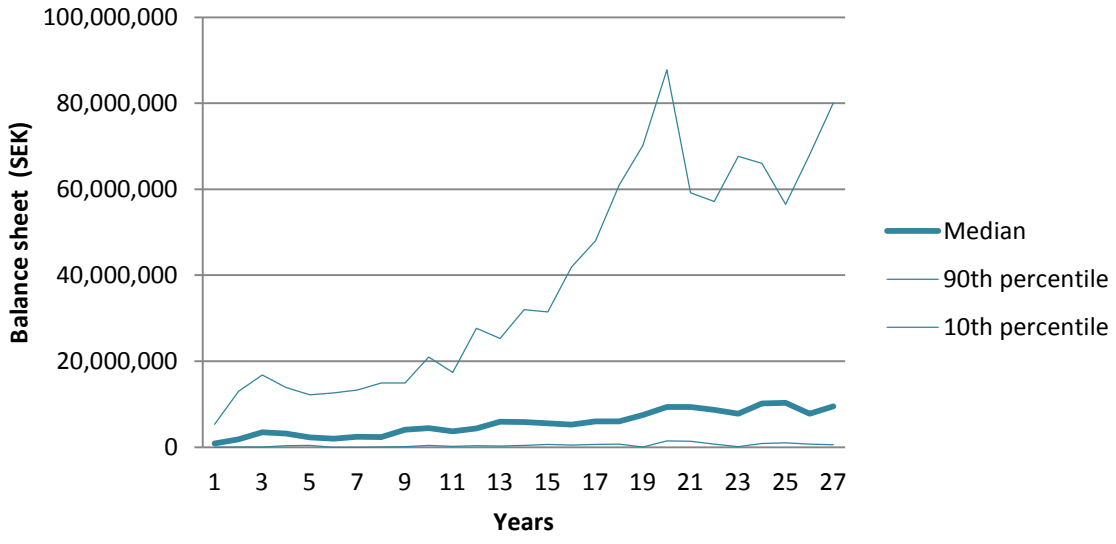

Figure 4.6: Development of balance sheet total for the enterprises that succeed in going from an eligible to a non-eligible enterprise during the studied 30-year period (based on a sub-sample where all enterprises have been operational for at least 27 fiscal years). The amounts are given in 2016 prices.

4.3 Sensitivity analysis

Three parameters have been identified to be major potential sources of error that could influence the result and the validity of the hypotheses:

- where the threshold is set when an enterprise moves from the start-up phase to the expansion phase;
- how the exclusion of non-eligible enterprises affects the result;
- if the patterns of growth change over the 30-year period.

The transfer from the start-up phase to the expansion phase is, in this study, determined by three parameters crossing a threshold: turnover, staff headcount and balance sheet total. The literature shows that a staff headcount of 10 persons seems to be a reasonable threshold. For this parameter there is no need to test a lower threshold. When it comes to turnover there are sources in the literature that suggests a threshold of SEK 10 million (Gabrielsson et al., 2014; Englund, 2008; Englund, 2010). Regarding the balance sheet total the levels on loans and grants from European Union suggest a lower threshold at EUR 0.4 million.[18] A statistical test made on these levels shows that the mean fiscal year when an enterprise that succeeds in its growth moves from the start-up phase to the expansion phase falls to 10 years from 13 years. The median year falls to 7 years from 13 years. The main cause for the fall in in the mean an median year is the lower threshold of the balance sheet total. The shift in turnover has a more limited effect on the mean and the median. A test on a 95 percent confidence level shows that it can be validated that the mean year exceeds the five-year time limit while the dividing line for 95 percent confidence level for the median year touches the five-year time limit. It could therefore, according to this sensitivity test, not be fully established that new environmental technology enterprises move from the start-up phase to the expansion phase after the five-year time limit set by the EU, even though it is very likely (see appendix 1 for detailed information about the statistical analysis).

Non-eligible enterprises have been excluded from the sample population manually. In this process mistakes can have been made. Also it has not been possible to exclude partner enterprises that are non-eligible. It could be assumed, based on results from Daunfeldt and Halvarsson (2011) that linked enterprises, partner enterprises and enterprises formed through a merger of existing enterprises grow faster than other enterprises. This assumption has been tested by analysing the mean and median year when enterprises that succeed in their growth, which are not eligible even the first fiscal year, go from a micro-enterprise to a small enterprise status. The test shows that the assumption is valid. The mean year falls from 13 fiscal years to 5 fiscal years and the median year falls from 13 years to 2.5 years (see appendix 1 for detailed information about the statistical analysis). This result points to the importance of excluding non-eligibles when analysing statistics on new enterprises and their growth. It also implies that the mean and median year when a new eligible environmental technology enterprise moves from the start-up phase to the expansion phase might be even later than 13 fiscal years, since it has not been possible to exclude partner enterprises in this study. It could be assumed that among the partner enterprises that are not excluded non-eligible enterprises that should have been excluded can be found.

[18] Exchange rate SEK/EUR=9,4704 is used based on Riksbanken average for 2016 (Jan-Dec).

To test the hypotheses a sub-sample population has been selected from enterprises registered between 1986-1990. The patterns of growth may have changed over the 30-year period and the results may not be valid if extrapolated to modern growth patterns. The literature indicates that the growth patterns of new enterprises have changed little over the last 30-years (Lindholm Dahlstrand, 2004; Wallmark and McQueen, 1986). To test whether the growth patterns have changed or not, a sub-sample has also been selected from the period 2006-2010 to investigate if there are any difference in their growth. This period has been chosen since it is the latest five-year period in the sample population where it is possible to acquire a sub-sample where all limited companies are guaranteed to include five fiscal years. The average turnover, staff headcount and balance sheet total for the first five fiscal years have been compared between the sub-samples from the period 1986-1990 and 2006-2010 (see appendix 1 for detailed information about the statistical analysis). The results from this sensitivity test are inconclusive. The average turnover is substantially lower in the period 2006-2010 compared to the period 1986-1990, while staff headcount is somewhat higher and balance sheet total is substantially higher. The result has only been possible to establish on a 95 percent confidence level for the balance sheet total. One should be careful in drawing a conclusion on these results. The test results are probably due to the fact that there are more innovative enterprises in the sub-sample from the period 2006-2010. There are indications in the material that innovative enterprises have substantially lower growth when it comes to turnover. This also is supported by the literature (Englund and Carlman, 2015; Hyytinen, 2015; Löfsten, 2015; Löfsten, 2016). In the period 1986-1990 the share of innovative enterprises is 15 percent while in the period 2006-2010 the share is 55 percent. A test that excluded the innovative enterprises shows a good fit when it comes to turnover between the period 1986-1990 and 2006-2010, while staff headcount is still somewhat higher and balance sheet total is still substantially higher in the period 2006-2010, but not as much as before innovative enterprises were excluded. The results have been possible to establish on a 95 percent confidence level for turnover and the balance sheet total. According to Krakowski and Bager-Sjögren (2016) the general performance of the economy in Sweden affects the development of new enterprises. The general economic activity of the different periods may affect the results. It is, however, outside of the scope of this study to analyse this further. It has to be investigated further if the sub-sample of enterprises registered 1986-1990 is representative of enterprises of today.

Regarding the validity of the two hypotheses the sensitivity tests point in different directions. It could not be fully established that new environmental technology enterprises move from the start-up phase to the expansion phase after the five-year time limit set by the EU if a lower threshold is assumed, even though it is very likely. On the other hand, the sensitivity test on how the exclusion of non-eligible enterprises affects the result clearly indicates that the mean and median year when enterprises move from the start-up phase to the expansion phase may be underestimated. This may well also indicate that the mean and median year when enterprises no longer fulfil the non-time related eligibility criteria of Article 22 is also underestimated. If this is the case, the two hypotheses are strengthened. Finally it is inconclusive if the sub-sample of enterprises registered 1986-1990 is representative of enterprises of today, even though the comparison of the turnover and the literature suggest it is.

5 Conclusion

This report shows that an average new eligible environmental technology enterprise, which succeeds in its growth, needs more than five years after registration to (i) go from the start-up phase to the expansion phase and to (ii) no longer fulfil the non-time related eligibility criteria of Article 22. A balanced assessment of the different sensitivity analyses shows that the results are likely to be valid. However, further studies are needed to fully confirm that the sub-sample studied is representative of enterprises of today. Also, the first hypothesis described above is sensitive to an assumed lower threshold.

For the most successful enterprises turnover and balance sheet total indicate that a distinct growth phase starts around the 9th and 12th fiscal year respectively. This growth phase accelerates around the 16th fiscal year. Later on, growth seems to level out for turnover but continues for the balance sheet total. These results are in line with other studies, which show that a growth phase among Swedish enterprises seems to start around the 8th year and that high-growth enterprises have a mean of 19.8 years when they start the high-growth phase. If the ambition of public funding is to bridge the investment gap to the expansion phase for the majority of the enterprises, this study indicates that for environmental technology enterprises the five-year time limit may not be adequate for this purpose.

Further studies are needed to determine if there is a more appropriate time limit that would bridge the investment gap. The growth patterns also need to be analysed in greater depth. It would be of special interest to analyse further the innovative enterprises, since there are indications in the data used in this study that they have lower growth. Also, it would be of interest to compare the growth of new environmental technology enterprises with other new enterprises. It is essential to investigate if more enterprises could be expected to reach the expansion phase, if state aid is given to enterprises older than five years. Such a study is not easy to carry out, but nevertheless of great importance. Such further analysis would give valuable information to policymakers. It would be instrumental in designing the state aid system so as to better promote the growth of start-up enterprises and the diffusion of environmental technology. This would better achieve the twin aim of aiding environmental technology enterprises in the early phases; to bridge the investment gap for start-ups, and to protect and improve the quality of the environment.

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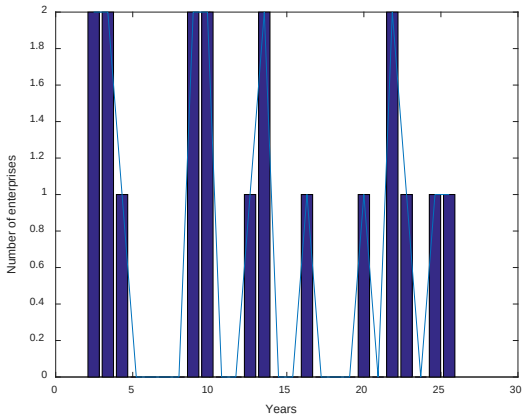
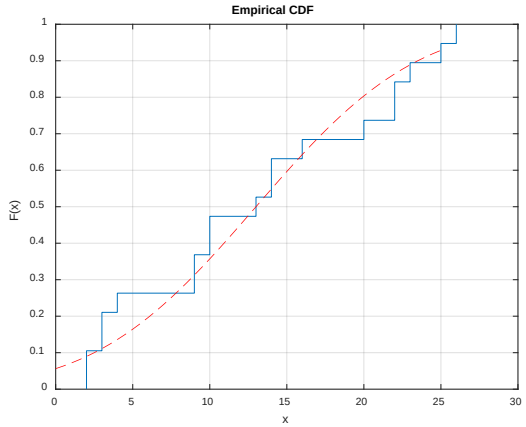
Appendix 1: Statistical analysis

Sub-sample (n=28), hypothesis testing, enterprises that succeed in going from micro-enterprise to small enterprise during the studied 30-year period:

meanYear = 13
stdYear = 8.1921
medianYear = 13





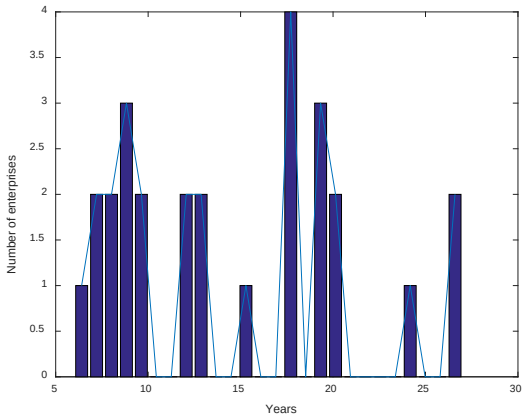
Kolmogorov-Smirnov test: H (null hypothesis, is normal, rejected) = 0 i.e. not rejected, max dev. = 0.12719, prob. (normal) = 0.89803

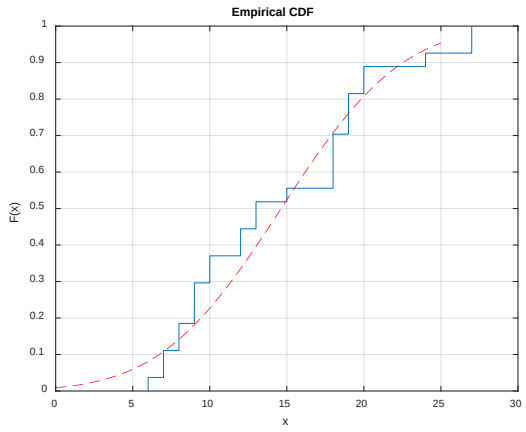
Parametric paired t-test: H (null hypothesis, mean == 5, rejected) = 1 i.e. rejected, prob. (mean == testValue) = 0.00047459
conf.int.: 9.0515 - 16.9485
Parametric paired t-test: H (null hypothesis, mean < 5, rejected) = 1 i.e. rejected, prob. (mean < testValue) = 0.00023729
conf.int.: 9.741 – Inf.

Wilcoxon signed rank test: p (median == 5) = 0.001276
Wilcoxon signed rank test: p (median < 5) = 0.00068429

Sub-sample (n=28), hypothesis testing, enterprises that succeed in going from an eligible to a non-eligible enterprise during the studied 30-year period:

meanYear = 14.6296
stdYear = 6.1716
medianYear = 13





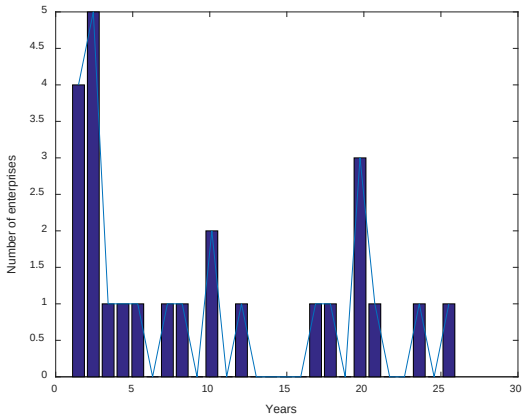
Kolmogorov-Smirnov test: H (null hypothesis, is normal, rejected) = 0 i.e. not rejected, max dev. = 0.15195, prob. (normal) = 0.52634

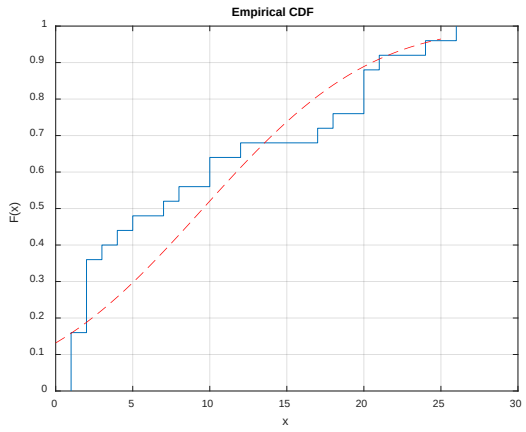
Parametric paired t-test: H (null hypothesis, mean == 5, rejected) = 1 i.e. rejected, prob. (mean == testValue) = 1.3755e-08
conf.int.: 12.1882 - 17.071
Parametric paired t-test: H (null hypothesis, mean < 5, rejected) = 1 i.e. rejected, prob. (mean < testValue) = 6.8774e-09
conf.int.: 12.6038 – Inf.

Wilcoxon signed rank test: p (median == 5) = 5.4981e-06
Wilcoxon signed rank test: p (median < 5) = 2.9103e-06

Sub-sample (n=28), sensitivity test, lower threshold, enterprises that succeed in going from start-up to expansion phase during the studied 30-year period:

meanYear = 9.56
stdYear = 8.5444
medianYear = 7





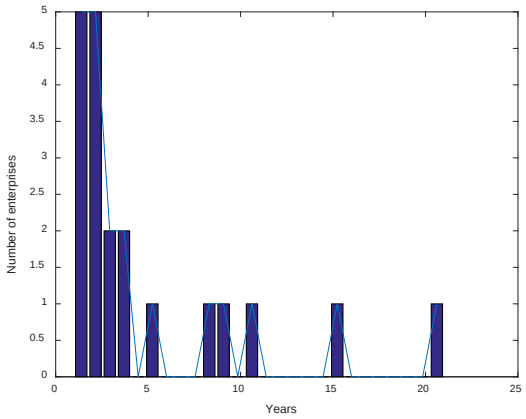
Kolmogorov-Smirnov test: H (null hypothesis, is normal, rejected) = 0 i.e. not rejected, max dev. = 0.18322, prob. (normal) = 0.33726

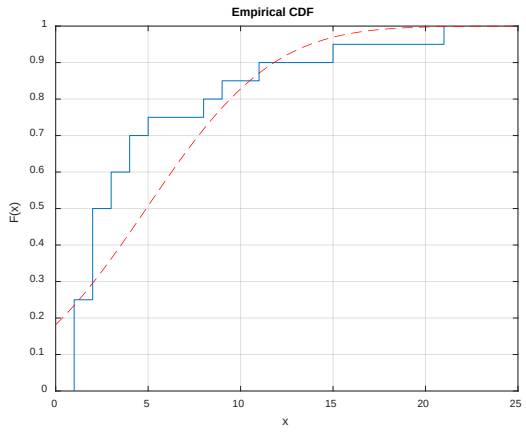
Parametric paired t-test: H (null hypothesis, mean == 5, rejected) = 1 i.e. rejected, prob. (mean == testValue) = 0.013444
conf.int.: 6.033 - 13.087
Parametric paired t-test: H (null hypothesis, mean < 5, rejected) = 1 i.e. rejected, prob. (mean < testValue) = 0.0067219
conf.int.: 6.6363 – Inf.

Wilcoxon signed rank test: p (median == 5) = 0.051423
Wilcoxon signed rank test: p (median < 5) = 0.026581

Sub-sample (n=23), sensitivity test, non-eligible enterprises that succeed in going from micro-enterprise to small enterprise during the studied 30-year period:

meanYear = 4.9
stdYear = 5.3891
medianYear = 2.5





Kolmogorov-Smirnov test: H (null hypothesis, is normal, rejected) = 0 i.e. not rejected, max dev. = 0.26632, prob. (normal) = 0.097259

Parametric paired t-test: H (null hypothesis, mean == 5, rejected) = 0 i.e. not rejected, prob. (mean == testValue) = 0.93473
conf.int.: 2.3778 - 7.4222
Parametric paired t-test: H (null hypothesis, mean < 5, rejected) = 0 i.e. not rejected, prob. (mean < testValue) = 0.53263
conf.int.: 2.8163 – Inf.

Wilcoxon signed rank test: p (median == 5) = 0.4175
Wilcoxon signed rank test: p (median < 5) = 0.79703

Sub-samples, sensitivity test, if the patterns of growth change over the 30-year period, the amounts are given in 2016 prices:

Eligibles, all enterprises:

	Turnover (SEK)		Staff headcount		Balance sheet total (SEK)	
	86-90 (n=54)	06-10 (n=110)	86-90 (n=54)	06-10 (n=110)	86-90 (n=54)	06-10 (n=110)
Year 1: mean	3,259,216	1,669,078	1.8	1.5	1,994,603	3,227,304
Year 2: mean	10,597,723	3,593,477	2.6	2.4	3,987,489	6,277,633
Year 3: mean	9,757,990	5,044,687	3.2	3.6	3,162,368	8,415,206
Year 4: mean	6,802,958	5,613,022	3.4	4.6	3,342,994	11,730,973
Year 5: mean	7,037,949	5,898,119	3.7	5.7	3,550,683	13,502,747
Year 1-5: mean	7,491,167	4,363,677	2.9	3.6	3,207,627	8,630,773
Year 1-5: 95% confidence level + -	2,532,030	1,532,892	0.7	1.5	652,664	3,617,477
Year 1-5: parametric paired t-test	0.0563		0.2284		0.0323	

Eligibles, innovative enterprises excluded:

	Turnover (SEK)		Staff headcount		Balance sheet total (SEK)	
	86-90 (n=46)	06-10 (n=49)	86-90 (n=46)	06-10 (n=49)	86-90 (n=46)	06-10 (n=49)
Year 1: mean	3,344,999	3,220,615	1.7	2.0	2,124,072	4,146,636
Year 2: mean	11,552,760	6,836,003	2.6	3.0	4,247,507	6,271,310
Year 3: mean	10,106,240	9,098,373	3.4	4,0	3,074,733	8,012,170
Year 4: mean	6,806,917	10,226,158	3.5	5.1	3,352,067	10,309,805
Year 5: mean	7,115,351	9,503,422	3.9	6.1	3,672,278	10,232,597
Year 1-5: mean	7,785,254	7,776,915	3.0	4.0	3,294,131	7,794,503
Year 1-5: 95% confidence level + -	2,796,105	2,493,558	0.8	1.4	689,136	2,316,844
Year 1-5: parametric paired t-test	0.9956		0.0529		0.0135	

Appendix 2: Selected parts of European Commission Regulation No. 651/2014

Article 22

Aid for start-ups

1. Start-up aid schemes shall be compatible with the internal market within the meaning of Article 107(3) of the Treaty and shall be exempted from the notification requirement of Article 108(3) of the Treaty, provided the conditions laid down in this Article and in Chapter I are fulfilled.

2. Eligible undertakings shall be unlisted small enterprises up to five years following their registration, which have not yet distributed profits and have not been formed through a merger. For eligible undertakings that are not subject to registration the five years eligibility period may be considered to start from the moment when the enterprise either starts its economic activity or is liable to tax for its economic activity.

3. Start-up aid shall take the form of:

a) loans with interest rates which are not conform with market conditions, with a duration of 10 years and up to a maximum nominal amount of EUR 1 million, or EUR 1,5 million for undertakings established in assisted areas fulfilling the conditions of Article 107(3)(c) of the Treaty, or EUR 2 million for undertakings established in assisted areas fulfilling the conditions of Article 107(3)(a) of the Treaty. For loans with a duration comprised between 5 and 10 years the maximum amounts may be adjusted by multiplying the amounts above by the ratio between 10 years and the actual duration of the loan. For loans with a duration of less than 5 years, the maximum amount shall be the same as for loans with a duration of 5 years;

b) guarantees with premiums which are not conform with market conditions, with a duration of 10 years and up to maximum EUR 1,5 million of amount guaranteed, or EUR 2,25 million for undertakings established in assisted areas fulfilling the conditions of Article 107(3)(c) of the Treaty, or EUR 3 million for undertakings established in assisted areas fulfilling the conditions of Article 107(3)(a) of the Treaty. For guarantees with a duration comprised between 5 and 10 years the maximum amount guaranteed amounts may be adjusted by multiplying the amounts above by the ratio between 10 years and the actual duration of the guarantee. For guarantees with a duration of less than 5 years, the maximum amount guaranteed shall be the same as for guarantees with a duration of 5 years. The guarantee shall not exceed 80 % of the underlying loan.

c) grants, including equity or quasi equity investment, interests rate and guarantee premium reductions up to EUR 0,4 million gross grant equivalent or EUR 0,6 million for undertakings established in assisted areas fulfilling the conditions of Article 107(3)(c) of the

Treaty, or EUR 0,8 million for undertakings established in assisted areas fulfilling the conditions of Article 107(3)(a) of the Treaty.

4. A beneficiary can receive support through a mix of the aid instruments referred to in paragraph 3 of this Article, provided that the proportion of the amount granted through one aid instrument, calculated on the basis of the maximum aid amount allowed for that instrument, is taken into account in order to determine the residual proportion of the maximum aid amount allowed for the other instruments forming part of such a mixed instrument.

5. For small and innovative enterprises, the maximum amounts set out in paragraph 3 may be doubled.

ANNEX I

SME DEFINITION

Article 1

Enterprise

An enterprise is considered to be any entity engaged in an economic activity, irrespective of its legal form. This includes, in particular, self-employed persons and family businesses engaged in craft or other activities, and partnerships or associations regularly engaged in an economic activity.

Article 2

Staff headcount and financial thresholds determining enterprise categories

1. The category of micro, small and medium-sized enterprises ('SMEs') is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million.

2. Within the SME category, a small enterprise is defined as an enterprise which employs fewer than 50 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 10 million.

3. Within the SME category, a micro-enterprise is defined as an enterprise which employs fewer than 10 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 2 million.

Article 3

Types of enterprise taken into consideration in calculating staff numbers and financial amounts

1. An 'autonomous enterprise' is any enterprise which is not classified as a partner enterprise within the meaning of paragraph 2 or as a linked enterprise within the meaning of paragraph 3.

2. 'Partner enterprises' are all enterprises which are not classified as linked enterprises within the meaning of paragraph 3 and between which there is the following relationship: an enterprise (upstream enterprise) holds, either solely or jointly with one or more linked enterprises within the meaning of paragraph 3, 25 % or more of the capital or voting rights of another enterprise (downstream enterprise).

However, an enterprise may be ranked as autonomous, and thus as not having any partner enterprises, even if this 25 % threshold is reached or exceeded by the following investors, provided that those investors are not linked, within the meaning of paragraph 3, either individually or jointly to the enterprise in question:

(a) public investment corporations, venture capital companies, individuals or groups of individuals with a regular venture capital investment activity who invest equity capital in unquoted businesses (business angels), provided the total investment of those business angels in the same enterprise is less than EUR 1 250 000;

(b) universities or non-profit research centres;

(c) institutional investors, including regional development funds;

(d) autonomous local authorities with an annual budget of less than EUR 10 million and less than 5 000 inhabitants.

3. 'Linked enterprises' are enterprises which have any of the following relationships with each other:

(a) an enterprise has a majority of the shareholders' or members' voting rights in another enterprise;

(b) an enterprise has the right to appoint or remove a majority of the members of the administrative, management or supervisory body of another enterprise;

(c) an enterprise has the right to exercise a dominant influence over another enterprise pursuant to a contract entered into with that enterprise or to a provision in its memorandum or articles of association;

(d) an enterprise, which is a shareholder in or member of another enterprise, controls alone, pursuant to an agreement with other shareholders in or members of that enterprise, a majority of shareholders' or members' voting rights in that enterprise.

There is a presumption that no dominant influence exists if the investors listed in the second subparagraph of paragraph 2 are not involving themselves directly or indirectly in the management of the enterprise in question, without prejudice to their rights as shareholders.

Enterprises having any of the relationships described in the first subparagraph through one or more other enterprises, or any one of the investors mentioned in paragraph 2, are also considered to be linked.

Enterprises which have one or other of such relationships through a natural person or group of natural persons acting jointly are also considered linked enterprises if they engage in their activity or in part of their activity in the same relevant market or in adjacent markets.

An 'adjacent market' is considered to be the market for a product or service situated directly upstream or downstream of the relevant market.

4. Except in the cases set out in paragraph 2, second subparagraph, an enterprise cannot be considered an SME if 25 % or more of the capital or voting rights are directly or indirectly controlled, jointly or individually, by one or more public bodies.

5. Enterprises may make a declaration of status as an autonomous enterprise, partner enterprise or linked enterprise, including the data regarding the thresholds set out in Article 2. The declaration may be made even if the capital is spread in such a way that it is not possible to determine exactly by whom it is held, in which case the enterprise may declare in good faith that it can legitimately presume that it is not owned as to 25 % or more by one enterprise or jointly by enterprises linked to one another. Such declarations are made without prejudice to the checks and investigations provided for by national or Union rules.

Article 4

Data used for the staff headcount and the financial amounts and reference period

1. The data to apply to the headcount of staff and the financial amounts are those relating to the latest approved accounting period and calculated on an annual basis. They are taken into account from the date of closure of the accounts. The amount selected for the turnover is calculated excluding value added tax (VAT) and other indirect taxes.

2. Where, at the date of closure of the accounts, an enterprise finds that, on an annual basis, it has exceeded or fallen below the headcount or financial thresholds stated in Article 2, this will not result in the loss or acquisition of the status of medium-sized, small or micro-enterprise unless those thresholds are exceeded over two consecutive accounting periods.

3. In the case of newly-established enterprises whose accounts have not yet been approved, the data to apply is to be derived from a bona fide estimate made in the course of the financial year.

Article 5

Staff headcount

The headcount corresponds to the number of annual work units (AWU), i.e. the number of persons who worked full- time within the enterprise in question or on its behalf during the entire reference year under consideration. The work of persons who have not worked the full year, the work of those who have worked part-time, regardless of duration, and the work of seasonal workers are counted as fractions of AWU. The staff consists of:

(a) employees;
(b) persons working for the enterprise being subordinated to it and deemed to be employees under national law;

(c) owner-managers;
(d) partners engaging in a regular activity in the enterprise and benefiting from financial advantages from the enterprise.

Apprentices or students engaged in vocational training with an apprenticeship or vocational training contract are not included as staff. The duration of maternity or parental leaves is not counted.

Article 6

Establishing the data of an enterprise

1. In the case of an autonomous enterprise, the data, including the number of staff, are determined exclusively on the basis of the accounts of that enterprise.

2. The data, including the headcount, of an enterprise having partner enterprises or linked enterprises are determined on the basis of the accounts and other data of the enterprise or, where they exist, the consolidated accounts of the enter prise, or the consolidated accounts in which the enterprise is included through consolidation.

To the data referred to in the first subparagraph are added the data of any partner enterprise of the enterprise in question situated immediately upstream or downstream from it. Aggregation is proportional to the percentage interest in the capital or voting rights (whichever is greater). In the case of cross-holdings, the greater percentage applies.

To the data referred to in the first and second subparagraph are added 100 % of the data of any enterprise, which is linked directly or indirectly to the enterprise in question, where the data were not already included through consolidation in the accounts.

3. For the application of paragraph 2, the data of the partner enterprises of the enterprise in question are derived from their accounts and their other data, consolidated if they exist. To these are added 100 % of the data of enterprises which are linked to these partner enterprises, unless their accounts data are already included through consolidation.

For the application of the same paragraph 2, the data of the enterprises which are linked to the enterprise in question are to be derived from their accounts and their other data, consolidated if they exist. To these are added, pro rata, the data of any possible partner enterprise of that linked enterprise, situated immediately upstream or downstream from it, unless it has already been included in the consolidated accounts with a percentage at least proportional to the percentage identified under the second subparagraph of paragraph 2.

4. Where in the consolidated accounts no staff data appear for a given enterprise, staff figures are calculated by aggregating proportionally the data from its partner enterprises and by adding the data from the enterprises to which the enterprise in question is linked.

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