

IMPACT STUDY OF ECONOMIC GROWTH

Startups, Scaleups and Funding for
Internationalization Planning

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TABLE OF CONTENTS

Foreword	4		
Tiivistelmä	5		
Executive Summary	7		
2 Introduction	9		
2.1 Objectives of the assignment	9		
2.2 Overview of the impact analysis, data and methods	9		
3 The context of the impact assessment	15		
3.1 Business Finland’s impact model and instruments analyzed	15		
3.2 Finnish startup and scaleup landscape since 2010	22		
3.3 Critical obstacles and bottlenecks identified	33		
3.3.1 Political and cultural challenges	33		
3.3.2 Financial and economical challenges.....	34		
3.3.3 Challenges specific to public services.....	36		
3.4 International case examples.....	38		
3.4.1 Denmark	40		
3.4.2 Germany (Berlin Focus)	41		
3.4.3 Sweden (Vinnova Focus)	42		
3.4.4 United States (SBIR Focus)	43		
3.4.5 United Kingdom (London Focus).....	45		
3.4.6 Singapore (Instrumentation Focus).....	47		
4 Business Finland-funded startups	49		
4.1 Success in startups in the literature	49		
4.2 Business Finland-funded startups.....	51		
4.2.1 Number and share of funded startups.....	51		
4.2.2 Funded startups vs. other startups.....	54		
5 Business Finland-funded scaleups	58		
5.1 Previous literature on high-growth firms	58		
5.1.1 Defining high-growth firms	59		
5.1.2 The characteristics of scaleups.....	60		
5.2 Business Finland-funded scaleups	61		
5.2.1 Number and share of funded scaleups	62		
5.2.2 Size and role of Business Finland-funded scaleups in Finland during 2010–2021	65		
5.2.3 Funded scaleups vs. other scaleups.....	67		
5.2.4 Economic development after scaleup status	71		
5.3 Business Finland funding and firm growth.....	73		
5.4 The use of R&D funding	76		
5.4.1 Participants of R&D funding	76		
5.4.2 Accepted and rejected R&D applicants	78		
5.5 The effectiveness of R&D funding	83		
5.5.1 Method and design	83		
5.5.2 Results.....	84		
6 Young Innovative Companies (NIY) funding and services ... 87			
6.1 Use of NIY.....	87		
6.2 Results of NIY in statistical analysis	89		
6.3 Different phases of NIY.....	92		
6.4 Qualitative results from NIY	94		
Case: NIY making growth possible	98		
7 Planning for international growth (Tempo, Market Explorer, Talent)	99		
7.1 Earlier literature	99		
7.2 Use and results of Tempo funding.....	100		
7.2.1 Tempo participants	101		
7.2.2 The results of Tempo	102		
7.2.3 Qualitative results from Tempo.....	105		
Case: Combining Tempo and R&D.....	110		
Case: Combining Tempo and Deep Tech Accelerator (DTA)	111		
7.3 Use and results of Market Explorer, Talent and Talent Explorer	112		
7.3.1 Participants of Explorer funding instances.....	112		
7.3.2 The results of Explorer funding instances	114		
7.3.3 Qualitative results from Market Explorer	116		
Case: Contribution of several assessed instruments	120		
7.3.4 Qualitative results from Talent	121		
Case: Talent as an important instrument in the internationalization path.....	125		
8 Overall analysis	126		
8.1 Overall assessment of the role of Business Finland and key impacts.....	126		
8.2 Future guidelines in developing services and actions in the field of startups and scaleups	130		
8.3 Sustainability as a goal	133		
9 Conclusions of the impact assessment	134		
9.1 Startups.....	134		
9.2 Young Innovative Companies funding and Services NIY	135		
9.3 Business Finland-funded scaleup development	136		
9.4 Planning for international growth.....	137		
9.5 Overall conclusions for common questions	139		
Sources	141		
Appendixes	150		
Appendix 1 Data and definitions.....	150		
Appendix 2 Methodology	156		
Appendix 3 The net jobs created by Business Finland-funded scaleups vs. other scaleups.....	162		
Appendix 4 Estimation results.....	164		
Appendix 5. Background information on survey respondents..	173		

FOREWORD

Business Finland has three strategic target areas, which are 1) Economic Growth, 2) Sustainable Development and 3) Competitiveness. Impact studies implement in each target area and impact studies presenting their results comprise the actual and official method for monitoring Business Finland's success and impact.

Focus of this impact study was to concentrate on economic growth target area. Wellbeing in Finland is mainly based on the wealth and jobs created by the success of Finnish companies on the global market. Investment in R&D and innovations as well as adoption of radical innovations and new technological solutions in both existing and new industries are needed to enhance company growth in the global market. These innovative pathways build new competitive advantages for companies. Renewal of private sector increase economic growth in the whole economy.

In this impact study, evaluation targeted on the start-up and scaleup companies. Therefore it concentrated on the Business Finland's instruments such as 1) R&D and innovation funding and services to the fast growth firms, more precisely a target is in startups including YIC fund-

ing, as well as in scaleups, which include all companies (SMEs, midcaps) that fulfill the criteria of scaleups; 2) Funding for Internationalization Planning (Tempo, Explorer, Talent). Main questions of the study are as follows: How Business Finland in general has succeeded to make successful funding decisions in this field? What kind of critical obstacles and bottlenecks have affected the possibilities to achieve these goals? How sustainability (economic, ecological, and social) might be considered at the customer and society level? What are the future guidelines on how Business Finland can improve its activities in this topic?

The evaluation team of Owl Group Oy, MDI and Pellervon taloustutkimus PTT carried out this impact study. Business Finland wishes to thank the evaluators for their thorough and systematic approach. Business Finland expresses its gratitude to the steering group and all others who have contributed to the study.

Helsinki, October 2024

Business Finland

TIIVISTELMÄ

Vaikuttavuusanalyysi arvioi Business Finlandin roolia talouskasvun edistämiseksi sen tarjoaman rahoituksen ja palveluiden kautta. Selvityksessä keskityttiin startup- ja kasvuyrityksiin ja kansainvälistymisen suunnittelun tueksi tarjottaviin palveluihin. Selvitys tarkastelee, miten Business Finlandin instrumentit ovat tukeneet näitä toimijoita Suomessa vuosina 2010–2021 hyödyntäen sekä määrällistä että laadullista analyysiä. Analyysiä on täydennetty kansainvälisillä vertailuesimerkeillä. Vaikuttavuusarviointi tarkasteli T&K-rahoitusta (startup- ja kasvuyrityksille), Young Innovative Companies (NIY) -rahoitusta sekä palveluja kansainvälisen kasvun suunnitteluun: Tempo, Market Explorer ja Talent.

Startupit: Tilastollisen analyysin perusteella Business Finlandin rahoitus näyttää tukevan startup-yritysten kasvua, erityisesti liikevaihdon ja työllisyyden osalta. Laadullisissa analyysissä Business Finlandin rahoituksen sekä muiden palveluiden roolia pidetään tärkeänä startup-ekosysteemin ja rahoituksen edistämiseksi erityisesti yritysten alkuvaiheessa ja skaalautumisvaiheen alussa.

NIY: Laadullisen analyysin mukaan NIY-ohjelmaa pidetään hyvin toimivana työkaluna sen keston ja sen kolmen eri vaiheen ansiosta. Tilastollinen analyysi viittaa siihen, että NIY-rahoituksen alkuvaihe keskittyy yritysten kansainvälistymiseen ja kolmas vaihe yrityksen kasvuun. Yritykset, jotka ovat toteuttaneet NIY-ohjelman alkuvaiheita, osoittavat hieman parempaa kasvua viennissä ja työvoiman tuottavuudessa. Laadullinen analyysi osoittaa, että NIY-rahoitus on mahdollistanut kansainvälisen kasvun tukemalla yrityksen markkinoiden laajentumista, globaalien myyntiverkoston rakentamista ja sijoittajien houkuttelemista.

Kasvuyritykset: Kasvuyritysten kokonaismäärä Suomessa on vaihdellut 200–500 välillä vuosina 2010–2021. Joka kymmenes kasvuyritys on hakenut Business Finlandin rahoitusta tänä aikana. Tilastollisen analyysin mukaan Business Finlandin rahoittamien kasvuyritysten liikevaihto, henkilöstömäärä ja tuottama lisäarvo on korkeampi kuin muiden kasvuyritysten rahoitushakemuksen tekohelellä. Business Finlandin rahoittamat kasvuyritykset kasvattavat työvoimaansa ja liikevaihtoaan enemmän

kuin muut kasvuyritykset 1–2 vuotta kasvuyritys-statusen saavuttamisen jälkeen. Sekä Business Finlandin rahoittamat että muut kasvuyritykset ovat tärkeässä roolissa uusien työpaikkojen ja talouskasvun luomisessa. Laadullisessa analyysissä kasvuyritysten merkitystä taloudelle pidetään erittäin tärkeänä työpaikkojen ja kasvun luomisessa.

Kansainvälistymissuunnittelu: Tempo-rahoitus auttaa yrityksiä testaamaan tai pilotoimaan tuotteen tai palvelun kysyntää asiakkailta ja markkinan validoinnissa. Tempo on erityisen tärkeä startup-vaiheessa koska yksityisen rahoituksen saaminen startup-vaiheessa on Suomessa haastavaa. Yksi kolmasosa tai puolet Tempo-rahoitusta saaneista yrityksistä saa myöhemmin T&K-rahoitusta seuraavien kolmen vuoden aikana. Market Explorer auttaa yrityksiä tunnistamaan liiketoimintamahdollisuuksia, kehittämään kansainvälistymissuunnitelmia ja -strategioita, kehittämään vientiprosesseja ja validoimaan tuotteen kilpailuetua ja arvolupausta kohdemarkkinoilla. Talent-rahoitus on tärkeää kansainvälisen osaamisen johtamisen kehittämisessä. Se on helpottanut kansainvälisen osaamisen johtamisen kehittämistä, edistänyt kansainvälisen asiantuntemuksen hyödyntämistä tukevan yrityskulttuurin luomista ja tukenut kansainvälisen osaamisen palkkaamista.

Arvioinnissa tarkasteltiin myös useita kansainvälisiä esimerkkejä. Yksi keskeisistä opeista oli, että maat tarjoavat kattavaa tukea startup- ja kasvuyrityksille. Useat

korkean kasvupotentiaalin yrityksiin kohdistuvat ohjelmat yhdistävät innovaatorahoituksen, mentoroinnin ja tutkimuksen sekä liiketoiminnan infrastruktuurin. Menestyneimmät ohjelmat yhdistävät innovaatorahoituksen, T&K-rahoituksen, tutkimuksen ja kaupallistamisen keskittymisen sekä muut toiminnot (kuten verkostoituminen jne.).

Suomessa on useita pullonkauloja, jotka hidastavat paremman startup-ekosysteemin ja kasvuyritysten luomista. Keskeisimmät pullonkaulat liittyvät poliittisiin, kulttuurisiin, taloudellisiin ja rahoituskellisiin haasteisiin. Joitakin tunnistettuja haasteita liittyy myös julkisten ja yksityisten rahoittajien yhteistyöhön startup- ja teknologia kentällä. Merkittäviä haasteita ovat lisäksi poliittisten pitkän aikavälin sitoutumisen puute startup- ja kasvuyritysohjelmiin sekä kunnianhimon puute innovaation keskeisten ajureiden suhteen.

Vaikuttavuusarviointi tunnisti kuusi tulevaisuuden kehitysteemaa: uusien startupien määrän lisääminen, yhteistyön lisääminen julkisten rahoittajien kesken, startupien ja kasvuyritysten muiden kuin (T&K-)rahoituspalveluiden tarpeen tunnistaminen, julkisen ja pääomasijoitusrahoituksen välisiin aukkoihin tarttuminen, osaajien houkuttelemineen Suomeen sekä palvelukokemuksen kehittäminen ja saumattoman palvelupolun rakentaminen sekä julkisen että pääomasijoitusrahoituksen osalta.

EXECUTIVE SUMMARY



This impact analysis evaluates the role of Business Finland in fostering economic growth through its funding and services, particularly focusing on startups, scaleups, and internationalization planning. The study examines how Business Finland's instruments have supported these entities in Finland between 2010 and 2021, providing a mix of quantitative and qualitative analysis, supplemented with benchmarking from international examples. The impact Assessment looked R&D-funding (for startups and scaleups), Young Innovative Companies (NIY) funding and services as well as services for planning for international growth: Tempo, Market Explorer and Talent.

Startups: Based on the descriptive statistical analysis, Business Finland funding seems to support startups in advancing growth, particularly in terms of turnover and employment. In qualitative analysis the role of Business Finland funding as well as other activities are seen as important in facilitating the startup ecosystem and financing especially in the early stages as well as in the beginning of the scaling phase.

NIY: NIY is seen as a well-functioning instrument because of its duration and three different stages according to qualitative analysis. The results from descriptive statistical analysis imply that the early phase of NIY funding focuses on the internalization of firms, whereas the third phase focuses on firm growth. Firms that have completed some of the early phases of the NIY program exhibit slightly better growth in export value and labor productivity. Qualitative analysis points out that NIY funding enabled international growth by supporting market expansion, building global sales networks, and attracting investors.

Scaleups: The total number of scaleups in Finland has varied between 200 and 500 firms annually during 2010–2021. One tenth of scaleups have applied for Business Finland funding during this period. According to the descriptive analysis, Business Finland-funded scaleups have higher turnover, employment, and value-added than other scaleups at the time of the funding application. Business Finland-funded scaleups grow their employment and turnover more than other scaleups 1–2 years after achieving scaleup status. Both Business Fin-

land-funded scaleups and other scaleups have an important role in creating new jobs and economic as noted in the qualitative analysis, the importance of scaleups for the economy is seen as extremely important in creating the jobs and growth.

Internationalization planning: The Tempo instrument helps companies test or pilot the demand for a product or service with customers and validate their markets. It is particularly important for startups, as securing private funding during the startup phase is challenging in Finland. Between one third and a half of the firms that receive Tempo funding subsequently obtain R&D funding within the following three years. **Market Explorer** helps companies identify business opportunities, develop internationalization plans and strategies and export customer processes, and validate their product's competitive advantage and value proposition in target markets. **Talent funding** is important for developing international skills management within companies. It has facilitated the development of international skills management, fostered a corporate culture that supports the use of international expertise, and supported the hiring of international talent.

This assessment looked at several international examples. One of the key learnings include, that the countries provide comprehensive support for startups and scaleups. Various programs targeting potential high-growth

companies combine innovation funding, mentorship, and research as well as business Infrastructure. Most successful programs combine innovation funding, R&D funding, research and commercialization focus and other activities (such as networking etc.)

There are several bottlenecks in creating better startup ecosystem and scaleups. Main bottlenecks relate to political and cultural as well as economical and financial bottlenecks. Some of the challenges recognized relate to cooperation among public and private funders in the startup and tech landscape. There is a certain lack of political long-term commitment for startup and scaleup policies and programs, and a lack of ambition towards some of the key drivers of innovation.

Impact Assessment recognized six themes for future development: Increasing the amount of new startups, increasing cooperation between public funders, recognizing that startups and scaleups need also other services than (R&D) funding, address the gaps in public and VC funding, attracting Talent to Finland as well as developing service experience and building a seamless service path for both public and VC funding.

2 INTRODUCTION

2.1 OBJECTIVES OF THE ASSIGNMENT

The objective of the assignment is to produce a comprehensive impact study of Business Finland's success in achieving the objectives associated with innovation funding and global network services. The assignment is based on up-to-date research data on the business and innovation environment and impacts of Business Finland's activities, as well as a theoretical frame of reference for assessing the impacts and effectiveness of business and innovation activities. The study delivers both ex-post and forward-looking impact analysis.

The assignment is organized into four work packages:

1. Business Finland-funded startup development in Finland
2. Young Innovative Companies (NIY) funding and services
3. Business Finland-funded scaleup development in Finland
4. Planning for international growth: Tempo, Market Explorer, Talent

Each chapter in this report corresponds to a work package. Chapter 3 describes the context of the instruments as well as learnings from international benchmarking. Chapter 4 outlines the main findings from the work package regarding startups, chapter 5 regarding scaleups and chapter 6 for Young Innovative Companies funding and services. Chapter 7 covers the services on planning for international growth. Chapter 8 responds to common assessment questions and chapter 9 summarizes the conclusions of the evaluation team.

2.2 OVERVIEW OF THE IMPACT ANALYSIS, DATA AND METHODS

Each work package has its own evaluation questions in addition to common questions. The evaluation questions and methodological approaches are presented in Table 1.

TABLE 1. EVALUATION QUESTIONS AND METHODOLOGICAL APPROACHES

WORK PACKAGE AND QUESTIONS	METHODOLOGICAL APPROACH
A. Work package: Business Finland-funded startup development in Finland	
<p>What are the results of Business Finland-funded companies (new companies, the impact of total funding on companies' growth of turnover, exports, value added and employment, internationalization, and VC funding) compared to other startup companies in Finland during 2010–2020?</p>	<ul style="list-style-type: none"> • Descriptive statistical analysis. Comparative analysis of funding recipients. • Complement survey of the startup community regarding overall startup development and meta-analysis of the existing knowledge base.
<p>What is the role of Business Finland funding and other activities when considering the impacts on startups via Business Finland's Impact Model for Economic Growth:</p> <ol style="list-style-type: none"> i. What is the role of Business Finland for outcomes and direct impacts? What is the impact on growth and renewal? ii. What value does Business Finland add to Finnish business life and economy? What are the main factors that have affected the growth of the startup ecosystem in Finland? What are the main bottlenecks outside Business Finland and the Finnish innovation environment? How will Business Finland's Deep Tech Accelerator alleviate these bottlenecks? 	<ul style="list-style-type: none"> • Comprehensive modelling of BF activities in the field and presentation of preliminary analysis for key strategic stakeholder interviews reviewing the development. • Specific interviews for Deep Tech Accelerator stakeholders and review of monitoring data.
B. Work package: Young Innovative Companies (NIY) funding and services	
<p>What are the experiences of NIY participants?</p>	<ul style="list-style-type: none"> • Review of existing knowledge base: participant surveys and feedback • Complementary specific interviews for NIY participants (companies, organizers, experts)

WORK PACKAGE AND QUESTIONS	METHODOLOGICAL APPROACH
<p>NIY has two main phases: 1) Go to Market (100k) for finding a scalable business model; 2) Scale (400K-750k) for fast growth. Is this still a workable funding model, or is there any need to adapt this phasing?</p>	<ul style="list-style-type: none"> • Review of existing knowledge base: Participant surveys and feedback, AI analysis of written materials obtained from BF • Complementary specific interviews for NIY participants (companies, organizers, experts)
<p>What are the results (the impact of total funding on companies' growth of turnover, exports, value added and employment, internationalization, and VC funding) of a) startups that have not completed the entire program; b) startups that have completed the entire NIY program during 2010-2020?</p>	<ul style="list-style-type: none"> • Statistical analysis
<p>What are other outcomes and impacts of the NIY program when considering the Business Finland Impact Model for Economic Growth?</p>	<ul style="list-style-type: none"> • Statistical analysis and comparison of the results against the impact model • Interviews with strategic stakeholders and expert workshop
<p>C. Work package: Business Finland-funded scaleup development in Finland</p>	
<p>What is the size and role of scaleups in Finland? Those funded by BF?</p>	<ul style="list-style-type: none"> • Statistical and econometric analysis • Descriptive analysis of the scaleup dynamics in Finland based on the interviews with strategic stakeholders and review of exist-ing literature
<p>What are the results (the impact of total funding on companies' growth of turnover, exports, value added and employment, internationalization, and VC funding) of Business Finland-funded scaleups compared to scaleups in general?</p>	<ul style="list-style-type: none"> • Statistical and econometric analysis

WORK PACKAGE AND QUESTIONS	METHODOLOGICAL APPROACH
What are other outcomes and impacts of the scaleups when considering the Business Finland Impact Model for Economic Growth?	<ul style="list-style-type: none"> • Interviews with strategic stakeholders and an interpretative workshop
D. Work package: Planning for international growth: Tempo, Market Explorer, Talent	
Tempo helps companies to set appropriate goals to learn from the market, to understand customer needs and the size of the market and, after Tempo, set out to develop the product in the right direction. How well has Tempo achieved these goals?	<ul style="list-style-type: none"> • Analysis of existing knowledge base and complementary survey to funding recipients (also AI analysis of written materials obtained from BF)
How has Tempo funding activated startup companies for international markets with a new product or service idea? How successful has internalization been? How many Tempo projects have led to new R&D funding projects via Business Finland?	<ul style="list-style-type: none"> • Analysis of existing knowledge base and complementary survey to Tempo participant companies (also AI analysis of written materials obtained from BF) • Statistical analysis of Tempo participants
How has Market Explorer funding improved knowledge of over five-year-old SMEs and mid-cap companies about a new international market, and how have they fared as new operators on the market?	<ul style="list-style-type: none"> • Statistical analysis of Market Explorer funding recipients • Analysis of existing knowledge base and complementary survey to funding recipients (also AI analysis of written materials obtained from BF)
How has Talent funding increased the capacity of SMEs and mid-cap companies for international growth (working, organizational, and management practices, international experts)?	<ul style="list-style-type: none"> • Analysis of existing knowledge base and complementary survey to funding recipients (also AI analysis of written materials obtained from BF) • Complementary interviews with participants and stakeholders
What are other outcomes and impacts of the Planning for international growth services when considering the Business Finland Impact Model for Economic Growth?	<ul style="list-style-type: none"> • Interviews with strategic stakeholders and an expert workshop

WORK PACKAGE AND QUESTIONS	METHODOLOGICAL APPROACH
E. General questions (for entire impact analysis)	
International benchmark: How fast have growth programs or organizations similar to Business Finland in other countries succeeded in improving development of fast-growth companies?	<ul style="list-style-type: none"> • International benchmarking of key countries, institutions, and their capabilities (6 countries)
<p>What kinds of critical obstacles and bottlenecks have affected the possibilities to achieve these goals?</p> <p>How has Business Finland generally succeeded in making successful funding decisions in this field?</p> <p>What are the other possibilities to support fast-growth companies than Business Finland’s funding?</p>	<ul style="list-style-type: none"> • Analysis of all previous working questions • Interviews with strategic stakeholders and an expert workshop
<p>How might sustainability (economic, ecological, and social) be considered at the customer and society level?</p> <p>How to measure the sustainability impacts (SDGs or other measures) of companies funded by Business Finland?</p>	<ul style="list-style-type: none"> • Incorporating the sustainability theme to international benchmarking, literature review and strategic stakeholder interviews • Presentation in an expert workshop and interaction together with Business Finland and the Ministry
What are the future guidelines on how Business Finland can improve its activities in this topic?	<ul style="list-style-type: none"> • Comprehensive analysis of all research work phases and use of workshops in the interaction

A mixed methods approach on assessing the impact and contributions of Business Finland’s activities was used in the study. This means combining econometric analysis, statistical analysis and qualitative specific (for a particular instrument) and qualitative strategic (for a group of

instruments or BF activities) analysis in judging the final impact of the activities.

Scoping Review of Literature. In this study, a comprehensive scoping review of the literature was conducted, focusing on listed activities and services related to the

scaleup phenomenon. Institutional frameworks, key actors, and notable programs or service portfolios for startup development, scaling, and internationalization were explored. This review was aimed at identifying relevant measures for impact assessment. Empirical literature is analyzed in chapters regarding startups and scaleups.

Benchmarking Analysis. The institutional frameworks, key actors, and prominent programs in six benchmarking countries (Sweden, Denmark, Germany, United Kingdom, United States and Singapore) were analyzed. This analysis was intended to provide insights into how these countries manage startup development, scaling, and internationalization, and to understand the impact of their development measures.

Review of Existing Knowledge and Business Finland's Activities. The existing knowledge base was reviewed and the activities of Business Finland were modelled in more detail towards its impact logic. This included the examination of the roles and responsibilities of service and instrument organizers within Business Finland. This also included interviews with stakeholders in Business Finland and the steering ministry (n=11). Monitoring data and reports on various instruments mentioned across the working packages were analyzed. An intervention logic was established to outline how these services contribute to Business Finland's overall intervention strategy, as described in the procurement description.

Participant Data Collection. A supplementary survey (n=285) was conducted for companies that have received NIY, Tempo, Market Explorer or Talent funding during the past five years (see Appendix 5 for respondent background). Specific interviews (n=29) were conducted for companies that have received funding. Based on these interviews, five case studies were written, ensuring a diverse representation of the different services provided.

Strategic Interviews and Interpretative Workshops. A cross-analysis of all collected materials was performed, and strategic interviews (n=22) were conducted to present preliminary results. Impact claims made by researchers were refined and commented on with the involvement of key stakeholders. A hybrid workshop was organized to present findings to these stakeholders and Business Finland, facilitating discussions and the gathering of feedback on the results.

Statistical and econometric analysis. Statistics Finland's business register data, financial statements data, and Business Finland's funding application data over the years 2010-2021 was applied. Also, Finnish Customs data on international trade from the same period was used, containing company-level information on the exports of goods. Unfortunately, the register data does not include information on exports of services. A more detailed description of the data is provided in Appendix 1.

3 THE CONTEXT OF THE IMPACT ASSESSMENT

This chapter describes the instruments assessed and the context in which they have operated.

3.1 BUSINESS FINLAND'S IMPACT MODEL AND INSTRUMENTS ANALYZED

IMPACT MODEL

Business Finland's new strategy has three strategic target areas: Economic Growth, Sustainable Development and Competitiveness. Business Finland has an impact model aligned with its strategy. The impact model contains five dimensions that describe how selected interventions may impact: inputs, activities, results, impacts on society and strategic goals. For economic growth Business Finland has set out several impact goals as shown in Figure 1.

In this study, the inputs of Business Finland are R&D, innovation funding and services to fast-growth firms. More precisely, the target consists of startups including those receiving Young Innovative Company (YIC) funding, as well as scaleups, which include all companies that meet the criteria of scaleups. Other inputs include fund-

ing for internationalization planning (Tempo, Explorer, Talent). It should be noted that during assignment more detailed intervention logic models were established for each service with respect to expected results (changes in company behaviors), which in turn were used in the survey and interview questions. Also, it should be noted that, at the same time as the assessment, Business Finland has developed more detailed expected impact paths. However, all of these were not used in this assignment since they were not officially established.

Figure 2 depicts the number of granted Business Finland subsidies during the years 2010–2021. It should be noted that there may be multiple subsidies per firm per year. Among the instruments under study, R&D subsidies are the most common form of funding. The number of R&D subsidies has decreased from over 1 000 to around 300 granted subsidies during 2010–2021. The number of R&D subsidies has decreased especially during 2020–2021. Tempo funding is the second most common instrument under study, and it was first applied in 2016. The number of Tempo subsidies has varied between 400 and 600 over the observation period. Other minority instru-

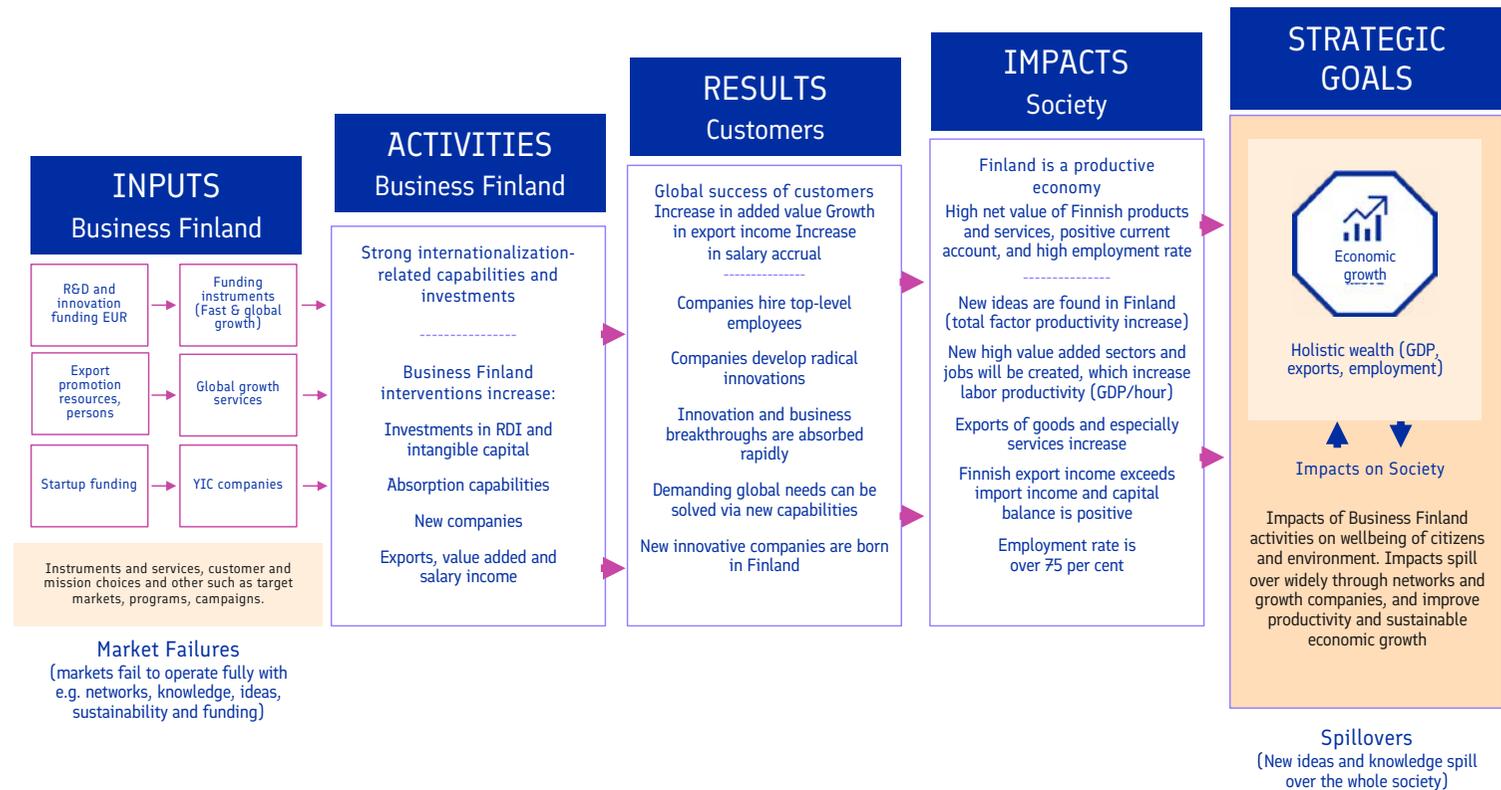


FIGURE 1. BUSINESS FINLAND IMPACT MODEL FOR ECONOMIC GROWTH

ments based on number are NIY and Explorer funding. It should be noted that we have combined the Talent, Talent Explorer and Market Explorer funding instruments under the 'Explorer' category due to a low number of observa-

tions. The total number of Explorer funding instances has been a few hundred in each year. The number of NIY funding instances is very low: around 10-70 yearly subsidies.

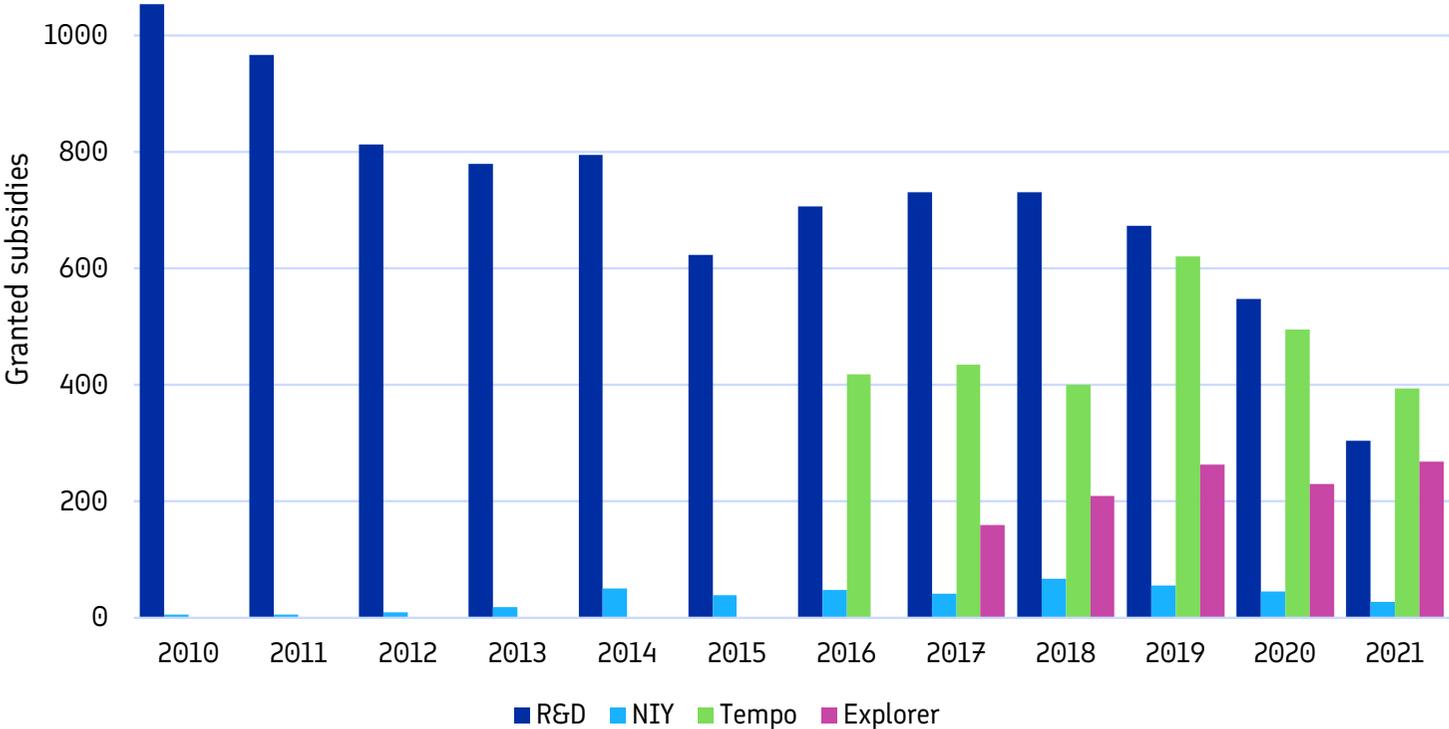


FIGURE 2. THE NUMBER OF DIFFERENT BUSINESS FINLAND SUBSIDIES DURING 2010–2021. The 'Explorer' category includes Talent, Talent Explorer and Market Explorer funding. The figure depicts the number of granted subsidies. The same firm may have received several subsidies during each year. Source: Business Finland, PTT.

R&D AND INNOVATION FUNDING¹

R&D and innovation funding targets SMEs (fewer than 250 employees, with a turnover of up to €50 million or a balance sheet total of up to €43 million) and mid-cap companies (with a consolidated turnover of up to €300 million) that aim for international growth. The funding can take the form of a grant or a loan. Grants support data collection and research to create new information that provides an international competitive edge, often in collaboration with universities or research institutes. Loans support the development of products or services.

For SMEs, the grant covers 50% of the project costs. If the project is entirely industrial research, the grant covers 60% of the eligible costs. For mid-cap companies, the grant covers 40% for research projects and 50% for projects consisting entirely of industrial research. Grants are paid after the costs have been reported. Loans, intended for development and pilot projects, generally cover up to 50% of the total project cost but can cover up to 70% if justified. Up to 30% of the loan can be received upfront, with the remainder disbursed based on actual costs at the end of the project. The current interest rate for loans is 1.25% (as of March 2024), and no collateral is required. The loan term is 7–10 years, with a grace period of 3 or 5 years, or longer if necessary. If a project fails or yields unusable results, the loan may be partially waived.

[1] <https://www.businessfinland.fi/suomalaisille-asiakkaille/palvelut/rahoitus/tutkimus-ja-kehitysrahoitus/tutkimus-ja-kehitysrahoitus>

Approximately 300 companies receive R&D and innovation funding annually. Between 2010 and 2022, SMEs received €3 169 billion in such funding.

The paper by Hyytinen and Toivanen (2005) concludes that government funding can significantly mitigate capital market imperfections, particularly benefiting SMEs in industries that rely heavily on external financing. Their analysis indicates that firms with better access to government funding tend to invest more in R&D and show a stronger growth orientation. This supports the idea that credit constraints can hinder innovation and growth, and that government finance can play a crucial role in innovation policy.

Karhunen and Huovari (2015) studied public R&D subsidies from Tekes (now Business Finland) for SMEs. They found that 1–2 years after receiving the subsidy, firm productivity decreased by 2–4% compared to unsubsidized firms. However, the subsidies have a positive impact on employment and firm survival, and low-skill firms become more human capital-intensive.

INNOVATION FUNDING FOR STARTUPS – NIY²

The funding is aimed at startups under five years old with great business potential. The funding consists of three phases: the first phase is a grant of €250 000, the second phase is another grant of €250 000 and the third phase is a grant of €500 000. However, before 1.1.2024 the third phase grant was a loan of €750 000.³ Business Finland covers 75% of project's cost.

Business Finland sets targets for the company along with the funding decision. Reaching the targets enables the company to move on to the next phase. In the first phase the targets are related to fast growth and competitiveness in the international market, investing in international sales and marketing, and strengthening the team to enable faster growth. Second phase targets are speeding up the global growth of the business, acquiring external funding for growth, and developing growth strategy, process, and organization to support the scaling of the business. Finally, the company must prove the sustainability of the competitive advantage and accelerate the growth with funding from public and private sources.

Requirements for the funding are a business plan for rapid international growth, a scalable business model with international turnover, full-time management with sufficient resources, and full-time key personnel must have significant ownership of the business.

[2] <https://www.businessfinland.fi/suomalaisille-asiakkaille/palvelut/rahoitus/nuoret-innovatiiviset-yritykset-niy>

[3] <https://www.businessfinland.fi/ajankohtaista/uutiset/2024/muutoksia-moniin-rahoituspalveluihimme>

Typically, companies selected for the NIY funding are around four years old, employ about 13 people, have a turnover exceeding €420 000 from scalable business activities, and have €1 million in equity investments. Management usually has strong international experience, and many companies already have significant international revenue. Approximately 40% of these companies have international investors, and many have previously utilized Business Finland's services in other projects.

The distribution of sectors among funded companies has been as follows: 44% are in B2B software and services, 20% in cleantech, energy, and industrial solutions, 14% in digital media, games, and B2C software, 12% in life sciences, medtech, and well-being, and 11% in consumer products and services.

Annually, around 40 companies receive NIY funding. Between 2008 and 2020, 423 companies received this funding, with 122 progressing through all three phases. Of these, 64 NIY-funded companies achieved an annual turnover of €5 million, including notable success stories such as Supercell, Seriously, Framery, and iLOQ.

Autio, Rannikko, Handelberg, and Kiuru (2014) found that the NIY Program was instrumental in supporting the early development stages of innovative, growth-oriented firms. Compared to firms without such support, NIY participants showed stronger foundational growth, with notable increases in sales and employment. This growth was more significant than that observed in comparable firms not participating in the program, indicating a positive im-

pact of the NIY on these key metrics. NIY-supported firms were also more successful in securing new equity funding, which was crucial for mitigating initial investment-related losses and supporting overall growth. The study focused on the program's impact from 2006 to 2012.

Autio and Rannikko (2015) examined Finland's NIY Program, designed to foster high-growth entrepreneurship, and found significant positive outcomes. The program more than doubled the growth rates of participating firms, demonstrating an efficient use of resources and strong value-for-money impact. The emphasis on capacity building and networking was key to this success. Post-2008, a notable divergence in sales growth was observed, with participating firms showing continuous growth, unlike their non-participating counterparts.

TEMPO⁴

Tempo funding is designed for startups under five years old with a new product or service idea. This funding helps companies prepare for international growth by gathering feedback from potential customers and assessing demand and performance in international markets. The maximum grant is €60 000, covering 75% of the project's costs. Of the grant amount, 70% is paid after the funding decision, with the remaining 30% disbursed upon submission of the final project report.

[4] <https://www.businessfinland.fi/suomalaisille-asiakkaille/palvelut/rahoitus/tempo-rahoitus>

To qualify, the company must have an innovative product, service, or business concept that differs from existing international solutions. The company should also have a realistic plan for further research and development if initial results are promising (with new recruitment required from 2024), at least €30 000 in equity funding, and total project funding over time. Additionally, the company must have a committed team of at least two people working in Finland.

Funding is competitive, and meeting the minimum criteria does not guarantee approval. Business Finland evaluates the company's overall business strategy when making funding decisions. Tempo funding qualifies as de minimis aid.

Each year, between 500 and 1 000 companies receive Tempo funding. Between 2016 and 2022, the distribution of funding by industry for companies under six years old was as follows: 45% in information and communication, 19% in professional, scientific, and technical activities, 14% in industry, 7% in wholesale and retail trade, 2% in education, and 13% in other fields. For companies over six years old, the distribution was 23% in information and communication, 20% in professional, scientific, and technical activities, 31% in industry, 11% in wholesale and retail trade, 1% in education, and 13% in other fields. Companies under six years old make up about 60% of the total.

Approximately 27% of companies under six years old proceed to R&D projects, compared to only 6% of companies over six years old. About 40% of applications are

accepted, with the rejection rate not being influenced by the company's age. Since 2019, the number of companies receiving Tempo funding has been decreasing.

MARKET EXPLORER⁵

Market Explorer funding is aimed at SMEs and mid-cap companies that are over five years old and have a product, service, or business model that is at least at the idea or pilot stage. To qualify, the solution must offer a credible competitive advantage in international markets. This funding helps companies gain insights into new international markets. After completing the Market Explorer project, companies will have a clearer understanding of the market situation and can begin taking operational steps to enter international markets.

Market Explorer funding is classified as de minimis aid. The grant amounts range from €5 000 to €40 000 and cover 50% of the project's costs. Prior to 2022, the maximum grant was €20 000. The grant is paid upon project completion, which can last up to one year. Companies may receive the grant up to three times, though most utilize it only once. Subsequent funding is awarded based on whether previous Market Explorer projects have successfully led to international business ventures.

Between 2017 and 2022, the number of applications has ranged from approximately 190 to 280 per year.

[5] <https://www.businessfinland.fi/suomalaisille-asiakkaille/palvelut/rahoitus/explorer/market-explorer>

TALENT EXPLORER / TALENT⁶

Talent funding is designed for SMEs and mid-cap companies that are renewing their practices and management to enhance their capacity for international growth. Funded projects must focus on improving the internationalization skills of the company's staff.

Talent funding is classified as de minimis aid. The grant ranges from €20 000 to €50 000 and covers 50% of the project's costs. The grant is paid in full at the end of the project.

Funding can be targeted at companies at different stages of internationalization. For companies **that are already established** but in the early stages of international business, the development and piloting of new ways of working and recruitment processes may be targeted. For companies at a **strong stage of international growth**, the development of human resources may include building an international culture, changes in pre-employment, and piloting/testing of new practices. For **pioneering companies operating in global international markets**, HR development may focus on, for example, piloting a new global approach, and developing a new way of working into a saleable service product.

[6] <https://www.businessfinland.fi/suomalaisille-asiakkaille/palvelut/rahoitus/talent-rahoitus>

3.2 FINNISH STARTUP AND SCALEUP LANDSCAPE SINCE 2010

The assessment period is a relatively long one. In this chapter we map out some of the key trends and non-technological phenomena related to the instruments assessed and the development of the startup and scaleup landscape. The chapter is based on literature review and expert interviews.

In 2008, slightly before the assessment period started, Finland suffered from the global financial crisis.

Around this time and the start of the assessment period the financial appropriations for RDI were diminishing or stagnant. Overall, many point out that the assessment period has been a time of stagnant productivity as stated in several reports (OECD 2024).

However, to get an overall understanding of the R&D landscape during the assessment period we can see that in the mid-2010s the expenditure of R&D was at a lower (overall) level and has since then been increasing (Figure 3), while the share of R&D of GDP has been decreasing during the period.

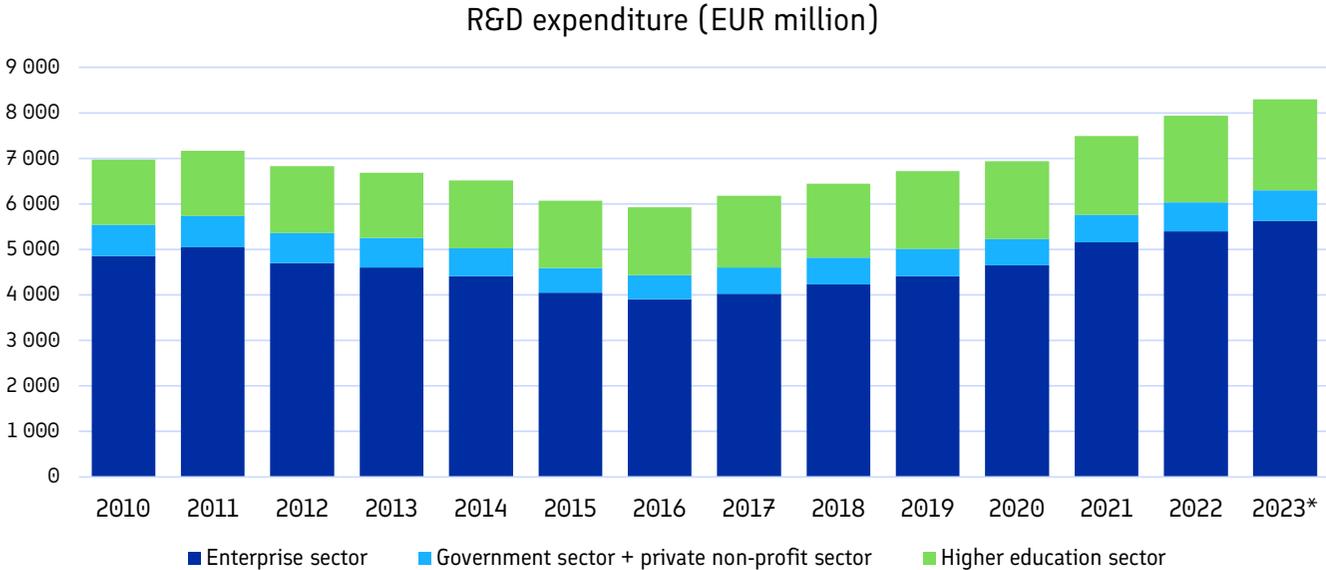


FIGURE 3. R&D EXPENDITURE IN 2010–2023 (* PRELIMINARY DATA). SOURCE: STATISTICS FINLAND

In 2015 there were cuts to the public spending on RDI. Some interviews point out that this was partly due to the trend that, from the start of the assessment period to the middle of it, innovation policy and public focus on startup and scaleup development were not sufficient in the policy agenda. In 2018 Business Finland was formed and internationalization and export support services were combined with RDI funding. Many point out that this caused a disruption especially in activities and services related to scaling up, and it took several years to get them to the same level as before. Interviewees point out that the overall focus of RDI funding has been going back to traditional RDI and other services, and the relevance for startup and scaling-up -themes has been decreasing. At the same time the ceasing of the Strategic Centres for Science, Technology, and Innovation (SHOKs) is seen as an important change in the landscape for more deep tech-oriented startups. SHOKs ended at the start of the assessment period in 2014, which was emblematic of this policy.

The overall financing landscape of startups and scaleups has been evolving over the last 10 years. Despite the general discussion in the interviews on the capital poorness of Finland and the lack of availability of private funding, it can be argued that, in the latter part of the assessment timeframe, both VC financing and angel invest-

ing have been drastically increasing and the idea of public and private financing co-existing and complementing each other is more evident today than the earlier “market failure” rationale. (See Figures 4 and 5 and 6.)

Interviews point out that the venture capital landscape in Finland has matured over the assessment period. The focus has shifted from only startups also to scaleups and even to the mid-cap section of companies. Despite the drastic drop mentioned in the interviews for 2023, the general trend in VC financing has been increasing and when comparing the available funds in 2010 and now, investment in seed-stage companies amounted to EUR 96 million in 2022 compared to EUR 9 million in 2010. (See also Business Finland, 2023.)

Regarding startups and early-stage companies, there has been strong growth in funding raised by Finnish startups during the past decade, the amount having increased tenfold. In recent years new venture capital fund managers have emerged, and new funds in the seed and startup stages have been established. Foreign investors have been increasingly interested in Finnish growth companies and private equity funds, which may have positive effects on the availability of growth funding in the long run. However, the level of buyout investments remains low compared to other European countries. (OECD, 2024.)

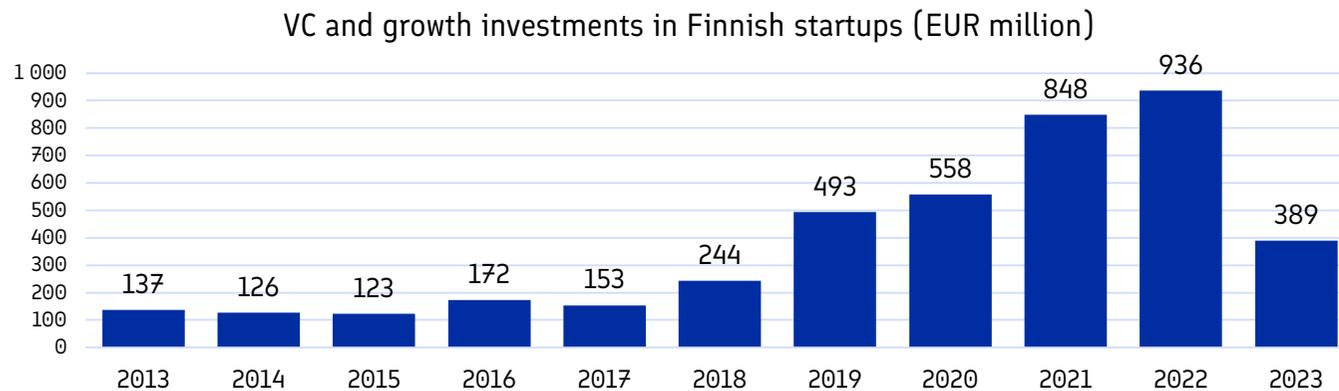


FIGURE 4. VENTURE CAPITAL INVESTMENTS IN FINNISH STARTUPS IN 2013–2023.
SOURCE: FINNISH VENTURE CAPITAL ASSOCIATION.

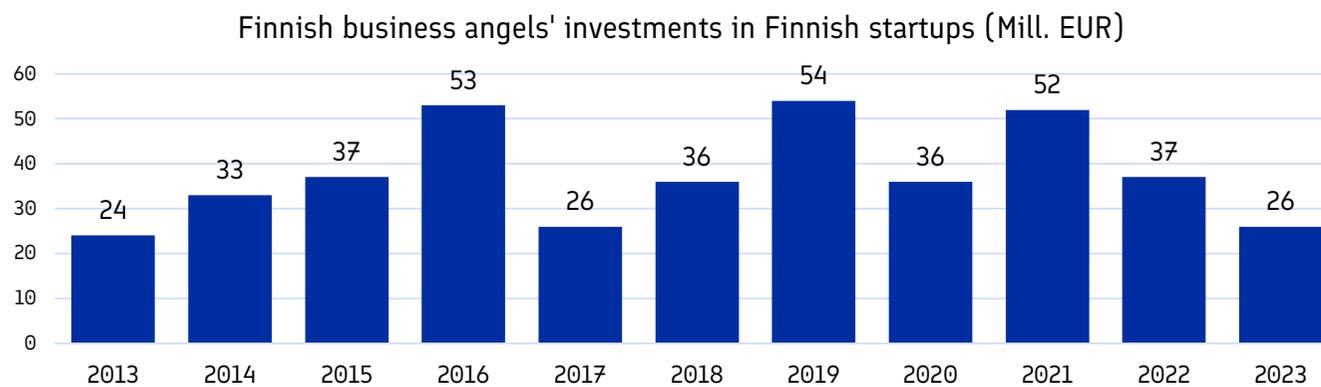


FIGURE 5. FINNISH BUSINESS ANGELS' INVESTMENTS IN FINNISH STARTUPS IN 2013–2023.
SOURCE: FINNISH VENTURE CAPITAL ASSOCIATION.

Despite these statistics many stakeholders point out in the interviews that, as recently as a few years ago, public R&D funders had an excessively large role. This has led to concerns whether the whole startup and growth landscape is on a healthy foundation. Overall, the funding landscape has become more versatile. During the last

few years of the assessment period and to this day, venture capital and angel funding have been decreasing in Finland. Despite this the interviewees remain optimistic in development of the VC and angel investing landscape. At the same time there might be a re-emergence of the importance of public funding.

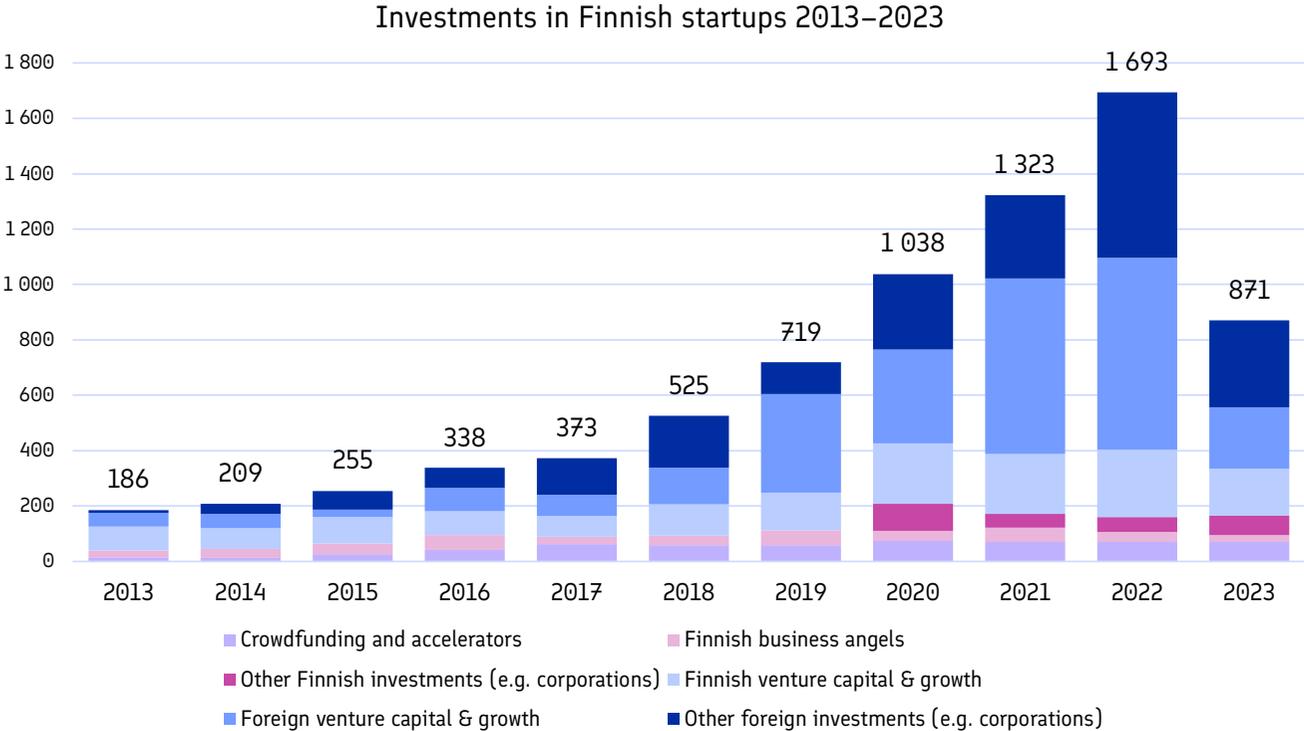


FIGURE 6. INVESTMENTS IN FINNISH STARTUPS. SOURCE: FINNISH VENTURE CAPITAL ASSOCIATION.

Ali-Yrkkö et al. (2021) further studied SMEs with growth intentions in relation to finance during the period 2013–2020 and discovered that bank financing is as common both for growth-oriented companies and other SMEs, while growth-oriented companies receive less funding from finance companies and turn more frequently to equity instruments and public funding provided by Finnvera, Business Finland, Centres for Economic Development, Transport and Environment (ELY Centres), and Finnish Industry Investment Ltd (Tesi). Young (max. 5 years old) and youngish (from 5 to 8 years) growth-oriented companies more frequently use business angel investments and funding from Business Finland, while bank financing is less common for youngish firms. Middle-sized growth-oriented companies are more likely to use bank financing and less likely to use funding from Business Finland and ELY Centres.

Ali-Yrkkö et al. (2019) studied the impacts of business angel investments to employment and sales growth, and the interaction of investments with public RDI funding. According to the data covering the years 2013–2017, companies attracting business angel investments were typically young startups active in the ICT and professional service industries and manufacturing sectors, while 75% of the companies employed less than 10 workers and were less than 8 years old at the time of the investment. Angel-backed target firms are more likely to produce physical goods than other startups. Most of these companies (75%) have received public RDI funding at least once

during their life span, most likely prior to business angel investment.

The results of the study indicate that among companies receiving business angel investments there are both more successful and unsuccessful cases compared to corresponding non-funded companies in terms of growth, but they perform better in terms of employment and short-term profitability and are more likely to survive in business. Furthermore, the study indicates that public RDI funding increases employment and net sales in the following three years. However, the study does not provide robust evidence that a combination of business angel investment and public RDI funding would increase growth in startups.

Startups and their importance have not always been on the political agenda. Around 2015, a scaleup discussion was started in public services and many public funders in several countries ended up launching various services for scaleups. This was important in terms of incorporating scaling up more precisely in government policy. However, at the same time interviewees note that the Finnish discussion about scaleups and growth enterprises is much more limited than in other countries, even in the Nordic countries, and the political commitment has not been sufficient during the assessment period. This can be seen also in recent opinions from the Finnish Startup Community.

The total picture of Finnish startups during the assessment timeframe is slightly mixed. After 2015 a startup boom was coming to Finland. This evolved around the

Finnish gaming cluster and startup conventions with Slush being a prominent example.

Startup is not a statistical term and the true number of startups is difficult to establish from statistics, but we are also using data from the Startup Community here. Based on the Startup Community’s data, the number of startups in Finland has seen a significant increase since 2010,

reflecting the country’s growing emphasis on innovation and entrepreneurship (Figure 7). The data from the Startup Community indicates a consistent upward trend, with significant growth particularly in the last decade. This growth can be attributed to Finland’s supportive ecosystem for startups, including access to funding, a skilled workforce, and favorable public policies.

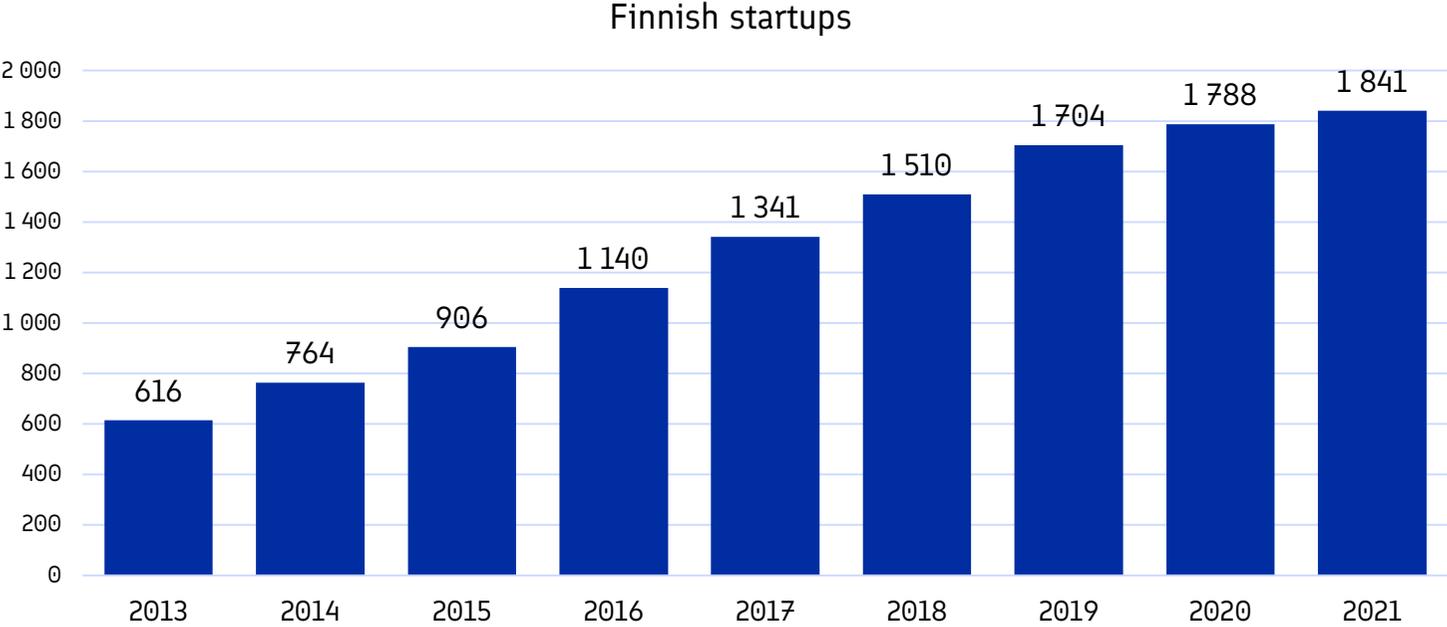


FIGURE 7. NUMBER OF FINNISH STARTUPS IN 2013–2021 BASED ON NUMBER OF FINNISH STARTUP COMMUNITY MEMBERS. SOURCE: FINNISH STARTUP COMMUNITY.

This is to some extent in contrast what Business Finland has experienced in its customer base. During the latter part of the assessment period, the number of newly established startups has decreased. On the other hand, the rejection rate of funding applications has significantly increased. Business Finland has had a special focus on startups since 2008. In 2010, 476 new customers were

established and in year 2015 a record number of 797. About 30 of the companies established in 2010 achieved a turnover of EUR 10 million or more. Only 3% of companies of the younger vintage of 2015 have reached the EUR 10 million threshold seven years after establishment. (Figure 8, Business Finland, 2013.)

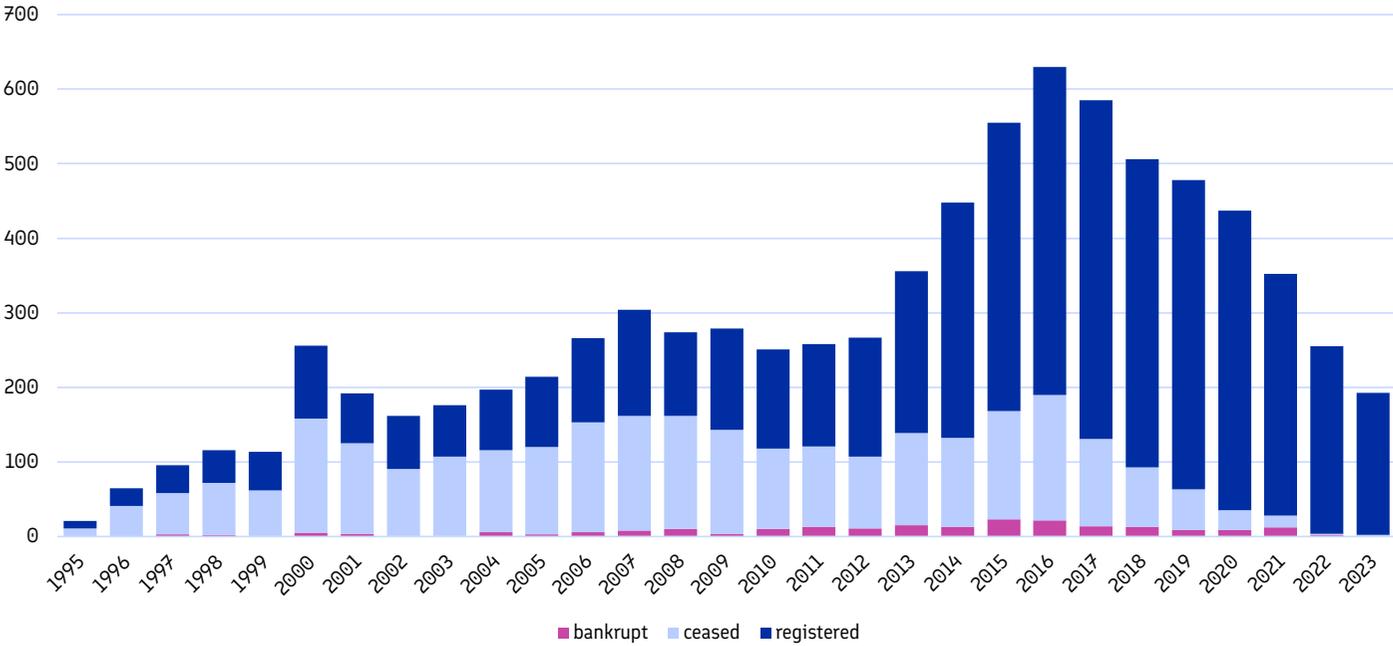


FIGURE 8. NUMBER OF FINNISH STARTUPS AMONG BUSINESS FINLAND APPLICANTS.
SOURCE: BUSINESS FINLAND 2023.

It should be noted that the Finnish literature on startups is scarce. According to Koski and Pajarinen (2013) startups, that is, firms up to five years old, covered 28% of all Finnish firms during the years 2003–2008. They observe that startups received more public funding per employee than older incumbent firms (firms over five years old). Their estimation results suggest that business subsidies positively affect employment growth for startups and incumbent firms. The employment of startups and incumbents increases more than that of non-subsidized firms four years after the subsidy. However, they also contend that business subsidies do not provide an additional growth boost for high-growth startups.

In their descriptive study, Lahtinen et al. (2016) found that startups account for approximately 5% of all Finnish firms. They define startups as small, private firms up to five years old (the age of the oldest establishment determines firm age), that are independent, limited companies. During 2006–2014, approximately 4 000–5 000 new startups were founded annually, of which about 300 companies (6–7%) achieved at least moderate growth over the next three years. They also find that about 70% of startups survive for at least five years, and during this time, their number of employees doubles on average.

As noted by in an analysis by ETLA Economic Research, only about 100 highly growth-oriented startups are founded annually, primarily in the software sector. These startups are generally larger, more innovative, and more growth-oriented compared to other new businesses. De-

spite the significant attention given to these firms, the overall number of such high-potential startups remains limited. The report also discusses the challenges of securing external funding for these companies, which affects about one third of them. (ETLA, 2018.)

The results in the literature suggest that positive developments in Finnish startup ecosystems since 2008 have not increased the number of startups, while the likelihood of startups to seek growth and attract venture capital has increased. In 2015, growth-seeking companies were more likely to be involved in innovation activities and own intellectual property rights compared to 2005. Furthermore, the startups had more often received public funding for innovation activities and other public support. As a part of a study by Lahtinen et al. (2016), a survey for startup entrepreneurs was conducted in 2015 to receive more recent information on startup behavior. The most common obstacles to growth mentioned by the respondents were highly competitive markets and high labor costs, while access to funding and lack of labor force were considered significant but less severe obstacles. Among startups that are seeking growth, the entrepreneurs were more concerned about the issues related to technology and production as well as access to funding when establishing their company. A smaller share of the respondents were not seeking for growth and a significantly larger share of the respondents was concerned about the highly competitive markets compared to 2005. (Lahtinen et al., 2016.)

The number of growth companies, which thematically come close to scaleups, on the other hand, has remained relatively stable and declined during recent years and this

has been seen as a challenge (Figure 9). Our analysis of scaleups is presented in chapter 5.

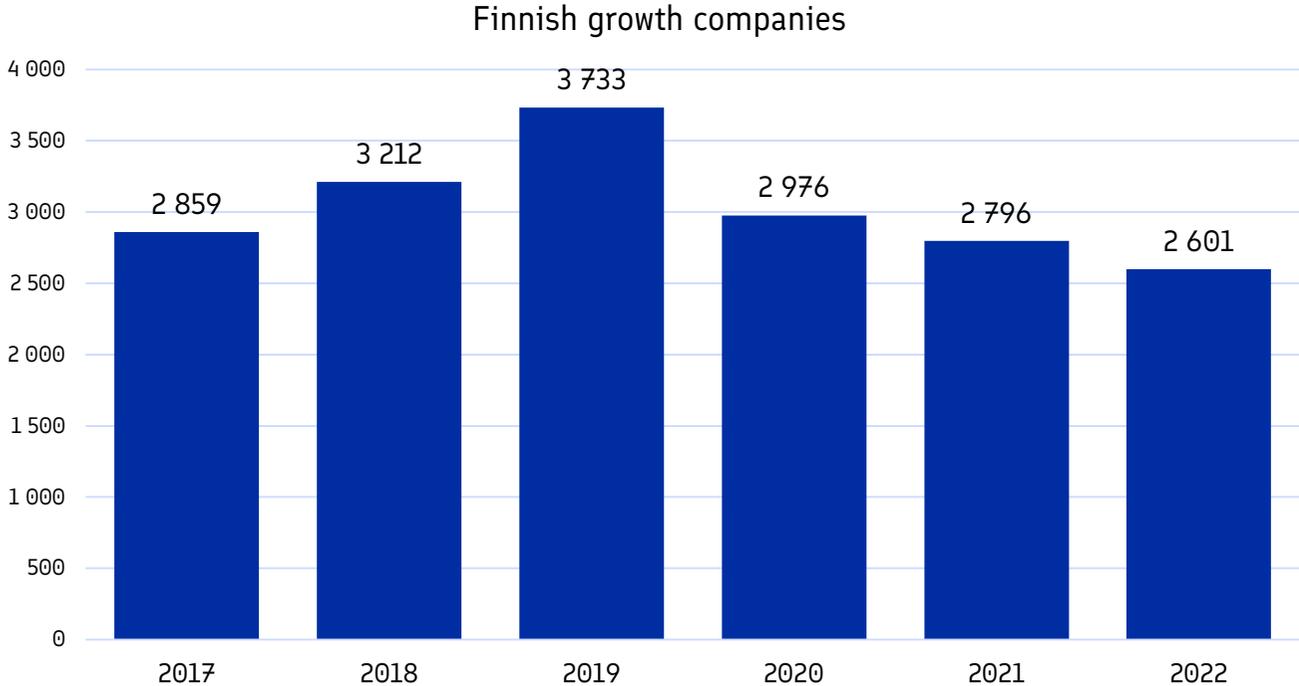


FIGURE 9. NUMBER OF FINNISH GROWTH COMPANIES IN 2017–2022. SOURCE: STATISTICS FINLAND.



By the definition provided by the OECD, scaleups are often defined as firms with 10 or more employees that grow by more than 20% annually over three years in employment, turnover or both. As in other Nordic countries the majority of scaleups resemble the most common type of firm, which are mature SMEs that have operated for 10 years or more in lower value-added service sectors such as accommodation, food services, wholesale and retail. In the earlier studies, the highest probability to scale up is in young firms providing professional business services or ICT services, which also attracts foreign investment in addition to scaleups operating in medium-high and high-tech manufacturing. Scaleups are twice as likely to expand to another region as comparable firms, with expansion taking place at the beginning of an extended growth period and being more common in the service sector than in medium-high and high-tech manufacturing. (OECD, 2023; OECD, 2022.)

Kotiranta et al. (2018) studied potential scaleup companies among new startups and discovered that only 0.3% of all-new companies appeared to have scaleup potential in 2016. These 79 startups were larger than other new companies at the time of establishment, and they were more often active in the ICT sector and located in business hubs, business parks and startup centers, and the entrepreneurs were likely to be experienced in business. More than one third of these companies reported having faced difficulties in accessing funding when starting the business, while all had RDI activities.

Middle-sized and mid-cap companies account for a small number of companies but play a significant role in the economy in terms of employment and value added. Studies produced by Simons et al. (2022) and Busk and Naumanen (2022) aim to fill the information gap on middle-sized companies together with a recent report (Lappi et al., 2023) describing the development of middle-sized companies and mid-cap companies identifying challenges and possibilities for growth and related policy options. During 2001–2020 positive development can be observed in the performance of middle-sized and mid-cap companies in terms of the number of companies, turnover, employment and value added. In 2020, there were around 2 500 middle-sized companies, 750 mid-cap companies and 300 large companies. Regarding small companies, the growth has taken place in the knowledge intensive sectors, whereas in production intensive sectors the situation has worsened since the 2008 financial crisis (Busk & Naumanen, 2022). On average, only around 3% of middle-sized companies were growth companies between 2017–2020, which is less than in other Nordic countries. However, growth companies are slightly more common among companies with 50–59 employees compared to other Nordic countries. (Nordic Innovation, 2019a, 2019b.)

Between 2013 and 2020 a transition from small companies to middle-sized took place most often in construction and trade. Regarding transition from middle-sized company to mid-cap company, the number of companies

increased in construction, manufacturing and trade, but almost as often in professional, scientific and technical activities and information and communication. Transition from mid-cap company to large company was extremely rare and took place most commonly in the trade and construction sectors. Turnover increased the most in construction among both middle-sized and mid-cap companies, while employment increased the most in the information and communication sector among middle-sized companies and in administrative and support services among mid-cap companies. The manufacturing sector, which produced the largest value added, experienced overall very limited growth in terms of turnover and employment (Lappi et al., 2022). In two thirds of middle-sized growth companies, growth was rapid based on external funding, while profitability decreased during the growth period. In the remaining part of the growth companies profitability remained positive (Busk & Naumanen 2022). For middle-sized companies a lack of labor force and fierce competition are the most acute growth obstacles reported (Simons et al., 2022). Middle-sized and mid-cap companies have not been subject to targeted policy interventions to support growth. However, between 2016 and 2021 RDI funding provided by Business Finland to middle-sized companies increased more than to other types of companies. (Lappi et al., 2023.)

Attracting talent to Finland has been a constant struggle over the assessment period. There has been plenty of discussion and plenty initiatives have been launched, but

the theme has remained the same: How to attract talent to Finland and how to get it to stay in Finland? At the same time the role of immigrants in startups has been growing in recent years (around one fifth of the persons in startups are nowadays migrants or foreign-born) (Business Finland 2023). Many aspects are deemed to influence this, notably migration policies, tax policies as well as potential economic and financial upside. Even though there are many instruments available (such as the startup permit), there is still a wider challenge in attracting talent to Finland.

The startup landscape has changed to some extent from ICT to deep tech startups. Most of the assessment period is seen as a “startup era” related to ICT or cloud and applications, whereas deep tech and industrial innovation is something that has seen more take-up in recent years. During the assessment period, besides the rise of deep tech there were also lot of technological trends impacting the startup landscape in the areas of quantum technologies, space and satellite technologies, optics and photonics and material technologies.

Furthermore, the Finnish Global Entrepreneurship Monitor report 2021/2022 (Björk et al., 2022) provides information on the observed entrepreneurial landscape in Finland based on surveys. The results indicate concerns despite positive developments since the previous monitor report in 2016. Lack of support to entrepreneurship in cultural and social norms remains as a national weak point, discouraging starting a business and becoming an

entrepreneur. In addition, Finland has a low number of early-phase or established entrepreneurs who expect high growth and high increase in employment, while Finnish entrepreneurs are the least active in exports compared to Sweden, Norway and Netherlands.

The COVID pandemic and the war in Ukraine changed the operating environment of startups and scaleups drastically, also opening some new areas for innovation and placing new emphasis on energy technologies as well as supply chain management.

3.3 CRITICAL OBSTACLES AND BOTTLENECKS IDENTIFIED

Critical obstacles and bottlenecks are identified in all the interview phases of the assessment and research literature. We have divided them into the following broad categories:

- Political and cultural obstacles: posing challenges for starting up, scaling up or internationalization.
- Financial and economic challenges relating to the finance available for different stages of company growth and internationalization.
- Obstacles relating to public funding and services helping startups and scaleups: challenges relating to the public or private services available for these companies.

Most of the challenges relate to general issues related to growth companies or internationalization, where possible we try to connect them to the services analyzed in this assignment.

3.3.1 POLITICAL AND CULTURAL CHALLENGES

Scaleups are not featured enough in the political agenda. Bold statements in some of the interviews claimed that scaleups or company scaling are not on the agenda of Business Finland or other public funding. There are several nuances to this, and it relates to available funding instruments, but the main concern was the lack of political goal setting and the managerial goal setting specifically dealing with the scale up phenomenon. From the service perspective the same is discussed later as a lack of growth-stage services other than funding.

Interest in establishing startup companies is waning, at least if you compare the situation in 2024 across the timescale of the impact assessment. Many interviews point out that interest has been decreasing. Many point out the weakening of the ICT sector, increased risks or the decrease of buzz around startups especially during the last few years. At the same time, especially investors point out that among those with ideas the quality of the ideas has been improving during the period.

There is a lack of competencies for sales, marketing and competitiveness. The lack of required competencies for startup and scaleup activities is mentioned both as a cultural challenge for Finland as well as overall internationalization challenge. Getting high-level expertise to Finland has been difficult over the analysis period and this situation continues.

Ambition and risk awareness of entrepreneurs at the scaleup state is too scarce. Too few companies in the startup phase are scaling up. Even though this may have to do with the viability of the business case or lack of funding, interviews point out the cultural challenge of risk taking or ambition as a supporting factor. This is in connection with various surveys from the assessment period, i.e. according to a survey conducted by ETLA (2015), particularly small businesses (0–9 person companies) face the challenge of wanting to avoid debt, which growth would require. The survey also found that heavy regulation and administrative obligations were seen as a challenge to growth for several companies.

Finland has a strong regulatory tradition. In some fields the regulatory environment might be an obstacle to the growth step. This is especially relevant for deep tech (material technologies, food technologies etc.) or foreseen to be same in the AI field. This has been seen more as European challenge and not only a Finnish one. According to Lahtinen et al. (2016) half of the companies that started have encountered obstacles, delays, or problems during the startup phase in 2015. The proportion

increased between 2005 and 2015 from 45% to around 50%. The problems and delays were primarily related to factors other than the skills and expertise of the entrepreneur or the founding team.

Lack of (deep tech) startup and scaling competencies in Finland. Many respondents point out that, in the longer term, the lack of competencies relevant to industrial innovation and deep tech innovation is prominent. Although in the recent downturns (of the assessment period) the lack of competencies might not be on the agenda.

3.3.2 FINANCIAL AND ECONOMICAL CHALLENGES

Access to finance is essential for firms' innovation and growth. Firms funded by venture capital experience higher growth rates than those without this type of funding (Felix & dos Santos, 2018). Venture capitalists are different from traditional investors because, besides capital, they bring along a network of contacts and other essential knowledge. For instance, venture capitalists can offer advice, engage in critical analysis of firm decisions, help recruit staff and, in some cases, even help attract a potential supplier (Felix & dos Santos, 2018).

Relatively few studies have examined the factors that hinder firm growth. For instance, Lee (2014) finds that the obstacles that high-growth firms face in the UK are related to recruitment, skill shortages, obtaining finance, cash flow, management skills and finding suitable premises. Karlsson (2021) explores the relationship between firm size and perceived growth barriers in Sweden. He

finds that the obstacles differ according to firm size. Small firms often face constraints in equity financing, whereas larger firms face obstacles regarding competition and recruitment.

There is a lack of private financing or VC financing or “capital poorness” (despite the growth in VC financing). Overall, the interviews and earlier research point out that, for startups, Finland has good public and to some extent private financing instruments available. However, during

the assessment period, the general amount of private capital has been decreasing significantly. This lack of capital and “capital poorness” is a phenomenon mentioned as a key bottleneck for the Finnish startup and scaleup landscape. This can be seen in the complementary survey to companies in this impact assessment where the availability of funding was seen as a major bottleneck relating to startup and scaling activities (see Figure 10).

From your experience today, how important have the following bottlenecks relating to public support for startup and scaling been for your company’s development:
(n=250–253)

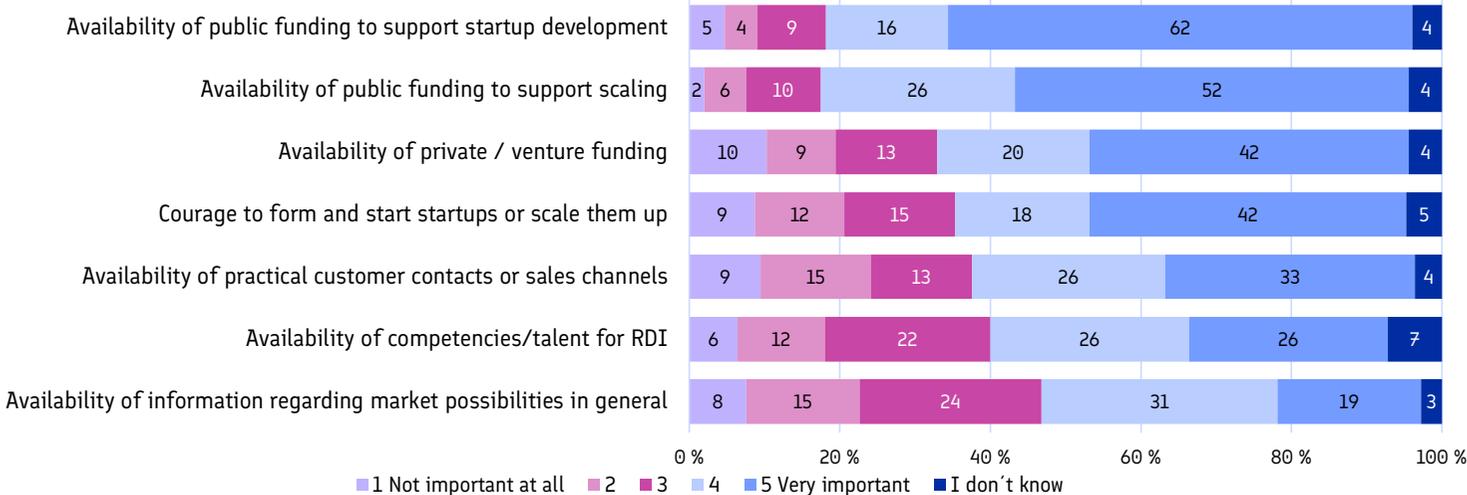


FIGURE 10. SURVEY RESPONDENTS’ VIEWPOINT OF BOTTLENECKS RELATING TO PUBLIC SUPPORT FOR STARTUP AND SCALING.

In 2015, problems related to business growth (Lahtinen et al., 2016) were particularly related to the intense competitive situation, with 20% of respondents reporting it as a challenge. A significant change has occurred in the competitive situation since in 2005, when only 7% of new entrepreneurs identified intense competition as the most important factor limiting growth. In addition, labor costs (16% reported it as challenge) and financing (9% reported it as challenge) posed challenges to growth in 2015. According to the research, public sector services and support have been utilized increasingly 2005–2015, but despite this, problems related to business financing have grown among growth-oriented companies.

Scaling up non-ICT related innovations requires a different level of investment or different kinds of financing instruments. During the assessment period there has been increasing interest among other technological sectors for startup and scaleup activities. This also applies to deep tech development in Finland. The innovations in process technologies, material technologies or deep tech require more financing in various tests and pilots, or industrial scaling, which poses challenges from the financial perspective for private and public financing as well.

Human capital is crucial to firm growth (Felix & dos Santos, 2018; Daunfeldt et al., 2016; Eklund, 2020). Felix and dos Santos (2018) observe that, in Portugal, investment in human resources and R&D intensity positively influences the growth of small and medium-sized enterprises (SMEs). In Italy, medium-sized firms that invest

more in foreign R&D have been observed to have higher innovation performance than others (Ferraris et al., 2021). The opportunity to gain knowledge from foreign partners can improve firms' innovation and help firms use their internal R&D investment more efficiently. Segarra and Teruel (2014) estimate that investment in internal and external R&D positively impacts firm growth in Spain. Eklund (2020) shows that in Denmark, intangible capital (R&D assets, organizational capital assets and information communication assets) and the share of highly educated employees can support a firm's growth.

3.3.3 CHALLENGES SPECIFIC TO PUBLIC SERVICES

Matching up the competencies of public services and startups and scaleups. Business Finland receives mostly positive feedback on its competencies. Only one challenge is pointed out: the matching of competencies with the needs of startups and scaleups. This is pointed out from various angles such as on the assessment of funding applications or on the ways of interaction between different Business Finland experts and the startup community. Some also criticize the long duration of funding decisions or inadequate industry knowledge of the professionals working at Business Finland.

Funding decision times are mentioned as a crucial development factor by external stakeholders. Organizational changes are partly seen as the reason for funding decisions. This is especially relevant for smaller scale services, such as Tempo, which can be seen as a “test for the company”

for various dimensions (i.e. product or team). Besides the long duration of the applications, more active preliminary scanning of ideas would be beneficial so that the viable ideas could be screened beforehand, and the entrepreneurs could avoid unnecessary application processes.

In our complementary survey to companies many respondents suggested that Business Finland could provide more hands-on support, particularly in market research, internationalization, and networking with private investors and venture capitalists. This includes facilitating participation in international events, pilot projects with large businesses, and building global sales networks.

There is a demand for funding programs tailored to companies that have outgrown early-stage funding but still require support for scaling, especially those that do not fit into the current NIY criteria due to age or other factors.

Balance between financing and other activities within Business Finland. In the interviews it is pointed out that not all funding possibilities are sufficiently well known. There are other activities in Business Finland: marketing, communications or activation work which should be better aligned with the funding services and processes. Developing this theme would avoid misunderstandings or misconceptions when applying for the funding and help in the general activation of startups and scaleups. This would potentially increase the quality of applications. There is also a discussion about the lack of incubation activities and/or environments for very early-stage startups.

The importance of internationalization in all communications (from funders to the companies, from companies to their customers) is not realized enough. Stakeholders point out that emphasizing the requirements for internationalization in all communications and funding processes is a double-edged sword. While recognizing the importance of this, it has also seen as a potential challenge for getting new ideas on board of the financing, which might later turn out to be internationally interesting or provide other combinations with the original idea.

The right balance between big enterprise or cluster funding and startup funding. Another discussion in the interviews is to find out the right balance between big companies or Veturi funding and startup funding. While the VETURI projects are generally seen as a positive, it is noted that potential radical innovations or ideas are left out of these approaches and are more likely to stem from the startup and scaleup field.

Political uncertainty and lack of long-term policy focus on startups and growth enterprises. External stakeholders see the national RDI policy in startup and growth fields as too short-term and lacking in long-term consistency. This, in connection with a capital-poorness, is seen as a challenge for developing startups in the fields requiring more financial investments, i.e. industrial or deep tech startups. Lack of long-term political focus is seen to impact on public services and financing available, making the funding environment slightly vulnerable for political challenges.

Focus in the internationalization support instruments is challenging. Internationalization instruments focus on competencies but not enough on real connections. From the internationalization perspective the respondents point out that the challenge of current public services and analyzed instruments is that they focus on creating market knowledge or understanding the market, while the real practical issues of the companies relate to entry into markets (i.e. participation to the key events or forming the first deal). No one misses the “export travels” of yesterday, but there is a lack of development, testing instruments or activities. Also, external stakeholders see the dual system of various public organizations as inefficient.

Lack of funding for the team in startup services. One of the challenges for public funding relates to the gap between public and private financing for the right team within the company. This is stated in many interviews as well as the earlier research. This means that in many companies the most helpful stage would be to partly subsidise the key persons of the team (CEO, Sales, Marketing) rather than or in addition to the technical side of the business. This would mean more focus on the commercialization aspect as well. As for the external competencies the interviews repeat many already noted challenges on getting expertise from aboard, utilizing those who already study and work in Finland and so on.

The lack of cooperation models and systemic processes between innovation funders seem to prevail and is especially relevant in scaleup phase. This includes Business

Finland, TESI and Finnvera. Also, the regional aspect has been lost after all the organizational arrangements, so in practical terms it only depends on the personal-level connections among the various public funders. Some challenges relate to group funding instruments (outside the scope of this assessment) and their organization. There is a lack of coordination among public funders in this respect.

There is also some discussion about the quality of applications and the excessively prominent role of consultants in the applications (especially in some assessed instruments as described later). To some extent external stakeholders point out that excessive focus on applications rather than interaction with the applicants might be challenges especially from the startup perspective.

3.4 INTERNATIONAL CASE EXAMPLES

This chapter summarizes the key findings on how fast growth programs or organizations similar to Business Finland in other countries have succeeded in improving the development of fast-growth companies. International benchmarking was relatively limited in this impact assessment, which focuses on different approaches the countries had taken and different service programs available for startups or scaleups within countries. We tried to find a mix of top-down and bottom-up approaches of the various countries (Figure 11). The chapter is based on online material, webpages and service “inventories” from

each country. These inventories are available from Business Finland if requested.

Based on the evaluations and impact assessments carried out in the different countries we first present our

viewpoint from the various countries and their strengths in success with startup and scaleup funding.

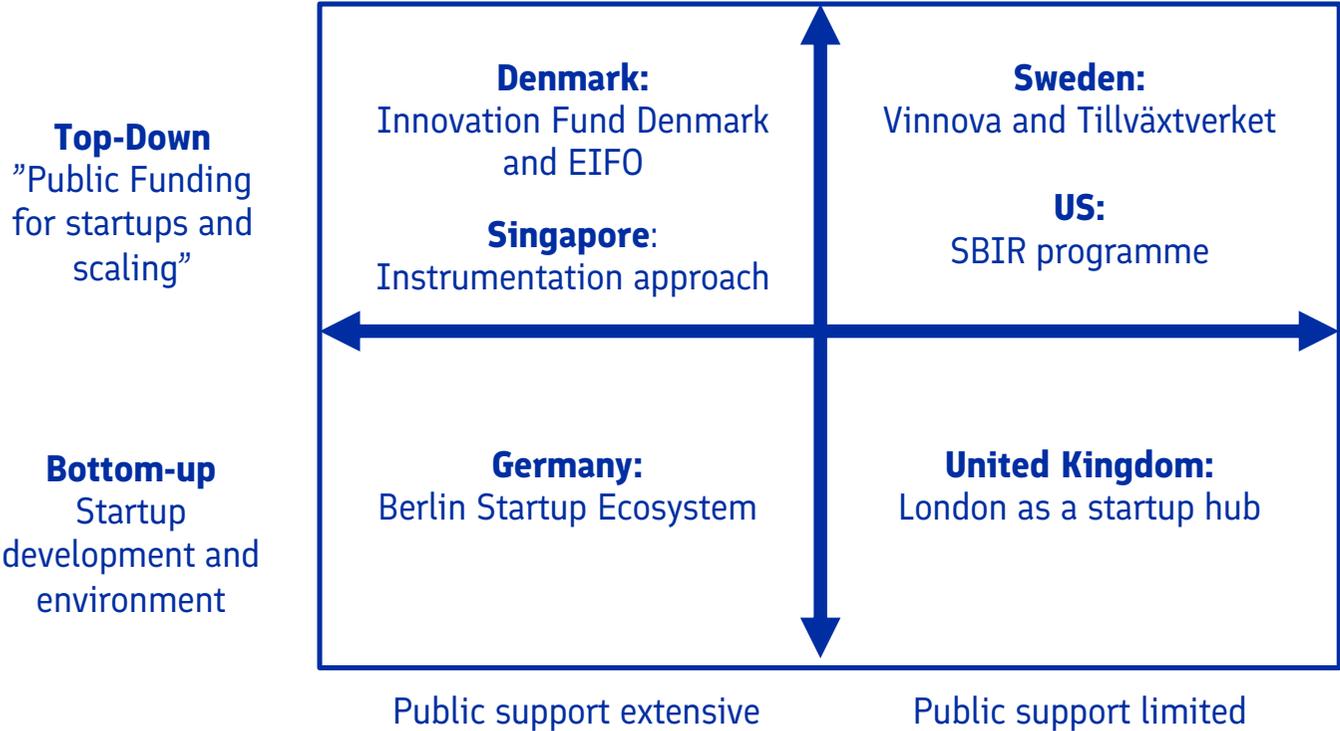


FIGURE 11. OVERVIEW OF THE BENCHMARKING COUNTRIES.

3.4.1 DENMARK

Denmark has a vibrant startup ecosystem supported by both public and private funding. The main public actors include Innovation Fund Denmark, which invests in early-stage projects with potential societal value, and the Export and Investment Fund of Denmark (EIFO), which offers loans and guarantees in collaboration with other financial institutions. Private foundations, particularly the Novo Nordisk Fund, significantly contribute to R&D funding, complementing public investments (Kuusisto et al., 2022).

Innovation Fund Denmark is a Danish government agency which invests in research and innovation. It invests particularly in sustainable solutions. Its primary goal is to invest in early-stage projects with the potential to generate societal value, foster growth, and create employment opportunities.

A state-owned financial institution, the Export and Investment Fund of Denmark (EIFO) is the national promotional bank and export credit agency. EIFO offers loans and guarantees to Danish companies in all stages of growth. The loans and guarantees are offered in collaboration with Danish banks, financial institutions, leasing companies and investors. EIFO has, for example, special loans for startups which are in the early stage of their development.

Private foundations complement public RDI funding in Denmark. Private foundations fund some projects that public RDI funding does not cover. A major contributor

to RDI funding in Denmark is Novo Nordisk Fund. Novo Nordisk Fund's share of private RDI funding in Denmark was 13% in 2021. The fund offers long-term RDI funding to offset short term fluctuations in government budget funding. (Kuusisto et al., 2022.)

There has been a clear positive shift in how the VC market in Denmark is viewed, with more VC firms participating and a notable rise in available funding. VC funding commitments increased in 2019. VC has mainly been invested in digital or life science startups (EY, 2020).

Innovation Fund Denmark has conducted several evaluations of its programs. The organization commissioned an impact study of Innobooster in 2021. The results of the impact study indicated that companies receiving the Innobooster grant outperformed comparable firms in the first year after project approval, showing higher R&D expenditure and total employees, as well as higher turnover. The study identified an increased probability of a change in ownership, which may reflect that companies receiving the grant become more investable. However, long-term outcomes were not demonstrated due to the study's short-term data. (HBS Economics, McKinsey & Co Denmark, and MUUSMANN, 2021.)

Summary of the key impacts from impact assessments from Innobooster:

- Companies receiving the grant outperformed comparable firms in R&D, employment, and turnover. There was an increased probability of ownership changes,

reflecting increased investability. (Innovation Fund Denmark 2021.)

- Evaluations showed user satisfaction and impact in terms of faster time to market and shared risk through state support. (Irisgroup, 2017.)

Besides these several other qualitative aspects could be mentioned based on online material and the studies available. These are:

- **Innovation Culture:** Denmark has a strong culture of innovation, supported by a high level of digitalization and strong intellectual property rights protection. The country ranks highly in global innovation indexes.
- **Sustainability Focus:** Denmark is known for its emphasis on sustainable and green technologies, aligning with global trends towards environmental responsibility. Startups in renewable energy, biotechnology, and sustainable agriculture are particularly encouraged.
- **Government Support:** Besides Innovation Fund Denmark, the Danish government offers various tax incentives and support programs to foster innovation and entrepreneurship.

3.4.2 GERMANY (BERLIN FOCUS)

Germany has a robust ecosystem of startup and scale-up funders, including venture capital firms, accelerators, and angel investors. The funding landscape in Germany is decentralized across federal states and institutions, en-

trepreneurs benefit from a diverse range of resources and funding options to accelerate growth, drive innovation, and build successful businesses.

When looking at a particular city or region, it should be noted that there are a multitude of actors involved in the startup and scaleup landscape within that city. Regional development agencies in German states (Bundesländer), such as Investitionsbank Berlin (IBB) in Berlin or NRW. BANK in North Rhine-Westphalia, administer funding programs tailored to local startup ecosystems.

The city of Berlin has developed an internationally competitive environment, an “ecosystem” for startup entrepreneurs. Berlin’s advantages include increasingly professional investor networks and the growing internationalization of startups. The Berlin Startup Unit is a division within the Senate Department for Economics that focuses on strengthening Berlin’s startup ecosystem through various programs and initiatives, including startup support services and ecosystem development. Berlin Startup report is an overview of the state of the Berlin startup ecosystem. Inflow of capital to Berlin reaches a new record level almost every year. Berlin startups were able to raise by far the most capital in Germany (Senate Department for Economics, Energy and Public Enterprises, 2022).

One of the region’s largest startup programs is EXIST. The Federal Ministry for Economic Affairs and Climate Action (BMWK/BMWi) commissioned a comprehensive evaluation of the EXIST startup grant and EXIST research transfer measures for the 2014 to 2018 funding period.

According to the evaluation, the companies founded by the beneficiaries of these two measures are highly market-relevant: Compared to the general population, these companies, which were on average 4.9 years old (EXIST startup grant) or 3.4 years old (EXIST research transfer) at the time of the survey in March 2020, not only exhibit a significantly higher survival rate but also demonstrate above-average employee numbers and turnover figures. The economic impact of the EXIST measures is also substantial. (Ramboll Management Consulting, 2021.)

The largest startup support program of Germany EXIST (Business Startup Grant (EGS)) is being also evaluated by Mueller (2023). According to Mueller, Germany's largest startup support program contributes substantially to the development of the products and the business planning of the funded startups and increases not only their degree of networking during the funding period but also their uptake of external funding. It apparently also contributes to an increase in the skills of the founding team, although this effect is small and associated with a high degree of uncertainty.

Key strengths in the Berlin Ecosystem are:

- **Diverse Ecosystem:** Berlin has a diverse and vibrant startup ecosystem, attracting talent from around the world. It is known for its strong creative and tech sectors, with a growing emphasis on fintech and health tech.
- **Access to Funding:** Germany offers a compre-

hensive range of funding options, including public grants, venture capital, and loans from institutions like KfW. Berlin's ecosystem benefits from both local and international investors.

- **Collaborative Environment:** Berlin's numerous incubators, accelerators, and co-working spaces create a collaborative environment that fosters innovation and business growth.

3.4.3 SWEDEN (VINNOVA FOCUS)

Sweden's startup ecosystem is highly supported by Vinnova, a government agency investing around EUR 300 million annually in innovation and research. Other significant actors include Tillväxtverket and the Swedish Institute, which promote sustainable business development and international cooperation. Private VC firms like Creandum and EQT Ventures also play a crucial role. Sweden leads in venture capital invested in impact startups in Europe.

Vinnova's funding and support programs accelerate the development of innovative solutions and help Swedish startups lead in venture capital funding for impact innovations. The programs enable startups to scale and contribute to a sustainable society. Vinnova's Impact Innovation program accelerates sustainable innovations, providing significant funding and support to startups and scaleups. (Vinnova, 2023.)

Strategic Innovation Programs: Evaluations of programs like Bioinnovation and Swelife showed concrete re-

sults in prototype development and initiation of follow-up projects. These programs have led to innovations that support sustainable societal transitions. (Sweco, 2023.)

Tillväxtanalys conducted an impact assessment of state-funded initiatives aimed at promoting SME exports. The impact assessment assessed following programs: Business Sweden: grundläggande exportutbildning (Steps to Export), Tillväxtverket: affärsutvecklingscheckar för internationalisering, Almi: Företagspartner AB, exportlån, Enterprise Europe Network: internationell affärsrådgivning och partnersökning. The impact assessment found that companies that do not export are more likely to start exporting after contact with export promotion. Companies already engaged in exporting showed an increase in export volume. The most significant positive effects were observed in companies receiving support from multiple actors. Only marginal effects were noted for companies already proficient in exporting. (Tillväxtanalys, 2020.)

Key strengths in the Swedish startup and scaleup ecosystem are:

- **High R&D Investment:** Sweden's substantial investment in research and development supports a strong innovation ecosystem. The country is a leader in tech innovation and home to globally recognized companies like Spotify and Klarna.
- **Public and Private Synergy:** There is a strong synergy between public initiatives (like those by Vinnova) and private venture capital, fostering a robust

environment for startups and scaleups.

- **Talent and Education:** Sweden boasts a high level of education and a well-trained workforce, particularly in STEM fields, which supports the growth of innovative companies.

3.4.4 UNITED STATES (SBIR FOCUS)

In the United States case, we focused on the Small Business Innovation Research (SBIR) program. The SBIR program is seen a key driver of startup and scaleup funding, providing competitive grants to support high-tech innovation in the United States. The SBIR program helps startups overcome early-stage funding challenges and fosters collaboration between small businesses and federal research agencies.

The SBIR program has been pivotal in providing early-stage funding and fostering collaborations between small businesses and federal research agencies. It has contributed to significant increases in patenting activities and revenue, especially for financially constrained firms. SBIR awards have been linked to higher probabilities of receiving subsequent venture capital, indicating the program's effectiveness in supporting high-tech innovation.

Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs are initiatives that support and encourage domestic small businesses in engaging in federal Research and Development (R&D) with a potential for commercialization. Central to these programs is the goal of stimulating high-tech inno-

vation and entrepreneurial spirit in the United States by integrating small businesses into the national R&D arena. This approach not only fosters technological innovation but also addresses specific federal R&D needs while promoting a robust national economy.

The SBIR and STTR programs are structured in three phases, each with distinct objectives ranging from the establishment of technical merit and feasibility in Phase 1, to the continuation of R&D efforts in Phase 2, and eventually moving towards commercialization in Phase 3. The Small Business Administration (SBA) plays a critical role in coordinating the SBIR program, ensuring its alignment with congressional directives and overseeing its implementation across various federal agencies. Phase 1 lasts from 6 months to 1 year and has a funding of \$50 000 – 250 000, and phase 2 lasts 2 years and has a funding of \$500 000 – 1.5 million. Phase 3 does not get SBIR funding.

The impact assessments point out:

- Key findings demonstrate that these programs effectively support high-risk, high-reward research initiatives. Awardees are three times more likely to publish scientific papers and eight times more likely to secure patents post-award compared to their pre-award outputs. (National Academies of Sciences, Engineering, and Medicine, 2023.)
- Furthermore, firms receiving SBIR/STTR awards are more likely to attract follow-on private-sector funding,

achieve acquisition, or initiate public offerings. However, these firms also exhibit a higher propensity for failure, which may reflect the inherent risks associated with pioneering high-innovation projects. (ibid.)

- The programs also expand the diversity and geographical reach of innovation by funding startups in regions typically underserved by venture capital. This strategic funding broadens the technological innovation landscape across the United States, enhancing the nation's competitive edge in global markets. (ibid.)
- The NIH SBIR and STTR programs have significantly fostered innovation and commercialization within the U.S. health and technology sectors (National Academies of Sciences, Engineering, and Medicine, 2022).
- NASA's Small Business Innovation Research (SBIR) program has demonstrated significant impacts on participating companies and the broader technological landscape. According to a comprehensive survey, around 11% of the companies initiated spin-off companies, and 6% underwent mergers or acquisitions, showcasing the program's role in fostering business growth and innovation. Despite these transformations, a substantial 75% of companies reported no major corporate changes like IPOs, indicating varied commercial outcomes. (National Academies of Sciences, Engineering, and Medicine, 2016.)
- Research shows that the SMP-I program, which provides matching funds to successful SBIR Phase I

recipients, significantly increases the success rates of companies advancing to SBIR Phase II, particularly for those participating in the National Science Foundation's SBIR program. This suggests that state-level interventions can enhance the effectiveness of federal innovation programs by improving outcomes for small businesses. (Lanahan, 2015.)

A study in 2021 found that firms receiving SBIR subsidies generally hire fewer employees compared to non-recipient firms. This suggests that the subsidies, while bolstering innovation, do not translate equivalently into direct job growth. (Lanahan, Joshi & Johnson, 2021.)

In the assessment it is also noted that SBIR provides a lot of activities within programs around networking between companies, between companies and VC funders and other actors. (Selviaridis, 2019). Besides the SBIR the overall U.S. market ecosystem helps its success. The United States is seen as a leading innovation hub with diverse funding opportunities and strong IP protection.

3.4.5 UNITED KINGDOM (LONDON FOCUS)

The UK's startup ecosystem is concentrated in London, with substantial support from public and private sectors. Innovate UK and UK Research and Innovation (UKRI) are key public funders, providing grants and resources to startups. London also attracts significant venture capital investment, making it a dynamic hub for startups and scaleups. The national innovation agency Innovate UK

supports the UK startup ecosystem through multiple accelerator programs, grants and resources.

UK Research and Innovation (UKRI) is the national funding agency investing in science and research in the UK. Operating across the whole of the UK with a combined budget of more than £6 billion, UKRI brings together the seven Research Councils, Innovate UK and Research England.

Private equity and venture capital firms are very active investors in London startups and scaleups. Aside from a slight drop in 2018, VC activity in London has grown significantly over the past decade, from just 39 deals in 2012 to 634 in 2022. (Cheesman, 2024.) The local startup "environment" is a crucial factor for success. Then "how public instruments are used" is the key question for the future.

In the study comparing the U.S. Small Business Innovation Research program (SBIR) with the UK Small Business Research Initiative (SBRI) (Tredgett & Coad, 2013), quantitative data from the initial years of both programs were analyzed. This analysis included metrics such as the number of competitions, applicants, and research contract expenditures. The study identified key differences in implementation between the US SBIR and the UK SBRI and discussed possible reasons for the divergent growth trajectories observed in their early years: quantitative data show that while the US SBIR had steady growth, the UK SBRI has had a shaky start.

The evaluation of the Seed Enterprise Investment Scheme (SEIS) revealed significant benefits. SEIS ef-



fectively channels investment towards small startups, reducing risk for investors and helping businesses that struggle to secure external funding. It addresses funding gaps for early-stage businesses and mobilizes additional private investment, supporting essential business development and innovation. SEIS-backed businesses experience notable growth in turnover, employment and assets, with positive impacts on productivity and expansion across different sectors and regions. SEIS investment helps startups attract further finance beyond equity funding by demonstrating product viability. Stakeholders, including investors and businesses, view SEIS positively for its role in facilitating early-stage funding and fostering business growth. SEIS plays a crucial role in supporting small startups and driving business development, with potential for further enhancement through increased investment limits. (Ipsos, 2023.)

One evaluation focused on assessing the effectiveness of the Enterprise Investment Scheme (EIS) and the Venture Capital Trust (VCT) scheme in incentivizing investment in early-stage businesses concludes that the EIS and VCT schemes effectively target and support early-stage and innovative companies, incentivizing investment from high-net-worth individuals through appropriate tax relief mechanisms. The schemes are considered appropriate mechanisms for achieving policy objectives, with no identified better alternatives. (Kantar Public, 2023.)

Overall London's strengths relate to its global role in world economy, such as:

- **Financial Services Hub:** London is one of the world's leading financial centers, providing ample opportunities for fintech startups. The city also has a strong focus on tech innovation.
- **Global Connectivity:** London's position as a global city with extensive international connections makes it an ideal location for startups aiming for rapid international expansion.
- **Supportive Ecosystem:** The UK government offers numerous initiatives, such as the Enterprise Investment Scheme (EIS), to support early-stage companies and attract investment.

From the service perspective Innovate UK's accelerator programs and grants have played a pivotal role in supporting startups and scaleups in London. The substantial venture capital investment in London has further driven the growth of innovative companies. (Kantar Public, 2023.)

SEIS and EIS Programs evaluations have shown that these schemes effectively channel investment towards small startups, reducing risk for investors and supporting business growth. The schemes have led to increased turnover, employment, and assets among supported businesses. (Ipsos, 2023; Kantar Public, 2023.)

3.4.6 SINGAPORE (INSTRUMENTATION FOCUS)

In 2017, Enterprise Singapore initiated Startup SG to promote the dynamic startup scene in Singapore both at home and abroad. This platform facilitates a smoother pathway for startups and their ecosystem allies to identify and utilize available support channels. Following that, in 2018, the Startup SG Network was introduced to further unify the nation's technology startups, fostering a culture of innovation and cooperation. As a digital hub for Singapore's tech startup community, it enables these emerging businesses to enhance their visibility and connect with local and international industry stakeholders, thus broadening their potential for development.

Startup SG has five programs: Founder, Equity, Infrastructure, Accelerator and Startup SG Talent. Startup SG Talent includes six different subprograms: EntrePass, T-Up, Global Ready Talent Program, Tech@SG, Global Tech Talent Alliance, and Innovation and Enterprise Fellowship Program. Government initiatives like the Enterprise Financing Scheme and Productivity Solutions Grant have provided essential funding and support to startups in the instrumentation sector, facilitating their growth and innovation. (Enterprise Singapore, 2023.)

Enterprise Financing Scheme and Productivity Solutions Grant: In 2023, Enterprise Singapore supported 18 000 enterprises, boosting revenue and creating jobs. The programs facilitated internationalization and innovation, leading to significant economic impacts.

Evaluations highlighted the effective utilization of R&D investments and the positive impact on total factor productivity, although there is room for further improvement (Sfarif, Chandra, Mansoor & Sinha, 2021).

Singapore's startup ecosystem, particularly in instrumentation, is supported by various government initiatives such as the Enterprise Financing Scheme and the Productivity Solutions Grant. These programs help startups access capital and develop innovative solutions. The Global Ready Talent program also supports talent attraction and development.

- **Strategic Location:** Singapore's strategic location in Asia makes it an ideal hub for startups looking to access Asian markets. The country's robust infrastructure and connectivity support international business operations.
- **Government Initiatives:** The Singaporean government is highly proactive in supporting startups through various schemes and grants, such as the Startup SG initiatives.
- **Innovation and Technology:** Singapore focuses on high-tech and innovation-driven startups, particularly in fields like biotechnology, fintech, and smart city technologies.



In 2021 the Capability Development Grant (CDG) has been shown to lead to statistically significant improvements in firm-level outcomes, specifically in revenue and exports. Firms that received the CDG generally saw a 3.1% increase in revenue and a 2.5% increase in total exports. (MTI, 2021.)

Recipients of the Global Company Partnership (GCP) Grant experienced increases in both revenue and exports, with the grant leading to a 1.8% increase in revenue and a 1.0% increase in exports. This grant effectively supported firms in deepening their international presence. (Ibid.)

The Market Readiness Assistance (MRA) has been particularly impactful, with recipients seeing significant increases in both revenue and exports. An additional grant amount led to a 5.3% increase in revenue and a 4.4% increase in total exports for the average recipient. (Ibid.)

4 BUSINESS FINLAND-FUNDED STARTUPS



This chapter presents a statistical analysis of the economic and internationalization development of Business Finland-funded startups. We applied the Finnish Startup Community's database on startups from 2010 to 2021, restricting the data to firms that have operated for a maximum of five years. We merged firm-level information from Statistics Finland, Finnish Customs and Business Finland from the same period. Before presenting the results of the statistical analysis, we will briefly discuss the research literature on startups. We will discuss the key factors influencing startup success as identified in the research literature.

4.1 SUCCESS IN STARTUPS IN THE LITERATURE

Founders and their characteristics, skills, knowledge, and experience are crucial factors in startup success. Of the founder-related characteristics, self-efficacy, creativity, innovativeness, and risk-taking are the most important for startups' success (see literature view by Aryadita et al., 2023). Management and political skills are some of the founder skills needed in startup development. Moreover, founders' and teams' technical and product-related

knowledge and market- and business-environment-related knowledge are essential for startup success. (Aryadita et al., 2023.) Recently, Jo and Jang (2021) have argued that process innovation is the most critical factor in creating fast-growing startups.

Access to finance is vital for startup growth. Startups can use several different financial sources, although prior studies have found that small growth firms often face difficulties acquiring external financing (Coad and Srhoj, 2020; Hadlock and Pierce, 2010; Brown et al., 2009; Beck et al., 2006). According to some studies, most startups use internal funds or debt financing for growth (e.g., Brown & Lee, 2014; Smallbone et al., 2002). Using survey data, Mann and Sanyal (2010) observe that larger startups and incorporated startup firms use external financing (debt or equity) more likely than sole proprietorships or small firms, which are more likely to be financed by internal financing sources. Moreover, they also find that hi-tech startups are more likely to use external equity financing as opposed to internal resources.

Venture capital (VC) can be a vital financial resource for startups (e.g., Hellmann and Puri, 2000; Brown et al.,

2017). Venture capitalists differ from traditional investors in that they provide not only capital but also a network of contacts, along with essential knowledge and support. These are important factors for the development of startups. Some studies show that firms funded by VC present higher growth rates than those without this type of funding (Felix & dos Santos, 2018), while some papers do not find such effects (Ali-Yrkkö et al., 2019). Business angels typically invest in the same high-risk and growth-oriented startup firms as VC but at an earlier stage. Ali-Yrkkö et al. (2019) discovered that angel-funded firms have faster employment growth than similar non-funded firms. After controlling for public innovation funding received and other firm characteristics, the average growth rates do not differ significantly. However, angel investments increase the survival rate of young companies. The literature also states that VC events can act as important signals of startup quality in markets with high levels of information asymmetry. However, Davila et al. (2003) find that new firms that receive VC funding experience high growth, but the previous growth of a startup does not predict future VC funding. This implies that venture capitalists do not use growth as a criterion when selecting suitable startups for their investments.

Weik et al. (2024) examine the international migration patterns of startups, leveraging extensive data on the headquarters locations of startups across 17 countries (Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Norway, Poland, Portugal, Rus-

sia, Spain, Sweden, Switzerland, and the United Kingdom). They argue that venture capital in most European countries is somewhat dependent on foreign investment, which may facilitate the relocation of startups. Their findings suggest that enhancing domestic financing conditions can mitigate the outflow of startups from a country. The study reveals that the relocation of startups abroad is relatively frequent (with 6% of startups engaging in such moves) and identifies the United States as the most prevalent destination for these relocations. The results imply that venture capitalists relocate startups mainly to help with subsequent fundraising. Furthermore, the research indicates a strong association between foreign venture capital investment and the relocation of startups, often accompanied by the migration of a substantial portion of the startups' workforce. Braun et al. (2019) also provide evidence that foreign VC in Europe leads to talent emigration.

The literature typically finds a positive relationship between innovativeness and firm performance (e.g. Rosenbusch et al. 2011). Using Finnish data and an ex-ante measure of innovativeness, Hyytinen et al. (2015) find a negative association between startup innovativeness and survival. They estimate that survival probability is 6-7 percentage points lower for startups engaged in innovations than other startups. One explanation for the result is that the innovativeness of startups can potentially constrain their access to external financing, and it may also alter startups' overall risk profile by increasing the variability and skewness of the revenue stream.

4.2 BUSINESS FINLAND-FUNDED STARTUPS

We will describe the results of Business Finland-funded startups compared to other startup firms in Finland during 2010–2021. Startups were identified using the Finnish Startup Community’s database from 2010 to 2021, and the data were restricted to firms that have been operating for a maximum of five years.⁷ Business Finland’s funding application data and Statistics Finland’s firm-level register data (business register and financial statement data) were merged into the dataset from 2010–2021. We also applied Finnish Customs data on international trade of goods from the same period. Our data on startups contains 10 877 firm-year observations. The data are described in more detail in Appendix 1.

In the analysis, the firms that applied for Business Finland funding were separated into two groups: accepted and rejected applicants. In addition, we analyzed and compared startups that did not apply for Business Finland funding during the same period. We studied the following Business Finland funding instruments: R&D, NIY, Tempo, Marker Explorer, Talent Explorer, and Talent.

[7] The startup database was formed in cooperation with Business Finland and it includes, among other things, the Business ID, registration date and industry of a startup that is a member of the Finnish Startup Community. The Finnish Startup Community is formed by Finnish startup companies, and growth-oriented startups are accepted as members (<https://startupyhteiso.com/members/>).

4.2.1 NUMBER AND SHARE OF FUNDED STARTUPS

Figure 12 displays the number of startups in the data and those that have applied for Business Finland funding during 2010–2021. It should be noted that the sample contains firms that are registered in the Startup Community and were no more than five years old during the observation year. Since firms register themselves in the Startup Community, the total number of startups may be underestimated, especially in the beginning of the research period. The data accumulates in the beginning of the research period because the Startup Community’s data starts from year 2009 and new startups register every year. Each startup firm remains part of the sample until it reaches six years of age.

Due to limitations in data merging, only one application per firm per year can be observed (see Appendix 1). The share of startups applying for Business Finland funding has varied between 37–60% during 2010–2021. Approximately 70–93% of the startups that applied have been accepted to receive Business Finland funding. Thus, most startup applicants receive funding from Business Finland.

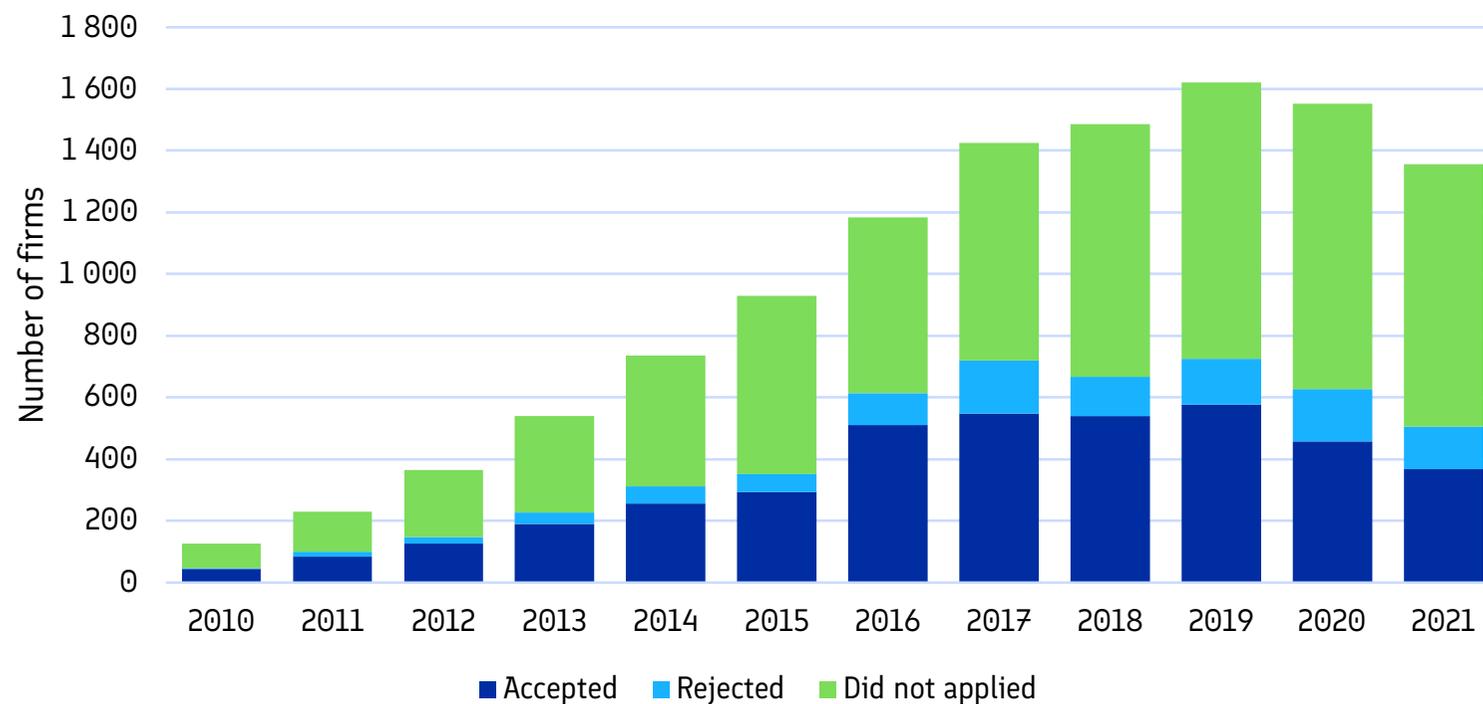


FIGURE 12. STARTUPS DURING THE YEARS 2010–2021.

The figure depicts those who have applied (accepted and rejected separately) and those who have not applied for Business Finland funding during the observation years.

Next, we focus on Business Finland-funded startups. Figure 13 presents the provinces and industries with the most Business Finland-funded startups from 2010 to 2021. The four most common regions of the subsidized startups are Uusimaa, Pirkanmaa, North Ostrobothnia, and Southwest Finland. These are all provinces with high business activity in general. A relatively large portion of the startups operate in Uusimaa.

Business Finland-funded startups often operate in computer programming, consultancy and related activities industries (NACE 62) (Figure 13). Other common industries are the activities of head offices (NACE 70), architectural and engineering activities (NACE 71), scientific research and development (NACE 72) and the manufacture of computer, electronic and optical products (NACE 26). These industries are also common among startups in general (see Appendix 1).

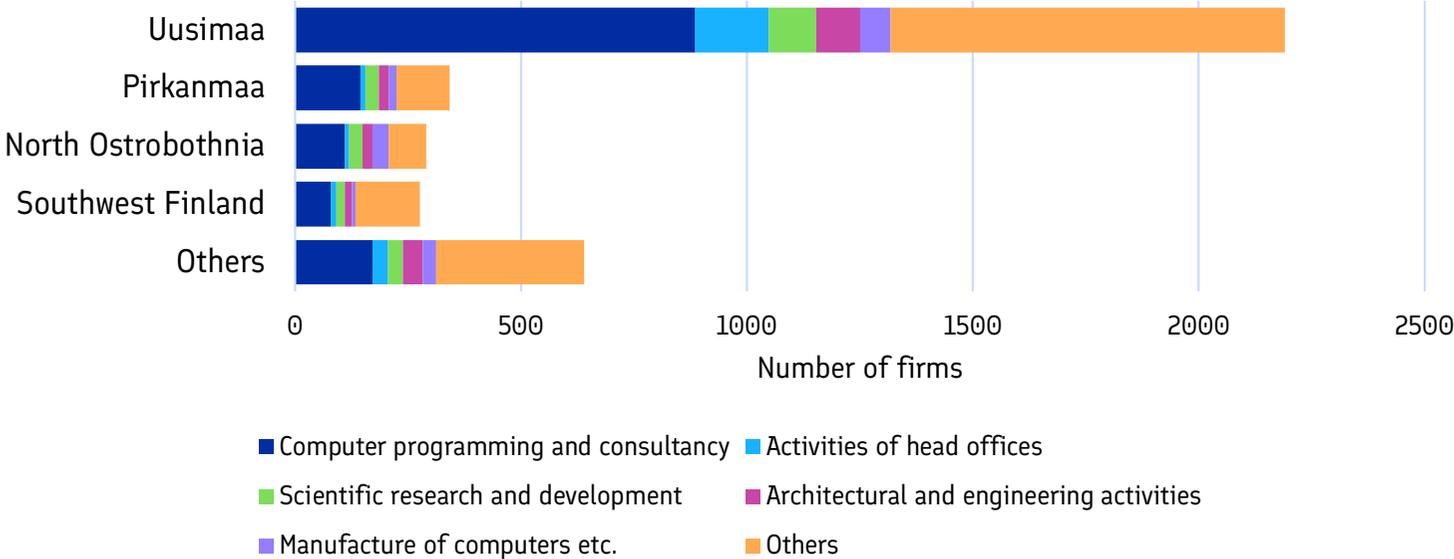


FIGURE 13. THE NUMBER OF BUSINESS FINLAND-FUNDED STARTUPS BY PROVINCE, AND SECTORS WITH THE LARGEST NUMBER OF BUSINESS FINLAND-FUNDED STARTUPS DURING 2010–2021.

4.2.2 FUNDED STARTUPS VS. OTHER STARTUPS

In our research data, startup firms applied for Business Finland funding approximately 4 700 times between 2010 and 2021. Roughly 80% of the applications were accepted. The median funding per accepted application for startup companies has been EUR 113 000. In 2010–2015, the median funding was around EUR 203 000, but after that, the median startup funding dropped to EUR 50 000. Among the funding instruments under study, the most used funding instrument for startups during 2010–2021 was R&D funding (59% of approved applications) and Tempo (43%). NIY and Explorer have only a 4% share each.

We statistically compared startups that have received Business Finland funding to other scaleups, i.e., rejected applicants and those not applied, over the period from 2016 to 2021. Table 2 presents the median values for age, turnover, number of employees, added value, labor productivity, profit margin, and export of goods per turnover for these three groups measured for the year of the funding decision. The same table also provides information

on the proportion of exporting companies and the total number of companies within each group. We used median values because the variables contain large outliers that increase the mean. The median provides a more accurate representation of the majority of firms. Table 2 addresses whether there are significant differences between the accepted and rejected firms at the time of the funding decision. When firms that applied for funding are compared to those that did not, conclusions can be drawn about the allocation of the funding.

The median turnover of startup firms that received Business Finland funding between 2010 and 2021 was EUR 125 000, which is slightly lower than the median turnover of companies that did not receive funding or did not apply for it (Table 2). However, they employed slightly more labor. By other financial indicators, such as turnover, labor productivity and profit margin, startups that received Business Finland funding performed worse than those that did not receive funding or did not apply for it. Also, the share of exports in turnover is also slightly lower for the funded startups.

TABLE 2. THE DESCRIPTION OF STARTUPS THAT APPLIED FOR BUSINESS FINLAND FUNDING (ACCEPTED AND REJECTED) AND OTHER STARTUPS DURING THE PERIOD 2010–2021.

The table presents the median value for each variable measured for the year of the decision.

STARTUPS	ACCEPTED, MEDIAN	REJECTED, MEDIAN	DID NOT APPLY, MEDIAN
Number of observations	3,999	1,045	6,557
Age	2	3	3
Turnover, €1,000	125	154	162
Employees	3	2.6	2
Added value, €1,000	6	20	39
Labor productivity €1,000/ employee	4	12	34
Profit margin, %	-54	-38	-8
Share of exporting companies, %	82	85	87
Share of goods exports in turnover, %	0.001	0.003	0.003
Funding amount, €1,000	113	-	-



Figure 14 shows the average development by various performance measures of accepted and rejected startups two years before and three years after the funding decision (including only R&D, NIY, Tempo, and Explorer funding). We investigated the average development of the number of employees (number of personnel), (log) turnover, (log) labor productivity and (log) value of exports. These figures can indicate whether there have been changes in the development of the studied variables after the funding. However, they do not provide a basis for assessing the effectiveness of the funding decision itself. Since firms that received funding are not compared to similar firms that did not receive it, the observed changes could also be due to other factors, such as better management or additional funding sources.

The levels of the studied variables for accepted and rejected startup applicants differed slightly from each other before applying for funding. However, there is not much difference in the development of accepted and rejected startups before and after the funding application. The turnover and average employment of accepted companies have grown slightly faster after a positive funding decision than in those companies whose application was rejected. Labor productivity was lower in accepted companies than in rejected companies after the funding decision, but the growth rate was roughly the same. The value of exports grew slightly more slowly in accepted startups than in rejected startups after the funding decision.

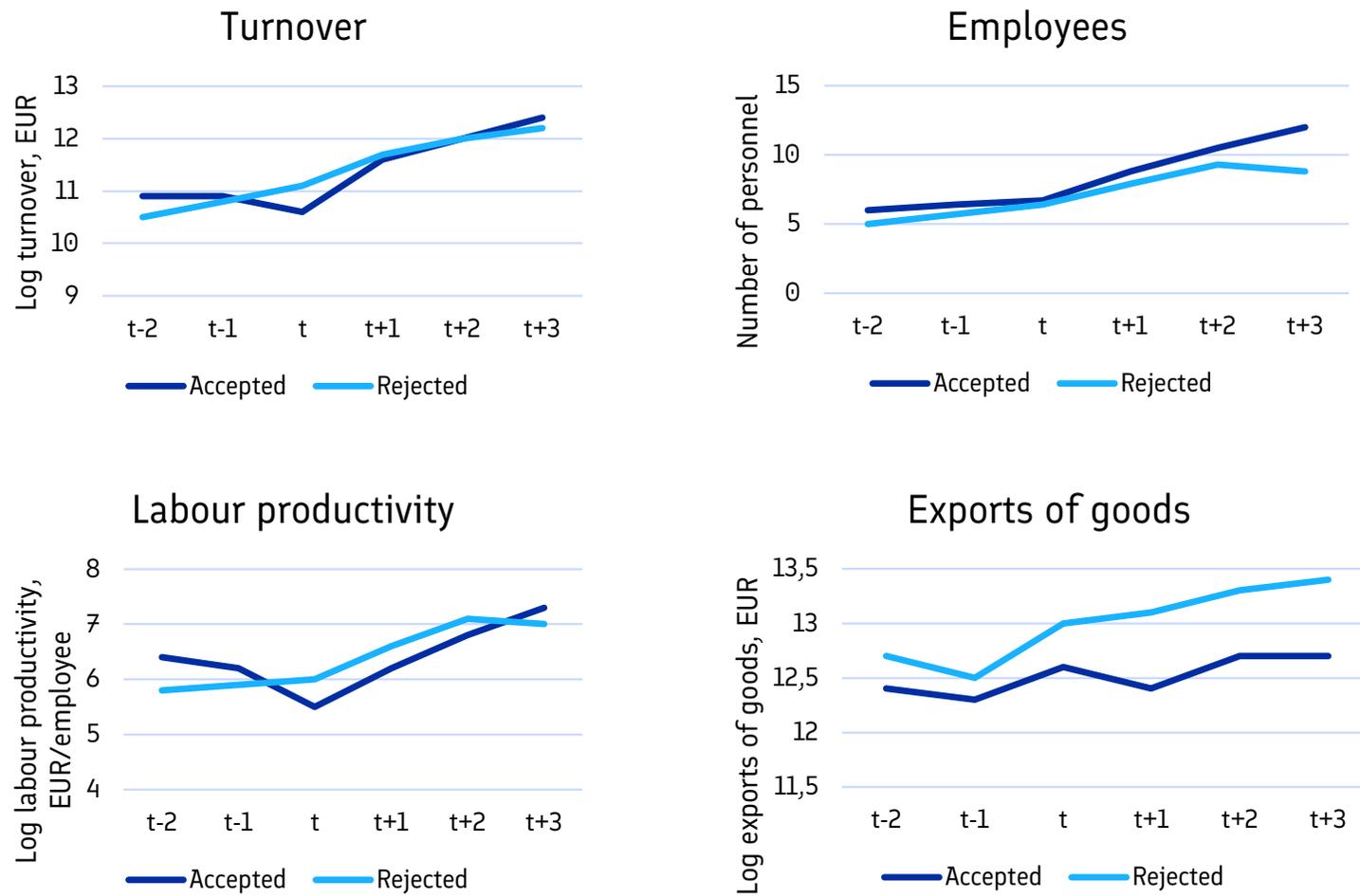


FIGURE 14. AVERAGE VALUES OF (LOG) TURNOVER, EMPLOYEES, (LOG) LABOR PRODUCTIVITY, AND (LOG) EXPORTS OF GOODS OVER TIME FOR ACCEPTED AND REJECTED STARTUP FIRMS THAT APPLIED FOR BUSINESS FINLAND FUNDING.

5 BUSINESS FINLAND-FUNDED SCALEUPS



In this chapter, we statistically investigate and describe scaleups in Finland during 2010–2021. We primarily explore and compare the development of the Business Finland-funded scaleups to that of other scaleups. Scaleups were identified using Finland’s firm-level register data. More precisely, in the analysis, we apply firm-level data from Statistics Finland, Business Finland, and Finnish Customs over the years 2010–2021.

In this study, high-growth firms and scaleups are considered synonyms. Scaleups are firms with an annual turnover of more than EUR 2 million, at least ten employees, and an average yearly growth rate of at least 20% in three consecutive years. Thus, our definition follows the OECD definition (OECD, 2008), except that there is a condition for firm turnover at the start of the growth period. Nordic Innovation (2019; 2023) has used a similar definition. It should be noted that a micro firm cannot be a scaleup firm by definition.

In addition to scaleups, this chapter also describes R&D funding recipients and the impact of R&D funding on firm outcomes. The impact is analyzed separately for micro firms and SMEs. Before conducting the impact evaluation, we will estimate whether receiving Business Finland funding is related to rapid firm growth.

5.1 PREVIOUS LITERATURE ON HIGH-GROWTH FIRMS

The literature underscores the importance of high-growth firms, which, though a small portion of the economy, are responsible for a significant share of the new jobs created (e.g. Coad et al., 2014; Hölzl, 2014; Henrekson & Johansson, 2010; Maliranta & Hurri, 2018). High growth is a crucial topic in Nordic welfare countries, given the need for a high level of employment to finance public expenses.

The literature also suggests that high-growth firms are particularly important for the labor market integration of immigrants (Coad et al., 2014; Daunfeldt and Westerberg, 2020). Managers of high-growth firms focus on growth opportunities and hence place greater emphasis on the pace of growth when recruiting. This means that they are more likely to hire available individuals in the labor market, emphasizing their specific skills or prior experience less. For instance, Daunfeldt and Westerberg (2020) find that Sweden’s fastest-growing firms are more likely to hire unemployed immigrants from Africa and Asia than non-growth firms. Thus, high-growth firms are more likely to provide employment opportunities to marginalized groups, indi-

cating that they are less selective in hiring decisions. Consequently, policies promoting high-growth entrepreneurship may also be crucial in enhancing the employment prospects of unemployed non-Western immigrants.

While most companies grow slowly or not at all, a small number of high growth companies account for a large share of job creation and economic impact. High growth is a very rare phenomenon and not persistent over time but a temporary phase in the lifespan of companies, which may occur several times without sustained high growth. (Coad et al., 2014; Daunfeldt & Halvarsson, 2015; Brown & Mawson, 2013; Holzl, 2014.) It remains debated in the literature to what extent these companies are young, small and active in certain sectors (see Autio, 2016; Coad et al., 2014). Several methodological and conceptual challenges have been identified in producing robust evidence. A literature review carried out by Brown et al. (2017) on empirical evidence of high growth highlights that there is no typical type of high-growth company. Instead, they are heterogenous and vary in their characteristics as firm growth is achieved through several internal and external mechanisms and channels. Furthermore, research suggests that in addition to high growth, attention should be placed also to other aspects of the firm performance, notably to profitability, productivity and sustainability, when seeking positive economic and social impacts. (Daunfeldt & Halvarsson, 2015; Daunfeldt et al., 2014.) Ali-Yrkkö et al. (2022) studied scalability based on business model, which as a metric does not require growth in the past but is forward-looking

in nature and indicates the scalability potential, and the research emphasizes that not all high growth is scalable with potential to increase profitability.

5.1.1 DEFINING HIGH-GROWTH FIRMS

The literature has no consistent definition for high-growth firms (HGFs). Often, high-growth firms are identified by their growth in employment, but growth in turnover or sales is also a standard metric for defining and measuring these firms (see, e.g., Brown et al., 2017). Over the 2000s, the OECD's (2008) definition has become the standard definition for high-growth firms. The OECD's definition states that an HGF is "an enterprise with average annualized growth (in a number of employees or turnover) greater than 20% per annum, over a three-year period, with a minimum of 10 employees at the beginning of the growth period" (OECD, 2008). Hart et al. (2021) and Brown et al. (2017), for instance, discuss the criticism of the OECD definition. While the OECD definition is a standardized and precise definition for a HGF, its policy relevance is debatable. For instance, the definition excludes firms that may be growing rapidly but fall just outside the given threshold. Also, the threshold for the growth in percentages biases the measure towards smaller firms. It is easier for a smaller firm to achieve relative growth than it is for larger firms. Hence, some studies have adopted the Birch (1979) index⁸ for identifying growth firms due to its size neutrality (e.g., Eklund 2020).

[8] The Birch index is calculated by multiplying relative growth by absolute growth: $Birch_{t,t-3} = (L_t - L_{t-3}) \times (L_t / L_{t-3})$, where L_t represents the number of employees in a firm in year t and L_{t-3} the number of employees in year $t-3$.

Monteiro (2019) points out that empirical studies have focused exclusively on HGFs, leaving scaleup firms largely unexamined. This oversight stems from the lack of a precise definition for scaleups in the literature and measurement challenges in register data. Scalability is often associated with a firm's ability to grow rapidly without being constrained by its structure. A scaleup firm can be defined as an HGF whose growth is primarily, though not exclusively, based on the scalability of its business model (Monteiro, 2019). Thus, any scaleup firm can be a high-growth firm, but only some high-growth firms can be scaleups. Register data does not often include information on the firm's business model or other relevant variables that could be used to define scaleups, as Monteiro (2019) suggests. The debate over the pros and cons of different definitions and measures for HGFs continues in the literature.

5.1.2 THE CHARACTERISTICS OF SCALEUPS

Since the seminal work by David Birch (1981), it has been debated in the literature to what extent high-growth firms are young, small or overrepresented in specific sectors (see Brown et al., 2017; Coad et al., 2014). The variety of results in the literature is due to differences in their definition and measures of growth, observation periods, geographic areas and methods used (Brown et al., 2017; Coad et al., 2014; Henrekson & Johansson, 2010). Coad et al. (2014) note that using different growth indicators selects different firms. Bown et al. (2017) argue that different definitions and measures for identifying

high-growth firms can potentially lead to very different, perhaps wrong, policy implications. Thus, the most significant controversies in the literature revolve around the methodology for selecting high-growth firms (HGFs) and the policy implications of the research findings.

Despite the varying results, the current literature has identified several stylized facts about scaleups: 1) HGFs are young but not necessarily small, 2) HGFs are found in all types of sectors and locations, and 3) high firm growth is short-lived and episodic (see, e.g., Goswami et al., 2019).

First, many recent studies have shown that younger firms are more likely to have a growth period (e.g., Coad & Karlsson, 2022; Felix & dos Santos, 2018; Daunfeldt et al., 2014), whereas there is no clear relationship between firm size and growth (e.g., Haltiwanger et al., 2013; Henrekson & Johansson 2010). Second, it is often argued that public funding should be targeted at high-tech firms, that is, firms with high R&D intensity, because these firms are innovative and thus potentially fast-growing. However, high-growth firms are present in almost all sectors. Recent literature shows that knowledge-intensive industries (service industries with a high share of human capital) are more likely to have a higher proportion of HGFs than other sectors (Daunfeldt et al., 2016). Third, the fast growth is often volatile and episodic (e.g., Brown et al., 2014; Daunfeldt & Halvarsson, 2015; Hölzl, 2014). External shocks can promote or slow down firm growth, but even in the absence of these shocks, rapid growth is challenging to sustain in the long term.

In their literature review, McKelvie and Wiklund (2010) argue that the literature has focused too much on “how much” firms grow instead of “how” firms grow. Very little is known about the internal growth dynamics of high-growth firms (Leitch et al., 2010; McKelvie & Wiklund, 2010). However, we do know that not all firms grow organically or internally. Some firms grow due to organizational changes, mergers or acquisitions (Brown et al. 2017). In Finland, Deschryvere (2008) shows that approximately 65% of the jobs created by HGFs were due to organic employment growth and not due to acquisitions. Also, medium-sized companies typically have the highest potential to grow and create jobs. Moreover, Busk and Naumanen (2022) also discovered that most HGFs in Finland grow organically, and only a tiny part of the increase in personnel is created through corporate merges, sales or intra-corporate transfers. Interestingly, more business acquisitions and outsourcing occur during growth periods than otherwise. This is particularly emphasized in the knowledge-intensive sectors. Growth periods are also characterized by transferring personnel within the group from one firm to another. Instead, in production-intensive sectors, employees often continue to work for the same employer.

A small group of studies has also examined the routes to growth and growth-profitability dynamics (Davidsson et al., 2009; Ben-Hafaiedh & Hamelin, 2022; Jang, 2011). The studies find that profit-focused firms are more likely to achieve profitable growth than growth-focused firms.

Mansikkamäki (2023), using data on Finnish firms, shows similar results. She also finds that very small, young firms encounter fewer risks associated with growing at low profitability levels compared to other firms. The advantages of firm size for future performance depend on the firm’s current profitability. Overall, the studies argue that policies aimed at encouraging job creation through firm growth should prioritize enhancing firm profitability rather than directly targeting growth.

5.2 BUSINESS FINLAND-FUNDED SCALEUPS

High-growth firms contribute disproportionately to job creation and economic growth (e.g. Coad et al., 2014; Hölzl, 2014; Henrekson & Johansson, 2010). The results have also been replicated in Finland, where scaleups, accounting for less than half a percent of the company stock, contribute to one third of new jobs in the business sector (Maliranta & Hurri, 2018). Drechyvere (2008) further supports this, finding that 750 scaleup firms created over 60 000 jobs in Finland during 2003–2006. There is, however, less information available on job creation of scaleups that have received public business funding.

We compared the development and growth of scaleups funded by Business Finland with those that did not receive funding from Business Finland. In the analysis, we consider only the following Business Finland funding instruments: R&D, NIY, Tempo, Marker Explorer, Talent Explorer and Talent. We also explore how Business Fin-

land-funded and other scaleups have evolved over the two years following their attainment of scaleup status.

In the analysis, we apply Business Finland's funding application data and Statistics Finland's firm-level register data (business register and financial statement data) over the years 2010–2021. We also employ Finnish Customs data on international trade of goods from the same period. The data are described in Appendix 1. Scaleups are firms with an annual turnover of more than EUR 2 million and at least ten employees at the start of the growth period, and an average growth rate of at least 20% in at least three consecutive years. We use employment growth to identify scaleups. The firm receives scaleup status always at the end of a three-year growth period. Thus, the group of scaleups varies over time.

5.2.1 NUMBER AND SHARE OF FUNDED SCALEUPS

We will start by looking at the number of scaleups in Finland and those scaleups that applied for Business Finland

funding during 2010–2021 (Figure 15). The total number of scaleups has varied between 200 and 500 firms annually. The share of scaleups that have applied for Business Finland funding has been 11%, which is quite low. Most scaleups (68–86%) applying for Business Finland funding have received the funding.

Figure 16 presents the provinces and industries with the largest number of the Business Finland-funded scaleups from 2010 to 2021. Most Business Finland-funded scaleups are in Uusimaa, Pirkanmaa, North Ostrobothnia and Southwest Finland. The highest represented industry among Business Finland-funded scaleups is the computer programming, consultancy and related activities sector (NACE 62). Other common industries include specialized construction activities (NACE 43), wholesale trade (NACE 46), architectural and engineering activities (NACE 71), construction of buildings (NACE 41) and activities of head offices (NACE 70).

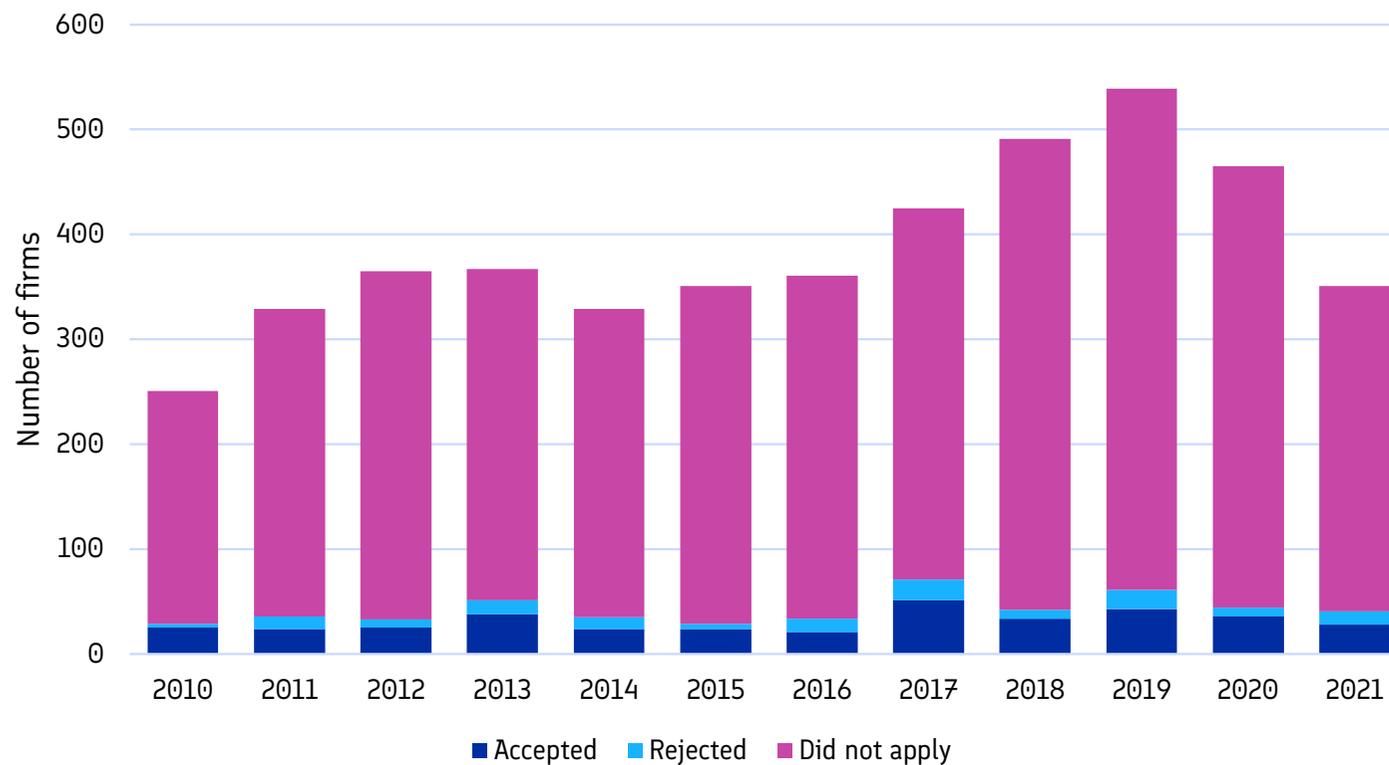


FIGURE 15. NUMBER OF SCALEUPS (BY EMPLOYMENT) DURING 2010–2021.

The figure depicts those scaleups that have applied (accepted and rejected separately) and those that did not apply for Business Finland funding during the observation years. Due to limitation in data merging, only one application per firm per year can be observed.

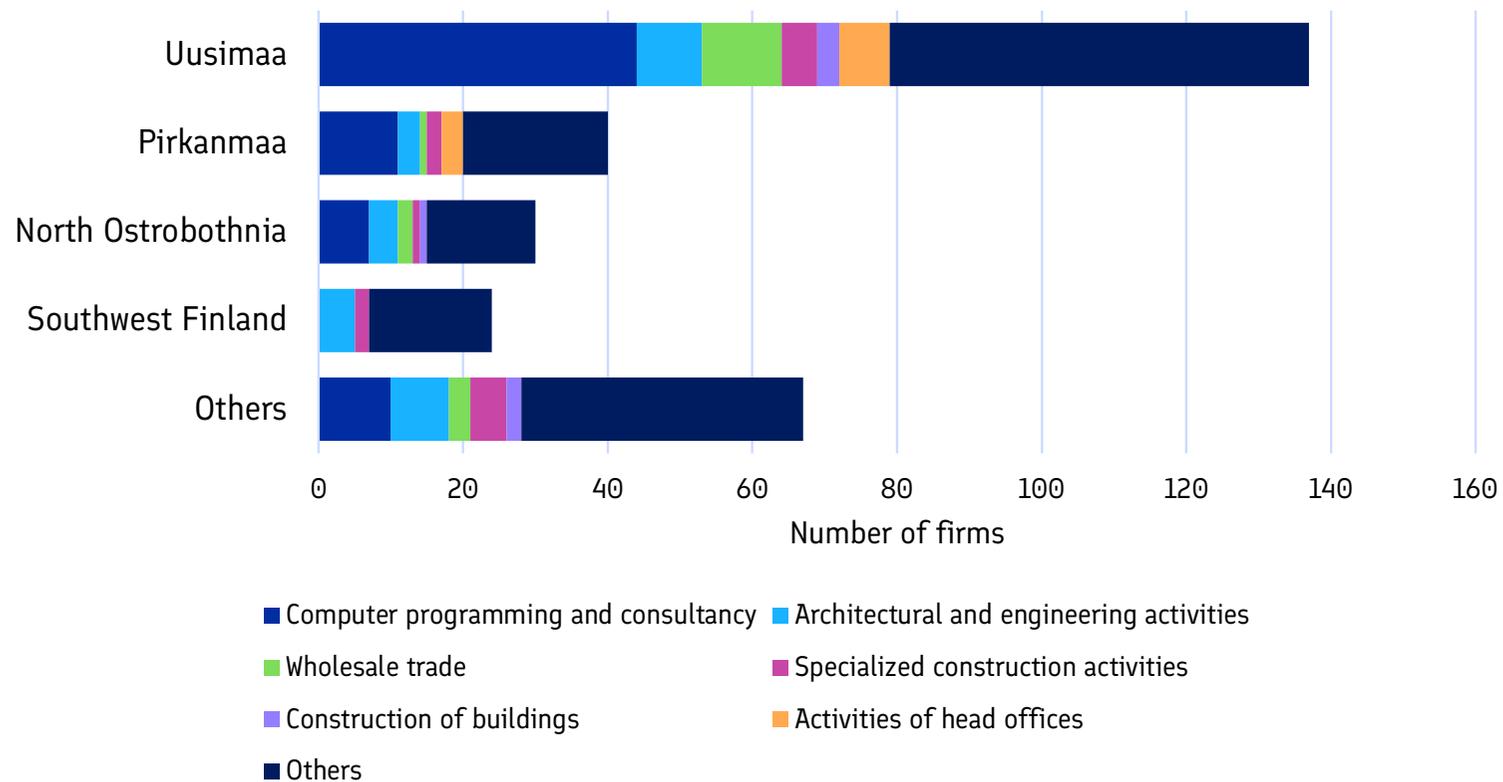


FIGURE 16. NUMBER OF BUSINESS FINLAND-FUNDED SCALEUPS BY PROVINCE, AND SECTORS WITH THE LARGEST NUMBER OF BUSINESS FINLAND-FUNDED SCALEUPS DURING 2010–2021.

5.2.2 SIZE AND ROLE OF BUSINESS FINLAND-FUNDED SCALEUPS IN FINLAND DURING 2010–2021

The role of scaleup firms in an economy is significant as they are important drivers of economic growth. Their ability to grow quickly may improve GDP growth as well. Scaleups are already in a phase of growth, so they have plenty of potential for creating new employment. Scaleup companies often develop innovations and introduce new products, services and technologies. This may boost the innovation atmosphere in the whole economy. As scaleups grow, they attract investment from venture capitalists, private equity firms, and other financial institutions. Scaleups can also significantly impact their supply chains, supporting the growth of suppliers, service providers and other businesses within their ecosystem.

We have calculated the sum of personnel and the sum of turnover for the Business Finland-funded SME-sized scaleups during 2010, 2014, 2018 and 2021 (Table 3). Then these sums are compared to the sums of turnover and personnel of all similar-sized firms during the same years. The figures in share row indicate the proportion of the Business Finland-funded startups sums relative to the total personnel of and turnover sums of all companies of the same size. Although the share of funded

scaleups among other SMEs is only one or two tenths of a percent, their share of turnover and employment is larger. These shares have stayed constant throughout the research period.

In Appendix 3, we have separately analyzed the net job creation among SME-sized scaleups, comparing those that received Business Finland funding to those that did not. Both Business Finland-funded SME-scaleups and other SME-scaleups have consistently created new jobs at an annual rate of 15–30% between 2010 and 2019.

When Business Finland-funded scaleups are compared to all companies, it can be observed that their importance is more significant than their number suggests (Table 4). Business Finland-funded scaleups account for only 0.02% of the company stock, but their share in turnover amount is tenfold. Their share in the number of personnel is even more prominent, approximately 0.26%. Thus, the findings of Table 3, Table 4 and Appendix 3 show that scaleups and Business Finland-funded scaleups have a significant role in the Finnish economy, and their potential to create new employment is substantial.

TABLE 3. NUMBER OF FIRMS, SUM OF TURNOVER AND SUM OF PERSONNEL OF BUSINESS FINLAND-FUNDED SME-SIZED SCALEUPS IN 2010–2021, AND THE SHARE RELATIVE TO ALL SME FIRMS. THEIR SHARE OF EQUIVALENT FACTORS FOR OTHER SME FIRMS.

FUNDED SME SCALEUPS	2010	2014	2018	2021	CHANGE 2010–2021, %
Number of firms	17	23	28	23	35
Share, %	0.1	0.2	0.2	0.1	
Sum of turnover, 1,000,000 €	246	259	374	288	17
Share, %	0.3	0.3	0.4	0.3	
Sum of personnel	991	1,425	1,523	1,134	14
Share, %	0.3	0.4	0.4	0.3	

TABLE 4. NUMBER OF FIRMS, SUM OF TURNOVER AND SUM OF PERSONNEL OF BUSINESS FINLAND-FUNDED SCALEUPS IN 2010–2021 AND THE SHARE RELATIVE TO ALL THE FIRMS.

FUNDED SCALEUPS	2010	2014	2018	2021	CHANGE 2010–2021, %
Number of firms	25	24	34	28	12
Share, %	0.02	0.02	0.02	0.02	
Sum of turnover, 1,000,000 €	246	259	374	288	17
Share, %	0.19	0.20	0.25	0.19	
Sum of personnel	1,583	1,499	1,967	1,505	-5
Share, %	0.28	0.24	0.29	0.24	

5.2.3 FUNDED SCALEUPS VS. OTHER SCALEUPS

In the research data, scaleup firms applied for Business Finland funding approximately 500 times between 2010 and 2021. Approximately 75% of the applications were accepted. The median funding amount per accepted application was EUR 265 000, but the amount has varied greatly during the research period. In 2016, the median funding amount was EUR 400 000; in 2013, it was EUR 140 000. Among the funding instruments under study, the most used funding instrument for scaleups was R&D funding (82% of approved applications) and Tempo (11%), while Explorer accounted for a 7% share.

We statistically described and compared scaleups that have received Business Finland funding to other scaleups, i.e., rejected applicants and those that did not apply, over the period from 2016 to 2021. Table 5 presents the median values for age, turnover, number of employees, added value, labor productivity, profit margin, and export of goods per turnover for these three groups measured at the year of the funding decision. The same table also provides information on the proportion of exporting com-

panies and the total number of companies within each group. We used median values because the variables contain large outliers that increase the mean. The median provides a more accurate representation of the majority of firms. Table 5 addresses whether there are significant differences between the accepted and rejected firms at the time of the funding decision. When firms that applied for funding are compared to those that did not, conclusions can be drawn about the allocation of the funding. Scaleups receiving funding are somewhat older than those denied funding (Table 5). Both groups have nearly identical turnover, but funded companies employ slightly fewer staff. Regarding labor productivity and profit margins, funded companies are only marginally better than those whose funding application was rejected. Compared to scaleups that have not applied for Business Finland funding, those that received funding have higher turnover and productivity, and they employ somewhat more workforce. Thus, it seems that more successful scaleup firms in terms of financial indicators apply for Business Finland funding.

TABLE 5. DESCRIPTION OF SCALEUPS THAT APPLIED FOR BUSINESS FINLAND FUNDING AND OTHER SCALEUPS DURING THE PERIOD 2010–2021.

The table presents the median value for each variable measured for the year of the decision.

SCALEUPS	ACCEPTED, MEDIAN	REJECTED, MEDIAN	DID NOT APPLY, MEDIAN
Number of observations	373	133	4,118
Age	14	12	13
Turnover, €1,000,000	15.4	15	10.6
Employees	69	74	55
Added value, €1,000,000	4.3	4.1	3.3
Labor productivity, €1,000/ employee	79	83	67
Profit margin, %	2.8	2.1	2.9
Share of exporting companies, %	79	80	83
Share of goods exports in turnover, %	0.2	0.5	0.0
Funding amount, €1,000	265	-	-



Figure 17 shows the average development by various performance measures of accepted and rejected scaleups two years before and three years after the Business Finland funding decision (including only R&D, NIY, Tempo and Explorer funding). We investigated the average development of employees (number of personnel), (log) turnover, (log) labor productivity and (log) value of goods exports. These figures can indicate whether there have been changes in the development of the studied variables after the funding. However, they do not provide a basis for assessing the effectiveness of the funding decision itself. Since firms that received funding are not compared to similar firms that did not receive it, the observed changes could also be due to other factors, such as better management or additional funding sources.

Before receiving funding, there were no significant differences between accepted and rejected scaleup firms that applied for Business Finland funding regarding turnover and average employment. However, the development in accepted scaleups has been slightly better than in rejected scaleups. In particular, the development of the number of employees in accepted scaleups has increased more than in rejected scaleups. Labor productivity development has been increasing in accepted scaleups before and after the funding decision. Instead, the labor productivity of rejected scaleups has varied. The growth rate of the value of goods exports slowed down slightly in the accepted scaleups after receiving funding but accelerated again in the third year following the funding decision.

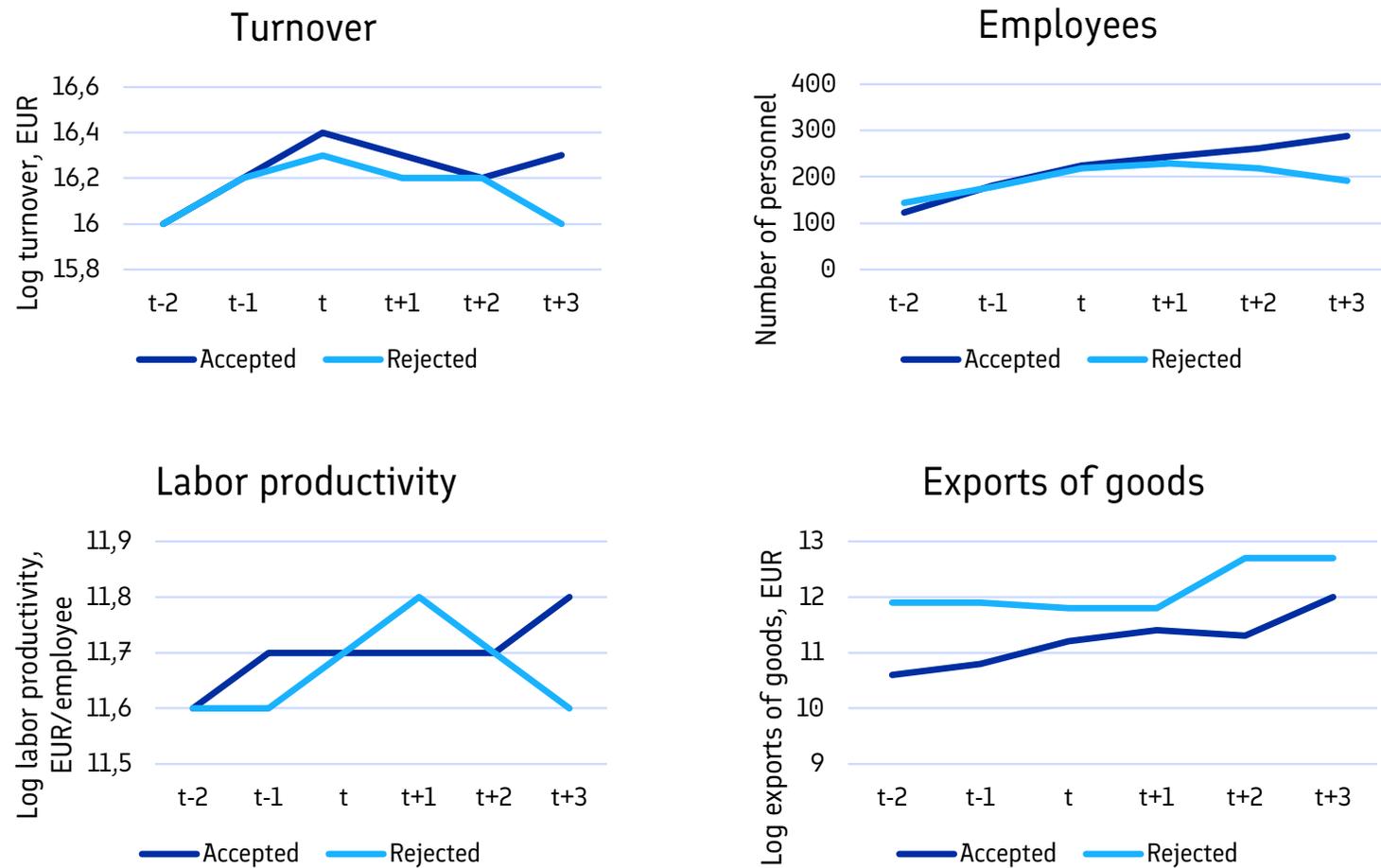


FIGURE 17. AVERAGE VALUES OF (LOG) TURNOVER, EMPLOYEES, (LOG) LABOR PRODUCTIVITY AND (LOG) EXPORTS OF GOODS OVER TIME FOR ACCEPTED AND REJECTED SCALEUP FIRMS THAT APPLIED FOR BUSINESS FINLAND FUNDING.

5.2.4 ECONOMIC DEVELOPMENT AFTER SCALEUP STATUS

We studied the post-scaleup development of firms that have received Business Finland funding compared to those that have not. Specifically, we examined and compared the development of Business Finland-funded scaleups with other scaleups over the two years following their attainment of scaleup status. The firms in question achieved scaleup status (based on employment growth) within the previous three years.⁹ Business Finland-funded scaleups received at least one instance of Business Finland funding by year t . In contrast, the other scaleups did not receive any such funding in year t or earlier. The analysis does not include micro firms due to the scaleup definition.

Table 6 presents the findings of our analysis. The results indicate that Business Finland-funded (BF-funded) scaleups experienced a greater increase in employment in the two years after achieving scaleup status compared to other scaleups. Additionally, turnover growth is higher among funded scaleups one year after attaining scaleup status, but this difference is no longer statistically significant after two years. The two groups have no statistically significant differences regarding export value, labor productivity, or equity investments at any period.

The findings suggest that while Business Finland funding may contribute to sustained employment and turnover growth in the short term, it does not correlate with the internationalization or labor productivity of the funded firms. The subsidized firms may have continued to grow even in the absence of the funding. We will explore the causal relationship between Business Finland funding and firm growth in Chapter 5.5.

[9] Scaleups are firms with an annual turnover of more than EUR 2 million, at least ten employees, and a yearly growth rate of personnel of at least 20% in at least three consecutive years.

TABLE 6. THE AVERAGE VALUES OF DIFFERENT OUTCOME VARIABLES OF THE BUSINESS FINLAND-FUNDED SCALEUPS AND OTHER SCALEUPS IN THE NEXT TWO YEARS AFTER ACHIEVING THE SCALEUP STATUS.

Birch index, change in the number of personnel						
period	BF-funded	N	other scaleups	N	difference in the means	p value
t+1	7.316	1,114	4.011	2,643	3.305	0.000
t+2	6.104	956	3.310	2,642	2.795	0.000
Turnover, relative change						
period	BF-funded	N	other scaleups	N	difference in the means	p value
t+1	0.063	1,114	0.017	2,643	0.045	0.000
t+2	0.001	957	-0.008	2,643	0.009	0.522
Export, relative change						
period	BF-funded	N	other scaleups	N	difference in the means	p value
t+1	0.017	1,114	-0.008	2,643	0.024	0.813
t+2	-0.014	957	-0.169	2,643	0.154	0.182
Productivity, relative change						
period	BF-funded	N	other scaleups	N	difference in the means	p value
t+1	-0.074	1,108	-0.039	2,637	-0.035	0.471
t+2	-0.092	948	-0.009	2,633	-0.083	0.134

Equity investments, relative change						
period	BF-funded	N	other scaleups	N	difference in the means	p value
t+1	0.260	1,114	0.296	2,637	-0.035	0.934
t+2	-0.118	957	0.484	2,643	-0.602	0.174

5.3 BUSINESS FINLAND FUNDING AND FIRM GROWTH

This analysis explores the relationship between Business Finland funding and firm growth among SMEs, focusing on whether such funding influences the likelihood of a firm becoming a scaleup within three years. We estimate a logistic regression model, where the dependent variable is a binary indicator of scaleup status three years after receiving the funding ($\text{Scaleup}_{i,(t,t+3)}$). The independent variables include:

- *BF funding* $_{i,t}$. A dummy variable indicating if any Business Finland funding was received in year t (=1), or not (=0).
- *R&D funding* $_{i,t}$. A dummy variable indicating if R&D funding was received in year t (=1), or not (=0).
- *Explorer funding* $_{i,t}$. A dummy variable indicating if Explorer funding was received in year t (=1), or not (=0). Explorer funding includes Market Explorer, Talent, and Talent Explorer funding instances.
- *Cumulative BF funding* $_{i,t-1}$. The number of cumulative

Business Finland funding instances received until year t-1.

In addition, all the models include various firm-specific characteristics as control variables, such as firm age, personnel size, turnover, equity investments, debt ratio, funding received from other sources (over EUR 10 000), and industry (2-digit level).

Instead, for Tempo funding (*Tempo funding* $_{i,t}$) we estimate a linear regression model, where the relationship between Business Finland funding and firm growth is analyzed by utilizing the Birch Index $_{i,(t,t+3)}$ as the dependent variable^[10]. Tempo funding targets startups, thus making the standard scaleup definition inapplicable. Typically startups are micro firms, and for firms with under ten employees we cannot apply the OECD definition of scaleups ('firms with an annual turnover of more than 2 million euros, at least ten employees, and a yearly growth rate of at least 20% in three consecutive years').

[10] The Birch index is calculated as the relative change times absolute change in the number of personnel: $\text{Birch}_{i,t,t+3} = (L_{t+3} - L_t) \times (L_{t+3} / L_t)$, where L_t represents the number of employees in a firm in year t and L_{t+3} the number of employees in year t+3.

Since the Birch index is a continuous variable, we cannot employ a logit model; instead, we use a linear regression model. For NIY funding, which is also targeted at start-ups, the number of observations was not large enough to implement a similar estimation.

Table 7 presents the results of our analysis. The findings indicate that receiving any Business Finland funding correlates with the probability of a firm becoming a scale-up within three years (Table 7, column 1) even when taking account of differences in previous Business Finland funding and various firm characteristics among funded

and other firms. Specifically, R&D funding (comprising both grants and loans) and Tempo funding are particularly related to rapid firm growth of SMEs (Table 7, columns 2 and 4). Although Explorer funding alone is unrelated to the likelihood of firm growth, the cumulative amount of Business Finland funding received by year t-1 is associated with a higher probability of achieving scaleup status three years later (Table 7, column 3). Overall, these results suggest that rapid growth is more likely for funded companies than for SMEs on average.

TABLE 7. ESTIMATION RESULTS: BUSINESS FINLAND FUNDING AND FIRM GROWTH.

Model Dependent variable	Logistic model 1) Scaleup _{i,(t,t+3)} (L)	Logistic model 2) Scaleup _{i,(t,t+3)} (L)	Logistic model 3) Scaleup _{i,(t,t+3)} (L)	Linear model 4) Birch Index _{i,(t,t+3)}
BF funding _{i,t}	0.278*** (0.072)			
R&D funding _{i,t}		0.210** (0.102)		
Explorer funding _{i,t}			-0.156 (0.427)	
Tempo funding _{i,t}				2.11** (0.880)

Cumulative BF funding _{i,t-1}	0.027 (0.022)	0.035 (0.022)	0.074** (0.030)	1.62*** (0.196)
Number of observations	128,719	128,719	41,347	63,094
Pseudo R2	0.10	0.10	0.11	0.07
Sample	SMEs, 2010–2021	SMEs, 2010–2021	SMEs, 2017–2021	Startups, 2016–2021

Notes: Columns 1–3 present the estimation results of a logit model, where the dependent variable is a dummy variable indicating whether a firm is a scaleup firm three years later. Column 4 presents the estimation result of a linear regression model, where the dependent variable is a Birch index calculated over a three-year period. In all of the models, control variables include firm age, (log) number of personnel, (log) turnover, debt ratio (long-term debt divided by the total assets), (log) equity investments, birch index_{i,(t,t-1)} (the relative change times absolute change in the number of personnel), other than Business Finland funding received (over EUR 10 000), average educational years of the firm personnel, industry and year. Statistical significance: *** p<0.01, ** p<0.05.

5.4 THE USE OF R&D FUNDING

Next we will describe the use and participants of Business Finland's R&D funding. We statistically analyzed firms that have applied for Business Finland's R&D funding by comparing those which have received funding to those whose applications were rejected over the period between 2010 and 2021.

5.4.1 PARTICIPANTS OF R&D FUNDING

In the research data, companies applied for Business Finland's R&D funding approximately 6 400 times between 2010 and 2021. Approximately 60% of the applications were accepted. The median amount of R&D funding has been nearly EUR 206 000 per accepted funding decision. The median amount of R&D funding has increased roughly 70% from 2010 to 2021. The most typical industries to which R&D funding was granted are computer programming, consultancy and related activities sector (NACE 62), architectural and engineering activities (NACE 71) and Manufacture of machinery and equipment (NACE 28).

Table 8 presents the median values for age, turnover,

number of employees, added value, labor productivity, profit margin, and export of goods per turnover for the accepted and rejected R&D applicants, measured at the year of the funding decision. Funding decisions over the years 2010 to 2021 are included. Additionally, the table provides information on the proportion of exporting companies and the total number of companies within each group.

Companies that received R&D funding are slightly younger than those that received a rejected funding decision (Table 8). While R&D-funded companies are somewhat younger, they employ more people than those whose application was rejected. Additionally, funded companies have higher turnover and value added. However, their labor productivity and profit margins are lower. This may be due to the focus on growth and product development among companies that applied for funding. The examined variables, particularly turnover and number of employees, have fluctuated according to economic conditions. During 2017–2019, when GDP was growing fast, companies saw increases in both turnover and employee numbers. However, the COVID-19 pandemic significantly impacted business operations and decreased companies' turnover.

TABLE 8. DESCRIPTION OF FIRMS THAT APPLIED FOR BUSINESS FINLAND R&D FUNDING DURING THE PERIOD 2010-2021.

The table presents the median value for each variable measured for the year of the decision.

R&D	ACCEPTED, MEDIAN	REJECTED, MEDIAN
Number of observations	3,947	2,405
Age	5	7
Turnover, €1,000	935	650
Employees	8.7	6.2
Added value, €1,000	242	187
Labor productivity, €1,000/employee	40	43
Profit margin, %	-8.4	-4.6
Share of exporting companies, %	82	84
Share of goods exports in turnover, %	0.9	0.3
Funding amount, €1,000	206	

5.4.2 ACCEPTED AND REJECTED R&D APPLICANTS

In this analysis, we investigate firms that have applied for Business Finland R&D funding by comparing those that received funding to those whose applications were rejected. The comparison is made within three categories of firms: micro firms, SMEs, and mid-cap firms. While the firms in both the accepted and rejected groups likely share similar motivations and goals regarding innovation and growth, it is essential to interpret the results cautiously due to (to us) the unobserved characteristics and potential quality differences between accepted and rejected applications and firms. We have not performed matching for these groups.

Figures 18, 19, and 20 present the average values of employees, turnover, exports of goods, labor productivity, and equity investments at different periods for the accepted and rejected R&D funding applicants. All the outcome variables, except employees, are measured in log form. The R&D funding is received in year t , which we refer to as the treatment year. It should be noted that these results cannot be interpreted as causal effects because we have not performed matching and DID analysis. Figure 18 displays the results for SMEs, Figure 19 for micro firms, and Figure 20 for mid-cap firms. The statistical tests for the results are presented in Appendix 4 (Table 21, Table 22, Table 23).

SMEs

Before receiving the R&D funding, there were no significant differences between accepted and rejected SME applicants regarding average employment and turnover (Figure 18). However, post-funding, the accepted applicants showed a statistically significant increase in both employment and turnover compared to the rejected applicants, suggesting that R&D funding is positively related to these outcomes (see also Appendix 4, Table 22). No significant differences were observed in the development of exports of goods, labor productivity, or equity investments before or after the funding. Notably, SMEs receiving R&D funding were more likely to be oriented toward international markets even before the funding.

Micro firms

For micro firms, the results of R&D funding were more varied (Figure 19). Post-funding, there was a significant increase especially in employment and turnover among accepted applicants compared to rejected ones. In the exports of goods and labor productivity, we also found some statistically significant differences in some individual years. However, turnover and productivity were initially higher among rejected applicants, with the accepted applicants catching up in turnover three years after receiving the funding. Equity investment trends also differ already before the treatment year. The results suggest that R&D



funding is positively related to employment, turnover, productivity, and internationalization for micro firms, although the timing and magnitude of these relationships vary (see also Appendix 4, Table 21).

Mid-cap firms

In the case of mid-cap firms, accepted applicants exhibited higher levels of turnover, productivity and exports of goods both before and after receiving R&D funding (Figure 20). However, no statistically significant differences were found in the development of these variables between the accepted and rejected applicants. Instead, after the funding decision, the rejected applicants raised the number of employees more than the accepted applicants. Also, it is worth noting that the average equity investments are negative in both groups. In other words, the owners are taking dividends from these companies rather than investing more equity capital in the company. As a summary, the findings indicate that R&D funding is mostly unrelated to the development of mid-cap firms (see also Appendix 4, Table 23).

Summary

Overall, R&D funding appears to be related especially to employment and turnover in SMEs and micro firms. Moreover, its relationship with the development of mid-cap firms is mostly insignificant.

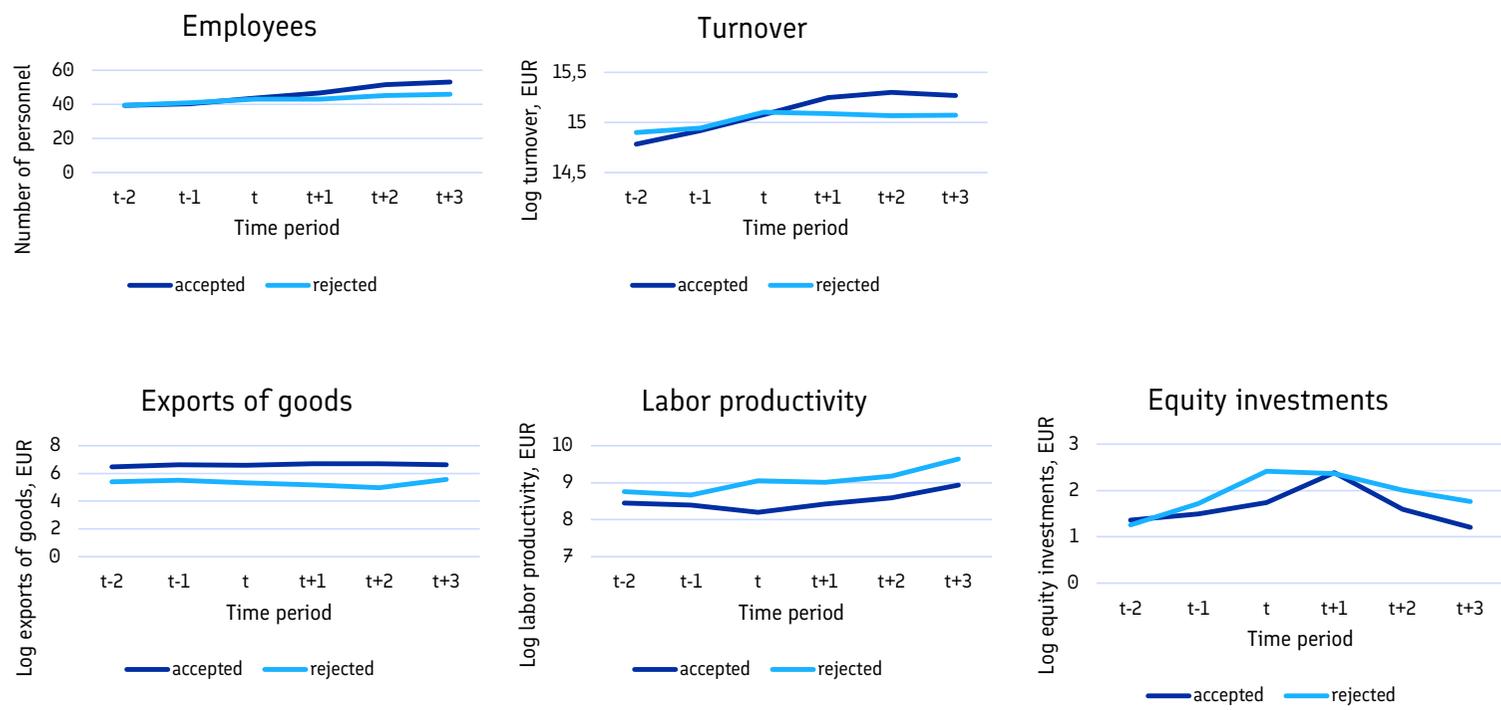


FIGURE 18. SMES. AVERAGE VALUES OF EMPLOYEES, (LOG) TURNOVER, (LOG) EXPORTS OF GOODS, (LOG) LABOR PRODUCTIVITY AND (LOG) EQUITY INVESTMENTS OVER TIME FOR ACCEPTED AND REJECTED R&D FUNDING APPLICANTS.

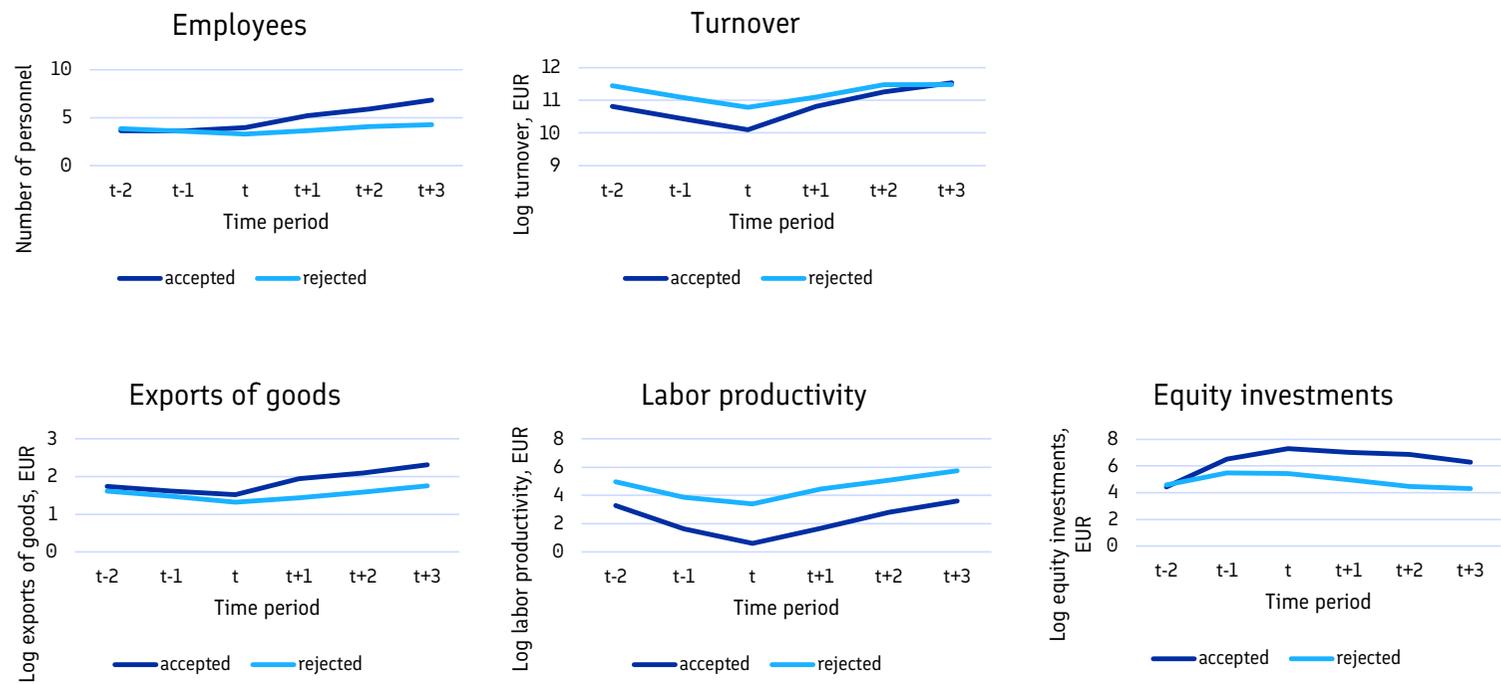


FIGURE 19. MICRO FIRMS. AVERAGE VALUES OF EMPLOYEES, (LOG) TURNOVER, (LOG) EXPORTS OF GOODS, (LOG) LABOR PRODUCTIVITY AND (LOG) EQUITY INVESTMENTS OVER TIME FOR ACCEPTED AND REJECTED R&D FUNDING APPLICANTS.

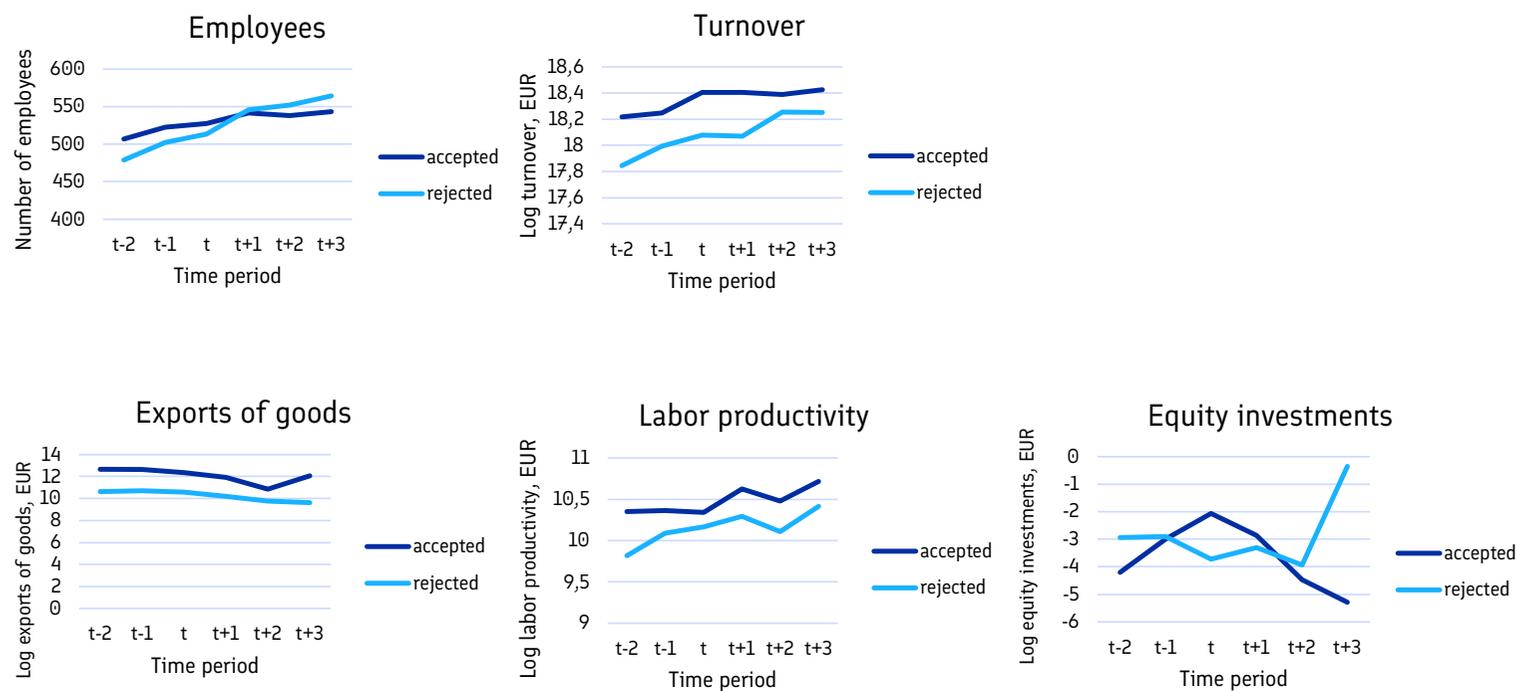


FIGURE 20. MID-CAP FIRMS. AVERAGE VALUES OF EMPLOYEES, (LOG) TURNOVER, (LOG) EXPORTS OF GOODS, (LOG) LABOR PRODUCTIVITY AND (LOG) EQUITY INVESTMENTS OVER TIME FOR ACCEPTED AND REJECTED R&D FUNDING APPLICANTS.

5.5 THE EFFECTIVENESS OF R&D FUNDING

We assessed the impact of Business Finland's R&D funding on various firm-level outcomes, including turnover, employment, exports of goods, labor productivity, and equity investments. All variables except employment are measured in logarithmic form. Employment is measured as the Birch index¹¹. Our analysis combines firm-level register data from Statistics Finland, Finnish Customs data, and Business Finland's funding application records. A more detailed description of the data and methodology can be found in Appendix 2.

5.5.1 METHOD AND DESIGN

We employed propensity score matching and difference-in-differences (PSM-DID) methods to assess the impact of Business Finland funding, with a primary focus on R&D funding due to the sufficient number of observations and amount of funding. The impact evaluation primarily targets SMEs while also considering micro firms. However, the limited number of observations for mid-cap firms precludes a meaningful impact assessment for this group.

In this analysis, the R&D funding decision is made in year t , which we designated as the treatment year. The R&D funding includes both loans and grants.

[11] The Birch index is calculated as the relative change multiplied by the absolute change in the number of personnel: $Birch_{t,t+3} = (L_{t+3} - L_t) \times (L_{t+3} / L_t)$, where L_t represents the number of employees in a firm in year t and L_{t+3} the number of employees in year $t+3$.

The treatment group consists of firms that receive only R&D funding in year t , while the control group comprises firms that do not receive any Business Finland funding between years $t-1$ and $t+3$. The evaluation was conducted separately for SMEs and micro firms, with the analysis commencing in 2010. The variables used in the matching process include a firm's capital structure, turnover, number of employees, profitability, balance sheet size, productivity, age, export volume, subsidies from other sources, average educational level of the personnel, and industry. It is important to acknowledge that identifying a suitable control group for R&D recipients proved challenging, largely due to the inherent growth orientation of firms applying for Business Finland funding. In addition, there may still be some unobservable firm characteristics, such as the quality of management or demand shocks, that affect the firm outcomes and could raise endogeneity issues.

Following the matching of R&D-funded firms with their counterfactuals – firms similar with respect to the variables used in the matching but which did not receive R&D funding – we estimate the average treatment effect on treated (ATT) on various outcome variables. If we observe differences in the outcome variables between the treatment and control groups, these differences cannot be attributed to the variables used in the matching. A more detailed description of the methodology is presented in Appendix 2.

5.5.2 RESULTS

We assessed the impact of R&D funding on various firm outcomes over time, namely, employment (as measured by the Birch index), turnover, exports of goods, labor productivity, and equity investments¹². Table 9 summarizes the difference-in-differences (DID) estimation results for SMEs. The analysis estimates treatment effects three years after the funding decision and pre-trends two years before the funding decision, with the results expressed as logarithmic changes. The final row of Table 9 highlights the changes for the whole period from year t to year $t+3$. Similarly, Table 10 provides the DID estimation results for micro firms.

In Table 9, the findings indicate that the R&D funding has a positive effect for employment and turnover in SMEs. However, there are some differences in the pre-trends between the R&D-funded and control firms already before period t . When looking at the results for the whole period from year t to $t+3$, R&D funding has a positive effect also on the exports of goods and equity investments. However, the results for individual years of $t+2$ and $t+3$ are statistically insignificant. For productivity the results are statistically insignificant.

[12] A positive value for equity investments indicates that more equity funding has been invested into the company, whereas a negative value indicates that dividends have been withdrawn from the company.

The results for the micro firms are presented in Table 10, and they are mostly similar as in Table 9 because the R&D funding has positive effects on employment and turnover but also on exports of goods and equity investments when analyzing the whole period from t to $t+3$. Moreover, the results suggest that the effect on labor productivity is somewhat negative. One explanation for this could be that the growth-oriented R&D-funded firms seek growth at the expense of profitability.

Overall, our estimation results indicate that R&D funding has a positive and statistically significant effect on employment and turnover among SMEs and micro firms. Moreover, the impact of R&D funding on the exports of goods and equity investments is also positive but the results are statistically more dubious. Our findings align with previous studies that have demonstrated the positive impact of R&D subsidies on firm employment and turnover (e.g., Koski & Pajarinen, 2013; Karhunen & Huovari, 2015; Fornaro et al., 2020; Hirvonen et al. 2023; Martikainen et al. 2023). The literature presents somewhat mixed evidence regarding the effects of R&D subsidies on productivity (e.g., Ali-Yrkkö, 2008; Koski & Pajarinen, 2015; Karhunen & Huovari, 2015). While R&D subsidies may affect productivity over a longer time horizon, it becomes increasingly challenging to establish causality as the time since the receipt of the subsidy increases.

TABLE 9. THE IMPACT OF R&D SUBSIDY: SUMMARY OF THE DID ESTIMATION RESULTS FOR SMES.

TIME PERIOD	EMPLOYMENT, BIRCH INDEX	TURNOVER, RELATIVE CHANGE	EXPORTS, RELATIVE CHANGE	PRODUCTIVITY, RELATIVE CHANGE	EQUITY INVESTMENTS, RELATIVE CHANGE
t-2	0.97***	0.09***	0.11	0.09	0.22
t-1	1.09***	0.08***	-0.04	0.05	-0.54
t	0.50*	0.02	-0.13	0.00	-0.44
t+1	1.31***	0.07***	0.56***	-0.08	1.55***
t+2	0.82***	0.05***	0.15	0.04	-0.18
t+3	0.14	0.04***	0.10	-0.01	0.18
t, t+3	2.78***	0.17***	0.76***	0.00	0.36***

Notes: The table presents the estimated average treatment effect two years prior and three years after receiving the R&D subsidy (t-2, t-1, t, t+1, t+2, t+3). The estimate (t, t+3) captures the direct change from year t to year t+3. Statistical significance: *** p<0.01, ** p<0.05, * p<0.1.

TABLE 10. THE IMPACT OF R&D SUBSIDY: SUMMARY OF THE DID ESTIMATION RESULTS FOR MICRO FIRMS.

TIME PERIOD	EMPLOYMENT, BIRCH INDEX	TURNOVER, RELATIVE CHANGE	EXPORTS, RELATIVE CHANGE	PRODUCTIVITY, RELATIVE CHANGE	EQUITY INVESTMENTS, RELATIVE CHANGE
t-2	0.77***	0.12***	0.13	-0.00	-0.05
t-1	0.98***	0.22***	0.07	0.28*	0.74*
t	0.38**	0.05	0.05	0.39***	-1.57***
t+1	0.82***	0.04	0.40***	-0.65***	2.36***
t+2	0.65***	0.14***	0.09	0.04	0.18
t+3	0.70***	0.12***	0.29***	0.11	0.04
t, t+3	3.57***	0.37***	0.80***	-0.35**	0.70***

Notes: The table presents the estimated average treatment effect two years prior and three years after receiving the subsidy (t-2, t-1, t, t+1, t+2, t+3). The estimate (t, t+3) captures the direct change from year t to year t+3. Statistical significance: *** p<0.01, ** p<0.05, * p<0.10.

6 YOUNG INNOVATIVE COMPANIES (NIY) FUNDING AND SERVICES

This chapter describes the results regarding the NIY instrument.

NIY funding is aimed at under-6-year-old startups with great business potential. The goal is to foster high-growth entrepreneurship. NIY funding enables the company to invest in the growth of international business, strengthen the team, develop its business model and growth strategy, and target new markets. The NIY funding consists of three phases, and reaching the targets set by Business Finland enables the company to move on to the next phase. The first phase of NIY is a grant of EUR 250 000, the second phase is another grant of EUR 250 000 and the third phase (before 1.1.2024) is a loan of EUR 750 000 (Business Finland covers 75% of project's costs).

6.1 USE OF NIY

We statistically investigated the use and results of NIY funding during 2010–2021. In the analysis, we employed information regarding the approval of Business Finland funding applications and created two groups of firms: accepted and rejected NIY applicants. We then merged financial information on the firms from Statistics Finland's

business register and financial statements data, as well as information on the firms' exports of goods from Finnish Customs data. The data is described in more detail in Appendix 1.

According to our research data, companies applied for NIY funding approximately 230 times between 2010 and 2021, and 57% of the applications were accepted. The most common industry among NIY recipients was the computer programming, consultancy and related activities sector (NACE 62). The median funding per accepted application has been EUR 500 000. Over time, this median amount has decreased significantly. In 2010, the median funding was EUR 800 000, while by 2021, it had declined to just under EUR 400 000.

We statistically described and compared firms that have received NIY funding (accepted applicants) with those that have not (rejected applicants) over the period between 2010 and 2021. Table 11 presents the median values for age, turnover, number of employees, added value, labor productivity, profit margin, and export of goods per turnover for these two groups measured for the year of the funding decision. Additionally, the table provides

information on the proportion of exporting companies and the total number of companies within each group. We used median values because the variables contain large outliers that increase the mean. The median provides a more accurate representation of the majority of firms. Table 11 addresses whether there are significant differences between the accepted and rejected firms at the time of the funding decision.

NIY funding is targeted at innovative startups, so both accepted and rejected applicants tend to be small and relatively young companies (Table 11). Both groups engage in international business to some degree, as evidenced by

the fact that nearly 90% of the firms export. However, the share of exports in turnover is larger for funded companies. Moreover, firms that receive funding tend to be larger in terms of both employee count and turnover compared to those whose funding applications were rejected. Despite their higher turnover, these funded companies often exhibit weaker financial indicators. Specifically, their labor productivity and value added are typically lower than those of rejected applicants. This disparity may suggest that funded startups are more focused on growth, which could lead to weaker financial metrics, aside from turnover.

TABLE 11. DESCRIPTION OF FIRMS THAT APPLIED FOR BUSINESS FINLAND NIY FUNDING DURING THE PERIOD 2010–2021.

The table presents the median value for each variable measured for the year of the decision.

NIY	ACCEPTED, MEDIAN	REJECTED, MEDIAN
Number of observations	129	98
Age	4	5
Turnover, €1,000	599	404
Employees	7	5.5
Added value, €1,000	27.6	44.2
Labor productivity €1,000/employee	6	11

Profit margin, %	-76	-63
Share of exporting companies, %	86	87
Share of goods exports in turnover, %	0.35	0.05
Funding amount, €1,000	500	-

6.2 RESULTS OF NIY IN STATISTICAL ANALYSIS

There are several studies produced specifically concerning NIY program, or including the scheme as a part of the overall impact assessment. Autio et al. (2014) studied the companies receiving NIY funding and discovered positive impacts of the funding in 1) sales and employment growth; 2) access to funding, including new equity funding. Halme & al. (2015) analyzed the impact of public funding on young companies (less than six years old). The analysis based on survey methodology concluded that Tekes grants and loans had significant positive impact on strategic competencies and on the R&D activities of the companies, while only NIY funding had a positive impact on internationalization. Research carried out by Autio & Rannikko (2016) analyzed the growth impact of the NIY program over a six-year period. The results indicate that the growth rate of participating firms more than doubled. The program also demonstrates good value for money for the public funding invested.

In line with earlier studies Halme et al. (2018) found that NIY funding has a positive effect on growth in terms of employment and turnover beyond selection bias. Impacts of the funding on labour productivity seem positive but are less clear and emerge with considerable lag. The funding does not have effect on survival, but dispersion of growth outcomes is higher among participating startups, suggesting higher risk-taking among participating companies. There are indications that NIY funding complements private venture capital funding and Tekes (at the time of the study) tended to be involved with startups in an earlier phase than private venture capitalists. The survey to participating companies indicates that the funding had positive impact on firms' capabilities, namely strategic expertise, product offerings, and investments in research, development or innovation, which enhanced their ability to sell to new markets to acquire new international customers. There are indications that positive impacts are increased when combin-

ing non-financial support with financial support. Overall, the impact study suggests that Tekes/Business Finland has supported the development of the startup ecosystem by facilitating the development of new products, services and business models through its R&D funding for young companies and boosted scaling up of startups through the NIY program and VIGO program enhancing Finnish early stage venture support markets, even if the ecosystem has developed largely independently.

We statistically described and compared the development of the firms that have received NIY funding to those that have applied but not received it. Figure 21 shows the average development by various performance measures of accepted and rejected NIY funded firms two years before and three years after the funding decision. We investigated the average development of employees (number of personnel), (log) turnover, (log) labor productivity and (log) value of goods exports. These figures can indicate whether there have been changes in the development of

the studied variables after the funding. However, they do not provide a basis for assessing the effectiveness of the funding decision itself. Since firms that received funding are not compared to similar firms that did not receive it, the observed changes could also be due to other factors, such as better management or additional funding sources. The developments of companies that have applied for NIY funding from Business Finland after the funding decision varies somewhat depending on whether the funding decision was approved or rejected. Turnover increased in both approved and rejected companies in the same way before the funding, but the turnover of the approved companies has developed slightly more weakly after the funding. In terms of the number of employed people, the situation is inverse and the employment of approved companies has developed more favorably. Labor productivity growth has varied in accepted and rejected companies, but the development of goods exports has been very similar.

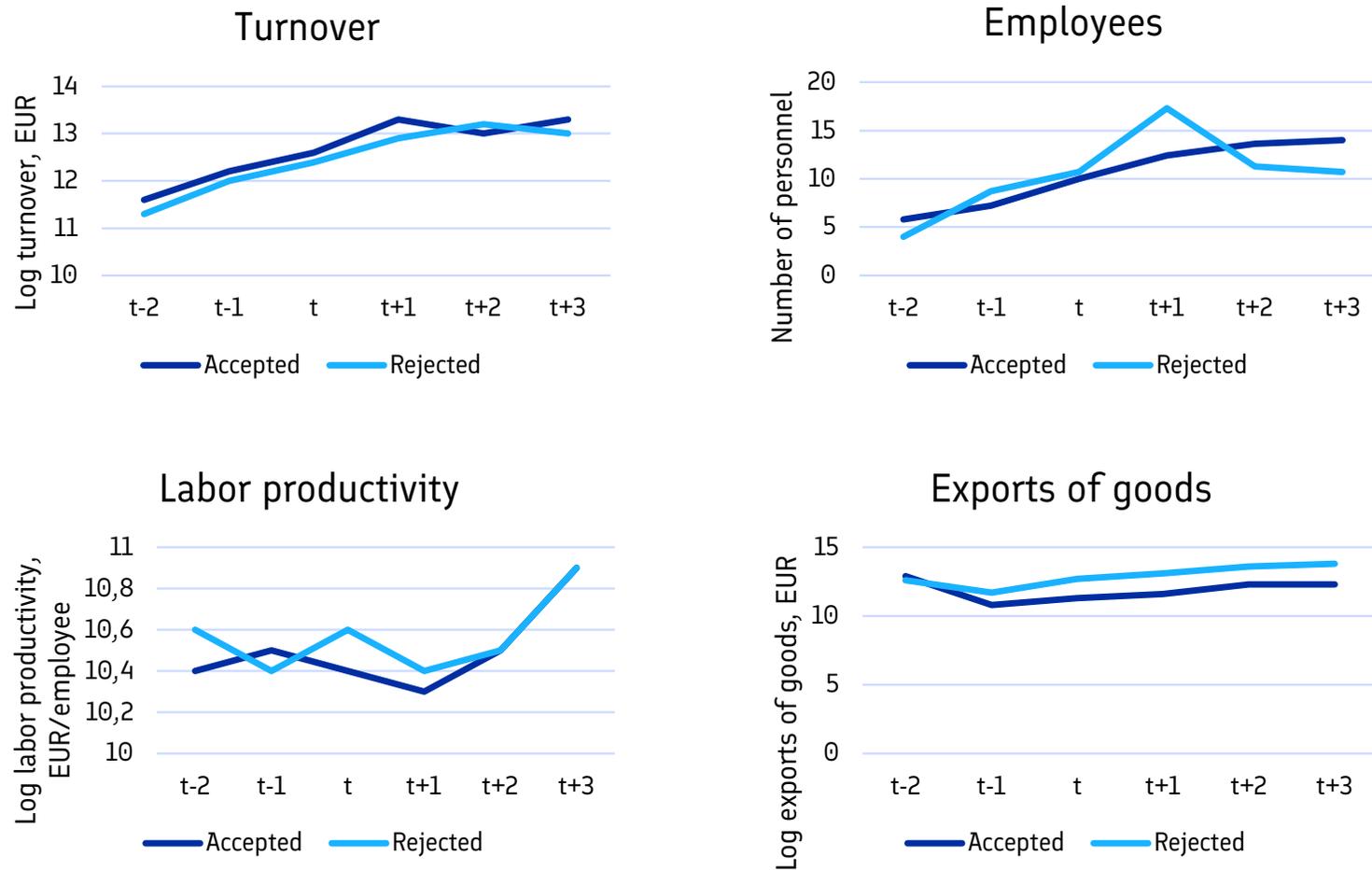


FIGURE 21. AVERAGE VALUES OF (LOG) TURNOVER, EMPLOYEES, (LOG) LABOR PRODUCTIVITY AND (LOG) EXPORTS OF GOODS BEFORE AND AFTER FUNDING APPLICATION FOR ACCEPTED AND REJECTED NIY APPLICANTS.

6.3 DIFFERENT PHASES OF NIY

The NIY funding is structured into three phases: the first two phases involve grants, while the third phase provides a loan (until 2024 and after that the third phase is also grant). Reaching the targets set by Business Finland enables the company to move on to the next phase. We analyzed and compared the results of firms that have completed the whole NIY program (three phases) to firms that have completed only some of the initial phases. Due to the low number of observations for NIY, we did not separate the analysis by firm size.

In this analysis, we applied Business Finland's funding application data that includes all the firms that have applied for NIY funding during the years 2010–2021. Since the funding amounts vary greatly in the data, we were not able to identify the NIY phases based on the amounts. Instead, we identified the NIY phases by the funding type, that is, whether the funding is a grant or a loan. We assume that firms that have received a loan in a certain year have proceeded to the third phase and thus completed the whole NIY program, whereas those that have received a grant have not. If a firm has received a grant and a loan during the same year, we assume that these firms have proceeded to the third phase.

In our sample, approximately 420 firms received NIY funding over the years 2010–2021, and of those firms around 100 firms (20%) passed through all three phases. NIY funding is most common in the programming industry (NACE 62), but this is especially the case among those firms that proceeded to the third phase.

For all the NIY recipients in our sample, we gathered information from Statistics Finland's financial statements data and Finnish Customs data on international trade of goods over 2010–2021. We calculated the average values of employees, turnover, export of goods and labor productivity during and three years after receiving the NIY funding. All the variables are measured in log form. Table 12 presents the descriptive results. The descriptives show that firms that have completed only initial phases of the NIY program have demonstrated consistent increases in employment, turnover, export value and labor productivity over the three years following funding. Similarly, firms that have completed the entire NIY program have experienced sustained growth in employment and turnover during the three-year post-funding period. However, improvements in labor productivity and export value were observed for them only during the first two years after receiving the third funding phase.

Overall, there are no significant differences in the financial development of firms that have completed the entire NIY program compared to those that have completed only the initial phases. Firms that have completed some of the early phases of the NIY program exhibit slightly better growth in export value and labor productivity, whereas firms that have proceeded to the third phase have slightly higher growth in employment and turnover. Thus, the results suggest that early phase funding of the NIY appears to enhance the internalization and productivity of the firms, whereas the third phase appears to increase firm growth.

TABLE 12. AVERAGE VALUES OF (LOG) EMPLOYEES, (LOG) TURNOVER, (LOG) EXPORT OF GOODS AND (LOG) LABOR PRODUCTIVITY FOR FIRMS THAT HAVE COMPLETED THE ENTIRE NIY PROGRAM AND FOR FIRMS THAT HAVE COMPLETED SOME OF THE PHASES DURING 2010–2021.

SOME NIY PHASES	EMPLOYMENT (LOG)	TURNOVER (LOG)	EXPORT OF GOODS (LOG)	LABOR PRODUCTIVITY (LOG)	NUMBER OF OBS.
t	2.0	12.5	2.8	-0.1	324
t+1	2.3	13.1	3.6	-0.1	321
t+2	2.3	13.2	3.6	1.9	306
t+3	2.2	13.2	3.8	3.5	276
t, t+3	0.2	0.6	0.9	3.1	276
ALL NIY PHASES	EMPLOYMENT (LOG)	TURNOVER (LOG)	EXPORT OF GOODS (LOG)	LABOR PRODUCTIVITY (LOG)	NUMBER OF OBS.
t	2.4	13.7	2.7	1.9	95
t+1	2.8	14.3	3.0	3.3	95
t+2	3.0	14.7	3.5	4.3	87
t+3	3.1	14.8	2.9	2.9	71
t, t+3	0.7	1.2	0.0	0.4	71

Notes: The table presents the average values of different outcome variables for firms that have completed the whole NIY program (all three phases) and for firms that have completed only some of the initial phases. The NIY phases were identified by the funding type. Firms that have received a loan in year t have assumably completed all three NIY phases, whereas those who have received a grant have completed only some of the phases.

6.4 QUALITATIVE RESULTS FROM NIY

NIY is seen as a well-functioning instrument because of its duration and three different stages according to interviewees and the complementary survey. The survey respondents found NIY to be very useful. On a scale of 1 to 5 (1 not at all useful, 5 very useful) the average was 4.9. A total of 71% of the survey respondents found the current phasing of NIY (1. 250k grant, 2. 250k grant and 3. 500k grant) very suitable or suitable as it is. The majority of the respondents used the funding primarily to invest in the growth of their international business. Around half of the respondents utilized the funding to strengthen their company's team, target new markets, develop a better growth strategy, and develop a business model. The only comment regarding the phasing of the NIY is a discussion regarding the amount of funding in the third phase. Some case interviews point out that the relative scale of the third phase funding could be increased slightly or could be extended.

NIY funding provides reassurance to private investors. Many of the case interviewees said that NIY funding was fundamental for the company and without it they probably wouldn't be able to continue. The possibilities of only using private funding in the startup phase vary between companies and different fields.

Survey respondents highlighted, among other things, results such as access to new markets, numerous new distribution partnerships, and enhanced resources for scaling. Many companies reported accelerated growth, particularly in internationalization, R&D, and business development. The funding was critical for expanding operations and executing growth plans, even during a challenging financial year. Respondents noted success in entering new markets, especially in Central Europe, and in strengthening sales and marketing, leading to growth and new business models. NIY funding also helped attract venture capital investments and provided a significant competitive advantage.

According to the survey, NIY funding enabled international growth by supporting market expansion, building global sales networks, and attracting investors. Many companies emphasized the importance of being able to invest in sales and marketing, which accelerated growth in target markets abroad. Additionally, the funding provided financial security, allowing businesses to pursue growth more aggressively, even in challenging market conditions. The ability to hire more talent and expand teams was another significant benefit. Moreover, the program brought valuable PR and credibility, enhancing visibility and making companies more attractive to private investors.

Most respondents (78–83%) felt that NIY helped them achieve revenue growth in international markets, expand into new markets and attract new foreign customers, and strengthen their team and resources (Figure 22). Around a fourth of the respondents didn't think NIY helped them attract talent. The majority of respondents (79%) felt that

the funding also increased the company's own financial contributions to the development of the same theme they developed with NIY. Three quarters of the respondents thought that the funding increased their company's investment in RDI activities.

How would you assess the results of the NIY? NIY helped us to... (n=27–28)

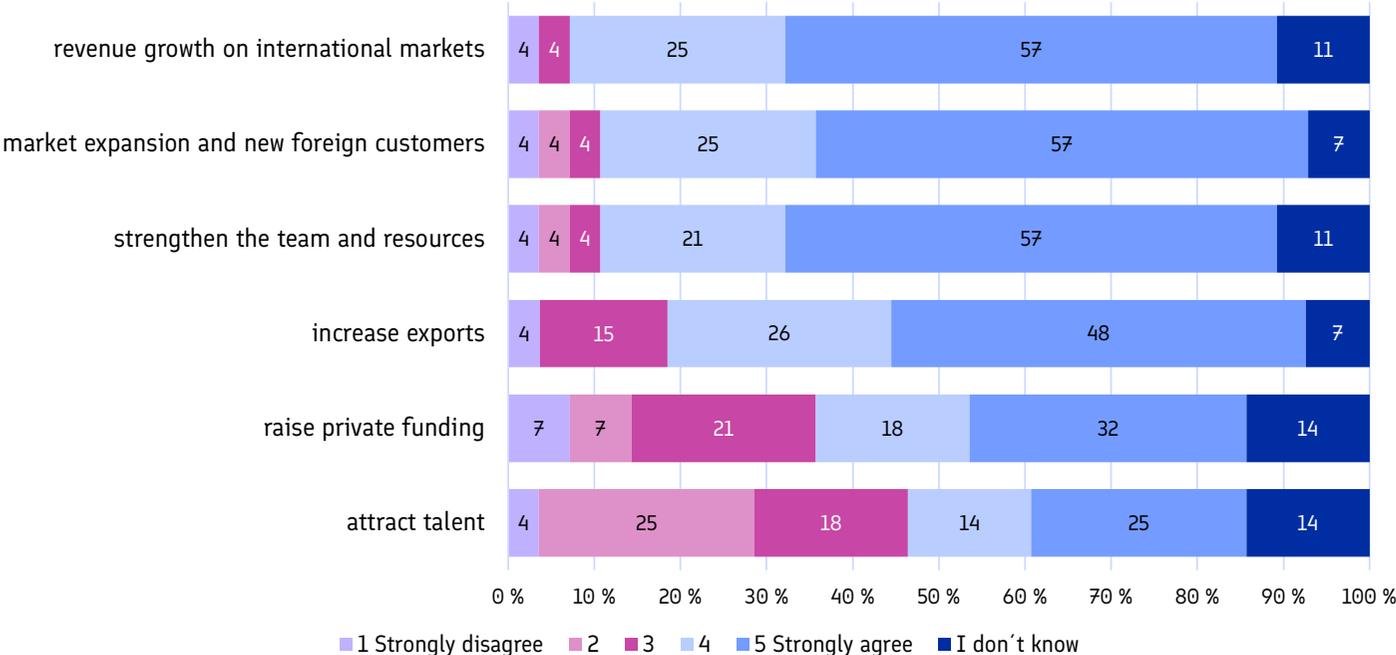


FIGURE 22. RESULTS OF NIY FUNDING.

The majority of the respondents thought that the funding was vital for creating new service business models (Figure 23). Around half of the respondents would have carried out the development without the funding, but with

a smaller budget. A quarter of the respondents felt that they wouldn't have carried out the development with different funding.

Evaluate the following statements regarding the effect of the programme on your company:
(n=27-28)

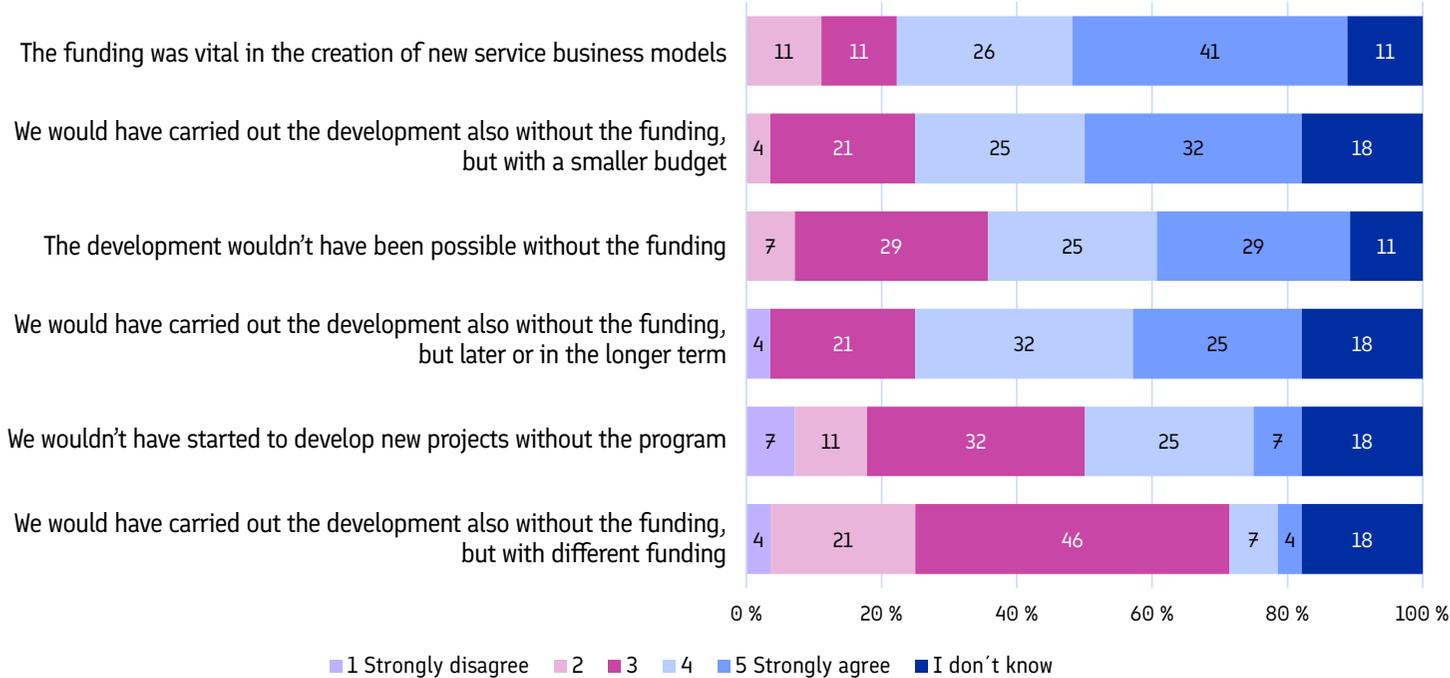


FIGURE 23. IMPACTS OF NIY FUNDING.

A significant majority of the survey respondents said the use of the service led to thinking about changes in mar-

keting or sales activities and to thinking about changes in how to operate in different markets (Figure 24).

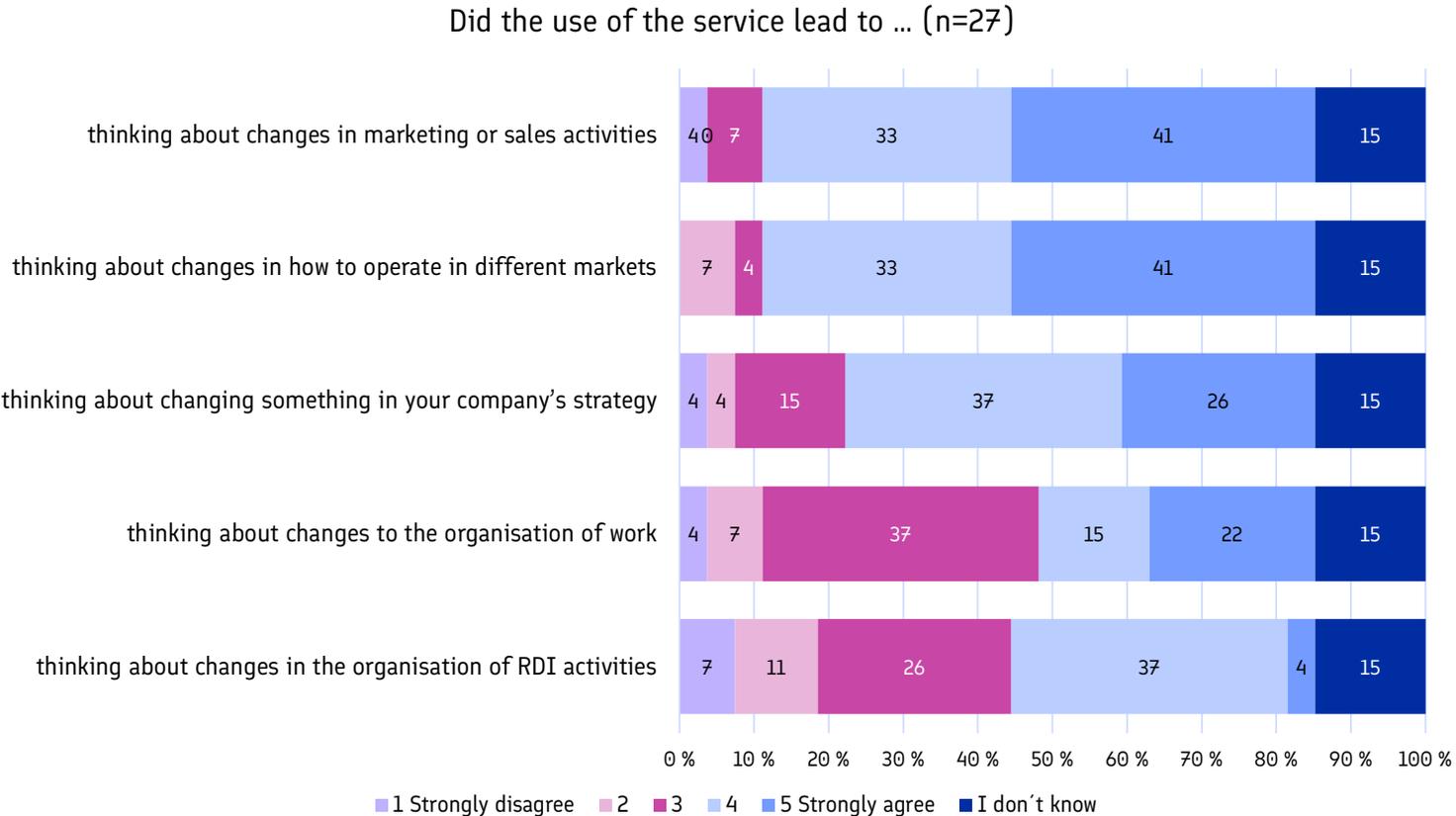


FIGURE 24. THE CHANGES IN THE COMPANY INSTIGATED BY NIY FUNDING.

CASE: NIY MAKING GROWTH POSSIBLE

Company:

Framery Oy

Description:

An industry pioneer and global leader in engineering and manufacturing soundproof pods, services and solutions that enable people at work to connect

Field of operations:

Furniture and home furnishings manufacturing

Turnover:

2023: EUR 130 million (2020: EUR 67.6 million)

Employees:

2023: 367 employees (2020: 270 employees)

Instruments:

NIY

Case:

NIY funding served the company's needs and purpose well, enabling rapid international growth. The NIY funding enabled the securing of private funding which, together with the NIY support, made growth possible – something that would not have been achievable otherwise. The critical enabler for the company's growth was the NIY funding, as the industry was so new and unknown at the time that obtaining VC funding wasn't possible, despite efforts. The company did secure funding from an angel investor, and together with the NIY, the support was mutually reinforcing. The NIY program's requirement for own funding and a successful investment round helped attract private investors. This led to a growth trajectory, and within a year of receiving the NIY funding, the company became self-sufficient. Since then, it has remained stable, generating jobs and contributing to tax revenue.

7 PLANNING FOR INTERNATIONAL GROWTH (TEMPO, MARKET EXPLORER, TALENT)

This chapter describes the results achieved with services aimed at planning international growth. As these services differ in nature from R&D and NIY as well as in their logic (planning of internationalization), they are presented as a separate chapter with references to earlier literature.

7.1 EARLIER LITERATURE

The economic rationale for public export promotion services is based on two types of information related market failures, arising from asymmetric information and externalities, which cause firms to underinvest in internationalization. In addition, in the literature review, Aalto and Gustafsson (2020) identify two policy rationales for intervention, namely the SME support rationale and the policy outcome rationale. It should be noted, that from the assessed instruments Market Explorer and Talent do not belong to export promotion service as such but rather to the services helping in internationalization planning. The SME rationale is based on the SMEs' overall lack of resources, capabilities, motivation and knowledge to find market opportunities, enter and operate in foreign mar-

kets. In addition, SMEs may fail to estimate the real potential of host markets, and choose not to bear the risks of internationalization. The policy outcome rationale is based on widely accepted policy objectives to increase exporting for both direct effects (export performance: increased export revenue and trade surplus) and indirect effects (outcomes beyond exporting: firm, industry and economy level), which are especially relevant for small and open economies.

The research of Broocks and Van Biesebroeck (2017) identifies three potential benefits of export promotion programs based on earlier literature and the results of the study. These are 1) increase in export volumes, mostly by penetrating new markets; 2) increase in the survival of existing exporters in the export market, particularly in times of unfavorable economic conditions in the target markets; and support for non-exporters to enter the export market for the first time. However, despite the development of methodologies and data to evaluate impacts of the export promotion policies, due to differences in the characteristics of export promotion schemes, institutional environments and target firms, the results are

heterogeneous and should be interpreted with caution (see Aalto & Gustafsson, 2020; Koski et al., 2020; Olarreaga et al., 2019).

Koski et al. (2020) studied the impacts of publicly funded internationalization services in Finland including Tempo, Market Explorer and Talent Explorer, on growth in terms of turnover, value added, employment, exports and labor productivity. The study supports the view that use of export promotion services has a positive effect on the sales of participating companies compared to their counterparts. The use of internationalization services decreases the likelihood of a firm switching to the lowest 10% sales and employment growth quantile, while the simultaneous use of internationalization services and R&D subsidies increased the probability of a firm switching to the highest 10% sales growth quantile. However, regarding other growth indicators and spillover effects materializing as higher growth in companies that had hired employees from firms that use internationalization services, the study did not present any statistical evidence of any clear impacts.

Busk & Naumanen (2022b; see also Simons et al., 2022) studied the impacts of Business Finland direct grants to middle-sized companies and found diverse results. The funding has the most obvious impacts to the balance sheet, goods exports and goods and services exports as a share of a turnover, where positive impacts were observed one year after the funding. The results indicate that direct grants have supported internationaliza-

tion of middle-sized companies, especially in the field of professional, scientific and technical activity.

7.2 USE AND RESULTS OF TEMPO FUNDING

Tempo funding is aimed at under six year old startups with a new product or service idea. The company can prepare for international growth by getting feedback from potential customers and by identifying the demand and performance in international markets. The maximum grant is EUR 60 000, and it covers 75% of the project's cost. As the funding is competitive, the funding is not granted automatically if the minimum criteria are met. Business Finland evaluates the company's business as a whole when making a decision.

We statistically described the firms that have used Tempo funding during 2016–2021. We also analyzed the success of the subsidized firms' internationalization. In the analysis, we utilized acceptance information of the Business Finland funding applications and created two groups of firms: accepted and rejected Tempo applicants. We merged financial information on the firms from Statistics Finland's business register and financial statements data as well as information on the firms' exports of goods from Finnish Customs data. The data are described in more detail in Appendix 1. Tempo users were part of the survey (see Appendix 5) and most of the case respondents (N=29) had also considered or used Tempo funding.

7.2.1 TEMPO PARTICIPANTS

In our research data, companies applied for Business Finland Tempo funding approximately 2 500 times between 2016 and 2021. Approximately 60% of the applications were accepted. Median funding per accepted application was EUR 50 000 euros and it has remained stable over time. The most common industry among Tempo recipients was the computer programming, consultancy and related activities sector (NACE 62). Activities of head offices (NACE 70) and wholesale trade (NACE 46) are the second and third most common industries.

We statistically described and compared firms that have received Tempo funding with those that have not (rejected applicants) over the period between 2016 and 2021. Table 13 presents the median values for age, turnover, number of employees, added value, labor produc-

tivity, profit margin, and export of goods per turnover for these two groups measured for the year of the funding decision. The same table also provides information on the proportion of exporting companies and the total number of companies within each group. We used median values because the variables contain large outliers that disproportionately affect the mean. The median provides a more accurate representation of the majority of firms. Table 13 addresses whether there are significant differences between the accepted and rejected firms at the time of the funding decision.

The descriptives show that firms that received Tempo funding differ from those that were denied funding in terms of number of employees, labor productivity and profit margins (Table 13). Funded companies have slightly more employees, but their productivity and profit margins are lower than those denied funding.

TABLE 13. DESCRIPTION OF FIRMS THAT APPLIED FOR BUSINESS FINLAND TEMPO FUNDING DURING THE PERIOD 2016–2021. THE TABLE PRESENTS THE MEDIAN VALUE FOR EACH VARIABLE MEASURED FOR THE YEAR OF THE DECISION.

TEMPO	ACCEPTED, MEDIAN	REJECTED, MEDIAN
Number of observations	1,508	894
Age	3	3
Turnover, €1,000	164	160

Employees	2.3	1.5
Added value, €1,000	29.7	40.7
Labor productivity, €1,000/employee	18	36
Profit margin, %	-19	-6,8
Share of exporting companies, %	86	90
Share of goods exports in turnover, %	0.01	0
Funding amount, €1,000	50	

7.2.2 THE RESULTS OF TEMPO

We compared the development and internalization of the firms that have received Tempo funding to those that have not. Figure 25 shows the average development by various performance measures of accepted and rejected Tempo-funded firms two years before and three years after the funding decision. We investigate the average development of employees (number of personnel), (log) turnover, (log) labor productivity and (log) value of goods exports. These figures can indicate whether there have been changes in the development of the studied variables after the Tempo funding. However, they do not provide a basis for assessing the effectiveness of the funding decision itself. Since firms that received Tempo funding are

not compared to similar firms that did not receive it, the observed changes could also be due to other factors, such as better management or additional funding sources. The turnover of both accepted and rejected firms decreased before the funding application. For the approved companies, the turnover turned to growth after the funding. The number of personnel was also decreasing in both groups before the funding decision but started to increase regardless of the funding decision. Labor productivity also turned to a clear increase in accepted companies after the funding decision. On the other hand, the value of goods exports was increasing in accepted companies both before and after the funding.

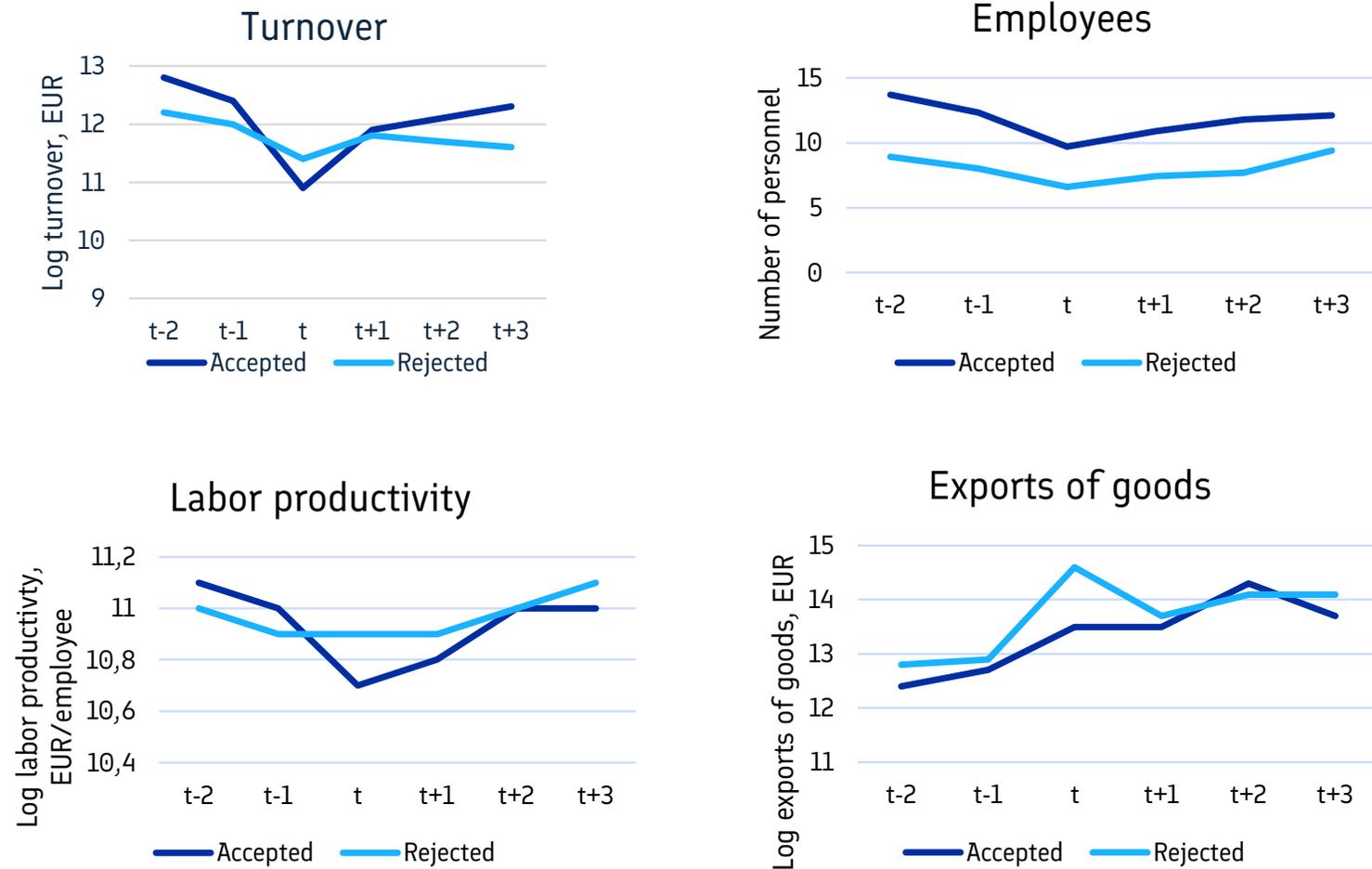


FIGURE 25. AVERAGE VALUES OF (LOG) TURNOVER, EMPLOYEES, (LOG) LABOR PRODUCTIVITY AND (LOG) EXPORTS OF GOODS BEFORE AND AFTER FUNDING APPLICATION FOR ACCEPTED AND REJECTED TEMPO FUNDING.

DOES TEMPO WORK AS A LINK TO R&D?

We also investigate how many Tempo projects have led to subsequent R&D funding through Business Finland. Table 14 details the number of firms that secured R&D funding within three years after receiving Tempo funding. Tempo funding instrument was implemented in 2016, and our data extends to 2021. Thus, we focus on the years 2016–2019 because these years provide sufficient follow-up time.

The findings indicate that 36 to 55% of the firms that received Tempo funding subsequently obtained R&D funding within the following three years. The share varies according to the year in which the Tempo funding was received. Notably, R&D funding is most frequently received within one year after receiving Tempo funding, and the share of subsequent R&D funding decreases as more time elapses since the initial Tempo funding. A minor share of firms received both R&D funding and Tempo funding during the same year.

TABLE 14. THE NUMBER AND SHARE OF R&D FUNDING RECIPIENTS OF THE FIRMS THAT HAVE RECEIVED TEMPO FUNDING IN THE YEARS 2016, 2017, 2018 OR 2019.

	TEMPO FUNDING RECEIVED IN YEAR T							
R&D FUNDING RECEIVED IN YEAR	t=2016	% of Tempo recipients	t=2017	% of Tempo recipients	t=2018	% of Tempo recipients	t=2019	% of Tempo recipients
t	50	12%	38	8%	30	7%	60	8%
t+1	110	26%	99	21%	66	17%	77	11%
t+2	69	16%	71	15%	49	13%	41	6%
t+3	55	13%	51	11%	23	6%		-
cumulative t, t+3	234	55%	221	46%	138	36%		-
Number of Tempo recipients	426		482		380		711	

7.2.3 QUALITATIVE RESULTS FROM TEMPO

In the interviews Tempo was seen as a relatively easy program for the companies to utilize. In order to achieve the maximum benefits, it is important to identify the right timing for Tempo as well as the necessary steps before and after the funding. This requires more comprehensive customer management on the side of Business Finland. According to the Business Finland experts, the number of rejected applications has risen in recent years, which was deemed to be a result of lacking customer service and advice.

In our survey, the companies found Tempo to be very useful. Survey respondents were asked to estimate the usefulness of Tempo on a scale of 1 to 5 (1 not at all useful, 5 very useful) and the average was 4.6. Tempo was seen by the interviewees as especially crucial in the startup phase. Most of the respondents used the funding primarily to test or pilot the demand for a product or service with customers and for market validation. Interviewees also added that it allowed them to use advisory services that they would not have been able to use otherwise. This helped newer companies to allocate their limited resources more wisely. Tempo was also beneficial in the later stages, allowing more substantial investments and helping to attract private funding.

Many of the case interviewees thought that obtaining private funding in the startup phase is extremely difficult in Finland, which is why Tempo is so important for startup companies. Without Tempo many of the companies wouldn't have been able to move forward or grow as fast

as they did. Some of them wouldn't have started at all. Approximately a fourth of the survey respondents felt that they wouldn't have been able to expand to international markets without Tempo. Around half of the respondents felt that they would have been able to expand, but not to the same extent as they did with Tempo. Only 11% of the respondents felt they would have been able to expand to international markets to the same extent without Tempo.

Respondents identified several key benefits from the program. The funding provided crucial support for research and development, enabling companies to test and refine their concepts and advance product development. This assistance was vital for achieving a better product-market fit and accelerating overall development. Additionally, the program played a significant role in international expansion, allowing companies to explore and enter new markets, build global sales networks, and attract investors. Respondents valued the opportunity to gather customer feedback and market insights, which guided product development and helped in understanding market needs. The financial backing also allowed companies to pursue growth more aggressively, manage operations effectively during tough times, and support hiring and scaling efforts. Moreover, the program facilitated valuable networking opportunities, connecting companies with new customers, partners, and investors, and contributing to overall business development.

The companies agreed that Tempo has especially helped them learn from the market, develop their product

or service in the right direction, and understand the market size. Over half of the respondents agreed with these statements (Figure 26). Around a fourth of the respondents didn't think that Tempo helped them gain new help-

ful connections. Interviewees also added that Tempo expedited their expansion to international markets or made it possible by attracting private funding.

How would you assess the results of Tempo? Tempo helped us to... (n=193-194)

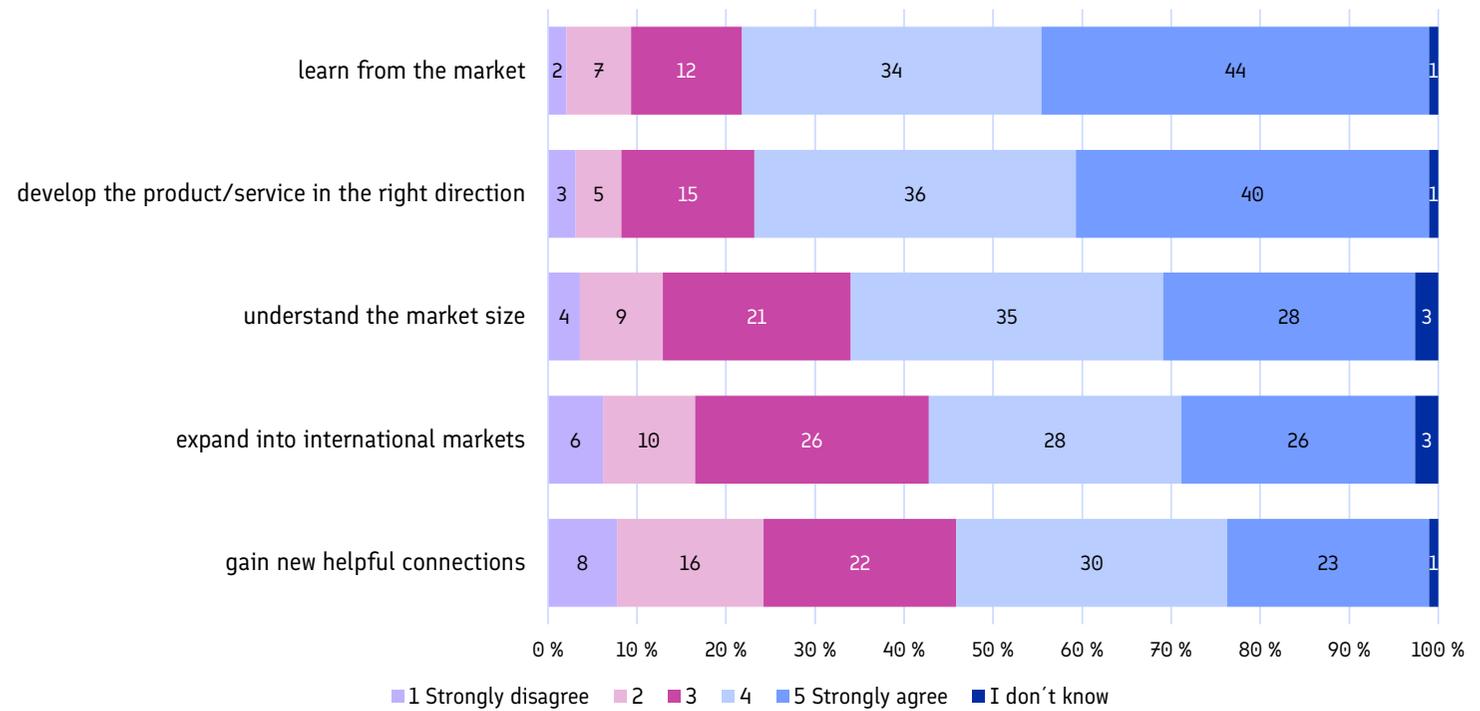


FIGURE 26. RESULTS OF TEMPO.

The survey respondents felt that the companies gained many benefits from the funding. The most common benefits were developing the company's service or product to meet international opportunities, improving the compa-

ny's understanding of the market, and strengthening the company's understanding of the phenomena of interest to their future business (Figure 27).

Please assess the benefits of the funding for your company based on the feedback received in Tempo and after working with that (n=193)

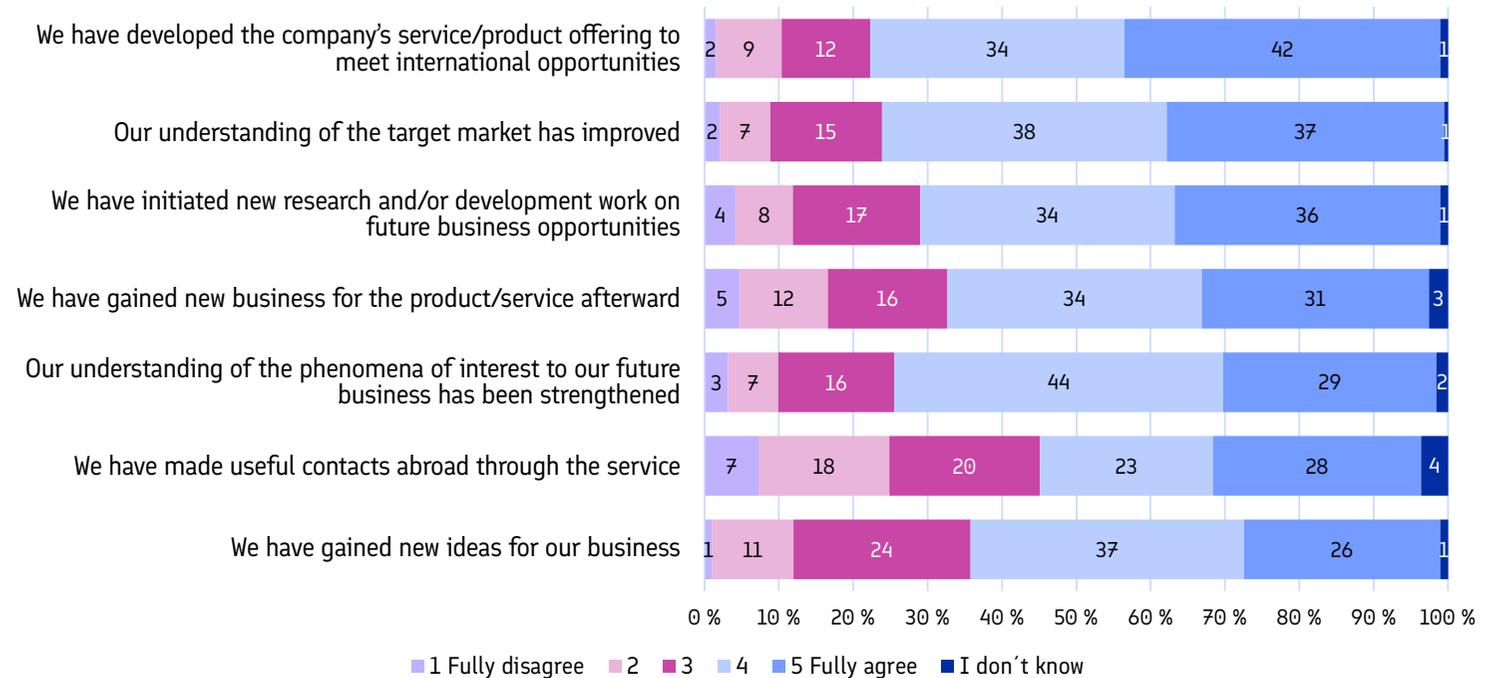


FIGURE 27. BENEFITS OF TEMPO.

Tempo funding increased resources and made it possible for companies to allocate more resources to development. As many as 83% of the respondents thought that the funding increased company's contribution to the development of the same theme or issue as developed in the Tempo project. Around half of the respondents thought that early-stage Tempo funding lowered the barrier to starting a company. Some 51% of the companies that responded to the survey have applied for Business Finland's R&D funding after Tempo. On the other hand, four fifths of the respondents said that the funding increased their own investment in RDI activities.

Approximately half of the respondents thought they would have been able to acquire the same kind of information as provided by Tempo in some other way, but only to some extent (Figure 28). The most common methods to obtain information would have been hiring international talent or from international or national market researchers. Especially the interviewees from newer companies thought that the same information gains and development wouldn't have been possible, or they would have been much slower without Tempo. On the other hand, the representatives of older companies regarded Tempo as free funding for something they would do anyway.

Would you be able to acquire the same kind of information as provided by the Tempo service in some other way? Please consider the following examples: (n=184–190)

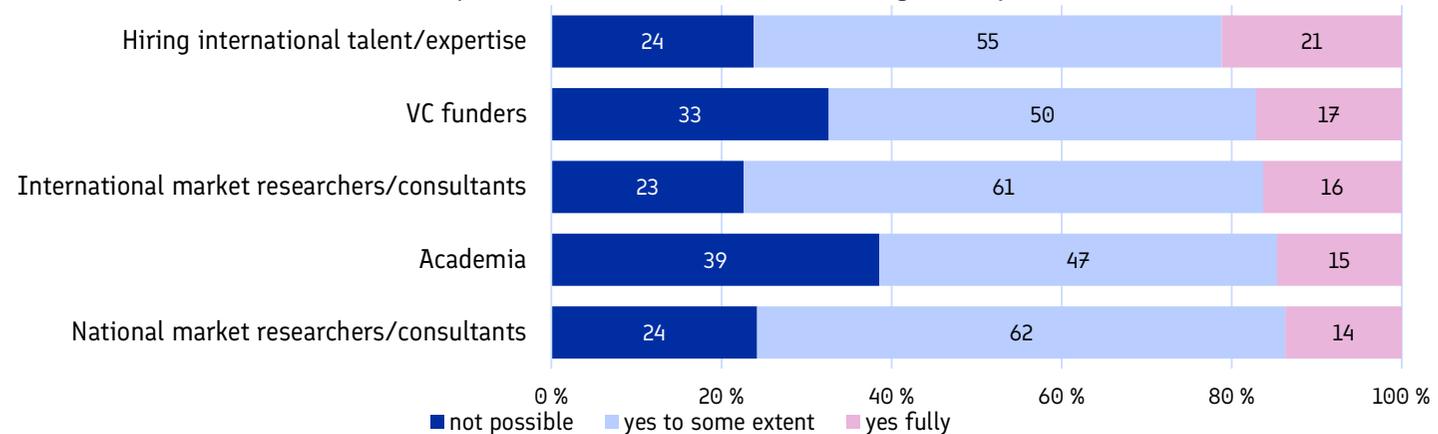


FIGURE 28. ACQUIRING THE SAME INFORMATION TEMPO PROVIDED.

A significant majority of the respondents said the use of the service led to thinking about changes in how to operate in different markets, changes in marketing or sales activities, and changes in the company's strategy (Figure 29). The interviewees also said that after Tempo they had

a complete product ready for the market and/or production. Some of the interviewees added that after Tempo they would need funding for larger production facilities or sales and marketing know-how.

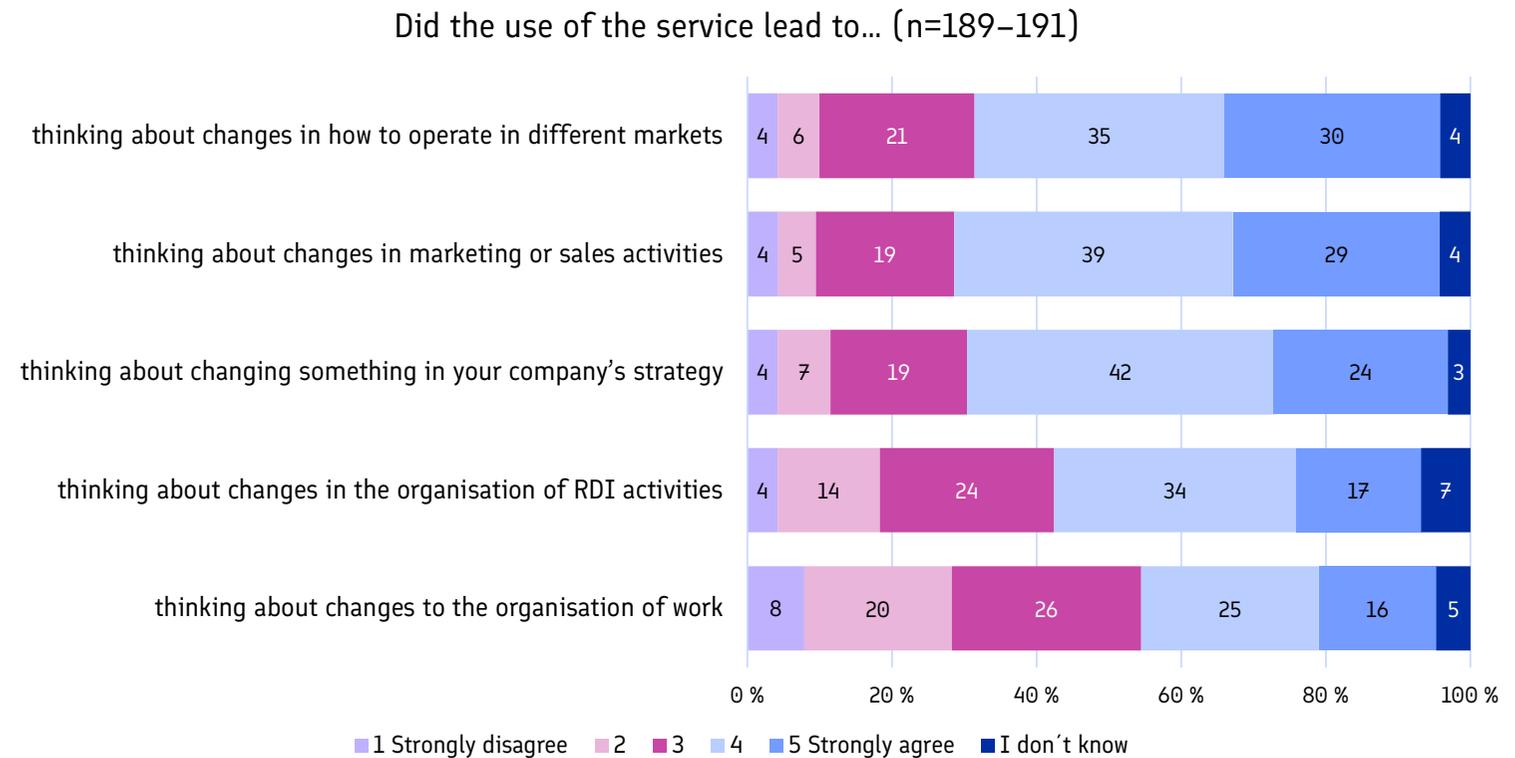


FIGURE 29. EFFECTS OF TEMPO.

CASE: COMBINING TEMPO AND R&D

Company:

Silcube Financial Systems Oy

Description:

Software Design and Development

Field of operations:

FinTech

Turnover:

2023: EUR 60 000 (2020: EUR 60 000)

Employees:

2023: 3 employees (2020: 1 employee)

Instruments:

Tempo, R&D

Case:

The company realized that the original product needed significant development in a different direction, necessitating a pivot. The role of Business Finland's funding was very significant when the company needed to redesign its operations. R&D loans enabled increased investment, freeing capital for sales and marketing. Tempo guided the company to focus on business and customer interaction, essential for leveraging product development. With Tempo, the company's knowledge base has significantly grown, and they now understand customer needs more precisely. The funding also made the company more attractive to other investors.

CASE: COMBINING TEMPO AND DEEP TECH ACCELERATOR (DTA)

Company:

Elmery Oy

Description:

Elmery Oy is a Finland-based tech company offering patented, cost-efficient and sustainable critical metal refining technology. The rapidly growing global customer base is highly interested in selective and chemical-free technology.

Field of operations:

Metal treatments

Turnover:

2023: EUR 157 000 (2022: EUR 93 000)

Employees:

Summer 2024: 9 employees
(2023: 4 employees, 2022: 2 employees)

Instruments:

Tempo, Deep Tech Accelerator

Case:

As a young company, Elmery received Tempo funding in 2022. This support was instrumental in preparing for international growth, leveraging advisory services, and setting the stage for the next funding round. In its early phase, the company wouldn't have been able to undertake these critical activities without Tempo's assistance.

In 2023, Elmery participated in the Deep Tech Accelerator (DTA), which proved to be an ideal fit given the company's deep tech foundation. The DTA funding was designed to accelerate market entry, allowing Elmery to hire key employees, enhance market and customer insights, and significantly improve its marketing efforts. The DTA has had a profoundly positive impact on the business. The structure of the DTA, which consists of a grant followed by a loan, has provided the company with a longer-term perspective for planning and executing necessary actions.

In summary, Business Finland's funding has allowed Elmery to make significant investments in its growth and scaleup efforts. As a result, Elmery is currently on an excellent trajectory, with several of the world's leading precious metal refineries as customers.

7.3 USE AND RESULTS OF MARKET EXPLORER, TALENT AND TALENT EXPLORER

We statistically described the firms that have used Explorer funding during 2017–2021. The number of observations for Talent and Talent Explorer is low and we have pooled this data with Market Explorer. In the analysis, we employed acceptance information of the Business Finland funding applications and created two groups of firms: accepted and rejected Explorer applicants. We merged financial information on the firms from Statistics Finland's business register and financial statement data as well as information on the firms' exports of goods from Finnish Customs data. The data is described in more detail in Appendix 1. These instruments were also part of the participant survey (see Appendix 5) and case interviews covered these instruments as well.

7.3.1 PARTICIPANTS OF EXPLORER FUNDING INSTANCES

In the research data, companies applied for Business Finland Explorer funding instruments approximately 720 times between 2017 and 2021. Explorer funding includes Talent, Talent Explorer, and Market Explorer. Approximately 80% of the applications were accepted. Median Explorer funding has been EUR 10 000 per accepted application, and it has remained the same in all the years the instrument has been in use. The most common industry among Explorer recipients was the computer programming, con-

sultancy and related activities sector (NACE 62). Wholesale trade (NACE 46) and manufacture of fabricated metal products (NACE 25) are the second and third most common industries.

We statistically described and compared firms that have received Explorer funding with those that have not (rejected applicants) over the period between 2017 and 2021. Table 15 presents the median values for age, turnover, number of employees, added value, labor productivity, profit margin and export of goods per turnover for these two groups measured for the year of the funding decision. The same table also provides information on the proportion of exporting companies and the total number of companies within each group. We used median values because the variables contain large outliers that increase the mean. The median provides a more accurate representation of the majority of firms. Table 15 addresses whether there are significant differences between the accepted and rejected firms at the time of the funding decision.

The companies that received funding from Business Finland are somewhat older and have more employees than those that were denied funding (Table 15). Measured by financial indicators, companies that received funding are more successful. The added value of the Explorer funded companies is more than five times greater than the added value of companies whose application was rejected. Also, labor productivity is almost 20% higher in Business Finland-funded companies.

TABLE 15. DESCRIPTION OF FIRMS THAT APPLIED FOR BUSINESS FINLAND EXPLORER FUNDING DURING THE PERIOD 2017–2021.

The table presents the median value for each variable measured for the year of the decision.

EXPLORER	ACCEPTED, MEDIAN	REJECTED, MEDIAN
Number of observations	582	136
Age	10	7
Turnover, €1,000,000	1.3	0.4
Number of personnel	7	3.5
Added value, €1,000	422	79
Labor productivity €1,000/employee	57	48
Profit margin,%	0.03	-3.5
Share of exporting companies,%	91	88
Share of goods exports in turnover,%	0.90	0.13
Funding amount, €1,000	10	

7.3.2 THE RESULTS OF EXPLORER FUNDING INSTANCES

We compared the development of the firms that have received Business Finland's Explorer funding to those that have not. Explorer funding includes Talent Explorer, and Market Explorer. Figure 30 shows the average development in various performance measures of accepted and rejected Explorer-funded firms two years before and three years after the funding decision. We investigated the average development of employees (number of personnel), (log) turnover, (log) labor productivity and (log) value of goods exports. These figures can indicate whether there have been changes in the development of the studied variables after the funding. However, they do not provide a basis for assessing the effectiveness of the funding decision itself. Since firms that received funding are not compared to similar firms that did not receive it, the observed changes could also

be due to other factors, such as better management or additional funding sources.

Business Finland Explorer-funded companies have had a higher turnover and a larger number of employees than non-funded companies. The growth in turnover and number of personnel accelerated slightly in accepted firms after Explorer funding. The development of labor productivity of the accepted companies remained stable after the funding decision. The value of goods exports seems to have jumped to a new level in conjunction with the funding application in both accepted and rejected companies. This may be due to both accepted and rejected applicants aiming for international markets, and thus the selected sample is such that these firms can expect export growth. The export growth of rejected firms may then indicate that the rejected firms were able to expand to international markets also without funding from Business Finland.

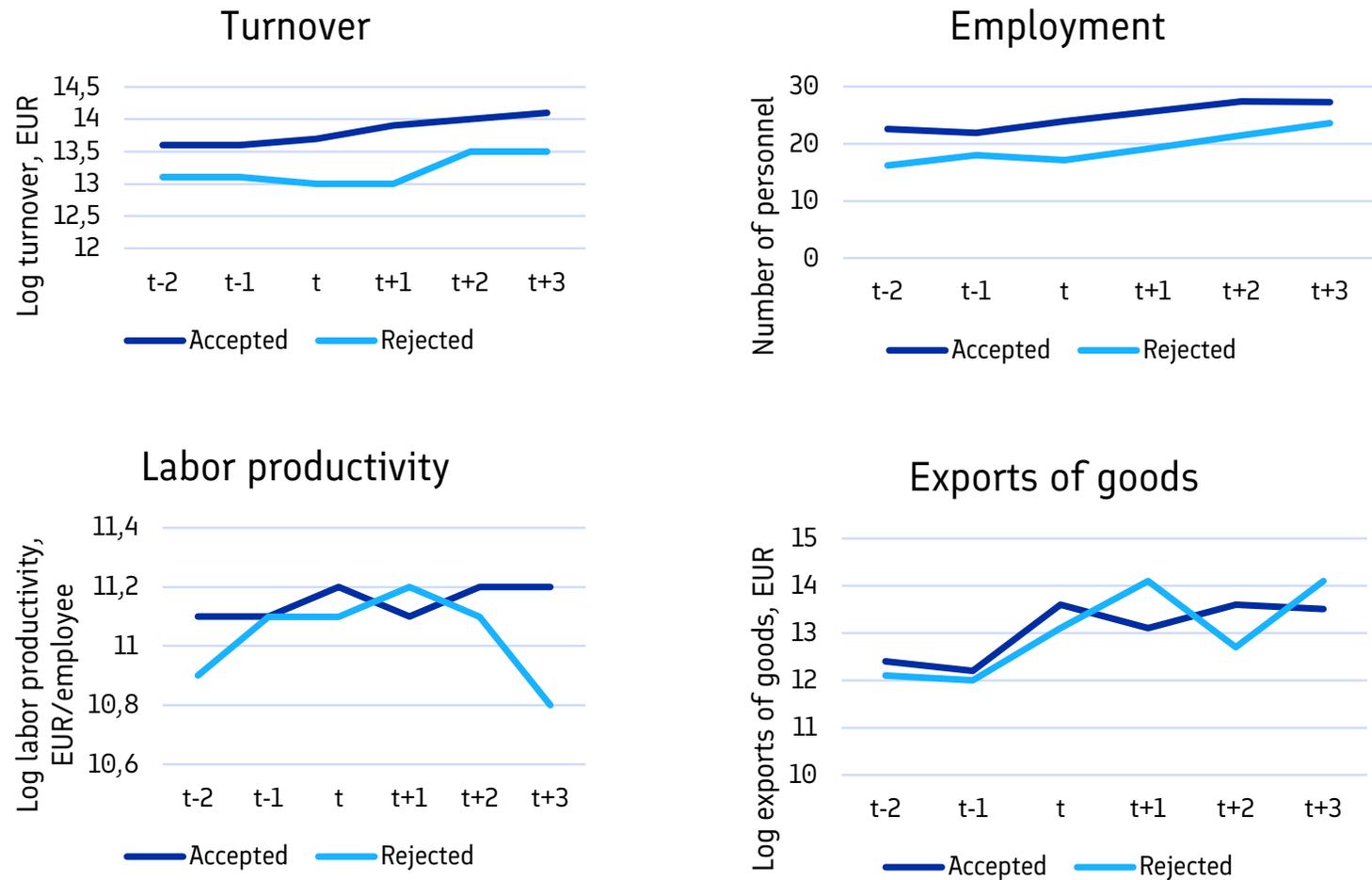


FIGURE 30. AVERAGE VALUES OF (LOG) TURNOVER, EMPLOYEES, (LOG) LABOR PRODUCTIVITY AND (LOG) EXPORTS OF GOODS BEFORE AND AFTER FUNDING APPLICATION FOR ACCEPTED AND REJECTED EXPLORER FUNDING.

7.3.3 QUALITATIVE RESULTS FROM MARKET EXPLORER

The companies which answered the survey found Market Explorer to be very useful. On a scale of 1 to 5 (1 not at all useful, 5 very useful) the average was 4.4. Market Explorer is viewed as concrete money that the companies can use for external advisory services. Unlike Tempo funding, Market Explorer is meant for companies that have a product on the market already.

Market Explorer funding was most commonly used by respondents to identify business opportunities, develop an internationalization plan and strategy, export customer processes, and validate the product's competitive advantage and value proposition in the target market. According to the interviewees, Market Explorer gives companies the opportunity to carry out specific market studies. In many cases these studies were something the companies would have done even without the funding. The interviewees pointed out that it would be foolish for the company not to apply for the funding. In newer and smaller companies, Market Explorer made it possible to carry out larger

market studies and the funding was seen as crucial. The use of Market Explorer expedited the move to international markets in some cases.

According to the survey respondents, Market Explorer significantly enhanced companies' understanding of potential new markets and provided valuable insights into markets outside Finland. The funding enabled increased international presence, supported market research, and facilitated the development of internationalization strategies. Respondents noted that the financial support was crucial for exploring and validating new markets, such as the United States and Saudi Arabia, and for identifying local competitors and market structures. The program also facilitated testing marketing approaches and connecting with talent and potential partners in target markets. While some projects faced challenges, such as market conditions and currency fluctuations, the overall support helped companies gain a better understanding of market needs, refine their strategies, and plan for future expansion.

According to the survey, the most common benefits were improving the company’s understanding of the market, facilitating the practical processes related to exporting or planning to export and making useful contacts abroad through the service (Figure 31). As many as 73% of the

respondents thought that the funding increased their financial contribution to the development of a theme or issue that was developed in the service. Some 56% of the respondents said that the funding increased their own investment in RDI activities.

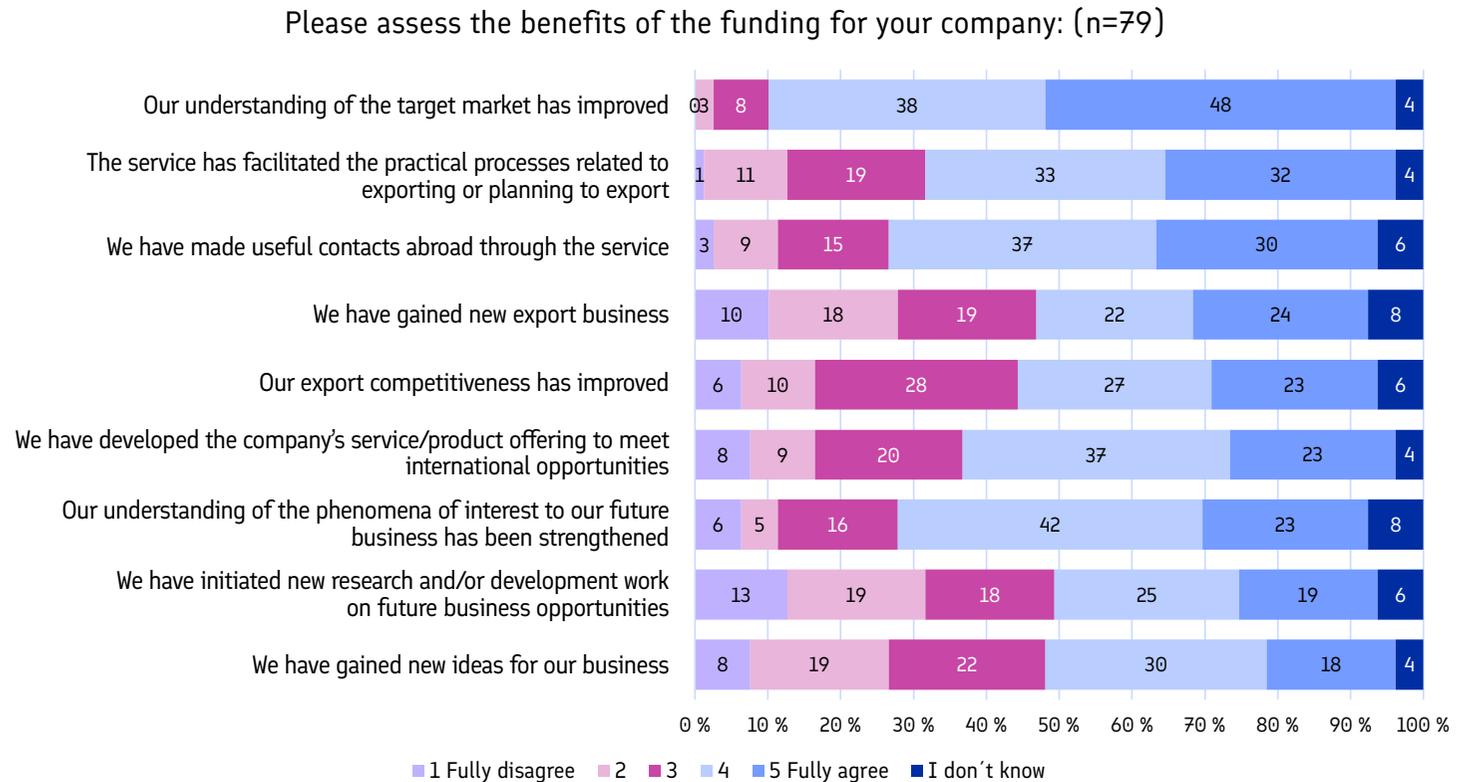


FIGURE 31. BENEFITS OF MARKET EXPLORER.

Approximately half of the respondents thought they would have been able to acquire the same kind of information as provided by Market Explorer in some other way, but only to some extent. The most common methods to obtain information would have been hiring international talent or from international or national market researchers or con-

sultants (Figure 32). Interviewees deemed the funding to be crucial in the very first stages of the company. As the company grows older it gains knowledge about markets and more opportunities to carry out market studies, for example.

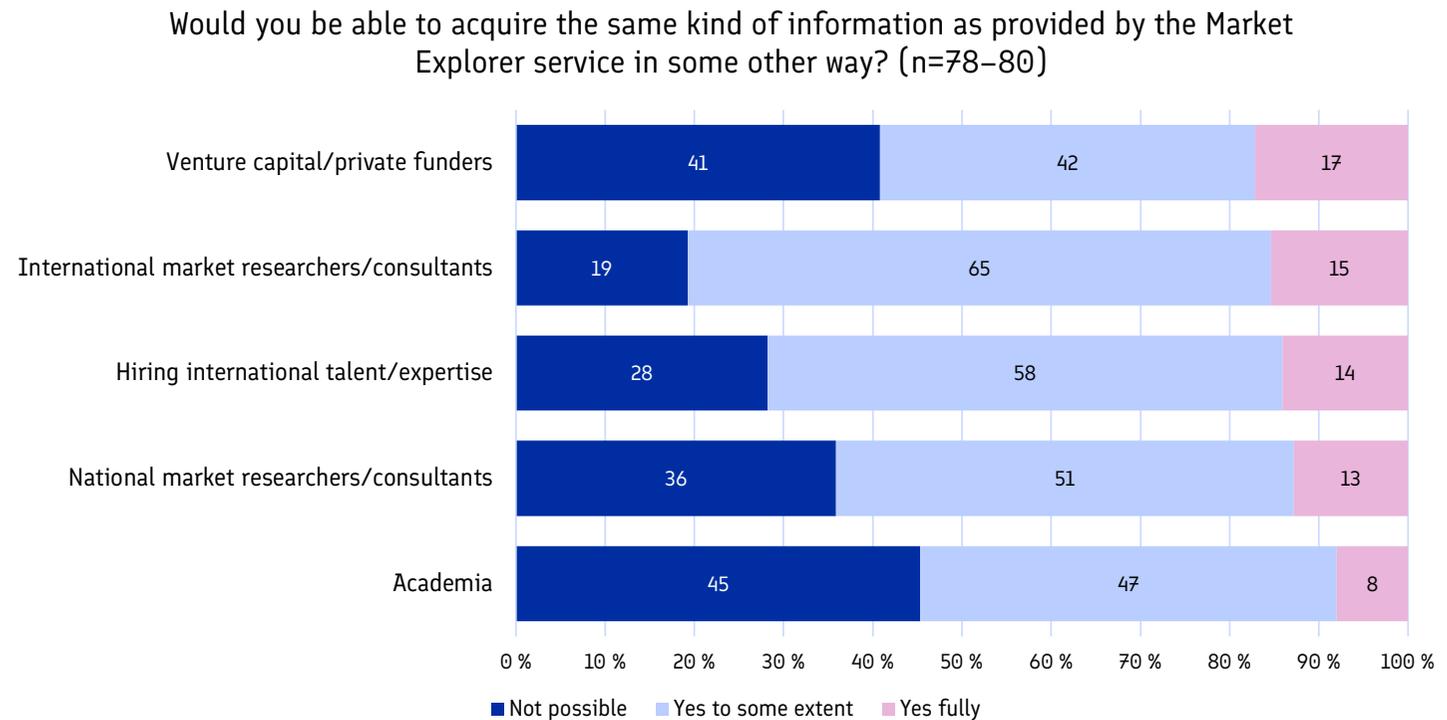


FIGURE 32. GAINING THE SAME INFORMATION PROVIDED BY THE MARKET EXPLORER.

A significant majority of the survey respondents said the use of the service led to thinking about changes in how to operate in different markets, changes in marketing or

sales activities, and changes in company strategy. The service didn't lead to thinking about changes in the RDI activities as often (Figure 33).

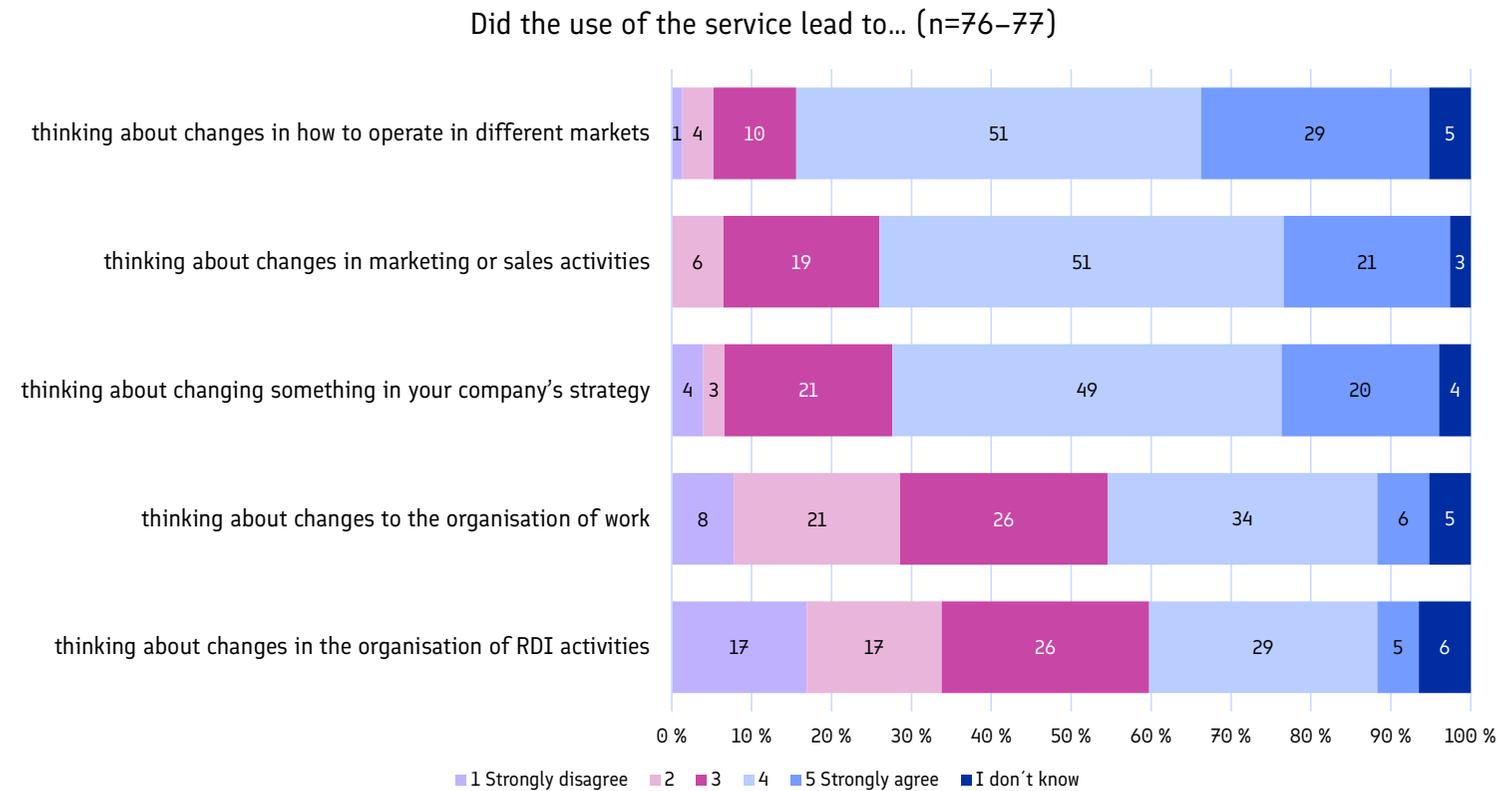


FIGURE 33. EFFECTS OF MARKET EXPLORER.

CASE: CONTRIBUTION OF SEVERAL ASSESSED INSTRUMENTS

Company:

GrainSense Oy

Description:

Solutions for instant grain and oilseed quality monitoring

Field of operations:

Measuring and control instrument manufacturing

Turnover:

2023: EUR 1.2 million (2020: EUR 1.1 million)

Employees:

2023: 13 employees (2021: 18 employees)

Instruments:

NIY, Market Explorer, R&D

Case:

NIY funding played a vital role in accelerating international expansion within the program's framework. The company has scaled globally as a "born global" entity, with only 3–4% of its operations based in Finland and the rest being exports. Without this funding, the company would have struggled to build effective sales channels, leading to a slower, incremental market entry, potentially focusing on one country at a time. Additionally, the NIY funding enabled a significant presence at trade shows, which has been crucial for business development.

Market Explorer funding provided valuable insights for decision-making. Without it, the company would have faced higher risks or missed strategic market entry opportunities. This funding provided essential information and reduced uncertainties, facilitating more informed and strategic expansion decisions.

R&D funding accelerated product development from the outset. It supported advancements in sensor technology, opening a completely new business realm. This allowed the company to demonstrate a functional device to clients, leading to significant contracts and ongoing business opportunities from 2025 onwards. Although the timelines for converting investment and effort into financial value are lengthy, the R&D funding was essential for achieving this progress.



7.3.4 QUALITATIVE RESULTS FROM TALENT

Overall, the companies found Talent to be very useful. On a scale from 1 to 5 (1 not at all useful, 5 very useful) the average was 4.7. Talent is not as well-known as the other funding elements. The companies that use Talent are usually large and old enough to have professional management. Talent is aimed at making companies more attractive to international experts by improving their culture and operations. Respondents predominantly used Talent funding to develop international skills management. Around a fifth of the respondents used the funding to develop a corporate culture that supports international recruitment, as well as to enhance international recruitment skills and processes.

According to the survey, the most common results of the funding were developing international skills management and developing a corporate culture that supports the use of international expertise. Interviewees said that Talent helped companies to expand their international workforce. Projects made possible by the funding were aimed at building new recruiting networks and providing training for personnel, for example. The international experts recruited by the respondents were not usually connected to Finland. Slightly less than a third of the respondents to the survey reported that the expert had previously worked in Finland, while 47% said that the expert was not connected to Finland.

Talent funding significantly supported hiring international talent, which was crucial for enhancing companies' global expertise and improving their local market presence (Figure 34). This recruitment enabled companies to better serve customers in their local languages and strengthened their international skills. Survey respondents not-

ed that the ability to attract and integrate international talent improved companies' understanding of complex international business models, particularly in niche areas like literary and talent agenting. Overall, the program was instrumental in building a stronger international presence and increasing business effectiveness in global markets.

What kind of results did you achieve with the funding? How would you assess the success of the funding against the original goals: Talent helped us to... (n=18-19)

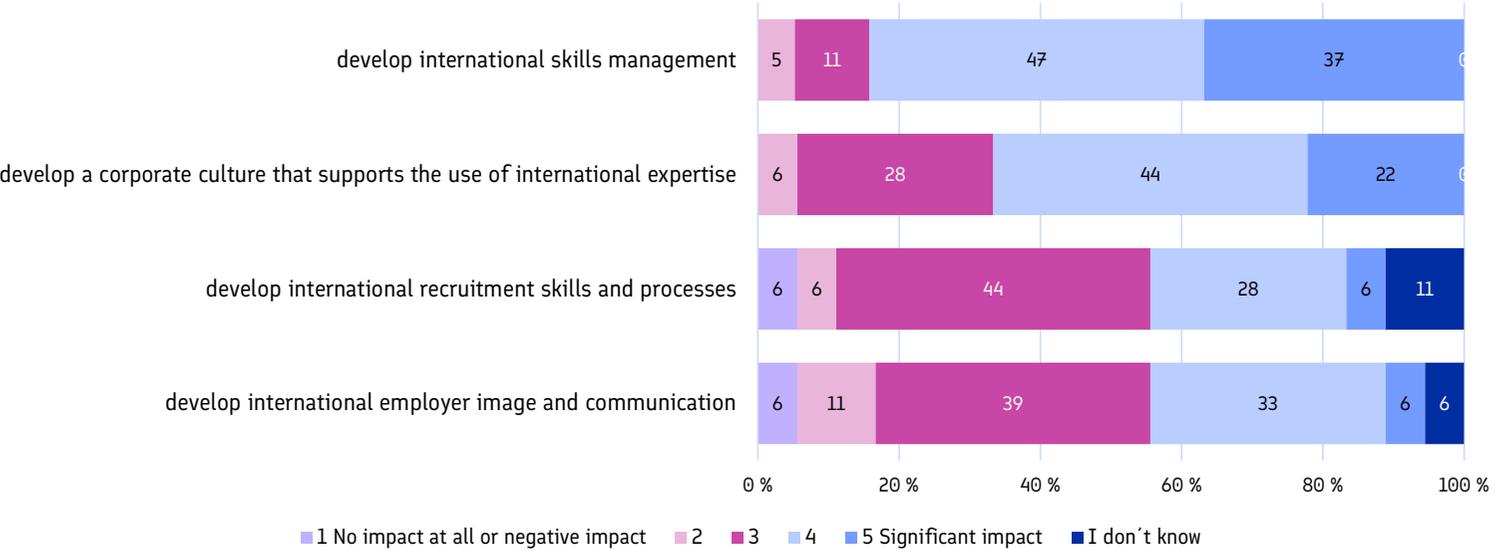


FIGURE 34. RESULTS OF TALENT.

The most important benefits of the funding included valuable business insights from international expertise, the development of a global management approach, and an improved international image for the companies (Figure 35). Of the respondents, 72% said that the funding in-

creased their financial contribution to the development of a theme or issue that was developed in the service. Half of the respondents said that the funding increased their own investment in RDI activities.

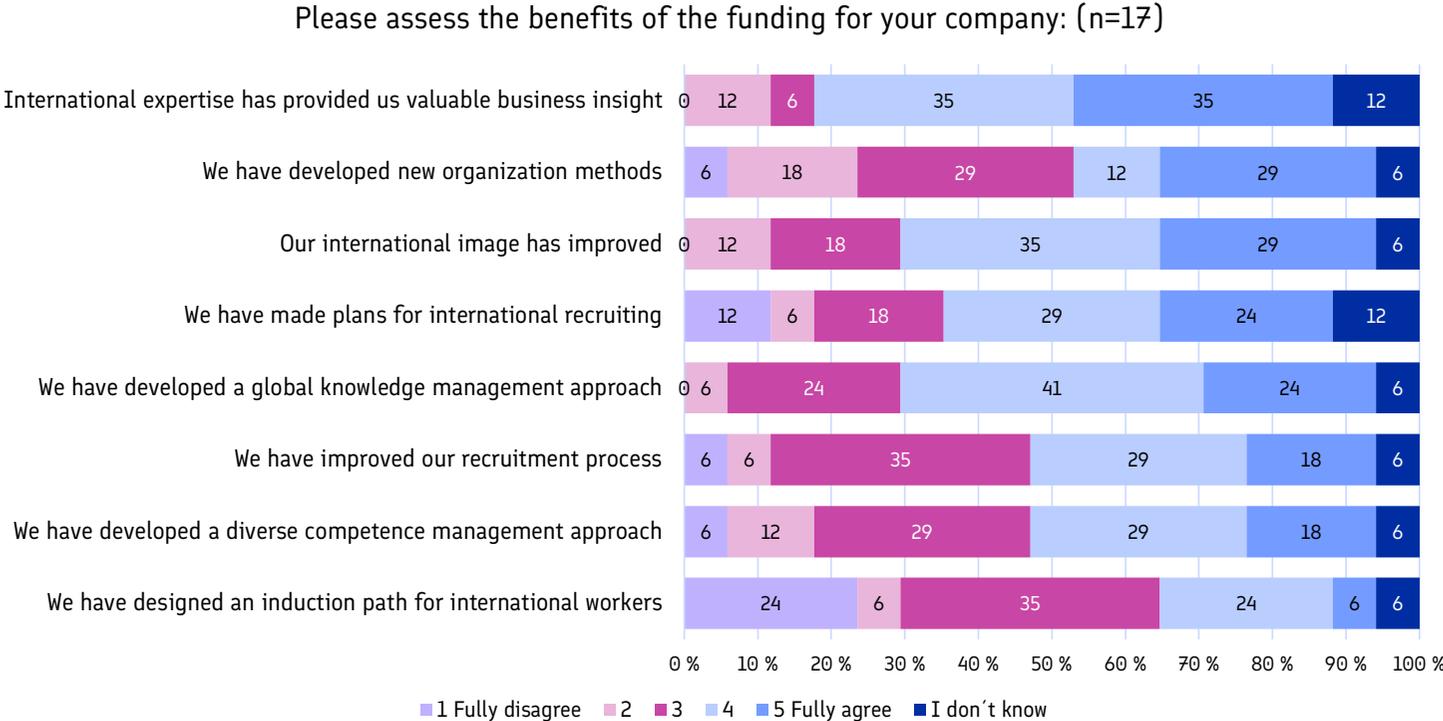


FIGURE 35. IMPACTS OF TALENT.

Talent is seen as a unique funding element. Around half of the survey respondents felt they would not have been able to acquire the level of support provided by Talent through other means (such as HR consultants or public or private services).

The majority of the respondents said the use of the service led to thinking about changes in marketing or sales activities, and changes in how to operate in different markets (Figure 36). Talent had less effect on what companies think about their strategies or RDI activities.

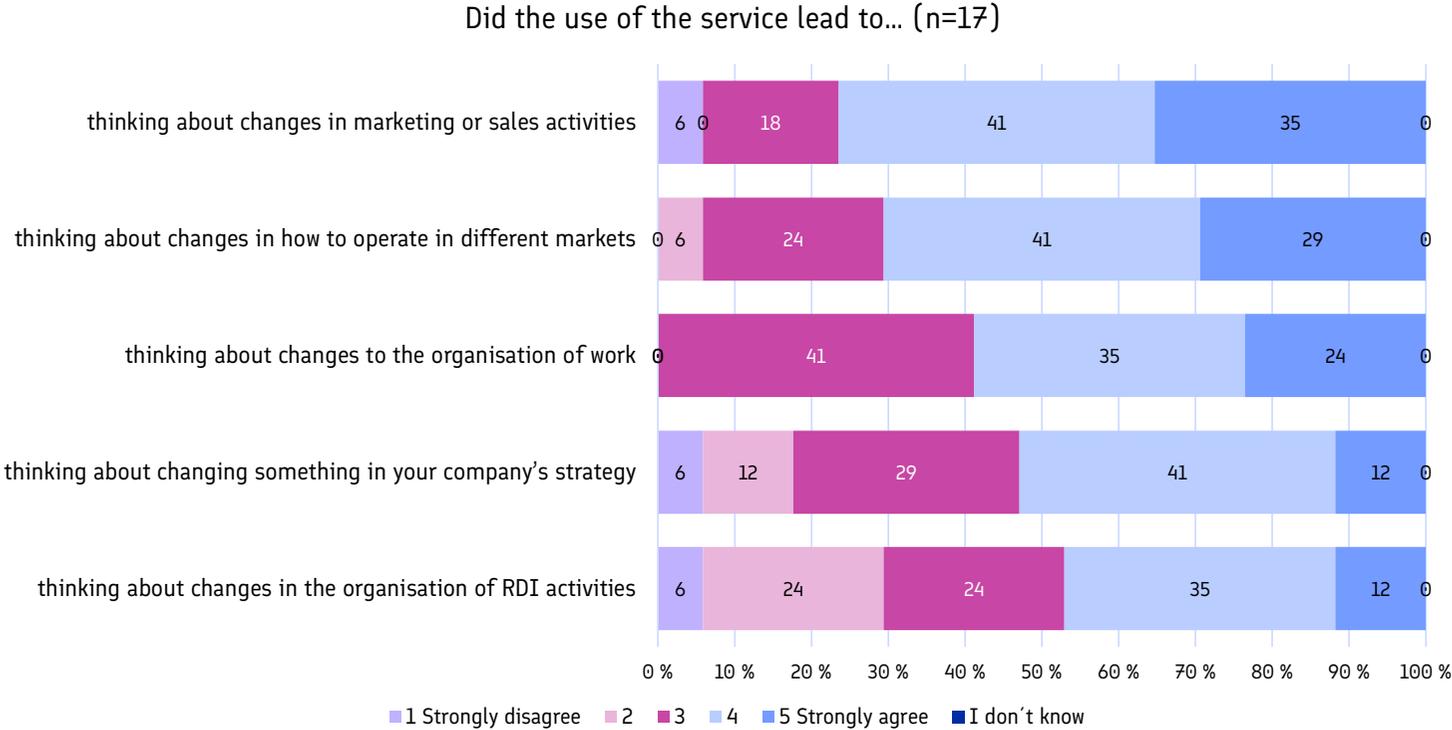


FIGURE 36. USE OF TALENT.

CASE: TALENT AS AN IMPORTANT INSTRUMENT IN THE INTERNATIONALIZATION PATH

Company:

Luxid Group Oy

Description:

Accelerates business growth with end-to-end marketing.

Field of operations:

Advertising services

Turnover:

2023: EUR 9.8 million (2019: EUR 3.3 million)

Employees:

2023: 66 employees (2019: 30 employees)

Instruments:

Talent

Case:

The company applied for Talent funding to enhance its international growth and ability to hire international talent. The funding was used to improve recruitment capacity, employer branding and corporate culture. The funding had many positive impacts on the company. For example, the internationalization skills and knowledge within the company increased, supporting its international businesses. The company trained its staff to build team structures and work that support internationalization and to manage international talents. On the employer side, the company developed strategies and plans for internationalization, for example. On the recruitment side, the company discovered during the project that it needs partners in the target countries to help in the recruitment market. During the project, the company built networks to help its international recruitment processes.

8 OVERALL ANALYSIS

This chapter covers common assessment questions from the Impact Assessment.

8.1 OVERALL ASSESSMENT OF THE ROLE OF BUSINESS FINLAND AND KEY IMPACTS

The overall assessment of the role of the public funder was twofold. Funding opportunities for startups were generally seen as good in Finland and Business Finland and its service were generally perceived central and its role well designed. Funding for scaling activities or success of scaling instruments were not seen as successful due to capital poorness and the recent decline in venture capital financing. Most of the issues are larger than those solvable with the means available to Business Finland.

From the standpoint of this impact assessment there are three levels in which the activities around the selected instruments can be modelled: the Business Finland Impact Model for Economic Growth (defined as a starting point for the impact assessment), the model in which the funding instruments and activities in general impact the participant companies (what we call a dynamic level of impacts) and the particular intervention logic of each in-

strument and their expected impacts (modelled through the assignment and leading to the survey and case-study questions).

The Business Finland Impact Model (see chapter 3) for Economic growth works as a standard to this assessment. Figure 37 illustrates the key findings from this assessment. Wider impacts at society level as outlined in the Business Finland Impact Model for Economic Growth can to some extent be claimed based on the findings of this impact assessment and earlier literature. However, the data and methods available today do not make it possible to establish claims at society level (i.e. the contribution of the assessed instruments towards the employment level).

It should also be noted that there are other instruments in Business Finland's portfolio which have higher expectations to contribute to the wider societal impacts (such as co-innovation funding and Veturi funding) in connection with these instruments. Thus, the following picture demonstrates the results and impacts at the firm level and how they connect to the impact model as realized results and impacts. There are many mechanisms that affect the impact of the instruments such as selec-

tion of applications, selection of instruments, exchanging ideas with and advising the applicants, as well as other support rather than funding (i.e. networking, connecting

etc.). This work on developing impact paths is currently under development in Business Finland.

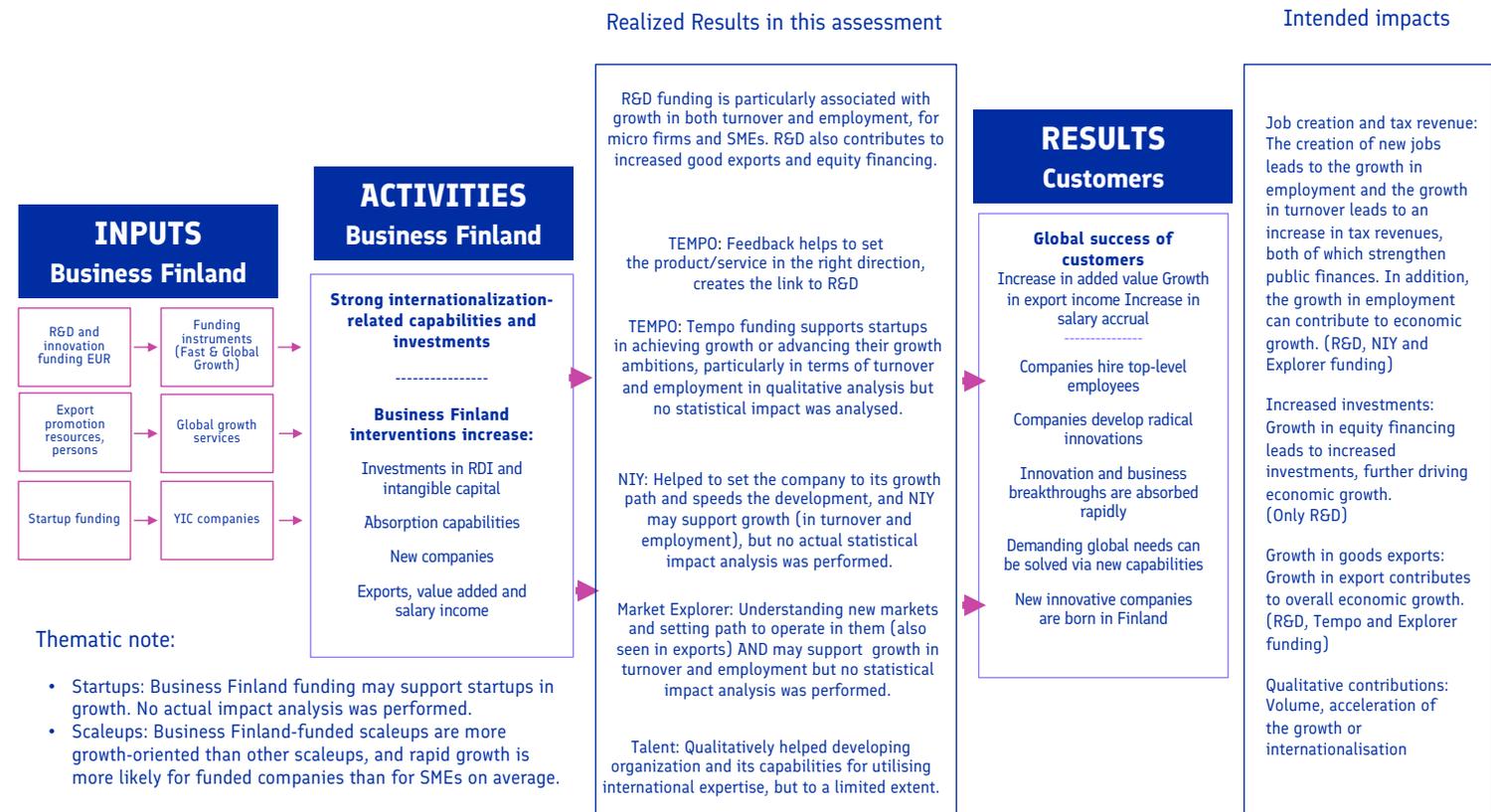


FIGURE 37. REALIZED RESULTS AND INTENDED IMPACTS TOWARDS THE IMPACT MODEL FOR ECONOMIC GROWTH.

Startups: The results of the descriptive analysis imply that Business Finland funding may have supported startups in growth. However, there is not much difference in the development of accepted and rejected startups before and after the Business Finland funding decision. In the descriptive analysis, the average turnover and average employment of the funded startups have grown slightly faster after a positive funding decision than those startups whose application was rejected. However, no actual impact analysis was performed. Qualitatively, Business Finland's role is deemed rather crucial in the startup funding landscape providing a plethora of services to complement private financing and private services.

Scaleups: Our analysis of the post-scaleup development of firms that have received Business Finland funding compared to those that have not received it suggest that, while Business Finland funding may contribute to sustained employment and turnover growth in the short term, it does not correlate with the internationalization or labor productivity of the funded firms. Also, the analysis suggests that Business Finland funding is positively related to the likelihood of a firm becoming a scaleup within three years of the funding decision. Overall, these results imply that firms receiving Business Finland funding are more growth-oriented, and rapid growth is more likely for funded companies than for SMEs on average.

Moreover, when comparing the firms that applied for R&D funding, we found that R&D-funded firms increase their number of employees and turnover more than the rejected firms. These results apply for both SMEs and micro firms. However, the R&D funding is mostly unrelated to the development of mid-cap firms.

The estimation results of the impact analysis indicate that R&D funding has a positive and statistically significant effect especially on employment and turnover among SMEs and micro firms. Moreover, the results imply positive effects also for the development of exports of goods and equity investments when considering the whole three-year period. The findings indicate that there are some observable differences in the development of employment and turnover between the treatment and control groups already before the R&D funding decision that may raise some endogeneity concerns (see methodological discussion in Appendix 2 and chapter 5.5).

NIY funding plays a crucial role in supporting companies' international growth efforts. It is primarily used to invest in the expansion of international business, access new markets, establish new distribution partnerships, and boost resources for scaling operations. These actions have enabled companies to grow internationally by supporting market expansion, building global sales networks and attracting investors. One key qualitative impact of NIY is that it provides reassurance to private

investors. The statistical analysis provides no clear results for NIY. The funding may support growth in turnover and employment, but no actual impact analysis was performed. The descriptive analysis also suggests that early phase NIY funding focuses on the internalization and labor productivity of the firms, whereas the third phase is related to firm growth.

The Tempo instrument has helped companies to test or pilot the demand for a product or service with customers and validate their markets. It is particularly important for startups, as securing private funding during the startup phase is challenging in Finland. Tempo provides essential support for research and development, allowing companies to test and refine innovative concepts and advance product development. The funding has boosted companies' ability to allocate more resources to development. The impacts of Tempo include supporting the growth of companies and offering valuable insights that would have been difficult to obtain through other means. The findings of the descriptive statistical analysis imply that Tempo funding may support startups in growth, particularly in terms of turnover and employment, but no actual impact analysis was performed.

Market Explorer has helped companies identify business opportunities, develop internationalization plans and strategies, export customer processes, and validate their product's competitive advantage and value proposition in target markets. It enhances companies' understanding of potential new markets and provides valuable

insights into markets outside Finland, though similar studies might have been conducted without the funding. Market Explorer makes broader market studies possible and offers insights that would not have been obtainable through other means in most cases. In the descriptive statistical analysis, Explorer funding (including Talent, Talent Explorer and Market Explorer) seems to support growth in turnover and employment and facilitate entry into international goods markets. However, no actual impact analysis was performed.

Talent is important for developing international skills management within companies. It has facilitated the development of international skills management, fostered a corporate culture that supports the use of international expertise, and supported the hiring of international talent. Through Talent, companies have been able to cultivate a corporate culture that embraces and utilizes international expertise effectively.

On a dynamic level many of these instruments impact the "thinking" or "behavior" of the companies as stated in case study interviews. One important example of this is "setting a path" from Tempo to other services or from NIY to wider R&D or internationalization and scaling, usually through VC funding. Although these incremental changes lead to other impacts within the company, such dynamics (or externalities) fall beyond the impact assessment methods used here. This would require longer-term research at company level than was possible in this assignment.

8.2 FUTURE GUIDELINES IN DEVELOPING SERVICES AND ACTIONS IN THE FIELD OF STARTUPS AND SCALEUPS

One of the main instruments in the startup and scaleup funding landscape is the R&D funding. Our results are described in greater detail in chapter 5.5. To summarize the results R&D funding has a positive and statistically significant effect on employment and turnover among SMEs and micro firms. Moreover, the impact of R&D funding on the exports of goods and equity investments is also positive but the results are statistically more dubious. R&D funding is also seen an important instrument in startup and scaleup financing landscape in the interviews. This suggests, that the core of the Business Finland's funding instruments may also work from the startup and scaleup perspective.

Once the Impact Assessment was completed, actions and developments were already planned in Business Finland as well as among other stakeholders in the startup and scaleup support ecosystem. The startup roadmap and action plan for 2030 (Business Finland 2023) analyzes the current situation and sets a roadmap for startup and deep tech service paths. This strategy also analyzes key technological or application areas which Business Finland is focusing on. Key activities in the startup service line include a plethora of actions, such as coaching for international growth, developing VC investments and investor panels to ensure deal flow of Finnish startups to venture capitalists, the actual funding services and matchmaking

activities (for example challenging venture capitalists to collaborate with startups or redesigning Business Finland programs to offer services that meet the needs of startups). In addition, investor services are foreseen to be developed to support investors. These already planned actions reflect quite well what the stakeholders and analysis point out as service challenges. (Business Finland 2023.) Many of these plans seem to be in line with what key stakeholders suggest.

The key suggestions for future development are strategic in their nature and based on qualitative learnings from the assessed instruments and how they currently work in the context of the Finnish funding landscape. The key qualitative learnings can be summarized as follows:

1. Increase the amount of new startups The number of startups as Business Finland's clients has been decreasing during the last few years. On the other hand, the mid-2010s can be seen as a startup boom in Finland, which led to relatively surprising numbers of startups in general and thus also in Business Finland's client base. However, as many interviewees point out, that successful start-up landscape means also paying attention to the amount of startups established. This means that focusing on getting startups as customers of Business Finland should be seen as an important objective.

Another viewpoint in the case studies has been the rise of "VETURI" instruments and the role of large corporations versus wider participation of startups and scaleups.

Some successful cases mention that there is a need for programs and activities specifically ensuring the number of successful starts and startups. Whether this role belongs to Business Finland or some other public activities is another question.

2. Increase cooperation between public funders. This theme is prevalent in the interviews across the gathered data. Currently there has been too little, or too general or even ad hoc cooperation among public funders working in the field of startups and scaleups. It should be more constantly supported with consistent structures and be based on a future-looking orientation. The whole startup and scaleup landscape would need a cross-funder roadmap rather than organization-specific strategies.

3. Startups and scaleups need also other services than (R&D) funding. Even though the general packaging of the assessed services and overall service portfolio seems to serve the needs relatively well, the findings indicate that there is also need for other services than assessed funding services. These services relate to matchmaking (startups and investors or startups and other technical experts), general advice, growth planning and so on. Some interviews point out the lack of startup- and scaleup-specific programs (in addition to NIY for instance).

Some interviewees point out that there is a lack of team building support instruments in the public support for startups and scaleups. However, this is extensively

covered both in terms of VCs (Sisu, Icebreaker), associations or universities (Startup Sauna, Helsinki Games Capital etc.) and to some extent public institutions (i.e. VTT's incubator for groundbreaking technologies). This would suggest a need for either promoting these activities or creating new ones.

4. Address the gaps in public and VC funding. Increase the level of NIYs and develop some public support for leveraging later stage funding. From the existing services there is the notion to make Tempo more efficient (faster decision times, better communication of the services from Business Finland to companies and more direct link from Tempo to RDI projects). Case interviews and some stakeholders mention that the gap after NIY and before TESI funding could be analyzed. There might be some focus industries or (deep) tech areas where there could be more room for public funding coexisting with private funding as well. This should also include creating better connection between startup and scaleup instruments and funding with the services and instruments for research commercialization (and research).

5. Finland needs Talent. Strategic international communication between public funders and joint work on talent attraction is mentioned in most of the interviews for stakeholders or to companies. However, it was noted that, at the time of the impact assessment, Finnish migration policies and services relating to talent attraction are con-

stantly under change, which makes it difficult to establish a clear picture of what should be done. The role of talent and human capital in startup and scaleup policies should be understood and developed consistently together with migration policy and economic policy.

6. Developing service experience and building a seamless service path for both public and VC funding. There is a broad consensus among stakeholders, in case interviews, and in survey feedback that a more seamless service path in public services is needed. In many instances companies point out that there are a plenty of funding and other services available, but the lack of knowledge, lack of contact persons or advice on building the funding or other help on their growth path remains a challenge. On the other hand, many successful case companies point out that finding a Business Finland contact with deep technological and industry knowledge and an interactive communication process has been a crucial part of the usefulness of the public services used and without them, the company would not have made its growth as fast as it did. In Business Finland services, there is a need to increase the interaction between financing processes and those (startups and scaleups) who apply for it. This way, there would be less need for external consultants to write applications, which would also lead to increased understanding of the technology in question within Business Finland.

In our complementary survey and interviews the respondents called for simpler, faster, and more accessible

funding processes. They widely suggested reducing bureaucracy, lightening application procedures, and offering easy-access grants with minimal administration. There is a strong demand for more targeted funding options, such as smaller initial grants with potential follow-on funding, and greater flexibility in how funds can be used, particularly in early-stage R&D, sales, and marketing. Many respondents proposed additional support services, including hands-on consulting, networking opportunities, and assistance with internationalization.

Respondents called for more direct and proactive engagement from Business Finland, including clearer feedback on funding applications and ongoing support throughout the scaling process. Suggestions were also made to ensure that funding decisions are based on a deep understanding of the company's scaling potential and market opportunities. This would also include more transparent and expert-driven evaluation processes, along with improved communication and support from Business Finland's personnel.

Besides the variation of the service experience, the themes of "continuation" of customer experience with public sector funders is something that is mentioned in the interviews. Respondents point out that the service path should be built not only within Business Finland, but among public funders and with clear linkages to private investors as well. This is something that is already planned in the context of the Business Finland's startup roadmap (see Business Finland 2023).

8.3 SUSTAINABILITY AS A GOAL

The theme of sustainability (economic, ecological, and social) was mapped in this impact assessment in literature reviews and qualitative interview phases. Despite the intuitive urgency of these goals, relatively little has been written on this issue in terms of RDI funding and its measurement, thus we rely here mostly on interview data and a review of some existing practices. The findings provide three different approaches to analyzing and further measuring the impacts of the companies:

1. Utilizing existing sustainability reporting or assessment frameworks to avoid extensive red tape,
2. Analyzing the footprint of the companies and their innovations,
3. Analyzing the (potential) future handprint of the funded companies.

Utilizing existing sustainability reporting and assessment frameworks. Many respondents suggest not to include additional reporting metrics or indicators, but rather build these aspects into the funding applications and reporting databases. To some extent this may have already been done. This could include utilizing ESG re-

porting questions/templates already used by venture capital firms, making it easier for startups to report ESG goals to various funders. Whilst these kinds of questions would be reported using the same questions and metrics, the monitoring data would then make it possible to analyze companies funded by Business Finland and their relation to ESG.

Analyzing the footprint. Another viewpoint in the interviews was the traditional way of measuring the sustainability as the ecological footprint of the companies. This would mean developing a Business Finland-specific ESG reporting structure or some indicator on the social impact of the companies in terms of job creation and so on. On the other hand, it was noted that this is already covered in readily available ESG reporting tools and indicators as noted in option one.

Analyzing the (potential) handprint. The most difficult option would be to analyze the potential handprint of the startups at the funding stage and at the end of project stage. This would mean developing a specific indicator and reporting assumption from the companies' inventions and business models and would be very company specific and relatively time-consuming. In practice this would need a separate development project for such indicators.

9 CONCLUSIONS OF THE IMPACT ASSESSMENT

This chapter presents the conclusions of the impact assessment for each assessment question.

9.1 STARTUPS

Assessment questions: What are the results of Business Finland-funded companies (new companies, the impact of total funding on companies' growth of turnover, exports, value added and employment, internationalization, and VC funding) compared to other startup companies in Finland during 2010–2020?

Business Finland funding tends to be allocated towards startups with lower labor productivity than other startups. In the early stages of business operations, productivity and value added are often low, which the firms aim to improve via Business Finland funding.

The economic development of Business Finland-funded and other (rejected) startups is quite similar. The average turnover and employment of the funded companies have grown slightly faster after a positive funding decision than those startups that received a rejected funding decision. Labor productivity is lower in the funded startups than in others (rejected), but the growth rate after

the funding decision is roughly the same. The value of exports of goods has grown slightly slower among the funded startups than among other startup. However, the results might be different if we had information on total exports, including exports of services.

Based on the descriptive statistical analysis, Business Finland funding seems to support startups in advancing growth, particularly in terms of turnover and employment. It can be assumed that the creation of new jobs leads to the growth in employment and the growth in turnover leads to an increase in tax revenues, both of which strengthen public finances. In addition, the growth in employment can contribute to economic growth. However, these were not part of the statistical analysis in this assignment.

Assessment questions: What is the role of Business Finland funding and other activities when considering the impacts on startups via the Business Finland Impact Model for Economic Growth:

- i. What is the role of Business Finland on outcomes and direct impacts? What is the impact on growth and renewal?

- ii. What is the value added of Business Finland to the Finnish economy and business life in Finland? What are the main factors that are affected in the growth of the startup ecosystem in Finland? What are the main bottlenecks outside Business Finland and the Finnish innovation environment? How will Business Finland's Deep Tech Accelerator alleviate these bottlenecks?

In qualitative analysis the role of Business Finland funding as well as other activities are seen as important in facilitating the startup ecosystem and financing especially in the early stages as well as in the beginning of the scaling phase. When considering the Business Finland Impact Model for Economic Growth, it can be argued that many outcomes on a customer level are reached and instruments are able to change firm-level behaviors or at least influence them. The role of Business Finland is recognized in the Finnish startup (as well as scaling) ecosystem. There is also call for even more cooperation and coordination together with key stakeholders working with the startup ecosystem in Finland.

Main bottlenecks relate to political and cultural as well as economical and financial bottlenecks as described in the findings of the evaluation. Some of the challenges recognized relate to cooperation among public and private funders in the startup and tech landscape. There is a certain lack of political long-term commitment for startup and scaleup policies and programs, and a lack of ambition towards some of the key drivers of innovation. The

Deep Tech accelerator is mentioned as a good example of tackling the funding challenges in the field, but overall, the challenges relate to whole policy and ambition level in the startup and scaleup ecosystem rather than particular funding instruments or services. Lack of private financing and capital poorness are still challenges, despite the strong development of the venture capital market.

9.2 YOUNG INNOVATIVE COMPANIES FUNDING AND SERVICES NIY

Assessment Questions: What are the experiences of participants of the NIY?

NIY has two main phases: 1) Go to Market (EUR 100k) for finding a scalable business model; 2) Scale (EUR 400K–750k) for fast growth. Is this still a workable funding model, or is there any need to adapt this phasing?

NIY is seen as a well-functioning instrument because of its duration and three different stages according to qualitative analysis. There have been no significant findings indicating a need to change the phasing even though there have been some calls for the extension of the scaling phase to a larger amount.

Assessment questions: What are results (the impact of total funding on companies' growth of turnover, exports, value added and employment, internationalization, and VC funding) of a) startups, which have

not completed the whole program; b) startups, which have completed the whole NIY program during 2010–2020?

The results from descriptive statistical analysis imply that the early phase of NIY funding focuses on the internalization of firms, whereas the third phase focuses on firm growth. Firms that have completed some of the early phases of the NIY program exhibit slightly better growth in export value and labor productivity, whereas firms that have proceeded to the third phase have slightly larger growth in employment and turnover during the three-year post-funding period.

Assessment questions: What are other outcomes and impacts of the NIY program when considering the Business Finland Impact Model for Economic Growth?

According to the survey, the NIY funding enabled international growth by supporting market expansion, building global sales networks, and attracting investors. Most consulted companies felt that NIY funding helped them achieve revenue growth in international markets, expand into new markets and attract new foreign customers, and strengthen their team and resources. NIY funding plays a crucial role in supporting companies' international growth efforts. NIY funding has enabled companies to grow internationally by supporting market expansion, building global sales networks and attracting investors. One key impact of NIY funding is that it provides reassurance to private investors. All these impacts make NIY

funding a key instrument in supporting some of the wider societal impacts mentioned in the Business Finland Impact model.

9.3 BUSINESS FINLAND-FUNDED SCALEUP DEVELOPMENT

Assessment questions: What is the size and role of scaleups in Finland? (of those funded by BF)

The total number of scaleups in Finland has varied between 200 and 500 firms annually during 2010–2021. One tenth of scaleups have applied for Business Finland funding during this period.

Business Finland-funded scaleups cover only 0.02% of the total company stock. However, their importance is more significant than their number. The share of Business Finland-funded scaleups in the sum of turnover is tenfold, and the share of personnel is even more prominent: 0.3% of the companies' total workforce. Business Finland-funded scaleups have a significant role in the Finnish economy, and their potential to create new employment is substantial.

Assessment questions: What are results (the impact of total funding on companies' growth of turnover, exports, value added and employment, internationalization, and VC funding) of Business Finland-funded scaleups compared to scaleups in general?

According to the descriptive analysis, Business Fin-

land-funded scaleups have higher turnover, employment, and value-added than other scaleups at the time of the funding application. However, the turnover, employment, and value added of rejected companies are also higher than those of non-applied scaleups. This finding could hint that the applicants may be more growth-oriented or otherwise motivated to improve their business than other scaleups. The observation is further supported by the finding that Business Finland-funded scaleups grow their employment and turnover more than other scaleups 1–2 years after achieving scaleup status. This difference is also statistically significant. However, there is no marked difference in the development of exports of goods, labor productivity, or equity investments between the funded and other scaleups. It should be noted that our data does not include information on exports of services, so the results cannot be applied to total exports. Qualitatively case studies point out that the funding and services assessed can have positive impact on speeding up the scaling of companies.

Assessment question: What are other outcomes and impacts of the scaleups when considering the Business Finland Impact Model for Economic Growth?

Both Business Finland-funded scaleups and other scaleups have an important role in creating new jobs and economic growth. In addition, the growth in turnover leads to an increase in tax revenues, which strengthen public finances. As noted in the qualitative analysis, the impor-

tance of scaleups for the economy is seen as extremely important in creating the social impacts mentioned in the Business Finland Impact Model. However, it should be noted that the success of scaling is not only the success of Business Finland, but the company itself, as well as the private funders the company has for the scaling phase. It should also be noted that many of the services assessed provide the exchange of ideas of the key founders or persons from startups (in terms of product, service or market) and provide credibility towards investors.

9.4 PLANNING FOR INTERNATIONAL GROWTH

Assessment question: Tempo helps companies to set appropriate goals to learn from the market, to understand customer needs and the size of the market and, after Tempo, set out to develop the product in the right direction. How has Tempo achieved these goals?

The Tempo instrument helps companies test or pilot the demand for a product or service with customers and validate their markets. It is particularly important for startups, as securing private funding during the startup phase is challenging in Finland. Tempo provides essential support for research and development, allowing companies to test and refine innovative concepts and advance product development. The funding has increased companies' ability to allocate more resources to development. The perceived impacts of Tempo include supporting the growth of companies and offering valuable insights that

would have been difficult to attain through other means. These lead to changes in company activities: focusing on different parts of product or service development, or planning, or R&D activities, albeit not necessarily leading to submitting a funding application to Business Finland. It should also be noted that many startups “bypass” the Tempo phase and get the relevant information from market sources or venture capital investors.

Assessment questions: How has Tempo funding activated startup companies for international markets with a new product or service idea? How successful has internalization been? How many Tempo projects have led to new R&D funding projects via Business Finland?

The results of the descriptive statistical analysis suggest that Tempo funding may support startups in growth. Moreover, an analysis of company development prior to their funding application reveals that companies applying for Tempo funding are already export oriented, with exports showing growth even before the application process. This export growth continues after the funding decision, but there is no significant change in the overall growth rate trend. Case studies demonstrate that sometimes relatively minor financial support on developing and testing a product or service idea can have an impact on the behavior of a company and can help the company redesign or revamp the original idea. This helps the company on its growth path.

Between one third and a half of the firms that receive Tempo funding subsequently obtain R&D funding within the following three years. R&D funding is most frequently received within one year after receiving Tempo funding, and the share of subsequent R&D funding decreases as more time elapses since the initial Tempo funding. A minor share of firms has received R&D funding during the same year as Tempo funding. Thus, the results imply that Tempo funding supports firms in their research and development path.

Assessment questions: How has Market Explorer funding improved knowledge of over five-year-old SMEs and mid-cap companies of a new international market, and how have they started to operate in the market?

Market Explorer helps companies identify business opportunities, develop internationalization plans and strategies, export customer processes, and validate their product’s competitive advantage and value proposition in target markets. It enhances companies’ understanding of potential new markets and provides valuable insights into markets outside Finland, though similar studies might have been conducted without the funding. However, no statistical analysis of the impact was done due to the low number of observations.

Assessment questions: How has Talent funding increased the capacity of SMEs and mid-cap companies for international growth (working, organizational and management practices, recruiting international experts)?

Talent funding is important for developing international skills management within companies. It has facilitated the development of international skills management, fostered a corporate culture that supports the use of international expertise, and supported the hiring of international talent. Through Talent, companies have been able to cultivate a corporate culture that embraces and utilizes international expertise effectively. However, no statistical analysis of the impact was done due to the low number of observations.

9.5 OVERALL CONCLUSIONS FOR COMMON QUESTIONS

Assessment questions: International benchmark: How have fast growth programs or organizations similar to Business Finland in other countries succeeded in improving the development of fast-growth companies?

This assessment looked at several international examples from different viewpoints: From a funder perspective bottom-down and from a locality viewpoint bottom-up. It is difficult to identify particular reasons from other countries since the impact assessment literature or the overall analysis of startup and scaleup ecosystems of the bench-

marking countries are rather limited. However, key common themes on success relate to several characteristics in the benchmarking.

Firstly, the countries provide comprehensive support. Various programs targeting potential high-growth companies combine innovation funding, mentorship, and research as well as business Infrastructure. They focus on particular technological fields or high-potential sectors and solutions. Facilitating international expansion and market entry is incorporated in all key programs and services. Besides that, many programs prioritize ecological and societal sustainability in connection to R&D&I policies. Combination of funding and other activities: Instruments and programs are surprisingly similar. Most successful programs combine innovation funding, R&D funding, research and commercialization focus and other activities (such as networking etc.) to services that resemble NIY as a program with a difference, that they include even more other activities besides the funding (networking, best-practice sharing, mentoring). This would call for the recognition of other innovation services besides traditional R&D funding.

However, the success of such hubs as London, Berlin or Singapore in attracting private investors, startups and then potential high growth companies is a sum of different developments which are not deemed to be controllable by public policies as noted both in research literature and interviews.

Assessment questions: What kinds of critical obstacles and bottlenecks have affected the possibilities to achieve these goals? How has Business Finland in general succeeded in making successful funding decisions in this field? What are the other possibilities to support fast-growth companies than Business Finland funding?

Most of the challenges and bottlenecks in startup and scaleup creation are outside of Business Finland's services or instruments. The challenges relate even to the political and cultural landscape in Finland. The key suggestions for future development are strategic in their nature and based on qualitative learnings from the assessed instruments and how they currently work in the context of Finnish funding landscape. These are summarized in more detail in the findings.

Assessment questions: How might sustainability (economic, ecological, and social) be considered at the customer and society level? How to measure impacts of funded companies by Business Finland on sustainability (SDGs or other metrics)?

Three different approaches to analyzing and further measuring the sustainability impacts of the companies

are recognized. These are utilizing existing sustainability reporting or assessment frameworks (such as those used by VC funds) to avoid excessive red tape, analyzing the footprint of the companies and their innovations, and developing a tool for analyzing the (potential) future handprint of the funded companies. Especially the latter would require a specific development project.

Assessment question: What are the future guidelines on how Business Finland can improve its activities in this topic?

Startups and scaleups require also other public support than funding. The findings in the impact assessment call for maintaining a proactive and communicative funding process as well as participation in other services and support geared towards startups and scaleups. In many instances the startup roadmap created by Business Finland and activities recognized in the roadmap form a solid basis for developing these activities further.

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APPENDIXES

APPENDIX 1 DATA AND DEFINITIONS

THE RESEARCH DATA

In the statistical analysis, we apply Statistics Finland's business register data, financial statement data, and Business Finland's funding application data over the years 2010-2021. We also employ Finnish Custom's data on international trade from the same time period, which include firm-level information on the total values of imports and exports of goods. Unfortunately, the register data does not include information on export of services.

The Business Finland's funding application data comprise information, e.g., on the date of application, the instrument applied, the funding decision, the amount of support granted, and the type of support (grant or loan). The Statistics Finland's business register includes background information of the firms and the financial statement data includes information on the income statement and balance sheet of firms (e.g., turnover, the number of personnel, debt ratio and value-added). In all the analyses, the data are restricted to private, domestic firms

(Classification of Sectors 2023: "11102; non-financial corporations excl. housing corporations, national private") and firms that are limited companies by their corporate form (OIK_VERO=12 or oik=31).

The research data have been formed by merging Business Finland's funding applications data to Statistics Finland annual business register data. Due to the panel-form of the company data, only one financial instrument per year has been linked to a firm in research data. This causes a 46-percentage loss in terms of funding applications (Table 16). The loss is rather equally distributed among funding instruments, though for NIY funding the loss is little bit bigger than for other instruments. We use the Business Finland's funding applications data to describe the number of accepted and rejected applications. The research data are used in different firm group comparisons and in impact assessments.

TABLE 16. THE LOSS OF APPLICATIONS WHEN MERGING STATISTICS FINLAND'S BUSINESS REGISTER DATA AND BUSINESS FINLAND'S FUNDING APPLICATIONS DATA OVER THE YEARS 2010-2021.

INSTRUMENT	LOSS OF APPLICATIONS,%
R&D	48
NIY	56
Tempo	40
Explorer	47
Total	46

FIRM SIZE

In this study, the firm sizes are defined as follows:

- Micro firms have fewer than ten employees and a turnover or balance sheet of no more than 2 million euros.
- SMEs are firms with fewer than 250 employees and a turnover of no more than 50 million euros or a balance sheet total of no more than 43 million euros.
- Mid-cap firms are large firms with no more than 300 million euros in turnover.

SCALEUPS

In this study, scaleups at the start of the growth period have an annual turnover of more than 2 million euros, at least ten personnel, and an average yearly growth rate of at least 20% in at least three consecutive years. Thus, our definition follows the OECD definition, except that there is a condition for firm turnover at the start of the growth period. It should be noted that a micro firm cannot be a scaleup firm by definition. Moreover, the firm receives a scaleup status always at the end of the three-year growth period. Therefore, the group of scaleups varies over time.

We use employment growth to measure firm growth. However, Figure 37 shows the number of scaleups with multiple measures: scaleups by employment growth, scaleups by turnover growth, and scaleups by both turnover and employment growth. The number of scaleups is higher when identified by turnover growth versus employment growth. When conditioning on both variables, the number of scaleups is mechanically lower.

Most of the scaleups by employment growth are SMEs, and the share or number of mid-cap firms is low (Figure 38). Micro firms are excluded due to the definition of scaleup (at least ten personnel). The TOP5 industries among scaleups by employment growth are specialised construction activities (NACE 43), computer programming, consultancy and related activities (NACE 62), retail trade (NACE 47), construction of buildings (NACE 41) and wholesale trade (NACE 46) (Figure 38). These same

sectors are also common when scaleups are identified by turnover growth (not presented in the figure).

In the main text, we explore and compare scaleup firms that applied for Business Finland funding by dividing them into two groups: accepted and rejected applicants. In addition, we also analyse and compare those scaleups

that did not apply Business Finland funding. These are scaleups that have not applied for Business Finland funding, namely R&D, NIY, Tempo, Market Explorer, Talent or Talent Explorer, during the same observation year as the funded scaleups.

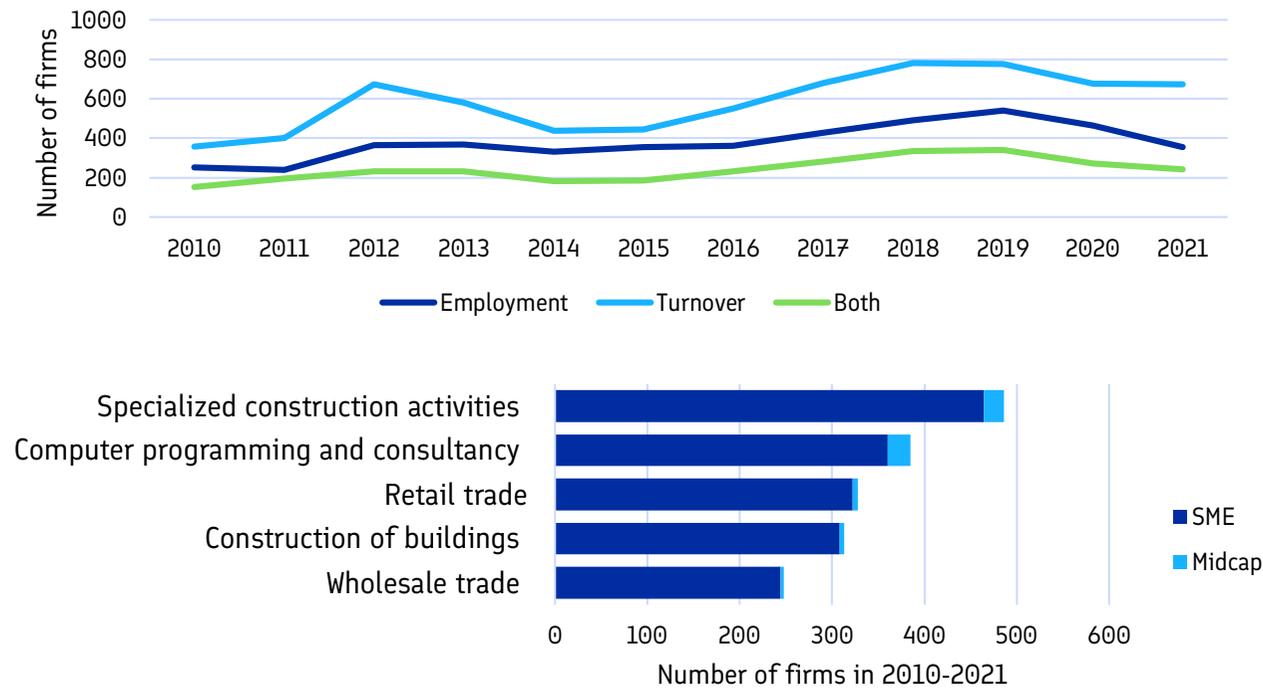


FIGURE 38. NUMBER OF SCALEUPS DURING 2010–2022 WITH DIFFERENT MEASURES (LEFT), AND THE SIZE AND TOP5 INDUSTRIES OF SCALEUPS IDENTIFIED BY EMPLOYMENT GROWTH (RIGHT).

Table 17 present the fastest-growing firms compared to all firms in Finland during 2010-2021. The fastest growing firms are defined according to the annual employment growth, and the firms in the tenth growth decile are defined as the fastest growing. According to Table 17, the fastest growing scaleup's share from the company stock is approximately 0.004%. Their share from the sum of

turnover and sum of personnel is significantly larger. The share of fastest growing scaleups' sum of turnover is approximately 0.49% from the sum of turnover of all firms. The share of sum of personnel is 0.47%. The share of fastest-growing scaleups' value-added is even higher, approximately 0.68%.

TABLE 17. NUMBER OF FIRMS, SUM OF TURNOVER, SUM OF PERSONNEL AND SUM VALUE ADDED OF FASTEST GROWING SCALEUPS IN 2010-2021 AND THE SHARE OF OTHER MID-CAPS.

FASTEST GROWING SCALEUPS	2010	2014	2018	2021	CHANGE 2010–2021,%
Number of firms	40	56	59	66	65
Share,%	0.03	0.04	0.04	0.04	
Sum of turnover, 1 000 000 €	574	660	697	833	45
Share,%	0.44	0.50	0.47	0.54	
Sum of personnel	2,186	3,141	3,027	3,386	55
Share,%	0.38	0.50	0.45	0.54	
Sum of value added, 1 000 000 €	200	249	812	333	67
Share,%	0.41	0.49	1.33	0.49	



STARTUPS

In this study, we identify startups by utilising the Finnish Startup Community's database on member startups. The data is merged with Statistics Finland's firm-level register data and Business Finland's funding application data. We restrict the data to firms younger than six years.

Figure 39 displays the annual number of new startups in the Startup Community's data over the years 2010-2021. Annually, there have been approximately 100-400 new startups in the data. The number of startups has increased over time (up to 2016) but declined in recent years, especially during the COVID-19 pandemic. In the beginning of the research period, the growth in the number of startups is probably due to firms' accelerating willingness to join the Community. Figure 39 also depicts the size and the five most common industries of the startups in the data. Most startups are micro-firms operating

in the computer programming, consultancy, and related activities sector (NACE 62). Other common sectors are activities of head offices (NACE 70), architectural and engineering activities (NACE 71), scientific research and development (NACE 72) and manufacture of computer, electronic and optical products (NACE 26). Most of these industries are known to be knowledge intensive.

In the analysis, we explore and compare startup firms that applied for Business Finland funding by dividing them into two groups: accepted and rejected applicants. In addition, we also analyse and compare those startups that did not apply for Business Finland funding. These are startups that have not applied for Business Finland funding, namely R&D, NIY, Tempo, Market Explorer, Talent or Talent Explorer, during the same observation year as the funded startups.

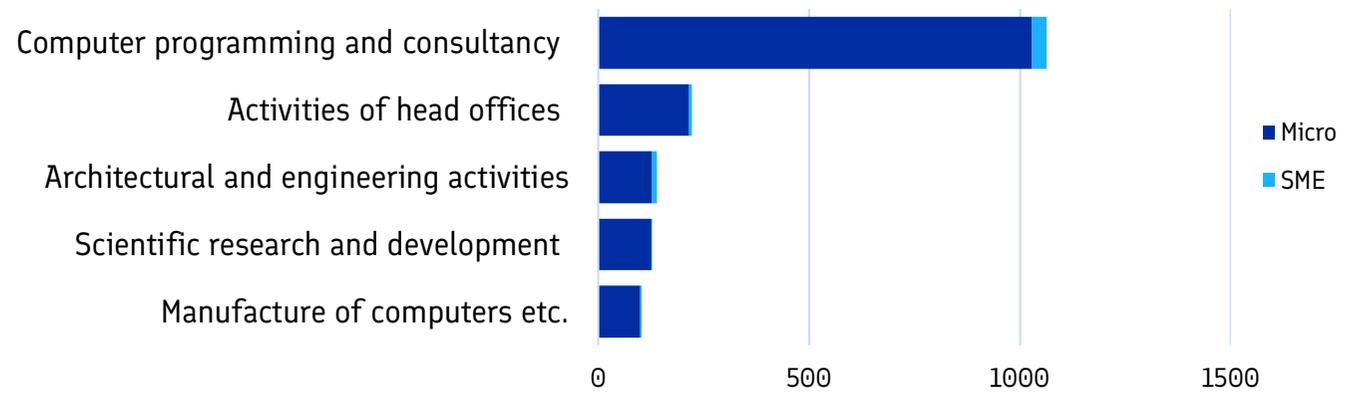
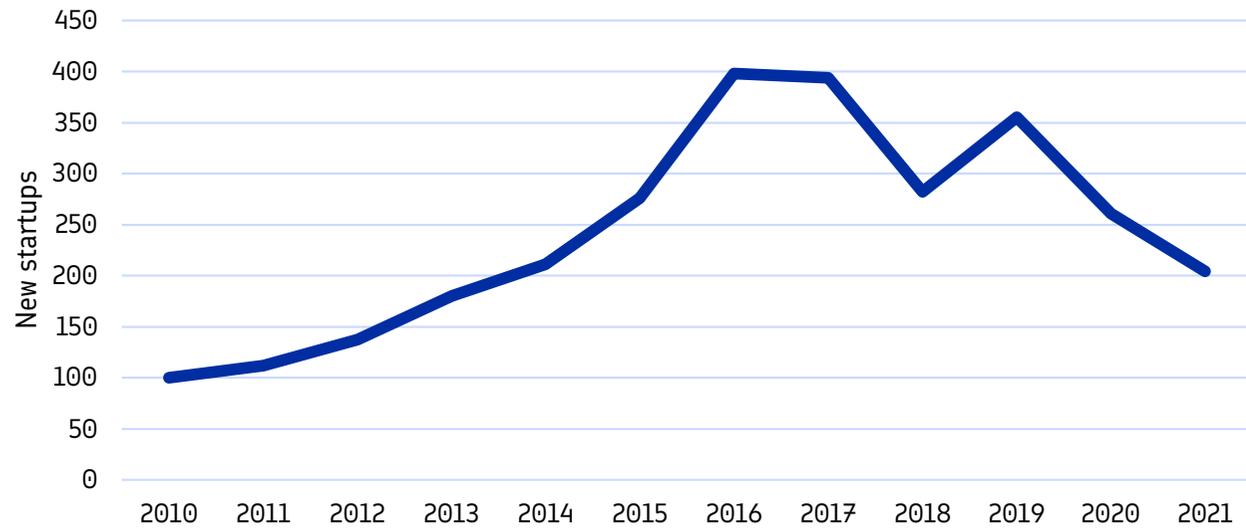


FIGURE 39. NEW STARTUPS DURING 2010–2021 (LEFT) AND THEIR SIZE AND TOP5 SECTORS (RIGHT).

APPENDIX 2 METHODOLOGY

In evaluating the effectiveness of Business Finland funding, we apply propensity score matching with difference-in-differences. We utilise Statistics Finland's financial statement data, firm-specific personnel characteristics, firm-level business subsidy data, and Business Finland's funding application data. We also apply Finnish Customs data on international trade of goods from the same time period. The export of services is not included in the analysis, since it is not available from the register data.

The Business Finland's funding application data comprise information, e.g., on the date of application, the instrument applied, the funding decision, the amount of support granted, and the type of support (grant or loan). The Statistics Finland's financial statement data includes information on the income statement and balance sheet of firms (e.g., turnover, the number of employees, debt ratio, and value-added). Moreover, the personnel characteristics data contains firm-level information on the aver-

age personnel characteristics and shares of different personnel groups (e.g. the average educational level of the workers). The subsidy data includes information on the public business subsidies paid by the Ministry of Economic Affairs and Employment, Business Finland, Finnvera, and the Ministry of Agriculture and Forestry.

The data are restricted to limited companies in the private sector. Variables measured in euros are deflated to 2023 euros, and some of the variables (debt ratio, Birch index, turnover, exports, previous cumulative funding, and equity funding) have been winsorised. Winsorising is a procedure that moderates the influence of outliers on the mean and variance (see e.g., Blaine 2018). In winsorising, all values above a certain threshold value, say 99th percentile, are replaced by the threshold value. In this example, the same could be done analogously in the left-hand side of the distribution for the values below the 1st percentile. The variable specific thresholds are shown in Table 18.

TABLE 18. THE VARIABLE SPECIFIC THRESHOLDS FOR WINSORISING.

VARIABLE	LOWER THRESHOLD VALUE OR PER-CENTILE	UPPER THRESHOLD VALUE OR PER-CENTILE
Birch index $x_{i,t,t+3}$	1st percentile	99th percentile
Debt ratio i,t	0	2
Cumulative BF funding i,t		7
(ln) equity investments i,t	1st percentile	99th percentile
$\Delta \ln(\text{exports}_{i,t-1,t})$	-10	10
$\Delta \ln(\text{turnover}_{i,t-1,t})$	-2	2

Notes: The Birch index is calculated as the relative change multiplied by the absolute change in the number of employees. Debt ratio is calculated as long-term debt divided by the total assets. Cumulative BF funding is the cumulative number of positive funding decisions. Equity investments is calculated as $\text{equity}_{i,t} - (\text{equity}_{i,t-1} + \text{net income}_{i,t})$. Due to negative values, the logarithmic transformation is calculated as $\text{sign}(x) \times \ln(\text{abs}(x))$. Δ indicates relative change.

IMPACT ANALYSIS

In the impact analysis, we focus on R&D funding. The treatment group receives only an R&D subsidy (grant or loan) in the treatment year t , and the control group does not receive any Business Finland funding (BF-funding) between years $t-1$ and $t+3$. If a firm in the treatment group receives some other BF-funding in addition to R&D subsidies in the estimation period t , it is not included in the analysis. Micro firms are estimated separately from small and medium

sized firms. The impact analysis is not conducted to mid-cap firms due to their small number. However, descriptive analysis is presented also for mid-cap firms.

MATCHING

Business Finland-funded firms may differ from other firms as they initially chose to apply for BF-funding, while most of the other firms in the data did not. This may be, for instance, due to the growth-orientation, demand

shocks, or better competence of the management in the BF-funded firms. In other words, firms with better prospects are more likely to receive funding. These differences in firm characteristics and behavior would likely bias the results, if we conducted a simple analysis by comparing the outcomes of BF-funded firms to the outcomes of all the other firms. Hence, we try to control the group-specific differences by conducting a propensity score matching. When comparing the outcomes of firms with different characteristics, it is not clear whether the potential differences in outcomes are due to accepted BF-funding or other firm characteristics. By comparing firms with similar characteristics, we can attribute more of the difference in outcomes to differences in funding. While all relevant characteristics, that is characteristics that correlate both with outcomes and funding, cannot be controlled for, we aim to control for some observable firm characteristics using matching methods. In this way, we aim to compare groups of firms that are as similar as possible in terms of their observable characteristics but differ in whether they got R&D funding from Business Finland or not.

The matching is conducted within years using the propensity score model. The micro firms and SMEs are analyzed separately due to their different characteristics. We apply Stata's `kmatch` function with kernel matching. The caliper used for matching is estimated with the Epanechnikov kernel function.

The control variables used in the matching are as follows:

- Cumulative BF funding. The number of cumulative Business Finland funding instances (number of accepted applications) received until year $t-2$.
- Subsidies (grants or loan) from other institutions. A dummy variable indicating if grants or loans from other institutions, such as ministries and Finnvera, was received. Separate variables for years t and $t-1$.
- Number of employees (log) in a firm.
- Turnover (log). Annual turnover of the firm, in logarithmic euros.
- Equity funding (log). Annual equity investments of the firm, in logarithmic euros. Equity investments is calculated as $(\text{equity}_{i,t} - (\text{equity}_{i,t-1} + \text{net income}_{i,t}))$.
- Debt ratio of the firm, calculated as $(\text{long-term debt}_{i,t} / \text{total assets}_{i,t})$.
- Return on total assets (%) of the firm, calculated as $(100 \times ((\text{net income}_{i,t} + \text{financial expenses}_{i,t} + \text{income tax}_{i,t}) / \text{total assets}_{i,t}))$.
- Total assets (log) of the firm, in logarithmic euros.
- Labor productivity (log) of the firm, calculated as $(\text{value added}_{i,t} / \text{number of employees}_{i,t})$.
- Firm age in years.
- Exports of goods (log). Annual exports of the firm, in logarithmic euros. Export is measured as the total value of exports of goods.
- Average years of schooling among employees in the firm.
- Industry of the firm, NACE 2-digit industrial classification.

One way for evaluating the quality of matching is to compare the group averages, which are shown in Tables 19 and 20.

TABLE 19. BALANCING TESTS FOR SMES FIRMS AFTER MATCHING.

	BIRCH INDEX			TURNOVER			EXPORTS			LABOR PRODUCTIVITY			EQUITY INVESTMENTS		
	Treated	Un-treated	StdDif	Treated	Un-treated	StdDif	Treated	Un-treated	StdDif	Treated	Un-treated	StdDif	Treated	Un-treated	StdDif
Cumulative BF funding _{i,t-2}	0.902	0.789	0.103	0.902	0.789	0.103	0.902	0.789	0.103	0.902	0.792	0.100	0.899	0.786	0.103
Other subsidies _{i,t}	0.370	0.340	0.071	0.370	0.340	0.071	0.370	0.340	0.071	0.370	0.339	0.074	0.370	0.340	0.071
Other subsidies _{i,t-1}	0.357	0.346	0.026	0.357	0.346	0.025	0.357	0.346	0.026	0.357	0.347	0.024	0.357	0.346	0.026
ln(L _{i,t})	3.400	3.435	-0.046	3.400	3.436	-0.046	3.400	3.435	-0.046	3.403	3.438	-0.045	3.398	3.434	-0.046
ln(L _{i,t-1})	3.269	3.282	-0.015	3.269	3.282	-0.016	3.269	3.282	-0.015	3.271	3.284	-0.015	3.267	3.281	-0.016
ln(turnover _{i,t})	15.255	15.312	-0.032	15.255	15.320	-0.036	15.255	15.312	-0.032	15.275	15.314	-0.022	15.253	15.312	-0.033
ln(turnover _{i,t-1})	15.033	15.080	-0.022	15.033	15.088	-0.026	15.033	15.080	-0.022	15.046	15.082	-0.017	15.030	15.078	-0.023
ln(equity investments _{i,t})	0.762	0.249	0.044	0.762	0.241	0.045	0.762	0.249	0.044	0.737	0.196	0.047	0.724	0.240	0.042
ln(exports of goods _{i,t})	6.907	6.866	0.007	6.907	6.864	0.008	6.907	6.866	0.007	6.926	6.884	0.007	6.893	6.861	0.006
ln(valueadded _{i,t} /L _{i,t})	8.991	9.241	-0.047	8.991	9.254	-0.050	8.991	9.241	-0.047	9.068	9.270	-0.039	9.001	9.239	-0.045
debt ratio _{i,t}	0.248	0.242	0.024	0.248	0.242	0.024	0.248	0.242	0.024	0.246	0.240	0.023	0.249	0.242	0.025
ROA _{i,t}	-0.029	-0.019	-0.038	-0.029	-0.019	-0.038	-0.029	-0.019	-0.038	-0.027	-0.016	-0.043	-0.029	-0.019	-0.037
ln(total assets _{i,t})	15.339	15.346	-0.005	15.339	15.344	-0.004	15.339	15.346	-0.005	15.344	15.356	-0.009	15.338	15.342	-0.003
Firm age _{i,t}	17.585	17.322	0.017	17.585	17.328	0.017	17.585	17.322	0.017	17.619	17.366	0.017	17.546	17.314	0.015
Average years of schooling	14.356	14.292	0.040	14.356	14.292	0.040	14.356	14.292	0.040	14.351	14.288	0.039	14.356	14.291	0.040

Notes: Columns 'treated' and 'untreated' show the group averages. Sectors Birch index, Turnover, Exports, Labor productivity, and Equity investments refer to the dependent variables in difference-in-differences analysis. StdDif refers to standard differences.

TABLE 20. BALANCING TESTS FOR MICRO FIRMS AFTER MATCHING.

	BIRCH INDEX			TURNOVER			EXPORTS			LABOR PRODUCTIVITY			EQUITY INVESTMENTS		
	Treated	Un-treated	StdDif	Treated	Un-treated	StdDif	Treated	Un-treated	StdDif	Treated	Un-treated	StdDif	Treated	Un-treated	StdDif
Cumulative BF funding _{i,t-2}	0.605	0.680	-0.100	0.605	0.680	-0.100	0.605	0.680	-0.100	0.610	0.673	-0.083	0.607	0.684	-0.102
Other subsidies _{i,t}	0.305	0.273	0.091	0.305	0.273	0.091	0.305	0.273	0.091	0.305	0.271	0.095	0.304	0.272	0.090
Other subsidies _{i,t-1}	0.319	0.279	0.110	0.319	0.279	0.110	0.319	0.279	0.110	0.322	0.279	0.116	0.319	0.278	0.112
ln(L _{i,t})	1.348	1.285	0.096	1.348	1.285	0.096	1.348	1.285	0.096	1.358	1.297	0.093	1.352	1.284	0.103
ln(L _{i,t-1})	1.099	1.100	-0.002	1.099	1.100	-0.002	1.099	1.100	-0.002	1.110	1.112	-0.002	1.103	1.099	0.006
ln(turnover _{i,t})	11.451	11.592	-0.049	11.451	11.592	-0.049	11.451	11.592	-0.049	11.500	11.711	-0.074	11.458	11.603	-0.051
ln(turnover _{i,t-1})	10.867	11.074	-0.065	10.867	11.074	-0.065	10.867	11.074	-0.065	10.945	11.205	-0.083	10.884	11.084	-0.063
ln(equity investments _{i,t})	6.842	6.155	0.079	6.842	6.155	0.079	6.842	6.155	0.079	6.716	5.957	0.088	6.827	6.145	0.079
ln(exports of goods _{i,t})	2.029	2.009	0.006	2.029	2.009	0.006	2.029	2.009	0.006	2.073	2.022	0.016	2.038	2.007	0.009
ln(valueadded _{i,t} /L _{i,t})	3.261	3.761	-0.064	3.261	3.761	-0.064	3.261	3.761	-0.064	3.556	4.146	-0.077	3.307	3.777	-0.060
debt ratio _{i,t}	0.442	0.476	-0.088	0.442	0.476	-0.088	0.442	0.476	-0.088	0.435	0.473	-0.100	0.443	0.476	-0.087
ROA _{i,t}	-0.261	-0.248	-0.038	-0.261	-0.248	-0.038	-0.261	-0.248	-0.038	-0.251	-0.238	-0.040	-0.259	-0.247	-0.034
ln(total assets _{i,t})	13.147	13.109	0.030	13.147	13.109	0.030	13.147	13.109	0.030	13.154	13.101	0.041	13.153	13.108	0.035
Firm age _{i,t}	7.936	9.081	-0.117	7.936	9.081	-0.117	7.936	9.081	-0.117	8.085	9.189	-0.113	7.948	9.096	-0.117
Average years of schooling	15.391	15.069	0.142	15.391	15.069	0.142	15.391	15.069	0.142	15.421	15.016	0.179	15.396	15.064	0.147

Notes: Columns 'treated' and 'untreated' show the group averages. Sectors Birch index, Turnover, Exports, Labor productivity, and Equity investments refer to the dependent variables in difference-in-differences analysis. StdDif refers to standard.

The matching process was conducted utilizing a comprehensive set of firm characteristics. However, unobservable factors may still influence the interpretation of the results. For instance, we are unable to observe the quality of funding applications and the prospects of the firm, which partly explain the firm's performance and growth in the future. In addition, Business Finland aims to choose the applicants with the best prospects and reject the applicants with poor prospects, i.e., picking the winners and leaving the poorer firms in the control group that makes it more problematic to compose a proper control group. Because of these omitted variables, the results should be interpreted with caution.

DIFFERENCE-IN-DIFFERENCES

After matching the subsidised firms with their counterfactuals, we estimate the average treatment effect on the treated on several outcome variables and apply a difference-in-differences estimation. In other words, we study whether the outcome variables have evolved differently between the treatment and control groups after the matching. Each of the outcome variables, except the Birch index, is measured in logarithmic form. We examine the impact of R&D funding on absolute values and relative changes in the outcome variables.

The outcomes to be studied are as follows:

- Turnover (log). Annual turnover of the firm, in logarithmic euros.
- The Birch index (number of employees in the firm). The Birch index is calculated as the relative change times absolute change in the number of employees: $\text{Birch}_{i,(t,t+3)} = (L_{i,t+3} - L_{i,t}) \times (L_{i,t+3} / L_{i,t})$ where $L_{i,t}$ represents the number of employees in a firm i in year t .
- Labor productivity (log). Productivity of the firm is measured as valued-added divided by the number of employees.
- Exports of goods (log). Annual exports of the firm, in logarithmic euros. Export is measured as the total value of exports of goods. The register data does not include information on export of services.

Equity investments (log). Annual equity investments of the firm, in logarithmic euros. Equity investments is calculated as $(\text{equity}_{i,t} - (\text{equity}_{i,t-1} + \text{net income}_{i,t}))$. A positive value indicates that more equity investments has been put into the company, whereas a negative value indicates that dividends have been withdrawn from the company.

APPENDIX 3 THE NET JOBS CREATED BY BUSINESS FINLAND-FUNDED SCALEUPS VS. OTHER SCALEUPS

We analyzed net job creation among scaleups, comparing those that received Business Finland funding to those that did not. The analysis focused on SMEs that achieved scaleup status based on employment growth within the previous three years. Business Finland-funded scaleups received at least one BF-funding by year t , whereas the other scaleups did not receive any such funding. We calculated the annual net job creation rates for these two groups from 2010 to 2019, following the methodology of Davis et al. (2010). The annual net change in employment was determined by subtracting the relative number of jobs lost from the relative number of jobs created.

The relative number of jobs created (JC) each year is calculated as:

$$JC_t = \sum_e (Z_{e,t} / Z_t) |\max\{0, g_{e,t}\}| = \sum_e |\max\{0, L_{e,t} - L_{e,t-1}\}| / Z_t$$

where

$$Z_t = \sum_e Z_{e,t} = \sum_e 0.5(L_{e,t} + L_{e,t-1}).$$

$L_{e,t}$ is the number of employees in firm e in year t and $Z_{e,t}$ is the average size of the firm e in year t and $t-1$. The relative number of jobs destroyed (JD) is obtained when the max-operator in the equation is replaced by the min-operator. The relative net change in jobs (NET) is obtained

when the relative number of jobs destroyed is subtracted from the relative number of jobs created (NET = JC - JD).

As illustrated in Figure 40, both Business Finland-funded (BF-funded) and other scaleups have consistently created new jobs at an annual rate of 15-30% between 2010 and 2019. On average, Business Finland-funded scaleups achieved a slightly higher net job creation rate of 24% compared to 22% for other scaleups over this period. While the overall difference between the two groups is modest, Business Finland-funded scaleups demonstrated stronger job creation in the early and late 2010s, whereas other scaleups outpaced them in job creation between 2013 and 2015.

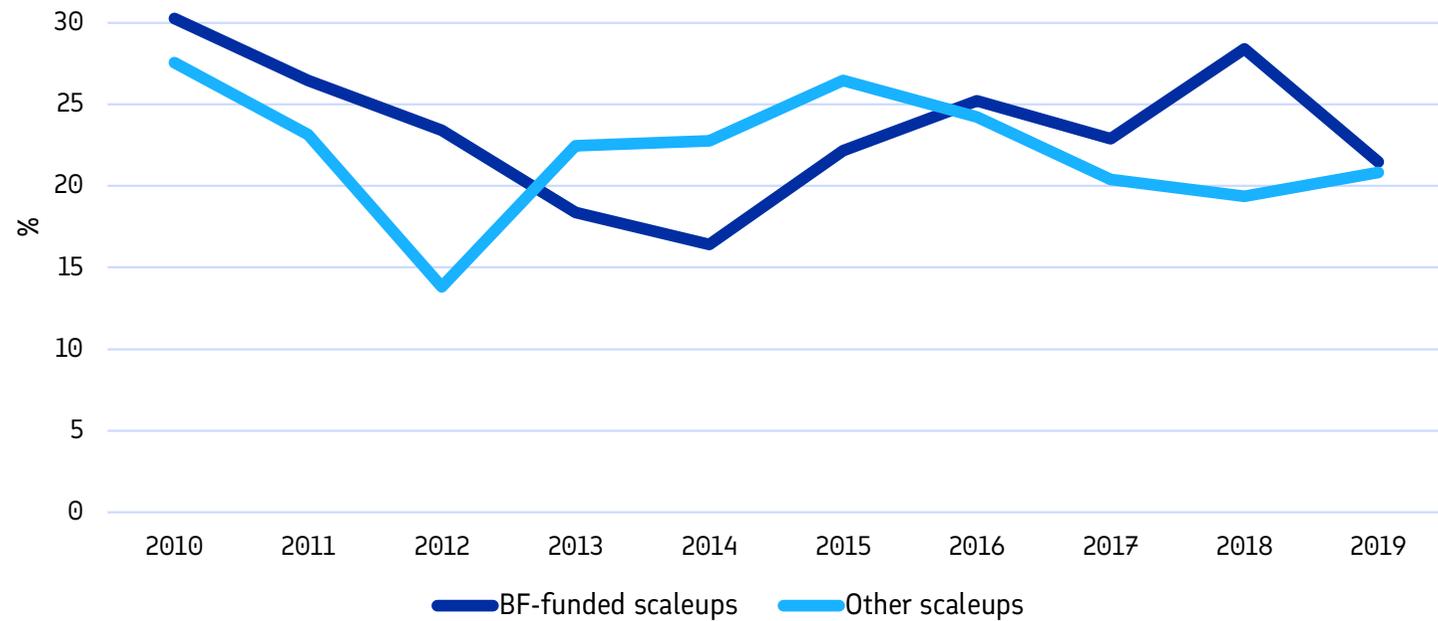


FIGURE 40. RELATIVE NET CHANGE OF JOBS (%) AMONG SME-SCALEUPS IN YEARS 2010-2019.

For each year, the relative net change of jobs is calculated in the cross-section of SME-sized firms that have experienced rapid employment growth in the previous three years and calculated separately for Business Finland-funded and other scaleups.

APPENDIX 4 ESTIMATION RESULTS

TABLE 21. SMES. AVERAGE VALUES OF EMPLOYEES, TURNOVER, EXPORTS, PRODUCTIVITY AND EQUITY INVESTMENTS OVER TIME FOR ACCEPTED AND REJECTED R&D FUNDING APPLICANTS AND THE T-TEST FOR THE DIFFERENCE IN THE MEAN VALUES BETWEEN THE GROUPS.

BIRCH INDEX (CHANGE IN THE NUMBER OF PERSONNEL)						
period	accepted	N	rejected	N	difference in the means	p-value
t-2	4.290	1,557	3.775	956	0.515	0.099
t-1	4.681	1,667	3.834	995	0.846	0.007
t	4.754	1,756	3.588	1,027	1.166	0.000
t+1	3.727	1,750	2.599	997	1.128	0.000
t+2	2.910	1,617	2.415	877	0.495	0.113
t+3	2.398	1,417	2.194	750	0.204	0.529
TURNOVER, RELATIVE CHANGE						
period	accepted	N	rejected	N	difference in the means	p-value
t-2	0.218	1,558	0.142	961	0.077	0.001
t-1	0.213	1,669	0.117	998	0.096	0.000
t	0.155	1,756	0.104	1,028	0.051	0.013

t+1	0.119	1,749	0.029	997	0.090	0.000
t+2	0.040	1,616	-0.008	877	0.047	0.019
t+3	0.018	1,418	-0.045	749	0.063	0.005
EXPORT, RELATIVE CHANGE						
period	accepted	N	rejected	N	difference in the means	p-value
t-2	0.375	1,558	0.272	961	0.104	0.374
t-1	0.281	1,669	0.143	998	0.138	0.204
t	0.083	1,756	-0.126	1,028	0.208	0.068
t+1	0.127	1,750	-0.088	997	0.215	0.109
t+2	0.000	1,617	-0.186	878	0.186	0.229
t+3	-0.059	1,419	0.274	751	-0.333	0.054
PRODUCTIVITY, RELATIVE CHANGE						
period	accepted	N	rejected	N	difference in the means	p-value
t-2	0.136	1,553	0.079	956	0.057	0.580
t-1	0.140	1,664	-0.002	993	0.142	0.162
t	-0.050	1,751	0.194	1,022	-0.244	0.013
t+1	0.109	1,742	-0.030	987	0.139	0.174

t+2	0.013	1,609	-0.026	867	0.039	0.695
t+3	0.068	1,407	0.078	738	-0.010	0.920
EQUITY FUNDING, RELATIVE CHANGE						
period	accepted	N	rejected	N	difference in the means	p-value
t-2	0.242	1,447	-0.184	906	0.426	0.373
t-1	-0.165	1,558	0.320	960	-0.485	0.287
t	-0.091	1,669	0.481	998	-0.572	0.202
t+1	0.539	1,711	-0.043	980	0.582	0.207
t+2	-0.898	1,616	-0.601	877	-0.297	0.550
t+3	-0.325	1,416	-0.200	749	-0.126	0.818

TABLE 22. MICRO FIRMS. AVERAGE VALUES OF EMPLOYEES, TURNOVER, EXPORTS, PRODUCTIVITY AND EQUITY INVESTMENTS OVER TIME FOR ACCEPTED AND REJECTED R&D FUNDING APPLICANTS AND THE T-TEST FOR THE DIFFERENCE IN THE MEAN VALUES BETWEEN THE GROUPS.

BIRCH INDEX (CHANGE IN THE NUMBER OF PERSONNEL)						
period	accepted	N	rejected	N	difference in the means	p-value
t-2	1.896	967	1.652	957	0.244	0.215
t-1	2.195	1,283	1.329	1,157	0.866	0.000
t	2.725	1,767	1.262	1,419	1.463	0.000
t+1	2.517	2,181	1.237	1,543	1.281	0.000
t+2	1.657	1,970	1.158	1,310	0.499	0.001
t+3	1.681	1,715	0.921	1,079	0.760	0.000
TURNOVER, RELATIVE CHANGE						
period	accepted	N	rejected	N	difference in the means	p-value
t-2	0.232	990	0.239	976	-0.007	0.847
t-1	0.341	1,301	0.134	1,173	0.206	0.000
t	0.290	1,797	0.153	1,443	0.137	0.000
t+1	0.341	2,206	0.098	1,589	0.242	0.000
t+2	0.215	1,987	0.049	1,342	0.166	0.000
t+3	0.098	1,747	-0.071	1,111	0.170	0.000

EXPORT OF GOODS, RELATIVE CHANGE						
period	accepted	N	rejected	N	difference in the means	p-value
t-2	0.323	990	0.179	976	0.145	0.182
t-1	0.309	1,301	0.055	1,173	0.254	0.010
t	0.177	1,797	0.060	1,443	0.117	0.180
t+1	0.359	2,206	0.056	1,589	0.304	0.001
t+2	0.122	1,987	0.106	1,342	0.016	0.877
t+3	0.178	1,747	0.115	1,111	0.063	0.580
LABOR PRODUCTIVITY, RELATIVE CHANGE						
period	accepted	N	rejected	N	difference in the means	p-value
t-2	-0.073	958	0.225	948	-0.298	0.093
t-1	0.232	1,270	-0.056	1,143	0.287	0.078
t	0.144	1,741	0.261	1,364	-0.116	0.448
t+1	0.481	2,116	0.250	1,449	0.231	0.112
t+2	0.423	1,886	0.061	1,239	0.362	0.017
t+3	0.157	1,636	0.013	1,015	0.143	0.369

EQUITY FUNDING. RELATIVE CHANGE						
period	accepted	N	rejected	N	difference in the means	p-value
t-2	0.136	759	0.291	816	-0.155	0.775
t-1	1.314	984	0.825	967	0.488	0.302
t	0.193	1,301	-0.216	1,173	0.408	0.322
t+1	-0.466	1,761	-0.540	1,361	0.075	0.846
t+2	-0.407	1,987	-0.747	1,342	0.340	0.373
t+3	-0.743	1,740	-0.434	1,099	-0.309	0.465

TABLE 23. MID-CAP FIRMS. AVERAGE VALUES OF EMPLOYEES. TURNOVER. EXPORTS. PRODUCTIVITY AND EQUITY INVESTMENTS OVER TIME FOR ACCEPTED AND REJECTED R&D FUNDING APPLICANTS AND THE T-TEST FOR THE DIFFERENCE IN THE MEAN VALUES BETWEEN THE GROUPS.

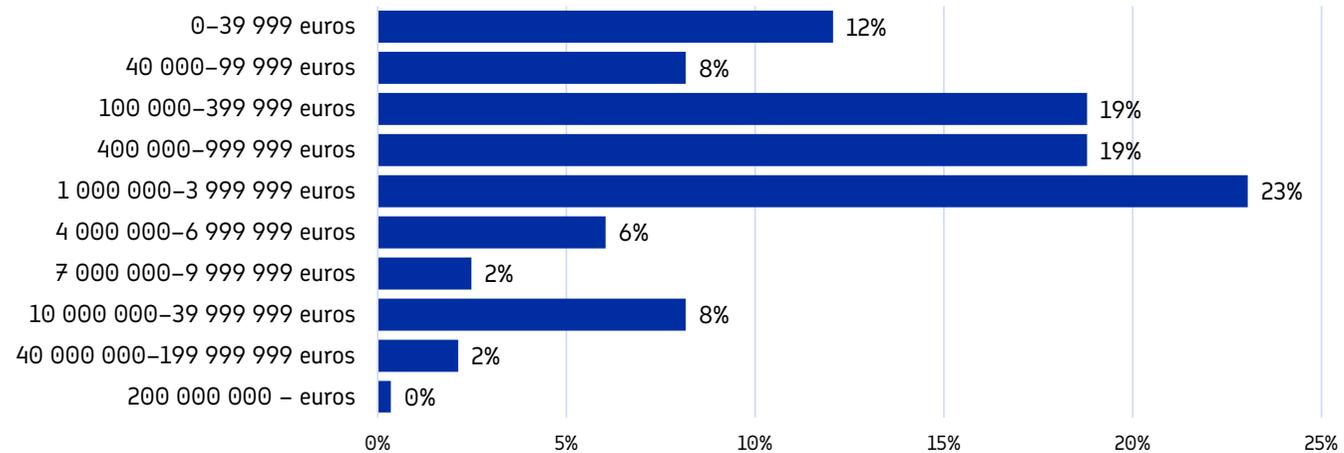
BIRCH INDEX (CHANGE IN THE NUMBER OF PERSONNEL)						
period	accepted	N	rejected	N	difference in the means	p-value
t-2	9.058	140	9.236	92	-0.178	0.916
t-1	9.381	142	10.335	96	-0.954	0.584
t	8.541	146	9.008	98	-0.466	0.785
t+1	6.283	145	8.179	96	-1.896	0.268
t+2	4.820	140	7.826	94	-3.006	0.076
t+3	4.470	126	8.754	80	-4.284	0.016
TURNOVER, RELATIVE CHANGE						
period	accepted	N	rejected	N	difference in the means	p-value
t-2	0.063	140	0.116	91	-0.053	0.204
t-1	0.044	142	0.087	96	-0.043	0.221
t	0.049	146	0.075	98	-0.026	0.446
t+1	-0.003	145	0.007	96	-0.010	0.726
t+2	0.011	140	0.005	94	0.006	0.893
t+3	-0.010	126	-0.002	80	-0.008	0.766

EXPORT OF GOODS, RELATIVE CHANGE						
period	accepted	N	rejected	N	difference in the means	p-value
t-2	0.336	140	0.087	92	0.249	0.447
t-1	0.058	142	0.221	96	-0.163	0.610
t	-0.228	146	-0.032	98	-0.195	0.571
t+1	-0.315	145	-0.319	96	0.004	0.993
t+2	-0.529	140	-0.304	94	-0.225	0.697
t+3	0.668	126	-0.312	80	0.979	0.127
LABOR PRODUCTIVITY, RELATIVE CHANGE						
period	accepted	N	rejected	N	difference in the means	p-value
t-2	0.076	140	0.013	92	0.063	0.690
t-1	-0.012	142	0.150	96	-0.162	0.312
t	0.068	146	0.025	98	0.044	0.823
t+1	0.118	145	0.055	96	0.063	0.686
t+2	-0.141	140	-0.116	94	-0.025	0.912
t+3	0.132	126	-0.201	80	0.333	0.062

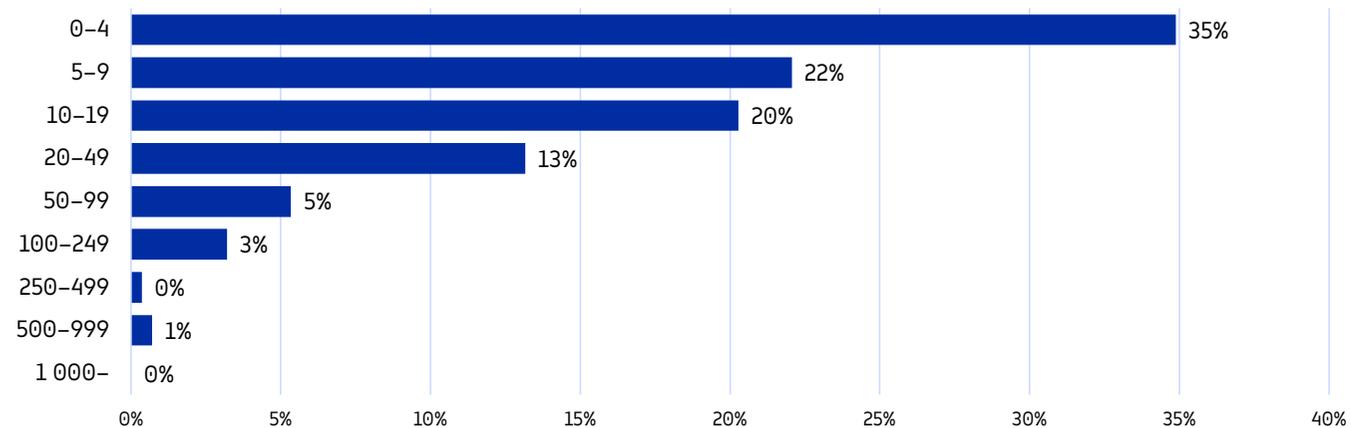
EQUITY FUNDING. RELATIVE CHANGE						
period	accepted	N	rejected	N	difference in the means	p-value
t-2	0.870	140	1.362	90	-0.492	0.747
t-1	0.916	140	-0.177	92	1.093	0.478
t	0.818	142	-0.635	96	1.453	0.337
t+1	-0.692	143	-0.171	95	-0.521	0.726
t+2	-1.066	140	-0.424	94	-0.642	0.694
t+3	-0.512	126	2.940	80	-3.452	0.044

APPENDIX 5. BACKGROUND INFORMATION ON SURVEY RESPONDENTS

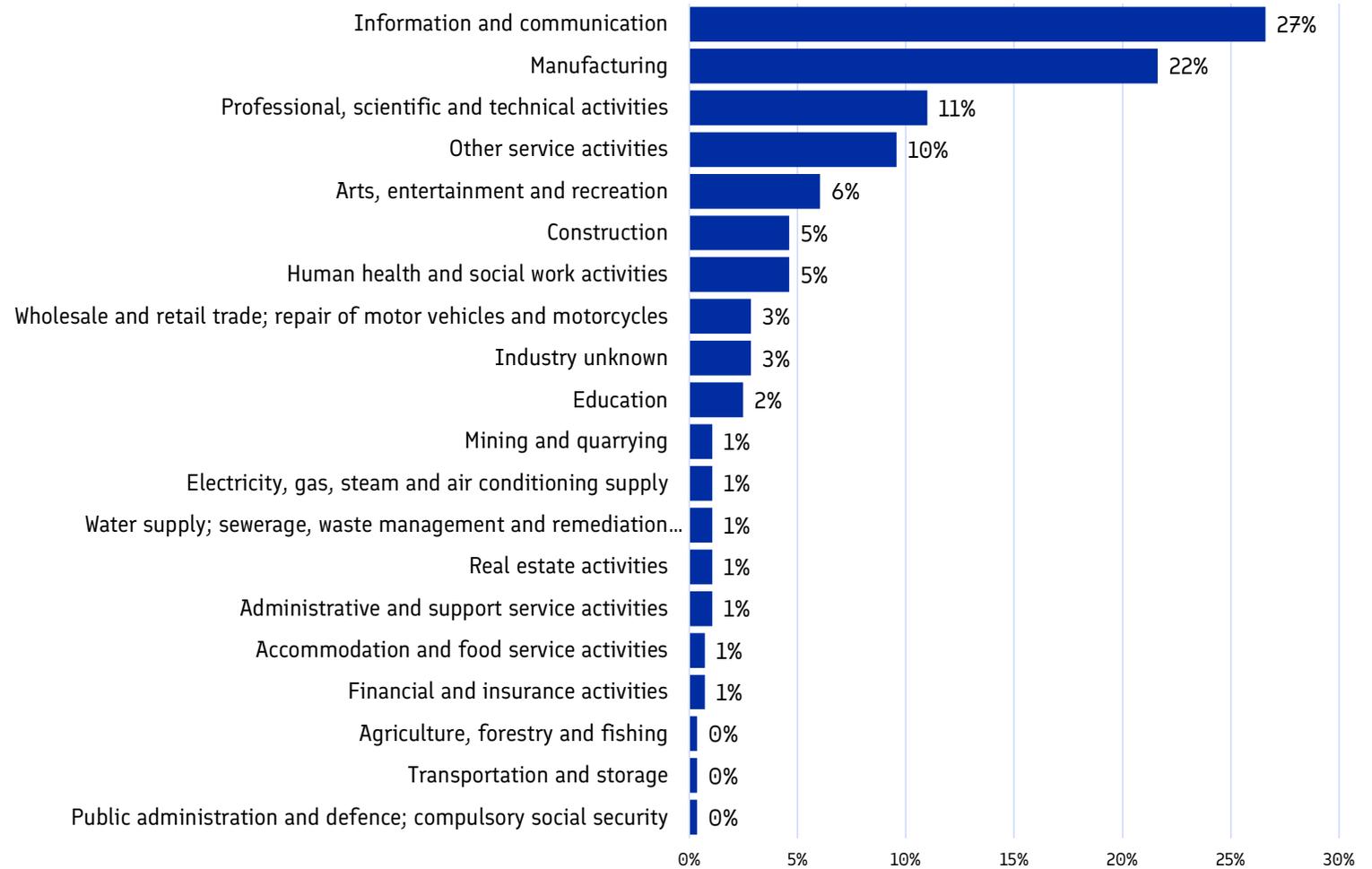
What was approximately your company's turnover at the end of 2023? (n=282)



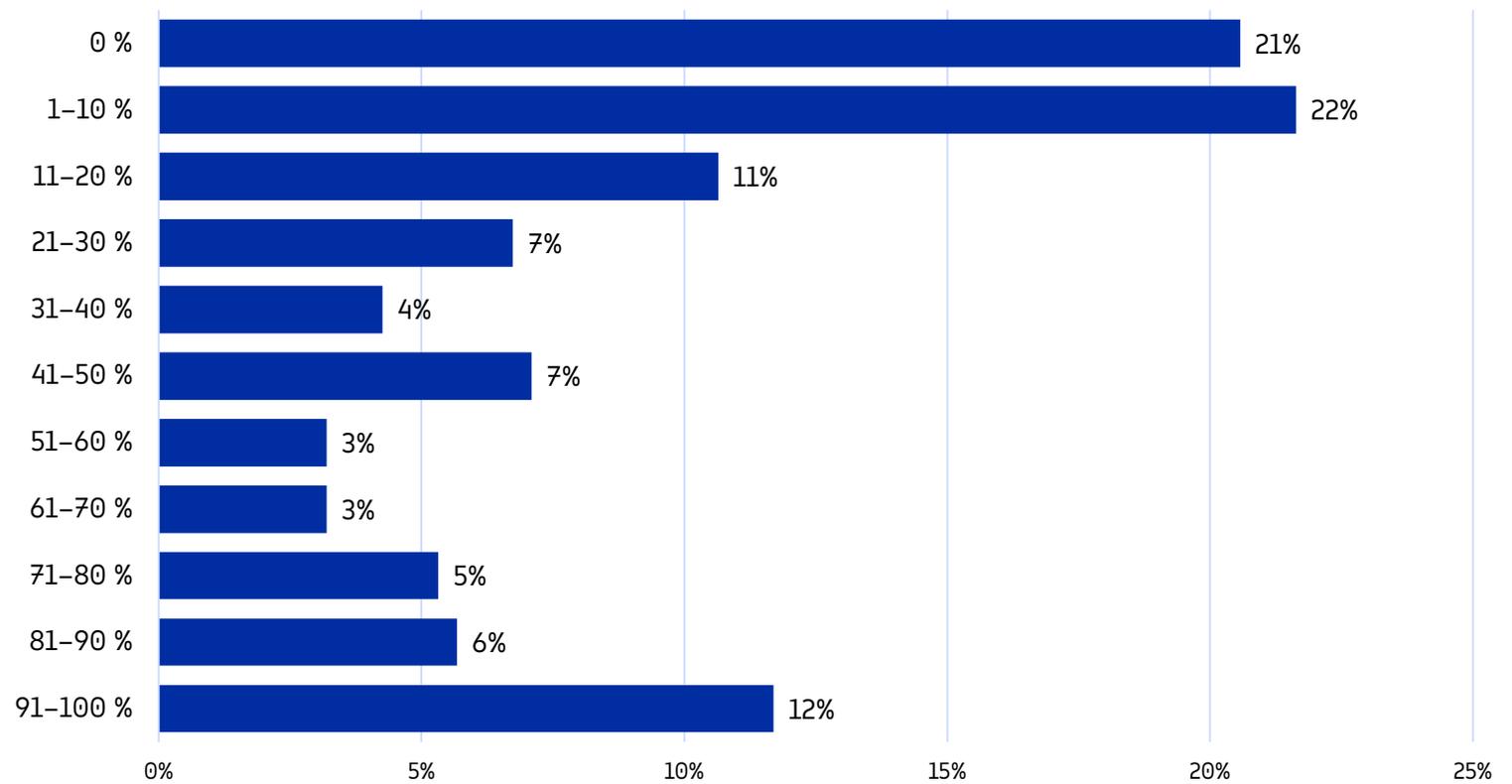
What was the total number of employees in your company at the end of 2023? (n=281)



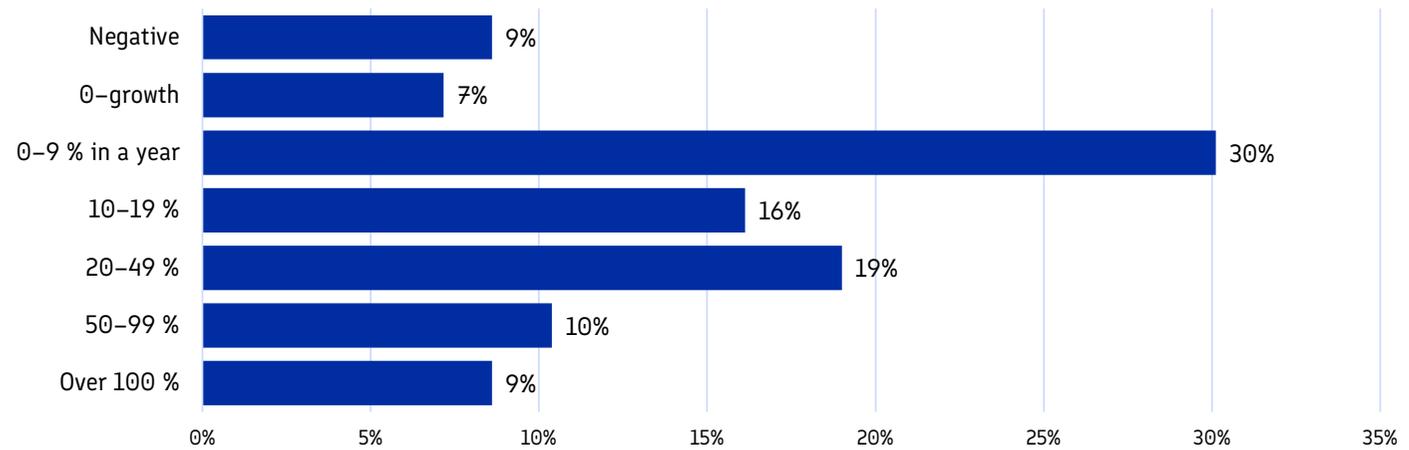
In which industry does your company operate? (n=282)



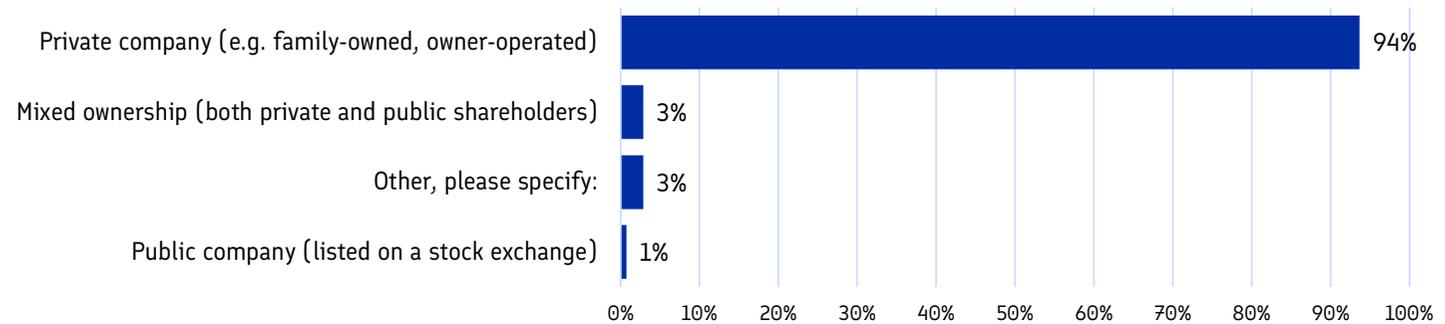
What was approximately the share of exports of your company's total turnover at the end of 2023? (n=282)



What has been your company's estimated yearly growth rate in the last five years?
(in terms of turnover) (n=279)



What is the ownership structure of your company? (n=282)



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