BUSINESS
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EVALUATION OF BUSINESS FINLAND CONTRIBUTION TO HEALTH AND WELLBEING

Analyzing health initiatives in the 2000s with a detailed look at two recently ended programmes

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BUSINESS FINLAND

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CONTENT

FOREWORD

Business Finland has played an instrumental role in promoting innovation, internationalisation and growth in Finland. The health and wellbeing sector in Finland has been a significant focus area for Business Finland over the years, and its thematic choices and programmes have made substantial contributions to the sector's development. As Business Finland continues to invest in the sector's growth, understanding the impact and effectiveness of these activities becomes increasingly important.

This evaluation report encompasses two main parts. The first part is a programme evaluation of two recent programmes - Personalised Health (2018-2022) and Smart Life (2019-2022), whereas the second part is a thematic analysis of Business Finland's actions in the health sector over the past two decades. This analysis aims to assess Business Finland's activities and achievements in the health and wellbeing sector over the years, in addition to giving a detailed view of the results, relevance, effectiveness, and impact of two of the most recent programmes. This provides insights into how Business Finland can continue to support the sector's growth and development.

The report provides vital insights that will guide Business Finland's support for Finnish healthcare innovation, competitiveness, and growth. The results and recommendations of this study will be used to guide the design and implementation of Business Finland's future activities and programmes in the health and wellbeing sector.

The evaluation was carried out by MDI Public Oy and Nordic Healthcare group bringing together a wealth of expertise in healthcare innovation, strategic planning, and economic development. Business Finland wishes to thank the evaluators for their thorough and systematic approach and express its gratitude to the steering group and all those who have contributed to the evaluation.

Helsinki, January 2024
Business Finland

1. INTRODUCTION

Finland is a leading player in terms of RDI-activities in the health and wellbeing sector. At the same time, the Finnish health sector has increasingly been viewed by government as an industrial and innovation policy priority. The institutional and organisational pillars supporting this approach include a solid research and development base, an internationally recognised healthcare system covering the entire population and the emergence of various opportunities related to data storage and management as well as the ongoing process of digitalisation, all of which generate advantages but require collaboration1[1]. Additionally, global megatrends within the healthcare sector such as digitalisation, personalised healthcare, participatory healthcare and value-based healthcare, as well as the ongoing reform of the way in which Finland produces and implements social and health care, have also had a significant influence on developments within this sector. Digitalisation has, for instance, impacted healthcare production and delivery at all levels, including working processes, resource allocation, public health policy and thus how health is understood, experienced and measured[2]. Moreover, the process of digitalisation has also delivered many new business opportunities to the sector, opportunities which have been identified and supported by the government level.

Business Finland (and its predecessors Tekes and Finpro) has, over the years, invested significantly in the development of the health and wellbeing sector. Considerable efforts have been made to develop the sector through the execution of multiple programmes and thematic actions, the provision of funding and help to strengthen businesses, expertise, partnerships and platforms for collaboration. More recently, the Personalised Health Finland (2018-2022) and Smart Life Finland (2019-2022) programmes have been added to this programme continuum.

The health and wellbeing theme will, moreover, continue to be highlighted in Business Finland's operations as Business Finland has chosen to implement a mission in the health and wellbeing theme area (Healthcare Reimagined 2035).

1 Kalle A. Piirainen, Kimmo Halme, Ira Haavisto, Riikka-Leena Leskelä, Ashley Walker, Mimosa Zhao, Brian Barge, Kari Lehmussaari (2019) Programmes contributing to health and wellbeing: Evaluation of Finnwell, Pharma, Innovations in social and healthcare, Digital Hospital and Team Finland health programmes.

2 Petri Virtanen and Jari Stenvall (2018) Intelligent Health Policy – Theory, Concept and Practice. Springer International Publishing. 2018.

2. GOALS AND IMPLEMENTATION **OF THE EVALUATION**

The main goal of the evaluation has been to produce a comprehensive evaluation of Business Finland's contribution to the development of the health and wellbeing sector in Finland over time. The evaluation focuses on Business Finland's thematic activities (including programmes) during the period 2000-2022. In addition, a more detailed evaluation was also carried out on two recent Business Finland programmes that ended in 2022. These programmes were Personalised Health Finland (PHF) and Smart Life Finland (SLF). For these programmes, a final evaluation was carried out where the focus was placed on the execution and achievements of these programmes. The main goal of this evaluation has been to form a comprehensive understanding of BF's actions, impacts and added value in terms of the development of the health and wellbeing sector in Finland.

The evaluation questions are divided into four parts: the final evaluation of the two programmes, evaluation of the programme-continuum, the overall evaluation of Business Finland's thematic contribution and an evaluation of the impacts of Business Finland's efforts on the industry sector as a whole.

Questions relating to the evaluation of the Personalised Health Finland (2018-2022) and Smart Life Finland (2019-2022) programmes:

- How relevant have the Personalised Health and Smart Life programmes been in relation to the operating environment, target group needs and the other programmes (complementarity and continuum)?
- Have the Personalised Health and Smart Life programmes been executed effectively and have they been coherent?
- What concrete results have been generated by the Personalised Health and Smart Life programmes? What impacts have the Personalised Health and Smart Life programmes had?
- Regarding programme implementation and related services, what has worked well and what could be improved, with reasons explained?

Questions relating to the long-term programmatic efforts on health and wellbeing:

- Has the long-term programmatic effort of BF to advance digital health through the continuum of its digital health programmes been fruitful?
- What is the main added value in respect of the programmes/continuum of programmes?
- Regarding both the implementation and services of the programmes, what has worked well and what could be improved, with reasons explained?

Questions for the overall Thematic Actions evaluation:

- What thematic areas has BF invested in and what has been the contribution and impact, as well as the mechanisms of impact, on these areas?
- Has the long-term effort of BF to advance health and wellbeing been fruitful?

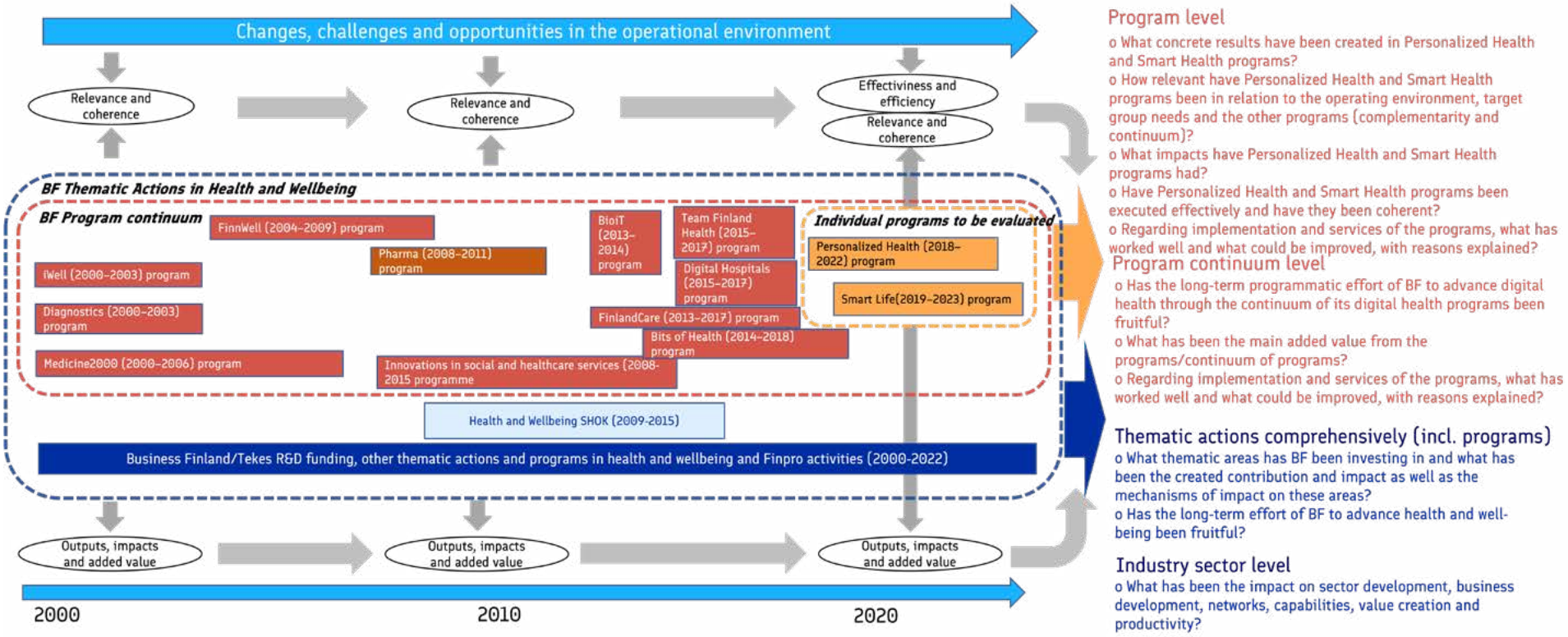
Questions relating to the industry sector's development:

- What has been the impact on sector development, business development, networks, capabilities, value creation and productivity?

An additionally important question here concerns the identification of successful case-examples that should be highlighted in relation to the programmes and thematic actions.

A primary cross-cutting theme in the evaluation has been the learnings in terms of what has been gained from the activity with the future in mind. The final goal of the evaluation is to produce conclusions in relation to the questions posed above and to provide concrete recommendations on how health and wellbeing could be advanced by Business Finland in the future. Business Finland is implementing a new approach where Thematic Focus Areas form the basis for its missions. Programmes will be implemented under these missions. Special attention in the formulation of recommendations will be directed to ensuring that the learnings from this evaluation can be used to refine and deepen this approach. Recommendations will thus be formed in such a way that they contain a vision of how the health and wellbeing sector should be developed by Business Finland through its programmatic and other activities.

In the graphic below the overall idea and framework of the work has been illustrated.



Picture 1. Framework of the evaluation.

METHODS AND DATA

In the context of the evaluation, different types of methods and data were be used in order to produce a comprehensive picture of the subject of the evaluation. The evaluation conclusions were based on a comprehensive interpretation of the information gathered from several sources and various types of materials.

The initial phase interviews were carried out in December 2022 and January 2023. Business Finland experts were interviewed (e.g., PHF and SLF programme directors and branch managers) as well as experts in the health and wellbeing sector form other organisations. The purpose of the interviews was to gain an overall picture of Business Finland's operations, the development of the operating environment and the key effects and added value resulting from Business Finland's operations. A total of 8 persons were interviewed.

Document analyses were carried out at different stages of the evaluation. The analysed documents included those produced for the final evaluated programmes (final reports, annual summaries, service descriptions, etc.), evaluations of previous programmes, materials and reports describing other activities of BF/Tekes and Finpro and relevant research reports related to the health and wellbeing sector. Particularly important materials here were those documents regarding the final evaluated programmes, as well as those relating to the evaluations of previous programmes.

Supplementary interviews with the project implementers of the PHF and SLF programmes, Business Finland and other experts in the health and wellbeing sector were carried out in February-March of 2023. The purpose of these interviews was to deepen the information base derived from other materials in order to gain more detailed information, e.g., on the importance of Business Finland for various organisations and on the development of the industry more generally. A total of 16 interviews were conducted in this context.

A number of Case studies were also carried out as part of the evaluation. The purpose here was to describe in greater detail the impact-mechanisms of the actions taken. These impacts, generally emerging in relation to complex and multi-stage processes, often cannot be fully detected by quantitative methods and data analysis alone. Case studies are therefore useful in this context in order to describe the impact logic and benefits attained. The subject of the case studies generally related to projects and the benefits gained by project-implementing organisations in the PHF and SLF programmes, effective services in respect of the PHF and SLF programmes and the effective activities Business Finland has engaged in over the 20-year period in question.

Electronic questionnaires were designed and distributed to the project implementers of the Personalised Health Finland and Smart Life Finland programmes. The questionnaires were distributed during February and March 2023. The themes of the questionnaires related to the implementation, results, impacts and added value

of the projects. Four surveys were carried out with the response percentages as follows:

- PHF research projects 32%
  (22 responses/the survey was sent to 68 persons)
- PHF company projects 39%
  (25 responses/the survey was sent to 64 persons)
- SLF research projects 40%
  (27 responses/the survey was sent to 68 persons)
- SLF company projects 26%
  (17 responses/the survey was sent to 66 persons)
- All surveys together 34%
  (91 responses/the survey was sent to 266 persons)

An analysis of Business Finland project and funding data was also carried out using descriptive statistical methods. The goal here was to gain a better understanding of the annual funding volumes targeting the health and wellbeing theme and to understand what kinds of organisations have received funding (organisation type, industry sector, organisation size). In addition, the share of project funding included in the programmes as well as other project funding was also examined. The definition and delimitation of the field of health and wellbeing in this evaluation is presented in the next chapter.

A word analysis of project descriptions was also carried out in order to deepen our understanding in terms of which themes the funding had been targeted at across the health and wellbeing theme more generally. The purpose here was to determine which health and wellbeing themes have been invested in the most in relation to Business Finland's projects using the word and word pairs that appear most often in project descriptions. In addition, tests were carried out to determine whether key terms in relation to the health and wellbeing theme can be found in the descriptions using a key word search.

A statistical analysis was also carried out in relation to the financial statement information and export data of Business Finland's customer companies in the health and wellbeing sector. The goal here was to understand how the companies that received financial support developed in relation to their industrial sector average. The implementation of this analysis is described in more detail in chapter 5.

Internal work meetings of the evaluation team were organised throughout the implementation period of the work. In these meetings, summaries of the results of the different work phases were produced and preliminary conclusions of the evaluation work and development recommendations formed.

A Workshop was organised on June 6, 2023, where the preliminary conclusions and recommendations were finalised. In addition to the evaluation team, experts from Business Finland participated in the workshop.

An interim report on the evaluation was produced in January 2023, designed, primarily, for Business Finland's internal use.

The evaluation was supervised by a steering group of Business Finland experts, who provided important additional information and insights which helped in the final production of the evaluation. The evaluation was carried out between November 2022 and June 2023.

DEFINING THE HEALTH AND WELLBEING SECTOR IN THE EVALUATION

No clear definition of the health and wellbeing sector currently exists, as it can be defined in many ways depending on the situation at hand. In general, the theme can include many kinds of activities and industry sectors, particularly in the field of wellbeing. Given this, in the context of the evaluation, particular attention had to be paid to what is meant by health and wellbeing.

In relation to the current list of industry sector classifications, it is not possible to precisely define what does, or does not, belong to the industry, since in any individual industry classification, we may find activity that could relate to both the health and wellbeing themes, and activity that should not be included in either. On the other hand, there are a number of industry sectors that clearly do belong to the theme.

For the purpose of the evaluation, the health and wellbeing sector was defined in cooperation with Business Finland's experts, in relation to the requirements of this evaluation. Demarcation was necessary in order to gather the data on Business Finland's project and funding in the theme. The aim was to include the funded projects and organisations in accordance with Business Finland's interpretation of what should be included in the health and wellbeing sector. This was done by using the various classifications that Business Finland's data includes. Projects and project implementers with the following classification were considered to belong to the health and wellbeing field.

- projects defined by Business Finland with the health and wellbeing label
- projects belonging to the theme's programmes regarded as being in the health and wellbeing theme
- projects that were part of health and wellbeing SHOK (Strategic Centres for Science, Technology and Innovation) SalWe
- projects that are, or were, part of GILT (Global Industry Leadership Team – wellbeing theme)
- BF industry (Focus and industry star companies)

The data was supplemented with companies from selected industries, if they were missing from the data. The data was collected by Business Finland for the period 2008-2023.

3. OPERATING ENVIRONMENT AND BUSINESS FINLAND'S THEMATIC ACTIONS IN DEVELOPING THE HEALTH AND WELLBEING SECTOR DURING THE PERIOD 2000-2022

3.1. OPERATING ENVIRONMENT

At the beginning of the millennium, Finland's health and social care sector faced new challenges with an ageing population and rising healthcare costs, generating the need for more efficient and cost-effective healthcare solutions. By recognising these challenges, the Finnish government began to invest, increasingly heavily, in research and development to support the growing demands of the health and wellbeing sector.[3] The priorities here focused on improving the quality, accessibility and efficiency of healthcare services.

During the same period, various factors including population ageing, improved accessibility to healthcare services, the introduction of innovative medications and the expansion of global markets fuelled the growth of the global pharmaceutical industry. In response to the rising costs of drug research and development and the pressure to accelerate the product development process, the pharmaceutical industry sought new operational models, including outsourcing. This led to a shift in drug development activities towards networks involving academic research, specialised small and medium-sized enterprises focused on drug development and large pharmaceutical companies.[4]

Concurrently, the globalisation of health technology gained significant attention in Finland, particularly in 2003 when **General Electric** (GE) acquired **Instrumentarium's** patient monitoring business for approximately two billion euros[5], making it the largest deal in Finnish economic history at that time. Health technology thus emerged as a key focus area in the early 2000s, with Finland making substantial investments in biotechnology during this period. Public financial support exceeded 50 million euros in 2002, with around 30 million euros allocated to small and medium-sized biotechnology companies.[6] Almost 60% of these companies operated in the pharmaceutical sector, while others were involved in diagnostics, biomaterials,

3 The impact of Tekes Activities on wellbeing and environment, Review 308/2014
4 Martti Kulvik, Tero Kuusi & Mika Pajarinen (2021) Terveysteknologia ja tutkiva lääkeala Suomen taloudessa. Elinkeinoelämän tutkimuslaitos. Kustantaja: Taloustieto Oy
5 STT & Startel (2003). GE:n tarjous Instrumentariumista läpi. Yle Uutiset 6.10.2003
6 Kulvik, M., Tähtinen, M. & Ylä-Anttila, P. (2013). Business and Intellectual Capital Development in Financial Riptide – Case Studies of Finnish Biotechnology and Pharmaceutical Companies Dispersing into Global Value Chains. Etla Raportti No 17.

bioinformatics, enzymes and healthcare device development and manufacturing.[7] Consequently, a significant portion of the funding was directed towards building a research-based pharmaceutical and health technology ecosystem which subsequently began to grow and develop dynamically.[8]

Amidst these developments, the early 2000s witnessed significant progress in terms of diagnostic tools, driven by breakthroughs in genomics, molecular biology, imaging, and data analysis. One notable milestone during this period was the completion of the Human Genome Project in 2003 which profoundly advanced understanding of the human genome and laid the foundations for the development of advanced genomic-based diagnostic tools.

In Finland, the ageing population prompted targeted investments towards screening programmes and diagnostic testing, with a focus on disease prevention and early intervention. This emphasis on proactive healthcare strategies fuelled the demand for innovative diagnostic technologies. Finnish companies emerged as notable players in this field, playing a pivotal role in introducing ground-breaking diagnostic tools to the market, both domestically and internationally.[9]
Furthermore, in the early 2000s, private healthcare in Finland experienced notable advancements. While private healthcare and health services had been present throughout the country's history of independence, they were primarily accessible to the more privileged segments of society. The economic recession of the 1990s emphasized the importance of the private sector in discussions about the welfare state. [10] Since the start of the new millennium, there has been an increasing utilization of private services through purchased arrangements, and even entire municipal health centres have been outsourced to private service providers.

Notable reforms included the introduction of the treatment guarantee in 2005 and changes to state subsidies through the Act on the Planning and State Subsidy of Social and Healthcare Services (1733/1992). These reforms played a crucial role in the development of private housing services. [11] Additionally, Section 8 of the Municipal Act (410/2015) allowed tasks to be assigned to the private sector, further strengthening its role.

Currently, the private service providers already contribute to more than a quarter of healthcare and social services production.[12] In 2019 there were approximately 15,170 private healthcare sector companies in Finland. Their combined turnover was about 5.4 billion euros. The

7 Hermans, R. & Tahvanainen, A. (2006). Regional Differences in Patterns of Collaboration, Specialisation and Performance. Kirjassa R. Hermans & M. Kulvik (Toim.), Sustainable biotechnology development – New insights into Finland. Etla B217. Taloustieto Oy, Helsinki

8 Kotiranta, A., Kulvik, M., Maijanen, S. Tahvanainen, A., Trieste, L. & Turchetti, G. (2015). Raiders of Lost Value. Etla B267. Taloustieto Oy, Helsinki.

9 Spotlight on Finland. Nature (2000) https://doi.org/10.1038/nj0022

10 Harjula Minna 2015. Hoitoonpääsyn hierarkiat. Terveyskansalaisuus ja terveyspalvelut Suomessa 1900-luvulla. Tampereen Yliopistopaino Oy – Juvenes Print. Tampere. Saatavissa: https://trepo.tuni.fi/bitstream/handle/10024/98006/hoitoonpaasyn_hierarkiat_2015.pdf?sequence=1&isAllowed=y

11 Terveydenhuoltolaki 2010/1326.

12 Yksityiset sosiaali- ja terveyspalvelujen tuottajat, Sosiaali- ja terveysministeriö, 2023

companies in the sector employ approximately 38,600 people in terms of full-time equivalent employment. Since 2013, employment has increased by over a fifth (6,700 individuals).[13]

In the mid to late 2000s, growing recognition emerged of the potential benefits that digitalisation could bring to healthcare, including improved efficiency, quality of care, patient outcomes and access to healthcare services. In Finland, one of the primary objectives here was the development of the first nationwide electronic health record system (Kanta) which was officially launched in 2010. The purpose of Kanta was to improve the quality and efficiency of healthcare services by providing healthcare professionals with quick and easy access to their patients' medical records. Alongside Kanta, the introduction of Omakanta, a system for accessing electronic patient records, aimed to provide patients with convenient access to their health information, supporting their active involvement in the management of their own wellbeing.[14] These initiatives marked important steps in Finland's digitalisation journey and positioned Finland as a forerunner in the digital health market.

In the early 2010s, notable developments occurred in terms of wireless sensor networks (WSNs), as well as wearable devices in healthcare.[15] The introduction of products like the Fitbit fitness tracker, Apple Watch and other smartwatches helped popularise the concept of wearable devices, opening up new possibilities for health monitoring, activity tracking and communication on the wrist. Wearable technologies offered new opportunities for remote patient monitoring and real-time data collection, allowing healthcare providers to better understand their patients' health status and make more informed treatment decisions.

In Finland, a further significant development in the wearable health technology space was the emergence of the Oura Ring, in 2013. This was one of the first devices to provide accurate and continuous tracking of key health metrics, such as sleep patterns, heart rate and body temperature. Since then, wearable technologies have continued to evolve and diversify, with continual advancements in features, functionality and design. Finland has also seen the emergence of several innovative startups in the wearable technology sector, contributing to the ongoing evolution and diversification of wearable technologies.

In 2006, the healthcare industry experienced the impact of a transformative framework known as value-based healthcare.[16] This innovative approach prioritises the delivery of high-quality, cost-effective care by focusing on patient outcomes and value. The impact of this framework has been significant, not only in Finland

13 Lääkäripalveluyritykset ry

14 Jormanainen V. Kanta-palvelujen käyttöönotto vuosina 2010-2014 [Introduction of Kanta services between 2010 and 2014]. Duodecim. 2015;131(13-14):1309-17. Finnish. PMID: 26536728.

15 Darwish A, Hassanien AE. Wearable and implantable wireless sensor network solutions for healthcare monitoring. Sensors (Basel). 2011;11(6):5561-95. doi: 10.3390/s110605561.

16 Porter, Michael E., and Elizabeth O. Teisberg. Redefining Health Care: Creating Value-Based Competition on Results. Boston: Harvard Business School Press, 2006.

but also across the global healthcare industry. The concept of value for patients has resonated with various stakeholders, including patients, providers, provider organisations, payers, governments and suppliers. Since its introduction, the principles of value-based healthcare have been widely disseminated through publications and courses, leading to the implementation of its core elements in pilot programmes worldwide.

Around the same time, advances in genetic testing and precision medicine further enabled healthcare professionals to tailor treatments to individual patients based on their genetic makeup and other factors. [17] This personalised approach aimed to improve treatment outcomes, reduce side effects and ensure tailored care for patients. In addition, a growing emphasis was placed on preventive medicine and wellness.[18] Healthcare providers were encouraged to focus on promoting healthy lifestyles and preventing diseases before they occurred, rather than just treating them once they developed. This approach aimed to reduce the burden on the healthcare system and improve patient outcomes by focusing on preventative measures.

During the period 2010-2015, the Finnish healthcaresystem continued to focus on digitalisation and on improving patient outcomes through patient-centred thinking and personalised medicine and treatment. As part of the patient-centric care approach, patient feedback was increasingly emphasised while healthcare providers were encouraged to involve patients in their care and decision-making processes.

The emergence and widespread adoption of the internet and digital communication technologies in the 2000s further accelerated the use of digital solutions in healthcare. The ability to transmit medical information, images, and data quickly and securely over the internet opened up new possibilities for remote healthcare delivery and consultation. With an increasingly ageing population and limited healthcare resources in some areas, telemedicine emerged as an important tool in the provision of healthcare to patients, specifically in remote locations. In 2017, the Finnish government launched a national telemedicine programme called Digital Health Village, to provide remote consultations and care to patients. This programme has been continually expanded in the years since.

The profound advancements in technology, particularly in the digital realm, introduced its own set of challenges associated with the collection, storage and processing of personal data.

17 Abul-Husn N, Owusu Obeng A, Sanderson S, Gottesman O, Scott S. Implementation and utilization of genetic testing in personalized medicine. Pharmgenomics Pers Med. 2014;7:227-240 – https://doi.org/10.2147/PGPM.S48887

18 O'Daniel, J. M. (2010). The Prospect of Genome-Guided Preventive Medicine: A Need and Opportunity for Genetic Counselors. J. Genet. Couns. 19, 315–327. doi:10.1007/s10897-010-9302-4

By acknowledging these challenges, the European Union established the General Data Protection Regulation (GDPR) in 2016. This marked a significant milestone in data protection and privacy regulation. The primary objective of the GDPR was to strengthen data protection and privacy for individuals within the EU while unifying data protection rules across member states.

In Finland, an increasing level of interest emerged around the issue of better utilising data and analytics in healthcare. In order to address this, the Finnish government launched the Health Sector Growth Strategy for Research and Innovation Activities initiative in 2014 to promote innovation and growth in the healthcare industry (updates and refinements of implementation were made in 2016 and 2020). A major component of this strategy was the use of real-world data (RWD) to inform healthcare decision-making and improve patient outcomes, aiming to make better use of the vast amount of health data generated in Finland from EHRs and other sources. Furthermore, the Finnish Innovation Fund Sitra launched the IHAN programme in 2018, with the aim of creating a secure and transparent data ecosystem for healthcare and other industries. This programme brought together stakeholders from across the healthcare industry to collaborate on data sharing and analytics projects.

In addition to the data protection challenges addressed by the GDPR, the digitalisation of social welfare and healthcare introduced its own set of complexities. The substantial volume of data generated from various registries made it difficult and inefficient for researchers, health authorities and other stakeholders to effectively utilise the data. To address this issue, the Finnish government-led initiative, Findata, was established in 2019. The primary goal of Findata was to develop a national health and social care data exchange platform that enables healthcare providers and social care providers to securely access and share patient data and other health-related data in a standardised format. Findata's platform aimed to improve care coordination, reduce the administrative burden on healthcare providers and promote the use of digital solutions in healthcare.

Looking forward, The COVID-pandemic in 2020-2021 and its aftermath are expected to permanently re-shape the operating environment of health and wellbeing in Finland. The pandemic not only increased awareness regarding the limited resources available to healthcare professionals, but also the importance of a sustainable work environment. Moreover, the pandemic significantly increased the adoption of new digital platforms and health solutions for remote care, a trend that is likely to be continued.[19] Moving forward, the healthcare sector will be focusing on new models of care that are flexible and better prepared for future pandemics or other health crises.

Apart from COVID-pandemic, the social and healthcare (SOTE) reform was finally implemented in 2023 representing a major turning point for the social and healthcare

19 The rise of digital health technologies during the pandemic, European Parliament, (2021)

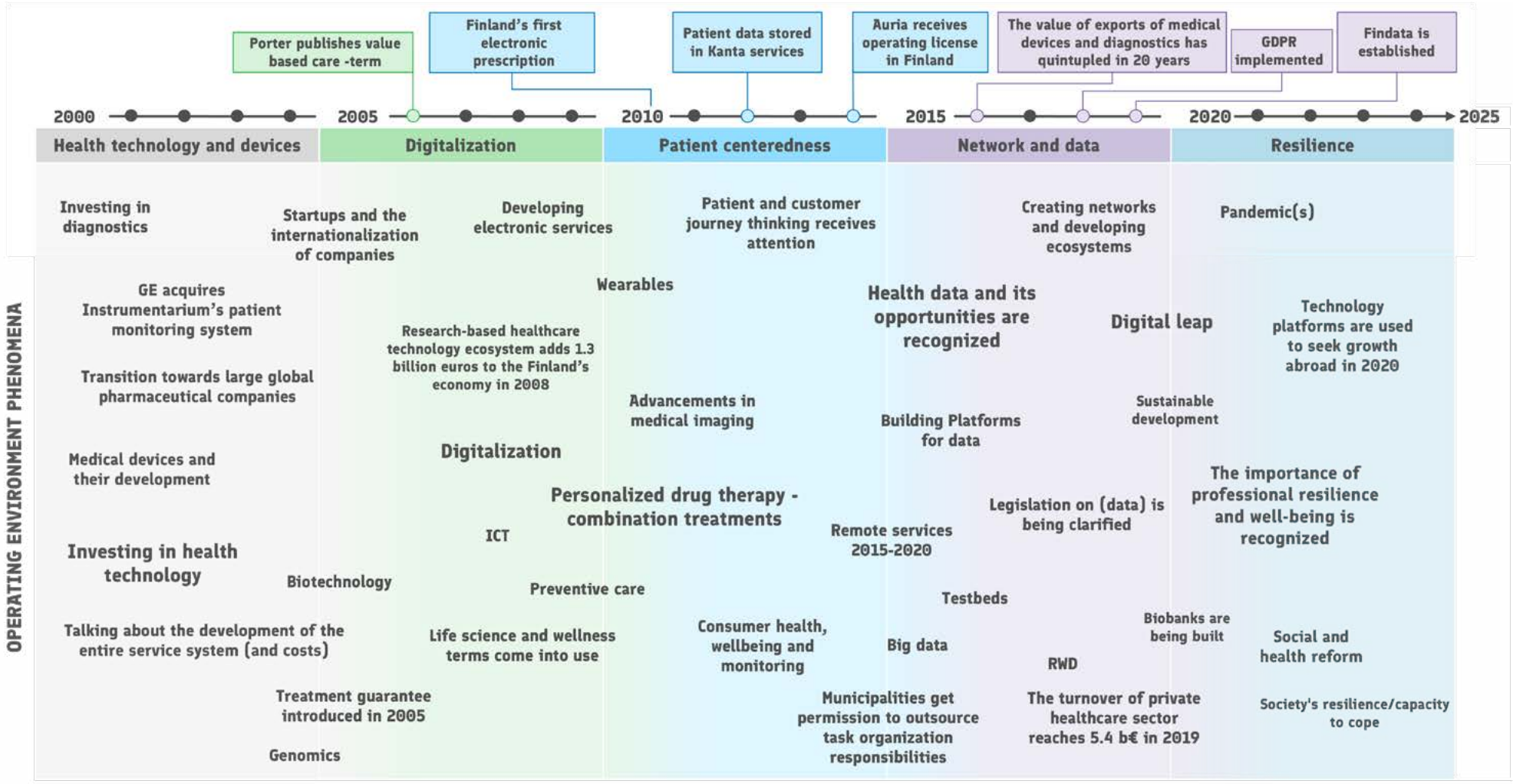
sector. The primary goals of the reform are to increase system efficiency and quality of care, as well as to improve patient outcomes. The reform involves significant organisational changes, such as the merging of social and healthcare services under a single administration. The reform will undoubtedly have a significant impact on the future of healthcare in Finland.

According to recent research, the Finnish private research medicine and health technology sector has developed positively over the last decade, as the value added has increased, employment has also done so, work productivity has improved as has profitability. In addition, exports have also grown and start-up activity has become even stronger in the sector.[20] This shows that Finland has competitive businesses and significant know-how in the sector.

International health sector enterprises have increased their presence in Finland especially when Finnish companies have been sold to foreign ownership. Given the need to access the high competence levels of a specialised workforce Finnish companies have continued their operations in Finland. Foreign companies have also brought their R&D activities to Finland, illustrating Finland's strong position in the field in terms of know-how and its position as a good platform for R&D activities.

The absence of investment funding in Finland did however present a challenge to the development of the sector. However, the development ideas and actors with the greatest potential have received funding to develop further. As such, recent years have seen the situation improve.

20 Martti Kulvik, Tero Kuusi & Mika Pajarinen (2021) Terveysteknologia ja tutkiva lääkeala Suomen taloudessa. Elinkeinoelämän tutkimuslaitos. Kustantaja: Taloustieto Oy



Picture 2: Operating environment in the health and wellbeing sector in 2000-2025

3.2. DESCRIPTION OF BUSINESS FINLAND'S THEMATIC ACTIVITIES (INCLUDING PROGRAMMES) DURING THE PERIOD 2000-2022

Business Finland's thematic activities and programmes during the period 2000-2022 focused on the promotion of innovation, internalisation, growth, digitalisation, and sustainability among Finnish companies. Before Tekes (the Finnish Funding Agency for Innovation) and FinPro fused into Business Finland, Tekes focused on promoting innovation and R&D among Finnish companies.

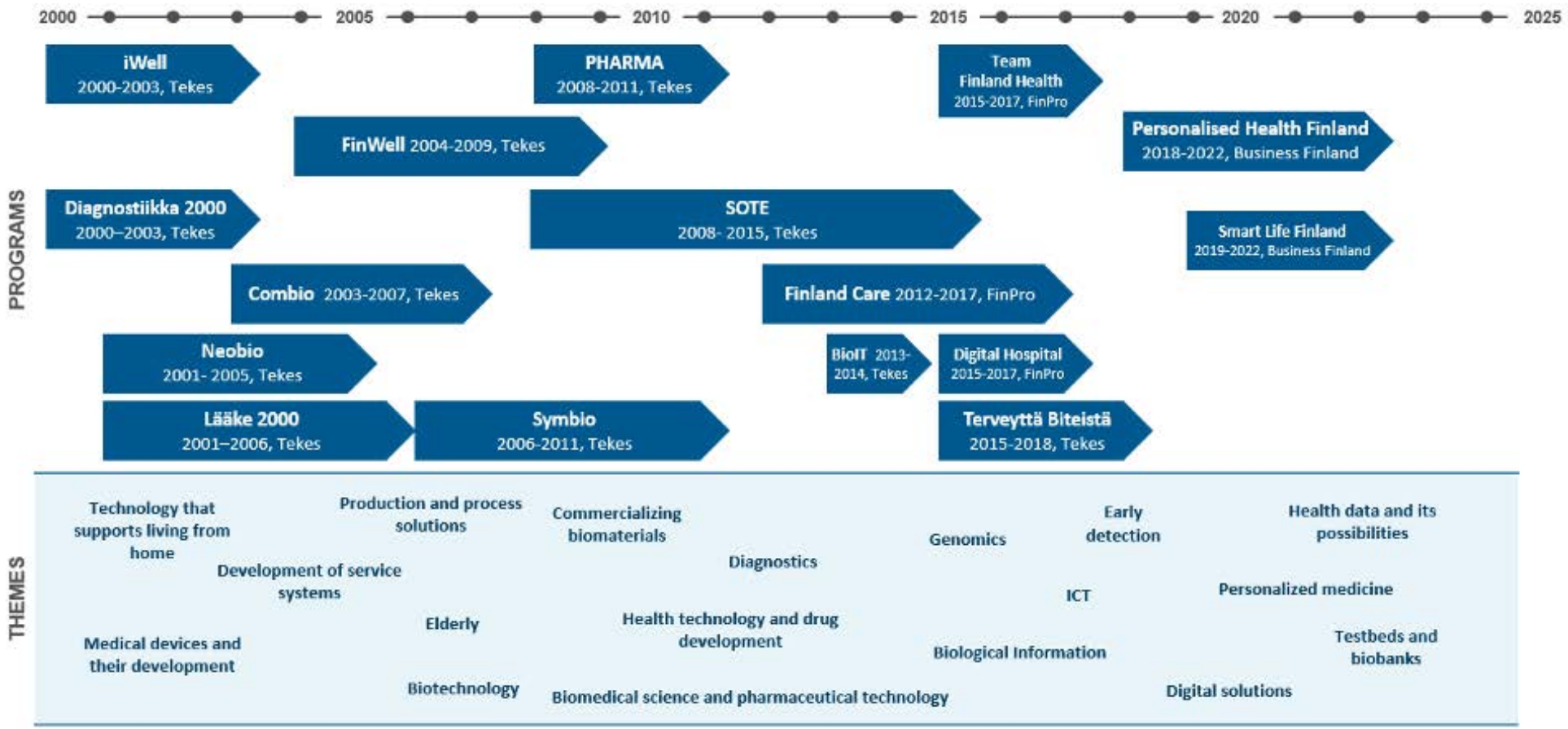
In the early 2000s, Finland's emphasis on improving the quality, accessibility and efficiency of healthcare services was reflected in Tekes-funded programmes. Notably, programmes like iWell and FinnWell played an important role in promoting innovation and economic growth in the healthcare and wellness sector.[21] The iWell programme (2000-2003) aimed at promoting innovation in the healthcare sector through the funding of research and development in areas such as medical devices, healthcare services and healthcare technologies. In 2004, the FinnWell programme was launched to expand the work of iWell and move from the development of medical devices to the systematic development of health and wellness. While iWell prioritised technology and service products that would enhance health and wellbeing for individuals at home, at work or while travelling, FinWell sought to improve the quality and productivity of national healthcare, while also advancing the commercial activity and internationalisation of the service.

Furthermore, the funding strategies of Tekes also reflected the recognition of biotechnology as one of Finland's primary industries for the future. In alignment with this vision, Tekes launched the 2001 the NeoBio[22] programme in 2001. This programme aimed to develop new and more efficient methods for biotechnology research, create new business opportunities and facilitate networking within the biotechnology sector. Additionally, the Combio programme[23] aimed to develop Finland's expertise in biomaterials even further, with a specific focus on materials used in healthcare applications, integrated within the human body. Its primary objective was to accelerate the commercial utilisation of research findings. Moreover, in 2006, the Symbio programme focused on developing bioprocessing solutions tailored to industrial requirements, aiming to provide biotechnology solutions across various industry sectors, and enabling cost-efficient and environmentally friendly production.

During the early 2000s, the investment strategies also recognized the advancements within the pharmaceutical industry. Significant investments were targeted towards the Finnish pharmaceutical industry, including the Lääke 2000 programme (2001-2006)[24] ,in order to strengthen

21 Programmes contributing to health and wellbeing, Evaluation Report 2/2019
22 Evaluation of the NeoBio and SymBio programmes, Tekes Report 3/2014
23 Biomateriaalista liiketoimintaa, Combio-teknologiaohjelman loppuarviointi, Tekes, 10/2007
24 Pharma-ohjelman loppuarviointi sekä diagnostiikka- ja Lääke 2000 -ohjelmien jälkiarvioinnit, Tekes, 3/2013

the industry sector and accelerate the early stages of international business development. As the pharmaceutical development activities were increasingly shifting towards networks involving academic research, specialized small and medium-sized enterprises, and large pharmaceutical companies, the goal of the Lääke 2000 program was to support the research expertise of universities and research institutions. The aim was to transfer this knowledge to the Finnish business sector and leverage it for entrepreneurial purposes.



Picture 3. Tekes and Finpro programmes in a timeline, and the most central themes they included.

To enhance the cost-effectiveness of social and healthcare systems and prioritize customer-centricity, Tekes expanded its focus on wellbeing to include social and health services, reflecting a shift in the healthcare sector towards more open co-development models. Beginning in 2008, in collaboration with the Ministry of Social Affairs and Health, Tekes launched a number of Innovations in its Social and Healthcare Services programme. The programme aimed to develop and implement solutions for more effective and customer-oriented health and social services.

As the health technology and pharmaceutical industry continued its rapid growth, there was an increasing need to support the internalization and competition capabilities of companies. Consequently, the Pharma-programme was initiated in 2008 with the objective of promoting the Finnish pharmaceutical industry and in particular it's competition capabilities through the high-end integration of technologies, processes, and service businesses. Moreover, during the 2010s, investments were directed towards programmes that promoted Finnish healthcare technology, competence, and services in international markets. Programmes like Finland Care[25] and BioIT[26] aimed to create new sustainable collaborations and partnerships between traditional ICT actors and experts in biology, genetics and environmental sciences across academia and industry. Launched in 2015, Bits of Health aimed to make Finland a business hub for digital health, whereas the Team Finland Health programme (2015–2017, Finpro) aimed to further raise the profile of Finland as an attractive investment and business environment in health and wellbeing.

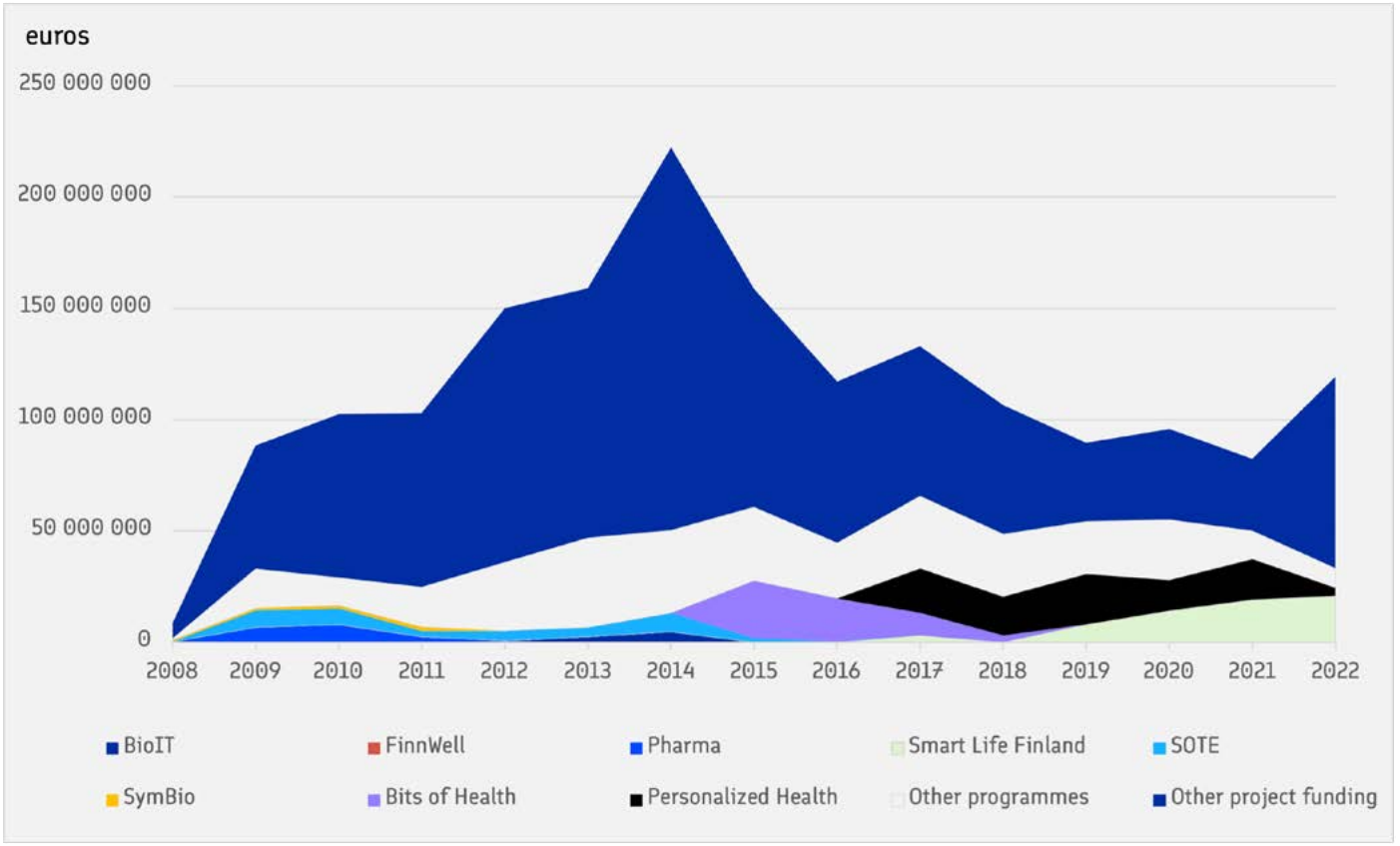
Digital Hospitals (2015-2017, Finpro) was another programme aimed at facilitating the internalization of companies. This specific funding initiative was based on the finding that Nordic countries were planning investments into refurbishing, renovating, and building hospitals and other care facilities between 2015–2025. Consequently, the funding was directed towards enterprises specializing in technologies used in hospital environments. The programme's focus was on improving patient flow in hospital processes, implementing assisted living technologies for home care, advancing rehabilitation practices, optimizing hospital logistics, providing technical consulting and advisory services, as well as offering infection control solutions.

25 Programmes contributing to health and wellbeing, Evaluation Report 2/2019
26 Striving toward a vibrant ecosystem, Evaluation of Tekes' Combio, BioIT and Trial Programmes, Tekes, 5/2016

3.3. THEMATIC AREAS FOR BUSINESS FINLAND INVESTMENT IN HEALTH AND WELLBEING

Business Finland has funded projects through programmes and directly from various funding instruments. As a whole, 5613 projects have been funded in the period 2008-2023 in the health and wellbeing sector. 1,798 billion euros of funding has been allocated to the sector by Business Finland and Tekes. Funding peaked in 2013-2015. Funding directed to projects through the programmes was at its highest in 2015 and 2017. On the other hand, funding for clear health and wellness programmes will be at its highest in 2021.

The themes of the programmes described in the previous paragraph have directed funding to various themes in the health and wellbeing sector. In addition to this, project implementers have applied for project funding for their own development needs in the health and wellbeing sector. A significant part of the project funding targeted to the sector is funding that does not relate to the project financing of the programmes. As such, on average, about two-thirds of the annual funding has been non-programme funding, i.e. Business Finland funding not allocated through programs.



PICTURE 4. OVERALL PICTURE OF ANNUAL PROJECTS FUNDING FROM PROGRAMMES AND OTHER FUNDING

In the following, the content descriptions of the funded projects have been analysed using the word analysis method. In the analysis, a search was done to find out which individual words or pairs of words related to the health and wellbeing theme appear most often in the project descriptions. The aim here is to gain a better understanding of what kinds of health and wellbeing themes the projects have touched upon. The analysis concerned on projects implemented during the years 2010-2022.

The words most often mentioned in the project descriptions are product, service, solution and business. The projects aimed, specifically, to develop these things, so it is to be expected that these words will regularly appear in the project descriptions. These words would however probably also be commonly used in a similar exercise related to other industries.

The next most common words clearly indicate that health and wellness projects have been under review. Words like treatment, patient, healthcare and clinical show that healthcare and patient care have been a particular focus of development in the projects. Other words, such as device, technology and digital also show that many of the projects have focused specifically on the development of health technology.

This review does not really deliver any major surprises in relation to the kinds of themes that featured in the health and wellbeing sector and, specifically, in the operations of Business Finland in the 2010s. As a word, 'health' is perhaps emphasised a little more than 'wellbeing'. Business Finland's projects have thus focused on both themes but have done so particularly strongly on the health sector.

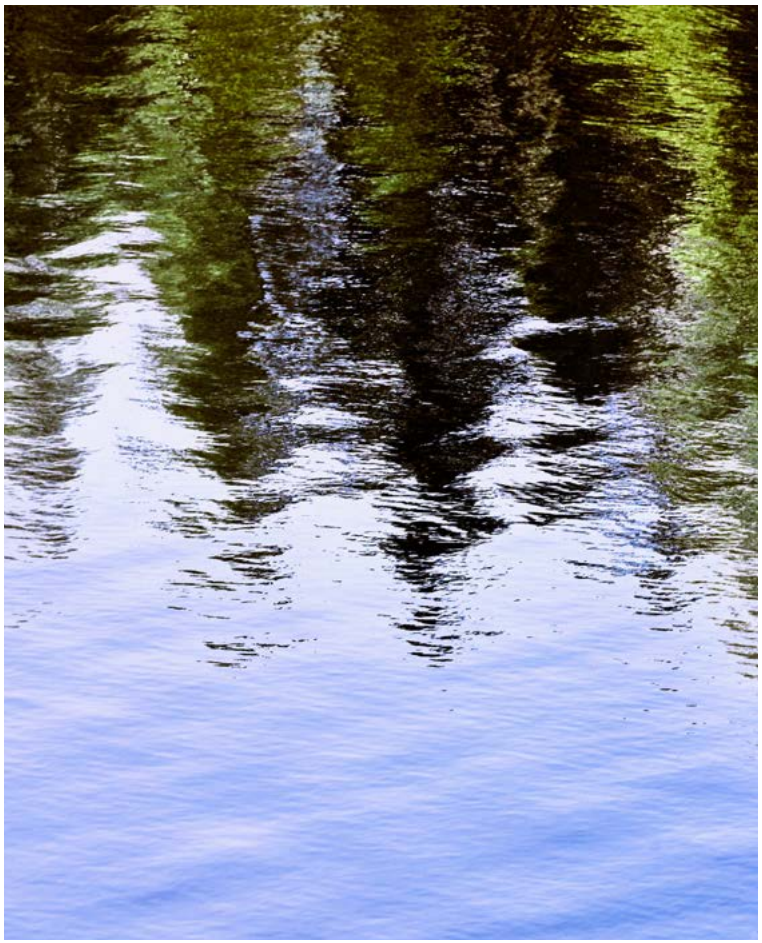


TABLE 1. WORD ANALYSIS OF PROJECT DESCRIPTIONS IN THE YEARS 2010-2023. THE TABLE SHOWS THE 30 MOST FREQUENTLY OCCURRING HEALTH AND WELLBEING RELATED WORDS IN PROJECT DESCRIPTIONS.

1.	Product	16.	System
2.	Service	17.	User
3.	Solution	18.	Finland
4.	Business	19.	Sales
5.	Data	20.	Concept
6.	Treatment	21.	Consumer
7.	Patient	22.	Model
8.	New	23.	Human
9.	Healthcare	24.	Wellbeing
10.	Device	25.	Application
11.	Technology	26.	USA
12.	Health	27.	Company
13.	Clinical	28.	Hospital
14.	Digital	29.	Medicine
15.	Customer	30.	Process

The word pair analysis focused more specifically on the years 2015-2023. Health care is clearly a frequently occurring word pair there as well. In addition, products and services as well as business models and medical device also come to the fore here. This supports the findings of the previous analysis, according to which the projects have primarily focused on the health sector and health technology.

Contrary to expectations, "personalised health" does not emerge strongly from the material as a word pair, although the theme has been increasingly emphasised in recent years. On the other hand, other frequent word pairs, such as personal data, show that the projects have indeed touched upon the theme in question.

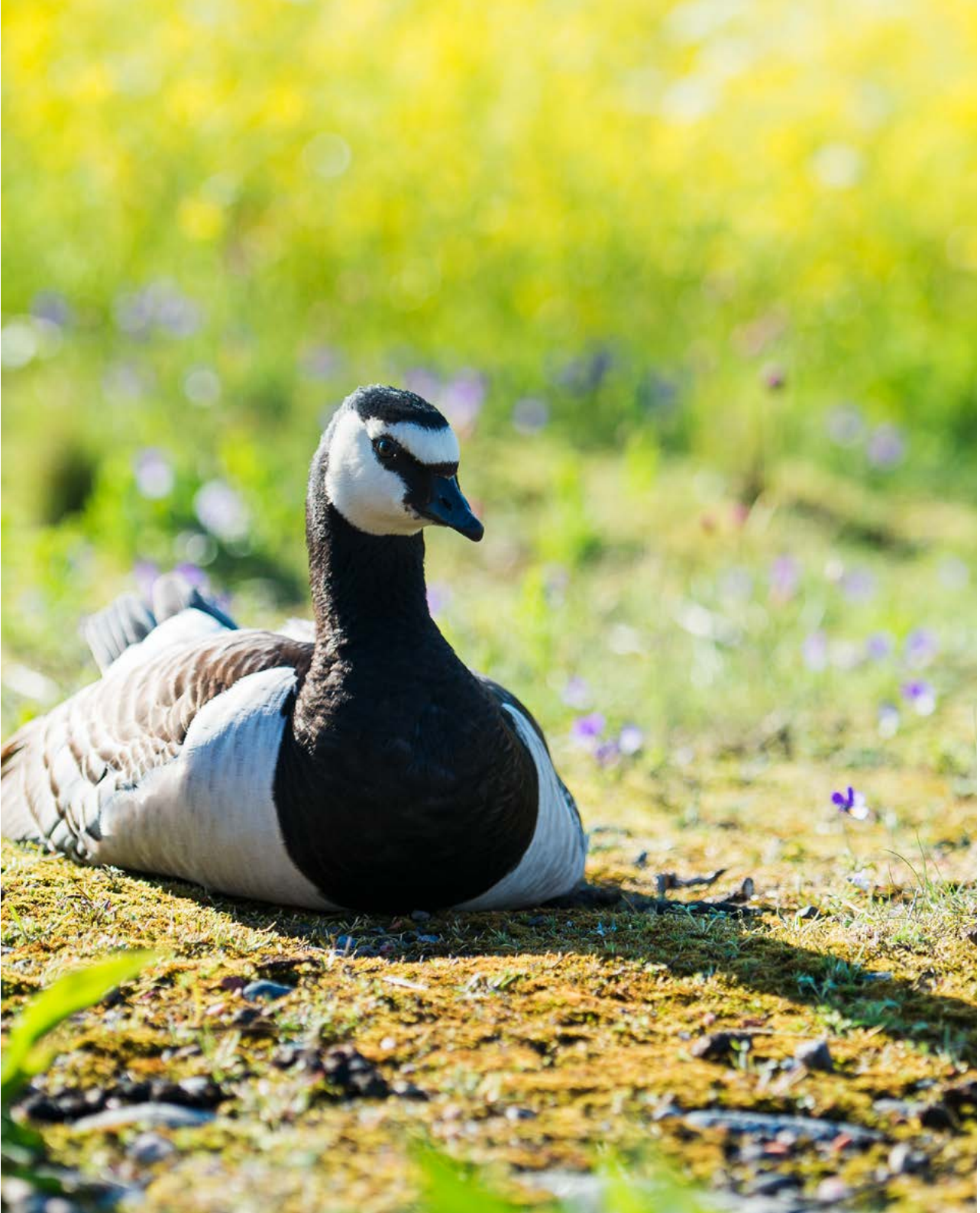
Several pairs of words also indicate that the utilisation of data is widely used as a development target in projects. This represents a particularly 'hot' focus area where investment has been extensively sought in recent years.

Surprisingly, to some extent at least, air quality comes up several times, relating to the fact that solutions to air quality issues have often been developed in the context of the projects. Moreover, words and/or word pairs such as 'food industry' and 'wastewater' show that the projects have extensively developed and addressed issues relating to the broader theme of wellbeing and the social determinants of health. Overall, however, the emphasis is on the health sector.

On a separate note, when looking at word pairs, other than those related specifically to health and wellness, "Business Finland" clearly emerges as the most frequently used word pair, after 2017. Tekes does not register in the same way in the analysis of one word or pairs of words.

TABLE 2. WORD PAIR ANALYSIS OF PROJECT DESCRIPTIONS IN THE YEARS 2015-2023. THE TABLE SHOWS THE 30 MOST FREQUENTLY OCCURRING HEALTH AND WELLBEING RELATED PAIRS OF WORDS IN PROJECT DESCRIPTIONS.

1.	Health care		16.	Health wellbeing
2.	Clinical test		17.	Bc footprint
3.	Product service		18.	Prostate cancer
4.	Business model		19.	Data management
5.	Medical device		20.	Healthcare professional
6.	Air Quality		21.	Digital health
7.	Personal data		22.	Food industry
8.	Digital service		23.	Sweden Norway
9.	Synthetic data		24.	Wastewater
10.	Big data		25.	Type diabetes
11.	Drug delivery		26.	Raw materials
12.	Data data		27.	Clinical decision-making
13.	Digital solution		28.	Celiac disease
14.	Image analysis		29.	Cancer io
15.	Machine learning		30.	Connected health



A keyword search was conducted on all the projects funded by Business Finland. In essence, the objective was to compare the prominent keywords found within the project reports with the concurrent programme themes illustrated in picture 3. This analysis aimed to provide a comprehensive understanding of how effectively the themes were integrated into the project content.

The keyword search results were relatively low. The number of key words among the top 20 words was consistently below 1% across all categories, given the total word count of approximately 3 657 500 throughout the projects. The highest key word occurrences were observed within the domains of health technology (health, drug, terveysteknologia, lääkekehitys), production and process solutions (production, process, tuotanto, prosessi) and digital solutions (digital, digitalisation, digitalisaatio). All key word search results are compiled in table 3.

Furthermore, no clear connections were found between the key words and the programmes associated with their respective themes. Instead, the key words appeared across a wide range of programmes.

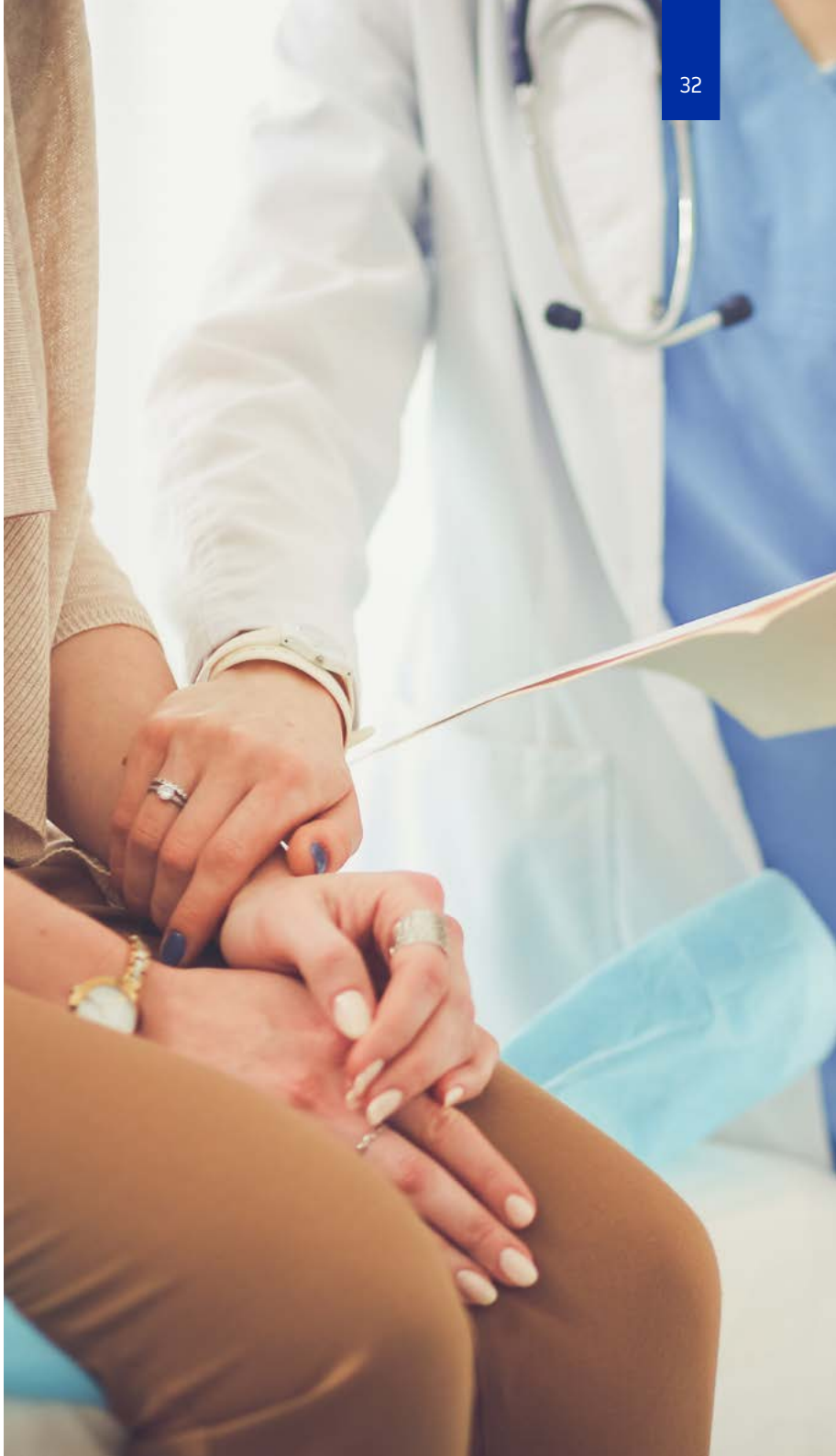
Themes	Key words	Occurence % of total word count
Health technology and drug development	*Health, drug, terveysteknologia, lääkekehitys*	**0,24 %** (8 746 words)
Production and process solutions	*Production, process, tuotanto, prosessi*	**0,20 %** (7 352 words)
Digital solutions	*Digital, digitalization, digitalisaatio*	**0,20 %** (7 385 words)
Health data and its possibilities	*Health, terveysdata*	**0,19 %** (6 844 words)
Diagnostics	*Diagnostic, diagnostiikka*	**0,10 %** (2 792 words)
Development of service systems	*Service, palvelujärjestelmä*	**0,08 %** (2 871 words)
Commercializing biomaterials	*Biomaterial, commercialisation, biomateriaali, kaupallinen, kaupallistaa, kaupallistaminen*	**0,08 %** (2 809 words)
Medical devices and their development	*Medical, lääkinnällinen*	**0,07 %** (2 671words)
Elderly	*Elderly, ikäasuminen, ikäihminen, ikärappeuma, ikääntyy*	**0,05 %** (1 818 words)
Personalized medicine	*Personal, personalization, personalized, yksilöllinen*	**0,04 %** (1 431 words)
Biological information	*Biological, information, biologinen, informaatio*	**0,03 %** (1 236 words)
Early detection	*Early, detection, varhainen, havaitseminen*	**0,03 %** (979 words)
Biomedical science and pharmaceutical technology	*Biomedical, pharmaceutical, sicence, biolääketiede*	**0,02 %** (805 words)
Technology that supports living from home	*Living, asuminen, home, kotona, koti*	**0,01 %** (365 words)
Genomics	*Genome, genomi*	**0,01 %** (180 words)
Biotechnology	*Biotech, biotechnology, bioteekki, biotekniikka, bioteknologia*	**0,01 %** (262 words)
ICT	*ICT*	**0,01 %** (187 words)
Testbeds and biobanks	*Testbed, testbedtoiminta, testiympäristö*	**0,001 %** (47 words)
	Total word count:	3 657 526

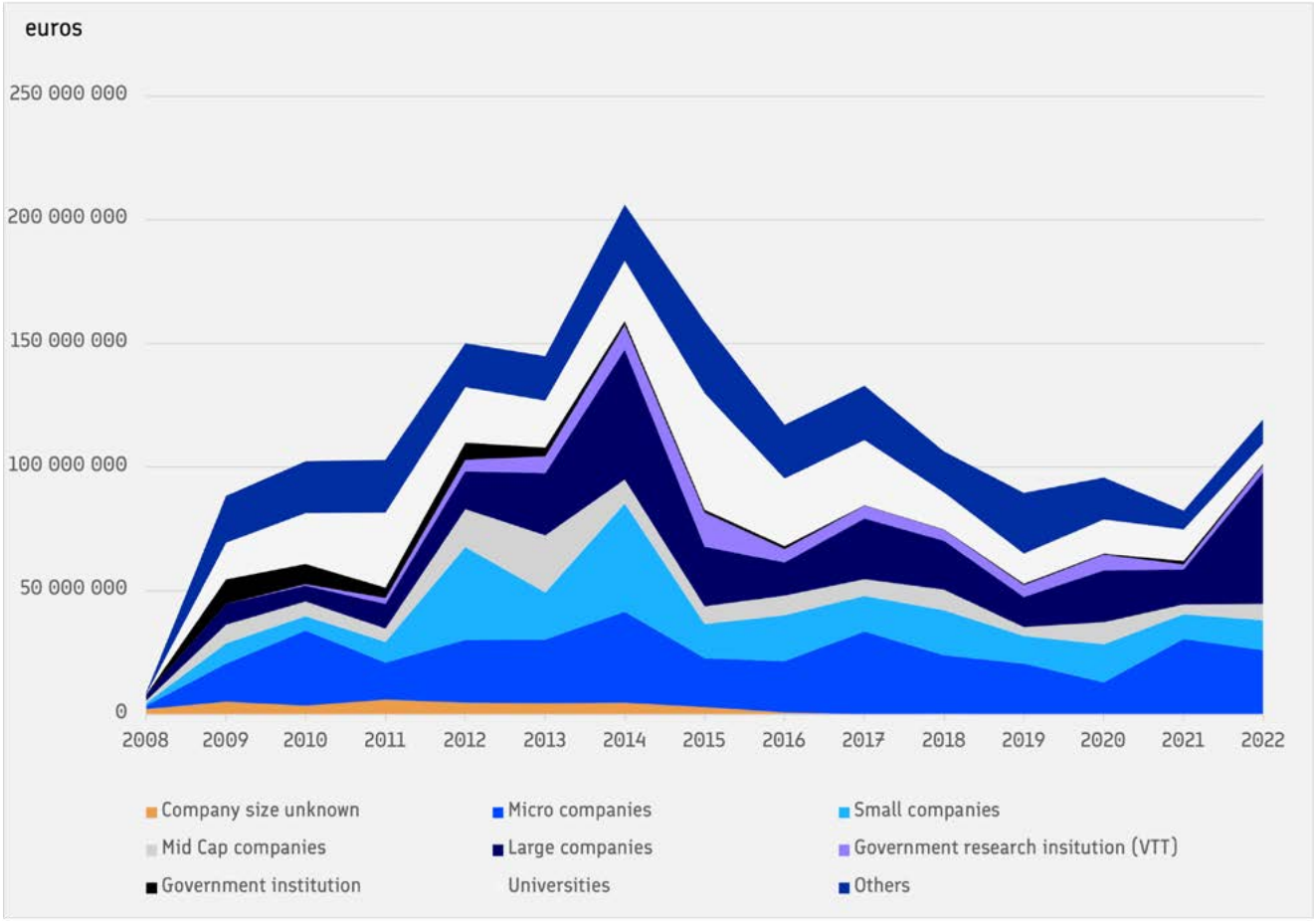
TABLE 3. BUSINESS FINLAND FUNDED PROJECT THEMES AND CORRESPONDING KEY WORD OCCURRENCES.

3.4. ORGANISATIONS THAT HAVE RECEIVED FUNDING IN THE HEALTH AND WELLBEING THEME

Based on Business Finland's project and funding data, information on which organisations have been funded during the period 2010-2022 is presented in the following segment. Several different types of organisations have received project funding. A total of 2684 organisations have received project funding in the health and wellbeing theme.

Companies (of various sizes) have been the most significant group of funding recipients in terms of funding volume. Around 50-70% of funding has been allocated to such companies annually. Micro and small companies have received, annually, 22-49% of the funding. Large companies have received 10-25% of the funding and Mid Cap companies 5-10% of the funding, annually. Universities are also significant project implementers and receivers of funding. Universities received 15-30% of the funding, annually.

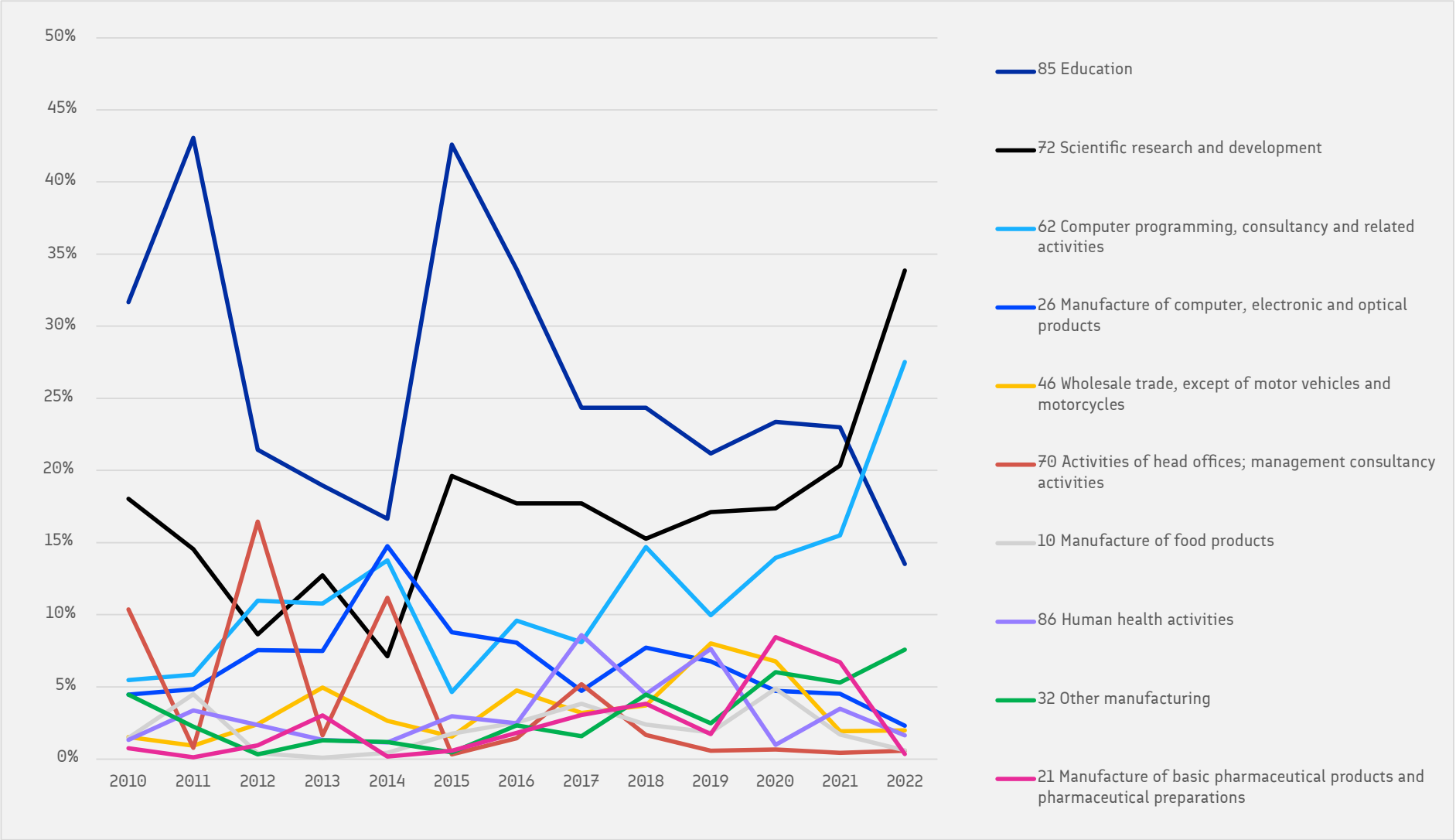




PICTURE 5. ALLOCATION OF PROJECT FUNDING TO DIFFERENT TYPE OF ORGANISATIONS.

When examining the direction of funding in different industry sectors, we can see that funding has been widely dispersed to different types of industry sectors. In total, funding has been allocated to 74 different 2-digit level industry sectors. The most significant industry at the 2-digit level is the education sector which includes universities. In recent years, the scientific research and development industry has also grown into a significant recipient of funding. Other significant industry sectors include e.g., software development, manufacturing of IT and electronic products, food manufacturing, consulting, health services and wholesale. However, there are significant variations between years in terms of to which industry funding has been allocated. This illustrates that the health and wellbeing sector, in accordance with the definition of this evaluation, broadly includes project implementers from various industries. Universities are the main recipients of funding each year, though the funding is broadly targeted at different industries and each year different industries are emphasised more strongly.

A closer look at the 5-digit level industries reveals that, in addition to universities, a few industries are strongly emphasised in terms of receiving project funding. These include industries related to software design, technology development, medical research and development, biotechnological research, consulting and the manufacturing of various types of health equipment. A significant part of the project's funding is therefore related to industries that carry out medical and health-associated scientific research, develop health technology, develop digital solutions for the health and wellbeing sector and produce and utilise health and wellbeing data.

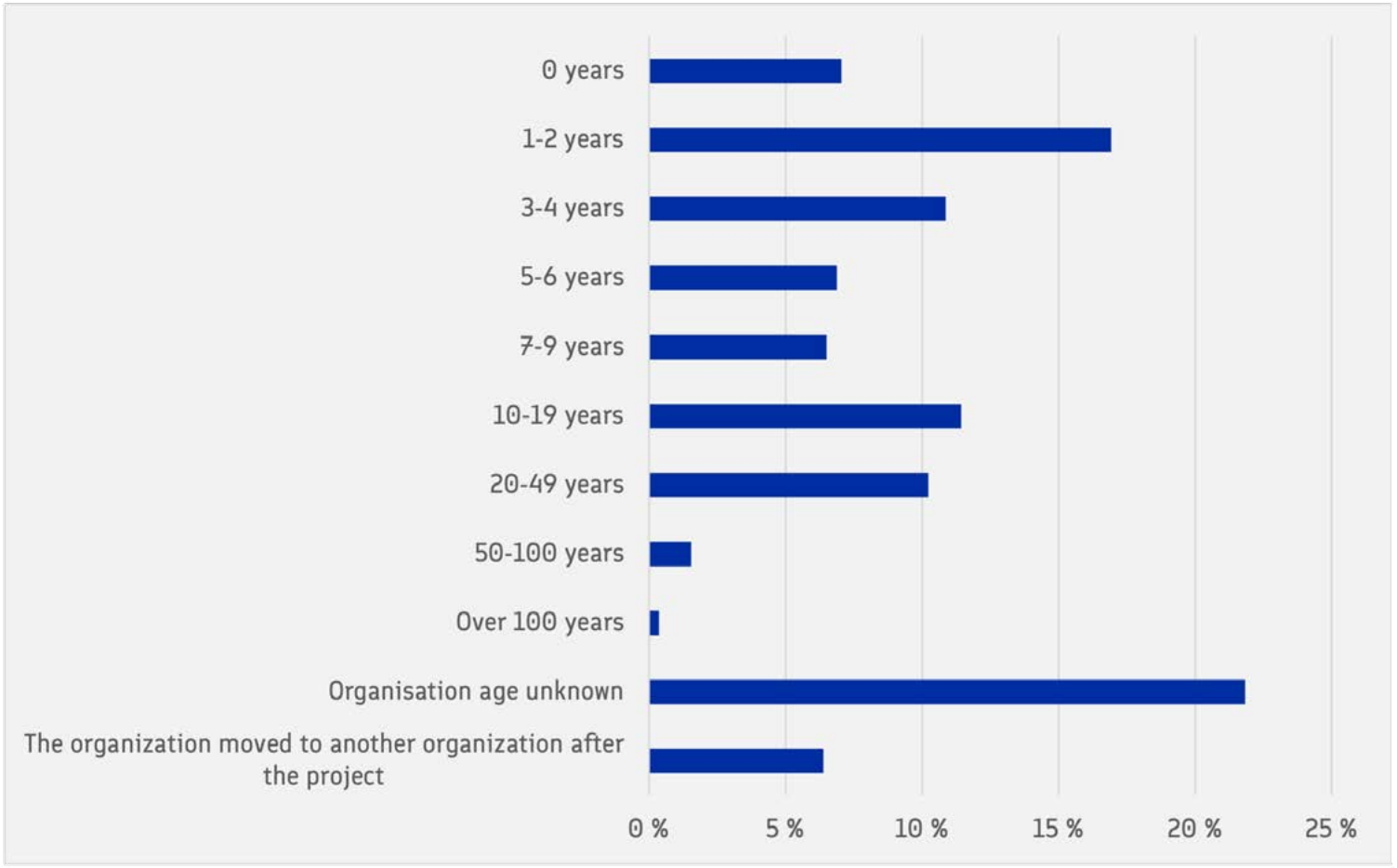


PICTURE 6. THE ANNUAL FUNDING SHARE OF THE TOP 10 INDUSTRIES THAT RECEIVED THE MOST FUNDING IN RELATION TO ALL PROJECT FUNDING (TOL 2008 2-DIGIT LEVEL)

TABLE 4. TOP 15 INDUSTRIES THAT RECEIVED THE MOST FUNDING DURING YEARS 2008-2023 (TOL 2008 5-DIGIT LEVEL)

	INDUSTRY	FUNDING (EUR)
1.	85420 Tertiary education	457 330 247
2.	62010 Computer programming activities	139 849 149
3.	72193 Research and development on engineering and technology	114 612 831
4.	72191 Research and development on medical sciences	96 329 059
5.	70220 Business and other management consultancy activities	60 169 096
6.	72110 Research and experimental development on biotechnology	57 165 247
7.	No information	56 038 861
8.	26510 Manufacture of instruments and appliances for measuring, testing and navigation	48 456 627
9.	26600 Manufacture of irradiation, electromedical and electrotherapeutic equipment	38 301 112
10.	32501 Manufacture of medical and dental instruments and supplies (excl. dentures)	37 767 637
11.	21200 Manufacture of pharmaceutical preparations	34 916 325
12.	26300 Manufacture of communication equipment	34 617 105
13.	62030 Computer facilities management activities	26 869 187
14.	62020 Computer consultancy activities	23 017 545
15.	86909 Other health care services	19 959 169

Business Finland has also extensively funded companies of different ages. Young organisations with a maximum age of four years have received a quarter of the available funding. Older and more established organisations have also received a significant part of the funding. Organisations that are 10-50 years old have received almost a quarter of the funding, while organisations that are 5-9 years old received approximately 15% of the available funding. It can also be concluded from this information that there are many different companies operating in the health and wellness sector at different stages of their development. Some are small organisations just starting out on their operations while others are organisations that have been operating for much longer. It should however be noted here that no information is available relating to the age of a significant portion of funding recipients.



PICTURE 7. SHARE OF FUNDING THAT ORGANISATIONS OF DIFFERENT AGES HAVE RECEIVED.

4. FINAL EVALUATION OF THE PERSONALISED HEALTH FINLAND AND SMART LIFE FINLAND PROGRAMMES

4.1. PROGRAMME DESCRIPTIONS

PERSONALISED HEALTH FINLAND PROGRAMME	
Implementation period	2018-2022
Main goals of the programme	• Promote solutions to shift the focus from the treatment of diseases towards personalised prevention, prediction and treatments as well as maintaining good health and wellbeing in a personalised manner. • Create new international business and innovations for personalised health platforms and to attract foreign investments to Finland. • Facilitate the growth of the health industry to one of the cornerstones of the Finnish economy. • Promote the development work in Finland, enabling it to become a global pioneer in personalised health by 2025. • Digital data, biobanks and advanced analytics are used in research, development and innovation by Finnish healthcare providers and export companies
Services	• Global growth • Investment promotion • Innovation funding • Ecosystem development • Training • Networking
Funding	Programme funding: 81.5 million euros, Implementation budget: 1 103 000 euros, Incurred programme implementation costs: 627 000 euros
Number of projects	150 projects (80 research projects/70 business projects)

One of the most important megatrends in healthcare terms has been personalised healthcare. The identification of individual effects with the help of, for example, genetic research makes it possible to move from one-disease-one-drug thinking towards the development of medicines for individual needs. Personalised healthcare makes it possible to find anticipatory and preventive measures or the right treatment at the right time for the right people. This development has also provided the background to the launch of the Personalised Health Finland programme (PHF).

The Personalised Health Finland programme was implemented during the period 2018-2022. The programme's focus was on the need to promote the utilisation of data in the promotion of health and wellbeing and related business in Finland. By combining information from different sources such as genomic information, health care information, biobank information or lifestyle information collected by the individual themselves, health maintenance, disease prediction and individualised treatment can be promoted. Personalised health is based on the digital data gathered from an individual in either the public or private healthcare sector and by means of consumer devices. The programme supports Finnish innovation and top-level research and creates new business opportunities around the personalised healthcare area, promoting growth and renewing and creating new business life. The programme also helps growth companies to raise venture capital and attract R&D funding, to develop new know-how and attract international venture capital, R&D and business units to Finland.

The main target groups for the programme were Finnish companies, research organisations and healthcare organisations focused on personalised health solutions. More specifically, these organisations act in the fields of life science, pharmaceuticals, diagnostics and data analytics. Additionally, biobanks are also a target group for the programme. Outside Finland, the main target groups were corporate customers and investors interested in partnering with Finnish companies and research organisations, as well as government organisations seeking innovation collaboration. The countries involved in the programme were the USA, UK, Japan, Switzerland, Sweden and Denmark.

SMART LIFE FINLAND PROGRAMME	
Implementation period	2019-2022
Main goals of the programme	• Promote personalised, real-time and smart health and wellness services that are accessible anywhere and anytime • Proactively help create 'high potential' business ecosystems in Finland, innovate, network and 'go international' with digital wellbeing & healthcare solutions. • Leverage the digital revolution in health, from hospital to home and the daily living environment.
Services	• Internationalisation services • Innovation funding • Ecosystem development • Training • Networking • Promoting investing opportunities in Finland
Funding	Project funding: 65 million euros, Programme implementation budget: 968 000 euros, Incurred programme implementation costs: over 660 000 euros
Number of projects	146 projects

The background to the Smart Life Finland (SLF) programme is provided by the changes, outlined above, which were taking place at this time in the area of health and wellbeing. Symbiotically, individual responsibility for, and interest in, one's own health and wellbeing has grown, meaning that the need for personalised and intelligent health and wellbeing services and solutions has also increased. Changes in the demographic structure also generates an increasing need for care, as the proportion of working people to pensioners and others not active in the labour market decreases. As such, it is necessary to develop cost-containment solutions.

The Smart Life programme has accelerated the development of health technology and services with the help of digital, exponential technologies (such as virtual reality, machine learning, 5G data transmission and wearable sensors), the platform economy and experimental, or so-called 'testbed' environments. The programme focused on two different aspects in the theme: 1) Living environments that promote health and wellbeing (solutions and services related to smart homes and living environments, nutrition, efficient data utilisation, robotics, artificial intelligence or virtual reality) and 2) Reforming health care (solutions and services that make it possible to offer different types of services along the entire treatment path like virtual hospitals, testbed environments, innovative public procurement, remote and home diagnostics and remote and home treatment solutions).
Target groups, in Finland, for the programme included the digital health and wellbeing companies, research organisations and healthcare providers. Internationally, the target groups included potential partners for Finnish companies as well as investors and corporations with an interest in investing in Finland. Target countries in the programme included the Nordic countries, Germany, the UK, Singapore, the Gulf States, Japan, Australia and the USA.

4.2. RELEVANCE OF THE PROGRAMMES

Preparation of the PHF programme began in 2017 while those for the SLF programme began at the end of the year, in 2018. Experts from Business Finland were appointed to prepare the programmes. In the preparation of the PHF programme, the development needs of the business and research organisations in the Finnish health and wellbeing sector were mapped. In addition, information was gathered on what kinds of measures were expected from the programme. Similar measures were also taken in the SLF programme. In the context of the preparation of the programmes, the needs of the sector were understood and addressed quite well, while Business Finland's expertise was also well utilised. Regarding the development themes defined in the programmes, there was a fairly broad and uniform view across the field that these were the right themes. Business Finland's foresight activities in the health and wellbeing sector have, in addition to mapping the needs of the field of activity, played an important role in ensuring the programmes' relevance.

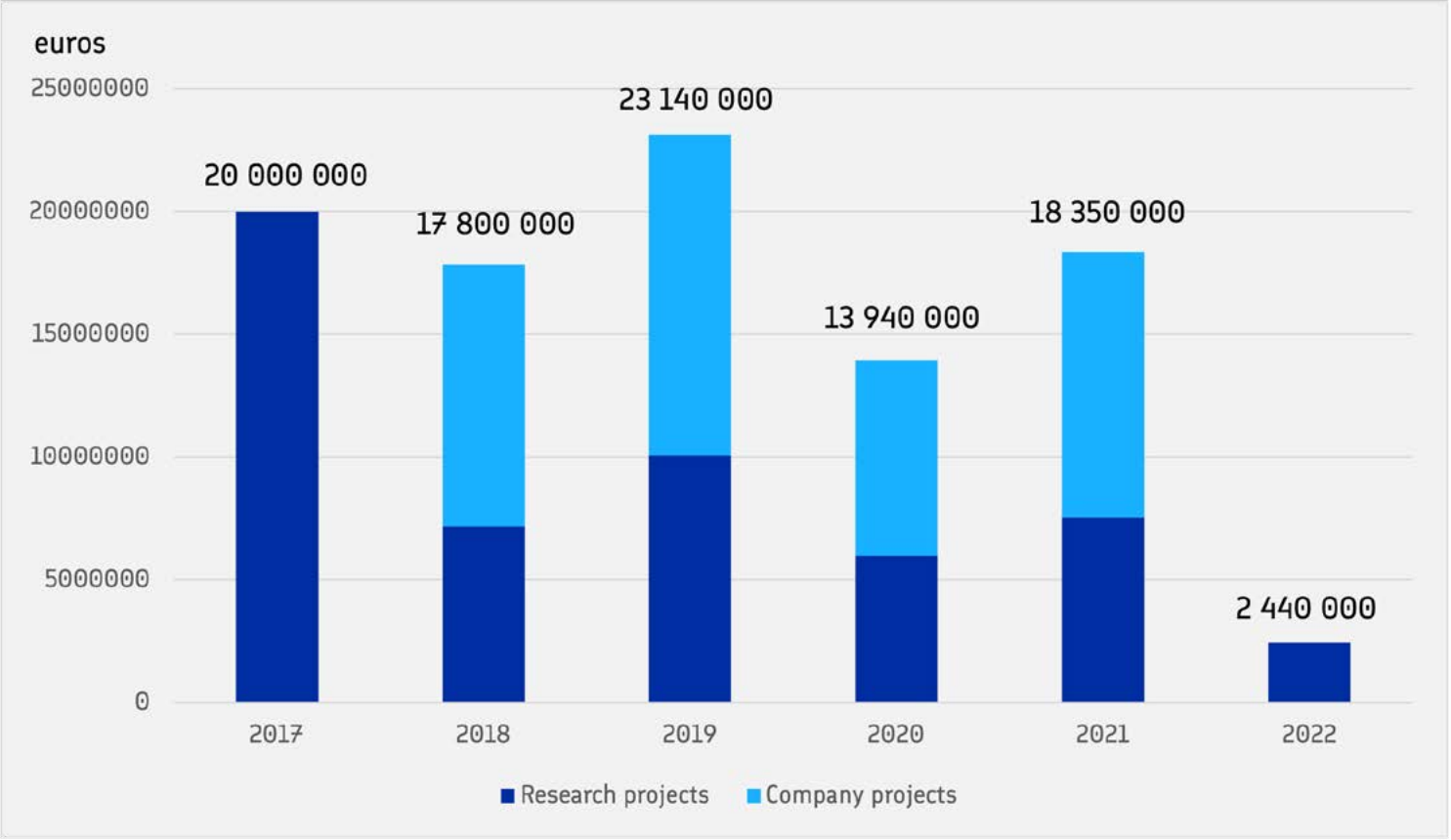
Forming the institutional background to these programmes were the previous Tekes programmes, Bits of Health (2015-2018) and BioIT (2013-2014) as well as the Finpro programmes Team Finland Health (2015-2017), Digital Hospital (2015-2017) and Finland care (2012-2017). The PHF and SLF programmes thus display a clear connection to previous programmes in terms of the themes addressed. They continue, for example, with the development activities included in the Bits of Health and BioIT programmes, while updating the themes addressed to the needs of the 2020s. In the previous Tekes programmes, emphasis was placed on the development of biological data management and data analytics and on the promotion of related business opportunities, as well as on activating the business potential of digital healthcare. In the programmes in focus here in the context of this final evaluation, emphasis is placed on the development of solutions, services and businesses for personalised healthcare and smart solutions that improve wellbeing. The previously-mentioned programmes have clearly however helped build the foundations for the development work, ideas, solutions and networks developed in relation to these newer programmes.

The PHF and SLF programmes have also complemented each other well with their themes. This has made it possible to generate greater overall resources for the development of the health and wellbeing sector. The development work has not been too fragmented, since the parallel programmes have promoted the development of the health and wellbeing sector in a parallel way in their own development themes. This has also enabled synergies (e.g., jointly organised services and events) between the programmes in terms of their implementation.

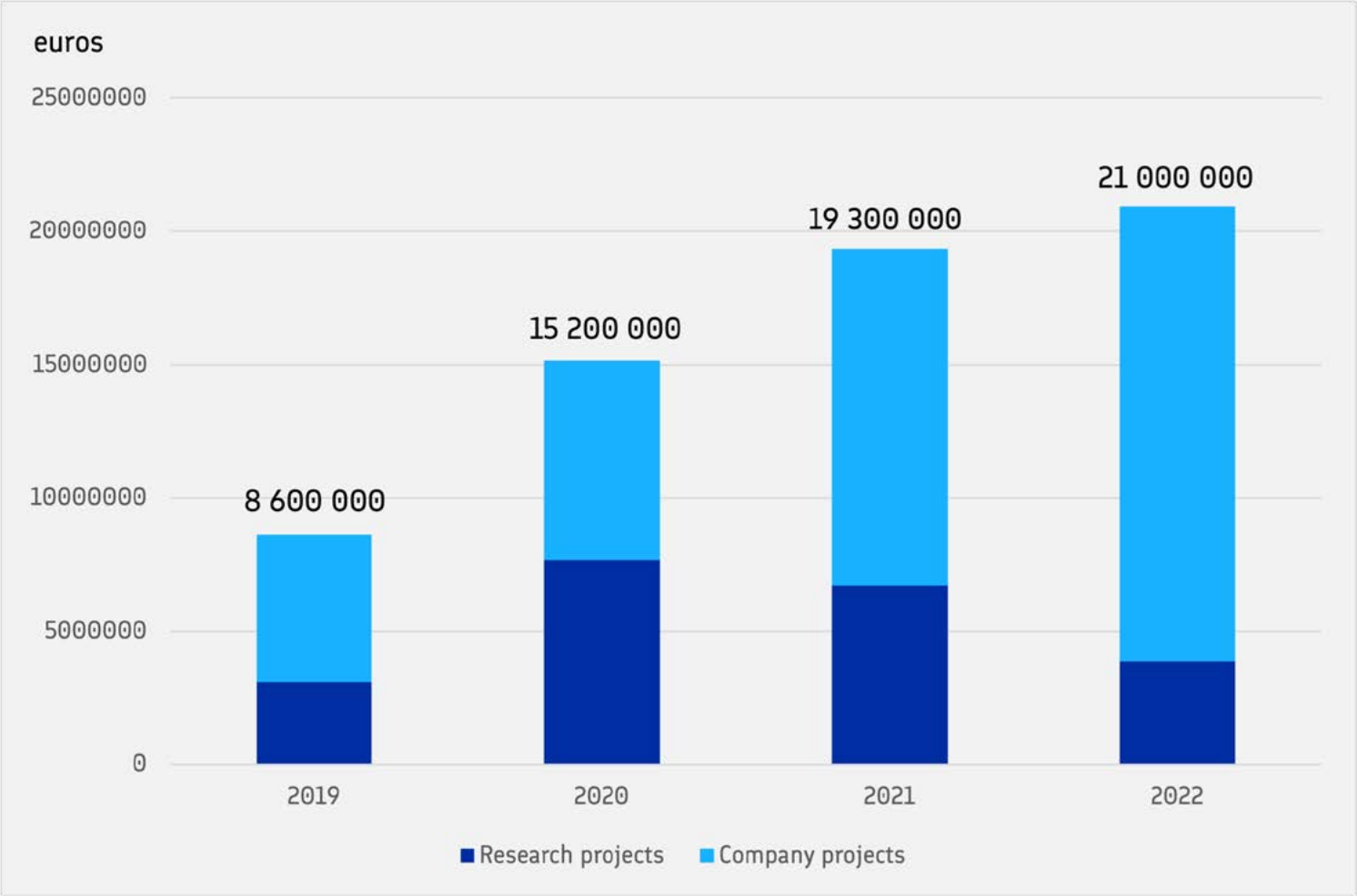
In terms of their character, the programmes can be seen as reactive and, as such, focused on improving the commercialisation abilities and internationalisation needs of the health and wellbeing sector. This also describes the development of Business Finland's programme activities more generally, where there has been a shift, after the fusion of Tekes and Finpro, from traditional technology programmes to programmes more strongly aimed at advancing commercial utilisation of research results, global growth and internationalisation. Compared to previous programmes focusing more on research and technology development, proactively creating and developing solutions for the future, these newer programmes have sought to advance business growth and increase exports on the basis of more mature RDI-work results. The programmes are adapted to the needs of the health technology industry, where the need for support has been identified especially in networking, commercial utilisation of research results, internationalisation, ecosystem development and investment attraction. From a longer-term point of view, it has also been viewed as important that larger leading companies in the health and wellbeing sector emerge and grow in Finland. Companies in the field have traditionally been smaller in size, with no significant ability to internationalise. Similarly, funding for the sector

has been a challenge. The programmes have thus aimed to improve access to funding for the sector and to attract foreign direct investments to Finland.

It should however be noted that a significant number of RDI-projects have also been connected to these newer programmes. The relevance of the themes in respect of both programmes is also illustrated by the projects linked to the programmes. Projects related to the PHF-programme have received funding amounting to 96 million euros. In comparison, SLF-programme projects have received 64 million euros in funding.



PICTURE 8. PROJECT FUNDING (EUROS) ANNUALLY (PROJECT START DATE) IN PERSONALISED HEALTH FINLAND PROGRAMME.



PICTURE 9. PROJECT FUNDING (EUROS) ANNUALLY (PROJECT START DATE) IN SMART LIFE FINLAND PROGRAMME.

The health and wellbeing sector has long been identified as having significant commercial and internationalisation potential which is why the programmes have been designed to service these needs. In the future, however, it is important that Business Finland or other parties also support more research-based activities in the field to ensure that new commercial innovations are also created in addition to current innovations being commercialised.

The promotion of personalised health and digitalisation in the health sector are broadly supported development directions, with the sector's actors are already committed to their promotion. These themes also support the national health sector growth strategy. In this respect, the relevance of the programmes has been acknowledged as high. The themes addressed by the programmes have also been identified by Business Finland as key in terms of future sector development. The programmes have also acted as a link from the previous programmes and continued development related to the themes while also enabling possible future development activities that may follow from the programmes themselves.

4.3. EFFICIENCY AND COHERENCE OF PROGRAMME IMPLEMENTATION

The PHF and SLF programmes were designed as open platforms with their services and activities open to different actors. The programmes were not therefore limited to a specific target group, nor did they involve programme memberships, though the key target groups were clearly identified in the programmes. Due to the chosen themes of the programmes, the organisations that have most actively utilised them have been those in the health and wellbeing sector, to whom the programmes are primarily aimed. In the PHF programme, the core customers have been used as the measuring group. These customers were mainly SMEs in the medical technology sector. Notwithstanding this however, larger internationally active companies and hospital districts have also participated in the programme. In SLF programme the main target groups were primarily SMEs in sub-segments within the digital health and wellbeing sector. These sub-segments included organisations acting in patient care pathway planning – the monitoring of conditions and the planning of therapy and recovery, AI/VR based planning and medical interpretation and decision support, improving lifestyle/health monitoring, manufacturing medical equipment and other hospital equipment and promoting remote appointments, monitoring and diagnostics.

Activities have been planned in the programmes to fill the gaps in terms of services that do not exist in the market - programmes have delivered services that companies and research organisations need but cannot be found from the services of other public or private actors in the market. Both programmes have included several different services and different methods of generating the desired impacts. In both programmes the impact logic is based on activating and enabling RDI-actions to create new services

and solutions and the partnering of Finnish actors with potential clients and cooperation partners as well as investors. The means of creating the desired impacts in the programmes are based in particular on partnering Finnish companies with each other and with foreign partner companies as well as with research organisations, investors and ecosystem actors. Various partnership concepts have been created in the programmes to promote the issue. In addition, generating information about international markets and highlighting the effects of regulatory changes to companies are also viewed as important. The primary ways used to influence the target groups can also be viewed as appropriate, as they are based on the needs and requirements raised by the target groups themselves and they supplement services that were missing from the market.

In the PHF programme three more specific service types can be detected: company growth and internationalisation services, services around attracting inward investments to Finland and building and promoting the growth of business ecosystems. The feedback given by the programme's customers about these services has been mostly positive. This shows both that there was a need for the programme's services and that these services have been deemed useful by the user groups.

In PHF, significant effort was directed at international partnering and attracting capital investments to Finland. In this context, the series of events created for investors can be considered a successful service. A particularly good example of this was the European Healthtech Investment Forum, organised annually between 2017-2023 by Business Finland and the PHF programme. The forum gathered together the most promising Healthtech entrepreneurs in Europe with leading investors from Europe seeking new companies in which to invest. The forum was organised virtually in 2020 and 2021 because of the Covid-19 pandemic. According to the PHF programme the forum attracted around 30 million euros of venture capital to Finland. Without a gathering event like this forum, Finnish operators would not have the same opportunity to meet investors and partners. It is important that Finnish actors are brought together in this context, as together they are more interesting for potential investors, compared to a situation where companies try independently to contact potential investors and partners.

According to the data gathered in the evaluation, other well-functioning services include the 'Moonshot' concept in PHF programme, where research to business projects were networked with capital investors. This concept has clearly been effective when introducing individual project actors to investors and in helping investors to understand the commercial potential of the RDI-development work. In recent years, a growing need has emerged for capital investors to make investments in companies in the sector and to make those investments at as early a development stage, in terms of the companies, as possible. Historically, the same readiness to make investments in riskier companies from an earlier stage of development did not exist to anything like the same extent.

Another successful service was the Health Tuesday event series in both PHF and SLF programmes. Health Tuesdays were networking events addressing topical health and well-being themes. The idea behind Health Tuesdays was that participants had the opportunity to discuss with professionals from health, wellbeing and health tech companies, decision makers, investors and representatives from the public sector. These events were organised live and also remotely several times per calendar year. Hundreds of industry representatives participated in the events. The events mostly received very good feedback.

In addition, another good operating method during the Covid-19 pandemic years has been the new 'virtual partnering' concept in both programmes. The goal here was to attract leading pharmaceutical companies to cooperate with Finnish companies. Two major partnering events were held. In 2021 the Neuroscience Partnering event and in 2022, the Cancer Partnering event. Both proved extremely fruitful in connecting local Finnish actors to 'Big Pharma' global actors.

Export promotion trips to target markets have also proven to be a very effective method of operation. These have led to the strengthening of cooperation with international partners and to various lucrative business deals.

CASE:

GOOD OPERATIONAL PROCESSES OF PROMOTING INTERNATIONALISATION IN BUSINESS FINLAND PROGRAMMES

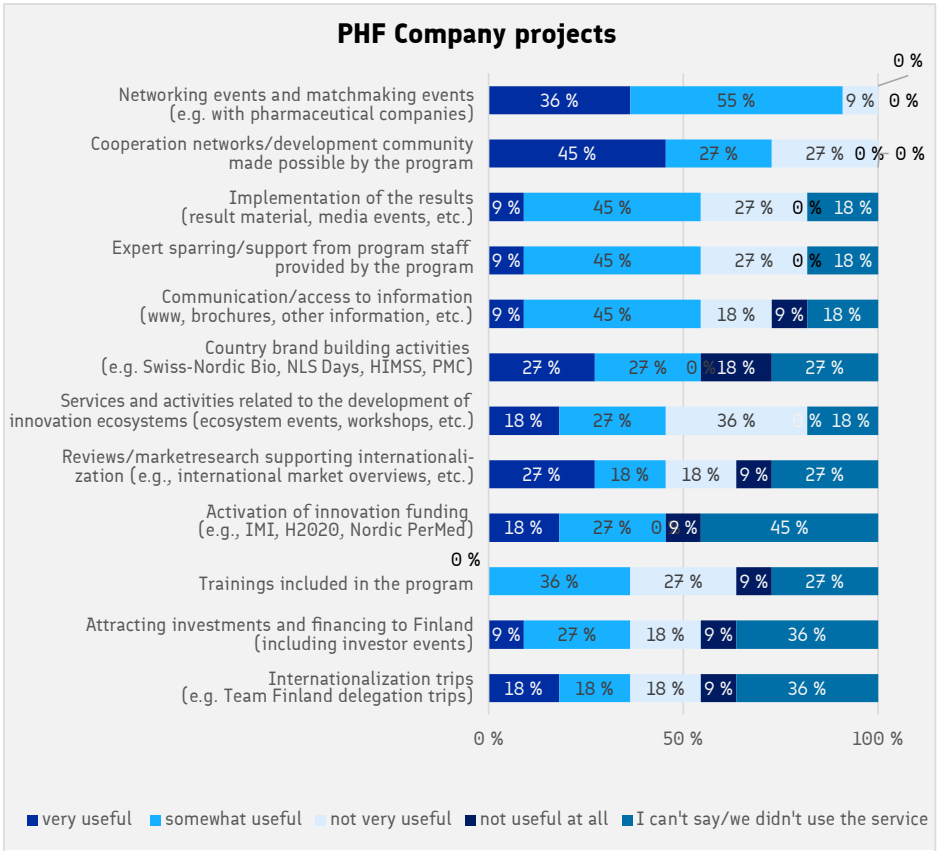
Business Finland has experts working globally across several countries whose job it is to promote the market access of Finnish companies in their target countries, networking Finns with local potential partners and customers and producing information about the target country with Finnish companies in mind. The network in question is also an important tool in Business Finland's programme activities. Its expertise and contacts are used in the implementation of theme-specific programmes and in the internationalisation services associated with the programmes.

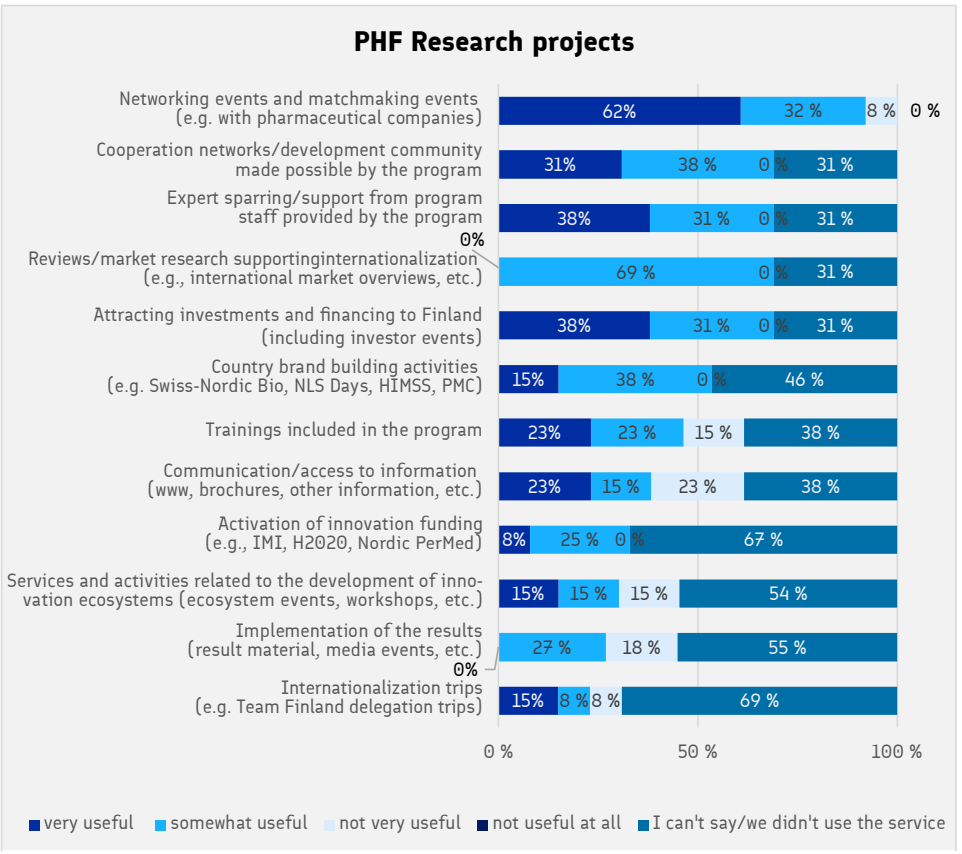
In both the PHF and SLF programmes, several activities aiming to help Finnish companies in the process of internationalisation have been implemented. These activities have been implemented in numerous countries.

Effective operating processes have been created, utilised and developed both in the programmes and in other Business Finland activities. Internationalisation activities begin when local Business Finland experts spot opportunities for Finnish operators in the target market. After this, an analysis is conducted and information about the market is produced with Finnish actors in mind. At the same time, in Finland, Business Finland experts map suitable Finnish companies into a group that could potentially be interested in the market opportunities available in the target countries. Information is then shared with these companies (events and webinars) and they are then helped to evaluate the potential opportunities in the target market. Interested companies are also trained for the target market, so that they are ready to meet potential partners, customers and financiers. Business Finland experts operating in the target market also help companies, if necessary, to identify local experts and consultants appropriate to their needs. Subsequently, a further key measure is a delegation trip to the target market. The trip is usually accompanied by a high-ranking representative from Finland, which improves the Finnish companies' chances of attracting attention. In addition, it is important that the trip ensures that a large number of companies are included under a common Finnish brand, such as a programme. These factors increase the importance of the visit and the chances of success.

In the SLF programme one of the main target countries was the UK. The aforementioned actions were also implemented in the internationalisation actions aimed

at the target country in question. A local consultant was hired to map the needs of local actors, such as the UK's National Health Services (NHS), to which Finnish companies could offer solutions and services. Suitable companies were contacted in Finland through communication and with Business Finland's expertise and contacts. After this, interested companies were prepared and a delegation trip was organised. As a result of the trip, participating Finnish companies got new contacts from the target market, the locals got information about and contacts with Finnish companies and the export opportunities for Finnish companies improved. Similar internationalisation measures have been implemented in several other target countries in the context of the SLF programme.





PICTURE 10. PHF PROGRAMME –USEFULNESS OF PROGRAMME SERVICES ACCORDING TO PROJECT IMPLEMENTERS QUESTIONNAIRE

According to the questionnaire for the PHF programmes' company and research projects, networking and matchmaking events have been widely used and are viewed as having been broadly beneficial for the project implementers. They have enabled new contacts, new cooperation and the obtaining of new information that would otherwise be very difficult to access. The programme has also enabled the creation of cooperation networks and development communities for R&D activities, thus bringing together and condensing the industry's collaborative work. This has also been found in several previous evaluations to be one of the key 'added value' components of the programmatic activities. In addition, the programme's support in terms of implementing the results, the expert assistance provided by the programme, information gained from the various internationalisation and communication events and the operation of Invest have all been found to be good services. It is also worth noting here that many project implementers have not used all of the programme's services, something which undoubtedly affects their answers in relation to questions about the most useful services.

In the SLF programme, its activities and services were targeted to support the industry sector as a whole; with the goal here being to help network and support Finnish companies of all sizes with research organisations and public and private health & wellbeing operators. In the SLF programme, a slightly stronger emphasis was placed on the utilisation, advancing the customers' ability and opportunities to commercialise, internationalisation and export promotion of digital technology compared to the PHF programme. The PHF programme also included these themes, but with a stronger emphasis on research and R&D. The SLF programmes services and activities can be classified in 5 categories: company growth and internationalisation services, building and promoting the growth of business ecosystems services, services related to the attraction of investment to Finland, targeted activities for the manufacturing industry (diagnostics) services and Finnish health and wellbeing testbed development services.

The services were also appropriately tailored with different time horizons in mind for the various types of target groups Business Finland facilitates in this sector. For start-ups and young companies, the services focused on going to existing markets with new products. These target markets were geographically close to Finland. For SMEs which in terms of size are less than 300M€ in revenue, services focused on helping these companies to penetrate existing markets that are new to the participating companies and are often located in more remote country locations. For bigger companies, services focused on strategic and long-term initiatives that may be organised around research collaboration, ecosystem & growth engine development and international strategic partnering. The main target country here was the USA.

In the SLF programme, effective programme services included delegation trips to target countries. These were successful especially when effects were sought in the short

term. During the delegation trips, Finnish companies were able to talk concretely with potential partners, customers and investors in the target countries. The trips also led to immediate results in the form of new export business and investments.

In respect of other programme services, the effects were expected to occur in the longer term. Effective services included Medical Device Regulation (MDR) and In Vitro Medical Device (IVDR) training. The programme organised training for Business Finland's staff and companies. The goal was to prepare these target groups to help them to better understand regulatory changes and their effects on R&D activities. When the ability to understand the effects of such changes improves, R&D activities can be supported and implemented in the longer term more efficiently and effectively.

CASE:

MDR TRAINING IN THE SMART LIFE FINLAND PROGRAMME

MDR (Medical Devices Regulation) and IVDR (In Vitro Diagnostics Regulation) trainings are viewed as an effective service in the context of the SLF programme responding, as they did, to a clear need in the markets. The background to the arrangement of the trainings was the expected changes in the regulation of medical devices which aimed to harmonise regulation at EU level and at the same time improve patient safety. The Regulation tightened the requirements for medical devices compared to the previous EU Directive (MDD) which left room for differences in national legislation. The regulation entered into force in 2017 with its transitional period due to end in 2020, but this was extended by one year.

Business Finland and other industry experts however found that the Finnish business sector was not sufficiently prepared for these regulatory changes. New regulations affect market access and RDI activities and companies lacked the capacity to acquire the necessary new standards and change their practices where necessary. The fear was that Finnish companies would not be able to get certified. There was also a need to train Business Finland's own staff on regulatory changes so that they could advise client companies appropriately. In addition, the hospital districts that used the equipment also had to take the changes into account, in order that they ensured that they were using certified equipment.

Several training sessions were arranged as part of the activity. Before trainings were arranged a clear Picture of the most important training and service needs and problems that companies and other actors had in relation to regulatory changes and certifications was established. Several training events were organised for Business Finland experts and customer companies. The training was organised by external experts. Some of the training events were also recorded and were subsequently widely disseminated to the various target groups. In addition, events were organised where information was shared more widely. Furthermore, an online guidebook was prepared regarding the regulatory changes. As a key part of the activity related to the issue, foreign organisations entering the Finnish market were also supported in the handling of regulatory issues.

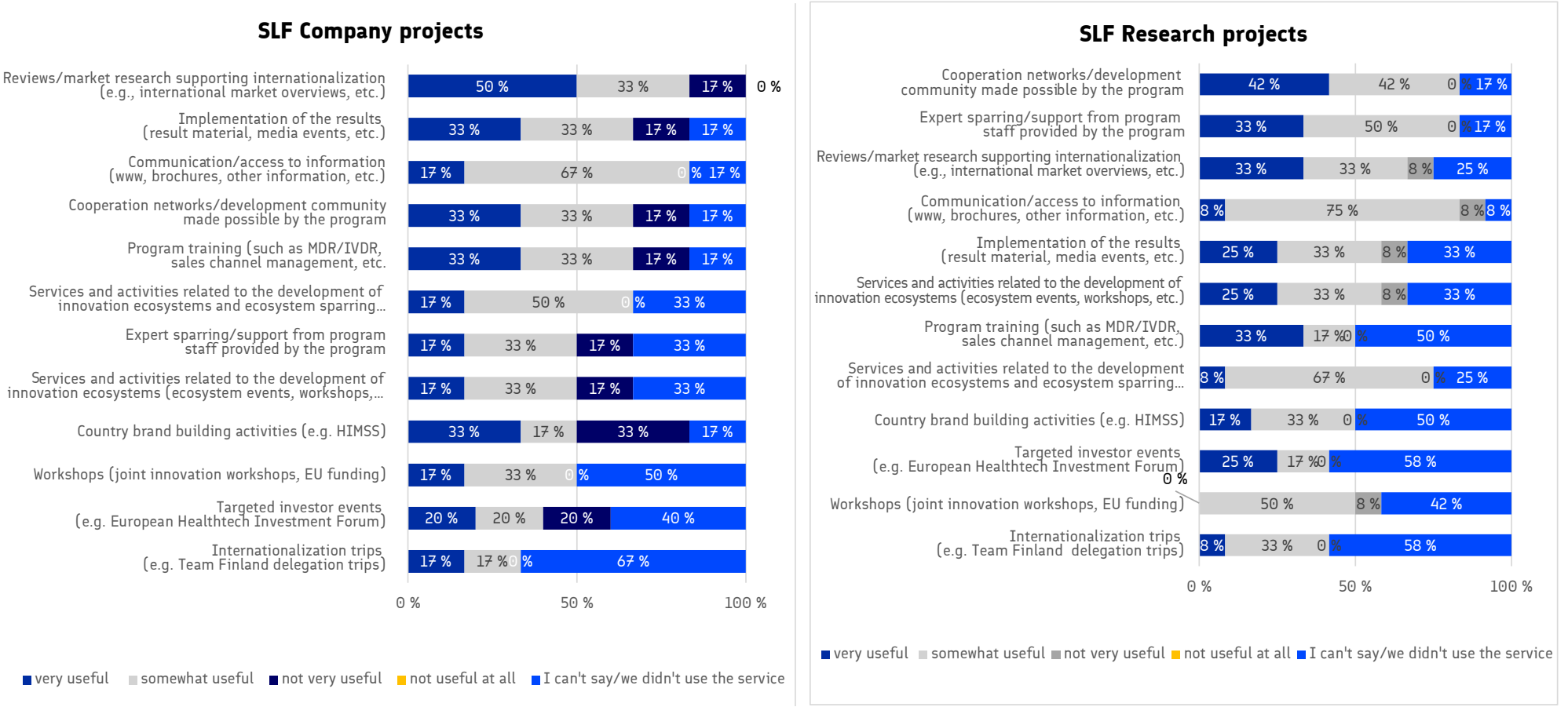
The main benefit of the activity was improved Finnish target groups' awareness of regulatory changes and their better ability to respond to changes in their own operations. In addition, the activity was also able to improve the situational

Picture of the readiness of various actors for changes and the most important challenges that the changes bring.

A key lesson from the operation has been that it is important to be able to find and target services to the right target groups, namely, to the groups who will most clearly benefit from them. A resource should be used for this. In addition, cooperation and coordination with stakeholders is important, so that there are no overlapping actions and the best overall benefit is obtained from the actions of different actors.

Other effective services included conferences and events organised in the context of the programme, either alone or with partners. These included the HIMSS 2022 European Health Conference & Exhibition, where a large number of Finnish and European experts in the field were networked. Another good operating method has been to combine the Finnish service and product supply of the industry into a catalogue, with foreign customers, partners and investors in mind. This simple solution has worked well to help foreign partners getting better understanding what Finnish organisations can offer.

In addition, the ecosystem development activities that extend to foreign actors have also been viewed as effective. In ecosystem operations, cooperation aiming at a similar goal has been increased and developed between Finnish hospital districts, public and private actors and foreign actors. This has enabled the creation of new information, ideas for new services and above all, new partnerships as well as the development of more effective cooperation.



PICTURE 11. SLF PROGRAMME USEFULNESS OF PROGRAMME SERVICES ACCORDING TO PROJECT IMPLEMENTERS QUESTIONNAIRE

According to the questionnaire for the SLF programmes' company projects, reports supporting internationalisation have been widely used and they have also been widely perceived as useful. Similarly, companies have also extensively used services related to the application and dissemination of results with these services also being considered good. In addition, programme communication, the cooperation networks made possible by the programme and the training organised by the programme have also been used quite extensively, with these services being considered both good and necessary. Far fewer of the project implementers have themselves been on internationalisation trips, but those who have done so have found them to be both good and useful. For research-projects, the collaboration networks and expert sparring made possible by the programme have been widely utilised and deemed useful. Research organisations have also found activities related to internationalisation trips, investor events and Finnish country brand development activities to be good. However, fewer organisations have utilised these types of services.

Both programmes had sufficient financial resources for programme implementation. The challenge, however, was the adequacy of human resources allocated to them. The personnel attached to the programmes included a full-time programme manager with, in addition, experts from Business Finland participating in the implementation of the programmes on a part-time basis. Both programmes suffered from a lack of personnel resources during their entire duration. For example, in the PHF programme the actual programme personnel resources were less than 2 FTE annually which can be regarded as inadequate when compared to the ambitious goals of the programme. An important addition to the human resources component however saw them gain a joint coordinator to support their implementation from January 2021 onwards. The work of the programme coordinators undoubtedly made the implementation work of both programmes more efficient meaning that more planned activities could be completed. Programmes did not have an allocated marketing and/or communications resource from 2021 onwards. This meant that the programme head and the coordinator had to use their resources for marketing and communications, something which affected their ability to promote the implementation of the programme in other areas. Even though the programmes were able to utilise other Business Finland personnel in their implementation, it is important to ensure in future that programmes such as this have sufficient human resources specifically committed to them. External experts were also hired to support the implementation of the programmes. The challenge for them was that due to confidentiality issues, external consultants could not perform all of the necessary tasks. A specific problem here was that they were unable to access Business Finland's internal ICT systems, something which was often required in the course of programme activities. Another problem was that external consultants did not have Business Finland email addresses. This caused problems in terms of credibility when dealing with customers and external stakeholders.

Business Finland's organisational reforms also affected

the level of support that it was able to offer to the programme. Experts specialising in the theme of health and wellbeing had previously formed teams, but now they were moved to different parts of the organisation. This temporarily reduced the support they could give to the programmes.

A further important aspect in respect of the implementation of the programmes was the collaboration with Business Finland's Global Growth network and its Team Finland network. Business Finland has experts working in different target countries across Europe, the Americas, Asia, Oceania, the Middle East and Africa. Through these networks, information about the target market is received and suitable partners and cooperation parties as well as customers are found. The programmes used these networks successfully in market surveys, organising networking events and promoting exports.

The programmes have not had their own project funding. In both programmes, however, potential project implementers have been networked and directed successfully to Business Finland's project funding instruments. The programmes and Business Finland experts have successfully sparred with project implementers and promoted the development of their RDI project ideas. Through this, funding has been channelled into the themes of the programmes and R&D activities have been activated in the themes. In the PHF programme, 96 million euros and in the SLF programme 64 million euros of funding was targeted to projects connected to these programmes. In the PHF programme the target was to link 80-100 M€ worth of funding to projects, a goal which the programme ultimately achieved. Similarly, the goal of the SLF programme was to direct 20 million in funding annually to projects. This goal was not however attained, as the funding remained, on average, around the 15 million euros mark annually. The underlying reasons for this relate, for example, to challenges in forming consortia for the co-innovation instrument as the large share of start-ups in healthcare companies and as potential co-innovation partners leads to long preparation times when companies are sought with some, inevitably, being eliminated during the process. In addition, we should also consider the long duration of project preparation times, changes in the consortium members and their withdrawal from the preparation process, the Covid-19 pandemic and its negative effects on project preparation and the lack of human resources in respect of co-innovation sparring.

Business Finland's goal before the programmes began was to direct 20 million euros of funding to health tech innovations. During these two programmes, annual funding was doubled for the sector.

The PHF programme in particular did not succeed in connecting its activities to EU funding and to the EU networks as strongly as initially desired or expected. The reason for this was that the primary emphasis and efforts of the programme were placed elsewhere while, when an effort was finally made to attract EU funding and connect into EU networks, the programme was already in its final stages. As the EU has now published a new health strategy, BF activities should connect with and anchor its activities more strongly to these EU funding programmes and networks. This would facilitate

valuable cooperation opportunities and additional funding for the development of the health and wellness sector.

A clear challenge for the implementation of both programmes here was the emergence of the Covid-19 pandemic which dictated that some of the events could not be carried out as hoped. Some planned events had to be cancelled or changed to online-only implementation. Unfortunately, face-to-face meetings between actors are important when trying to form trust and forge cooperation and the inability to pursue this avenue was clearly a limiting factor. However, the programmes were reactive at the beginning of the pandemic and virtual implementation forms of the events were developed during the programme. Virtually it was possible to access a potentially wider range of actors thus getting them involved in the events. The assessment by the programme lead was that more international actors were involved in the virtually arranged events than would probably have participated in the face-to-face events. The problem was that the level of commitment and opportunities for in-depth networking were clearly difficult to evaluate in respect of these virtually arranged events.

In terms of programme implementation, customer orientation and dialogue with customers, all could usefully be further enhanced during programme implementation, e.g., in the form of steering groups and advisory boards, with customer participation including the highlighting of their perspectives. Secondly, the programmes have included a wide range of activities which have often been implemented quite frequently. In the future, actions could be planned so that not so much is done in terms of routine quantity but rather the most effective actions are invested in instead. Engagement in too many activities reduces the effectiveness of each individual activity which ultimately affects the overall effectiveness of the programme. This requires the planned scheduling of actions and the comparison of different actions with each other so that they do not affect each other negatively.

On the whole, the implementation of both programmes has been mostly successful and suited to the customers' needs. In particular, the programme coordinators work input in the last 2 years of the programmes has enhanced their progress towards fruition, The programme challenges have mainly been related to human resource issues and difficult-to-predict challenges arising from the operating environment. The programmes have consistently responded to the need for change. Their implementation method can also be viewed as representing consistency with that of previous programmes. The different segments of the health and wellbeing sector have developed during previous programmes to a point where there is a need, especially in respect of activities that support internationalisation and the attraction of investments. The programme's services have been adapted to this whilst also supporting R&D activities and the development of ecosystems, something which is, undoubtedly, important for the future of the industry.

TABLE 5. FACTORS THAT PROMOTED AND CHALLENGED THE IMPLEMENTATION OF THE PROGRAMS

FACTORS THAT PROMOTED THE IMPLEMENTATION OF THE PROGRAMMES:	CHALLENGES OF PROGRAMME IMPLEMENTATION:
• Project management skills and effective tools • Bottom-up perspective in project management • Ability to duplicate operating models and concepts • Strong and competent programme management • Sufficient financial resources to organise services and fund projects • Programme Coordinator supporting the implementation of the programmes • Making use of Business Finland's own international networks and its Team Finland network • Working remotely and virtually made it possible to more easily reach international contacts • The simultaneous implementation of the programmes and the parallelism of the themes in respect of the programmes enabled the scheduling of joint events	• BF organisational reform broke up theme expertise and temporarily reduced support for programmes • Lack of human resources in programme implementation and personnel changes • The lack of a programme coordinator and marketing resource at the beginning of the programmes • Purchased external expert resources were not able to replace the missing BF human resources (e.g., no right to access all systems and information) • Practical challenges in terms of the organisation of effective hybrid events. Face-to-face meetings cannot be replaced virtually, especially when it comes to business and funding issues • The Covid-19 pandemic forced the cancellation of events or changes to the original plans • In the open programme, the lack of close contact with customers/target groups and lack of cohesion between actors

4.4. RESULTS AND IMPACTS

The PHF and SLF programmes have each been running for a period of 4–5-years, during which a vast number of actions have been taken and results produced. These results have been created in programme services, funded projects and other activities implemented in the programmes.

Already realized and expected results in respect of PHF and SLF programme services included, for example, new concepts and more effective new services created in the programme, new networks and contacts for Business Finland customers, new information on market opportunities, new investments in Finland, business opportunities and internationalisation for participating companies. From PHF and SLF projects the expected results included new solutions, new scientific information, information received from pilots and experiments and improving the ability and opportunities to commercialise services and products. In terms of other programmes, the expected results included the strengthening of ecosystem activities, new operating models for using databanks and improved understanding of market needs and market development.

RESULTS OF THE PERSONALISED HEALTH FINLAND PROGRAMME

In the context of the PHF programme the health-focused international investor event series, European Healthtech Investment Forum, was established. These forums, arranged from 2017 to 2023 have attracted numerous international investors to visit Finland for the first time. These forums have also helped Finnish companies gain more than 30 million euro in international venture capital funding.

The programme also saw the creation of new partnering concepts while existing ones were also re-developed to better suit programme needs. These include the new 'virtual partnering' concept (Neuroscience Partnering 2021 & Cancer Partnering 2022) which has attracted the world's leading pharmaceutical companies to attend and to forge new contacts with Finnish companies and other organisations. The concept has made it possible for smaller Finnish companies to cooperate with companies operating globally on the world market. Since there are no significantly larger leading companies capable of internationalisation in Finland, this method of operation has been important in promoting the internationalisation of smaller companies. Partnering events have also led to several cooperation agreements between Global Pharma companies and Finnish companies. This has improved the opportunities for Finnish companies to internationalise whilst also creating the conditions for an increase in the operation of large international companies in Finland.

The 'Moonshot' concept was also established in the context of the programme, something which made it possible for research-based teams to be directly in contact with global top-tier venture capital firms. Moonshot events were organised three times, in 2020, 2021 and 2022. Thanks to the concept, the research-teams have been able to apply more efficiently for funding for the further development

of their innovations. At the same time, the venture capital firms are now more aware of innovations developed in the research field in Finland.

For programme participant companies and other participating organisations, the results of the PHF programme are primarily related to the generation of new international contacts. Such new contacts include potential customers and investors as well as partners in other countries. These new contacts have also led to business deals and investments for Finnish organisations. Moreover, these new contacts will also enable new deals, further cooperation and investment for Finnish organisations in the years to come. The programme has clearly had a positive impact on its customers, as they have been able to open conversations with parties that they would not necessarily have been able to reach on their own.

As a result of the programme, cooperation between Finnish organisations in the sector has become closer and new partnerships have been formed between Finnish organisations. In addition, cooperation within existing networks has gained greater continuity and a new direction, e.g., in the form of new joint projects. It has also been important, considering the international market, that the Finnish offer in the field of personalised health care has been more effectively 'packaged' rendering its attractiveness much greater than if the organisations were operating alone. In terms of innovation, co-innovation projects and ecosystems the networks established are likely to create new products, services and spin-out companies in the future. In this sense the programme has laid the foundations for the continued future generation of outcomes and benefits.

Furthermore, programme services and activities have improved the involved companies' understanding of the development of the personalised healthcare market and their opportunity to develop their business with the needs of the market in mind. In particular, the international market perspective has been central here.

With 81.5 million euros funding targeted to the 150 projects connected to PHF programme several different solutions and concepts have been developed and created. The projects have included drug development, the development of new medical treatments and the development of new ways to diagnose and identify diseases as well as data-based projects. Larger projects have generally been cooperation-based and related to the development of ecosystems. These projects create new business opportunities for companies and develop new applied research information and innovations, on the basis of which it is possible to develop commercial products and services. A list of the observed results in PHF programme projects is presented in the table below.

TABLE 6. RESULTS REPORTED IN RESEARCH PROJECTS CONNECTED TO THE PERSONALISED HEALTH FINLAND PROGRAMME

- Product development moving closer to commercialisation
- Improved ability to commercialise products and services
- Commercialisation of products and services
- Patents and other intangible capital
- Research results, scientific publications
- New scientific data
- New cooperation, new contact networks
- Information and better understanding of international markets
- New information about the functionality and commercial possibilities in respect of products and services
- Technical validation of the innovation

TABLE 7. RESULTS REPORTED IN COMPANY PROJECTS CONNECTED TO THE PERSONALISED HEALTH FINLAND PROGRAMME

- Cooperation, team building, promoting the visibility of companies in Finland
- New networks and contacts
- International workshops, dissemination of information
- New RDI development work structures
- Commercialisation of products and services
- New projects, improved ability to continue RDI-work
- Data protection principles
- Better understanding of regulation and data protection issues
- Business development, better understanding how business needs to be developed mainly in other countries
- Product development, R&D, finance and international markets
- Successful piloting in the international market
- New prototypes
- New information of commercial potential of products and services
- New products and services
- The progress of R&D work towards commercialisation
- Information of prototype tests
- Validation of service product

The PHF programme has funded top-level research during its existence in Co-innovation and ecosystem instruments. A good example of this is the FinnGen -project, funded by Business Finland through Bits of Health and Personalized Health Finland programs. This is a study that combines genome information with digital health care data. It is one of the largest studies of this type, bringing together Finnish biobanks, universities, hospitals and wellbeing services counties, THL and 13 international pharmaceutical companies. Other bigger research projects have been Cancer IO (led by the University of Helsinki and focussing on the translation of cancer immuno-oncology into health actions), FUDIS (led by VTT, which accelerates the development of point of care diagnostics), PRIVASA (led by the University of Turku, focusing on privacy preserving AI for synthetic and anonymous health data) and EVE (led by the Finnish Red Cross Blood Service, focusing on the research of extra cellular vesicles and their isolation for drug delivery and diagnostics). The main research organisations and key cooperation parties have been intimately involved in these large projects. From these projects, significant new research information, new solutions and new ways of utilising information and solutions have been created or are being created in relation to the subject areas of the projects in question.

In the evaluation questionnaire, the project implementers feel that they have received many benefits and effects from the projects implemented in the programme. In both company projects and research projects, the most important benefit is seen as competence development in the project implementing organisations. The projects have also increased the ability of the involved organisations to develop personalised health care solutions, R&D activities and business operations.

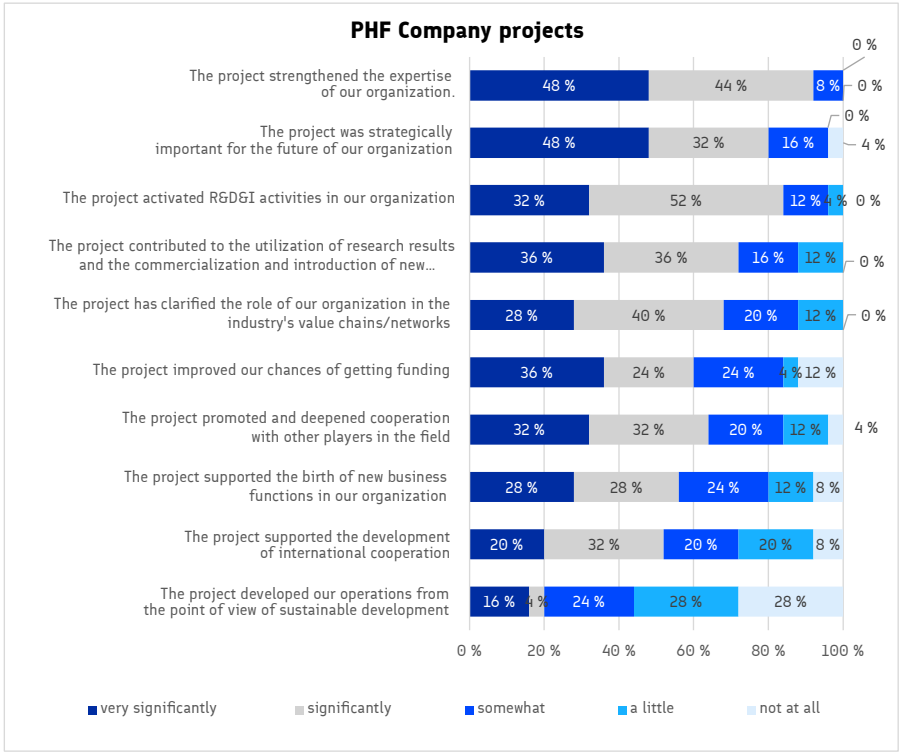
The importance of Business Finland's project funding for many companies and research organisations is illustrated by the fact that the projects have been strategically important in terms of the organisation's future development. The projects have implemented actions that are critically important to the future of these organisations.

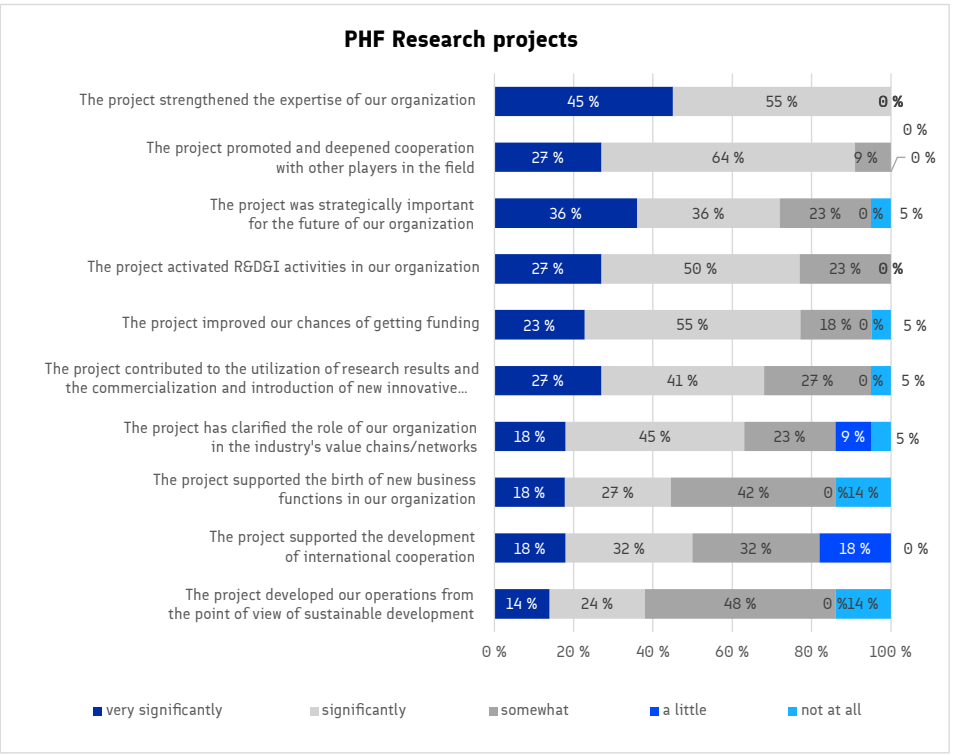
For research organisations, the projects have also clearly been important in strengthening cooperation with other players in the field. On the other hand, for companies, projects are a little less important in this regard. This may be due to differences in project types. Partners are involved in the research organisations' projects and the activities are strongly focused on cooperation. The starting points for business projects are stronger in the development of the company's own processes, products and services. However, the projects have also deepened and expanded cooperation with partners for several companies.

The projects have, in addition, also activated R&D activities in organisations, showing that Business Finland funding acts as a catalyst for R&D activity influencing it and often simply enabling it to commence. Projects have quite often also contributed to the utilisation of research results which, in itself, remains an important aspect of Business Finland RDI-funding. In the projects, new solutions are

not only developed through R&D activities but are also applied and put into use.

Projects have less often influenced the internationalisation of organisations, although this has also occurred in relation to projects. The programme's internationalisation services play a more significant role in this matter.





PICTURE 12. EFFECTS OF PHF PROGRAMMES PROJECTS ON PROJECT IMPLEMENTING ORGANISATIONS ACCORDING TO THE EVALUATION QUESTIONNAIRE

The projects have occasionally also influenced organisations to change their operations bringing them more into line with the sustainable development goals. The projects' focus has however been on the development of solutions related to the health and wellbeing sector and, as such, the sustainable development perspective features less often in them.

RESULTS OF THE SMART LIFE FINLAND PROGRAMME

The results of the SLF programme are strongly related to internationalisation and the opening up of markets to companies and other organisations, as well as to the strengthening of networks and the capability development of actors in the health and wellbeing sector.

The results of the programme can also be defined as the services developed and the direct effects achieved on the basis of them in relation to both customers and other target groups. Several trips and events have taken place in the programme's target countries with the programme organising several export-boosting meetings, including at the highest ministerial level, in Germany and Sweden. These meetings have strengthened the opportunities for, and the position of, several Finnish companies enabling them to enter the markets of these target countries. Finnish companies have also gained new contacts which can be used to export their own products and services to the target market. In the UK, it is noticeable that due to the impact of the programme, the local health and wellbeing market was opened up for Finnish companies. Health sector exports more than doubled from 2019 to 2020 with the programme playing a key role in this development. During the programme period, total exports in respect of the participating customer companies, increased while in terms of the individual companies involved, the programme's services have clearly had a significant impact.

Success has been achieved in combining research and innovation cooperation with export promotion in important target areas. A good example of this can be seen in respect of two significant projects, ICORY and STROKE DATA, where new markets were opened up for Finnish companies in Singaporean hospitals. The operation is based on ecosystem-like joint development between actors from different countries.

In the context of the programme, testbeds have also been developed by increasing marketing activities and development coordination. Workshops were organised in association with university hospital and university of applied sciences testbeds, new internet pages were launched highlighting the testbeds' offerings, a blog was also published and on Health Tuesdays, 7 testbeds were presented to participants.

Other significant results have been achieved in the Persian Gulf region. Finnish political and business delegations participated in one of the largest healthtech exhibitions in the world, Arab Health. Many participating companies negotiated several valuable new business contacts potentially leading to exports to Persian Gulf region.

Several companies have also been helped to better understand how to gain a foothold in target markets and better understand how those markets work. In 2021, activities commenced in China. In terms of US markets, Invest in Finland's activities represent the main result here. The programme with its customers also participated in the MedTech 2019 event in Boston. These activities reflect how the programme has helped to open up global markets for Finnish companies whilst also enabling new partnerships and customer relationships to develop.

A key result of the programme is that it has improved companies' and Business Finland's experts' understanding of the effects of regulatory changes on medical devices with regard to R&D activities. The programme has organised e.g., training, through which companies learn how to address and adapt to these changing requirements. At the same time, Business Finland has also developed a fuller understanding of these changes and a better ability to advise client companies.

In connection with the regulation of the Finnish pharmaceutical industry, the programme has also created services and produced information packages for foreign companies and investors who want to enter the Finnish market. In this way, efforts have been made to increase the level of investments to these companies and bring other new investments to Finland.

Significantly, the programme has also improved the networking of Finnish operators, both internationally and domestically, as well as improving the operators' ability to internationalise, export and engage in RDI activities.

In the project part of the SLF programme, several positive results have also emerged. There were 146 projects attracting 65 million euros. The emphasis here was on the results in respect of networking and improving cooperation, commercialisation, producing new scientific information, the collection of data and the development of methods and concepts, as well as new projects, new development work and new solutions and services.

TABLE 8. RESULTS REPORTED IN RESEARCH PROJECTS CONNECTED TO THE SMART LIFE FINLAND PROGRAMME

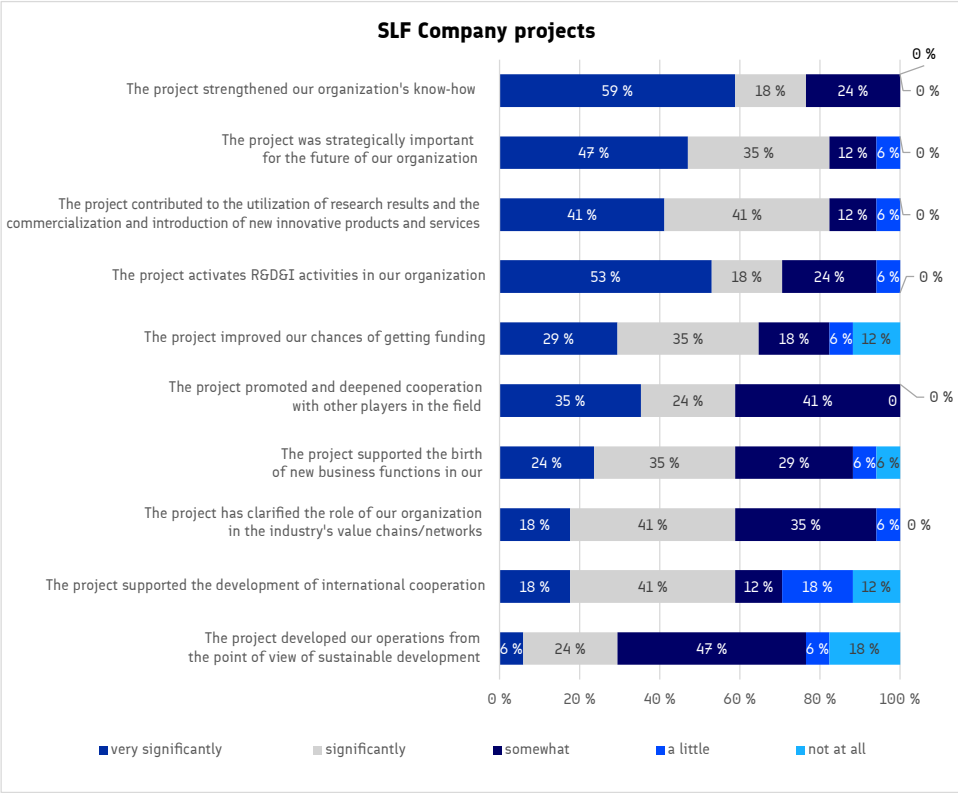
- New networks and contacts, consortium formation
- New cooperation
- Key partners identified
- Strengthening of business cooperation
- Expansion of the research partner network
- Strengthening of market knowledge
- Innovations brought closer to commercialisation
- Scientific publications,
- More research-based knowledge and understanding
- Information about the spread of the pandemic and its prevention measures
- Better understanding of the needs of the health care system
- A new website
- Gathering of data, new databases
- New methods, concepts and demos; New method scientifically validated
- Good practices and methods for utilising data and machine learning
- New follow-up projects and development plans
- Development of skills
- Patent
- Funding application
- New Co-Innovation project
- New solutions based on scientific research

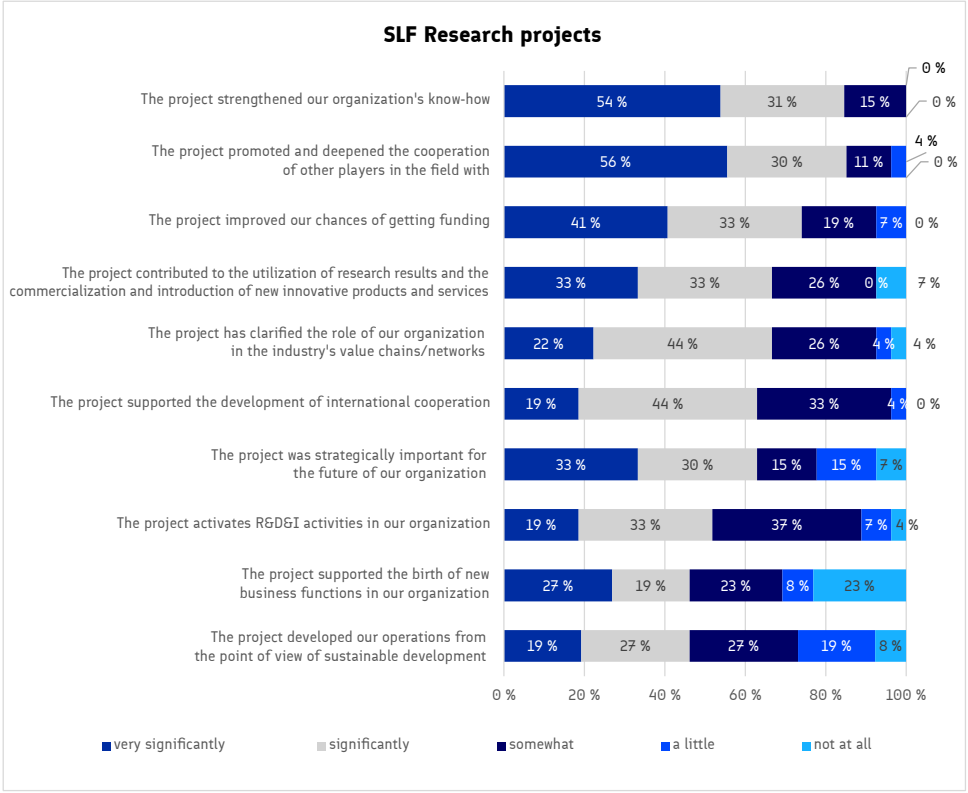
TABLE 9. RESULTS REPORTED IN COMPANY PROJECTS CONNECTED TO THE SMART LIFE FINLAND PROGRAMME

- Better understanding of customer needs
- Better understanding of international markets
- Internationalisation of company business horizons, new contacts, business deals
- With research activities, strengthening competitiveness, especially with international markets in mind.
- Information of foreign markets, better understanding of opportunities and challenges
- Product development
- New products and services
- Improved scientific expertise and abilities
- New information and its utilisation
- Development of artificial intelligence-enhanced algorithms, development of software
- Development of medical device, new devices
- New patient treatment methods
- Improved understanding of changes in the regulation of medical devices and their effects on the operations of companies, new MDR – regulatory approval for product
- Clinical research results, publications, patents, marketing authorisation processes
- Development of solutions and service concepts to a new level
- New concept
- Improved processes

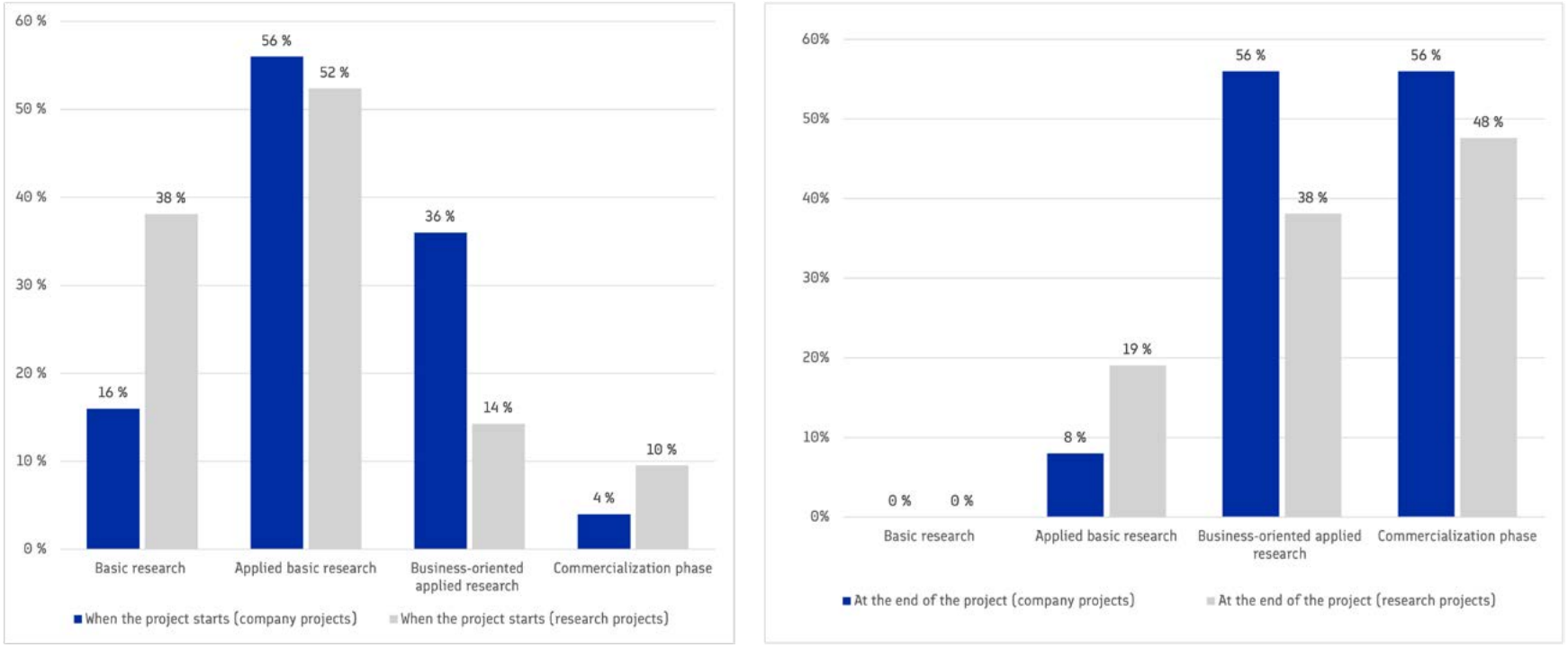
Innovation ecosystems have been a major target for programme funding. The programme has funded 10 innovation ecosystems in the sector during its implementation period. In these ecosystem and co-innovation projects, new solutions have been developed and information related to health technology has been disseminated. As such, the development of the field has been promoted cooperatively. These ecosystem-like operations have often been at the forefront of industry development opening up new RDI and business opportunities for the actors in the industry sector.

Various benefits and direct effects have resulted from the projects for the project implementers. For both company projects and research projects, the development of competence and 'know how' has been widely recognised as one of the clearest direct impacts of the projects. For the companies involved, projects have also often played an important strategic role in terms of developing their business operations. As such, projects can be seen to play a role in the development of business operations as they are used for company development by many companies. The projects are often also seen as important in the application and commercial utilisation of research results. For research organisations, projects have often played an important role in strengthening cooperation with other players in the field. For research organisations, the projects funded by Business Finland therefore play a significant role in terms of networking and cooperation between operators. For research organisation other significant benefits accruing from the projects include that they have also made it possible to attract other funding for R&D activities and improved international cooperation. The projects have not however played a central role in the development of the operations of companies or research organisations in line with the sustainable development goals.



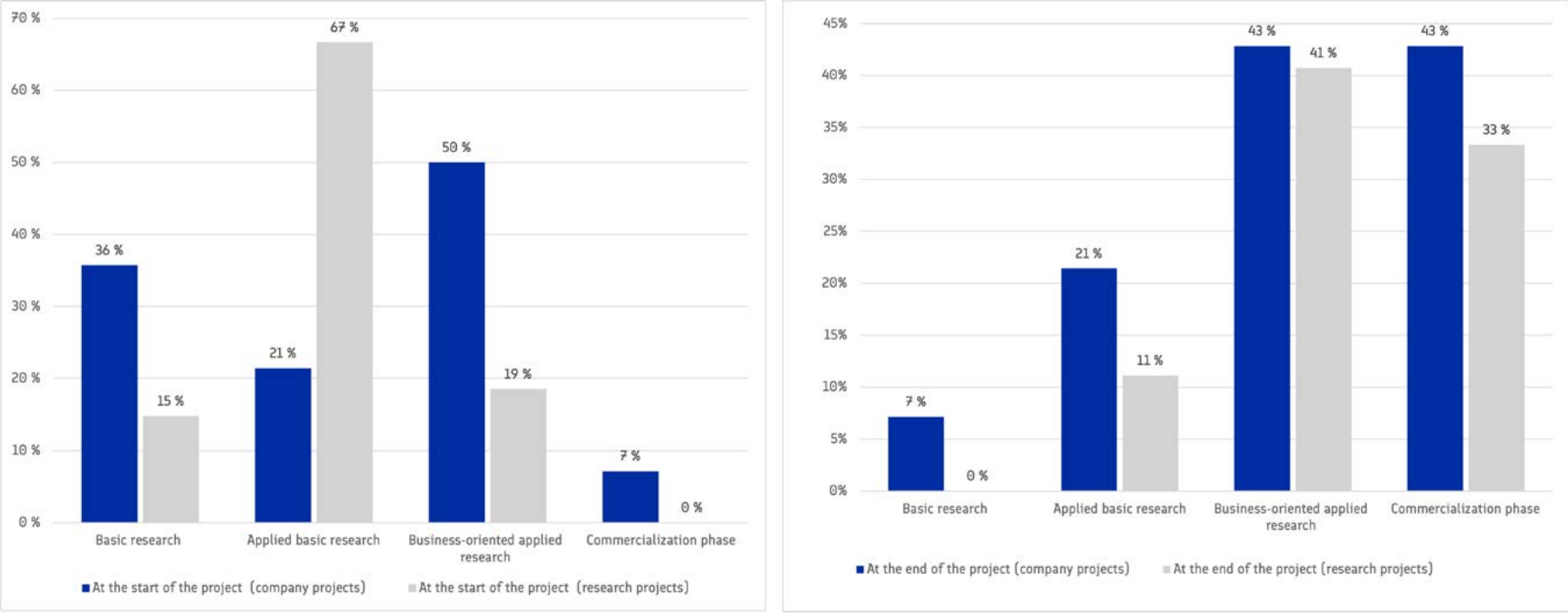


PICTURE 13. EFFECTS OF THE SLF PROGRAMMES PROJECTS ON PROJECT IMPLEMENTING ORGANISATIONS ACCORDING TO THE EVALUATION QUESTIONNAIRE.



PICTURE 14. THE STAGE OF THE DEVELOPMENT WORK AT THAT START AND AT THE END OF PHF RELATED PROJECTS, ACCORDING TO THE EVALUATION QUESTIONNAIRE.

When looking at the situation of the development work of the projects at the beginning and at the end of the projects, it can be noticed that, on average, the projects have clearly advanced RDI work towards the goal of commercial utilisation. This can be observed in the projects of both programmes. Thus, in the projects connected to the programs, various potential innovations have been widely promoted on the innovation path.



PICTURE 15. THE STAGE OF THE DEVELOPMENT WORK AT THAT START AND AT THE END OF SLF RELATED PROJECTS, ACCORDING TO THE EVALUATION QUESTIONNAIRE.

IMPACTS OF THE PERSONALISED HEALTH FINLAND AND SMART LIFE FINLAND PROGRAMMES

The PHF and SLF programmes have generated many impacts in relation to the development of the industry in Finland. The nature of these impacts is however such that some have arisen more directly and quickly during the programme while others will only become apparent in the longer term, or even after the programme has concluded. It is clear also that they often depend on the development of the operating environment. The programme has aimed to increase the internationalisation and export levels of Finnish organisations, as well as promoting international and domestic cooperation, even in the short term. The programme has also tried to develop the capabilities of the actors involved to enable them to work more efficiently in the future. The programme has therefore created the potential for the creation of many effects. Since a significant part of the programme's impacts remain 'hidden,' the evaluation has also focused on the perspective of whether the programme has created a sufficiently strong basis for these effects to eventually materialise.

In the current situation, the main observable impacts of the PHF and SLF programme relate to the internationalisation of the programme's target group and the development of their skills and abilities. New ways and perspectives of doing business have also been developed and improved.

Both the PHF and SLF programmes have been able to increase the level of Finnish operators' contacts with international partners, customers and investors. Partly thanks to the programme, the operators are now in a better strategic position in relation to the international markets that interest them. Potential customers and partners are now also more familiar with the offerings of Finnish companies and research organisations. Thanks to the programme, Finnish operators are better equipped to trade abroad and operate in international markets. The programmes have also contributed to the fact that Finnish companies now know their international target markets better and understand their own potential and opportunities in terms of operating in these markets. These issues, related specifically to internationalisation, can be viewed as one of the key impacts of the programmes.

Another key effect of the programmes has been their facilitation of skills and abilities growth in the participating companies and other organisations, particularly in respect of their personnel. The level of competence development here relates to the ability to create new products and services, to develop the business more generally, the ability to direct R&D activities in accordance with the needs of the market and to cooperate and internationalise. The ability to develop new innovations and take them to international markets has clearly been improved among the actors involved.

The programmes have also contributed to strengthening the financial base in Finland. With the help of these programmes, investments have been attracted to further the development of the Finnish health and wellness sector.

In addition, the programmes have directed Business Finland's funding and, with it, development activities from the perspective of future development needs. The programmes have also directed the development of the field and promoted the readiness of Finnish operators to engage in shaping the future development of the health and wellness sector.

TABLE 10. THE IMPACTS OF THE PROGRAMMES

IMPACTS IN PERSONALISED HEALTH FINLAND PROGRAMME	IMPACTS IN SMART LIFE FINLAND PROGRAMME
• Improved ability of target companies to internationalise and increase exports • Improvement of competence and skills in target companies and research organisations • Enabling the growth of investments in Finland - improvement of the funding situation in the health and wellness sector • Enabling the business growth of the programme's target companies according to monitoring data (turnover and personnel) • Enabling R&D activities and showing direction for R&D activities • In the projects connected to the programme, promoting new innovations which can then become new business opportunities in the longer term.	• Strengthening of the network of health technology companies and the facilitation of regular cooperation. • Opening of new markets and increasing international contacts for target group companies. Improving the understanding of customers of foreign market potentials. • Improvement in understanding of the needs of potential international investors', partners' and customers of Finnish actors in the sector. Increase in international investments and partnerships • Improvement of the ability and understanding of both target companies and Business Finland experts in terms of the effects of the changes in regulation to R&D-activities • Enabling the development of new innovations. The following potential new R&D development work and business effects.

The PHF programme has contributed to the development of its target companies. The programme has also monitored the turnover and personnel development of key customers (30 Tier 1 companies) during the programme implementation period. According to the monitoring data, Tier 1 companies' total turnover has increased from 84 million euros to 155 million euros during the period 2018-2021. Personnel growth has also been positive as Tier 1 companies' personnel establishment has grown from 676 persons to 1219 (25% increase).[1]

In relation to the SLF Finland programme, the level of development in terms of these figures has however been more modest. The total turnover of the participating companies has increased from 9 655 000 000 to 10 136 000 000 euros during the period 2019-2021[2]. Exports have also grown moderately from 1 578 000 000 to 1 853 000 000 euros in the companies that participated in the programme. One of the key goals and indicators of the programme was to double the exports of participating Finnish SME companies. This goal was not met in the programme during its implementation period, though in the programme many good measures have been conducted to help internationalise the target companies. The programme has improved participant companies' readiness for export growth, something which may only be realised in the coming years in terms of export figures.

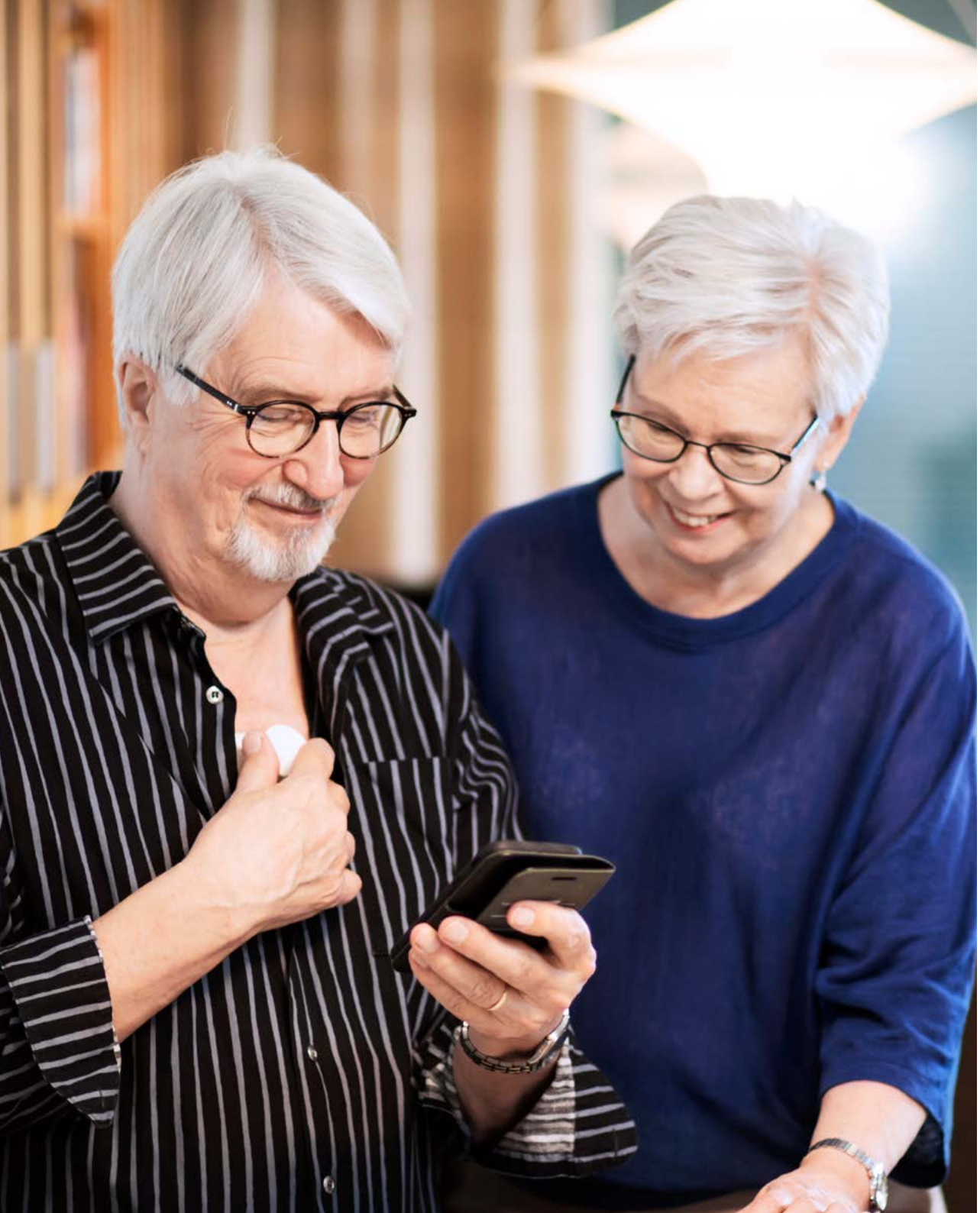
In the businesses of several PHF and SLF programmes' customer companies, significant developments have also occurred during the programme. These include acquisitions by bigger companies, stock exchange listings and the acquisition of smaller companies by customer companies as well as the granting of marketing authorisation for new products in new international markets.

In the projects linked to the programmes, the main effects relate to the development of companies' business competitiveness and business renewal, according to the evaluation questionnaire. New markets have been opened up, competitive services and solutions developed and the ability of participating companies to compete in new markets improved through understanding and competence development.

The projects have also been used, to some extent, to increase the international scope of the participating companies' business operations, according to the questionnaire. However, the projects have a stronger focus on product development while the programmes services have had a greater impact in terms of promoting internationalisation.

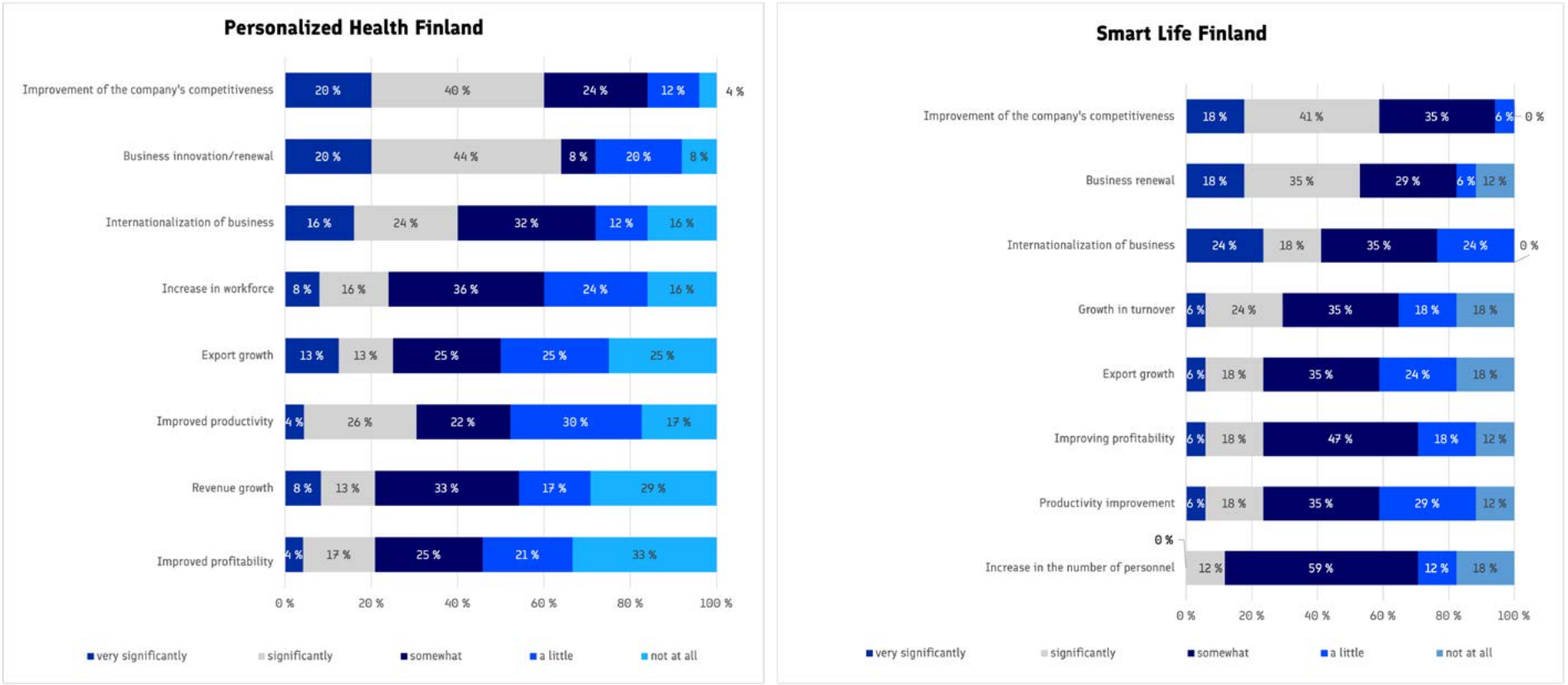
Fewer direct impacts related to business growth, profitability, productivity personnel growth and exports have however been achieved in these projects. It is however assumed that the results of the project development work will begin to have an effect over a longer period of time, when new solutions can be commercialised and new processes introduced into company operations.

1 Personalised Health Finland - Final Report. Business Finland. 2023.
2 Smart Life Finland - Final Report. Business Finland. 2023.



Based on the open-ended responses of the PHF programmes' business projects, the strengthening of expertise and ability in terms of both technical and commercial understanding was considered to represent a significant lasting effect of the project. Several responses highlighted the fact that the results of the project support the company's competitiveness in the longer term, as a result of the strengthening of their market knowledge, the introduction of new technology, the renewal of business operations, the expansion of the product portfolio and the creation of new partnerships. Individual answers also highlighted the improvement of opportunities for private capital investments and access to EU funding.

In the SLF programmes' business projects, a significant permanent impact, in addition to the increase in competence, was considered to be the creation of new types of, e.g., service products (based on new types of software, machine learning, artificial intelligence and IoT solutions) and building them into a permanent business, increasing know-how and market ability related to the target market and an improved ability to internationalise and compete in international markets.



PICTURE 16. IMPACTS OF THE PROJECTS ACCORDING TO THE QUESTIONNAIRES TO PROJECT IMPLEMENTERS OF PHF AND SLF PROGRAMMES.

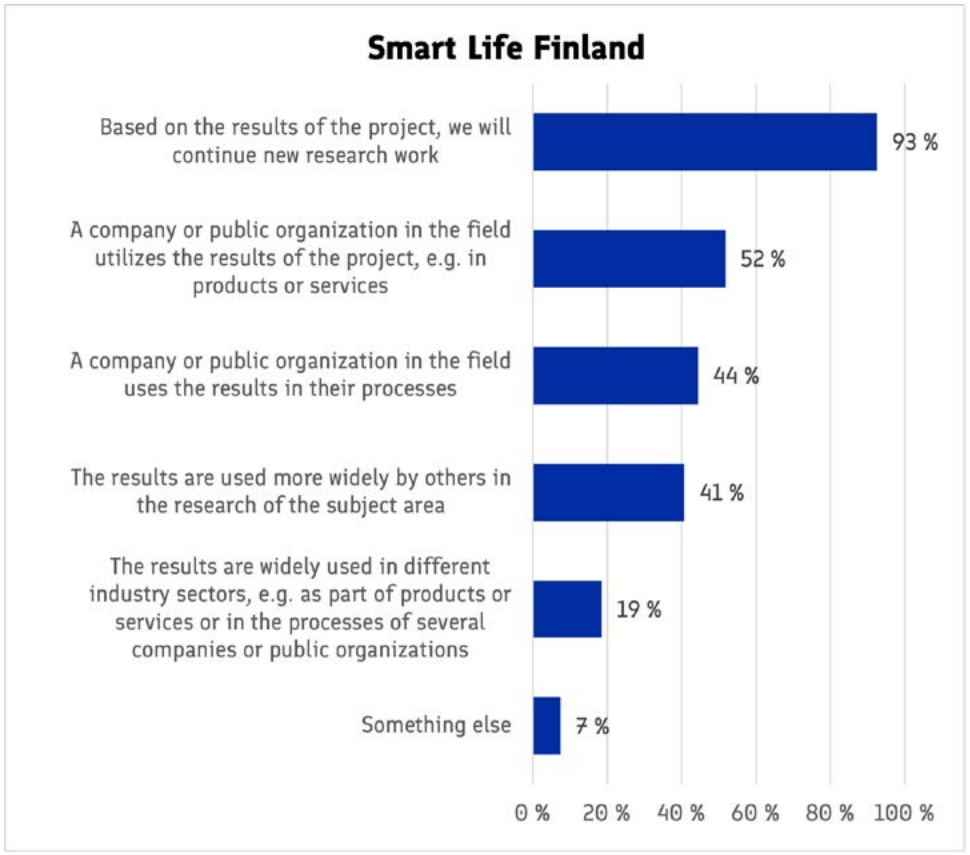
In terms of research projects, the evaluation explains how the results of the R&D activity will be utilised after the end of the project. An important observation here is that they have enabled new development activities and also that the results can be further refined. A large number of the research projects have, moreover, reported that things have been achieved in the project that it could be important to further develop. The project results were also used more broadly by, for example, companies and public organisations in relation to their business strategies, product development and services as well as in their organisational processes more generally. Only in exceedingly rare cases were the results not used at all. This shows that the projects were deemed useful and that the level of demand in respect of participation remained high even after the project was concluded and finally, that the projects themselves were viewed as being necessary to the development of the sector.

In the PHF programme, based on the open-ended responses to the survey, the knowledge capital of the research organisations was strengthened (e.g., in diagnostics, health data analytics) and in terms of gaining a better understanding of the commercial utilisation possibilities of the project findings. These were lasting effects of the research projects. This, in turn, has increased the credibility and interest of the organisation in the eyes of customers and more broadly in the field of health technology. In addition to new expertise, new national and international networks have also been created based on the projects. In addition, individual answers highlighted that innovations created through longer-term research have been commercialised or are in the process of being commercialised, new research-based activities are being introduced in the public sector's operating area and new lines of research have emerged based on innovations developed in the context of the programme.

In the SLF programme, based on the open-ended responses to the survey, the know-how and ability of the research organisations involved were strengthened and thereby also the role and visibility of the unit that implemented the project in its own organisation, while the theme of the research project in the organisation's strategy has also been strengthened. Again, these things can be seen as lasting effects of the research projects. Based on the individual answers, the research projects have supported the birth of new business activities and helped in the utilisation of research results as well as in the commercialisation and introduction of new innovative products and services. In addition, several responses pointed out that the project(s) brought together the results of previous projects and indicated the direction in which the solution models are to be taken in future. New research and development projects have been launched from the projects. Cooperation between the research institutes was already close, so the projects have specifically chosen to promote the strengthening of cooperation with those companies utilising the research results.

Based on the open-ended responses to the survey, the

effects of the PHF programme's projects on the broader health and wellbeing sector will be seen in particular in relation to the strengthening of the prerequisites for diagnostics, biomedicine and drug development, as well as in the improvement of patient treatment methods (e.g., remote diagnosis and monitoring, artificial intelligence algorithms for cancer radiotherapy) and the general level of the quality of life in Finland. The results of the research projects facilitate a number of things including, easing the workflow of health care professionals, accelerated access to the right treatment and the reduction in fiscal outlays for health care, benefiting society as a whole. The results of the projects are expected to promote disease prevention and are seen to have strong business potential both commercially and from the perspective of health economics.



PICTURE 17. ANSWERS FROM RESEARCH PROJECTS, HOW THE RESULTS OF THE PROJECT WILL BE UTILISED AFTER ITS CONCLUSION, ACCORDING TO THE EVALUATION QUESTIONNAIRE.

The importance and added value of the PHF programme can be seen in the fact that it has been possible to direct measures and investments to the most central development targets in the field and to encourage operators to invest in new targets and long-term development work. In this sense, it has played an important role in reforming the market. The programme is felt to have played an important role in the networking of the industry and in the creation of functioning cooperation networks. "It has brought many actors together not only to compete with each other, but to compete together." The programme is also seen to have been well-timed, as the personalisation of treatment (Personalised Health) is seen as one of the most important trends in the entire healthcare sector which can be used to significantly increase the effect of treatment while at the same time reducing costs.

In the case of the SLF programme, based on the open-ended answers to the survey, new technology, methods and solutions have been developed in the research projects and significant development steps have also been taken, for example, in the early identification of diseases, monitoring people's wellbeing and in promoting health, integrating care and making treatment processes more efficient. These are seen to have significant and lasting effects on the strengthening of business opportunities in the sector, the reduction of health care costs, higher quality and more independent care and services (for example in services for the elderly) and, more generally, in terms of improving people's quality of life.

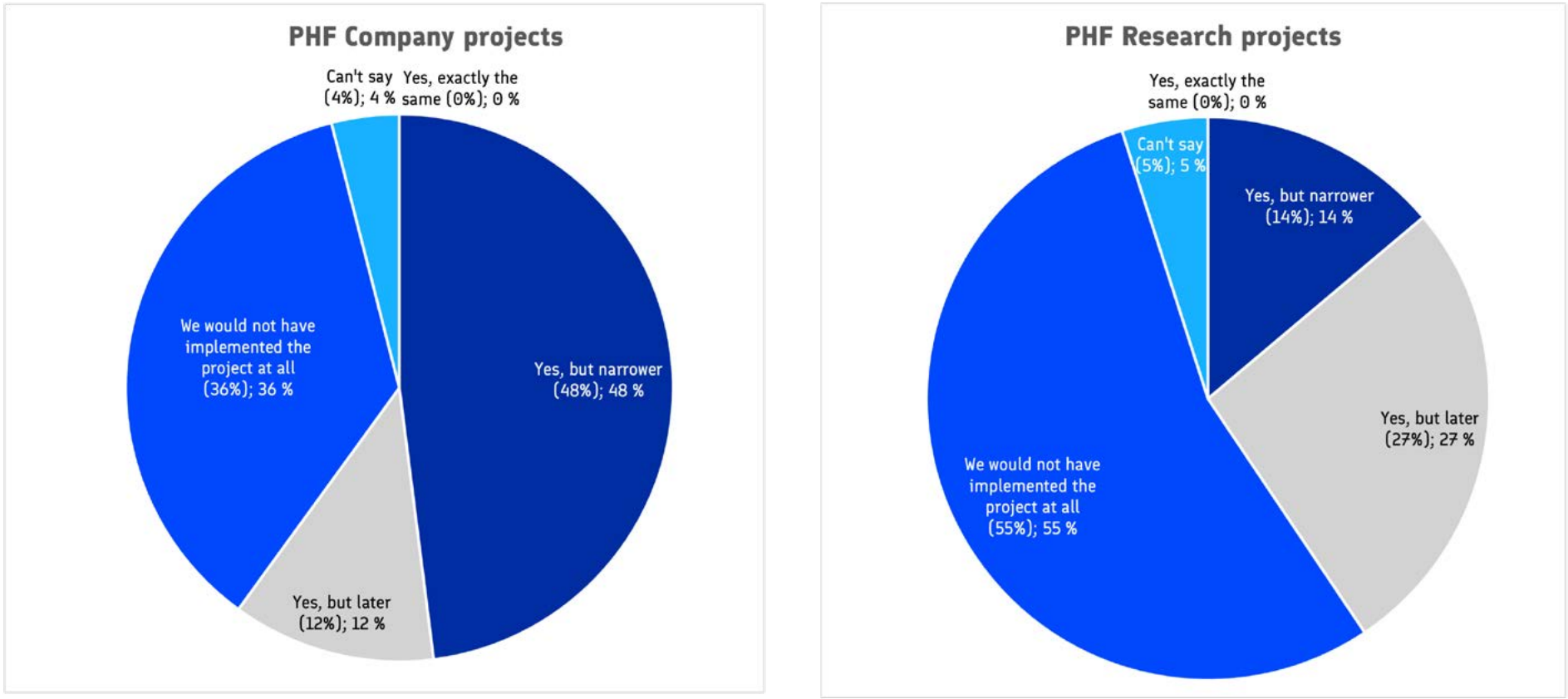
The projects have also significantly increased industry awareness and networking across different research fields and strengthened the ability of companies and research organisations to produce joint service solutions based on new technology. The innovations developed in the projects are widely viewed as having significant commercial potential. In terms of individual answers, e.g., in addition to the growth of the company's own exports, we see the general strengthening of the competitiveness of health technology export companies, the establishment of a company supporting the commercialisation of the solution developed in the project, the further development of the created solutions and scaling them up for market use.

The importance and added value of the SLF programme can be seen in the fact that BF's significant and long-term funding has enabled the creation of longer-term development projects and the sustainable utilisation of their results. Based on the open-ended responses to the survey, the programme has encouraged collaboration between different stakeholders, such as researchers, start-ups and established companies, to develop innovative solutions for the health and wellness sector. The programme has also brought together actors in the field and assisted in the initiation, implementation and utilisation of the results of joint projects. The programme has supported numerous public research projects and companies' R&D&I projects. The results of these projects will be widely utilised in society (e.g., the cost-effectiveness of healthcare and the quality of services) and in the development of

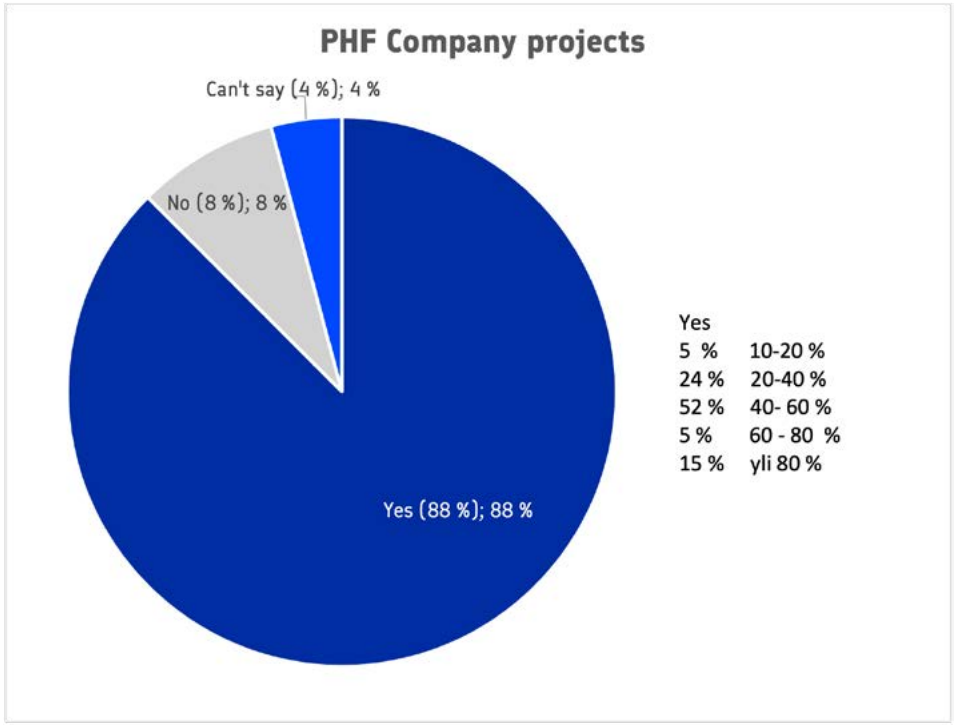
new products and services. As a result of the programme, society is better prepared than before to respond to future health threats, for example when new pandemics threaten.

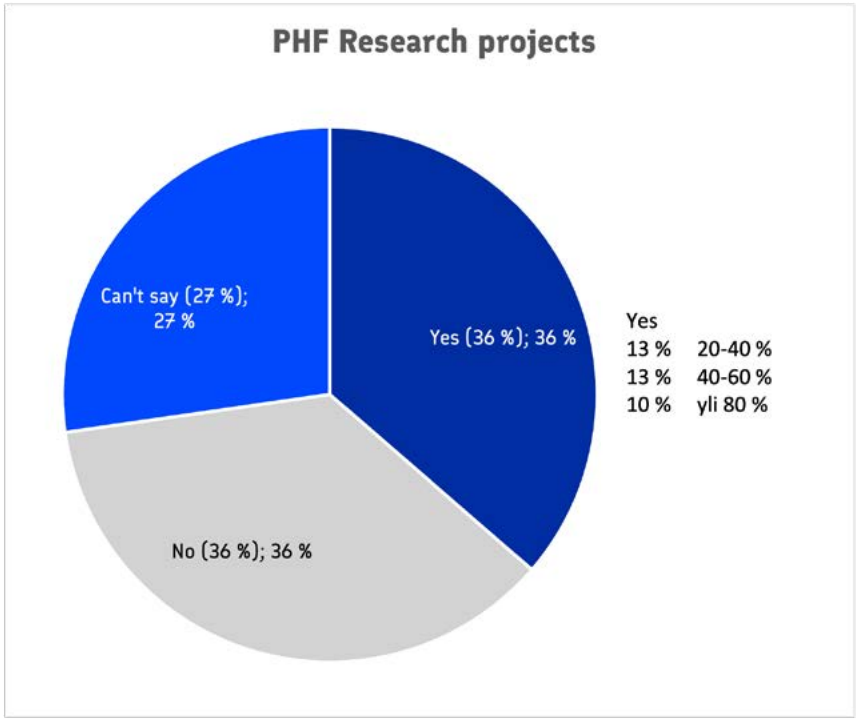
The key added value related to both programmes is that the RDI work of the projects connected to them would not have been implemented at all or in the same way, without Business Finland's funding and advice. According to the evaluation questionnaire no project in either programme would have been realised in the same way without funding. For research organisations the added value is even greater. A majority of the research organisations involved would not have implemented the project at all without Business Finland's funding. The added value for companies is particularly evident in the fact that, thanks to Business Finland, the projects have been implemented more ambitiously. Business Finland's funding has thus clearly enabled RDI activities and the results achieved in that context, results which would not have been possible without Business Finland's funding.

It is also significant that Business Finland's funding has increased these organisations' own investment in RDI work. This can be seen particularly in the case of private sector companies, of which almost all survey respondents, in both programmes, put more funding into their RDI work. About half of the companies involved estimate that they increased their own funding by 40-60% in terms of the R&D project, when compared to the funding they would have invested in development work without Business Finland funding. In the PHF programme 20% of the companies, and in SLF programme 35% of the companies, increased their own funding by more than 60%. This means that Business Finland's funding has clearly increased input additionality in the projects of both programmes. This again illustrates that the development work has been done with a larger volume, more ambitiously and with more commitment than what would otherwise have been the case without Business Finland's funding.

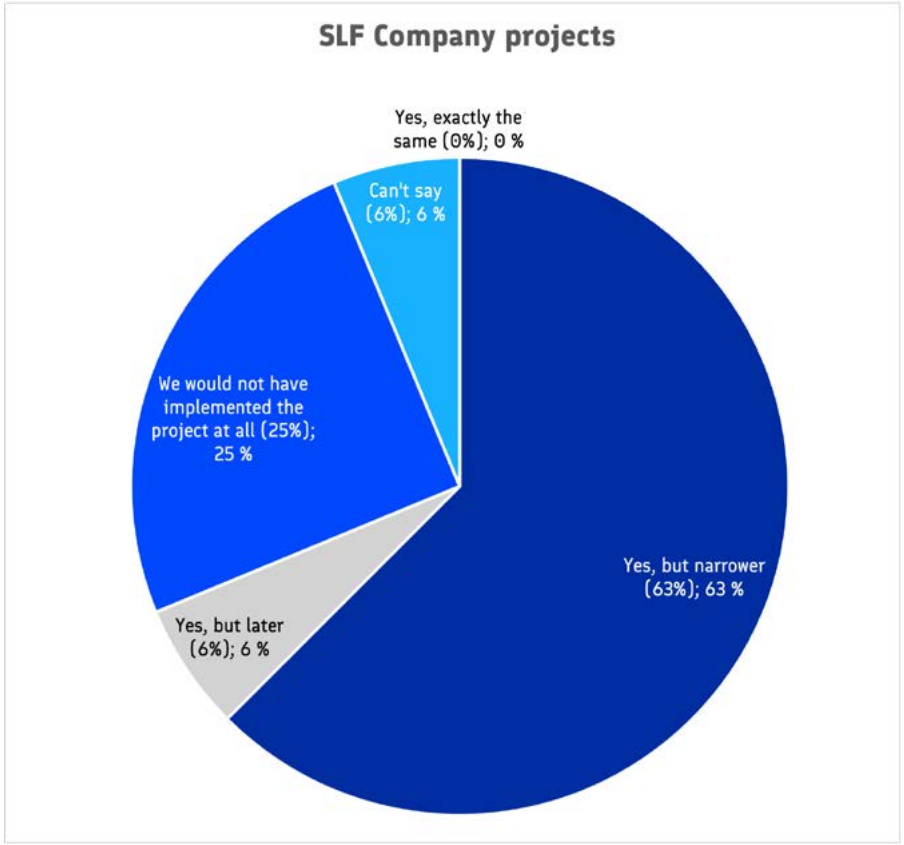


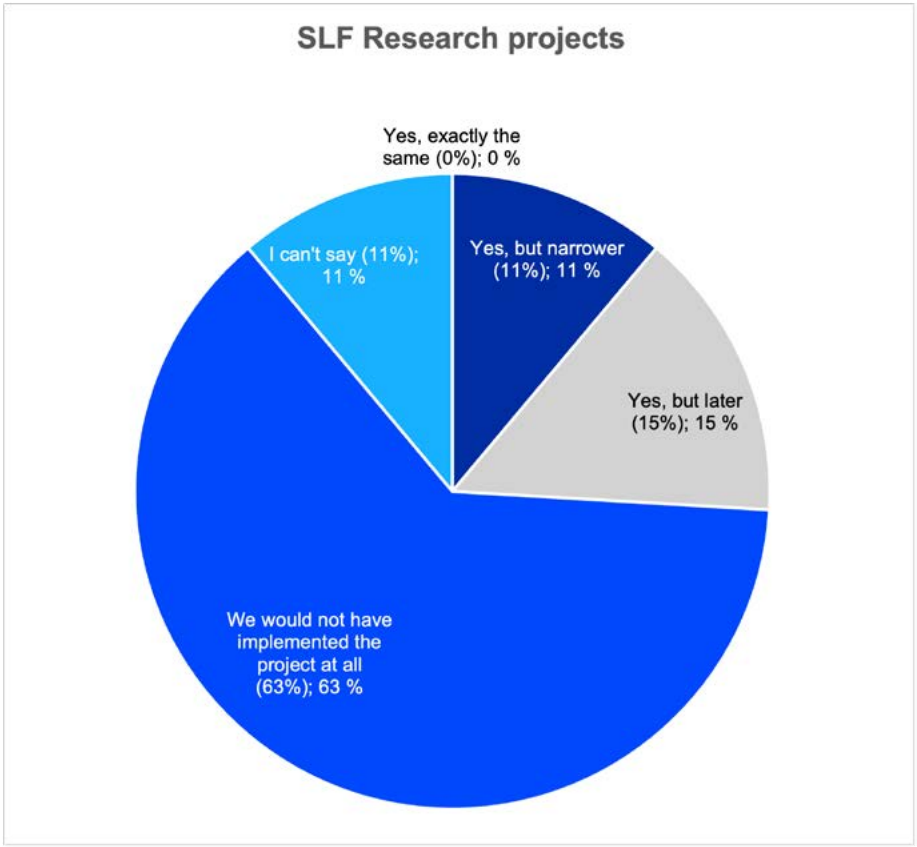
PICTURE 18. THE PHF PROGRAMMES' PROJECT IMPLEMENTER'S ANSWERS TO THE QUESTION ON WHETHER THE PROJECT WOULD HAVE BEEN IMPLEMENTED WITHOUT BUSINESS FINLAND'S FUNDING.



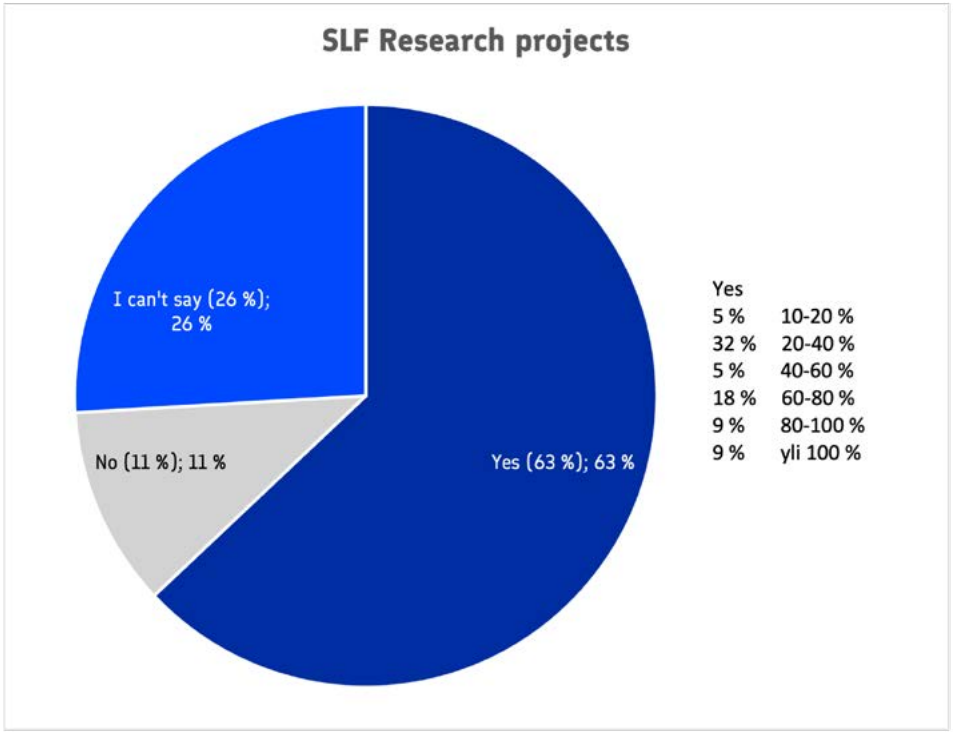


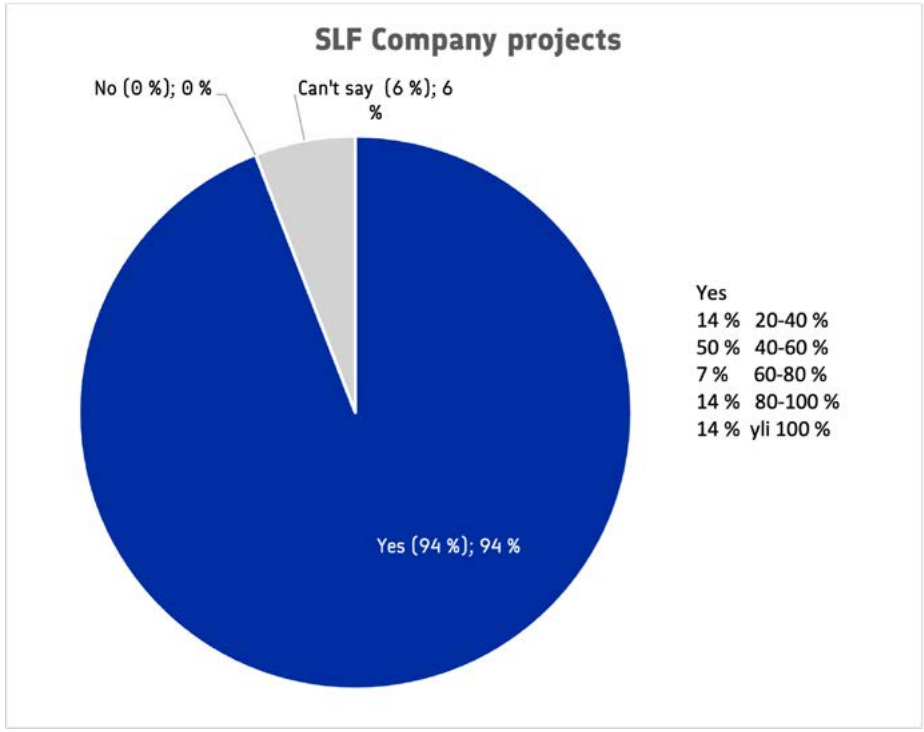
PICTURE 19. ANSWERS TO THE QUESTION OF WHETHER BUSINESS FINLAND'S FUNDING INCREASED THE ORGANISATIONS' INVOLVED OWN FINANCIAL CONTRIBUTION TO THE PROJECT AND, IF SO, BY HOW MUCH.





PICTURE 20. THE SLF PROGRAMMES PROJECT IMPLEMENTER'S ANSWERS TO THE QUESTION ON WHETHER THE PROJECT WOULD HAVE BEEN IMPLEMENTED WITHOUT BUSINESS FINLAND'S FUNDING.





PICTURE 21. ANSWERS TO THE QUESTION OF WHETHER BUSINESS FINLAND'S FUNDING INCREASED THE INVOLVED ORGANISATIONS' OWN FINANCIAL CONTRIBUTION TO THE PROJECT AND, IF SO, BY HOW MUCH.

CASE:
BLUEPRINT GENETICS

Blueprint Genetics is a genetic testing company focusing on inherited diseases. Blueprint Genetics is based in Helsinki and Seattle, with a customer base spanning over 70 countries. Blueprint Genetics provide high-quality genetic testing for the global clinical community. By combining a state-of-the-art laboratory process, the latest sequencing technology, AI-empowered data-crunching tools and techniques, world-class professionals and a holistic customer-experience approach, Blueprint Genetics are bringing genetic knowledge into mainstream healthcare. Blueprint Genetics participated in the Personalised Health Finland 2018–2022 programme, and had previously participated in many Business Finland programmes.

Blueprint Genetics worked in close cooperation with Business Finland. Cooperation has been a significant factor for the company in promoting growth and internationalisation. In the implementation of RDI projects, it was seen as important to focus efforts on promoting technology development. With the support made possible by Business Finland, it has been possible to gain new abilities, to developed laboratory automation and to improve various features in respect of the genetic tests. The actions taken have improved the company's competitiveness and created opportunities to expand into new markets and application areas.

Business Finland's export promotion trips have also been useful for the company. These trips have helped the company, for example, to network and to explore new market openings. New openings and contacts have also concretised into cooperation and an annual turnover of several million euros in the new markets. Export promotion trips have also proved to be important in terms of meeting potential investors.

The importance of R&D projects funded by Business Finland is particularly evident in early-stage companies with high development risks. Business Finland financing has made it possible to take fundamental development steps and implement development projects that the company would not otherwise have had the opportunity to invest in alone. Development projects always have their own risks, but they also provide an opportunity to achieve valuable development and, at best, the results of the development change the practices of the entire industry. Supporting development projects is important because it is often the case that it can be difficult to find a real 'business perspective' during the initial stages of the project. Development projects typically provide longer-term development, with the company investing in them both long-term and strategically. The added value brought by the financing to the development project can be seen

particularly in the fact that RDI projects have been able to be implemented faster. With the help of the support, it has also been possible to start riskier development projects and open up new business areas. Measures towards commercialisation have also become possible when the projects have been able to pilot, clarify and verify market opportunities.

In the Accelerating Rare Disease Treatment with Genetic Testing of Biobank Donors project, a system, tools and the necessary cooperation processes that produce tangible benefits for the company have been created. A digital treatment path from the donor to the transfer of information and the possibility to identify potential patients better than before was the result. Thanks to the project, it has been possible to improve the efficiency, speed and cost-effectiveness of diagnostics. Identifying diseases at an early stage can also bring enormous savings to society, when treatments do not accumulate and the load on the system can be minimised. This reduces the need for healthcare and thus the need to utilise resources on diagnoses searches while also concretely improving the patient's quality of life.

CASE:
BENETE

BeneCare is designed to support the daily work of elderly care staff, nurses, doctors and physiotherapists. The service ensures round-the-clock, safe monitoring of customers, making nursing work more efficient and meaningful. A person's daily activities and operating methods are modelled using agile sensor technology and smart algorithms. With the help of this information, professionals detect changes in their clients' health, wellbeing, functional capacity and cognition and can react to the needs of clients who need immediate treatment at an early stage. Benete participated in the Personalised Health Finland 2018–2022 programme.

Benete implemented a market research project called Lifetempo. The company has also been engaged in projects related to product and service development financed by Business Finland. In the Lifetempo project, the services offered in other markets were mapped thus helping them to identify which markets the company should focus on and what options there are for new market openings. In the context of the project, it was also important to gain an understanding of the needs of different markets, in order that they can be better taken into account in the development of the service. In the end, the project also made a plan for entering the selected target markets. The new target markets are Denmark which has the same social security model as in Finland, and Holland which utilises an insurance-based financing model. Countries with different financing models for social and health services were selected as new target markets, so that the development work of the service can determine what kinds of requirements the expansion to new markets places on the service.

Benete also participated in a trade fair trip organised by Business Finland. From Benete's point of view, there was a very low threshold for participation, organised by Business Finland, as the arrangements had already been taken care of and participation did not require a large financial investment from the company. The most important aspects of the fair were the opportunity to market their own services and to get to know a new market area while engaging in networking more generally. Finding suitable partners in Denmark was also a key goal of participation in this trip and was successfully achieved. While participating in the fairs trip, Benete also applied to become a member of the health industry network operating in Denmark, where operation helps to follow current themes in the market. Benete has also utilised the market overviews and analyses produced by Business Finland. They have proven very useful from the company's point of view as without them, the company's awareness of the situation in the other Nordic markets would be significantly reduced, while

the collection of similar information would require a considerable resource outlay. The background work done by Business Finland and the production of information is valuable for the company and it has also brought synergies in terms of the company's development work.

The support received from Business Finland has played a very significant role and enabled the development of the company's operations. A company that had practically started from scratch to build a demanding service would not have been able to operate and focus on building its product without the support received from Business Finland. Business Finland's role has thus been significant for the company, in addition to financing R&D activities, also in developing market knowledge through the information produced and in broadening perspectives through various events and the promotion of networking.

CASE:
KAIKUHEALTH

Kaiku Health is a platform for digital health interventions. It provides patient-reported outcome monitoring and intelligent symptom tracking. The use of Kaiku Health helps cancer clinics provide optimised care through timely symptom management and improved workflow.

Through the Personalised Health Finland 2018–2022 programme, Kaiku Health has participated as a Team Finland delegate on the export promotion trip to Basel and implemented the Cleverhealth Smart Care for Me development project funded by Business Finland. On the export promotion trip, the companies got to meet pharmaceutical industry companies. These trips made it possible to meet pharmaceutical companies face-to-face, strengthening the company's visibility in this area. The meetings were very important for Kaiku Health and they also supported other ongoing meetings and negotiations at the company. Kaiku Health subsequently published cooperation agreements and strategic partnerships with Roche and Novartis after meeting them on export promotion trips. Business Finland's trip had a significant supporting impact on Kaiku Health's ability to attract large pharmaceutical companies as partners.

Kaiku Health has implemented several R&D projects with funding from Business Finland. These projects have had a significant impact in terms of supporting the company's innovative product development and internationalisation. The Cleverhealth Smart Care for Me development project was one of the major projects financed by Business Finland. The most important contribution of the project to the company is that it was able to test the application's suitability for different types of user cases outside of cancer treatment monitoring. The project has clearly been successful from the company's point of view particularly in terms of supporting clarification around their focus on product development. In addition, Kaiku Health has also been able to find the application's core areas and specific strengths. With the help of the project, Kaiku Health has also been able to direct the expansion of the development of its application to the most suitable user cases while, on the other hand, weeding out unsuitable use cases.

From Kaiku Health's point of view, both support for export promotion and the financing that enables R&D operations, have played an important 'enabling' role in the company's development. Without Business Finland's support,

the company would not have reached its current point. The funded projects have also played an important role in contributing to the funding attracted by the company. The support received for R&D operations has also been very important, especially in the early stages of the company's development, when product development requires a lot of investment and future returns are still uncertain. The support provided by Business Finland has made it possible to make bold and important future-oriented product development investments and also enabled international growth. The generous level of support made it possible for Kaiku Health to focus on product development in such a way that it was able to aim for a world-leading position in its own focus area.

CASE
BRAINCARE

BrainCare Oy is a Tampere University of Technology spin-off company founded in 2013. The company's mission is to deliver personalised solutions to improve the quality of life of patients and healthcare professionals. BrainCare develops novel solutions for the long-term monitoring of neurological diseases and other symptom-like chronic diseases.

Braincare has actively participated in various measures associated with the Smart Life Finland 2019—2022 programme. The company utilised the materials and market research produced by the programme, participated in export promotion trips and used Business Finland's internationalisation services.

The market analyses produced by Business Finland have been very useful for the company. With their help, BrainCare has been able to analyse where the company's market focus should be. Market analyses such as this provide important information for the company, information that the company would not otherwise have had the resources to produce to anything like the same extent. BrainCare ended up joining the export promotion trip to Germany after noticing the opportunity in Business Finland's newsletter. On this export promotion trip, the company was able to make useful contacts, meet various authorities and accumulate in-depth market knowledge. Their meetings with key people and various keynote speakers at the event also played an important role in terms of the success of the trip. Business Finland's contact person also helped to find suitable contacts in Germany. An important part of mapping the market knowledge was also familiarisation with the requirements brought by German law as it relates to the company's industry.

BrainCare also participated in events and sparring sessions organised for companies interested in expanding into the UK market. The concept of the event was particularly useful because after the seminar event common to all companies, sparring was available for companies both in small groups and individually.

The services provided by Business Finland have benefited Braincare in many ways in terms of its business development strategy. BrainCare describes the market research task as 'homework for companies', something which Business Finland does on behalf of the company. The nature of the services offered by Business Finland is also such that companies would generally not be able to replicate them on their own. The services provided have also followed a clear path, where companies are first offered market information, then consulting and subject-expert talks, followed by the search for suitable contacts in new target markets and the offer of an opportunity to participate in export promotion trips. In addition, the support provided

by Business Finland was seen as being very practical and supportive of concrete actions. The information and support received was very useful for the company particularly in respect of their subsequent discussions with financiers. Business Finland's support has proved to be useful in a situation where the company is looking for international funding, gathering market information and building networks. Business Finland's programmes appear to be very important forms of support in the field of digital health services. The programme measures enable the growth and development of companies that are best able to provide a durable product response to large megatrends thus becoming important players in their chosen field.

4.5. SUMMARY OF FINAL EVALUATION OF THE TWO HEALTH PROGRAMMES

The Personalised Health Finland and Smart Life Finland programmes are firmly connected to the longer-term continuum of Tekes, Finpro and Business Finland's health and wellbeing programmes. The most recent programmes are clearly linked to the chain formed by previous programmes. In the two final evaluated programmes, the development activities of the sector have also been directed with the future in mind while a strong investment has been made in the internationalisation of Finnish companies in this sector. The programmes have also created the basis for future development activities in the health and wellbeing sector and for the development of the sector more generally.

The implementation of the programmes has been, for the most part, efficient and successful in relation to the available resources and considering the challenges of the programmes' operating environment. Key factors in the implementation of the programmes have been the relevance of the programmes' services to the needs of the health and wellness sector, competent and motivated implementers of the programme and representatives of the target groups, well planned and systematic operations and utilising Business Finland's expertise in the sector, as well as its international networks and contacts. The programmes have also included several good services which should continue to be utilised in future. Challenges have however emerged in terms of the lack of human resources and other personnel-related issues, as well as in the ability of external experts to support the implementation of programmes, the impact of the Covid-19 pandemic on the implementation of services and in relation to Business Finland's organisational reform which broke up thematic expertise, temporarily reducing support for the programmes.

The programmes have thus partially attained the goals set for them. In terms of some of these goals, the operating environment in particular has presented challenges in terms of their promotion. When looking at the key performance indicators set for the programmes, it is clear that some of the goals were attained while others were not. The PHF programme succeeded in attracting the targeted number of companies to the programme's services while there has also been an increase in turnover in the programme's target companies. The programme has also supported ~~7~~ ecosystems related to the health and wellbeing sector. Regarding the other key performance indicators of the programme, it can be said that top-class RDI activities are carried out in several centres in Finland and that the RDI activities of different types of target companies have developed positively during the programme. From the perspective of growth engine funding, a clear growth engine for the health and wellbeing sector didn't emerge during the implementation of the programme, but was launched in 2023 when the programme was finished. The SLF programme managed to fund 10 different

ecosystems related to the health and wellbeing sector. The programme did not however succeed in meeting the project funding goals, coming up short of the set targets (completed project funding 65 million euros, while the goal was 80-100 million euros). Additionally, the goal of doubling the turnover of the participating companies was also not realised. It should however be noted here that the goals of the programmes were set quite high and that the programmes have significantly promoted the monitored issues, even if the goals themselves were not, ultimately, attained in all respects.

When viewed from perspectives other than those relating to KPIs, the programmes have promoted their goals well. The PHF and SLF programmes have enabled their customers to contact hundreds of potential clients, investors and partners. The PHF programme has helped Finnish companies to gain international venture capital funding and attracted numerous international investors to visit Finland for the first time. International operators are now much more aware of Finnish operators thanks to the programme which could have many positive effects on the development of the sector in the future. The SLF programme has helped its customers, both in terms of networking and in the creation of new partnerships between participating companies. The programme has also helped to develop the capabilities of the participating companies enabling them to enter foreign markets with digital health and wellbeing offerings. Additionally, they have supported the development of ecosystems and have been involved in supporting several important development projects in the health and wellbeing sector operating in Finland (e.g., FinnGen). Finally, expertise and individual solutions, as well as concepts and services with commercial potential have also been developed in the projects connected to the programmes.

The programmes have brought added value to the development of the sector. They have offered several services to the programme's target groups which would not otherwise have been available without them. Finnish organisations in the sector would not have had the ability to attract the same attention or to form the networks and contacts that have been formed without the help of the programmes' services. One key added value of the programme here has arisen from the fact that it has brought together actors and highlighted what Finland has to offer internationally. It is also viewed as important that the programmes have directed the development of the health and wellbeing sector, with their content focus areas, by sparring the actors and by enabling the provision of expert help. It has been possible to internationalise the industry with programmatic actions, most likely in a far stronger manner than what would otherwise have been the case if the actors had tried to do this independently. There was a clear need for both programmes, something which can be seen e.g., in the fact that their services have been widely utilised with demand for them remaining consistently high. As such, the services have mostly received good feedback and when the programmes end it is clear that the need

for these services remains. More generally, the programmatic activity and the public investments made through the programmes also raise the importance of the sector and its development themes. Since the health and well-being sector is socially significant it is important that investment is made in its development. Without properly targeted support, the development of the industry would clearly be more uncertain.

The PHF and SLF programs are examples of how, with the merger of Tekes and Finpro in 2018, Business Finland's programs have become more comprehensive in their activities and goals. In addition to the promotion of RDI activities and the development of ecosystems, the programs have been able to bring together a significant investment in services and activities related to internationalization, export promotion and attracting investments to Finland. With this, it has been possible to develop the health and wellbeing sector more comprehensively and gather resources and measures into a more parallel whole under the programmes. Through the programs, it has been possible to successfully offer the services and networks of Business Finland's internationalization and at the same time support RDI work, which can potentially lead to new products and services with international markets in mind.

Lessons have also been learned from the programmes, considering the development of future programmatic measures:

- The programmes did not succeed in connecting operations and customers strongly to EU networks, development projects and funding. In future, it will be important to better link the programmes to the strategic goals of the EU health sector and to its funding and development networks.
- The marketing of the programme's customers could be further developed in the programme's services which aim at partnership. Company offerings could, for example, be more versatile: covering the various functions. In addition, it is important to make use of the existing good operating methods developed in programmes. Consolidating the Finnish supply as a catalogue with potential international partners in mind has been a useful method of operation.
- When looking for short-term impacts, delegation trips and partnering events in Finland have been effective methods of operation.
- In the preparation of the programmes, the needs of the customers have been prioritised, but the customers have been less involved in the implementation phase of the programme. Customer orientation and dialogue with customers could be further increased in the programmes e.g., in the form of steering groups and advisory boards, with a greater customer perspective at the centre of these activities.
- The programmes have included a wide range of different types of services which have been implemented over time and also quite frequently. The programmes' service offering has perhaps however been too broad and in some cases overlapping. In future, actions could be prioritised while more effort should be placed on the most effective actions.
- The programme's personnel resources in relation to the ambitious goals of the programmes remained a challenge throughout. In future, it will be necessary to ensure that an appropriate level of human resource is provided and dedicated solely to programme implementation.

5. OVERALL EVALUATION OF BUSINESS FINLAND'S CONTRIBUTION TO HEALTH AND WELLBEING, 2000-2022

Business Finland (previously Tekes and Finpro) has implemented a wide range of activities over the past 20 years with the aim of developing the health and wellbeing sector in Finland. It has channelled over 1,798 billion euros in funding to develop the sector since 2008. The health and wellbeing sector has been one of the key funding target areas for Business Finland during this period.

Business Finland's thematic efforts and funding are focused on programme activities, SHOK activities (SalWe), basic project funding in the sector, as well as, for example, campaigns and other activities. Business Finland has implemented 16 programmes, each directly focusing on the thematic area. It must be also remembered that several other programmes have supported the development of the sector by promoting, e.g., digitalisation, programmes which have also benefited the development of the health and wellbeing sector.

5.1. RELEVANCE AND COHERENCE OF THEMATIC EFFORTS

The health and wellbeing sector represents an important focus area for Business Finland with the theme gaining a strong position in the organisation's portfolio over the last 20 years. Its importance, in a broader organisational context, has however waxed and waned over time. In relation to themes such as digitalisation and bioeconomy, it has clearly remained less important, while its position and the resources allocated to it have had to be justified at certain times such as during the drafting of the new strategies for Tekes and Business Finland. Changes have also taken place in which funding for the health and wellbeing sub-themes, among other things, were targeted for cuts.

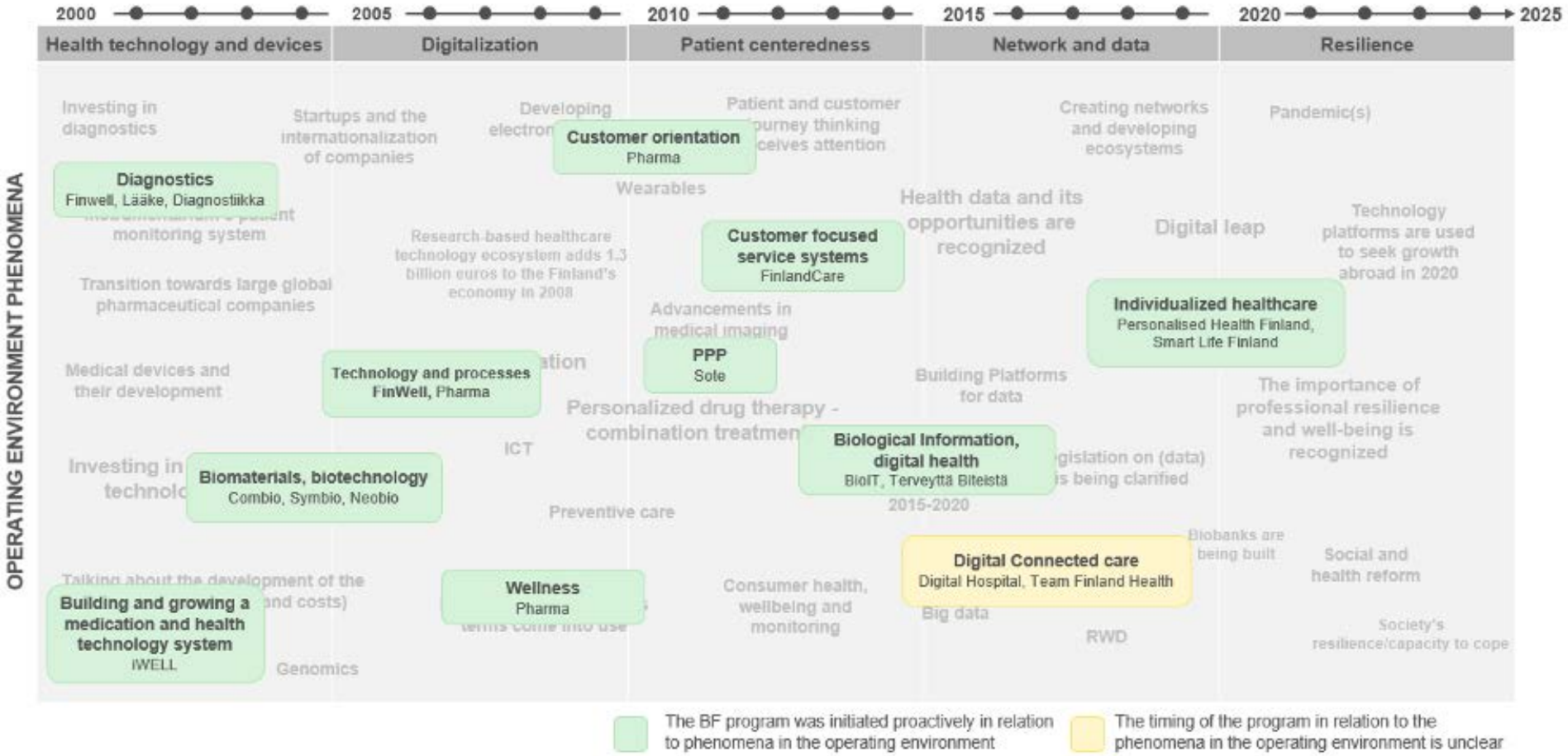
Business Finland's programme themes have related to diagnostics, biotechnology, pharmaceuticals, the need for reform of the healthcare system, the need for preventative care, rehabilitation and the maintenance of functionality, especially in relation to the elderly population and home care. They also cover the ongoing themes of digital health and the intersection of health care, biotechnology, medical devices and IT as well as personalised healthcare, all

of which were recognised as important early on and thus implemented in the programmes. [3]

At the turn of the millennium, Finland and Tekes in particular began to invest heavily in biotechnology, health technology and in the pharmaceutical industry. [4] After 2008, the emphasis shifted to services, digitalisation and the utilisation of health data. At the same time, different things have been emphasised more generally in Business Finland's programme activities and other activities. In the 1990s, the emphasis here was clearly on technology development. In the 2000s, advancing commercial utilisation became a stronger focus area, while recent years, have seen internationalisation emphasised more than ever before. More dimensions have been added to the programmes over time, with support now provided across a wider area in order to better address the needs of customers. In the past, internationalisation activities were stronger in Finpro's programmes and RDI activities and network cooperation was developed at Tekes. In recent Business Finland programmes, both perspectives have however been featured in the programmes. The background to this is the merger of Tekes and Finpro in 2018, as a result of which more recent programmes include Tekes' RDI services and Finpro's internationalisation services. This is also partially reflected in how the development of the health and wellbeing sector has been supported. The programmes of the early 2000s gathered together and networked the field of actors, directing R&D activities and promoting global growth. The newer programmes have placed a stronger emphasis on advancing commercialisation and internationalisation as well as 'Invest in' activities. [5] The strength of recent programmes is that there is now a wider range of different activities that can be offered to customer groups for different needs.

At the beginning of 2000s the main focus of the programmes was on health technology and drug development (Diagnostics, Lääke2000). In these programmes, technology development and biotechnology were viewed as particularly important (iWell, Combio, NeoBio), with the FinWell programme in particular developing the concept of supporting technology in addition to development as well as the need to develop and change operating methods. After 2008, the focus of BF's operations expanded to include services. This change reflects the broader transition from closed to open development models in the health sector particularly in relation to joint development. As with the Pharma programme, the Diagnostics programme placed a strong emphasis on advancing commercial use research results and creating new business opportunities. In terms of continuity, Tekes' Finnwell programme (2004-2009) can be seen as a continuation of the Diagnostics programme.

3 Pharma-ohjelman loppuarviointi sekä diagnostiikka- ja Lääke 2000 -ohjelmien jälkiarvioinnit, Tekes, 3/2013
4 The impact of Tekes Activities on wellbeing and environment, Review 308/2014
5 Striving toward a vibrant ecosystem, Evaluation of Tekes' Combio, BioIT and Trial Programmes, Tekes, 5/2016



PICTURE 22. OPERATING ENVIRONMENT AND BUSINESS FINLAND PROGRAMME THEMATIC ACTIONS.

On the public sector side, the structural changes in the social and health sector were taken into account with the SOTE programme, where the service system and the public sector played a strong role. This was an exceptional programme where instead of focusing on business, there was a stronger focus on the public side. On the other hand, Tekes has also received criticism that its focus area should be, specifically, business development.

Several Business Finland programmes have emphasised the importance of digitalisation in the sector. In particular, programmes such as "Innovations in Social Services and the Health Care System (SOTE)", "BioIT", "Bits of Health" and "Digital Hospitals" have each focused on the digitalisation of services. The funding mechanisms within these programmes have prioritised cross-sectoral and multi-organisational cooperation. Additionally, digitalisation was a thematic focus of programmes such as "Digital Hospitals" and "Team Finland Health". The "Digital Hospitals" programme (2015–2017) introduced by Finpro aimed to identify and utilise business opportunities arising from hospital construction and renovation works, particularly in the Nordic area. This thematic focus on digitalisation has led to successful Public-Private-Partnership (PPP) efforts, including the development of AI and predictive healthcare, as well as the increased provision of digital services (such as apps, chats and electronic prescriptions) collaboratively, between public service providers and ICT companies. [6]

Over the last 20 years as a whole, BF/Tekes'/Finpro programme operations have generally been relevant to the operating environment. Recent programmes emphasised notions of reactivity and business growth more strongly as well as that of internationalisation to new markets within the overall context of shorter-term programme goals. The older programmes had a greater focus on advancing commercial utilisation and technology with longer-term goals being focused more. Overall, the programmes have responded to the challenges and opportunities in the operating environment and into the development trends of the foreseeable future rather well. Compared to normal project funding, the programme's continuity has enabled the utilisation of previous expertise more effectively. [7]

The Strategic Centre for Science, Technology and Innovation (SHOK) SalWe, in the health sector, was founded in order to combine more effectively relevant industry-driven and scientific expertise. There was a clear need for this kind of activity. SalWe was a good experiment and was used as a new instrument to advance cooperation between business life and research organisations on a sector-by-sector basis. There were however problems, as different actors had different, often, contradictory objectives, for example, companies generally displayed a propensity towards short-term interests while research organisations aimed at long-term scientific breakthroughs[8]. Nevertheless, SalWe did highlight important themes in relation to the future of the health and wellbeing sector,

6 Striving toward a vibrant ecosystem, Evaluation of Tekes' Combio, BioIT and Trial Programmes, Tekes, 5/2016
7 Pharma-ohjelman loppuarviointi sekä diagnostiikka- ja Lääke 2000 -ohjelmien jälkiarvioinnit, Tekes, 3/2013
8 Kaisa Lähteenmäki-Smith, Kimmo Halme, Tarmo Lemola and Kalle Piirainen (2013) "Licence to SHOK?" External Evaluation of the Strategic Centre for Science, Technology and Innovation. Ministry of Employment and Economy. January 2013.

producing numerous insights and valuable information on the issues at hand.

Business Finland's project funding has enabled the project implementers' own development needs within the framework of the funding criteria and it has also directed the development of the industry in accordance with, among other things, the programme themes. According to previous evaluations and also in line with the data upon which this evaluation is based, funding has enabled development that would not have been implemented at all or in the same way without it. The funding has therefore matched well the needs that have existed in the sector. In recent years, project funding has focused in particular on the development of health technology, solutions for the utilisation of health and wellbeing data, the development of medical devices and the production of research information in the field of health and wellbeing.

Business Finland's foresight activities have also been successful in the health and wellbeing sector. In forecasting activities, cooperation has been carried out with key players in the field. This has been a key factor in its success. In addition, Business Finland has also utilised good levels of know-how and the ability for foresight in its own organisations. Something which, in the future, it is clearly worth continuing to invest in.

5.1.1 SUSTAINABLE DEVELOPMENT AND THE DEVELOPMENT OF THE HEALTH AND WELL-BEING SECTOR

Business Finland has promoted sustainability through its earlier thematic choices and actions, including support to health and well-being. It is fair to say that promoting healthcare can be closely tied to promoting sustainability. Healthcare is a fundamental aspect of human well-being, and a healthy population is essential for the overall well-being of a society. Even though Business Finland's main focus has been on business development, supporting health and well-being sector does also typically support societal well-being and the UN's sustainability goals, most obviously the goal SDG3 "Good health and well-being" that aims to ensure healthy lives and promote well-being for all at all ages. Today, sustainability is one of the cornerstones of current Business Finland strategy.

5.2. EFFECTIVENESS OF THEMATIC EFFORTS

Business Finland's various efforts and activities in respect of the development of the sector have different logics in terms of creating the desired impacts. Some of them have functioned well while others have been less effective.

The programmes have, in many respects, been the most essential tools to specifically assist in the development

of the health and wellbeing sector for Business Finland. Programmes are important activities especially in the sense that they bring the actors in the sector together, direct the development of the sector and respond to the specific needs of the development of the sector. For example, from the perspectives of the development of medicine and diagnostics clusters and more open cooperation among the actors involved, the programmes have played a key role. In addition, programme services are very important in enabling the internationalisation of companies in the sector. Internationalisation services are very important for many operators, particularly so for smaller companies, as their own ability and resources to engage in such activities would not be sufficient. The key added value of the programmes is that they offer services and funding to the sector that would otherwise not be available.

The programmes have also directed R&D activities and thus promoted the kinds of new innovations that emerged from the R&D work, though in recent years, they have increasingly stepped back from this steering role focusing instead on enabling and sparring the development work in relation to emerging innovation ideas from the sector.

The programmes have also supported pathways to successful commercialisation by providing end-user and stakeholder feedback through networks and events. The continuity of the programmes has been particularly successful in the fields of biotechnology, diagnostics and digitalisation, particularly from 2015 onwards.

The programmes' 'programme support' has proven effective in increasing the R&D intensity (the share of R&D expenditures in relation to turnover), innovation outcomes (new-to-market innovations) and the growth rates of the supported companies. The creation of new networks, particularly between sectors, has also reinforced and bred new public-private partnerships, adding additional value. Tekes' programming activities have increased operational-level cooperation between public sector actors and private sector operators. However, significant impacts have not yet been achieved in this area. The application process for Tekes' healthcare programming activities should be developed in a more interactive direction with additional coordination resources allocated to programming activities in order to achieve this. The projects have produced results, but no significant national breakthroughs that could significantly enhance the quality and productivity of national healthcare have yet occurred. The main obstacles to this have been the localisation of innovations made or the inability of the current service system to implement innovations. The matching of support to the beneficiary or consortium maturity level is also important here. For example, commercialisation activities are not always relevant at the beginning of the development process, i.e., in the R&D phase. Services advancing commercialisation, it is suggested, should be offered not necessarily within a programme but jointly for all programmes and specifically for those projects that are at that stage. [9]

9 Pharma-ohjelman loppuarviointi sekä diagnostiikka- ja Lääke 2000 -ohjelmien jälkiarvioinnit, Tekes, 3/2013

The drug development programmes reached their customer groups quite effectively. However, timely provision of services aimed at business development and internalisation remains a challenge in Tekes programmes' more broadly. Services aimed at advancing commercialisation and business development were mostly offered to projects ahead of time. In the Diagnostics Programme, the most obvious impacts on the industry's development were the bringing together of the actors in the field and the creation of networks and collaborations as a result of this. Additionally, the programme has had a significant effect on the emergence of new business ventures, improving the visibility of the diagnostics sector and introducing new methods during the programme's early stages when the diagnostic industry was undergoing significant transformation. The immediate programmatic effects of the Pharma Programme include the strengthening of companies' business expertise and the transfer of methods, tools and service concepts developed in the programme's projects to be utilised by the product development companies and service-oriented businesses. On the other hand, there is currently no evidence to suggest that the Pharma Programme has created an innovation environment in Finland which attracts international capital. The promotion of internalisation and the creation of new businesses have proven to be a challenge in Tekes' programmes. In addition, the inclusion of projects in the preceding stages of commercialisation has impacted the results in terms of the commercial utilisation of research and development work. The programmes formed a continuum in the pharmaceutical industry and were built on the expertise created in previous projects. The Pharma programme continued with those areas which were left unfinished in the Lääke 2000 programme, such as new services and other business opportunities. All the programmes have similar goals and content, but compared to the Lääke 2000 programme which focused on research and networking perspectives, the Pharma programme was clearly more service- and business-oriented.

According to the impact assessment, it became clear that both the NeoBio and Symbio programmes yielded numerous positive results which were significant in terms of driving progress for both companies and research organisations. The programme's R&D activities and networking actions have proven to be of great importance in developing new methods, processes and products within the biotechnology sector. Technology programmes, such as Combio, usually comprise different types of projects at varying stages prior to commercialisation process. To streamline the process, it would have to be more efficient to offer concrete services supporting commercialisation jointly for those projects that have reached such stage. A closer examination of programmes such as FinnWell, Innovations in Social and healthcare, Finland Care, Digital Hospitals and Team Finland Health programmes[10] reveals that the value of specific services to a beneficiary

10 Programmes contributing to health and wellbeing, Evaluation Report 2/2019

is dependent on their maturity as an enterprise and on the development phase of the technology, product or service. Generally, younger, less-networked enterprises benefit from a broader spectrum of services, including mentoring, coaching and networking opportunities, whereas more mature organisations benefit from tailored advice and networking opportunities. At the system level, cross-pollination and network building between sectors can generate additional value by fostering new public-private partnerships. The common denominator of value creation for beneficiaries is the expertise and insights provided by coordinators and programme managers, as well as networking opportunities. In general, the more involved an organisation is in the planning of these activities, the better the results tend to be.

In some cases, however, Tekes has been overly ambitious regarding the timing and the types of outcomes realistically generated. There is however an opportunity here for Tekes to show greater patience in terms of considering longer projects, with intermediate evaluations and an initial setup period. This will allow possible recruitment and other preparations to take place. In addition, the programmes' services have resulted in notable additivity, especially in the form of networking and some new long-term collaborative arrangements.[11]

Notwithstanding this however the programmes have not generated as much commercial activity as originally expected, partly due to initialvwas committed to the actions. In addition, the development of the health sector shifted more strongly to the concurrent and newer Business Finland programmes during the 2010s. Despite these challenges, there were however successful aspects to the SHOK's operations. In some SHOK activities, it was also possible to create larger projects that combined scientific research information and a business perspective related to the health and wellbeing sector. In these, it was possible to lay the groundwork for the development of the coming years, for example, in personalised and proactive health care. All in all, however, it must be said that the SHOK's activities were better suited to other industry sectors with similar needs and more unified development goals.

In the development of the health and wellbeing theme, synergies with congruent areas e.g., for digitalisation development activities, have not always been as pronounced as they could have been. For example, in the programme activities, actors in the health and wellbeing sector have benefited from developments in digitalisation and information processing with solutions being transferred to them, but the synergy here could have been even stronger. Digitalisation developers and health and wellbeing actors often remain isolated from each other while, on occasion, digital solutions have been offered to the health and wellbeing sector at too early a stage for the companies involved to properly process and utilise it. Clearly, it is important to understand that in the health and wellbeing theme, while programmes have been dedicated

11 Evaluation of the NeoBio and SymBio programmes, Tekes Report 3/2014

to developing digital solutions, developers from different fields have over been simply thrown together when, in reality, such cross-sectoral cooperation and coordination often takes time in order that both sides develop a mutual understanding of each other's real needs.

A further challenge that has been observed in recent years is that important substantive expertise in the health and wellbeing sector has been transferred away from Business Finland to other places. Developing the field requires a deep understanding of it. In addition, competence has, in part, been dispersed across the organisation because of the organisational reforms. This has somewhat weakened support for thematic measures. Ensuring the requisite level of competence remains in the BF organisation will thus be key in the future.

Business Finland's Growth Engine and Leading Companies funding instruments funnel a significant amount of funding to RDI activities. In the health sector however few clear Growth Engine or Leading Company funding projects have existed during recent years. The Clever Health Network is the only success in this sense. Specifically, in respect of Leading companies funding, the challenge here is however that the use of the instrument would require a larger organisation able to gather together other organisations around it for ecosystem-like development activities. In Finland, there are not many large players in the health sector. Thus far, the existing ones have not displayed sufficient interest in starting a Leading Companies project. This matter will change in 2023, when a new Leading Companies project will start in the health sector.

The basic project funding has enabled actors in the health and wellbeing sector to develop their operations based on their own needs, taking into account the funding criteria. Project funding has enabled the development of several innovation ideas and through the development work supported the development of the health and wellbeing sector from both a business perspective and a research perspective. In the evaluations of the projects included in the programmes, it can be seen that the added value of the funding has been significant and that it has enabled actions that would not have been implemented without the funding. The funding has therefore been targeted in such a way that it produces clear added value. Regarding the projects, assembling consortia has caused challenges for funding applicants and project implementers. The requirements for consortia are such that it is difficult to assemble consortia while it also takes a lot of time. The fundamental problem here relates to the structure of the Finnish business sector, where there are many small companies while consortia such as would be necessary here require the existence of Mid Cap companies, of which there are not many in Finland. In addition, Finland lacks larger Leading Companies that could manage larger projects. Moreover, a further challenge relates to the criterion used for internationalisation which excludes smaller domestic market companies.

Regulation and legislation continue to challenge the

full utilisation of health data. From the point of view of individuals' information security, the use of data should have its limitations and regulations, but it would be important to try to find ways to use them more broadly than at present. Moreover, from business point of view, the data enables a wide range of actions which could also be of significant social benefit if the data would be used in a regulated manner.

5.3. IMPACTS OF THE THEMATIC EFFORTS

During the period 2000-2022 thematic actions and efforts by Business Finland have produced many impacts in terms of sector development, bringing added value to it. When examining the impacts, the challenge is to separate out those flowing specifically from Business Finland's actions, as many factors influence the emergence of the recorded impacts. Some of the impacts arise directly as a result of Business Finland's actions, while others arise indirectly and are, in effect, the sum of many chained factors, in which case Business Finland's actions may have been, for example, one key part of the "chain" in question. Business Finland's contribution to many of these impacts is, nevertheless, clearly evident.

According to previous evaluations[12], several sample studies have demonstrated the significantly positive effect of Tekes support on companies. Tekes' support has improved or increased R&D intensity (the share of R&D expenditures in turnover), innovation outcomes (new-to-market innovations) and growth rates, something which is consistent with earlier impact studies. Moreover, the logistic regression of post-completion project questionnaires highlights that societal impacts were perceived to be higher from projects in which Tekes played a significant role.

The role of Business Finland in producing societal impacts is primarily related to the ability to create networks, add relevant partners to project consortiums and enable the use of outside resources. This way Business Finland has influenced firm behaviour through its intervention, thereby creating positive changes in how networks are established.

In the following, the key observed effects from the thematic contributions to the sector are presented on a general level.

The actors of the health and wellbeing sector are more closely connected with each other and stronger cooperation has formed between health and wellbeing organisations, for example between research organisations and companies as well as between SMEs and larger companies. Bringing together the different actors in health and wellbeing sector and its sub-sectors and catalysing cooperation is a prominent impact where Business Finland's contribution is clear. During the period 2000-2022, Business Finland has conducted many actions and funded important activities, for instance bringing actors

12 Evaluation of Tekes R&D Funding for the European Commission, Business Finland Impact Study, 3/2020

together in events, seminars, RDI-cooperation networks, testbeds and innovation ecosystems. The programmes provided essential platforms in terms of networking and partnering actors and in bringing the actors together. In so doing, the synergy benefits between the actors in the Finnish health and wellbeing sector has been strengthened. Supporting cooperation between research organisations and companies (including SMEs and larger companies) represents another important impact of Business Finland's work. In strengthening the cooperation between research organisations and companies, the Research to Business instrument has proven to be effective tool in activating co-development and precommercialisation of the results of RDI-work. At the same time as resources and know-how have been combined, RDI activities and internationalisation have been undertaken more effectively. For example, when thinking about internationalisation, Finnish actors gain better visibility and attention together than if they worked separately.

There is a clearer shared vision within the health and well-being sector regarding the themes that should be prioritized in development. From the point of view of commercial utilisation of R&D work, Business Finland has also directed development work in relation to health and wellbeing, in cooperation with the sector's actors. The important thing here is that Business Finland has produced an foresight vision in relation to the development of the industry and directed, for example, with the themes of programme activities where it is worth investing in the future. Through this activity, the group of actors also has a stronger common vision of future development, through which different actors can direct their own actions. It is important that there is an actor in Finland who also produces information on the development of the industry from a business perspective. Recently, Business Finland has also influenced the growth strategy of the National health sector's research and innovation activities and brought useful insight to it. Over the years, Business Finland has also been involved in and influenced other strategy processes concerning the development of the national health and wellbeing sector.

Business Finland funding has been instrumental in enabling a range of R&D activities in Finland, the results, and impacts of which would not have materialized without this support. A further important impact of Business Finland is that it has enabled RDI activities with its funding and sparring, something which would not have been carried out without its support. Business Finland has also accelerated the start of R&D activities earlier and enabled more ambitious RDI-work. RDI activities include both research-related impacts and more business-oriented RDI impacts. Innovations have been developed in these R&D activities, also resulting in commercial products and new business operations. Business Finland's influence on these commercialisation impacts has been clear, although several other factors also contribute to these impacts (companies' own business development, market development and competition, societal changes,

etc.). Business Finland's role is to create the conditions for the birth and progress of innovation processes and eventually also to advance to the level of business effects.

Internationalisation of Finnish organisations in the health and wellbeing sector. Business Finland has also had an impact on the internationalisation of the organisations in the sector. In particular, Business Finland's international expert networks and contacts and the internationalisation services offered by the programmes have been important in this regard. Internationalisation is also an area where the business field and other organisations need support in the health and wellbeing sector. In the Finnish business sector, most of the organisations are small. Internationalisation requires resources and the ability to establish contacts abroad, something which these organisations do not generally have. In this area, Business Finland has clearly brought added value to the sector. However, the internationalisation of organisations has also been challenging, as there is fierce competition on the international market and breaking into international markets requires timing and luck as well as the right product. The challenge for Finns is that there are no larger companies capable of wide-ranging internationalisation in Finland. These kinds of companies could also attract, through their networks, smaller companies to engage in these international markets. As such, it remains important to encourage the growth of these kinds of companies in Finland.

Growth of inward investment to Finland and a strengthening of the sector's funding base in general. Business Finland has also been able to improve access to external funding for the sector, with its invest in activities. For example, the Business Finland's programmes' networking services for international investors and target organisations have enabled investments in Finland and to Finnish organisations. The risk funding situation has also improved thanks to Business Finland's own venture capital activity where Business Finland collaborates with venture capital funds and business angels to contribute to the growth and development of early-stage companies. However, it is clear that attracting further funding will require additional action in future.

Particularly over the last decade, Business Finland has also been one of the main actors contributing to the strengthening of the Finnish start-up field in the health and wellbeing sector while at the same time, it has also influenced and enabled companies to develop their businesses especially in the health technology sector. The case studies reported below, illustrate how Business Finland has supported the development of businesses at different stages with different services.

The development of Finland as a platform for RDI activities in the health and wellbeing theme. Stronger development structures in the health and wellbeing sector (ecosystems, testbeds, networks etc.,). Business Finland's activities have also contributed to the improvement of the national development environment of the health and wellbeing sector and the improvement of

the actors' ability to develop. A good individual example is the FinnGen project (2017-2024), the creation of which was supported by Tekes and whose development has also been supported by Business Finland. Business Finland has successfully supported the development of Finland's know-how and improved opportunities in research activities related to biobanks. In addition, Business Finland has supported the operation of several innovation ecosystems and contributed to their development. Finland also provides a good platform for the sector's RDI activities in terms of data banks and people's skills.

Growth of various sub-sectors in health and well-being. A good example of this being the growth of the health technology industry. According to recent research, the Finnish research medicine and health technology sector has developed positively over the last decade, the value added has increased, employment has increased, work productivity has improved and profitability has risen. In addition, exports have grown and start-up activity has become even stronger in the sector. Research data shows that Business Finland's activities have played a key role in enabling these developments.[13]

There are also matters where Business Finland has not however been able to create impacts as strongly as hoped. The significant level of investment in the pharmaceutical industry has not produced the expected benefits, as even though there is top-class pharmaceutical research in Finland, the business benefits have not been significant. Significant risks are associated with pharma, since drug development requires long time-periods and there is fierce global competition in the field. Finnish companies are small and thus it is difficult for them to grow and compete with large global pharmaceutical companies.

Although Business Finland has succeeded in supporting the development and growth of the health technology sector, we have not seen many Finnish international success stories in the field of health and wellbeing. There have been individual successes and breakthroughs into international markets, but even these companies have not developed into the same success stories as, for example, have been seen in the gaming industry. There is fierce international competition in the industry, making it difficult to achieve significant international growth. However, Finland has an exceptionally high-level of competitive know-how. This has made it possible that even if Finnish companies do not grow independently in the market, large international companies are nevertheless ready to expand their operations into Finland and utilise Finnish know-how by acquiring and investing in Finnish companies and establishing, for example, product development units in Finland. In the future, however, it will be necessary to think about the ways in which Finnish companies could also grow into international success stories.

Business Finland has promoted health and wellness

13 Martti Kulvik, Tero Kuusi & Mika Pajarinen (2021) Terveysteknologia ja tutkiva lääkeala Suomen taloudessa. Elinkeinoelämän tutkimuslaitos. Kustantaja: Taloustieto Oy

cooperation with other industries though it is clear that even stronger effects could have been generated here. This is important because new innovations are often born at the interface between industries. The field of actors in the health and wellbeing sector could thus have received even stronger benefits from deeper cooperation with other industries.

CASE
CLEVERHEALTH NETWORK

The CleverHealth Network (CHN) is an innovation ecosystem that brings together healthcare experts and companies from various industries, such as health technology, information and communications technology and pharmaceuticals, to develop better treatment options and successful export products for Finnish companies. Product and service innovations are based on the extensive health data of the Helsinki University Hospital (HUS), leading clinical expertise, and identified clinical needs.

The CleverHealth Network, coordinated by Helsinki University Hospital (HUS) in cooperation with Spinverse and funded by Business Finland, was founded in 2017. CHN's objective is to bring together companies and leading healthcare experts to develop better healthcare solutions for Finland and successful health technology products for export using health data, as well as attracting foreign investment to Finland. Currently, the CleverHealth Network comprises 21 partners, HUS, Tietoevry, Siemens Healthineers, Novartis, Telia, Roche, Varian, Takeda, BCB Medical, BC Platforms, Business Finland, CGI, Elisa, Fujitsu, GE Healthcare, Innofactor, Microsoft, Noona, Planmeca, Productivity Leap and Pfizer.

The CleverHealth Network ecosystem hosts the innovation functions within its development projects which combine interdisciplinary talent with agile joint development models. The ecosystem is centred around the HUS data lake, a large-scale data analysis and storage location that is globally distinctive in its scope and of high quality. The HUS data lake is operated by HUS with support from the Finnish Innovation Fund Sitra. Overall, product and service innovations are based on HUS's extensive health data, the leading expertise of clinicians and identified clinical needs.

The CleverHealth Network is currently involved in several AI-assisted projects related to early disease detection, automated diagnostics, treatment selection, comprehensive home care and expert services for companies in health and medical technology. Additionally, the CleverHealth Network is involved in three EU-funded projects, AICCELERATE, Long COVID and Public Procurement of Innovation (PiPPI).

As part of these projects, HUS has been developing mobile applications for the measurement of health metrics and the utilisation of machine learning and artificial intelligence to make predictions about an individual's future health. Moreover, HUS has been developing AI-based image analysis tools, early diagnostics AI-solutions and mining data lakes to discover predictive disease-related biomarkers and personalised therapies.

In the EU-funded projects HUS is leading the AICCELERATE- project which aims to produce cost-efficient health care services by leveraging advanced AI technologies. The project includes three pilots and involves testing new AI solutions with other European hospital

partners to improve patient-centric digital care pathways and optimise patient flow management. In addition, HUS is also leading the Long Covid project which aims to identify the key mechanisms between the long-term effects of the disease through cohort and registry studies, mechanistic studies and intervention and follow-up studies involving long COVID patients. In the PiPPI project which is a community of practice for innovation in healthcare, HUS is working to improve cooperation between various stakeholders, such as physicians, researchers and product developers, in order to find solutions to healthcare challenges through innovation procurement.

The Clever Health Network has successfully facilitated the development of three research and development projects which have reached the stage where companies can now lead the productization and commercialisation efforts. In one project, a clinical tumour board application was developed to aid the treatment of acute leukaemia with the aim of automating cancer diagnostics and the selection of suitable treatment options through machine learning methods. The Home Dialysis project resulted in the development of an automated end-to-end service solution to provide safe home-based dialysis for patients, with medical staff provided real-time data about the patient's health. Lastly, the eMOMGDM project developed a mobile application to treat gestational diabetes to improve glycaemic control for expecting mothers. The companies in the lead for these projects were Tietoevry, Gillie and Fujitsu.

Furthermore, the internalisation plan has been actively implemented as planned, resulting in global recognition for the CleverHealth Network. Several international delegations made frequent visits to HUS to learn more about the results showcased in international conferences and events. The launch of several EU projects mentioned above is one obvious result of the hard work undertaken. Business Finland has granted the CleverHealth Network with an additional 2-years of funding to continue launching new projects, increasing international collaboration and scaling existing results.

CASE
FINGENIOUS (FINNGEN)

Fingenious is a service provided by the Finnish Biobank Consortium (FINBB) and owned by the six largest well-being services counties in Finland, Finnish universities and THL. Fingenious is a service portal and is supported partly on FinnGen -project for its content and implementation. The service allows researchers to use a single access request to access all hospital biobanks, providing the opportunity to combine different data sets for tailored research purposes. Furthermore, Fingenious comprises an ecosystem that facilitates collaboration among public, academic and private actors in the field of biomedical research. The aim of the Fingenious service is to support biomedical research, serving the needs of academic researchers as well as researchers in other industries, both nationally and globally.

Finngen is a large public-private partnership project which is dedicated to collecting and analysing genome and health data from 500,000 participants in the Finnish biobanks. Its primary objectives are to uncover groundbreaking insights with medical and therapeutic relevance while establishing a world-class resource for future research. The project brings together Finnish universities, hospitals, wellbeing services counties, THL, Blood Service, biobanks, international pharmaceutical companies, and hundreds of thousands of individuals in Finland. FinnGen notably represents one of the pioneering personalised medicine projects on such a large scale, standing out for its prominent collaboration between public and private entities. Fingenious is a service portal developed by FINBB and relies partly on FinnGen for its content and implementation.

Through the efforts of FINNBB, Fingenious aims to build the world's best biobank network and to increase health and biomedical research activity in Finland. The service intends to offer visibility and full access to Finnish biobank data, saving researchers' time and resources by automating and standardising biobank searches, filing and the compiling of data. Moreover, Fingenious aims to assist in the selection of the right partners through the Fingenious ecosystem network which comprises various public, academic and private actors in the field of biomedical research. The Fingenious Service aims to advance your biomedical research by speeding up the search for and compilation of relevant data and to serve both academic and industry researchers though a 'one stop' hub.

Fingenius has managed to combine all Finnish biobanks and stakeholders in Finland in the network. The activities they have facilitated include networking, but also more concretely, a portal through which feasibility requests can be sent to Finnish biobanks. Currently,

the biobanks involved in the collaboration include Auria Biobank, Helsinki Biobank, Borealis North Finland Biobank, Tampere Biobank and THL Biobank.

There are over 10 successful medical research use cases for Finnish Biobanks through Fingenious. Moreover, several collaborations have been established between FINBB and other companies. Last year Fingenious signed a partnership with the pharmaceutical company Novartis to further advance medical research in Finland. Other partnerships, in addition to FinnGen, have been developed with Bayer AG, Roche, aiwell Inc. and TriNetX.

Through the service customers gain access to data from all the public biobanks in Finland. The portal provides researchers with a single-access service for availability, feasibility and access requests, as well as research coordination and contract services. In clinical trials, the role of the Fingenious Service is to help users find study subjects and to choose their partners for research. The Fingenious Service seems to have attained its initial aim by providing a one stop hub to access the various Finnish biobanks and to thus save researchers time by automating and standardising searches for Finnish biobank data.

5.4. STATISTICAL ANALYSIS

The following analysis compares the turnover of firms in the health and wellbeing sector (HWB) that have received Business Finland (BF) funding to those that have not. The funded firms were identified by their specific HWB industry (5-digit level code), and participation in an HWB-related BF programme or SHOK programme. The data source for the funded firms is financial statements in the BF database. The data on non-HWB-funded firms are based on Statistics Finland industry-level statistics. Some of the non-HWB firms may have received other BF funding.

The 'firms' comprise only non-financial corporations in accordance with the Statistics Finland sector category classification. The industry statistics from Statistics Finland do not include financial corporations, government and its bureaus, municipalities, joint municipal authorities, non-profit associations, or foundations. The excluded organisations (universities, government research institutions, hospitals) cover 6% of the funded organisations but 31% of the granted funding. The firms included in the analysis are public limited companies, limited liability companies, cooperatives, limited partnerships, general partnerships, or private traders. In practice, almost all funded firms (99%) are either limited liability companies or public limited companies. There were 2882 firms in the sample.

The Business Finland financial data are based on the Suomen Asiakastieto Oy database which uses industry coding from the Finnish Patent and Registration Office (PRH) registers. The PRH does not necessarily depict the actual main industry of the firm. Statistics Finland uses multiple data sources such as the tax authorities to identify the valid industry for statistics. Thus, the industry codes of BF data and Statistics Finland do not fully match causing serious problems in terms of industry comparison, particularly in the HWB sector, where the firms are scattered across a wide range of industries.

Statistics Finland provides a service where the industry codes of individual organisations can be checked. Unfortunately, this procedure must be done manually. As such, it would be very time consuming to check the industry code for all firms. Thus, the check was done for all firms that had a significant role in their industry (5-digit level). The role was considered significant if the turnover of the firm was 1% or more of industry turnover (or turnover exceeded EUR 10 million) in 2021. In addition, firms in Health & Wellbeing-specific industries were checked. The check covered 322 firms, of which 87 mismatches were corrected to follow Statistics Finland. This correction has a significant impact, particularly in industries relating to the manufacture of instruments.[14]

The HWB-funded firms include only those firms that have received HWB funding between 2009 and 2019. The firms funded after 2019 are included in the non-HWB firms because the impact of funding in 2020 and 2021 is expected to be minimal. Also, Covid-19 funding in 2020 increased the number of funded firms without a clear

14 note: the proportion of mismatches is higher among large and old firms

connection to actual HWB funding activities.

All financial figures are converted into 2021 monetary values using the conversion rates provided by Statistics Finland. The turnover of non-HWB-funded firms has been scaled to match exactly with the HWB-funded firms in the year 2015 making a 'counterfactual' curve for the HWB-funded firms.

INDUSTRIES

We focus on three industry subsectors – the Pharmaceutical Industry, the Health Technology Industry, and the Health and Wellbeing Service Industry. The first two subsectors follow the structure of Kulvik et al. (2021).

The pharmaceutical industry encompasses not only the manufacture of basic pharmaceutical products and preparations but also the wholesale of drugs, as some international drug companies have significant research operations in Finland, even though they do not have manufacturing facilities there. There were 19 HWB-funded firms by the end of 2019. Orion Oyj, Santen Oy and GlaxoSmithKline Oy are the largest firms who, in effect, dominate the group. Other large firms in the industry belong to the group comprising the counterfactual. Some of these firms, such as Bayer Oy, have received BF funding but not during the period included in the analysis. BF funding in the period 2009-2019 amounted to 32 million EUR. Approximately 80% of the funding was granted in a single year, 2010.

Health technology includes health and wellbeing-related manufacturing, information technology, and research and development. Many health technology firms are classified in 'generic' industries such as 62010 Computer programming activities or 26510 Manufacture of instruments and appliances for measuring, testing and navigation. The firms, especially the large ones, may have several divergent product lines or customer target groups, with health and wellbeing representing only a small part of their business. We also extended our analysis to include research and development industries within the Health Technology sector. Note also that for 72191: Research and development on medical sciences, we decided to include it within Health Technology even though it could be considered a part of the Pharmaceutical sub-sector. The final inclusion criterion for the analysis was that health or wellbeing is the focus of the business. This was checked from the firms' web pages. We identified 348 Health Technology firms. Even though there are large BF funded firms here such Thermo Fisher Scientific Oy, Planmeca Oy, GE Healthcare Finland Oy, PaloDEx Group Oy, most firms in this area are small and medium size enterprises. BF funding during the period 2009-2019 was 398 million EUR. 57% of this funding was granted before 2013.

Health and wellbeing services also include miscellaneous health care services, fitness and sports facilities and activities. We identified 200 such firms that have received BF funding. The largest firms are Suomen Terveystalo Oy, Mehiläinen Oy, SYNLAB Suomi Oy and Lääkärikeskus Aava Oy. The total BF funding was 37 million EUR: Health and wellbeing-related phenomena that are not based on industry coding, such as Medical Tourism are not covered in the analysis.

TABLE 11. INDUSTRIES INCLUDED IN THE ANALYSIS

PHARMACEUTICAL INDUSTRY
21100 Manufacture of basic pharmaceutical products
21200 Manufacture of pharmaceutical preparations
46461 Wholesale of drugs
HEALTH TECHNOLOGY INDUSTRY
26510 Manufacture of instruments and appliances for measuring, testing and navigation
26600 Manufacture of irradiation, electromedical and electrotherapeutic equipment
32501 Manufacture of medical and dental instruments and supplies (excl. dentures)
32502 Manufacture of dentures, dental implants, etc.
72110 Research and experimental development on biotechnology
72191 Research and development on medical sciences
72192 Research and development on other natural sciences
72193 Research and development on engineering and technology
62010 Computer programming activities
62020 Computer consultancy activities
62030 Computer facilities management activities

62090 Other information technology and computer service activities
63110 Data processing, hosting and related activities
63120 Web portals
HEALTH AND WELLBEING SERVICE INDUSTRY
86101 Hospital activities proper
86102 Rehabilitation centres and nursing homes
86210 General medical practice activities
86220 Specialist medical practice activities
86230 Dental practice activities
86901 Physiotherapy
86902 Laboratory examinations
86903 Diagnostic imaging examinations
86904 Ambulance service
86909 Other health care services
93130 Fitness facilities
93190 Other sports activities

ANALYSING THE IMPACT OF BUSINESS FINLAND FUNDING ON THE INDUSTRY LEVEL: CHALLENGES AND CONSIDERATIONS

When scrutinising the influence of Business Finland (BF) funding on industry-level indicators, a multitude of challenges must be navigated, including the following:

1. **Predominance of Large Firms:** Many industries are characterised by a limited number of large corporations that wield substantial influence in terms of turnover, headcount and export values. In this context, BF funding often appears modest when juxtaposed with the sheer scale of these corporates. Tracking this impact becomes an intricate endeavour due to non-fund-related business activities like acquisitions or divestitures which can exert a disproportionate influence on key performance indicators, thereby overshadowing the actual effects of the funding. Such external events can also alter the counterfactual scenario for analysis.
2. **Inclusion Limitations:** The dataset used for this analysis is limited to legal entities registered in Finland. BF funding to the Finnish operations of multinationals could significantly contribute to their global success, but this influence might not be adequately represented in the dataset.
3. **Industry Classification Ambiguities:** The reliability of industry coding in public databases, as previously highlighted, remains a cause for concern. Even when utilising Statistics Finland's coding, some industry classifications remain ambiguous. Furthermore, business units oriented towards Health and Wellbeing within diversified conglomerates cannot be distinguished from other business lines. Consequently, multi-industry firms have been excluded from the analysis. Additionally, certain HWB-focused entities do not fall within the defined scope of our analysis (as indicated in table 11).
4. **Data Quality Concerns:** Various data quality issues have been encountered in the available dataset. Some small businesses exercise their option under the Accounting Act not to report turnover in their financial statements. Additionally, the reporting of the number of employees is not mandatory for all businesses, even though larger corporations typically disclose this information. Furthermore, the export statistics at the industry level suffer from partial data sparsity.
5. **Spillover Effects on SMEs:** The reach of BF funding is not confined solely to the funded enterprises. In many cases, such funding triggers spillover effects that reverberate across the broader ecosystem, often benefiting small and medium-sized enterprises (SMEs) across various industries. Unfortunately, the intricacies of these cross-industry dynamics evade measurement using industry-level data. Consequently, this vital perspective remains necessarily absent from our analysis.

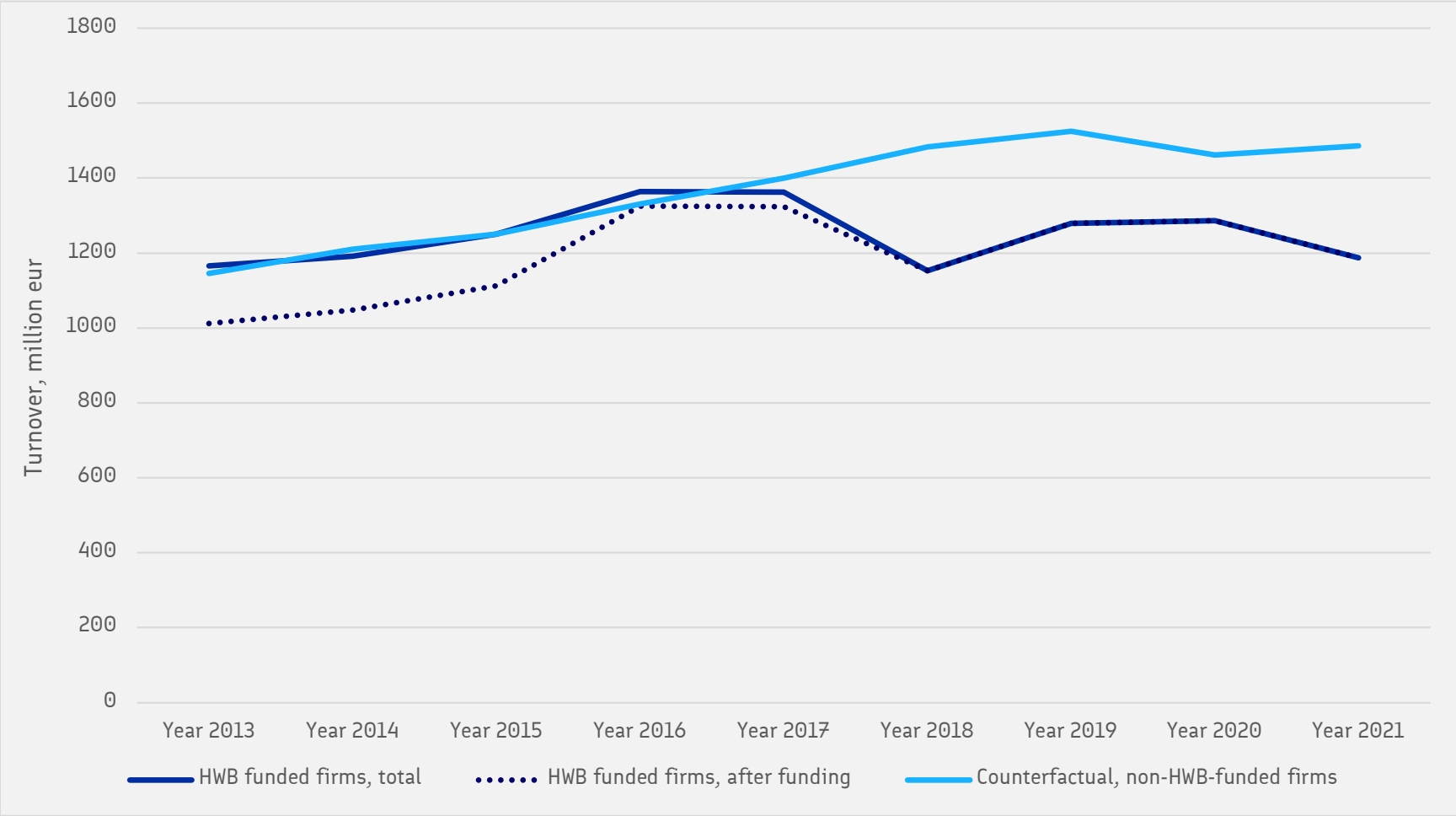
6. **SME Categorisation Dynamics:** BF funding aims to benefit SMEs, a category explicitly recognised in industry statistics. However, a challenge arises when these firms surpass the SME criteria (defined as having fewer than 250 employees, an annual turnover less than 50 million EUR, or a balance sheet total below 43 million EUR). Firms that grow beyond these thresholds are subsequently excluded from the SME statistics, introducing a downward bias to the analysis of the growth trajectory of initially SME-classified businesses.

Given the intricate nature of these challenges and uncertainties, it is essential to approach the results of our statistical analyses with caution, understanding that they are indicative in nature and subject to a variety of contextual factors and limitations.

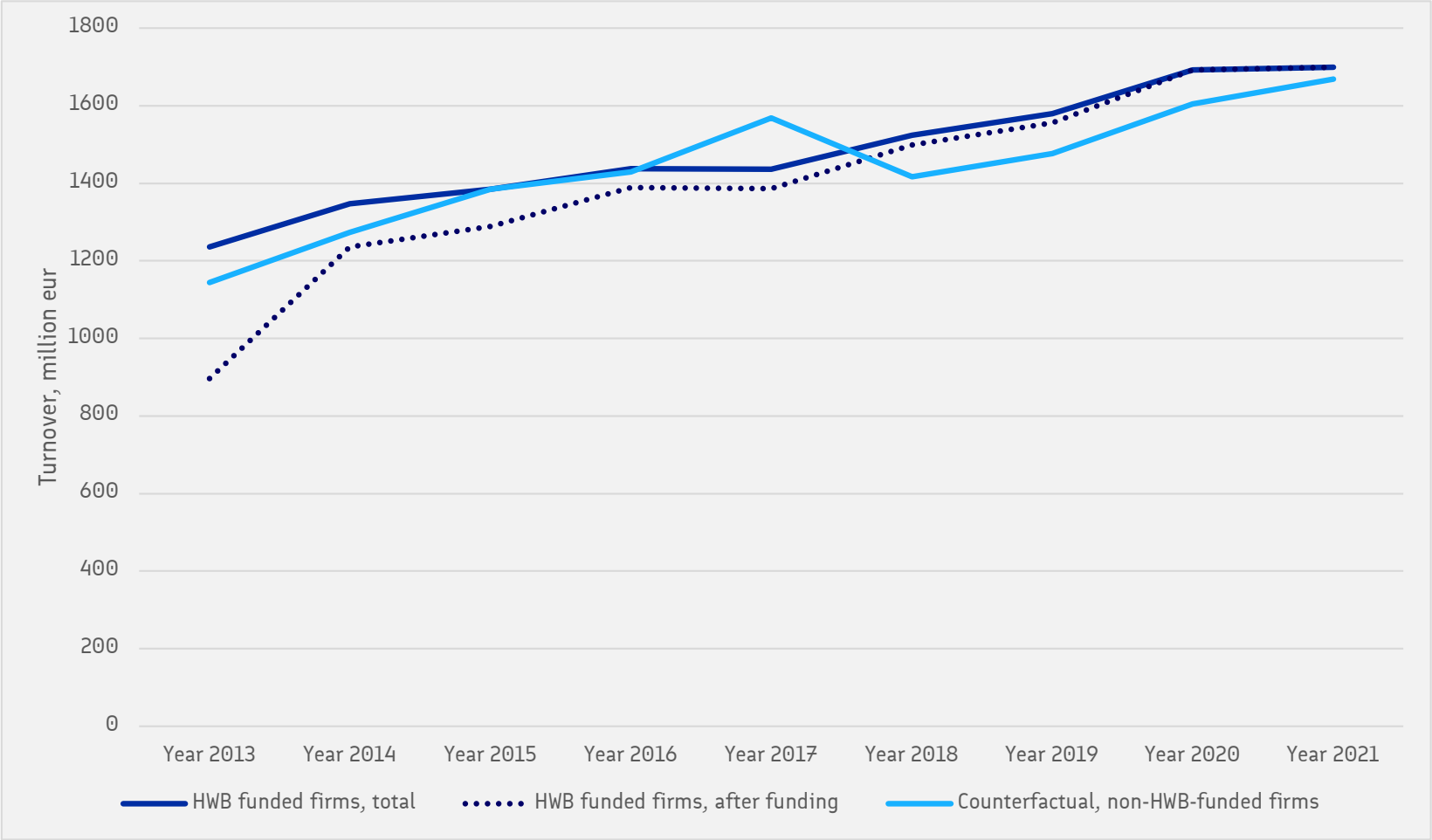
TURNOVER

The counterfactual list of companies has been formed from those industries that have companies that have received funding from Business Finland. The turnover has been scaled to match exactly with the reference year of 2015. Thus, the turnover values in EUR of the counterfactual companies are not actual.

Picture 23 presents the turnover curve of the Pharmaceutical Industry between the years 2013-2022. The curve indicated that the HWB firms and the counterfactual based on the nonfunded firms follow the same growth pattern until the year 2017. After 2018, the counterfactual continued growth while the HWB funded firm dropped. As the industry is dominated by a handful of large firms, the turnover curves are sensitive to the success of individual firms. It should also be noted here that funding has been minimal after 2010.



PICTURE 23. TURNOVER, PHARMACEUTICAL INDUSTRY, YEARS 2013-2021



PICTURE 24. TURNOVER, HEALTH TECHNOLOGY INDUSTRY, YEARS 2013-2021

The turnover curve of the Health Technology Industry is presented in Picture 24. The HWB-funded firms and the counterfactual follow mainly similar curves. However, the growth of the pool of HWB-funded firms has been constant and the trajectory has been slightly more positive since 2018. The portfolio of the HWB-funded firms is significantly larger, while the firms are, on average, smaller than in the pharmaceutical industry which may explain the constant growth.

Significant variations exist among the industries encompassing the Health Technology sector.

Some industries within Health Technology's Business Finland-funded firms have displayed notable successes. Take, for example, industry 26510: Manufacture of instruments and appliances for measuring, testing, and navigation. After 2017, HWB-funded firms in this industry experienced substantial growth in turnover. In 2021, total turnover was 32% higher than the counterfactual group. Similarly, in industry 62010: Computer programming activities, the distinction is even more apparent. HWB-funded firms exhibited robust growth after 2015, with a 91% higher total turnover than the counterfactual group in 2021. These industries are home to a significant number of SMEs and emerging stars.

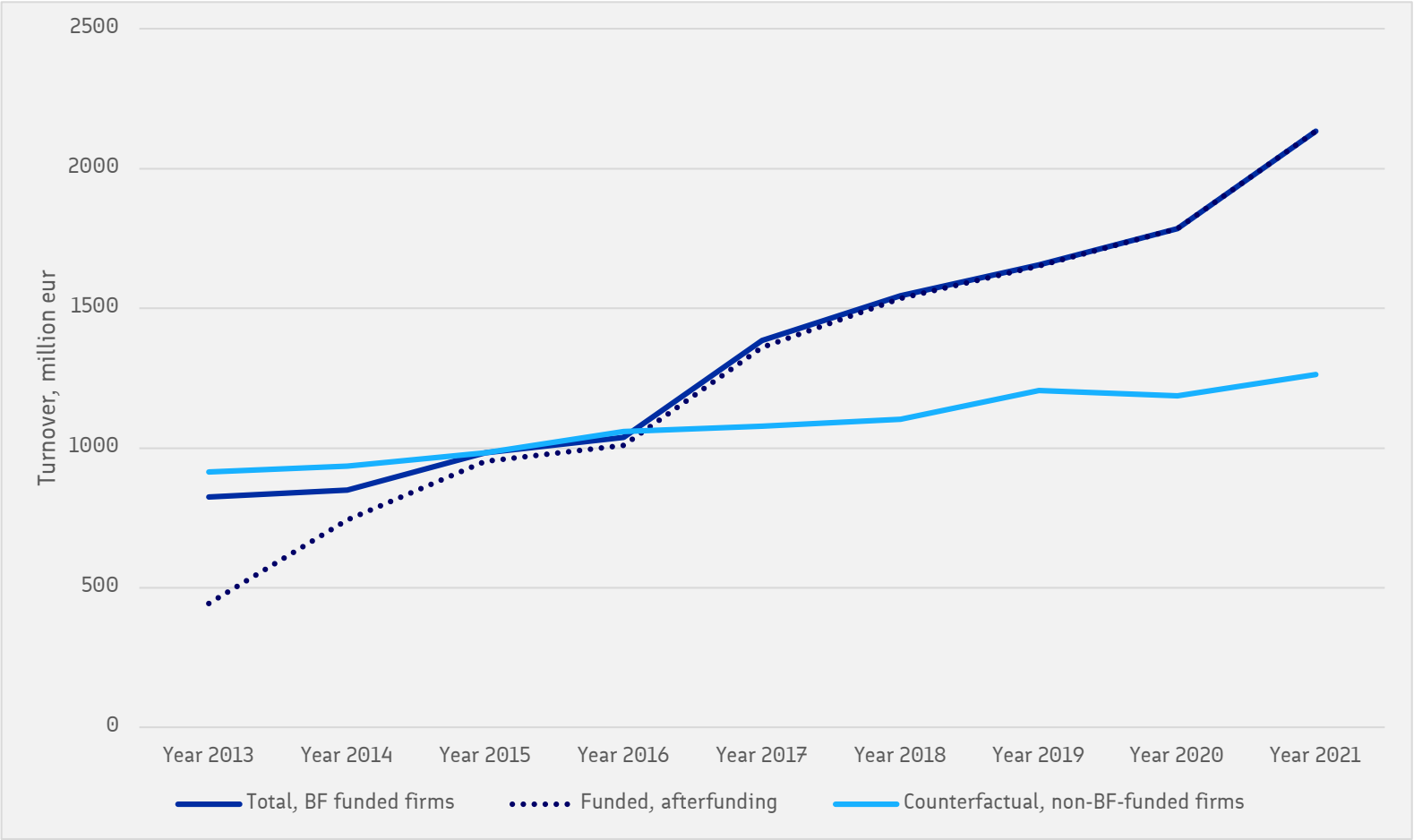
Conversely, industries 26600: Manufacture of irradiation, electromedical and electrotherapeutic equipment and 32501: Manufacture of medical and dental instruments and supplies, are predominantly comprised of HWB-funded firms. In these cases, non-HWB-funded firms in the same industry are not suitable for comparison. The counterfactual is established based on all non-HWB-funded manufacturing firms. In contrast to the overall manufacturing sector, turnover trends have remained relatively stagnant since 2014, with 2021 turnover figures ranging from 25% to 30% below the counterfactual. These sectors primarily consist of large, stable firms.

The Finnish research and development industry has enjoyed a period of substantial growth in the past decade, particularly in 72191: Research and development on medical sciences which has experienced a 50% increase since 2014. The growth trajectories of BF-funded and non-funded firms are similar, albeit with BF-funded firms achieving a 10% higher total turnover in 2021.

In 72110: Research and experimental development on biotechnology, remarkable growth is evident, with the sector expanding from 28 million EUR to 180 million EUR (over 640% growth). The comparison between BF-funded and non-BF-funded firms in this sector is however difficult due to the small number of medium-sized firms dominating turnover figures, leading to high annual fluctuations. While BF-funded firms have grown from 3 million EUR in 2013 to 50 million EUR, the counterfactual is three times higher, influenced by specific events in one or two non-funded firms.

Appendix 1 elaborates on the turnover growth of the selected industries in Health Technology.

The third main branch in Health and Wellbeing industries is services. This industry has grown significantly, especially since 2016. The HWB-funded firms have also grown significantly. The growth of the HWB-funded firms is caused by factors not related to BF such as the increasing demand of ageing population and extensive use of private sector services in the municipalities. On the other hand, the BF funding (37 MEUR between 2009-2019) is minor compared to the size of the industry. Despite the large growth, it is unlikely that BF funding has had a significant impact on the growth curve of the industry.



PICTURE 25. TURNOVER, HEALTH AND WELLBEING SERVICES

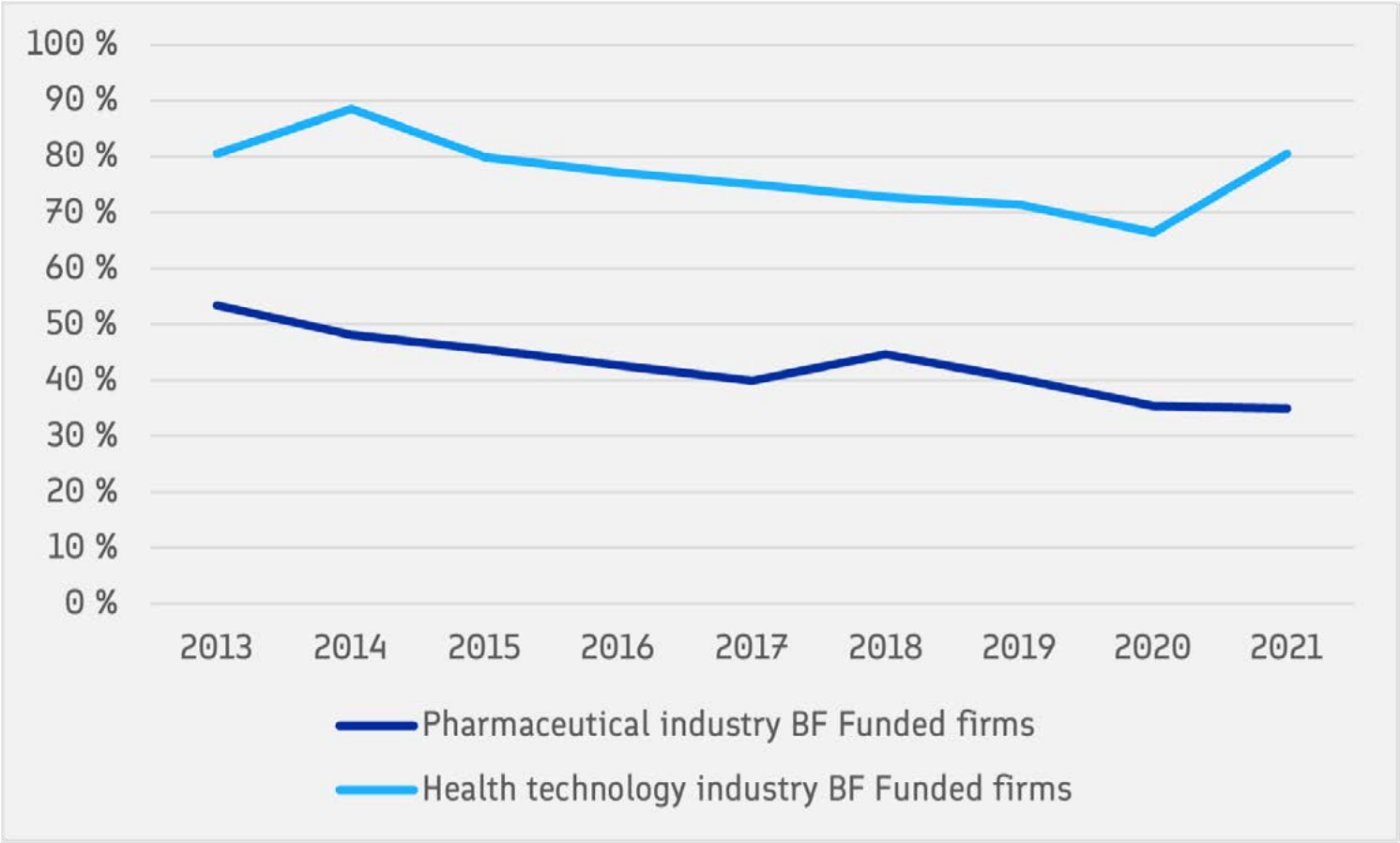
In addition to assessing the overall turnover of the sub-sectors, we conducted a focused examination of turnover growth exclusively within the small and medium-sized enterprises (SMEs). This approach was chosen to mitigate the influence of a handful of dominant large firms that exert significant control within the industry. Our specific area of interest was the Health Technology sector, notable for the substantial presence of funded SMEs.

The trajectories of HWB-funded SMEs and the counterfactual closely aligned until 2019. However, in the years 2020 and 2021, HWB-funded SMEs outperformed the counterfactual. In 2021, their total turnover exceeded the counterfactual by 9%. Notably, between 2015 and 2021, the turnover growth of HWB-funded firms exceeded that of the counterfactual by 27%. For a more comprehensive analysis, please refer to Appendix 1.

EXPORT

Our analysis of the contribution of BF exports to the HWB sector is based on the export data from BF databases and industry-level statistics from Finnish Customs. The industry level export data is only on the 3-digit code level while there are also quality issues to address (e.g., partly missing yearly data on the industry level). Thus, the export analysis covers only the pharmaceutical industry and health technology without analyses regarding specific industries. According to the Finnish Customs Authority the export of HWB services is small (approx. 2 million EUR yearly) and not included in the analysis. Furthermore, it is important to note that a sizeable number of major Finnish health and wellbeing firms are part of international corporations. Consequently, the practice of transfer pricing between the subsidiaries can exert an influence on the export values of the respective industries. This factor should therefore be taken into consideration when assessing the dynamics of the HWB export market.

Figure 31 compares the proportion of exports in HWB-funded firms in the pharmaceutical and health technology industry. In health technology, the proportion of exports has been, on average, 77%. This trend was however declining until 2021 when the proportion rose again from 66% to 81%. In the pharmaceutical industry, the HWB-funded firms exported, on average, 43% of their turnover with the proportion again declining. The ratios cannot be compared with non-HWB-funded firms because the export counterfactuals are based on a higher-level industry definition than the turnover counterfactuals.



PICTURE 26. PROPORTION OF EXPORTS, BF FUNDED AND NON-BF FUNDED FIRMS.

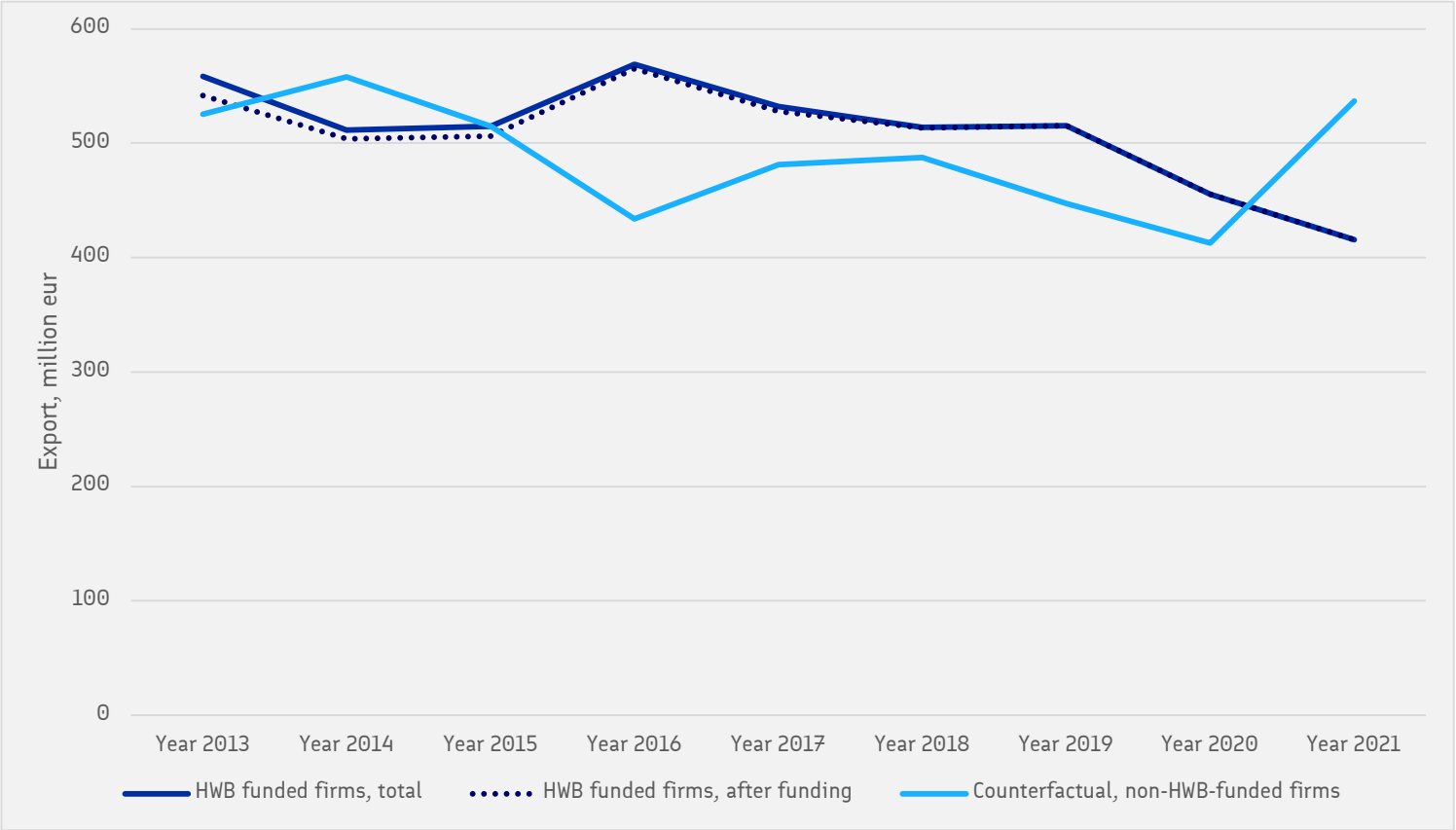
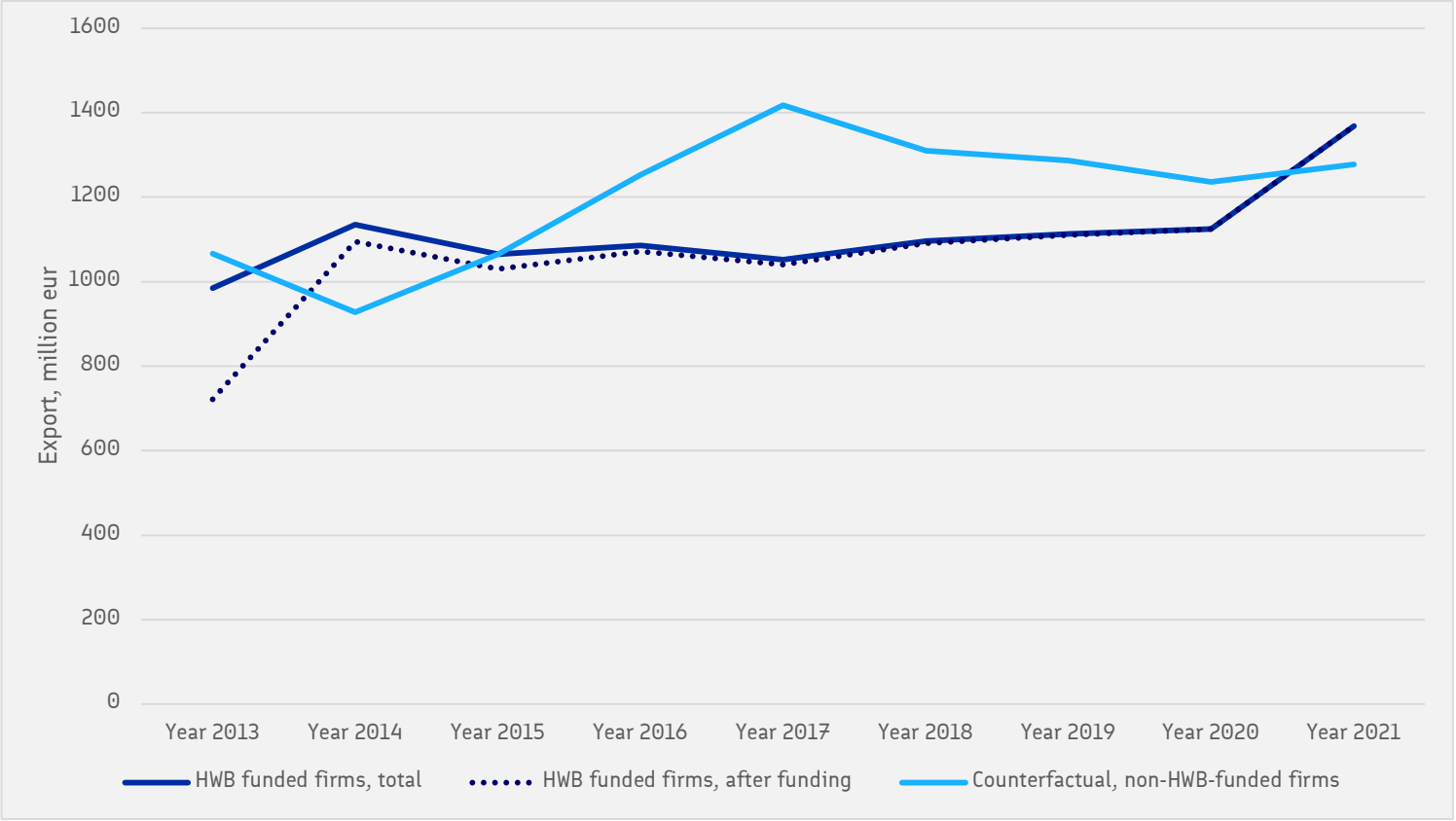


FIGURE 27. EXPORT PHARMACEUTICAL INDUSTRY

Pharmaceutical industry exports (Figure 32) have been declining slightly since 2013. The export curve of the HWB-funded firms was however more positive than the counterfactual up to 2021.

In terms of the health technology industry, exports were stable until rapid growth occurred in 2021. Counterfactual exports were however above the curve of the HWB-funded firms. The counterfactual is an adjusted curve based on a wider industry scope used in the turnover. The export statistics suggest, indicatively, that the HWB-funded firms are significantly more export-oriented than non-HWB firms.



PICTURE 28. EXPORT, HEALTH TECHNOLOGY INDUSTRY

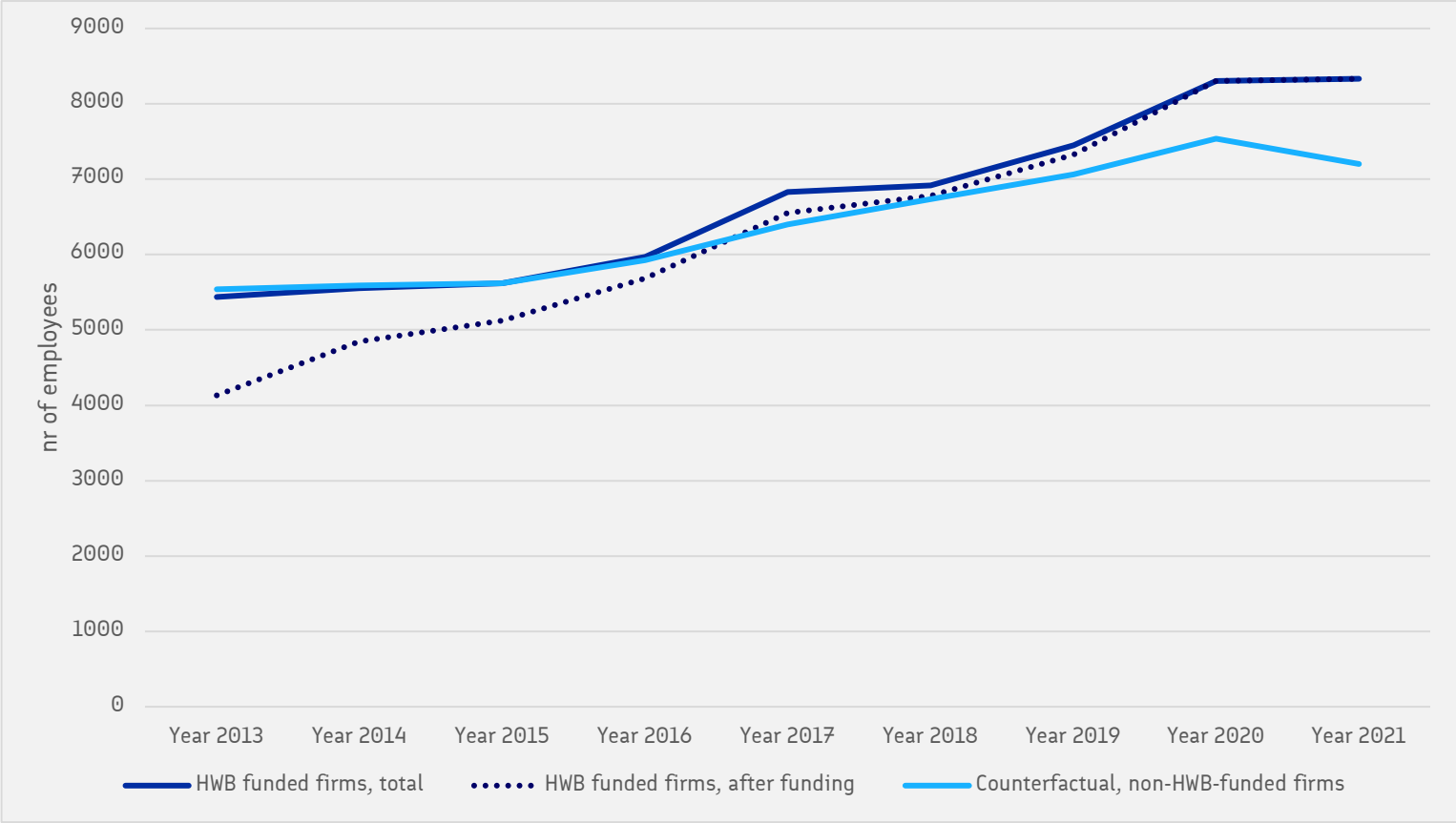
NUMBER OF EMPLOYEES

Using the number of employees as an illustrative statistic has limitations as it is not mandatory information that firms need to report. On a firm level then, it is not reliable, particularly for small firms who do not report it. Thus, wages and salaries (EUR) are often used as a proxy for the number of employees. In this case however, we do not have wages and salaries, though the number of employees here can be considered more accurate than usual. The industry-level numbers depend on large and mid-size firms which do tend to report on the number of employees. The counterfactual is based on the industry-level data of Statistics Finland.

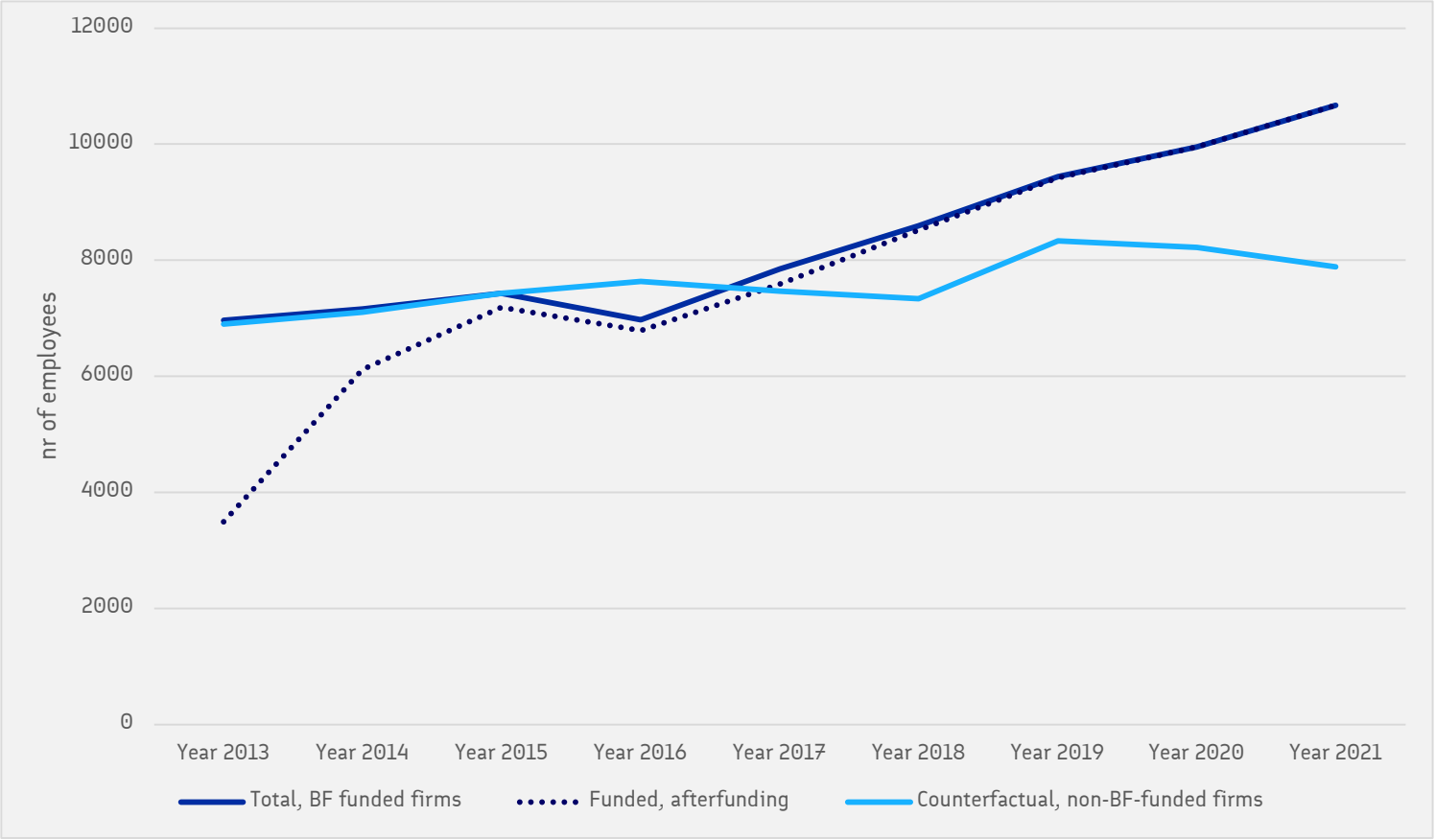
In the pharmaceutical industry, Figure 34, the number of employees follows the pattern of industry turnover. The headcount of the non-HWB-funded firms has grown strongly in recent years while the number of employees in the HWB-funded firms has been slightly, but constantly declining.

Figure 29. Number of employees, pharmaceutical industry

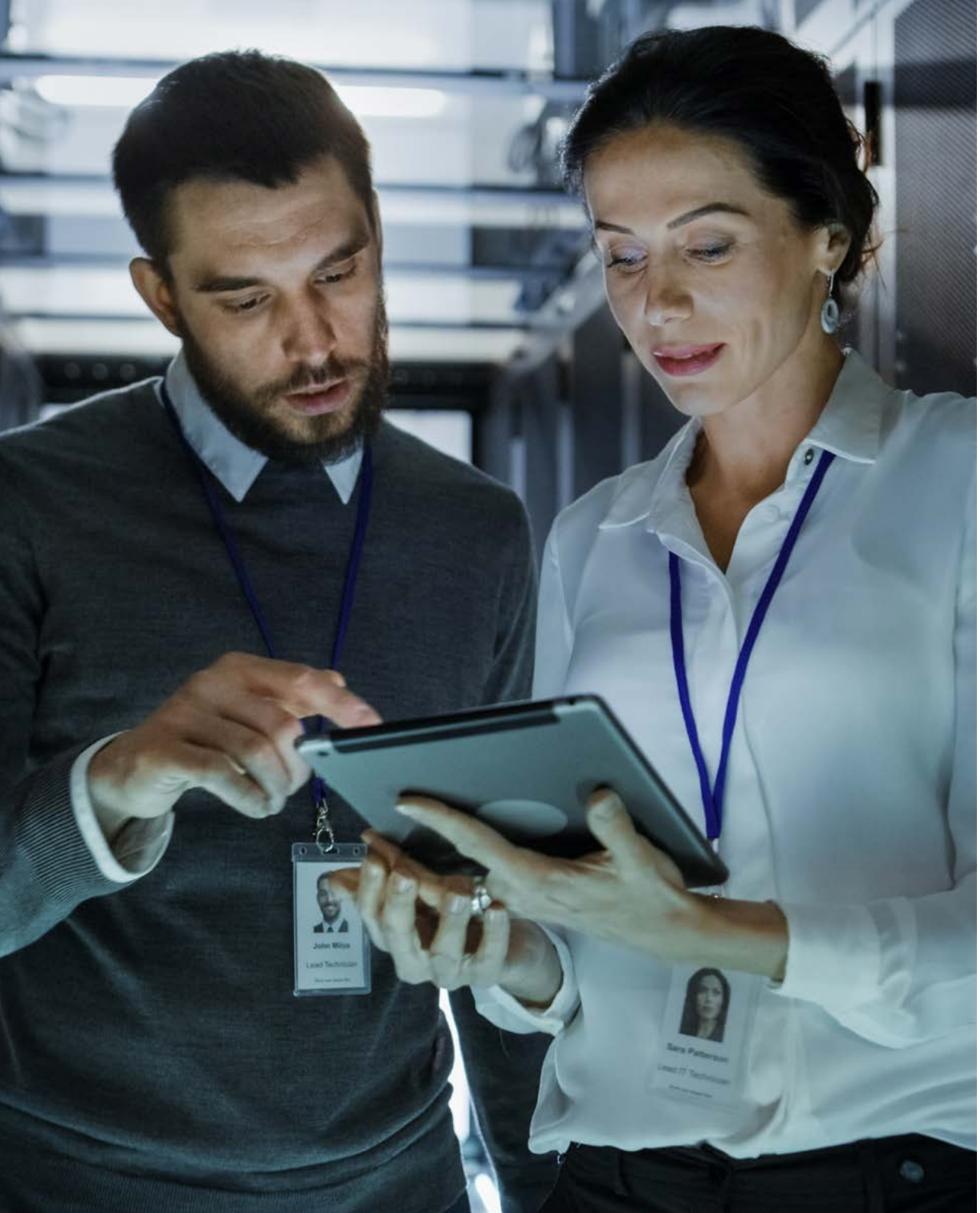
Figure 35 depicts the number of employees in Health technology between the years 2013 and 2021. Growth has been stronger in the HWB-funded firms than in the counterfactual. In addition, the number of employees has increased significantly more strongly in the HWB-funded firms (Figure 35), as can be expected based on the differences in turnover growth.



PICTURE 30 NUMBER OF EMPLOYEES, HEALTH TECHNOLOGY INDUSTRY



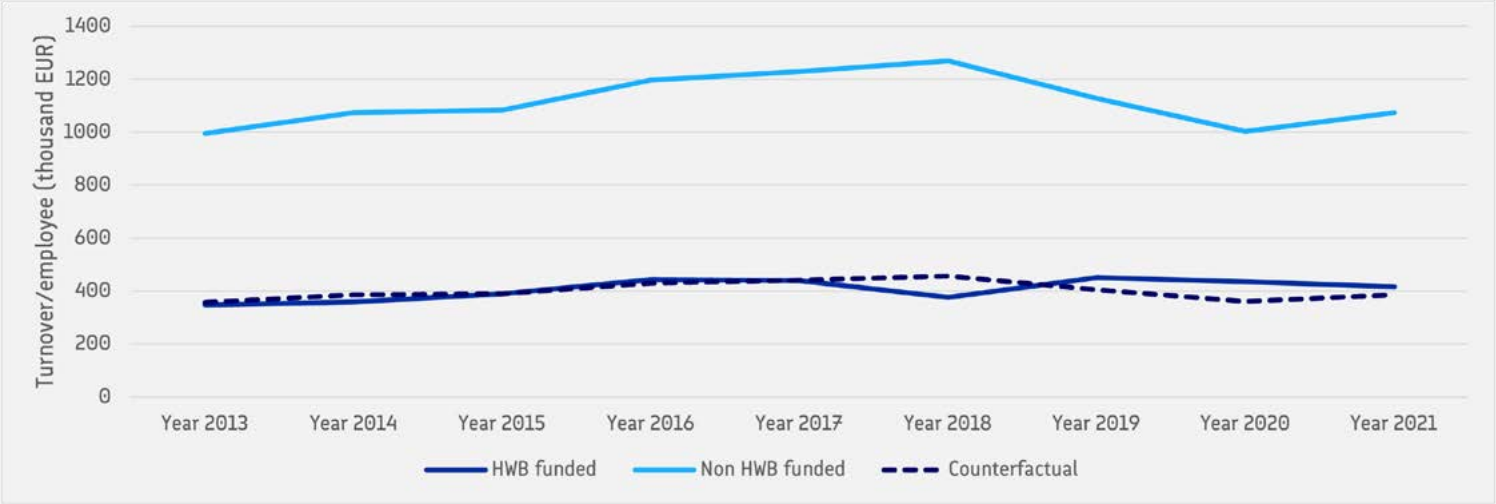
PICTURE 31. NUMBER OF EMPLOYEES, HEALTH AND WELLBEING SERVICES



TURNOVER/EMPLOYEE

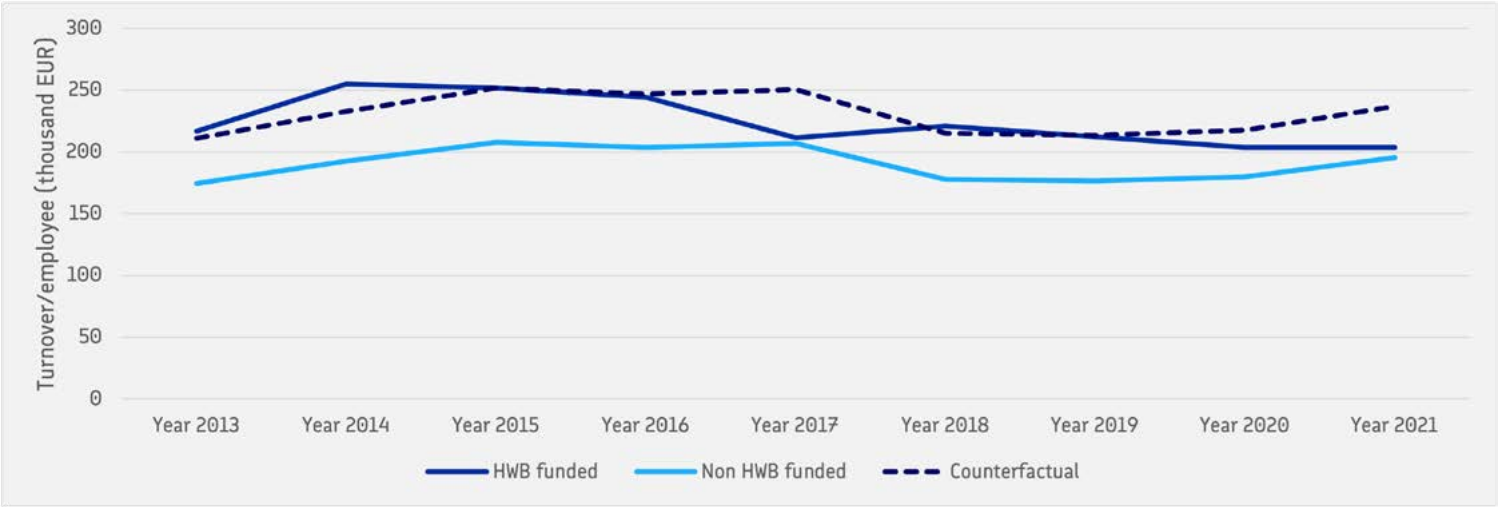
A firm's productivity is measured as a ratio of output to input. In this case, we focus on workforce productivity using the ratio turnover/employee. Turnover has been converted to the value year 2021. It is often the case that ratio value added/employee is considered a more valid indicator of productivity because input does not contain the use of materials and external services. We did not however have data available on this. Thus, the firms are not fully comparable when using turnover/employee.

In the pharmaceutical industry (Figure 37), the turnover/employee is much higher in the non- HWB-funded firms than in HWB-funded firms. The reason for this is that the sub-sector also contains the wholesale of drugs with wholesale being more strongly present in the non-HWB funded firms while the HWB firms focus more on the manufacturing of pharmaceutical products. When comparing the HWB-funded firm with the adjusted trend curve counterfactual the turnover/employee ratio has followed the same pattern. The HWB-funded firms have been slightly more productive after 2018.



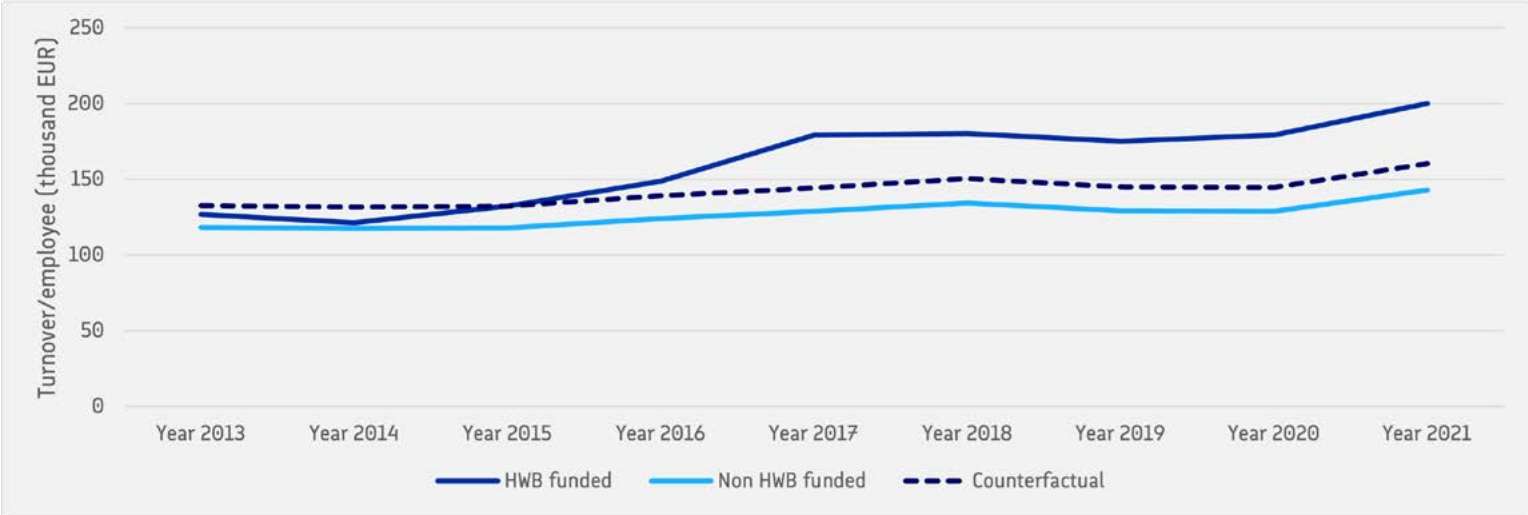
PICTURE 32. TURNOVER/EMPLOYEE, PHARMACEUTICAL INDUSTRY

In the health technology industry, the HWB-funded firms have had higher turnover/employee than the non-HWB-funded firms, though the non-HWB firms narrowed the gap, reducing most of the difference, after 2018.



PICTURE 33. TURNOVER/EMPLOYEE, HEALTH TECHNOLOGY

In health and wellbeing services, the HWB-funded firms have had a higher turnover/employee ratio after 2015. Indeed, the turnover/employee ratio increased significantly after 2015 compared to the counterfactual (which in this case is non-HWB funded health care and wellbeing services, not the public sector). This indicates that the HWB-funded firms have been able to utilise economies of scale and improve processes and technology in their services more effectively than their competitors.



PICTURE 34. TURNOVER/EMPLOYEE, HEALTH AND WELLBEING SERVICES

CONCLUSIONS FROM THE STATISTICAL ANALYSIS

BF has adopted various *foci* in terms of health and well-being over the decades. Our analysis is based on statistics covering a nine-year period starting from 2013. The research-oriented pharmaceutical industry is dominated by Orion and a few international firms. BF's funding has been limited during the period, compared to the size of the industry. Thus, it is hard to see evidence of impact in the statistics during the period.

The healthcare technology sector consists of multiple industries. During this period different industries in the health and wellbeing sector have reached various stages of maturity. The Manufacture of equipment and instruments comprises large firms that have been acquired by even international players and or become global corporates themselves. Thus, Finnish operations are currently in a steady stage of progress. BF's (Tekes) main contribution was seen before our analysis period. On the other hand, Health technology includes emerging areas of health and wellbeing related, for example, to personal health care and the 'quantified self.' BF has funded firms, for example, in the areas of instruments and appliances for measuring and testing and health-related software services. Also, research-oriented firms, especially in biotechnology, have grown expansively. Approximately 80% of turnover in the industry comes from exports. The number of employees has grown from 5400 to 8300 people (though this is due to the missing data issue) between 2013 and 2021. We identified over 300 health technology firms. Vast majority of them are SMEs. Many of them have received BF funding from their early phases of development, while some of them have already become international successes. The turnover of the BF funded firms in health technology SMEs exceed the other SMEs in corresponding industries by 9% (turnover growth 27% between year 2015 and 2021).

Private health and wellbeing services have also grown strongly. All large firms in this industry are BF customers. It is however at least questionable whether this growth can be attributed to BF because it is demand driven while, in addition BF funding has been small in this industry. It should however be noted here that productivity (the employee/turnover ratio as the proxy) improved strongly in the BF-funded health and wellbeing firms between 2013 and 2021. The statistics cannot explain this phenomenon. It is possible, however, that productivity improvement has indirectly benefited from the technology that BF funding has enabled.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1. CONCLUSIONS

Although the health and wellbeing theme has held a central position within in the Business Finland organisation over the past 20 years it has nevertheless remained a junior player compared, for example, to themes such as digitalisation and bioeconomy, particularly in terms of strategic importance, whilst also facing periodic calls to justify its status and funding demands. As the theme is, however, socially vital and presents many kinds of business opportunities, it is clearly important that it continues to play a central role in the future operations of Business Finland.

Business Finland's thematic activities and programmes during the period 2000-2022 have focused on the promotion within Finnish companies of innovation, internationalisation, growth, digitalisation and sustainability. Business Finland's actions can be considered largely relevant in relation to the development needs of the sector. What has been important here is that Business Finland has both made it possible to respond to the development needs arising from the sector, and also guided the development work of the sector within the framework of its own future anticipation knowledge. Business Finland's foresight activities have also been successful in predicting the future of the health and wellbeing sector. In terms of forecasting activities, cooperation has also been carried out with key players in the field. This has been a key factor in its success. In addition, Business Finland has also developed good know-how on and ability to utilise foresight in respect of its own organisations. This is clearly something that is worth further investment in future.

In the health and wellbeing programmes supported at the beginning of the millennium significant emphasis was placed on drug development, diagnostics and health technology. Later programmes however focused more on the broader development of the theme area. Additionally, ongoing general level changes to Business Finland's programme operations also impacted its programmes in the health and wellbeing sector. The early 2000s-era programmes gathered together and networked sector actors enabling and directing R&D activities and promoting commercial utilisation. Subsequent programmes have however placed stronger emphasis on internationalisation and international growth as well as on 'invest in' activities. The strength of recent programmes is that they promote a wide range of activities that can be offered to customer groups in order to address their varying needs.

The programmes have proven to be an essential tool for supporting the specific development needs of the health

and wellbeing sector. The programmes can be viewed as important because their activities bring the sector's organisations together and enable cooperation in R&D activities as well as other activities aimed at enabling commercialisation and exports. For example, the medicine and diagnostics programmes have enabled the development of clusters and more open cooperation as well as promoting new innovations. Programmes from the 2010s (BioIT, Bits of Health, Digital Hospital etc.,) had a strong emphasis on promoting digitalisation, data utilisation, internationalisation and attracting investments, all of which are visible in Business Finland's contribution to the sector. In addition, these programmes were important in terms of enabling the internationalisation of health and wellbeing organisations. The programmes thus also directed the development of the sector. More recently however BF's programmes have not attempted to steer RDI-development work as much. Instead, they have focused on enabling and sparring the development work of emerging innovation ideas from the sector.

In terms of effectiveness, the programme-based activities concept is the most important specific activity supporting the development of the sector. When programmes can be defined in such a way that they address clear sectoral needs as well as complementing missing services while taking longer-term development needs into account, they can clearly be said to have brought added value.

The SHOK experience as it pertained to the health sector was challenging due to the heterogeneity and fragmentation of the organisations in the sector. As the goals and interests of the organisations in the sector were different, insufficient effort was committed to the activities and because of this, development activities remained uneven in their results. In addition, the development of the health sector shifted more strongly to the concurrent Business Finland programmes. Nevertheless, large and effective projects were run and useful cooperation was achieved in the SHOK context. In addition, SHOK's activities highlighted a number of key development themes for the 2010s and 2020s.

Business Finland has granted almost 1.8 billion euros in project funding to the health and wellbeing sector during the period 2008-2022. This funding has clearly generated a significant amount of added value to the development of the sector, as it has made possible RDI activities that would not otherwise have been so without it while, in addition, also stimulating other funding streams for development work. The projects aimed for and achieved many useful results. These include solutions and devices, concepts, services and new networks as well as the promotion of collaboration between sector actors. Business Finland's project funding has enabled it to react to the project implementers' own development needs within the framework of the funding criteria. The funding has therefore matched well to the sector's needs.

Business Finland has also been an important actor in terms of influencing the health and wellbeing sector's national development strategies and thus the direction

in which the sector is developed. Business Finland then clearly played an important role in terms of bringing a mature business perspective into the strategies.

Environmental, social and economic sustainability has been one perspective in Business Finland's thematic actions during the last decades. In developing health and wellbeing sector, sustainability is at least indirectly affected by Business Finland's activities. It is fair to say that promoting healthcare can be closely tied to promoting sustainability as healthcare is a fundamental aspect of human well-being, and a healthy population is essential for the overall well-being of a society. Even though Business Finland's main focus has been on business development, supporting health and well-being sector does also support e.g. UN sustainable development goals, most obviously the goal SDG3 "Good health and well-being" that aims to ensure good health and well-being for all.

The Personalised Health Finland and Smart Life Finland programmes were firmly connected to the longer-term continuum of Tekes, Finpro and Business Finland's health and wellbeing programmes. They have continued the development continuum formed by previous programmes. The relevance of the programmes was ensured by taking into account the needs of the target groups and creating related goals and measures.

Programme implementation has, for the most part, been efficient and successful. A key factor here was the relevance of the programmes' services to the needs of the health and wellness sector. In addition, competent and motivated programme implementers focusing on the needs of the target groups, well planned and systematic operations and the utilisation of Business Finland's expertise in the sector, as well as its international networks and contacts, also proved to be important factors in terms of successful programme implementation. The primary challenges faced as regards programme implementation were the lack of human resources and other personnel-related issues, as well as the challenges caused by the Covid-19 pandemic. Further challenges were also caused by the bureaucracy encountered in foreign markets and the general challenges faced in attempting to break into these markets.

The main impacts of the Personalised Health Finland and Smart Life Finland programmes are the internationalisation of the programme's target groups and the development of the skills and abilities of companies and research organisations to further advance their innovations and engage in internationalisation. The programmes have improved the participants' opportunities to internationalise, enabled new contacts and international cooperation has also increased as a direct result of the programme. In the programmes' projects new innovations have also been developed and their commercial success advanced. The programmes have also enabled international investments in Finland and improvements in the funding situation of the industry more generally. The programmes significantly advanced their target goals, even if not all of the most ambitious goals were achieved.

The Personalised Health Finland and Smart Life Finland programmes have rendered important assistance with regard to the internationalisation and business and research capabilities of health and wellness organisations in Finland. Without the programmes, the sector would not have had the opportunity to internationalise in the same way and much RDI-development work and many of the RDI-development structures would not have been realised in the same way.

In a more general level, the Personalised Health Finland and Smart Life Finland programmes are examples of a new type of programmes, which is a result of the creation of Business Finland after the merger of Tekes and Finpro in 2018. These programmes include a stronger investment in the promotion of export and internationalization, which has also resulted in stronger investment, in the services related to internationalization. Through the programs, it has been possible to successfully offer the services and networks of Business Finland's internationalization and at the same time support RDI work. The results and impacts of the new programs are more strongly related to internationalization, in addition to the results of RDI activities.

In sum, Business Finland's activities as they relate to sector development have been highly versatile and have clearly influenced the development of the industry more generally. Notwithstanding this observation it should nevertheless be remembered that the development of the industry is influenced by many things and that impacts arise from the joint effect of many factors.

The key added value of Business Finland's thematic activities during the period 2000-2022 can be seen in the following aspects and impacts:

- The actors in the health and wellbeing sector are more closely connected with each other.
- There is a clearer shared vision in the sector of the themes that should be invested in the development of health and wellbeing.
- Stronger cooperation between health and wellbeing organisations, for example, between research organisations and the private sector, as well as within the private sector, between SMEs and larger companies.
- The comprehensive commercialisation of research results, with research-to-business instrument being a good example of effectiveness providing support to preparing for commercialisation
- R&D activities, results and the impacts of R&D-activities that would not have occurred without Business Finland's funding.
- The development of Finland as a platform for RDI activities in relation to the health and wellbeing theme. Stronger development structures in the health and wellbeing sector (ecosystems, testbeds, networks etc.,).
- Internationalisation of Finnish organisations in the health and wellbeing sector.
- Growth of various sub-sectors in health and wellbeing. A good example of this being the growth of the health technology industry.
- Growth of inward investment to Finland, including a strengthening of the sector's funding base more generally.
- The development of the skills and abilities of industry organisations in relation to R&D activities and business development.

Business Finland's actions have been important for the development of the industry. This is particularly evident where Business Finland has offered services and funding for development work, for which services or funding would not otherwise have been available. As such, it is likely that the health and wellbeing sector would not have developed as strongly over the last 20 years without Business Finland's support. Finland now has acknowledged competence, new innovations, ecosystems, development platforms and internationalised products, services and companies, based on the support Business Finland provided.

The role of Business Finland in producing societal impacts can thus be primarily related to the ability to create networks, add relevant partners to project consortiums and to enable the usage of relevant outside resources.

6.2. FUTURE DEVELOPMENT NEEDS

Business Finland's operations have been an important factor in the development of the Finnish health and wellbeing sector. The current decade however brings new challenges and opportunities that should be taken into account in Business Finland's future activities. In addition, even though Business Finland's operation has been successful and effective in many respects, there is, nevertheless, room for improvement. As such, lessons need to be learned from past practices and taken into account in Business Finland's future operations.

In November 2022, the European Union released its new Global Health Strategy to improve global health security and deliver better health for all. This directs funding, research, the operation of networks and EU programmes at the EU level. It also affects RDI-activities, developing healthcare and businesses in health and wellbeing in Finland. The programmes implemented in recent years were not strongly connected to EU-level activities. The EU perspective was included in the programmes but, in practice, the activities related to the EU perspective were not implemented as planned. Planned measures were not implemented which was due, for example, to the lack of human resources available to the programmes. Connecting the Business Finland programme and other activities in the health and wellbeing sector more strongly to EU strategies, operational networks and funding, would thus be an important improvement, enabling access to a greater level of resource for the development of the sector.

Ground-breaking research is currently being undertaken in respect of health and wellbeing by different funding and research organisations. Significant potential exists to commercialise the research results. One effective instrument here is the Research to Business (former TUTL) instrument. It should however be noted that the transposing of basic research results into applied research solutions and commercialisation could be further enhanced. This is particularly so in terms of the paths between Academy of Finland projects and Business Finland activities, something which should be strengthened, as significant research is also being done with Academy funding.

Over the past few years, the substantial expertise in health and wellbeing located in Business Finland has been dissipated to some extent by both retirements and changes in theme emphasis from a tight sectoral focus to broad, cross-cutting societal themes. As such, the organisational reform re-distributed sector expertise to different parts of the organisation. Currently, the expectation is that Business Finland's ability to develop the health and wellbeing sector will be weakened. It is important then to ensure that health and wellbeing expertise throughout the BF organisation is secured and that organisation structures better support the utilisation of this expertise.

In future, different types of programmes will be required in order to further develop the health and wellbeing sector, programmes which highlight the needs of the various areas of the sector. Nevertheless, there remains a clear need for more research-based activities in the programmes which can help to build the foundations for new commercial innovations, as well as activities that promote business growth and internationalisation. Both short-term actions to support business growth and internationalisation, as well as R&D actions aimed at longer-term horizons, are required here.

In recent years, Leading Companies and Growth Engine funding have proven to be important funding instruments for Business Finland. There are however few clear health and wellbeing related actions conducted in the context of these instruments, with the Clever Health Network being basically the only exception. As such, thought should be given in the coming years to how the health and wellbeing sector could better participate in and benefit from actions in accordance with the instruments in question. This would however require the participation of a bigger company that was willing to guide ecosystem-like development work. During the spring of 2023, this issue will be partly answered when a larger Finnish pharmaceutical company starts the Leading companies project.

Business Finland's foresight activities have also been successful in relation to anticipating developments in the health and wellness theme. Thus, it will be necessary in future to ensure that effective foresight activities are conducted, related expertise is secured within the organisation and cooperation with industry actors is prioritised. As part of the mission preparation, Business Finland has identified a number of key sub-themes related to the theme of health and wellbeing.

Important future themes in the health and wellbeing sector will likely include the anticipation and prevention of diseases, digitalisation and the development of individual personalised treatment. These should be fully highlighted in Business Finland's activities. It is also important to study how other development trends (digitalisation, AI, biosciences etc.,) related to these themes affect health and wellbeing and how they can be utilised in the development work of these sub-themes.

In the recent programmes, the customer perspective has been taken into account in the preparation of the programmes, but in the implementation phase it could have

been better utilised. In future, it should be ensured that programme implementation sufficiently utilises the customer's perspective. This could be achieved, for example, by including customer organisations in programme steering groups and by forming the necessary advisory boards of external sector experts.

One of the key elements in terms of promoting the development of the health and wellbeing sector, is the transfer of information, technologies and ideas from other sectors to the health and wellbeing sector. Challenges have however emerged in this respect, for example, in the recently implemented simultaneous health and wellness programmes of other themes. As such, health and wellbeing operators have not been able at times to cooperate closely and network with operators in other fields. In the future, in terms of the development of the health and wellbeing sector, it will be necessary to cooperate more fully with other sectors. In particular, it is important that the benefits of digitisation are transferred to the sector.

So far, activities supported by Business Finland have promoted internationalization to some extent for Finnish operators. However, very significant international breakthroughs have been limited. It is partly about the fact that breaking into the international market is challenging. On the other hand, even more ambitious internationalization could be the target level of Business Finland's customers.

Business Finland is implementing a new approach where Thematic Focus Areas form the basis for its missions. In Business Finland, the missions have a longer-term goal state, where the measures that are implemented to reach the goals are defined. Programs are implemented under these missions and are the main tool to generate the desired impacts. The theme of health and well-being has been chosen as one of the few mission themes of Business Finland. Since the health and well-being theme is nationally important and has clear business opportunities, and on the other hand the status of the theme has varied in Business Finland, a clear mission status is important to ensure its long-term established status. During 2023, health and wellbeing related theme has been chosen as Business Finland mission.

6.3. RECOMMENDATIONS

The role of the following recommendations is to provide Business Finland with some pointers on how health and wellbeing could be promoted in future as part of the organisation's operations. These recommendations are based on the development needs and learnings derived from the evaluation material. Preliminary recommendations were refined in the evaluation workshop together with Business Finland and the health and wellness sector experts.

The health and wellbeing theme will clearly be a central societal theme in the coming years but will also involve both the overcoming of significant challenges and the effective realisation of emerging business opportunities. Finland is an excellent platform for RDI-development work and commercialisation. For this reason, the sector should be positioned as an independent and central theme for Business Finland with additional activities and funding allocated to the theme over the coming years.

RECOMMENDATION 1.

The health and wellbeing theme should command an enhanced position in the coming years in terms of Business Finland's operations. In the spring of 2023 decision was made, that the theme is going to be one of Business Finland's missions (Healthcare Reimagined 2035 mission). Mission status ensures that sufficient funding resources would be targeted to the theme and that new programmes would also be launched in this area. Early 2023, Business Finland does not have any health and wellbeing programmes running. As the continuity of programme activities has been seen to be important for the development of the sector, Business Finland should start the planning of new programmes as soon as possible.

RECOMMENDATION 2.

In future, in order to better promote the development of the health and wellbeing sector, new programmes related to the theme are required. These programmes should take into account both the perspectives of commercialisation and internationalisation and that associated with RDI-activities in order to create new innovations and technologies.
The Academy of Finland also funds significant research activities related to the health and wellbeing sector, an activity which has produced results that have commercial potential. In recent years however research work, in a Business Finland context, has not resulted to the same extent in applied research and commercialisation.

RECOMMENDATION 3.

Connections between the research activities of the Academy of Finland and Business Finland's applied research activities and support to commercialisation should therefore be strengthened in order to promote the refinement and commercialisation of research results.

At the EU level, significant strategic policies affecting the development of the health and wellbeing sector are increasingly being made, research programmes are implemented, networks are operated and R&D activities are funded. These can also be of significant benefit to Finnish operators. In recent years, Business Finland's activities, e.g., in the programmes, have remained somewhat detached from these EU-level activities. Greater synergistic benefits for Finland could be available from paying closer attention to these EU-level activities.

RECOMMENDATION 4.

The development of the health and wellbeing theme in Business Finland should in future be connected more strongly to EU-level strategies, networks and funding. Strengthening the connections between Business Finland's operations and the EU should therefore be greatly enhanced.

Leading Companies and Growth Engine funding are key instruments for Business Finland, but

these instruments have included only few projects from the health and wellbeing sector[15]. The goal of these instruments is to get companies to significantly increase their research, development and innovation activities in Finland and support ecosystems aimed at new business and exports. The prerequisite for the instruments is that a larger company sets out to lead a group of companies and research organisations to enable ecosystem-like development work.

RECOMMENDATION 5.

In future, the larger Finnish health and wellness operators in particular should also be better activated in terms of the utilisation of these instruments. In addition, given the special features of the health and wellness sector, it should be investigated whether the utilisation of these instruments could be implemented in new ways.

In a precisely regulated and, in many respects, special field such as health and wellbeing, it is key in terms of supporting the development of the field, that access to high quality sectoral expertise is readily available. In recent years, the reduction in accessible expertise within Business Finland has been perceived as a threat in this respect. Previously, Business Finland operated on a sectoral basis. Its current organisational reform however spread industry expertise across different parts of the organisation dissipating the core expert group. In addition, to this, expertise in the field of health and wellbeing has also been transferred out of the organisation altogether.

15 These are Growth Engine funded Clever Health Network that started in 2017 and a new Leading Companies funded project that started in spring 2023.

RECOMMENDATION 6.

Business Finland should ensure that it retains sufficient high quality sectoral expertise in the field of health and wellbeing. In addition, it is necessary to ensure that this substantive expertise is not further dispersed across the organisation as a whole and that the remaining expertise can be utilised in an effective manner. Mission status enables organization and gathering of expertise under the theme of health and wellbeing.

Development of the health and wellbeing sector is linked to the development of other sectors. It is possible to benefit from the results of RDI-development work in other sectors and at the same time promote synergistic benefits. These potential synergies could still be further strengthened between the health and wellbeing sector and other sectors.

RECOMMENDATION 7.

In Business Finland's operations the cooperation and information exchange between the health and wellbeing sector and other sectors should be further strengthened. For example, the benefits of digitisation and artificial intelligence must be strongly utilised in the health sector in future as well as in the development of the welfare sector.

Business Finland's client organisations have significant knowledge and insight into the development needs of the health and wellbeing sector. In the past, customers were more heavily involved in programme activities, guiding the implementation of the programme. In recent years however the customer perspective has been utilised less.

RECOMMENDATION 8.

The customer perspective could be utilised more clearly in Business Finland's activities aimed at developing the health and wellbeing sector. In terms of programme implementation in particular, client organisations could be represented in the programmes' steering groups with the customer perspective being better utilised through the use of advisory boards consisting of customer organisations.

Business Finland has succeeded in promoting the internationalization of Finnish organisations. Despite this, the internationalization and international growth of Finnish organisations could be stronger and more extensive. Part of the challenge is that the R&D development work and the commercialization process are not sufficiently connected with internationalization in mind, and on the other hand, the ambition of Finnish operators for internationalization could be even greater.

RECOMMENDATION 9.

The starting point for development work in health and wellbeing sector should be more strongly linked to global systemic entity, so that the results of the development work undertaken do not remain national, but can be scaled up

to Europe and globally.

In recent years, Business Finland has invested heavily in advancing commercial success and internationalization of existing or developing products and services. In the coming years, it is also important to lay the groundwork with R&D development work in the longer-term innovations aimed at future markets 5-10 years from now. The threat is that there will not be enough investment in longer-term market opportunities, and in that case Finns will not be able to do succeed in the future markets.

RECOMMENDATION 10.

In the coming years, it must be ensured that Business Finland's R&D investments are also focused on activities that aim creating products and services for the expected markets 5-10 years away. In addition to the allocation of investments, a successful foresight activity is required and cooperation with organizations doing basic research and companies.

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APPENDICES

APPENDIX 1.

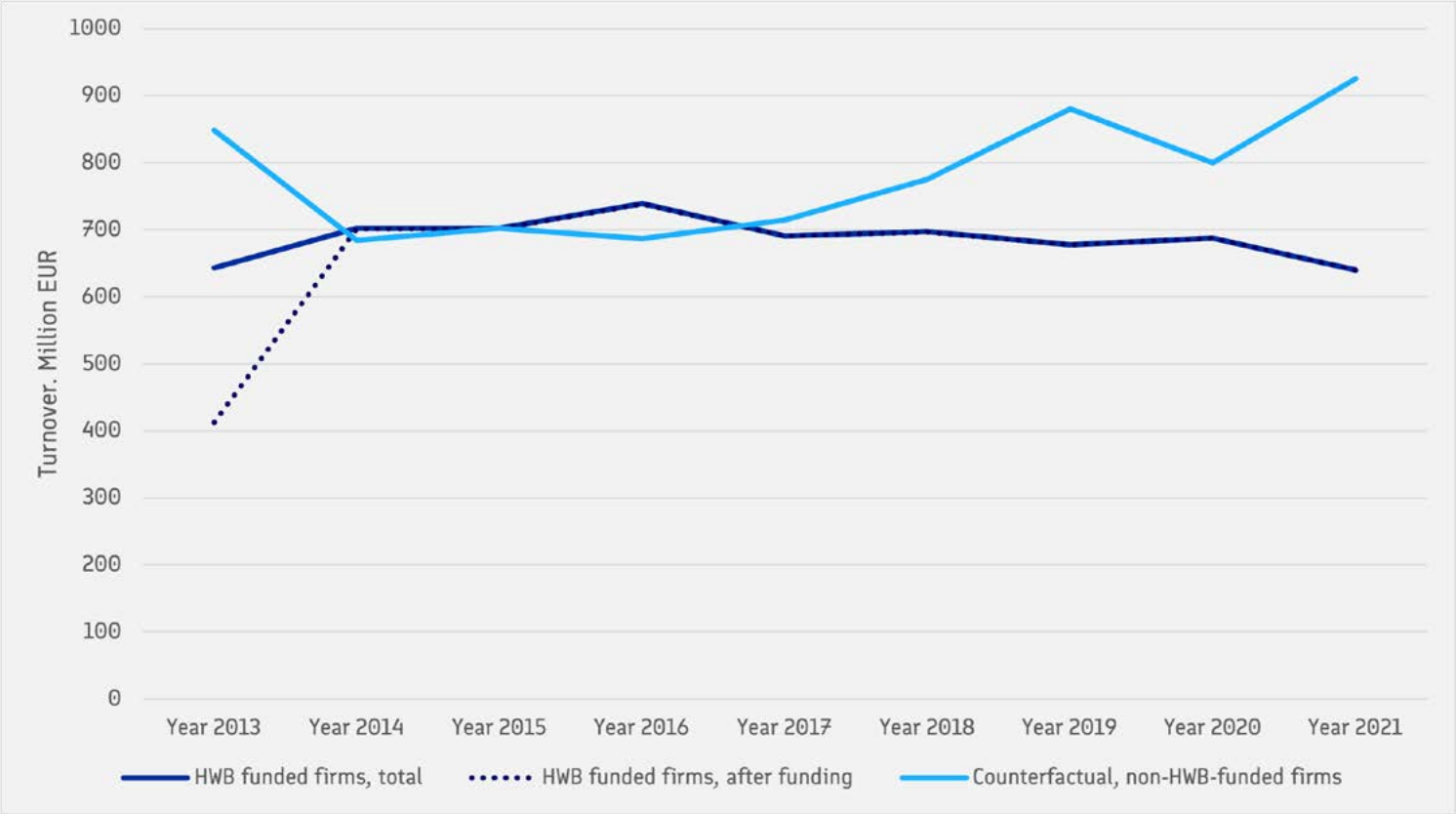
STATISTICAL ANALYSES ON HEALTH TECHNOLOGY

A/ INDUSTRIES IN HEALTH TECHNOLOGY

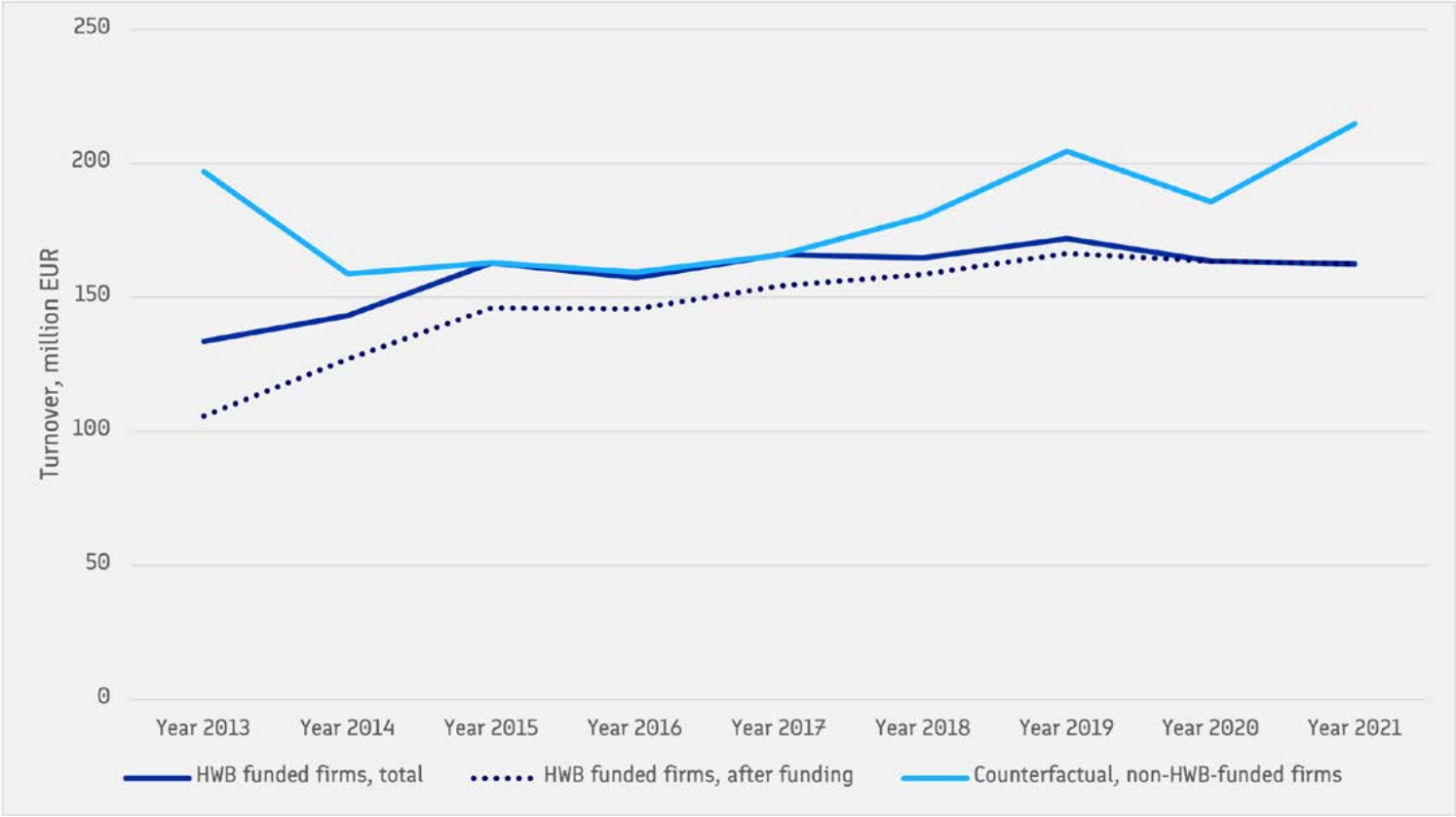
The following analyses present the turnover development of some specific 5-digit industries that include a high number of firms received Health and Wellbeing funding from BF.

INDUSTRIES DOMINATED BY THE BF FUNDED FIRMS

Picture 25 presents the development and **26600 Manufacture of irradiation, electromedical and electrotherapeutic equipment.** The HWB-funded firms in this industry include Planmeca Oy, GE Healthcare Finland Oy and PaloDEx Group Oy. Picture 26 presents the development curve of the **32501 Manufacture of medical and dental instruments and supplies.** The largest HWB-funded firms are Aidian Oy, LM-Instruments Oy, and Evondos Oy. Both industries are dominated by HWB-funded firms. Because the number and size of the non-HWB-funded firms in these industries are small, the Finnish manufacturing industry is used as the counterfactual. The figures show that the turnover of Finnish legal companies has remained at the same level or even declined. The reason for this is, at least partly, due to the mature phase of these industries compared to many other industries in the HWB technology sector. The largest firms are international and, as such, the growth of the corporate group may be in companies outside Finland. For example, Planmeca and LM-Instruments belong to Planmeca Group, a Finnish corporate deriving 80% of its turnover from their companies outside Finland.



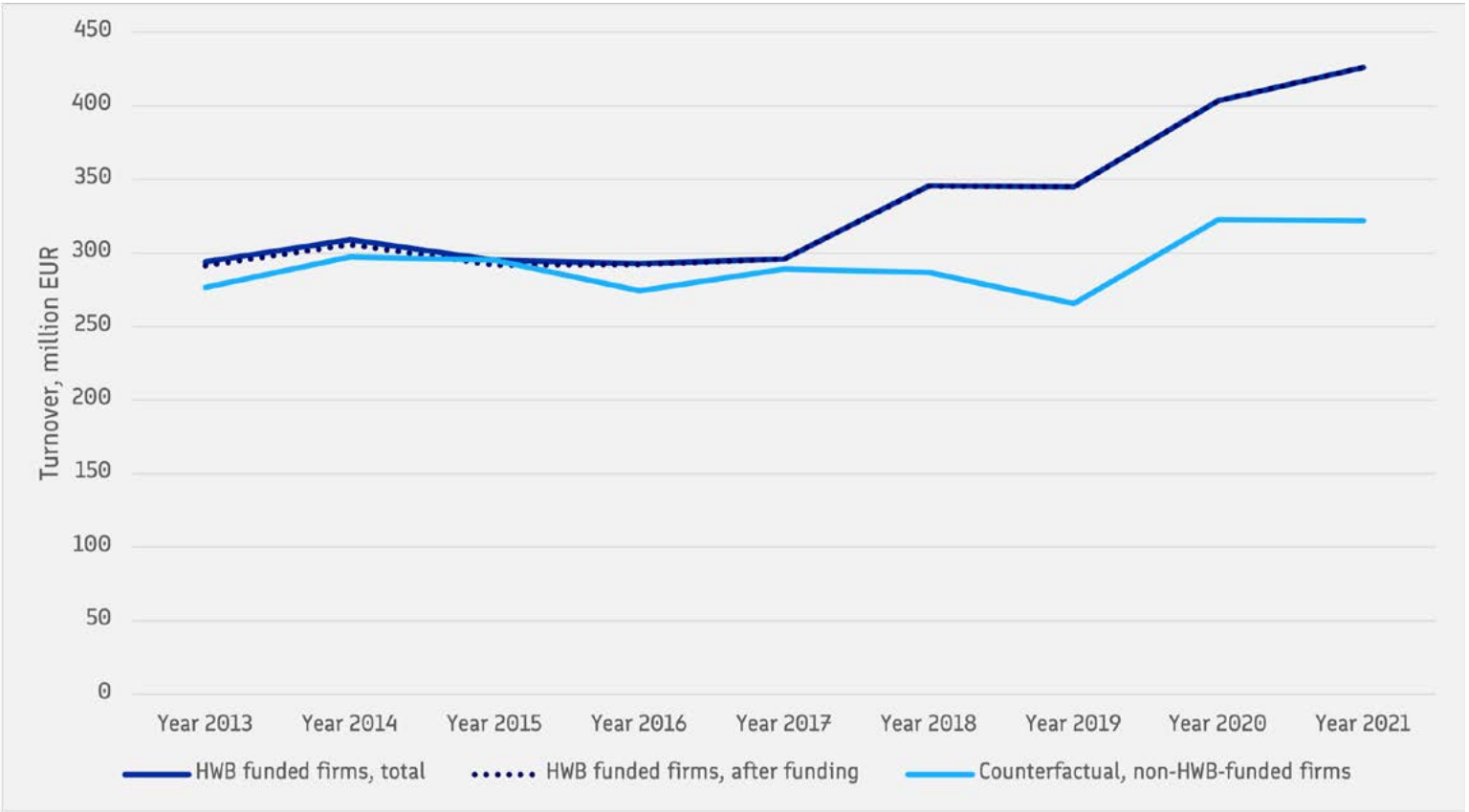
PICTURE A1-1. TURNOVER 26600 MANUFACTURE OF IRRADIATION, ELECTROMEDICAL AND ELECTROTHERAPEUTIC EQUIPMENT



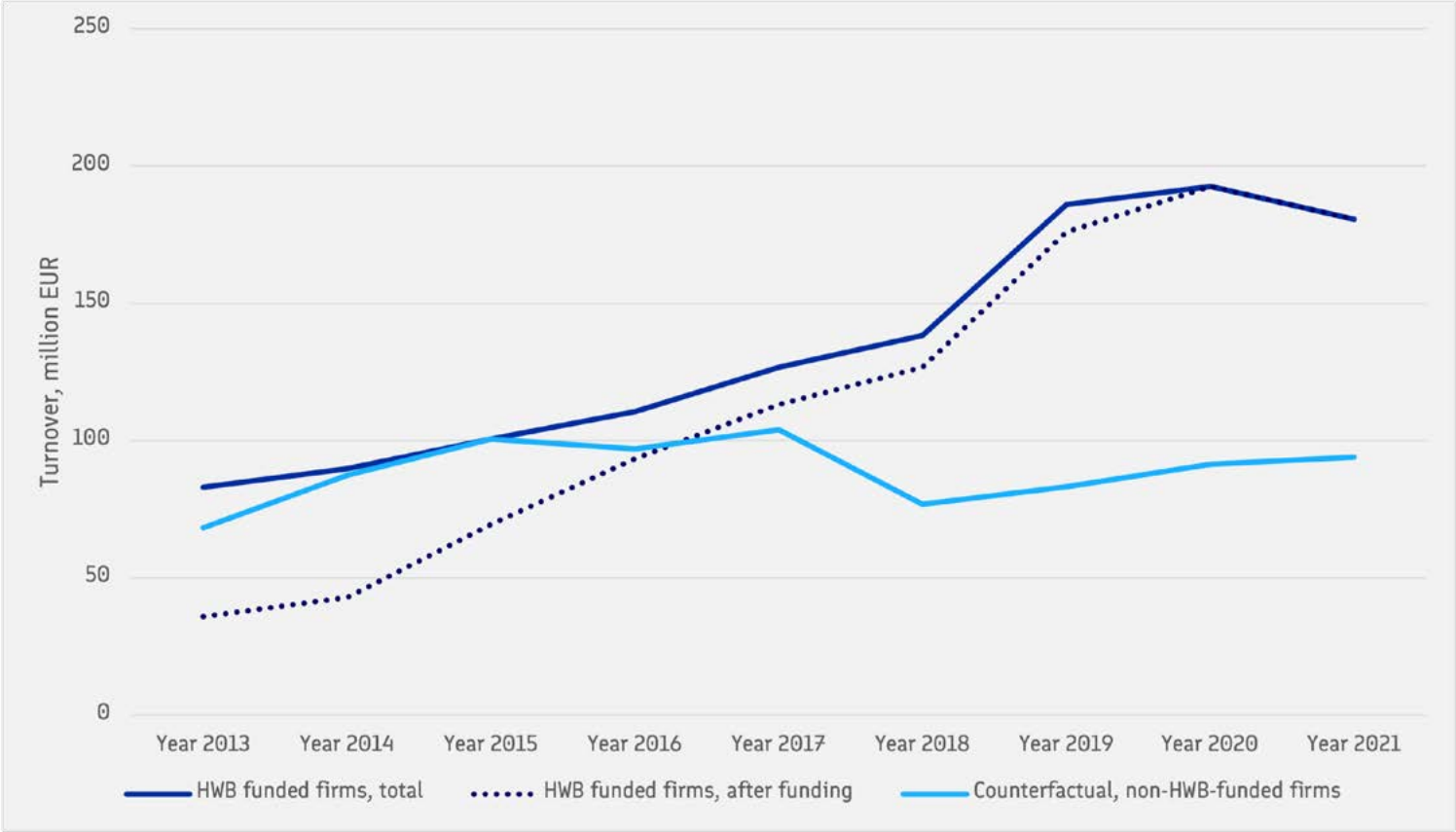
PICTURE A1-2. TURNOVER 32501 MANUFACTURE OF MEDICAL AND DENTAL INSTRUMENTS AND SUPPLIES

INDUSTRIES WITH AN EMERGING HEALTH AND WELLBEING FOCUS

On the other hand, Finnish health technology includes industries with significant growth in recent years attributable to HWB-funded firms. **26510 Manufacture of instruments and appliances for measuring, testing and navigation** and **62010 Computer programming activities** are generic industries where HWB-funded, health and wellbeing specialised firms have grown significantly faster than the corresponding industry generally. The largest HWB-focused firms in these industries include Thermo Fisher Scientific Oy, Oura Health Oy, and Polar Electro Oy in industry 26510 and Varian Medical Systems Finland Oy, Nortal Oy and Receptum Oy in 62010. Figure 26 and Figure 27 present the turnover curves of the firms in these industries focusing on HWB-specialised firms and comparing them to the rest of the industry that has not received HWB funding.



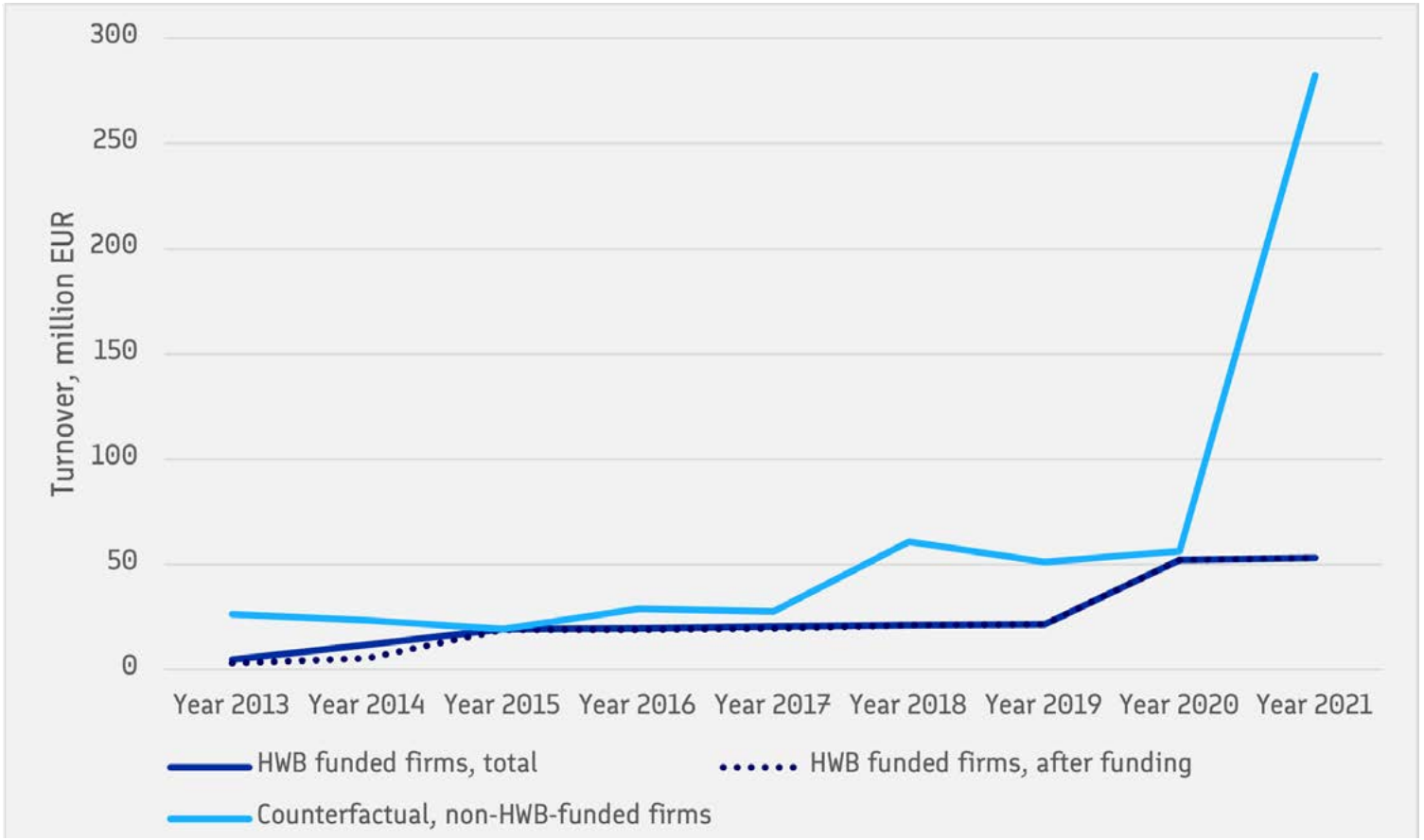
PICTURE A1-3. TURNOVER 26510 MANUFACTURE OF INSTRUMENTS AND APPLIANCES FOR MEASURING, TESTING AND NAVIGATION, HWB SPECIALISED FIRMS



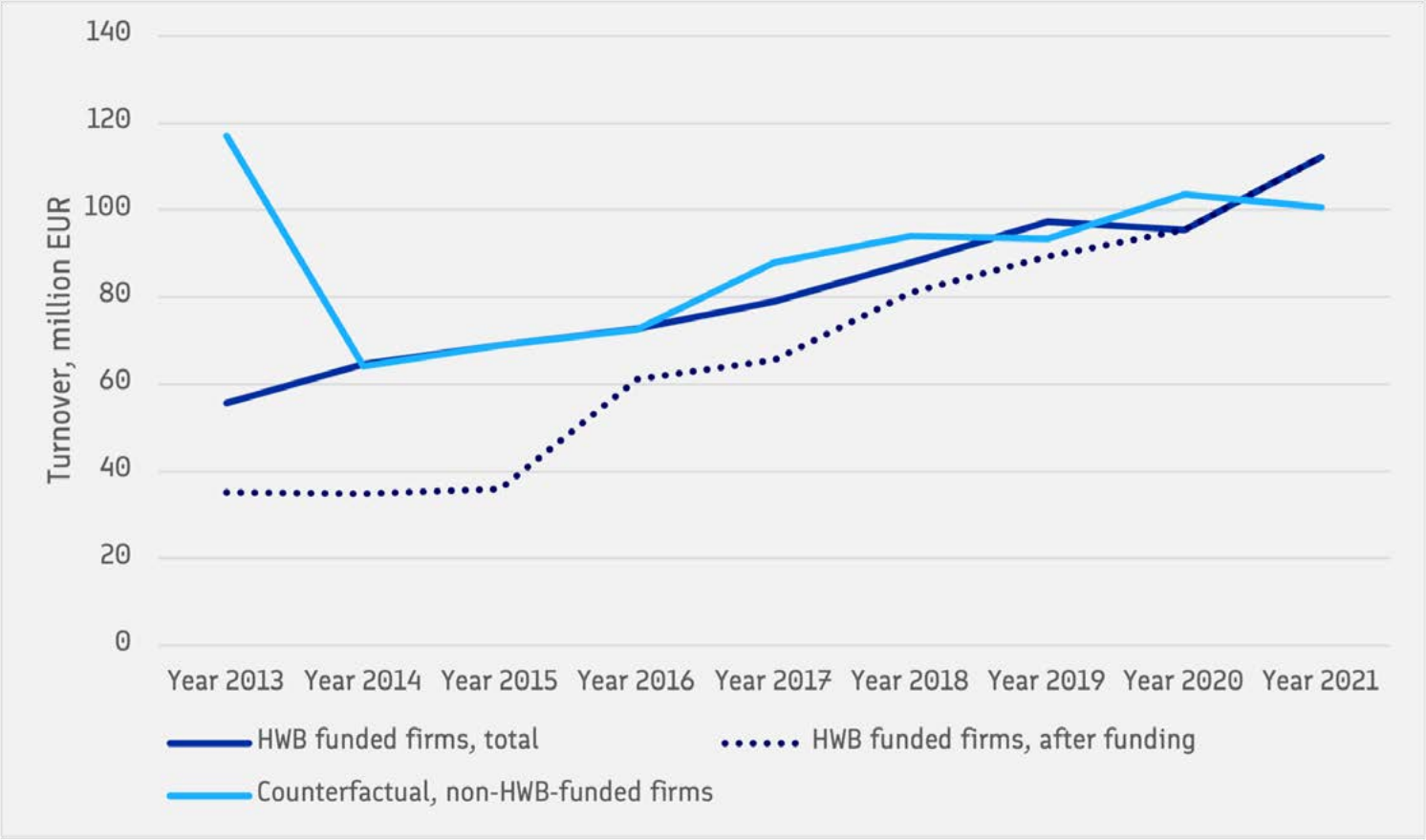
PICTURE A1-4. TURNOVER 62010 COMPUTER PROGRAMMING ACTIVITIES, HWB SPECIALISED FIRMS

RESEARCH AND DEVELOPMENT

We have also included Research and Development firms in Health Technology, even though contract research organisations can be included in pharmaseuticals (Kulvik et al., 2021). The growth of **research and experimental development on biotechnology** (72110) has been explosive, especially in recent years. The turnover of the industry has grown from 17 million EUR in 2013 to 180 million in 2018. The turnover of the HWB-funded firms has grown from 5 million EUR to 53 million EUR. Picture 28 presents the turnover curve of Industry 72010. In addition to BF-funded firms, other firms that have used only other funding sources have grown in this industry. The largest HWB funded firms are Mobidiag Oy, Labsystems Diagnostics Oy, and BonAlive Biomaterials Oy.



PICTURE A1-5. TURNOVER 72110 RESEARCH AND EXPERIMENTAL DEVELOPMENT ON BIOTECHNOLOGY



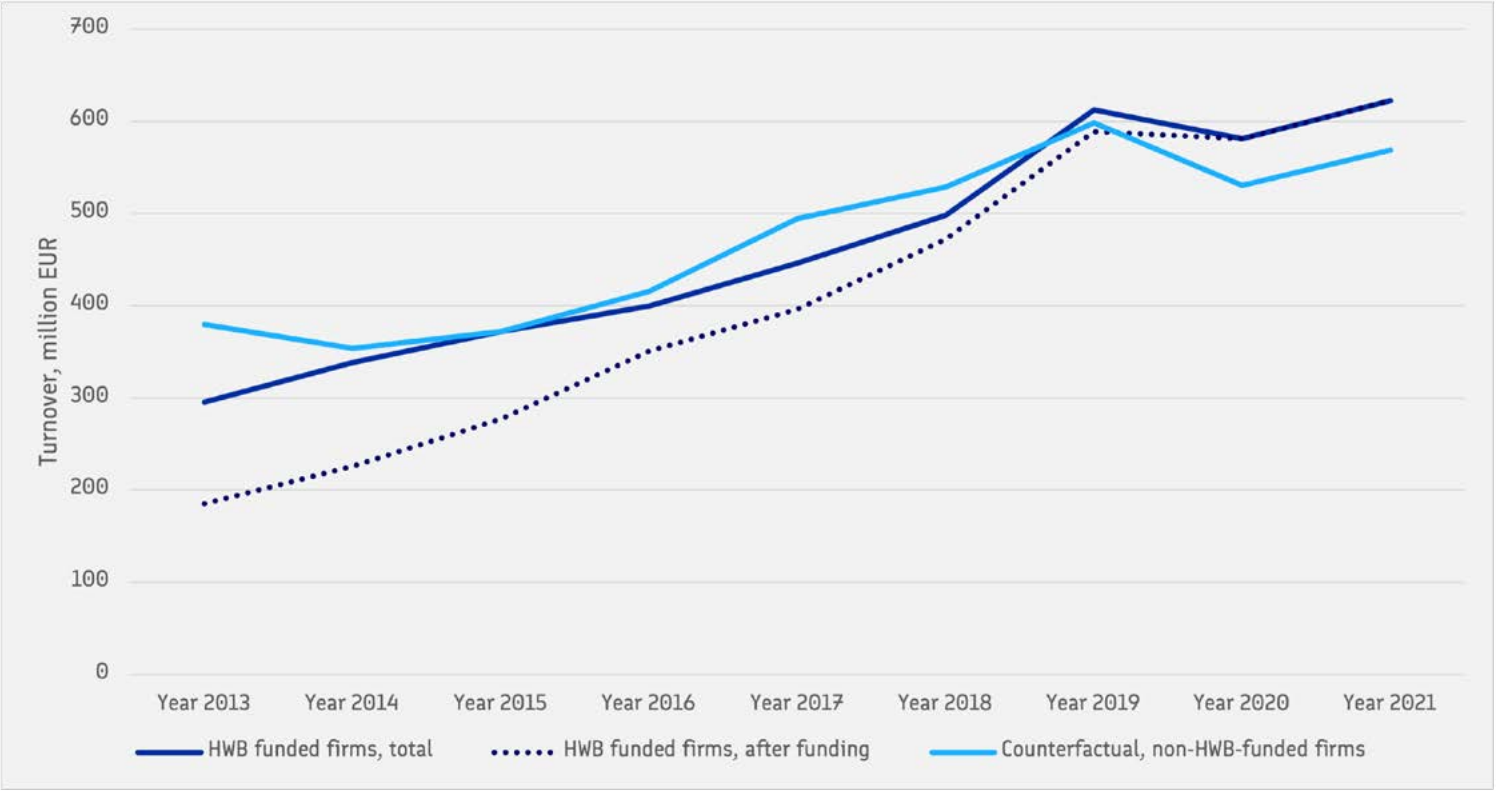
PICTURE A1-6. TURNOVER 72191 RESEARCH AND DEVELOPMENT ON MEDICAL SCIENCES

Picture 29 presents the turnover of industry **Research and development in medical sciences** (72191). The growth has been strong in this industry, but the curve does not deviate significantly from non-HWB-funded firms. The largest HWB-funded firms include iCare Finland Oy, Oy Medfiles Ltd and Optimapharm Nordic Oy.

B SMALL AND MEDIUM SIZED ENTERPRISES IN HEALTH TECHNOLOGY

Small and medium sized enterprises (SMEs) include firms with less than 250 employees and an annual turnover of 50 million EUR. The SME statistics are available only at the 2-digit industry level. To ensure a meaningful comparison, we weighted the two-digit industries in the counterfactual to align with the 2-digit level industry portfolio of the funded SMEs.

The trajectories of HWB-funded SMEs and the counterfactual largely mirror each other until 2019. However, in the years 2020 and 2021, HWB-funded SMEs outperformed the counterfactual. In 2021, their total turnover exceeded the counterfactual by 9%. The turnover growth of the HWB funded firms was 27% higher than the counterfactual growth between years 2015 and 2021.



PICTURE A1-7. TURNOVER, SMES IN HEALTH TECHNOLOGY

It should be noted that interpreting the growth of SMEs based on statistics presents significant challenges. This is primarily because once firms exceed the defined boundaries of SMEs, they no longer appear in the SME statistics. For this reason, we included HWB-funded firms only in those years when they met the SME criteria.

Consider the case of Oura Health Oy which began as a micro-enterprise in the early years of our analysis. After experiencing rapid growth, it surpassed the 50 million EUR threshold in 2020. Consequently, in 2020 and 2021, Oura Health Oy was excluded from the analysis, narrowing the turnover gap between the HWB funded firms and the counterfactual significantly, from 24% to 9%. It is again important to note that the exclusion of growing firms may affect the counterfactual as well.

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