

AN EVALUATION OF DSIT GRANT FUNDING FOR TECH NATION (FY2020/21 – FY2022/23)

A report prepared for the Department for
Science, Innovation and Technology

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Executive summary

The Department for Science, Innovation and Technology (DSIT) commissioned Frontier Economics to evaluate the grant funding provided by DSIT to Tech Nation, which was aimed at supporting the growth of the UK's digital sector.¹ This evaluation included a process and impact evaluation. It focuses on the funding provided in the financial year (FY) 2020/21, 2021/22 and 2022/23, £17.5m in total.^{2 3}

Tech Nation offered several distinct activities that varied substantially in how they were delivered, their intended beneficiaries and their objectives. Therefore, for this evaluation, we grouped the activities funded by DSIT into two broad groups: 1) Growth Programmes and Rising Stars; and 2) other initiatives. We summarise our findings below and provide further details on each of the two groups.

Key findings

We found evidence that most of Tech Nation's activities generated benefits. However, some initiatives were established too recently for their impact to be fully evaluated through this study (e.g. Growth Platform).

It was not possible to establish the overall Value for Money (VfM) of Tech Nation's initiatives due to data limitations. However, we found that Tech Nation's Growth Programmes alone generated impacts estimated at around £44m⁴. These results exceed the total value of funding provided to Tech Nation by DSIT during the evaluation period.

We found that all of Tech Nation's activities funded by DSIT successfully reached their intended beneficiaries. Over the evaluation period, Tech Nation made several changes to its initiatives, which contributed to its regional reach. The proportion of Growth Programme participants from regions outside London increased over the evaluation period; however, in FY 2022/23, half of the participants were still located in London.

¹ Previously, this grant was funded by the Department for Digital, Culture, Media and Sport (DCMS). Following a Machinery of Government change on 07/02/23, it has been funded by DSIT and will be referred to as an evaluation of DSIT funding throughout.

² Annual funding amounts were £6.7m, £6.6m and £4.2m for FY 2020/21, 2021/22, and 2022/23, respectively.

³ Please note that some of the data that is used in this evaluation refer to years outside the years in scope. That is due to data limitations which are mentioned in section 3.4.1. Even though the quantitative analysis includes past years, the scope of the evaluation, its results and recommendations refer to FY 2020/21, 2021/22 and 2022/23 only.

⁴ £34m from impacts realised one and two years after participation in Growth Programmes taking place in FY 2020/21 and an additional £10m from impacts realised one year after participation in Growth Programmes taking place in FY 2021/22. Impact two years after participation in FY 2021/22 and impacts from participation in the Growth Programme in FY 2022/23 are likely to happen, but since those have not yet been realised at the time of writing, they are not accounted for in the estimated monetary value of the benefits.

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Tech Nation implemented the recommendations from the previous evaluation (2019), with some exceptions:⁵ first, objectives, intended outcomes and monitoring data could have been recorded more systematically; second, overhead costs were not systematically allocated to each initiative, limiting our ability to assess the VfM of each initiative.

We provide further detail on the findings for each group of initiatives below.

Growth Programmes and Rising Stars

These initiatives aimed to help businesses successfully navigate the transition from startup to scaleup and beyond.⁶ We evaluated these initiatives using a quantitative econometric method and estimated the monetary value of the benefits, which was quantified as the additional Gross Value Added (GVA).

We found that Tech Nation's Growth Programmes had a substantial positive impact on the growth of participating firms. In particular, we estimated that participation in the Growth Programmes led to an additional increase in employment when compared to non-participating firms:

- 27% one year after participation;
- 37% two years after participation; and
- 38% three years after.⁷

We estimate the additional employment growth has generated substantial GVA. A conservative estimate suggests that the increase in employment in the first and second years after participation generated around £44m in additional GVA up to 2 years after participation: £32m from participation in FY 2020/21 (accounting for benefits one and two years after participation); and another £10m from participation in FY 2021/22 (account for benefits one year after participation).⁸

Additional benefits are also likely to materialise in FY 2022/23 and later on – as a result of the delivery of the programmes in FY 2021/22 and 2022/23.⁹

Due to data limitations regarding the cost of these programmes, we could not confidently estimate how much impact was generated per £1 spent by DSIT. That said, the benefit was likely significantly

⁵ Frontier Economics (2020), Tech Nation Impact Evaluation, [report](#) prepared for the Department for Digital, Culture, Media and Sport.

⁶ The Growth Programmes in scope included: Future Fifty, Upscale, Cyber, Applied AI, FinTech, Net Zero and Libra. Libra differs from other programmes in that it was aimed at earlier-stage ventures. For further details about each programme, see Annex B

⁷ We could not estimate the longer-term effects of the programmes (four years plus) as sufficient time has not yet elapsed since programme completion. We also estimated the impact of the programmes on firms' turnover, but the results were inconclusive due to limitations in turnover data.

⁸ In line with best practice in impact evaluation, we do not assume that the employment generated by the programmes was entirely additional, but, more conservatively, that the additional employees of Tech Nation firms would have been in jobs generating lower GVA if not for the Programmes. Our methodology is explained in detail in section 3.4.1, and the full analysis, including what impacts were included, can be found in C.2.

⁹ Our analysis was completed in March 2023, and, therefore, we considered FY 2022/23 benefits as future benefits.

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higher than the cost of delivery since the total annual value of the DSIT-funded grant was lower than the estimated value of impact presented above.

Our analysis of the Rising Stars competition was sensitive to analytical specifications and, therefore, the results were found to be inconclusive.

Other initiatives

Other initiatives included Tech Nation's learning and networking offer, the Scaleup Engagement Managers (SEM) and Tech Nation's Research & Insight (R&I) offering. We evaluated these initiatives qualitatively through interviews with Tech Nation staff, initiative beneficiaries and other stakeholders. We also analysed data on various Key Performance Indicators (KPIs), where possible. It was not possible to estimate the monetary value of any benefits generated.

Learning and networking initiatives included the Digital Business Academy (DBA), Founders' Network¹⁰, and the Growth Platform. We found some evidence that Tech Nation was able to increase the reach of its learning and networking initiatives via the Growth Platform. Since this was a new initiative that replaced the Founders' Network and DBA, it was impossible to fully assess its impact:

- The platform reached a relatively large number of potential beneficiaries (3,095 users), outperforming Founders' Network.
- Interviews with a limited number of stakeholders identified that the sign-up process could be lengthy, and some interviewees struggled to identify how they could benefit from the platform.

SEMs (previously known as Entrepreneur Engagement Managers or EEMs) provided region-specific support to tech entrepreneurs. We found that SEMs reached, and positively impacted, beneficiaries across all nations and regions of the UK:

- Beneficiaries valued the networking opportunities and one-to-one sessions provided by SEMs highly. Some improvements were identified regarding increased team resilience to staff turnover and the need for more granular, accurate and consistent data collection.
- In FY 2022/23, the 12 SEMs had 1,788 one-to-one sessions with scaleup founders and senior managers. They organised 59 regional and national networking sessions, which typically involved 5-10 founders and 10-15 senior managers.

R&I included Tech Nation's annual reports on the state of the UK digital sector and other publications. We found that the changes made to the initiative over the evaluation period increased engagement and had a positive impact on the initiative's users:

- Over the evaluation period, Tech Nation decided to reduce the number of R&I outputs produced (e.g. blogs and reports) to focus on fewer, higher-impact pieces of content.
- Measures of engagement with Tech Nation's outputs trended up during the evaluation period, suggesting that this strategy was successful. More broadly, stakeholders held a positive view of

¹⁰ Including Knowledge Insights Network (KIN).

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Tech Nation's R&I, with particular benefits around informing policymakers (in the UK and abroad) and international investors in the UK tech sector.

Recommendations

Following the 2022 Digital Growth Grant competition, support to UK tech startups and scaleups will be delivered by Barclays Eagle Labs in the next funding period (FY 2023/24 – FY 2024/25). Therefore, our recommendations refer to the future delivery and evaluation of activities to support the growth of UK tech businesses.

1.1.1 Recommendations for future delivery

- The delivery of Growth Programmes generates significant benefits. We found that both sector-specific programmes (e.g. Fintech and Applied AI) and programmes targeting firms at specific growth stages (e.g. Upscale or Future Fifty) can be effective in stimulating growth, and therefore, both should be considered as part of future initiatives.
- Online platforms that combine personalised online networking and learning on a single platform should be considered since they have the potential to reach a large number of beneficiaries. It would be beneficial to allow diverse users easy access to varied, personalised content, but this needs to be balanced against requesting too much information from users at the registration stage.
- We found that regional support is important in assisting non-London-based founders, who might be facing different barriers from those based in London. Activities tailored for each UK region and nation should still be developed under an overarching strategy that will ensure equal quality of support and allow more robust future evaluations.
- Future DSIT grant recipients might be well placed to continue research on the UK tech sector, which, together with sector insights gathered through running acceleration programmes, can provide valuable data and insight for policymakers, future investors and other ecosystem stakeholders.

Recommendations for future monitoring and evaluation

- Across all initiatives, an evaluation framework and monitoring strategy should be defined as early as possible. At a minimum, this should include:
 - Preparation of logic models for each initiative. Logic models would help identify the goals and intended impacts of each initiative.
 - Defining monitoring and evaluation metrics and a data collection strategy. Data collection should include, at a minimum, data on supported businesses (e.g. a unique number of users), engagements (e.g. the number of sessions attended) and users' personal characteristics (for diversity monitoring).
- Cost data should be allocated to each initiative separately, including a clear recording of investment costs and overhead costs per initiative.

1 Introduction

The UK tech sector is a substantial and growing part of the UK economy. The success of both is closely intertwined, as digital technologies are increasingly embedded across all sectors. The UK Government is committed to maintaining and enhancing the UK's status as a global science and technology superpower¹¹ and making the UK a leading country for starting and growing a digital business. For the past ten years, the government has provided dedicated support to accelerate the growth of tech startups and scaleups to achieve this goal.

Since 2018, the government grant to support Tech Nation's activities has been an asset to tech startups and scaleups across the UK. Tech Nation was established as a national organisation focused on supporting the UK tech sector. The Department for Science, Innovation and Technology (DSIT) funded Tech Nation's activities to deliver the following objectives:

- delivering a suite of Growth Programmes aimed at companies at all stages of development;
- strengthening the connections between ambitious entrepreneurs and companies in tech clusters across the UK, creating a national network of UK tech companies;
- supporting UK companies to attract investment and talent;
- providing access to digital entrepreneurial skills to help founders, companies and potential workers develop the skills to start a business, grow it or work in the sector; and
- promoting thought leadership and advocacy for the digital sector.

Following governmental requirements and in an effort to ensure the sector's long-term success, it is crucial to understand the impact and value that publicly funded initiatives generate. In this context, Frontier Economics was commissioned to evaluate the impact of grant funding awarded to Tech Nation for their activities in FY 2018/2019 to 2019/2020 (referred to in this report as 'the previous evaluation'). DSIT has also commissioned Frontier Economics to evaluate Tech Nation's initiatives' use of the current grant funding for FY 2020/21 to 2022/23 (referred to in this report as 'the current evaluation'). The findings of this evaluation are presented in this report. Please note that, following an open competition, the DSIT grant for the next funding support period (FY 2023/24–2024/25) was awarded to Barclays Eagle Labs. Therefore, our recommendations will focus on the future delivery of similar programmes.

This evaluation includes a process and impact evaluation of Tech Nation's initiatives funded by the grant over the years in scope. Given the nature of the activities and data availability, evaluation methods differ between the initiatives. Where applicable, we assess how Tech Nation addressed the previous evaluation recommendations. Lastly, given the results and conclusion of the evaluation, we provide recommendations for future DSIT-funded growth initiatives.

This report contains the following: 1) Introduction; 2) Scope and the approach of the evaluation; 3) Growth Programmes evaluation; 4) Non-Growth Programmes evaluation; 5) Conclusions.

¹¹ <https://www.gov.uk/government/publications/the-uk-as-a-science-and-technology-superpower>

2 Scope and approach to the evaluation

This study aims to provide a process and impact evaluation (and a Value-for-Money/break-even analysis, where applicable) of DSIT funding to support startups and scaleups in FY 2020/21, 2021/22 and 2022/23. This project was carried out between November and March 2023, and, therefore, findings on the impact of FY 2022/23 funding are limited since activities were still ongoing or their impacts may not have yet materialised.

The nature and number of Tech Nation initiatives funded by DSIT have changed over the three-year scope of this evaluation. Details about each initiative and the versions included in the evaluation can be found in Annex B

For this evaluation, we grouped the initiatives as follows:

- 1. Growth Programmes¹² and Rising Stars Competition:** Initiatives focused on accelerating the growth of UK-based startups and scaleups. Some were sector-specific, while others were broader and non-sector-specific. The initiatives aimed to accelerate the growth of participating firms, through the skills learnt and networks created during the programmes. Although not a Growth Programme, Rising Stars provides similar benefits to participants through competition with earlier-stage firms and through the increased exposure they receive to investors, networks and talent.
- 2. Non-Growth Programmes:** all other DSIT-funded Tech Nation initiatives in the evaluation period. Within this group, we discuss initiatives in the following categories:
 - a. Digital Business Academy (DBA), Founders' Network¹³ and the Growth Platform:** Three initiatives that were delivered through digital platforms aimed at increasing users' networks (Founders' Network) and enabling them to learn from their peers or online learning modules (Digital Business Academy). DBA provided bite-sized courses and was aimed at a wider set of audiences, while the Founders' Network was a Slack community where Growth Programme alumni could network and talk to each other. DBA and Founders' Network were consolidated into the Growth Platform (launched in June 2022): developed to allow users access to relevant, highly personalised content, create networks and see other relevant Tech Nation activities and events.
 - b. Scaleup Engagement Managers (SEMs), previously known as Entrepreneur Engagement Managers (EEMs):** From FY 2022/23, the initiative evolved into SEMs to incorporate Tech Nation's focus on scaleups. Each SEM (one for each UK region and nation) operated networking events and one-to-one sessions to help digital tech founders access information, networking opportunities and overcome region-specific challenges. In FY 2022/23, SEMs also delivered the Rising Stars competition.
 - c. Research and Insight (R&I):** Tech Nation's R&I offering included reports and blogs published on its website. It presented Tech Nation's thought leadership, research and analysis of the UK's digital economy, and it aimed to increase insights and information about the UK market to increase the UK tech sector market efficiencies.

¹² Growth Programmes include: Future Fifty, Upscale, Fintech, Applied AI, Libra (only FY 2021/22 and FY 2022/23), Cyber (only FY 2020/21) and Net Zero.

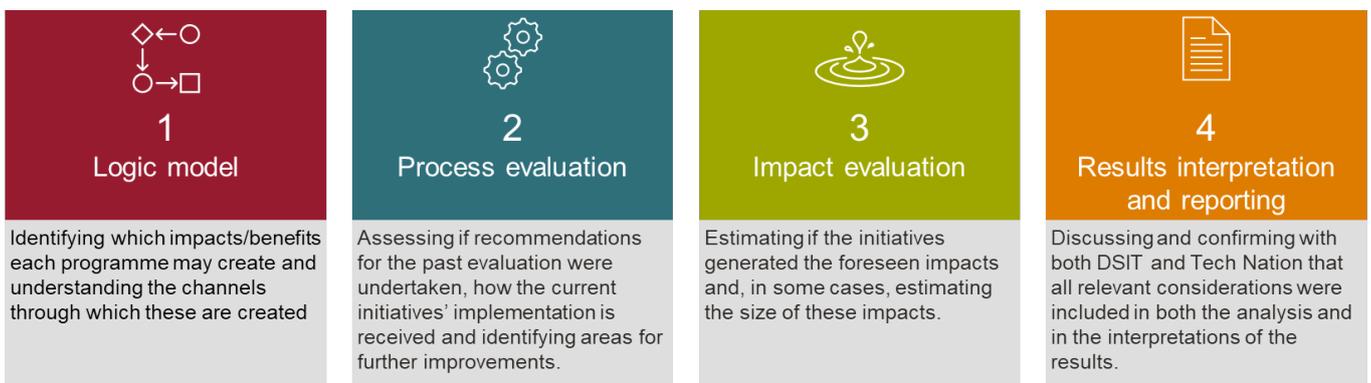
¹³ Including Knowledge Insight Network (KIN).

The following sections describe the analytical approach taken in evaluating each initiative.

2.1 Analytical approach

Following the guidance set out in HM Treasury's Green Book, we established an analytical framework that enables an understanding of the initiatives' objectives and the benefits that they are expected to generate.¹⁴ Next, we assessed the initiatives' processes and impacts in light of the identified benefits. The evaluation of Tech Nation's initiatives in scope follows the overall approach set out in Figure 1.

Figure 1 High-level analytical approach



Source: Frontier Economics

2.1.1 Defining a logic model

A logic model is a visual representation of the initiatives' Theory of Change which helps identify the relevant impacts/benefits generated by each programme and understand the channels through which these impacts are created.

Methods and sources

The Theory of Change, provided by Tech Nation, is the basis for the logic models presented in this report.¹⁵ One recommendation from the previous evaluation was for Tech Nation to create a bespoke logic model for each initiative. A clear logic model helps understand the connection between the activities and how these might produce the predicted impacts. As such, this is an important part of an evaluation. However, the Theory of Change we received was overarching and included all of Tech Nation's initiatives. We integrated the logic models in this report with insights collected during desk research, conversations with Tech Nation staff and stakeholder interviews. For this evaluation, the modified logic models were a vital part of the process. Logic models are discussed for each group of initiatives separately in section 3.2.

¹⁴ <https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government>.

¹⁵ The logic model that Tech Nation provided can be found in Annex F

Process evaluation

This part of the evaluation aims to understand several things about the interventions funded by the DSIT grant: have they been implemented as intended, what has worked more or less well, and why and what could be improved? In addition, it can help identify the aspects of the intervention necessary to achieve the predicted impacts. For example, a digital learning platform will be impactful if users sign up and engage with it – a condition that might be harder to achieve if it is difficult to sign up. We were especially interested in exploring how Tech Nation's programmes changed since the previous evaluation, whether those changes addressed prior recommendations and how the delivery adapted to the COVID-19 pandemic. The result of the evaluation includes recommendations and implications for similar initiatives' processes.

Methods and sources

The process evaluation was based on information gathered as part of a stakeholder engagement exercise involving 20 interviews lasting around one hour each, 14 with Tech Nation service users and 6 with Tech Nation staff.¹⁶ Interviews were based on a semi-structured topic guide agreed upon with DSIT.¹⁷ The guide contained questions aimed at gaining insight into both the process and the impacts of a given intervention. Annex A contains further detail on our stakeholder interviews.

Impact evaluation

An evaluation of whether the predicted impact of an intervention came to fruition and, if possible, to what degree. Given the variety of DSIT-funded Tech Nation initiatives, different programmes require various impact evaluation approaches. Data availability further dictates what approach is feasible and impacts the robustness of the evaluation. We group the initiatives into two:

1. Growth Programmes and Rising Stars

This group includes initiatives where a selected number of firms are chosen to participate in an accelerator-style training and networking programme. Given that these initiatives focus on providing a select number of firms with skills, connections and information that are expected to boost their growth, we can empirically assess how much additional growth was created in the sector by participation in the Growth Programmes.

Method and resources

We used econometric analysis to estimate the impact of participating in these programmes on the performance of the participant firms. Using *regression analysis*, a statistical method that allows us to examine the relationship between an intervention and outcomes of interest, we estimate how much participation in the Growth Programmes increased participating firms' revenues and number of employees.

¹⁶ Given the limited number of interviews in the scope of the evaluation, not all Growth Programmes were included in the conversations. Since the nature of Growth Programme initiatives implementation is similar across those programmes, we agreed with DSIT and Tech Nation that the views collected are representative of Growth Programme initiatives as a whole.

¹⁷ A semi-structured interview is a data collection tool where a predetermined framework around the topics is set, but questions are not presented in a set order or phrasing. The semi-structured stakeholder engagement in this evaluation involved 20 stakeholder interviews. Please see Annex A for further details.

We use a propensity score matching (PSM) approach; this allows us to identify a group of firms that have not participated in the Growth Programmes (control group) but are similar in characteristics to the firms which have (treatment group). Comparing the growth outcomes of the two groups allows us to isolate the additional growth the participating firms experienced as a result of the Growth Programmes.¹⁸ We based the analysis on Tech Nation's data and external data about firms' growth and characteristics. We discuss the method and specifications in further detail in section 3.4.1. Insight from conversations with stakeholders about the impacts is also used to support the quantitative analysis. In addition to the stakeholders mentioned in the process evaluation, we interviewed five external stakeholders to better assess the initiatives' impacts.

Although the Rising Stars competition differs from the Growth Programmes, its aim is similar: accelerating the growth of participating firms. Since data are available in a similar manner to the Growth Programmes, a similar econometric regression analysis is conducted for the Rising Stars competition. We discuss the method and specifications in section 3.4.1.

After estimating the impact size for the Growth Programme and the Rising Stars competition, we conduct a **Value for Money (VfM)** assessment. We converted the estimated impact to monetary value and compared it to the initiative's costs. This results in an assessment of the overall value produced given the monetary investment. Please note that operating costs for each programme were recorded separately, but overhead costs were not.¹⁹ As such, we treated the VfM assessment results as indicative.

2. Non-Growth Programmes Initiatives

These initiatives are designed to reach a much larger number of beneficiaries in a 'lighter-touch' way. As such, it is unlikely that, on average, an interaction between a supported business and one of the initiatives would lead to a large enough impact detectable with econometric analysis. However, we can evaluate the impact of the initiatives through an evaluation informed by qualitative interviews, analysis of Tech Nation's monitoring data and quantitative reach analysis.

Methods and sources

We based the analysis on monitoring data Tech Nation provided and assessed the outputs of each programme. Using monitoring data, we assess the outputs of the programmes and their evolution over time (where data allow).²⁰ Data are also used, when available, to evaluate the level of user engagement – this helps understand the impact that users might have experienced. Identified impacts were further corroborated through interviews with stakeholders (programme users and external stakeholders). For some non-Growth Programmes, where the marginal cost from additional users is small,²¹ we conducted a reach analysis and compared the reach of Tech Nation's initiatives to potential beneficiaries in the UK tech sector.

¹⁸ Further details can be found in section 3.4.3.

¹⁹ See Annex A on how the approach taken to allocate overheads to the initiatives.

²⁰ We note that, due to data limitations, some output trend analysis was not possible. In those cases, data points across years are provided.

²¹ Reach analysis is conducted only for DBA, Founders' Network and Growth Programme. Given the nature of SEM/EEM, only the potential reach is provided (without assessment of the % of the initiative's reach). Research and Insight are excluded from the reach analysis as well.

This step can assess how feasible it would be to increase the initiative's impact further (given that additional costs would be minimal).

Since we are unable to calculate the exact size of the impact, a VfM analysis is not possible for the non-Growth Programmes initiatives. As such, we considered the possibility of a 'break-even' analysis to assess the validity of the investment into those programmes. This type of analysis aims to estimate the likelihood of the initiative's monetary value overcoming the costs. It is used in cases where information on the value of the impact is not robust, but costs can be identified with high confidence. The cost can then be compared to the possible monetary value of the impact. After a review of the cost data provided by Tech Nation, we assess that a break-even analysis is only possible for DBA. Cost information about Founders' Network, EEM/SEM and Growth Platform was not clearly separated in the cost records, so it is impossible to arrive at a cost per user with high confidence for each of those programmes. Please see Annex A for further details.

Table 1 presents the initiatives in scope as well as the evaluations and methods that will be used.

Table 1 Evaluation method in scope – by programme type

Group	Initiatives included	Process evaluation	Impact evaluation approach	VfM/Break-even analysis
Growth Programmes and Rising Stars Competition	Future Fifty	Based on stakeholder engagement.	Econometric analysis.	Indicative VfM.
	Upscale			
	Fintech			
	Applied AI			
	Libra			
	Cyber			
	Net Zero			
	Rising Stars			
Other non-Growth Programme initiatives	DBA	Evaluated together. Based on stakeholder engagement.	Evaluated together. Based on stakeholder engagement, assessment of Monitoring data and reach analysis.	Break-even analysis is conducted as costs allocated to DBA separately.
	Founders' Network			Excluded as costs are not recorded separately.
	Growth Platform			
	SEM/EEM	Based on stakeholder engagement.	Based on stakeholder engagement and assessment of Monitoring data.	Excluded as costs are not recorded separately.

Research and Insight	Based on stakeholder engagement.	Based on stakeholder engagement and assessment of Monitoring data. Reach analysis is excluded due to the nature of the programme.	Excluded from the scope of VfM/break-even analysis.
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Source: *Frontier Economics*.

The following sections discuss the process and impact evaluations conducted for each service.

3 Growth Programmes and Rising Stars evaluation

Key findings and recommendations

Process evaluation

- **Feedback** from participants on Programme delivery was positive overall, especially around the type of sessions and the hybrid delivery approach adopted in response to the Covid-19 pandemic. Some organisational issues were raised around signposting the benefits of a given event, making sure that invites are shared more in advance, and potentially spreading events over a longer period.
- **Recommendations** from past evaluations have been partially implemented. The scoring of Growth Programme applicants could have been done more clearly, and overhead cost allocation to each programme would have allowed for a more robust evaluation of the programmes.

Impact evaluation

- We use a PSM approach to estimate the employment impact of these initiatives.
 - We find that participating in Growth Programmes led to a 27% increase in supported businesses one year after they completed the initiative. This percentage increased to 37% after two years and 38% after three years.
 - We convert this estimated employment impact into a Gross Value Added (GVA) impact by assuming that the additional workers employed as a result of this growth have shifted from average productivity jobs to higher productivity jobs. We estimate that Growth Programmes delivered in FY 2020/21 generated approximately £30.4m in GVA. We were unable to calculate a value-for-money figure given the limitation around the allocation of overhead costs, but we concluded that the estimated monetary value was much higher than the cost of programme delivery.
 - We cannot confidently quantify the impact of Rising Stars. However, we find that the organisation of Rising Stars successfully targeted companies located outside the London area, contributing to DSIT's wider policy objective to create levelling-up opportunities. We also found that the competition highlights initiatives from female founders.
 - **Recommendation:** costs, including investment and overhead, should be allocated and recorded for each intervention separately for future value-for-money assessment.
-

In this section, we discuss the results of the process and impact evaluation of the Growth Programmes taking place across the evaluation period. First, we describe the programmes and then report the process and impact evaluations. Finally, we present the conclusions, limitations and further recommendations for similar Growth Programmes.

3.1 Objectives of the initiatives

The overarching objective of the Growth Programmes is to support founders of tech startups and scaleups based in the UK and accelerate their growth. This is achieved via peer-to-peer learning, events with experienced entrepreneurs and sector leaders who can share their knowledge, and networking

opportunities. The main goal of the activities is to increase founders' skills, expand their networks, and improve their access to potential clients and investors.

Over the years included in this evaluation, Tech Nation operated seven Growth Programmes, each with a specific target audience. Four Growth Programmes targeted potential firms in specific sectors (sector-specific programmes, which included Applied AI, Fintech, Cyber and Net Zero). Others were not sector-specific and focused on the development stage of the firms (including Libra²², Upscale and Future Fifty). Given the varying targets, each programme had its eligibility criteria and a limited number of places in each version. Firms had to apply for spot in a given Growth Programme. Each firm, whether accepted or not, was then evaluated against a set of criteria. Some programmes ran throughout the evaluation period, while others operated only for some years.²³ Table 11 in Annex B presents further details about each of the Growth Programmes.

In addition to the Growth Programmes discussed above, this section includes the Rising Stars competition: a competition particularly focused on early-stage tech scaleups. The competition involved several stages, after which Tech Nation selected ten winners. Overall, the competition aimed to provide pitch training, coaching and masterclasses to the companies. In addition, the format granted opportunities to develop a network by meeting investors, accelerators, entrepreneurs and corporate leaders in the UK tech community. Moreover, Tech Nation provides content campaigns and press coverage for companies passing each stage of the competition. Further details about the Rising Stars competition can be found in Annex C.2.

Although not a Growth Programme, the competition objectives are similar: to increase visibility and increase early-stage startup founders' skills that will accelerate their business growth. We included Rising Stars in the discussion of the Growth Programmes below and mentioned where Rising Stars might differ.

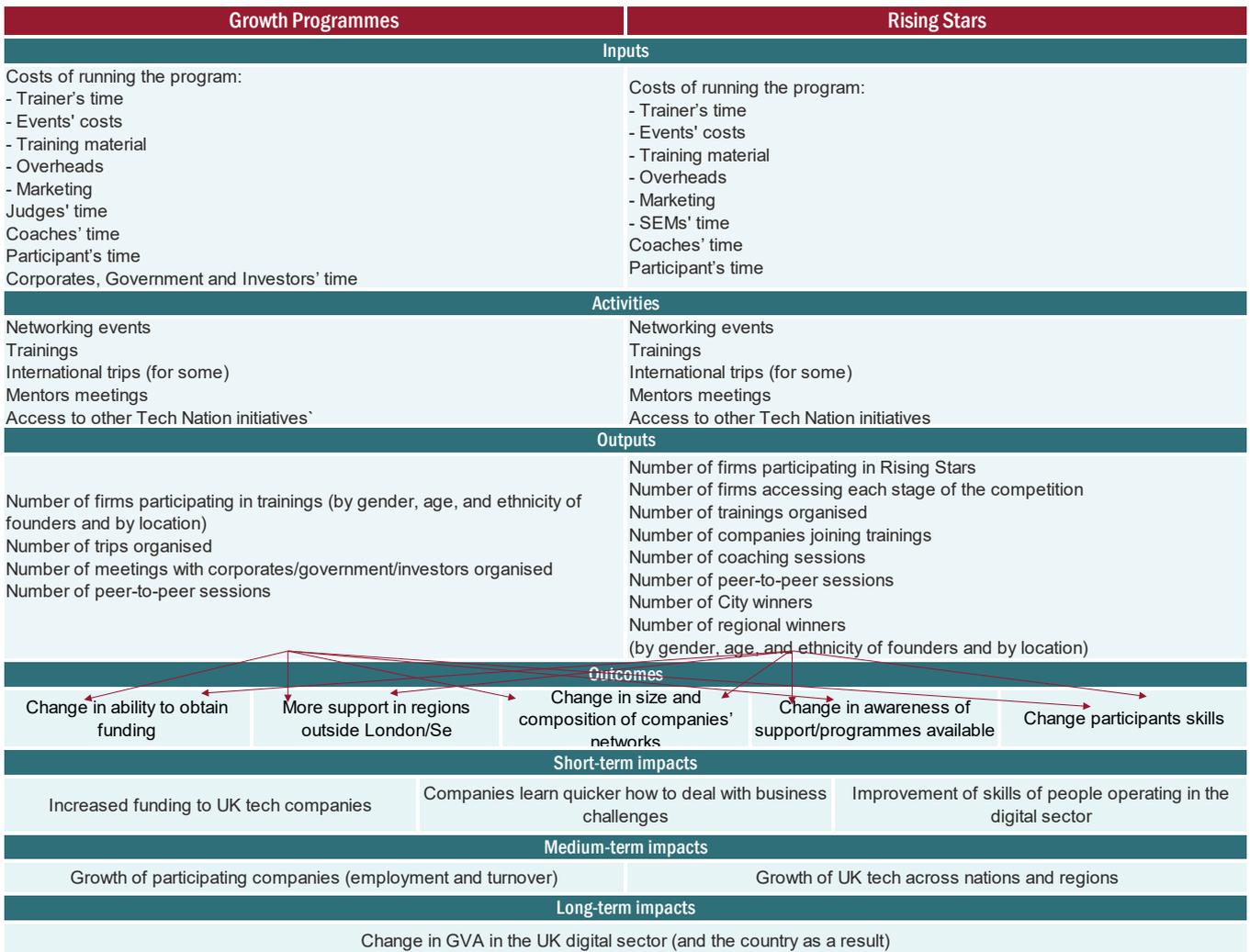
3.2 Theory of Change and Logic model for this group of initiatives

A logic model is a visual representation of the Theory of Change, helpful in clearly setting up the activities and outcomes of the input that create the initiative's foreseen impacts. Figure 2 below presents the logic model for the Growth Programmes (incl. Rising Stars).

²² Libra was focused on underrepresented funders in particular.

²³ Cyber only operated in FY 2020/21, and Libra only operated in FYs 2021/22 and 2022/23.

Figure 2 Logic model for Growth Programmes and Rising Stars



Source: Frontier Economics.

The logic model shows that the inputs, activities and outputs vary between the Growth Programmes and the Rising Stars competition. However, it is clear that both lead to the same outcomes and consequently to the same impacts.

Overall, the initiatives' two main impacts are skill improvement (through learning sessions and experience sharing) and improved access to networking. In addition, the programmes might have impacted participants' access to funding through increased visibility and exposure to investors. Furthermore, potential investors might consider the business skills the participants acquired attractive.

Entrepreneurs at different stages of development require certain skills for the startup's success.²⁴ Two participants mentioned that skills learnt, especially from other founders through their shared experience,

²⁴https://www.researchgate.net/publication/339469851_A_systematic_literature_review_of_skills_required_in_the_different_phases_of_the_entrepreneurial_process.

were highly valued. Those skills ranged from technical skills like the ability to design more efficient processes to softer skills like problem-solving at a pace in fast-changing businesses.

In addition, skills gained from networking are important for a successful startup. Passaro et al. (2020) found that 'the creation of a specific ecosystem is suggested to ease the new digital entrepreneurship generation toward acquiring an appropriate level of knowledge, skills, financial facilitations, and entrepreneurial culture', which was found to play a 'critical role in sustaining the evolution and success of new firms'.²⁵ Indeed, four stakeholders mentioned networking as one of the main benefits of the programme.

Although the impact analysis for the Growth Programmes and Rising Stars utilised quantitative analysis, discussions with participants provided insight into the impacts users experienced, which can help further validate the logic model. Overall, most participants we spoke with mentioned increased access to further funding as a consequence of the programmes. Be that through increased skills, increased networks and events with relevant funders or due to the validation provided through their participation in the prestigious programme. Two participants also mentioned the reputation of Tech Nations' programmes, which suggests that having Tech Nations' Growth Programme on the firms' CV helps investors know that the company has the parameters to succeed – a seal of approval. Because of the Growth Programmes' reputation and prestige, Tech Nation could secure high-profile event speakers, which users found impressive and beneficial. One stakeholder mentioned that meeting with the Prime Minister, for example, was very impactful for them and increased the company's exposure.

The following section explores the processes of the programmes and whether improvements can be made to ensure the impacts, as identified in the logic model, are realised. The following section will describe the analytical approach that we undertook to assess the size and impact of participation in the Growth Programmes (and Rising Stars) on firms' growth.

3.3 Process evaluation

The process evaluation follows the approach set in section 2.1 and aims to address the following questions:

1. How well did the changes in the initiative address the previous evaluation recommendations, and have those changes created additional process findings?
2. Did our stakeholder engagement point out other findings on initiative delivery?
3. How did the initiative delivery adapt to Covid-19?

We address each question below and follow with the conclusion and recommendations for future initiatives. The insights presented below are based on interviews with six Growth Programme and Rising Stars participants, four Tech Nation staff and five external stakeholders.²⁶

²⁵ <https://www.mdpi.com/2071-1050/12/22/9437>.

²⁶ See Annex A for further details on stakeholder engagement.

3.3.1 Assessment of the changes that occurred

The previous evaluation of Tech Nation activities provided two recommendations regarding the operation and evaluation of Growth Programmes (including the Rising Stars competition).

Different eligibility mechanisms to allow for more precise impact evaluation

In the previous evaluation, we suggested that Tech Nation consider more explicit eligibility criteria and introduce a scoring system that would allow evaluators to identify firms that were extremely close to participation but were not accepted. The main reason for this recommendation was to allow for a different, more robust econometric approach. In particular, a Regression Discontinuity Design (RDD) method would compare the effect of participation of the firms that were narrowly accepted to those that were narrowly not.

Tech Nation had a flag to mark firms that were 'Highly Commendable Applicants' (HCA) but were not selected as participants in the Growth Programmes. Tech Nation scored applicants for the Growth Programme on several parameters.²⁷ The second X number of firms with the highest scores receive an HCA flag. For example, if there are 30 places in a programme, the firms with the number 1 to 30 highest scores would be accepted, and the 31 to 60 highest would be marked as HCA. At the time of the evaluation, Tech Nation was not able to share the exact score of each accepted or flagged as an HCA firm.

Identifying HCAs is useful from an impact evaluation perspective. This identifies a potential group of firms that are motivated to access the Growth Programmes and are more comparable to participants than the average applicant. However, this falls short of the requirements for a typical RDD, which requires selection based on a quantitative variable and a sharp cut-off (discontinuity) value. For example, RDDs are used in close elections where a few votes determine which candidate achieved a majority of the vote. As such, comparing outcomes between participating firms and those identified as HCA would generate an impact assessment less robust than if the HCA were identified by having a very close score to those accepted.

For an impact assessment that more closely compares the impacts between participating and nearly participating firms, the eligibility criteria should allow identifying firms that 'nearly made it'. This means that the number of borderline cases is not predefined but based on scores very close to the pass threshold. The data that Tech Nation provided only allowed visibility of firms identified as HCA but did not include their score to allow identification of the firms extremely close to being chosen.²⁸ Future similar initiatives should aim to have a candidate scoring system that can be shared with future evaluators. With those scores, the most suitable comparator group can be chosen.²⁹

²⁷ Please see Annex B for the list of scoring parameters as received from Tech Nation.

²⁸ 'Extremely close' is defined as firms that Tech Nation would have liked to include in the programme, but space did not allow. If numerical scores for each candidate were produced and shared with us, a more precise definition of 'extremely close' would have been produced.

²⁹ Please note that having the ability to choose a close competitor for the treatment group does not automatically mean an RDD approach is feasible. The exact scores might reveal only a very small control group and lead to inconclusive results.

That said, we acknowledge that this type of approach and recordings can be time-consuming. If this process is implemented only for possible future econometric investigations, it might not be a proportionate request, as the analysis results might not yield useable results due to the small sample size.³⁰

Recommendation

We recommend considering a merit-based numerical scoring approach with a sharp cut-off point to allow future identification of HCA. However, the decision to implement such an approach should be taken only if the process would not be highly resource-consuming.

Cross-promote other programmes

In the previous evaluation, it was recommended that Tech Nation proactively promotes and tracks linkages between different programmes (including Growth and other programmes) to increase the reach of some programmes and have a more holistic view of how programme users interact with Tech Nation.

Tech Nation has consolidated all initiatives on the Growth Platform (launched in June 2022), and was offering them to eligible users on the platform. We discuss in detail the Growth Platform in section 4.1. On a high level, it is a personalised platform that allows users access to targeted content, creation of networks and viewing events and further programmes relating to their needs. From FY 2022/23, registration to the Growth Programme was done through the Growth Platforms. Through the creation of the Growth Platform and consolidation of initiatives on it, Tech Nation has implemented the recommendation. That said, the Growth Platform went live in June 2022, so potential opportunities to cross-promote in the past might have been missed.

Out of the five participants we spoke to, most were not fully aware of all of Tech Nation's programmes.³¹ That might be because most stakeholders participated in programmes pre-FY 2022/23 – before the Growth Platform's launch. Given how recent the Growth Platform launch was, we were not able to collect feedback from Growth Programme users registered through the platform to test how well this approach for cross-promotion achieved its targets. This finding also reflected comments from Tech Nation staff. They suggested registration through the Growth Platform should have made it easier to identify the right programmes and further needs of a Growth Programme participant; however, they have yet to see the impact.

Stakeholder engagement did reveal that five out of the six firms applied to the Growth Programmes due to EEM/SEM activities, which is further cross-promotion activity. That was also backed by Tech Nation staff, who mostly thought that SEM networks are critical in identifying and referring companies to the relevant

³⁰ Please see C.2, which presents the results of the HCA econometric analysis that was conducted this year. The results were unstable due to the small sample sizes. As such, even if the eligibility criteria are conducted as prescribed, it does not ensure that the results of the econometrics would be useable in the end.

³¹ The majority of stakeholders we spoke with were not aware of or understood the total offering of Tech Nation and how initiatives fit together. That said, in some instances, stakeholders used other programmes (not the core one they have signed up for) but were unaware they were using more than one Tech Nation initiative. For further details, please see 4.1.

programmes. Indeed, four out of the six Growth Programme users we spoke to mentioned that they applied because of an EEM/SEM referral.

One Tech Nation staff member mentioned that cross-promotion occurred between the non-sector-specific Growth Programmes (e.g. Future Fifty) and the sector-specific ones (e.g. Applied AI) when themes overlapped. Similar cross-promotion occurred with Rising Stars, where sector-specific awards³² were created, which would guarantee the winner a place on the respective Growth Programmes.

Overall, Tech Nation implemented the recommendation by creating the Growth Platform and increasing cross-promotion from SEMs and potential cross-referring within the Growth Programmes. But, given that the launch of the Growth Platform was recent, it is impossible to assess its success.

Recommendation:

In the future, we recommend collecting cross-promotion data and assessing its impact on the uptake of other initiatives.

3.3.2 Other findings on the delivery of the initiatives

In addition to the changes above, a few other process points have emerged from the stakeholders' discussion.

Delivery of the Growth Programmes as a whole

Overall, the participants we spoke to thought the programme was well organised. However, four of the six participants identified some areas for improvement:

- More notice time could have been given in advance of events organised as part of the programmes, which would have increased participation.
- Clearer signposting to where session recordings can be found would have helped catch up on missed content.
- Better explanation of the events' benefits would have made it easier to decide whether to join.
- Events could have been spread over a longer period as it sometimes felt too packed, making it hard to participate in all activities: 'The only thing that could have improved our experience is having more time available to actually engage with the programme. Our biggest challenge was that we could only do so much'.

Registration to the programmes

Interviewed participants took part in the programme pre-FY 2022/23. As such, registrations were not done through the Growth Platform. Most participants viewed the registration process positively, with no major issues. One participant out of six mentioned that the process was relatively long. Another participant noted

³² The awards available are for Fintech, Cyber, Applied AI and Net Zero.

that they had not applied to the Growth Programme a year prior as the website's eligibility criteria were unclear at the time, making them believe they were not eligible. Only after the registration closed did they realise they were eligible.

The mix of event types

Most participants agreed that having several types of events, sessions, and topics provided a good range of subjects and engagement opportunities. In particular, participants were positive about the mix between peer-to-peer (with other participants in the programme and hearing from past alumni) and expert events.

Programme reputation and impartiality

One participant and one external stakeholder mentioned the importance of the Growth Programme being run by an impartial party.³³ It was explained that impartiality makes the programmes focus solely on the needs of the firms without external pressures pulling to another direction. That leads to better-tailored programmes, which then increase the initiative's reputation. Two of the programme users mentioned that the programme's reputation and its long-running track record make it more effective in attracting investors to the participants. As mentioned above, it gives participants a 'seal of approval'. In their words: 'Tech Nation was a really great badge to have [...] it gave us a good degree of credibility with all kinds of stakeholders.'

3.3.3 Adapting to COVID-19

With the onset of the COVID-19 pandemic, all Growth Programmes were switched to online sessions and events, with a hybrid approach being adopted since. Most participants thought this was a positive move, especially for those outside London. That said, participants did mention face-to-face sessions are more effective for building relationships – most Tech Nation staff we spoke with shared this view. Tech Nation staff also did not think that the move to online/hybrid has saved significant resources.

3.3.4 Process evaluation conclusions, recommendations and limitations

Conclusions

-
1. Past recommendations were implemented, but some limitations still exist. The eligibility criteria were defined, but numerical scoring that can be shared with us to identify and flag borderline cases extremely close to being accepted could have presented better evaluation opportunities. Cross-referring has improved, but data about cross-promotion activities' effectiveness was unavailable.
 2. Feedback from participants on programme delivery was positive overall, especially around the type of sessions and the hybrid delivery approach adopted in response to the Covid-19 pandemic. Some organisational issues were raised around signposting the benefits from a given event, making sure that invites are shared more in advance and, potentially, over a longer period.
-

³³ An impartial party refers to an organisation whose main source of funding is not related to a particular investor or a large organisation.

Recommendations

1. Future initiatives aimed at increasing startups and scaleup growth and delivered in parallel (i.e., as was done by Tech Nation) should be cross-promoted. Data about the cross-promotion success level needs to be collected for future evaluation. Cross-promotion through region-focused teams (such as EEM/SEM) seems highly effective in referring relevant firms, especially from non-London areas.
 2. Ensure that sessions and events are spread across the programme period; invites are sent well in advance to participants and signpost the benefits of attending.
 3. Offer a mix of event types (peer-to-peer and experts), as well as a mix of online and in-person events.
-

Limitations

The process evaluation was based on a limited number of stakeholders that were able to share thoughts and insights about the Growth Programmes. The scope of the stakeholder engagement exercise was driven by the resource and timelines allocated for the impact and process evaluation of all Tech Nations' initiatives. Given that, for the Growth Programmes, a quantitative evaluation was feasible, a smaller share of resources was allocated to the stakeholder exercise. The evaluation period covers 22 versions of different Growth Programmes, while only six stakeholders shared views about their experience with those programmes – usually about one Growth Programme. Finally, versions of the programmes that have not been finalised up to December 2022³⁴ were excluded from the stakeholder interview scope as a full view of the programmes' processes and impacts would not have been complete and, therefore, might have been skewed. As such, the analysis above did not account for insight into the processes of Growth Programmes taking place in the last evaluation year.

3.4 Impact assessment

The impact evaluation of the Growth Programmes and Risings Stars competition was based on a quantitative approach (econometric analysis) aimed at analytically isolating the impact that participation in the Growth Programmes had on firms' growth. The quantitative model results were then used to assess the impact's monetary value and contrasted with those programmes' costs for an indicative VfM analysis. Lastly, we conducted a distribution analysis to gain insight into the demographics for which the estimated impacts occurred.

The following sections discuss the approach and results of the quantitative analysis and present the VfM and distributional analysis results.

3.4.1 Econometric approach

The econometric approach utilises a regression analysis – a statistical method aimed at isolating the impact of one variable (an independent variable which is, in this case, participation in the Growth Programme) on

³⁴ Shareholder engagement started in January 2023, and the scope and list of stakeholders were identified in December 2022. Please see Annex A for further details.

another variable (a dependent variable which, in this case, is the firm's growth). This is done by estimating the impact of participation in the Growth Programme (treatment group) compared to not participating (i.e. the counterfactual). The analysis compares the observed growth in the treatment group to a similar group of firms that did not participate (control group).

Identifying an appropriate control group is important because participants are selected based on a number of criteria, including further growth potential.³⁵ Therefore, comparing participants to all non-participating firms would likely lead us to overestimate the impact of the Growth Programmes.

The specific approach we have used to identify a suitable control group is Propensity Score Matching (PSM). The PSM is a robust analytical approach aimed at finding a control group similar to the treatment group by identifying firms that have not participated in the Growth Programmes but had a comparable likelihood of participating.

C.2 includes further detail about the PSM method and the various stages that it includes.

Econometric specification

There were two elements we identified before proceeding with the PSM analysis:

1. The variables that are part of the analysis.
2. The time period in the econometric analysis.

We discuss each in turn below.

The variables included in the evaluation

Figure 3 presents the variables of interest.

Figure 3 Regression specification

Outcomes of interest (dependent variable)	The driver of interest (independent variable)	Control variables
Employment (in T+1, T+2 and T+3)	Participation in Tech Nation's Growth Programmes at T+0	Characteristics that might be drivers for the likelihood of participating in the Growth Programmes as well as contributing to firms' growth alongside participation in the programmes. Mainly size, sector, other regional factors and participation in an accelerator.

Source: Frontier Economics.

Note: T+X represents the employment growth of firms X years after participation in the programme. For example, T+1 refers to the growth of the firm one year after participation.
Turnover was excluded from the main analysis because it can fluctuate substantially for businesses at the early stages of development. See turnover results in C.2

Employment is a widely used metric that indicates firms' growth and relates directly to the additional product added to the economy through the Gross Value Added (GVA). Unlike a firm's turnover, employment changes

³⁵Participants are chosen based on their score against several criteria which identify the potential for the high growth of those firms. Please see B.1 for further details.

are more gradual and less volatile. In the analysis for Growth Programmes, we used that change in employment growth.³⁶ In particular, employment growth is defined as the change in percentage in the number of employees a firm has for X years compared to the level of employment before participating in the programmes. For Rising Stars, given that many of the participating firms are at a very early stage with baseline employment at zero, we estimate the programme's impact on firms' number of employees instead of the percentage of the change in employment.³⁷

Lastly, we identified a set of control variables. Control variables in regression analysis refer to firm characteristics that may influence employment regardless of participation in the Growth Programmes. In a PSM analysis, this step is important. It is used to assess the impact of various pre-participation firm characteristics on firms' probability of participating in a Growth Programme. Then, it is used in the calculation of the effects on the treated and control firms (step 2 of the analysis). Conceptually, we expected the most important characteristics driving selection into Growth Programmes to include the firms' size at baseline, growth prior to participation and sectorial composition. In addition, we include information on firms' location, age (years since incorporation), participation in accelerator programmes and links to academia (whether the firm is an academic spin-out). By adding the proportion of workers in the firms' sectors that are able to work from home, we also control for the possibility that COVID-19 lockdowns may have disproportionately affected some firms' outcomes. The variables thus exploit the considerable range of information available in the dataset.

The period of time that is included in the evaluation

We are interested in understanding the impact that participation had on the growth of firms right after participation and several years later. In particular, we analyse the future growth impacts for up to three years.³⁸ As such, for this analysis, we need employment information about:

- T+0 – This is the employment at baseline (before participation); and
- T+1, T+2 and T+3 – Those are the years of impact after participation, where T+1 indicates the impact one year after participation, T+2 two years after and T+3 three years after.

Some of the activities in the evaluation period (FY 2020/21, 2021/22 and 2022/23) were very recent, and some of the impacts of interest above have yet to be realised and cannot be evaluated directly, as set in Table 2.

³⁶ Turnover was excluded from the main analysis because it can fluctuate substantially for businesses at the early stages of development. See turnover results in C.2.

³⁷ Please see C.2 for further details.

³⁸ We investigate impacts up to three years after participation in order to expand on the evidence generated by the previous evaluation, which looked at impacts up to two years after participation. The previous evaluation found significant impacts of participation over the two years following participation, and therefore it was useful to explore whether these impacts persist in the third year or whether they dissipate over time.

Table 2 Participation years and the realisation of impacts

FY	T+1	T+2	T+3
2020/21	2021	2022	2023
2021/22	2022	2023	2024
2022/23	2023	2024	2025

Source: Frontier Economics.

As such, the analysis can only include the years that have been realised and for which we have data (i.e., the green cells in Table 2). This creates two limitations:

- The analysis will examine two years of participation. This will allow for one year to assess the impacts of T+2 and will have no ability to test T+3 impacts.
- The two years in the analysis will both be impacted by the onset of COVID-19 in March 2020. That can create a bias in assessing any potential impacts in later participation years. For example, T+3 for participation in FY 2022/23 is much less likely to be impacted by COVID-19 than T+1 and T+2 for participation in FY 2020/21.

To increase the robustness of the analysis and introduce a wider range of COVID-19 and non-COVID-19 affected impacts, we widened the analysis to include 2018 and 2019. Including pre- and post-COVID-19 participation years allows isolating the years where COVID-19 occurred but also allows for more balanced impact estimates that can be used for later FY in the evaluation period.

The data used for employment are based on the Business Structure Database (BSD). BSD data files are published annually; each annual file includes the average employment of a firm in the four quarters before the end of March of the same year. For example, BSD 2020 would include firms' average employment in the four quarters before the end of March 2020. The latest available BSD annual files is BSD 2022, which reports the average employment of the four quarters before March 2022.

Table 3 presents the relevant BSD annual files used to measure impact employment in each 'baseline year' (the year before the estimation of participation impact of a firm's employment) and each outcome year for T+1, T+2 and T+3.

Table 3 BSD baseline and the relevant BSD report for impact employment data

Baseline year (T+0):	Outcomes		
	T+1	T+2	T+3
BSD 2018	BSD 2019	BSD 2020	BSD 2021
BSD 2019	BSD 2020	BSD 2021	BSD 2022
BSD 2020	BSD 2021	BSD 2022	

BSD 2021

BSD 2022

Source: Frontier Economics.

Note: BSD baseline year will include all firms that participated in a Tech Nation Growth Programme up to 6 months before and after the end of March of that reporting year.

We then matched participating firms with the relevant baseline BSD year. In particular, when allocating, we looked for the closest BSD report to the start date of the Growth Programme in which the firm participated. For example, if the firm participated in Future Fifty 8.0, which started on 26/03/2020, it would be matched with baseline employment reported in BSD 2020 as that is the closest report to the start of the Growth Programme.

Table 4 presents the number of treated and control firms that were assigned to each baseline year in the combined cleaned data set.

Table 4 Size of the combined cleaned data set for the econometric analysis

Baseline year	Number of treated		Number of non-treated
	Growth Programmes	Rising Stars	
BSD 2018	71	21	20,758
BSD 2019	63	26	20,786
BSD 2020	107	44	20,790
BSD 2021	64	0*	20,887

Source: Frontier Economics based on ONS data.

Note: * No Rising Stars version was allocated to BSD 2021 since the version in FY 2021/21 started only in November, making it closer to BSD 2022 rather than BSD 2021. Please see Annex B for programme start and end dates.

Several different analyses were conducted. The main analysis includes:

1. Pooled regressions in which changes in employment between baseline and T+X (available in the data) are analysed together to provide an average T+X effect across the years.
2. Annual regressions for each treatment year in the econometric analysis (2018, 2019, 2020 and 2021).

The next section describes the results of the impact analysis.

3.4.2 Econometrics results

Table 5 presents the results of the estimation of the employment treatment impacts. The number in each cell represents the additional percentage of employees that participation in Tech Nation creates in addition to the percentage change in employment that would have occurred if the firms had not participated – compared to their baseline employment. The corresponding average number of employees and the monetary value will be discussed in section 3.4.4 – where the VfM analysis results are presented.

Table 5 Employment growth at T+X compared to baseline from participation in the Growth Programmes

Year	T+1	T+2	T+3
Pooled	27% *	37% *	38% *
2018	19% *	18% *	43% *
2019	34% *	36% *	27% *
2020	26% *	42% *	
2021	31% *		

Source: Frontier Economics analysis of ONS data.

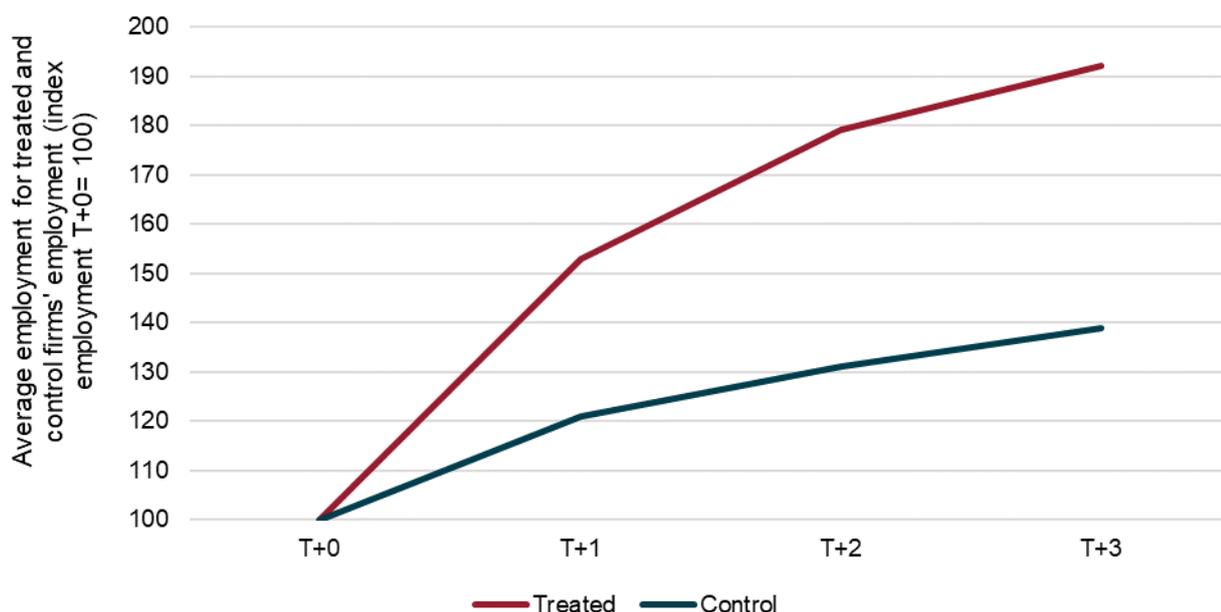
Note: * All effects are statistically significant at 99%, aside from T+2 2018 and T+3 for 2019, which are significant at a 95% confidence interval.

The pooled regression (which represents the average treatment effects across all years) shows that participation in Tech Nation has a positive and statistically significant impact on employment growth (through the additional percentage increase in employment compared to baseline) over the analysed period (T+1, T+2 and T+3). Between the year of participation (T+0) and the following year (T+1), the employment of treated firms has increased by 27 percentage points more than the employment of matched control firms. In the second year after participation, we estimate a further increase in the gap between treated firms' employment growth compared to the controls (37% treatment effect at T+2).³⁹ At T+3, the difference between treated and control firms in growth relative to baseline is very similar to T+2 (38% treatment effect compared to 37% at T+2), which indicates that between T+2 and T+3, the treated and controls are growing at a similar rate.⁴⁰ In other words, by T+3, control firms have caught up with the treated in terms of their growth speed. However, the difference in employment levels is virtually unchanged compared to T+2, though still higher than for the control group. This can also be seen in Figure 4 below.

³⁹ This is also confirmed by the following test. We compute the annual rate of employment growth for treated firms (Gt) and matched control firms (Gc). For example, for a firm participating in a Growth Programme in 2020, Gt at T+1 would be the rate of employment growth between 2020 and 2021. We find that the difference between Gt in T+2 and Gt in T+1 is statistically different from the difference between Gc in T+2 and Gc in T+1.

⁴⁰ Using the notation in the previous footnote, the difference between Gt at T+3 and Gt at T+2 is not statistically different from the difference between Gc at T+3 and Gc at T+2.

Figure 4 Pooled growth of the control population and the additional growth from participation in the Growth Programmes



Source: Frontier Economics based on ONS data.

The figure shows that at T+0, thanks to our PSM procedure, treated and control firms have similar employment levels. A gap in employment opens up at T+1 and widens during T+2. By T+3, the red (treated) and blue (control) lines are essentially parallel, indicating that treated and control firms' employment has increased at a similar rate in the last year, and the gap between the two lines is similar to T+2.

We conducted the annual regressions to see if COVID-19 impacted the treatment effects. We find no evidence that the onset of COVID-19 in 2020 had a negative impact on the outcomes of firms that had participated in the Growth Programme in previous years. Interestingly, some of the effects that occurred after the onset of COVID-19 (i.e., T+3 for 2018, T+2 for 2019 and T+1 for 2020) were the highest impacts seen in the analysis (43%, 36% and 31% respectively). We also found no evidence that participating in Growth Programmes in 2020 (when the programmes were affected by lockdowns) had an impact on the growth of firms in the medium term: firms participating in 2020 had the second lowest of all T+1 impacts (26%) and outperformed all in T+2 (42%). Overall, COVID-19 did not seem to have a wide impact.

3.4.3 Other econometric results

In addition to the main results above, other estimations were conducted for the following:

1. Employment impacts by type of programme (those focused on early and later stages)
2. Employment impacts between London-based companies and non-London-based ones

We discuss each below.

Employment effect by type of programme

In principle, it would be interesting to estimate impacts specifically for each Growth Programme (e.g. Upscale, Future Fifty and Libra). However, this is impossible because the number of firms participating in each programme is too low to identify the impacts robustly through quantitative analysis. Nevertheless, we can explore impact variations between different programme groups.

Three Growth Programmes are non-sector-specific and target firms across all sectors based on their stage of development (Future Fifty, Upscale and Libra). Four Growth Programmes target mid-stage firms in specific sectors (Applied AI, Fintech, Cyber and NetZero).

Table 6 presents the impact on employment for each of these two groups of programmes: sector-specific and non-sector-specific.⁴¹

Table 6 Employment growth at T+X compared to baseline from participation in Growth Programme: vertical versus horizontal – Pooled results

Programme type	T+1	T+2**	T+3
Main results (all together)	27% *	37% *	38% *
Non-sector-specific	26% *	35% *	28% *
Sector-specific	31% *	35% *	41% *

Source: *Frontier Economics based on ONS data.*

Note: * Results are statistically significant at a 95% confidence interval.

The coefficients were transformed from the raw results to show the final impact after the transformation $\exp(\text{regression results}) - 1$ is performed. Please see C.2 for further details.

** The fact the pooled treatment effect for T+2 is larger than both subgroups is due to the fact that in each case, the PSM is run separately, so the coefficients and propensity scores may differ across the different cells, causing a treated unit to be matched to different firms in the control group, or a sufficiently close match not to be found.

The table shows that both types of programmes are effective: the impact on employment of both sector-specific and non-sector-specific is positive and significant, and this shows that treated firms grew nearly 30% to 40% more than control firms.⁴²

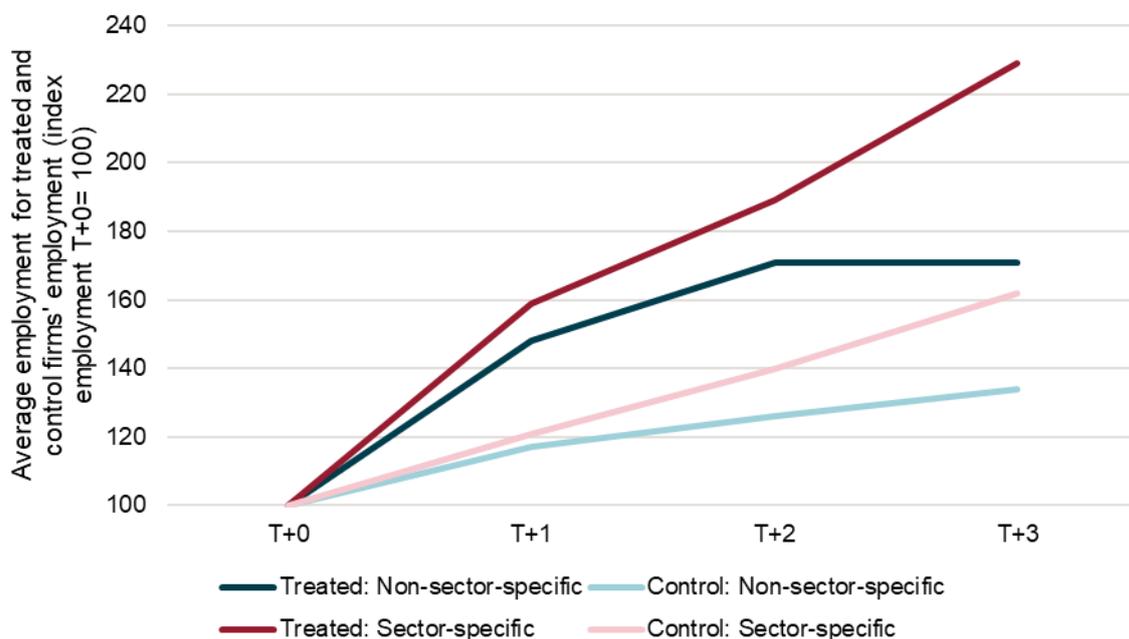
The impact of the sector-specific programmes is somewhat larger at T+1 and considerably larger at T+3. Figure 5 below shows that participants in the sectoral programmes experience higher growth, especially three years after participation in the Growth Programmes. For participants in the non-sector-specific programmes, the additional growth is highest in T+2, but in T+3 the control firms' growth starts to catch up.

The impacts between the two programme types are similar in T+1. But, by T+2, the sector-specific programmes are performing better, and in T+3, this gap widens further.

⁴¹ Please see C.2 for the annual results by type of programme. Given that annual results are similar to the pooled ones, they are presented in the C.2 only.

⁴² All sensitivity tests using a linear regression showed that participation in either sector-specific or non-sector-specific programmes is statistically significant and impacts growth similarly. Please see C.2 for the results of the linear regression sensitivity tests.

Figure 5 Pooled growth of the control population and the additional growth from participation in the Growth Programmes – by programme type



Source: Frontier Economics based on ONS data.

However, we cannot conclude that sector-specific programmes are more effective because:

1. the T+3 results are only based on one year of participation; and
2. the non-sector-specific Growth Programmes include Future Fifty, which attracts much larger firms than other programmes. These firms may be less likely than smaller firms to achieve very high annual employment growth rates.

Given that both types of Growth Programmes show a high positive impact, both benefited participants' growth. Indeed, in a sensitivity run utilising a regular regression, the programme-type indicator did not show a statistically significant impact on firms' growth at T+1 and T+2 after participation.

Employment effect for London versus non-London-based firms

Firm location can further affect the impact of participating in the Growth Programmes. As mentioned in the process evaluation, COVID-19 helped some non-London-based founders as sessions were done online or in a hybrid way. As such, we tested variations in the impact that firms experience depending on their location.

Table 7 shows the estimated employment effects for London-based firms and other firms. It also presents the impact differential based on location in each year of the analysis.

Table 7 Employment treatment effects for London and non-London

Year	Scenario	T+1	T+2	T+3
Pooled	London	32% *	40% *	42% *
	Non-London	25% *	18% *	22%
2018	London	24% *	34% *	34% *
	Non-London	22%	42%	28%
2019	London	29% *	39% *	40% *
	Non-London	28% *	14%	7%
2020	London	35%	60% *	
	Non-London	12%	22% *	
2021	London	24% *		
	Non-London	26% *		

Source: Frontier Economics based on ONS data.

Note: * Results are statistically significant at a 95% confidence interval.

The coefficients were transformed from the raw results to show the final impact after the transformation $\exp(\text{regression results}) - 1$ is performed. Please see C.2 for further details.

The results show that, on average, the impact of participation was larger for London-based firms than for others. However, this result should be interpreted with caution as it is driven by impacts of participation in two of the four available years: T+2 and T+3 impacts from participation in 2019 and T+1 and T+2 impacts from participation in 2020. In addition, year-specific sample sizes are small for London and non-London participants, which can further distort the results. Other years show small variations between the two populations.

Rising Stars

As discussed in section 3.4.1, the econometric approach for the impact analysis of the Rising Stars competition follows the same methodology as for Growth Programmes. The main difference is that we estimate changes in employment levels rather than employment growth – as was done for the Growth Programmes.⁴³

⁴³ The main reason for this change is that the Rising Stars programme targets very-early-stage firms which might have zero employment at the baseline, which means that growth percentages are not possible to be calculated. For further details please see C.2.

Table 8 Employment increase (in absolute numbers) from participation in the Rising Stars competition

Year	T+1	T+2	T+3
Pooled	0.84 *	1.48	4.63 *
2018	0.95	2.84 *	7.86 *
2019	-0.41	-0.26	1.78
2020	1.63 *	2.72 *	
2021**			

Source: Frontier Economics based on ONS data.

Note: * Results are statistically significant at a 90% confidence interval.

** No version of Rising Stars was classified for baseline BSD 2021. Please see C.2 for further details.

The results of the examination are highly sensitive to the analysis specification, which means the Rising Stars analysis is inconclusive.

The main specification results in Table 8 above suggest that participation in the Rising Stars competition adds 0.84 employees on average one year after participation. Unlike the Growth Programmes, those results are only significant at a 90% confidence interval (and not at 95%). Employment impacts were not statistically significant even at a 90% confidence interval two years after participation, and again statistics were significant three years after. Furthermore, the results are highly sensitive to the precise specification of the econometric model. In particular, we tested the result variations depending on how we controlled for the firms' baseline size.

The main results above are based on a specification where a dummy variable is used to note firms with zero or missing employment. In addition, it includes a log of employment as a control variable for the size of the firms at baseline where a given firm has more than zero employees. This is a reasonable specification as it accounts for the fact that some companies have zero employees but also allows for an analysis of continuous employment size otherwise. Another option for this analysis is to divide the firms into buckets of employment size, which correspond to the number of baseline employees they have. Those buckets are 0, 1-10 and 11-50. Only a categorical relative size of the firms is accounted for in this option. The results of this specification show insignificant growth across all T+1, T+2 and T+3.

Limitations

- We were unable to estimate some impacts. For FY 2022/23, this econometrics analysis did not directly estimate any of the impacts. As such, the impact assumed for the non-yet-realised impacts depends on the premise that these impacts would be similar to the average impacts found in the analysis.
 - In the analysis, we control only observable information to which we have data. That means other drivers of the impacts might be present and not controlled for. For example, founders participating in Tech Nation's programmes may have greater experience, skills and networks than the founders of firms in our control group.
-

Additional tests were conducted and reported in C.2. In particular, we analysed participation impacts on turnover, turnover per employee and survival rate, which did not release stable results.

3.4.4 Value for Money (VfM)

A VfM analysis aims to compare the benefit created given the costs invested in the initiative. There are three main steps to this type of analysis:

1. Estimate the monetary value of the impacts.
2. Identify the costs of the initiative.
3. Compare the costs to the monetary value of the benefit.

We discuss each below.

1. Estimated monetary value of the impacts

The impact we found in section 3.4.2 shows an increase in employee numbers in participating firms. Every employee creates additional value for the economy, GVA, which measures the monetary value of the product created and added to the economy.

In the analysis, we acknowledge that more employees do not automatically mean higher contributions to the economy. Governmental guidelines (Green Book) suggest that an increase in the number of employees, on its own, should not be considered an impact on GVA as, most likely, these employees would have been working in another firm in the counterfactual. Given that the firms participating in the Growth Programmes are mainly fast-growing digital scaleups⁴⁴, which are typically highly productive (more than the average worker), we calculated the impact of an additional employee as the higher productivity they generate when working in the tech sector.⁴⁵ In practice, we calculate the additional net GVA generated by each additional

⁴⁴ A weighted average of 0.59 of the participating firms, for which information on ONS can be disclosed, were classified under SIC code J.

⁴⁵ We note that this approach is based on the assumption that, on average, employees from other sectors would have lower productivity. That said, it might be that employees who join Tech Nation startups and scaleups are from the upper end of the productivity distribution of the overall less productive sectors. Given that there were no available data to assess the average productivity of the employees joining the sector, it was not possible to perfect this assumption. This approach, and the associated limitations, were discussed and agreed upon with DSIT.

employee that would have switched from another sector.⁴⁶ This was estimated at £12,484 annually in 2019.⁴⁷ For each year in the VfM analysis, we account for inflation to arrive at the annual net additional GVA per employee.

We follow the steps in the formula in Figure 6 to assess the total monetary value of the impact and find the additional net GVA per employee.

Figure 6 Analytical approach to estimating the Growth Programme VfM



Source: Frontier Economics.

1. Estimated percentage increase in employment: Results of the econometric analysis are used. Table 22 in C.2 presents the precise allocation of the regression results that are used for each FY and T+X in the VfM.
2. Average baseline number of employees: BSD data is used to estimate the average number of baseline employees.
3. Number of participating firms: Data received from Tech Nation is used to calculate the total number of participating firms in each FY.
4. Net additional GVA per employee: as discussed above.⁴⁸

2. Identify the costs of the initiative

The monetary value of the impacts calculated above then need to be compared with the costs of running the Growth Programmes. The costs should include all operating and overhead costs. The cost data shared by Tech Nation included the allocation of operating costs towards each Growth Programme. Some overheads (such as staff salaries) were allocated to the Growth Programmes as a whole, while others were recorded for all DSIT-funded initiatives together (such as HR-related costs).

Conversations with Tech Nation revealed that overhead costs could not be allocated for each programme individually in a precise way. As such, we were not able to conduct a full VfM analysis. Instead, we reallocated the overhead costs to each programme using the operating costs as weights, which resulted in the estimated overall costs of the programme. This appeared most appropriate given the scope and timelines of the analysis, as it accounts for each programme size, making the calculation feasible and transparent. We discussed and agreed on this approach with Tech Nation and DSIT.

⁴⁶ Assuming 41% are switching from non-SIC code J sector. Please see Annex E .

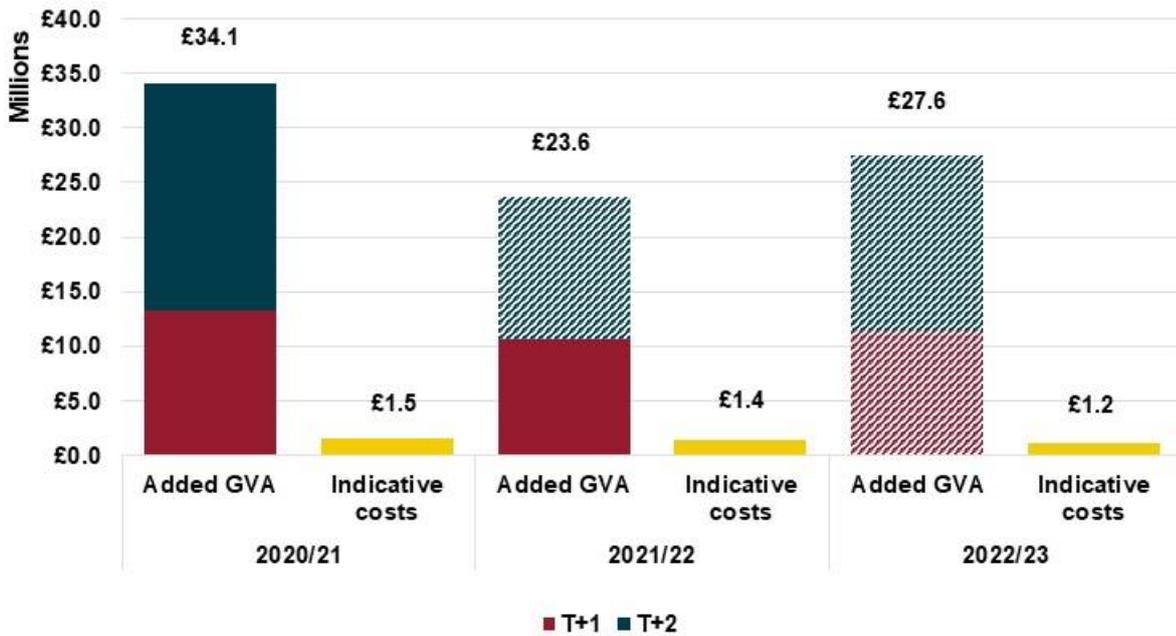
⁴⁷ Full details of this metric are presented in Annex E .

⁴⁸ Full details of this metric are presented in Annex E .

3. Results of the VfM for the Growth Programmes

Given that a full VfM analysis is not possible, an indicative comparison of the estimated monetary value of the impacts is presented alongside the approximated costs. Figure 7 presents those findings.

Figure 7 Estimated monetary value of benefits and approximate costs for the Growth Programmes



Source: Frontier Economics based on ONS data.

Note: The differences in the annual results are driven by the different average number of baseline employees for each year and the different coefficients used. Shaded bars indicate non-realised potential future benefits.

The VfM considers the monetary value of additional employment generated in T+1 and T+2.⁴⁹

The estimated monetary value Tech Nations' Growth Programmes' impact run in FY 2020/21 is £34.1m, based on an estimated 1,188 additional employees of participating firms in T+1 and another 1,909 employees in T+2. Both impacts were already realised at the time of this evaluation (further impacts might have occurred). Our best estimate of the cost to DSIT of Growth Programmes in FY 2020/21 is £1.54m.

⁴⁹ To be conservative, we do not include T+3 impacts as those were found to be statistically significant at lower confidence levels in the annual regression – T+3 for 2018 was statistically significant at a 99% confidence interval, while T+3 in 2019 was statistically significant only at 95% confidence interval. In addition, the assumption that 41% of the additional employees would switch from another sector is based on a snapshot view in 2019. Given that the UK tech sector is ever-growing, it is possible that in the years after 2019, the proportion of switchers will be lower than 41%. For T+1 and T+2, we use this assumption, but for T+3, which would be four years away from that snapshot, 41% seems to be a less likely correct assumption. Due to those two considerations and to keep the estimations conservative, T+3 is excluded from the VfM calculations.

Given the limitations of the allocation of overhead costs, we cannot assess the exact monetary value generated. That said, it is clear that the programmes generated substantially more than the operating costs in FY 2020/21.

We see a very similar result for FY 2021/22. In this case, the T+2 impact is a potential future impact, which would be expected in FY 2023/24. Even if we only consider the T+1 impact for this year, estimated at about £10.5m in monetary value from 959 additional employees, it is much higher than the approximated costs for FY 2021/22.

Lastly, we are still anticipating all impacts from participation in FY 2022/23. Using the average T+1 and T+2 across the analysed years (which average COVID and non-COVID impacts) shows an overall high impact compared to the approximated costs in that year.

Overall, over the three years of the evaluation period, the Growth Programmes generated, or are expected to generate in the future, substantially higher monetary benefits compared to the costs of running those initiatives.

Results of the VfM for Rising Stars

The VfM analysis for Rising Stars follows a similar approach to that of the VfM calculation for the Growth Programmes. The main difference is that because the employment impact of the Rising Stars is in absolute terms, it can be applied directly without the need to calculate the average baseline number of employees for participating firms.

Figure 8 presents the overarching approach for calculating the Rising Stars VfM.

Figure 8 Analytical approach to estimating the Growth Programme VfM



Source: Frontier Economics.

As mentioned above, the main econometric analysis for Rising Stars showed a small statistically significant impact of 0.84 additional employees in T+1. This result is highly sensitive to other specifications and only statistically significant at a 90% confidence interval. As such, we cannot be confident of the value of this impact, and therefore, we cannot confidently estimate its monetary value.

If we were to use the volatile 0.84 additional employees' effect and the same approach used for the VfM analysis of the Growth Programmes, we would find that the monetary value of the impact for Rising Stars is estimated at £1.3m.

Similar to the Growth Programmes, limitations with the allocation of overhead costs mean that we cannot assess the exact monetary value generated. We approximated that the annual costs for the competition were £0.29m, £0.31m and £0.05m for FY 2020/21, FY 2021/22 and FY 2022/23, respectively. We note that

the cost information we received only included costs up to January 2022, whereas most of the Rising Stars' costs are incurred later in the FY. As such, the costs mentioned for FY 2022/23 are incomplete.

Although the estimated monetary value of Rising Stars' impact appears to be higher than the costs of the programme, limitations on both the value and cost mean that we cannot conclude the value for money for this programme.

3.4.5 Distributional analysis

In this section, we provide a brief assessment of the distribution of the Growth Programmes' participants by region and nation within the UK to verify the penetration level of these initiatives. Where the data allows it, we also present insights on the proportion of participating firms with at least one female founder. In particular, below, we present the change in the regional distribution of participants over time, as supporting innovation across all nations and regions within the UK is part of DSIT's wider policy objectives.⁵⁰

Figure 9 below shows the location of Growth Programme participants during the current evaluation (between FY 2020/21 and FY 2022/23) and the two years preceding it (FY 2018/19 and FY 2019/20). Specifically, the figures report what proportion of Growth Programme participants⁵¹ is headquartered in each region and nation of the UK.⁵² The figure also displays the percent of Growth Programme participants out of all Tech scaleups in the UK.

⁵⁰<https://www.gov.uk/government/publications/department-for-digital-culture-media-sport-outcome-delivery-plan/dcms-outcome-delivery-plan-2021-to-2022>.

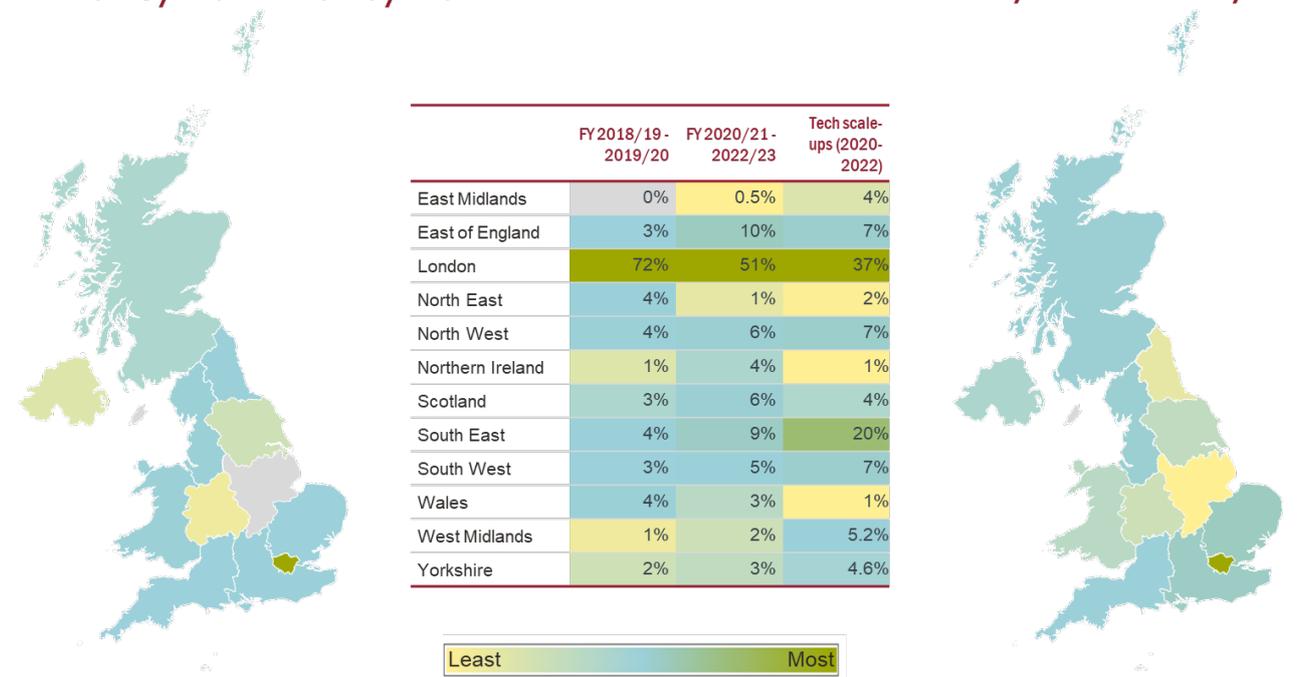
⁵¹ The Growth Programmes represented are Applied AI (active from 2019), Cyber (active in 2019 and 2020), Fintech, Libra, NetZero, Upscale and Future Fifty.

⁵² The registered address location was used for very few observations for which the headquarters location was not available.

Figure 9 Growth Programmes regional coverage

FY 2018/19 – 2019/20

FY 2020/21 – 2022/23



Source: Frontier Economics using Tech nation and ONS data.

Note: The number of tech scaleups has been identified as those companies in the BSD dataset with SIC code 62, that have achieved growth of at least 20% or more in either employment or turnover year on year for at least two years and have a minimum employee count of 10 at the beginning of the observation period. The approach to identifying scaleup firms is based on Tech Nation's definition of scaleups. To estimate the number of founders and C-suite leaders, we have assumed that companies have, on average, 1.5 founders and four other leaders (CEO/MD, CTO, CFO and COO). We use SIC code 62 – Computer programming, consultancy and related activities – as we expect leaders from this sector to be Tech Nation's primary target. We note this definition is narrower than the definition used in the econometrics approach (SIC J) as a wider grouping allows to capture exposure in regression and estimate the VFM. Numbers may not add up due to rounding.

The figure above shows that in both periods, the majority of Growth Programme participants were located in London. This is not surprising, as most Tech companies are London-based and, therefore, a larger pool of participants is expected to be from this area.

However, it is worth noting that the proportion of participants located in London decreased between the two periods. In FY 2018/19 and FY 2019/20, London companies accounted for approximately 72% of all participants, while between FY 2020/21 and FY 2022/23, these were 51%. Considering that the ONS BSD data show that between 2018 and 2022, 33%–39% of UK tech scaleups were located in London,⁵³ the proportion of London-based participants during this evaluation period is more in line with the current distribution of the tech industry; however, it still presents a gap.

The data also show that participating companies come from all UK nations and regions, although there are still some regional differences across. Outside of London, the regions with the highest proportion of participants are East of England, North West and South East. On the other hand, the areas with the lowest

⁵³ 33% in 2018, 34% in 2019, 35% in 2020, 37% in 2021, and 39% in 2022.

participation are North East, West Midlands and East Midlands. Interestingly, the location of Growth Programme participants does not mirror the tech sector distribution. For example, only 9% of participants are from the South East, even though, between 2020 and 2022, 20% of tech startups were located in the region.

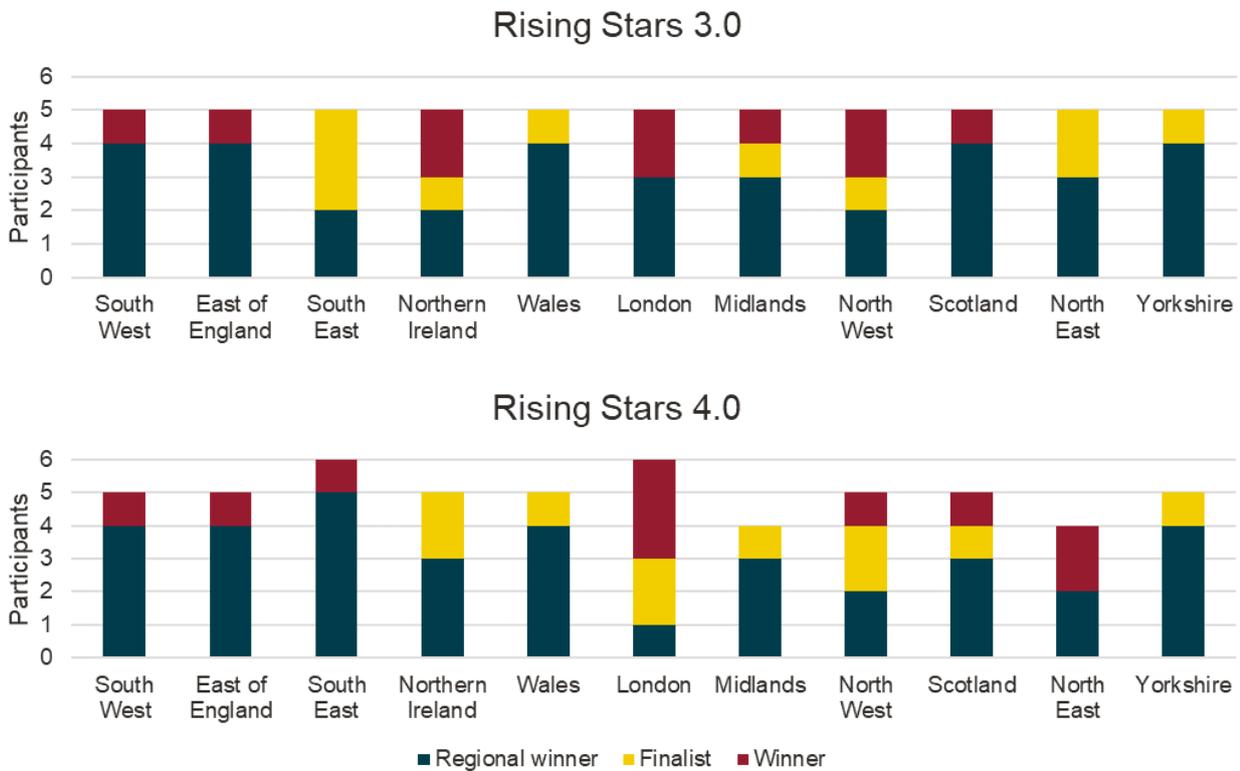
To date, it is not possible to explain the regional differences with certainty, but we expect these to be related to different tech landscapes and/or awareness levels of Tech Nation's offerings in each region. Overall, the data indicates that there has been a positive shift in the regional distribution of Growth Programme participants.

With regards to Rising Stars, no data is available currently to observe the competition's regional coverage before and during the evaluation. However, it is possible to observe regional coverage during the evaluation period for two editions, Rising Stars 3.0 and 4.0.⁵⁴ By design, Rising Stars has a more even regional coverage when compared to Growth Programmes, given that at the first step of the competition, between four to six Regional Winners are chosen from each UK region.⁵⁵ After this stage, twenty companies access the Finalists stage, where ten winners are chosen. Figure 10 below illustrates the distribution of finalists and winners of each stage for Rising Stars 3.0 and 4.0.

⁵⁴ At the time of this report (March 2023), the Rising Stars edition of FY 2022/23 is still to be concluded. For this reason, no consolidated data are available.

⁵⁵ Rising Stars 5.0 also identifies an initial pool of 132 'City Winners'. At the time of the evaluation, data on this edition was not available as the competition was not finalised at the time of the evaluation.

Figure 10 Rising Stars winners by region

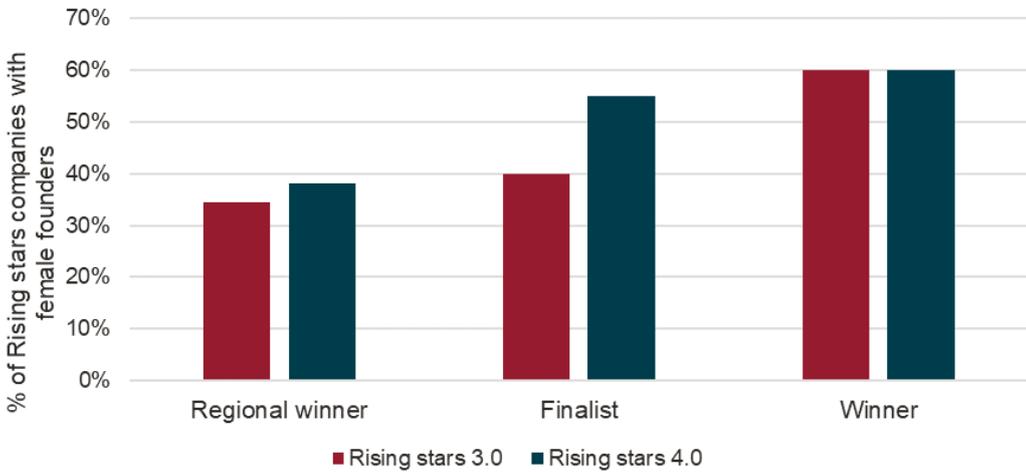


Source: Frontier Economics using Tech Nation data.

The data shows that non-London-based companies chosen for the two final stages of the competition (Finalists or Winners) represented 80% and 70% of Rising Stars 3.0 and 4.0 participants, respectively. The finding suggests that Rising Stars successfully targeted companies located outside the London area, contributing to DSIT's wider policy objective to create levelling-up opportunities.

The data provided on Rising Stars also shows (see Figure 11) that, during the evaluation period, around 35% of Regional winners were female-founded companies. Examining the later stages of the competition, female entrepreneurs led 40% and 55% of the Rising Stars 3.0 and 4.0 finalist companies, respectively. While among the Winning companies, the proportion of female-founded companies increased to 60%.

Figure 11 Proportion of Rising Stars companies with at least one female founder by competition stage



Source: Frontier Economics using Tech Nation data.

To date, it was impossible to find an exact comparator of Rising Stars' level of inclusiveness. However, it is reported consistently that the tech sector is struggling to achieve gender equality in leadership positions. For example, Tech Nation found that only 9% of C-suite leaders in tech companies were female.⁵⁶ In addition, the 2022 Rose Review Progress⁵⁷ report notes that 20% of incorporations in 2021 were all-female-led.

The fact that 40% to 60% of the competition participants are female-led companies is a positive sign. It not only suggests that the competition highlights initiatives from female founders, but it may also alleviate some gender-related barriers that these founders would face in other contexts.

⁵⁶ <https://technation.io/diversity-and-inclusion-in-uk-tech/#key-statistics>.

⁵⁷ <https://www.natwestgroup.com/news-and-insights/latest-stories/diversity-equity-and-inclusion/2022/feb/rose-review-reports-third-year-of-progress.html>.

3.4.6 Impact evaluation conclusions and recommendations

Conclusions

1. The evaluation found an additional increase of 27% in employment one year after participation in Growth Programmes and 37% two years after.⁵⁸
2. We estimated that the Growth Programmes had generated substantial monetary value from the impacts that have already been realised:
 - a. We estimated that the monetary value of the impact from participation in FY 2020/21 was £34.1m. That was due to an additional 1,188 and 1,909 employees one and two years after participation, respectively.
 - b. We also estimated that in FY 2021/22, a further monetary value of £10.4m was realised through the additional 959 employees in participating firms one year after participation.
 - c. In addition to the realised impacts, estimated future potential impacts (from the impacts two years after participation in programmes in FY 2021/22 and impacts from participation in FY 2022/23) might account for another £40.6m.
3. Due to cost allocation limitations, a full VfM analysis was not possible. That said, the estimated annual cost of the Growth Programmes, about £1.5m, is substantially lower compared to the estimated monetary value of the impacts. We conclude that the Growth Programmes have created a higher monetary impact than the costs, but we could not calculate a precise return-on-investment figure.
4. The impact evaluation of the Rising Stars competition was inconclusive. Even though some results suggest that participation in the Growth Programmes adds 0.84 employees one year after participation, those results change significantly with other analytical specifications.

⁵⁸ Three years after participation, the results still show a higher growth of participating firms compared to non-participants (38%). But this difference is less statistically significant compared to the additional growth seen in T+1 and T+2 (at a 95% confidence interval only and not at a 99% confidence interval as in T+1 and T+2).

5. The distributional analysis of the Growth Programmes showed that, over the evaluation period, the proportion of London-based firms reduced from approximately 72% of all participants between FY 2018/19 and FY 2019/20 to 51% between FY 2020/21 and FY 2022/23. Considering that the ONS data shows that, in 2022, 37% of UK tech scaleups were located in London and in FY 2022/23, London-based firms were still about 55% of the total cohort, we conclude that the proportion of London-based participants during this evaluation period is more in line with the distribution of the tech industry – with some discrepancy.
 6. Rising Stars data showed an equal distribution of participants across UK nations and regions, which is unsurprising given that, by design, the 55 Winners are chosen from each region and nation. The gender distribution of Rising Stars participants shows that the original share of females among the Regional winners is roughly in line with the overall population. By the end of the competition, females represented more than half of the participants, suggesting a positive impact of the competition in reducing the gender-related barriers female startup founders face.
-

Recommendations

1. Create Growth Programmes with various targets (sector-specific and non-sector-specific).
 2. Consider creating region-focused competitions for early-stage firms that can alleviate some regional and gender-related barriers.
 3. Record all costs, including overheads and investment costs, and allocate them to each programme (including for each acceleration programme) to enable future VfM assessment.
-

4 Non-Growth Programmes

In this section, we discuss the results of the process and impact evaluation of the non-Growth Programmes. We grouped the non-Growth Programmes initiatives into three categories:

- Learning and networking initiatives – given that Tech Nation deprioritised DBA and the Founders' Network (including Knowledge Insight Network) to eventually decommission these initiatives and replace them with the Growth Platform, we evaluate them together.
- EEM/SEMs.
- R&I.

In the sections below, we discuss the evaluation of each initiative group separately.

4.1 Learning and networking initiatives

Key findings and recommendations

Process evaluation

- Providing highly personalised content on a platform that consolidates all Tech Nations' delivery platforms might be good but creates further barriers to users, as it requires a lengthy sign-up process.
- Data collection has improved with the introduction of the Growth Platform because it was developed and operated internally (aside from some technical aspects, which were outsourced), and it records more granular data.

Recommendations

- A balance between personalisation and registration length should be considered carefully. A high level of personalisation might be beneficial, but a long registration process might hinder users from using the platforms.
- Taking steps to identify and advertise the value added of each online initiative would ensure users are willing to invest time utilising them.
- Data collection from the start of any online initiative would ensure that a proper evaluation of those interventions is possible.
- The adaptability of the platform to the ever-changing needs of users will ensure that benefits can be realised in the future.

Impact evaluation

- Data suggests that the Growth Platform was outperforming the Founders' Network in terms of the number of users and their engagement with the platform.
- Stakeholders provided limited evidence of the benefits of the platform. In most cases, they had not engaged with it (either did not sign up or did but did not interact with it), and those who did could not identify benefits of the platform over and above available alternatives.

Recommendations

- Future similar initiatives funded by DSIT should consider a balance between focusing on a specific target audience in the tech sector and the total benefits the initiative can generate. The wider focus leads to lower impact per user, but it can have a wider reach and vice versa. It is also important to clearly outline the reasons for choosing a specific target audience.
- Data collection should start from the launch of an initiative to allow for more robust evaluations. Systematically collecting information about the number of users and various engagement metrics (including time spent and bounce rates) would assist with the possibility of VfM calculations.

In FY 2020/21, DBA and the Founders' Network were two initiatives run by Tech Nation, each with its own objective. DBA was a free online platform that provided courses for tech startup founders, senior management and other aspiring tech entrepreneurs (e.g. students). Founders' Network started as a Slack community of UK tech startup founders and senior management, with further activities added at later stages.

At this time, Tech Nation also operated the Knowledge Insight Network (KIN), a platform for alumni and cohort companies' employees, with the view that KIN would eventually merge with Founders' Network into one offering.⁵⁹ However, due to issues with its external developer and provider, KIN was never merged with Founders' Network, and it was no longer active after March 2022.

In April 2021, Tech Nation started working on a new initiative: Growth Platform, which would incorporate elements of DBA (online courses), Founders' Network (an online platform) and additional aspects.⁶⁰ The Growth Platform was launched in June 2022.

DSIT funding for Founders' Network and DBA stopped after FY 2021/22. In FY 2022/23, Tech Nation deprioritised DBA and Founders' Network and planned to decommission them in the future.⁶¹

Given that the three initiatives are closely related, we evaluate them together. In the sections below, we discuss the objectives of the initiatives, including a logic model, process evaluation, impact evaluation and the break-even analysis for DBA.

⁵⁹ Tech Nation first started working on KIN in Q3 2019/20 and the initiative was launched in Q4 of that financial year.

⁶⁰ We understand that KIN features were included in the Growth Platform.

⁶¹ Tech Nation mentioned that no exact date was set for the decommissioning of DBA and Founders' Network.

4.1.1 Objectives of the initiatives

This section describes the three programmes, Founders' Network, DBA and the Growth Platform, followed by a logic model that covers all three initiatives. It then discusses the process and impact evaluations, including a description of the analysis, results, conclusions and recommendations.

DBA

The DBA was a free digital platform. Its goal was to provide relevant training and courses to technology entrepreneurs at the early stage of their startup development in the UK. Courses included digital marketing, finance and people management, with a focus on helping entrepreneurs to obtain the digital skills they need to match their business goals.

DBA included more than 90 15-minute courses. On completion of a course, learners received 'reward' points that they could convert to discounts, purchases and mentoring.

Founders' Network

The Founders' Network was a free peer-to-peer network for tech startup founders. It was aimed at startup founders at their early funding stages⁶² and was designed to facilitate connections between like-minded UK entrepreneurs.

The main offering was access to Tech Nation's national founders' Slack community of over 800 entrepreneurs.⁶³ In addition, it provided content aimed at supporting founders' journeys based on the experience of those who have 'been there and done it'. Additional content included webinars with leading experts on scaling topics, Ask-Me-Anything sessions with entrepreneurs, office hours with industry specialists, direct support from the regional SEM/EEM and ad-hoc media, press and speaker opportunities through the Tech Nation network.⁶⁴

In Q3 2019/20, Tech Nation started working on creating a community for its Growth Programme alumni offering called KIN. KIN was launched in Q4 of that financial year. KIN was a separate product from Founders' Network, but the long-term plan was for the two to merge and become one community platform. By the end of FY 2020/21, Tech Nation found that the KIN platform was not suited for Tech Nation's product strategy. As a response, Tech Nation started working on building an internal platform, the Growth Platform (see the following subsection). From March 2022, Tech Nation started to phase out KIN and invite members and potential members to use the Growth Platform instead. KIN officially closed at the end of March 2022.

Given that the number of KIN users is reported with Founders' Network, we include it in the Founders' Network initiative.

⁶² Source: <https://technation.io/programmes/founders-network/>.

⁶³ As described by Tech Nation staff.

⁶⁴ <https://technation.io/programmes/founders-network/>.

Growth Platform

In June 2022, Tech Nation launched the Growth Platform: an online ecosystem designed to assist scaleups in setting up networks and gaining the required skills. It is aimed at firms in later stages of development as the eligibility criteria include a growth of 20% year-on-year and having at least ten employees.⁶⁵

The Growth Platform includes data-driven insights to help participants build the right long-term strategy, have the needed tools and gain access to the resources and expert connections. It is highly personalised, allowing participants to see content related to their interests and needs. Further offerings include:

- Industry Insight: An expansive catalogue of content.
- Templates: Templates pitches and policies.
- Guides: Step-by-step guides for a number of scaling challenges.
- Reports: Reports that include trends which may impact business.
- Tech News: Updates on relevant UK tech news.
- Forums: A space to get answers to questions.
- The inside track benchmarking tool: A tool that shows participants what other successful scaling companies are doing. This allows them to evaluate their actions accurately.

Our ability to conduct a full evaluation of the initiative was limited because the Growth Platform launched only recently. The platform was introduced in June 2022, and not all functionalities Tech Nation planned to implement were active at the time of this evaluation. In addition, the user information we received would not have been complete and related to early engagements with the initiative. Finally, the cost data for this initiative only cover costs up to January 2023 and, as such, would have been incomplete.

4.1.2 Theory of Change and Logic model for this group of initiatives

Figure 12 below presents the logic model for the three initiatives together. We based it on the logic model covering all initiatives Tech Nation provided (see Annex F) and conversations with Tech Nation staff. Through the stakeholder interviews, we sought to validate the logic model with initiative users. However, from the conversations, we received limited input about the intended benefits of the programmes. Indeed, many stakeholders we spoke to had not engaged with these programmes. Those who had engaged could comment on their interaction experience with the programmes but not on the broader potential benefits.

⁶⁵ <https://growth.technation.io/register>.

Figure 12 Logic model for DBA, Founders' Network and Growth Platform

DBA	Founders Network (incl. KIN)	Growth Platform	
Inputs			
Cost of running the initiative: - Preparing training material - Platform maintenance - Licensing costs Users' time	Cost of running the initiative: - Developers time - Maintenance staff - IT equipment costs - Licensing costs Companies' data Companies' time to register Companies' time on the platform	Cost of running the initiative: - Developers time - Maintenance staff - IT equipment costs - Licensing costs Companies data Companies' time to register Companies' time on the platform Time to write articles and videos	
Activities			
Users join courses Provide courses on: - Marketing and Sales - Brand and Communications - Ideas and product - Operations and finance - People and Talent	Users contact people of their network	Users read articles Users watch videos Users sign-up for events Users join courses Users interact with the programme cohort Users contact people of their networks Users post questions on forums Users set up chat	
Outputs			
Number of courses completed Number of users (by gender, location, age) Rating of courses Average time spent on DBA	Number of networks created Number of messages exchanged	Number of articles read, Number of contribution to contents Number of comments on articles Number of videos watched Number of videos commented Number of subscriptions to events Number of networks created Number of questions asked in the programme networks Number of messages exchanged in the chat Number of messages asked in the forum	
Outcomes			
Direct change in Tech entrepreneurs' skills	Change in Tech entrepreneurs' awareness of support/programmes available	Change in size and composition of Tech companies' networks	Change in equalising access to support for Tech Entrepreneurs from regions outside London
Impact			
Overall improvement in the tech sector senior management's skills required for start-up scale up			
Longer term impacts			
Additional growth of participating tech startups			

Source: Frontier Economics based on the Theory of Change provided by Tech Nation (see Annex F) and further edits based on conversations with stakeholders.

The logic model shows that the inputs, activities and outputs vary between the three programmes. However, it is clear that the Growth Platform incorporates all the aspects of DBA and Founders' Network under one initiative.

As a whole, the three programmes' impact is skill improvement, achievable through training and contact sharing. Entrepreneurs at different stages of development require certain skills for the startup to succeed.⁶⁶ In addition, skills gained from networking are also important. Passaro et al. (2020) found that 'the creation of a specific ecosystem is suggested to ease the new digital entrepreneurship generation toward acquiring an appropriate level of knowledge, skills, financial facilitations, and entrepreneurial culture', which was found to play a 'critical role in sustaining the evolution and success of new firms'.⁶⁷ As such, it is reasonable that if the three programmes create the identified outcomes, this will lead to a longer-term increase in the firm's growth.

The following section explores the processes of those programmes and whether improvements can be made to ensure the impacts, as identified in the logic model, are realised. Further sections will explore the outcomes observed in the data Tech Nation provided. This would help understand the level to which the outcomes occurred. Finally, given cost data limitations, a break-even analysis is discussed only for DBA.

4.1.3 Process evaluation

The process evaluation follows the approach set out in section 2.1 and aims to address the following questions:

1. How well did the changes in the initiative address the previous evaluation recommendations, and did the changes create additional process findings?
2. Did our stakeholder engagement reveal other findings on the delivery of these initiatives?
3. How has the delivery of the initiatives adapted to Covid-19?

We address each question below and follow up with the conclusion and recommendations for the future. The insights presented below are based on interviews with Tech Nation staff and four users or external stakeholders.⁶⁸

Assessment of the changes that occurred

During the previous evaluation, DBA and the Founders' Network were part of the same evaluation group – Group 2. The previous evaluation found qualitative evidence that both initiatives help users achieve their goals, often better than available alternatives. That said, the evaluation found evidence that these initiatives could benefit substantially from reaching more users by improving target-audience definition and data collection.⁶⁹

⁶⁶https://www.researchgate.net/publication/339469851_A_systematic_literature_review_of_skills_required_in_the_different_phases_of_the_entrepreneurial_process.

⁶⁷ <https://www.mdpi.com/2071-1050/12/22/9437>.

⁶⁸ See Annex A for further details on the stakeholder engagement.

⁶⁹ The first recommendation was: 'Formally defining who these initiatives are targeting and within the overall group of "intended users", recognising that there will be different user sub-groups with different needs'. The second recommendation was: 'Starting to routinely capture data on the characteristics of users, and monitoring their use of these services and how they have benefited from them'.

Discussions with Tech Nation staff indicated that following the last evaluation, Tech Nation undertook a user research analysis to identify what would be most impactful for its users. As part of the study, Tech Nation commissioned user research with companies that participated in one of the Growth Programmes or in Rising Stars ('Tech Nation alumni') to understand what additional services Tech Nation could provide them.⁷⁰

According to this research, in terms of networking and skill needs, Tech Nation alumni were most interested in:

- training and networking for their senior managers;
- specialist knowledge on defined topics; and
- timely help to tackle specific scaling issues.

The need for training and networking for senior managers was identified by mid-stage scaleups; however, it was not identified by earlier or later-stage companies. Alumni also mentioned that a 'resource library' would not meet their needs.

This suggested a potential for Tech Nation to better address the needs of mid-stage scaleups by providing networking aimed at senior managers and tailoring training to mid-stage scaleup founders and senior managers. We also understand that Tech Nation expected their support of mid-stage scaleups to have a larger impact than supporting earlier-stage ventures.

Following those findings, we understand that Tech Nation shifted its strategic focus from those programmes towards mid-stage scaleups and focused on more personalised user-oriented offerings.

In April 2021, Tech Nation started to develop a new platform, the Growth Platform. The platform would have the ability to highly personalise content and events and suggest network members.^{71 72} In essence, the Growth Platform was created as the combination of DBA (it includes all the courses for senior startup managers) and the Founders' Network – including KIN (it allows the creation of networks, discussions and forum conversations). Over the past two years, Tech Nation reduced the development and resources spent on DBA and the Founders' Network due to the plan to merge them and improve them on the Growth Platform. This was corroborated by Tech Nations' financial records (see Annex A Tech Nation staff confirmed that Tech Nation planned to decommission DBA and Founders' Network, although firm dates were not set.

The Growth Platform was launched in June 2022 after Tech Nation conducted research into the needs of potential users.⁷³ The platform targets slightly more advanced startups than DBA. It aims to support over

⁷⁰ C space has undertaken an assessment of Growth Platform's potential user needs through 9 interviews and a survey of 51 respondents.

⁷¹ We note that Tech Nation outsourced some of the programme coding to an external provider, but the intellectual development and rights were kept with Tech Nation.

⁷² We note that prior to that, the KIN platform, which shares various aspects similar to that of the Growth Platform, was already operating. Because of issues with the KIN provider, Tech Nation decided to develop in-house the Growth Platform.

⁷³ Tech Nation indicates that they conducted two rounds of external research to understand two things - 1) What do leadership teams want from Tech Nation? (Apr 21); and 2) After they defined what would be built, ran the concepts past users and asked, 'How useful would this be to you'? (May 21). The Pilot consisted of onboarding a small group of users from the existing Tech Nation network, and a series of focus groups were run to refine further before the launch (Feb 22).

6,000 scaling tech businesses in the UK. The intended beneficiaries are businesses with at least ten staff members and a round of funding or showing stability from the bootstrap stage. Tech Nation staff pointed out that the overall focus of Tech Nation's accompanying programmes shifted from very early-stage startups to more developed companies in the past two years. The main reason for this shift is that failure rates of very early-stage startups are high. This means targeting more developed firms would create a greater impact.

With the creation of the Growth Platform, Tech Nation addressed the two main recommendations from the previous evaluation:

- The Growth Platform defined the target audience, recognising that there will be different user subgroups with different needs. Tech Nation addressed the needs of subgroups by researching and identifying more developed firms as the target audience and ensuring personalisation on the Growth Platform. That said, further work could have been done to identify ways of reaching subgroups within the target audience and what benefits they would derive from the Growth Platform.
- Collection of more detailed user data was facilitated through the highly personalised nature of the Growth Platform. The platform is able to record high volumes of data about users' characteristics, their engagements and other useful statistics. Given that the platform was developed and operated internally (with some coding and technical aspects being outsourced), it is less likely that data would be lost (as happened with the DBA historical data). Because the platform only launched in June 2022, some features were unavailable for this evaluation.

Other findings on the delivery of the initiatives

During this evaluation, we interviewed five Growth Programme users and four non-Growth Programme users. Of these, only four were aware of DBA, Founders' Network or Growth Platform. The discussion with these stakeholders revealed further process findings unrelated to past recommendations, reported below.

Nature of the platform and personalisation of content

- DBA (as well as KIN) was hard to update and change to make content personalised for users. As mentioned, users reported this type of 'resource library' was unable to meet their needs.
- The Growth Platform rectified this issue and was designed with content personalisation in mind. That said, two users commented that the Growth Platform would be more helpful if it were more personalised. Their initial perception was that the content displayed did not meet their interests. This suggests either the users did not engage enough with the platform to realise it was personalised or the presented content (although personalised) did not meet the users' needs. We note that this is based on a limited view of two users. Given that the Growth Platform is a relatively new initiative, users might have commented on DBA instead of the Growth Platform.

Ease of use and registration

- Tech Nation's staff considered signing up for DBA to be easy (no comments were made on that by Tech Nation users). Founders' Network was also easily operated because it used Slack and WhatsApp to facilitate discussions between founders.

- For the Growth Platform, Tech Nation staff identified that, given the highly personalised nature of the initiative, the sign-up process could be lengthy (requiring users to fill in a long list of interests and other information to enable user feed personalisation). Users were also encouraged to update inputs every six months to ensure the platform is up-to-date with their interests and the firm's development stage.
- Overall, the comments from three stakeholders familiar with the platform suggested that, given the saturation of networks they are already part of, the Growth Platform might be seen as just 'another one'. For example, one stakeholder said, 'The thing is that we've just got too many platforms to manage'. This suggests that the benefits of the Growth Platform are not sufficiently evident to users to justify the lengthy registration process. Indeed, the finding that led to the creation of the Growth Platform (the fact that the targeted users are time-poor) is also emerging as the main barrier to users joining and engaging with the Growth Platform. Both users and some Tech Nation staff shared this view.

Consolidation of all processes on the Growth Platform

- The Growth Platform was planned to be the central platform for Tech Nation's operations. As such, applications to the Growth Programmes were moved to the platform. The applications to the Growth Programmes for FY 2022/23 were processed through the platform. The aim was to consolidate all activities into one place to promote user awareness of all the initiatives Tech Nation offered – in line with recommendations from the previous evaluation. However, one Tech Nation staff member mentioned that, although applications for the Growth Programmes were processed through the platform, they saw little engagement from users.⁷⁴
- Throughout the creation of the Growth Platform, Tech Nation further defined the companies it targeted and focused on later-stage firms. That said, further work could have been done to identify how to reach additional categories⁷⁵ within the target audience and what benefits they would derive.

The adaptability of the software

- Although the Growth Platform is highly personalised for the user and more adaptable compared to KIN and DBA, it was perceived to be rigid from an operational point of view. For example, one stakeholder found the user-facing dashboard structure hard to change. This was seen as a potential shortcoming, as further changes and adaptation would require substantial resources.

Adapting to COVID-19

Stakeholders made no comments on any specific impacts of COVID-19 regarding DBA, Founders' Network, KIN or the Growth Platform.

⁷⁴ That is somewhat contradicting the data findings that suggested Growth Platform was outperforming the Founders' network. While engagement data suggest a positive engagement, the fact that the Growth Platform was launched only six months before the evaluation limited the results that can be drawn from this evidence.

⁷⁵ For example, targets could be further categorised by growth stage, sector, region and personal characteristics of founders (ethnic minorities, gender, etc). Potential work on those aspects might have occurred, but evidence of those activities were not shared.

Conclusions

1. The aim of providing highly personalised content on a platform that consolidates all of Tech Nations' delivery platforms might be good; however, this requires a lengthy sign-up process and creates further barriers to users.
 2. Data collection has improved with the introduction of the Growth Platform because it was mainly developed and operated within Tech Nation, and it records more granular data.
-

Recommendations

1. **A balance between personalisation and length of registration:**

There are likely to be benefits to personalisation, given that target users are 'time-poor'. However, platforms requiring lengthy sign-up processes and additional steps to update users' profiles will likely struggle with engagement.

2. **Taking steps to identify and advertise the value added:**

Steps taken by Tech Nation before initiating work on the Growth Platform (such as user research) are highly valuable. They ensure the design of a service that benefits its users. We recommended that future DSIT-funded initiatives undertake similar steps before initiating their work.

In the context of learning or a network platform, the target audience is likely to be time-poor and engaged with similar activities from other providers. The value of a tool should be apparent to drive individuals to spend time signing up and engaging with it. The users need to know what added value will the new tool offer.

As such, several factors need to be considered: how the programmes are advertised and how to ensure users quickly understand that platform engagement provides benefits that outweigh the cost.

3. **Data collection from the start:**

Given that creation of a similar network and learning platforms require substantial investment, it is recommended to start collecting data about users' engagement and characteristics early on. The data should then be easily accessible for evaluation processes. Learning from DBA, collecting and internally storing historical data is crucial to enable future evaluations. Tech Nation rectified this issue with the Growth Platform.

4. The adaptability of the platform:

The shift in focus from DBA and KIN towards the more personalised Growth Platform shows the need for flexible platforms. Given that target audiences and strategic focuses might change rapidly, investing in tools/software/platforms that can be adapted and changed frequently is beneficial.

The main process evaluation analysis limitation is the number of stakeholders able to share thoughts and insights about the three initiatives. Given that most users could not differentiate some of the initiatives, some comments about the Growth Platform likely referred to the DBA/Founders' Network.

4.1.4 Impact evaluation

As discussed in section **Error! Reference source not found.**, the impact evaluation for DBA, Founders' Network and the Growth Platform is based on an analysis of available monitoring data. Where possible, it is also based on a reach analysis and break-even analysis.

As part of the impact analysis, we would like to answer the following questions:

- What was the number of users of each initiative? This answer would reveal the number of individuals that are in scope for experiencing the impacts of the intervention.
- What was the level of engagement of users with each initiative? This answer further identifies the level of impact that was realised by users (for example, if a user is not taking any courses on a learning platform, the impact is not realised for them).

We would ideally assess how these outputs change over time. Since these interventions are delivered through digital tools, the marginal costs of adding new users are low. Therefore, an increase over time in the number of users would indicate that the initiative benefits are increasing (both gross and net of the cost of delivering the programme).

However, due to data limitations and changes in the initiatives' target users, our ability to measure both levels and changes in impact metrics accurately over time is constrained. As such, we complement the limited monitoring data analysis with a reach analysis that:

- assesses each initiative's ability to reach its target audiences;
- allows better comparison between DBA and Founders' Network reach to that of the Growth Platform; and
- identifies the highest bound of the potential impact of each initiative.

Given cost data limitations, a break-even analysis is conducted for DBA alone to assess if the investment was less than the potential benefit. Cost data limitations and the reasoning for conducting a break-even analysis only on DBA are discussed below.

Monitoring data analysis

Monitoring data analysis seeks to understand the number of users reached and the quality of their engagement. We identified several issues that limit the monitoring analysis. In particular:

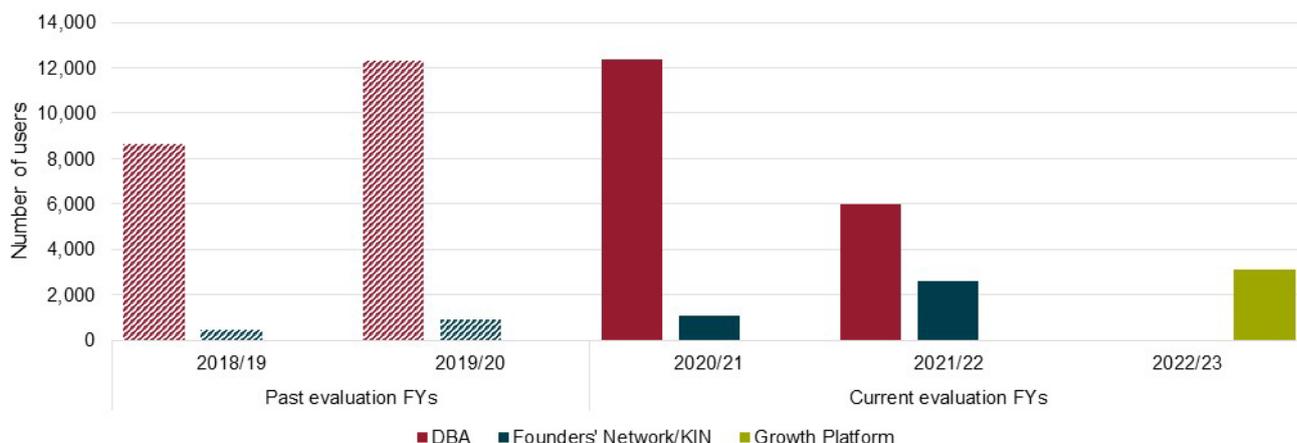
- **Change in the target audience between DBA and Founders' Network and Growth Platform:** DBA's focus was early-stage startups, and Founders' Network (as well as KIN) was a Slack community for Growth Programme alumni. The Growth Platform, on the other hand, was focused on mid-stage scaleups, which means that the data on the number of users is not fully comparable between different initiatives and years of the evaluation.
- **Incomplete year for the Growth Platform:** Since the Growth Platform was only introduced in June 2022, the number of reported users does not cover a full year. This makes it difficult to compare the number of users of the Growth Platform to the number of DBA and Founders' Network users, which refers to a full year of users.
- **Data limitations:** The annual data for Founders' Network includes users on KIN. We understand that Tech Nation was unable to separate the annual number of users between the two initiatives.
- **Inconsistent data on engagement:** Given the different nature of the three initiatives, different metrics on engagement variables were recorded for each of the initiatives.

We report the information that was received and, where possible, compare it between the initiatives (with the proper caveats in light of the limitations above) and other sources. In particular, we investigate:

1. How has the number of users changed over the evaluation period and between the initiatives?
2. What was the level of engagement with the platforms, and how has it changed over the evaluation period and between the initiatives?

Monitoring data of the number of users of each of the three initiatives are presented in Figure 13.

Figure 13 Number of users on DBA, Founders' Network and Growth Platform



Source: Frontier Economics based on data from Tech Nation.

Note: Please note that Founders' Network included the number of users on KIN from its introduction in Q4 2019. No data was available for DBA and Founders' Network for FY 2022/23 (i.e. there might have been users using those initiatives over this time which do not appear in the chart). FY 2022/23 includes only available information until 23.02.2023.

The reduction in the number of users on DBA⁷⁶ over FY 2020/21 and 2021/22 is not surprising. The shift in focus from DBA to the Growth Platform, starting in April 2021, led to fewer DBA users (mainly due to lower advertisement activities of DBA in that year). The fact that the number of users on DBA was still higher in FY 2021/22 compared to the Growth Platform in 2022 is also sensible. The focus shift from early-stage startups and aspiring entrepreneurs (DBA's target audience) to later development stages explains this trend. The reason is the narrow pool of targeted users for the Growth Platform – compared to that of DBA. We understand that the change in strategy was due to a conclusion that greater impact can be extracted from later development-stage startups. This might be true, but the new focus reduces the potential user pool. We discuss the number of users for each initiative in the reach analysis section. In addition, the data on the number of users for the Growth Platform is incomplete, covering data up to the end of February 2023.

Limited evidence suggests that DBA's engagement statistics were outperforming similar Massive Open Online Courses (MOOCs). Tech Nation data indicates that the percentage of users that completed at least one course (a 15-minute online session) on DBA was around 18%.⁷⁷ Other MOOCs' completion rates are 5-15%.⁷⁸ Please note that this comparison might be limited. For example, we found that MOOCs in the article take between 10 to 100 hours to complete. Since Tech Nation did not share similar information about DBA, it is hard to say with certainty that the difference in completion rate was due to shorter courses. Given that the Growth Platform's nature differs from DBA's (although it includes some of DBA's features), engagement statistics are not comparable between the two initiatives.

Founders' Network number of users increased throughout the evaluation period, albeit the numbers in Figure 13 include users of KIN. As such, the growth can be due to KIN instead of Founders' Network.

⁷⁶ DBA users are defined as 'People in DBA Training'.

⁷⁷ 17.7% in FY 2020/21 and 18.3% in FY 2021/22. No data was provided for FY 2022/23.

⁷⁸ <https://www.edsurge.com/news/2018-11-28-stop-asking-about-completion-rates-better-questions-to-ask-about-moocs-in-2019>.

However, the data available do not allow for the separation of users of the two programmes. Although it only includes data from FY 2022/23, the number of users on the Growth Platform outperforms the Founders' Network. Data on active members and engagement also show an improvement in the Growth Platform compared to the all-time data (2018–2023) for the Founders' Network. Between November and December 2022, 64% of the Growth Platform users were indicated as 'engaged users'⁷⁹, while for the lifetime of the Founders' Network, the proportion was only 13.5%.⁸⁰ This result contradicts users' opinion which suggested a low engagement level with the Growth Platform but more positive views about the Founders' Network. There might be several explanations for this:

- The focus shift from the Founders' Network to the Growth Platform, reduced the engagement with the latter.
- Growth Platform was launched only recently, and the metric of active users might indicate a higher engagement than after a full year – compared to users that registered six years ago.
- Users might have interacted with the Growth Platform once (and have been recorded as 'active users'), but their opinion was less positive.
- Stakeholder engagement was based on conversations with a limited number of programme users.

We gathered other statistics about the Founders' Network and the Growth Platform. The total number of messages and posts on the Founders' Network was 47,811.⁸¹ Considering the total number of Founders' Network users was 2,033 (not all active), this is an average of 23.5 messages and posts per user. For the Growth Platform, the number of messages is 5,757. Calculating for 3,095 total users, this is 1.9 messages per user. It is difficult to assess for either of the initiatives whether the level of engagement represents a high and positive impact. Nonetheless, it shows that users communicate and engage with the initiatives, which is the main mechanism that would benefit them. The two statistics are not comparable as one includes posts and considers engagement over several years, while the other solely refers to messaging and only includes several months of interaction.

Overall, the Growth Platform seems to be outperforming the Founders' Network. Given the different target audiences of the Growth Platform compared to DBA, it is hard to compare user numbers. As mentioned, the monitoring data analysis seems somewhat contradictory to the views shared by users. This might be due to the short period captured in the data or the limited number of engaged users. In the section on the reach analysis, we explore the differences between the target populations of the two programmes.

Other statistics on the Growth Platform showed good performance. The Growth platform reached 3,000 users in its first six months. The assessment of how this sits with the Growth Platform's potential reach is discussed below. Tech Nation data on the Growth Platform engagement show that Growth Platform users spent, on average, 7 minutes and 8 seconds on the website. It is challenging to find a relevant comparator, but using LinkedIn as an example of a well-established and wide-reaching online networking platform, we

⁷⁹ Engaged users are those users who have logged in and performed an action on the platform, such as engaging with content, sending a message, registering for an event and updating their profile.

⁸⁰ For Founders' Network, engaged users are identified as users sending a message in the Founders' Network Slack group.

⁸¹ This is the number of messages exchanged on Founders Network between 2018 and 2023.

find that time spent on the Growth Platforms is 6.6% more.⁸² The number of connections (i.e., the number of added members to the user network on the platform) per user for the Growth Platform was 6.1. Due to the specific nature of the initiative, there was no public information about an equivalent network that could be used as a benchmark.

Distributional analysis

The evaluation presented above suggests users benefit from Tech Nation's delivery platforms. Given delivery costs are largely fixed for these initiatives, it is reasonable to try and increase the number of beneficiaries to maximise return on investment (i.e., by delivering more aggregate benefit for a similar cost).⁸³ For this reason, we provide an assessment of the initiatives' current and potential users. Moreover, where possible, we also provide an assessment of the platform user distribution by gender and region.

DBA is a free digital platform aimed at providing relevant training and courses to technology entrepreneurs at the early stage of their startup development in the UK. For this reason, we have identified DBA's primary target audience to be employees of UK tech startups⁸⁴ and students interested in joining the tech sector.⁸⁵ On the other hand, founders and C-suite leaders of tech scaleup companies are the target audience of Founders' Network/KIN and Growth Platform. We, therefore, compared the number of users of these platforms with the estimated number of tech scaleup leaders across the UK.^{86 87}

Figure 14 below shows the number of users on Tech Nation's platforms as a proportion of their potential reach between 2018 and 2023.

⁸² Source: <https://influencermarketinghub.com/linkedin-stats/>.

⁸³ Founders' Network and KIN are partial exceptions to this, since in the former case, a Slack community over a certain size may be difficult to manage and too broad for some members, and in the latter, KIN was intended as a tool specifically for Tech Nation alumni.

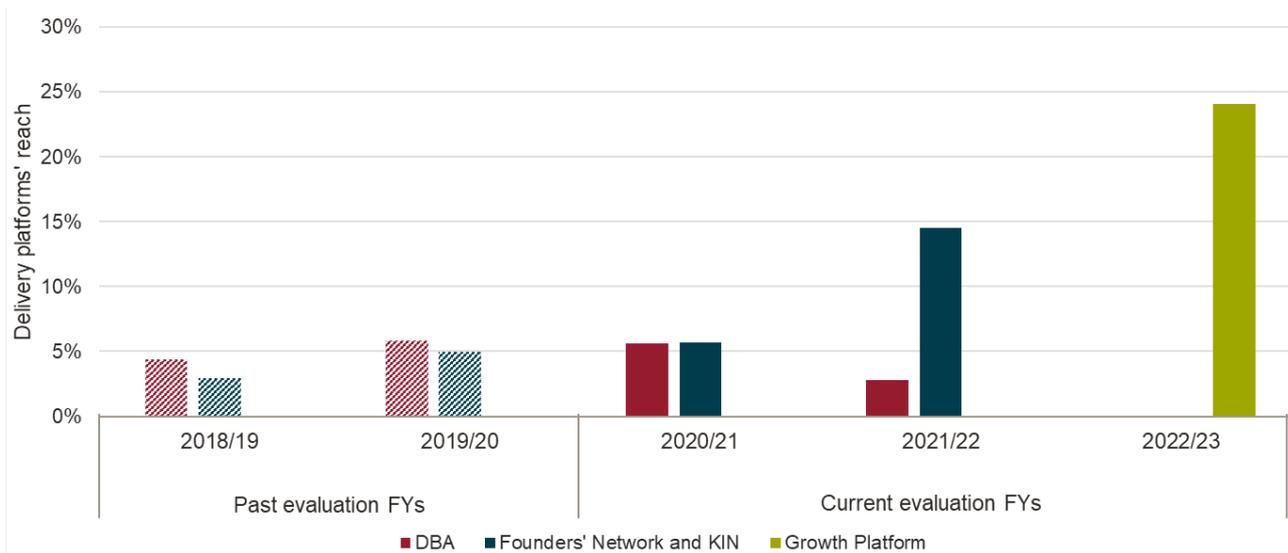
⁸⁴ The annual number of tech startups have been identified as those companies in the BSD dataset with SIC code 62, in their first year of activity and with less than five employees. We use SIC code 62 – Computer programming, consultancy and related activities – as we expect leaders from this sector to be Tech Nation's primary target. We note this definition is narrower than the definition used in the econometrics approach (SIC J) as a wider grouping allows to capture exposure in a regression (analysis) and estimate the VfM.

⁸⁵ The annual number of students interested in working in the Tech sector has been estimated by combining the HESA estimates of female and males graduating in the UK (source: Figure 17 – HE qualifications obtained by CAH level 1 subject and sex <https://www.hesa.ac.uk/data-and-analysis/students/outcomes>) and Tech Nation's insights on the proportion of graduating students interested in joining the Tech Sector (<https://technation.io/talent/future-talent-key-findings/>).

⁸⁶ The annual number of tech scaleups has been identified as those companies in the BSD dataset with SIC code 62, that have achieved growth of at least 20% or more in either employment or turnover year-on-year for at least two years and have a minimum employee count of 10 at the beginning of the observation period. The approach to identifying scaleup firms is based on Tech Nation's definition of scaleups (<https://technation.io/news/what-is-a-scaleup/>). To estimate the number of founders and C-suite leaders, we have assumed that companies have on average 1.5 founders and four other leaders (CEO/MD, CTO, CFO and COO). We use SIC code 62 – Computer programming, consultancy and related activities – as we expect leaders from this sector to be Tech Nation's primary target. We note this definition is narrower than the definition used in the econometrics approach (SIC J) as a wider grouping allows to capture exposure in a regression and estimate the VfM.

⁸⁷ We understand that when Founders' Network and KIN were first developed, Tech Nation did not set out a clear target audience, and leaders joining the community were also coming from earlier-stage companies. However, given the shift of Tech Nation's strategic focus to scaleups, we use this pool as the potential reach for Founders' Network and KIN as well.

Figure 14 The reach of Tech Nation’s delivery platforms



Source: Frontier Economics using Tech Nation and BSD (ONS) data.

Note: FY 2018/19 and FY 2019/20 data only include Founders' Network, while FY 2020/21 and FY 2021/22 represent the reach of Founders' Network and KIN. Due to data limitations, the actual number of users of KIN and Founders' Network in FY 2020/21 is not available. Therefore, the chart shows Tech Nation's reach in that year based on their forecasted number of users. FY 2022/23 covers data collected until the beginning of February.

Our estimates suggest that, of its potential reach in FY 2020/21 and FY 2021/22, DBA users were 5.5% and 2.8%, respectively. As mentioned, Tech Nation identified scaleup businesses as its target audience and shifted its strategic focus to them over the evaluation period. Consequently, the reduction in DBA's reach is not surprising: the platform's target is mainly early-stage businesses.

On the other hand, when focusing on platforms developed for Tech Nation's primary audience, we see a significant improvement in reach over the evaluation period. Tech Nation's coverage moved from expecting Founders' Network and KIN to reach an overall 6% of their audience in FY 2020/21 to a reach of 15% in FY 2021/22⁸⁸. In addition, the Growth Platform reached 24% of its audience in FY 2022/23. This is a positive sign that Tech Nation was able to increase its reach with the Growth Platform.

The previous evaluation found that female founders and C-suite managers are particularly expected to benefit from the networking these types of platforms offered. Therefore, we suggested that Tech Nation might want to focus more on women leaders and adapt its offer accordingly. Due to data limitations, it is impossible to calculate the proportion of female leaders that use the Founders' Network and KIN. FY 2022/23 data shows that 33% of the Growth Platform users were non-male, with 32% identifying as female and the remaining being non-binary, intersex or non-disclosive of their gender. A Tech Nation study reports that women cover 25.5% of all digital jobs.⁸⁹ Comparing this finding with the proportion of female leaders

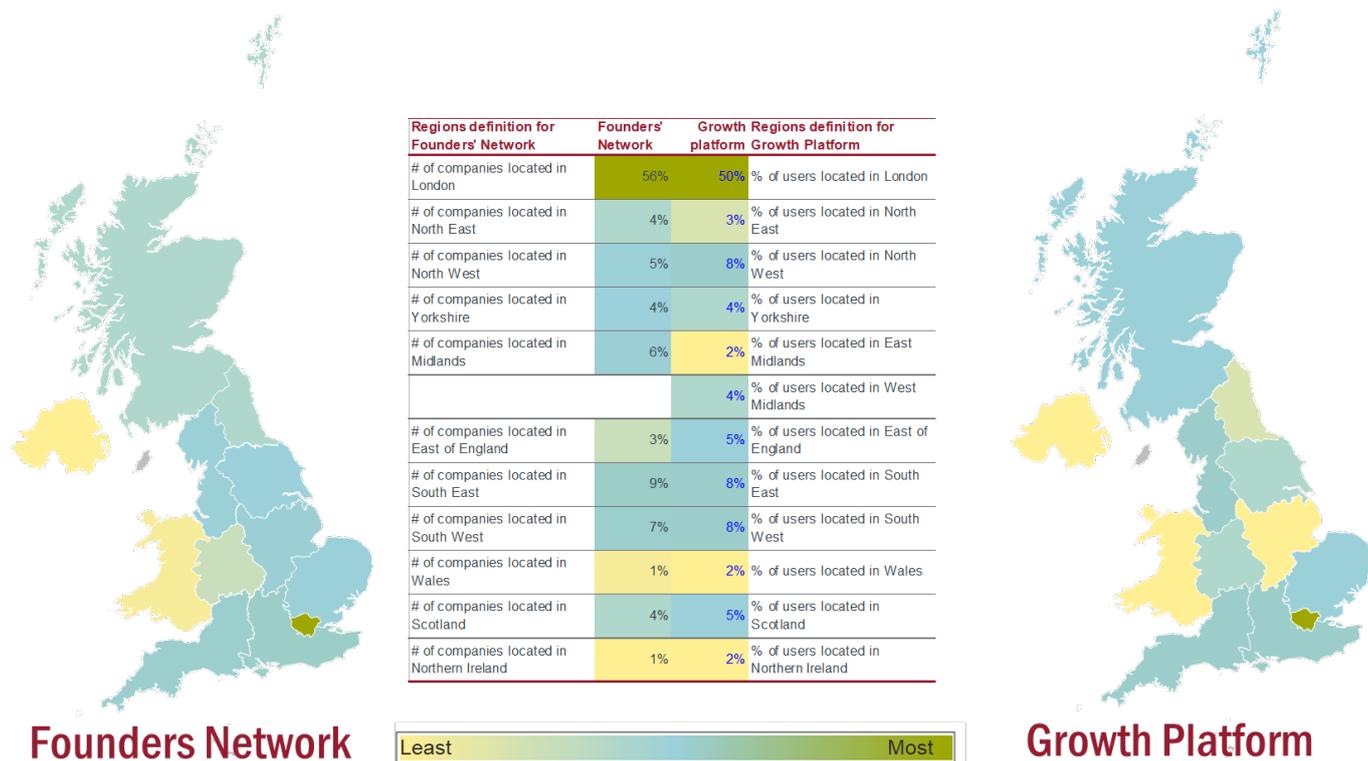
⁸⁸ Due to data limitations, it is not possible to verify to what extent this variation is driven by an increase in Founders' Network's users or by the introduction of KIN.

⁸⁹ <https://technation.io/diversity-and-inclusion-in-uk-tech/#inclusiveness-in-tech>.

registered on the Growth Platform⁹⁰, we see that female leaders are over-represented. This suggests that the platform may alleviate some gender-related barriers by providing additional opportunities to network.

For FY 2022/23, Tech Nation also provided data on the geographical distribution of the Founders' Network and Growth Platform users (and the location of users' companies). Both are presented in Figure 15.

Figure 15 Regional distribution of users/companies of the Founders' Network and Growth Platform



Source: Frontier Economics using Tech Nation and BSD ONS data.

Note: Please note that the distribution for Founders' Network is based on companies, while for the Growth Platform it is based on users. All figures are relative to the number of users in mid-January 2023. We understand that Founders' Network was not funded in FY 2022/23. However, data relative to the number of users during the funding period is not available. Numbers may not add up to one due to rounding.

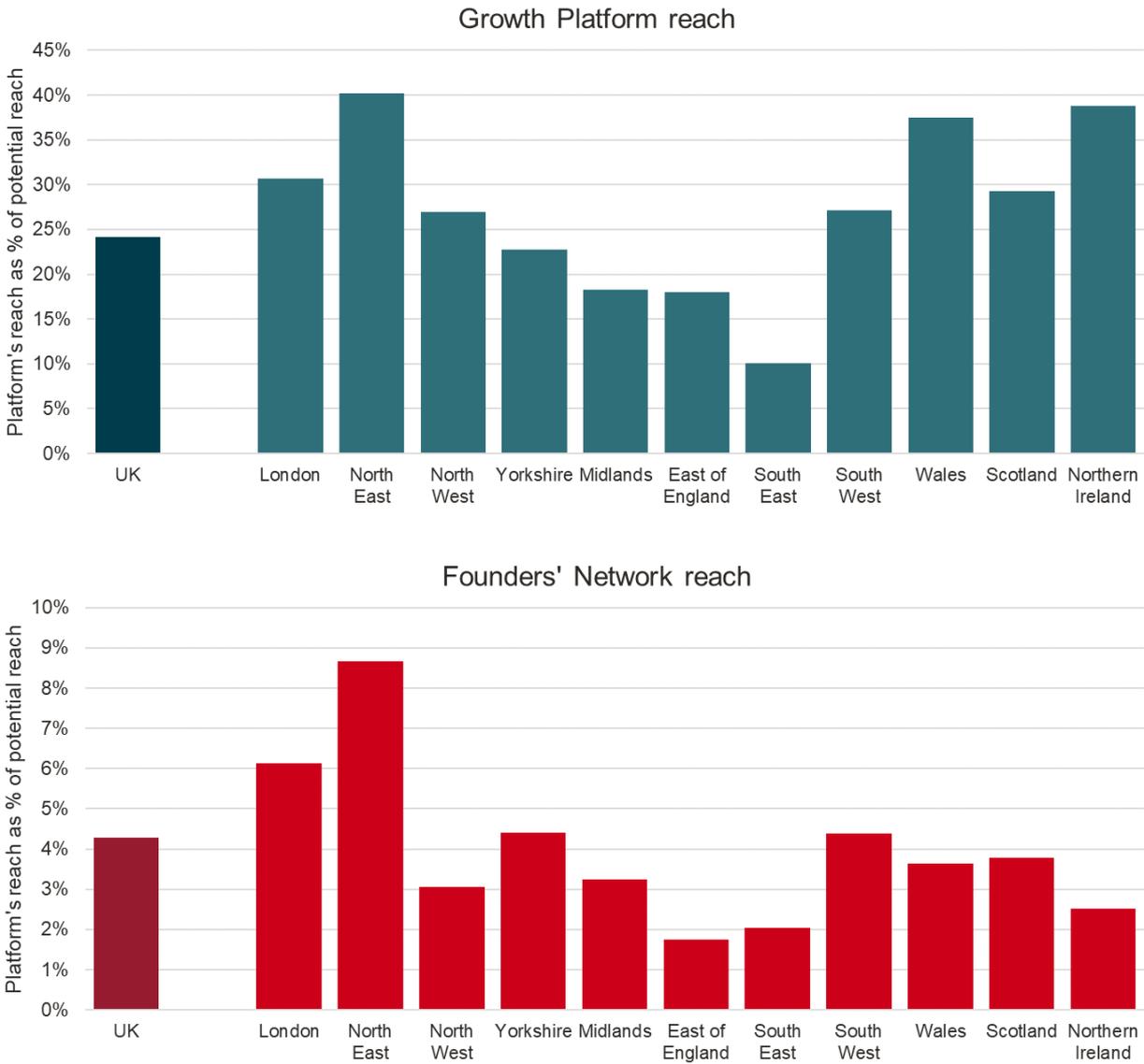
The data show a more even regional user distribution for the Growth Platform compared to the Founders' Network. In fact, we can see higher registration in areas outside of London. The distribution across the rest of the regions stayed roughly similar. Some regions gained a higher share (such as North West, which increased from 5% to 8%) while others saw a reduction (such as North East and South East, whose coverage decreased by one percentage point). The reduction in the London-based firms' share suggests

⁹⁰ The number of female leaders was estimated by applying Tech Nation's findings on the proportion of female leaders in Tech companies (8% of females are CEO/MD/Owners, 3% are CTOs, 0.4% are CFOs and 0.6% are COOs – <https://technation.io/diversity-and-inclusion-in-uk-tech/#key-statistics>) to the estimated number of leaders in Tech scaleups (see footnote 87).

that the Growth Platform was able to reach a more diverse regional user base compared to its predecessor, Founders' Network.

The available data demonstrates how Founders' Network and Growth Platform's regional coverage compares to the distribution of tech scaleup leaders in the UK. Figure 16 illustrates the coverage of the two platforms in each UK region.

Figure 16 Distribution of Founders' Network and Growth Platform reach



Source: Frontier Economics using Tech Nation and BSD ONS data.

Note: The platforms' reach is presented as a percentage of the estimated number of UK Tech founders and C-suite leaders in 2022. Please note that the distribution for Founders' Network is based on companies, while for the Growth Platform it is based on users. All figures are relative to the number of users in mid-January 2023. We understand that Founders' Network was not funded in FY 2022/23. However, data relative to the number of users during the funding period is not available.

The data shows that Tech Nation's reach, obtained through the Growth Platform, is higher in all regions. And its coverage is particularly high in Wales, Northern Ireland and the North East. This suggests that, despite having relatively fewer users from these regions (between 2% and 3% of all Growth Platform users – see Figure 16 above), the platform serves a large portion of the estimated number of leaders operating there. On the other hand, the data shows that the Growth Platform is only used by 10% of leaders operating in the South East, despite this being one of the most common regions of Growth Platform users (outside London). At this stage, it is impossible to determine the reason for these regional differences. The different

concentrations of scaleups in the UK regions may be a reason, or there could be explanations more specific to how the Growth Platform was advertised in each region.

Overall, this assessment shows that, during the evaluation period, Tech Nation improved the coverage of its target audience and reached a higher proportion of female leaders. On the other hand, the data shows that Growth Platform reached a lower proportion in certain regions. As the previous evaluation found that the benefits generated by networking platforms may vary depending on user characteristics (such as gender or location), future similar initiatives funded by DSIT may consider adding resources to ensure a more even user distribution.

Break-even analysis

We conducted a break-even analysis to assess whether the benefits of the programme outweigh its costs and what assumptions would need to hold for this to be the case. This type of analysis is conducted when it is impossible to quantify an initiative's benefits and monetary value robustly. Our analysis focuses on the DBA, excluding Founders' Network and the Growth Platform, due to the limitations of available data described below.

Data requirements for break-even analysis

Break-even analysis is usually undertaken when impact size is impossible to estimate, but cost data are available. Since the costs are used as a benchmark, it is important to have high confidence in the estimated initiative cost. Additionally, in many cases, the break-even analysis looks to benchmark the cost per user to the benefit per user. As such, two data points are required:

- The annual initiative costs. This should include all the costs, including overheads, for the initiative in question only.
- The annual number of users for each initiative. For some initiatives, it would be important to know the number of users who engaged with the initiative (e.g. those who not only signed up for a digital service but also used it). Engaged users are most likely to benefit from the initiative.

If those two data points are available, we can calculate the total annual cost per user. We can then assess the likelihood of the impact's monetary value being higher than that.

There are several ways of doing this. For example, looking at the price of similar paid-for initiatives would reveal the value the market has placed on the impact this intervention type can have. The market price might not reveal the full impact, because some wider impacts the purchaser may internalise will not be reflected in the price they are willing to pay. That said, using this approach can reveal a lower bound of the impacts' monetary value.

Before launching the break-even analysis, we explored the cost data for each initiative to see if a robust cost per active user could be calculated. Without these data, we cannot undertake a break-even analysis. For initiatives where cost data allows for a cost per active user calculation, we assess the available monetary value information about the benefits and conduct a break-even analysis.

Assessment of data on costs and number of users

Our assessment of cost data revealed several limitations:

- **Overhead costs were not allocated to each initiative separately:** Tech Nation was unable to allocate overhead costs, which accounted for about 60% of the total DSIT grant, to each DSIT-funded initiative. As such, by only looking at the costs reported for each initiative, we will underestimate the cost per active user.
- **Costs for some initiatives are impossible to separate:** We understand that Founders' Network and EEM/SEM costs were recorded under the same budget item.
- In addition to the cost-data limitation, we identified **limitations in assessing the number of active users** for each initiative. In particular, the Founders' Network's annual number of users includes KIN users.
- Given that the **Growth Platform only launched in June 2022**, the costs incurred would include potentially high investment costs, which were expected to last for several years. By dividing these costs by the number of active users, we might overestimate the cost per active user of running the platform for over a year or more.

In light of the assessment above, we conclude that it is possible to estimate a reasonably accurate cost per active user for DBA, but not for Founders' Network or the Growth Platform. Even for DBA, we have not received information on what proportion of overheads should be allocated to the initiative. Therefore, we allocate to DBA overheads equal to its share of 3% of the total.⁹¹

We also note that, given DBA launched before the evaluation period, it might be that investments costs that should be included in the total cost per user for FY 2020/21 and FY 2021/22 (FY 2022/23 is excluded as DBA was not funded by a DSIT grant in that year) were not available for the evaluation. As such, they are not included in the cost per active user calculations.

We provide recommendations for recording the cost data and their use in future value-for-money calculations in section 3.4.4 of this report.

DBA break-even analysis

Table 9 presents the total annual DBA costs, the number of active users, and the annual cost per active user.

Table 9 DBA costs estimates

Initiative	FY 2020/21	FY 2021/22	FY 2022/23*
Total estimated costs with a weighted allocation of DSIT-related overheads*	£210,842	£157,616	N/A
Number of users	12,339	6,012	N/A

⁹¹ Please note that only overheads that were identified as *related to all initiatives* were included in the redistribution toward DBA.

Initiative	FY 2020/21	FY 2021/22	FY 2022/23*
Number of users that completed at least one course	2,186	1,101	N/A
Cost per user	£17	£26	N/A
Cost per active user	£96	£143	N/A

Source: Frontier Economics based on data from Tech Nation and DSIT.

Note: * DBA was not funded by the DSIT fund in FY 2022/23.

For FY 2020/21 and FY 2021/22, the cost per DBA user was £17 and £26, respectively. The cost per active user (users that have completed at least one course overall) is £96 and £143, respectively. To assess whether DBA's value to users likely exceeded the cost, we use two types of analysis.

First, we compare the cost of DBA to the cost of similar paid-for courses. A comprehensive review of the market for digital entrepreneurship courses is beyond the scope of this report, so we identify an illustrative example. The City University of London offers a 10-week 'starting up a business' online course for £460.⁹² Among paid courses offered by an academic institution, this is a relatively low-cost option (comparatively, Wharton's 'Scaling a Business: How to Build a Unicorn,' a six-week 4-6 hours per week online course, costs \$2,600). We calculate the cost per hour of the City University course as follows:

- The course takes place over ten weeks, with a two-hour session each week: a total of 20 hours per course.
- Therefore, the cost per hour is £23 (i.e., £460 divided by 20 hours per course).

For DBA to break even, we would need to believe that DBA users valued the platforms as much as five hours of the City University course (since the cost per user is £143: five times that of City University) or two hours of the Wharton Course.⁹³ For context, the length of the 'Operations and Finance' module, one of five modules available on DBA, is approximately 7 hours.^{94, 95}

Second, to get a lower bound for the hourly value of DBA, we can use the average UK median wage to estimate the opportunity cost of users' time. The idea behind this calculation is that if users had not been using DBA, they could have worked an extra hour, which could have paid the median wage (or they could have spent their time on leisure activities, which they valued at least as much as their hourly wage). In 2022, the UK median wage for employees was £14.77.⁹⁶ Therefore, if one hour of DBA were valued at £14.77, we

⁹² <https://www.city.ac.uk/prospective-students/courses/short-courses/starting-up-in-business#tabs495417-link641553>.

⁹³ The cost per hour of the Wharton course in USD is \$2,600/(6 hours per week * 5 weeks) = \$87. Using a USD/GBP exchange rate of 0.83, this equates to £72 per hour.

⁹⁴ Another way to put this is to think that if DBA users valued their time spent on DBA, per hour, around £23, we would need to believe that DBA users spent at least 5.2 hours on average for their valuation of DBA to exceed the average cost per user over the evaluation period (which is £96+£143/2 = £119.50).

⁹⁵ This module consists of 5 courses which include a total of 28 sessions. Each session is 15 minutes which is 7 hours in total.

⁹⁶ <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/bulletins/lowandhighpayuk/2022>.

would need to believe that, on average, users spend around 8 hours on the platform ($\pounds 119.50/\pounds 14.77=8.09$) to break even.

Since data about the average user usage (time spent or the average number of courses completed) and the exact costs were not available, it is impossible to conclude if the monetary value of the impact broke even.

Impact evaluation conclusions, recommendations and limitations

Conclusions

1. Data suggest that the Growth Platform was outperforming the Founders' Network in the number of users and their engagement with the platform.
 2. Stakeholders we spoke to provided limited evidence of the Growth Platform's benefits. In most cases, they had not engaged with it (either did not sign up or did but did not interact with it), and those who did could not identify the platform benefits beyond available alternatives.
 3. As expected, the transition from DBA and Founders' Network to the Growth Platform likely led to a decrease in the number of users that engage with Tech Nation's learning offer. This is due to Tech Nation's strategic shift towards mid-stage scaleups and away from earlier-stage ventures or potential entrepreneurs. Unfortunately, since the Growth Platform was only introduced recently, it was impossible to ascertain whether the decreased number of users was compensated for by the increased value users gained from engagement.
-

Recommendations

- Future similar initiatives funded by DSIT should consider a balance between focusing on a specific target audience in the tech sector and the benefits the initiative can generate. The wider focus leads to lower impact per user but can have a wider reach, and vice versa.
- Defining the target audience is important, but benefit trade-off should be discussed to arrive at the right solution. This discussion should clearly identify why the chosen target audience is the right one to focus on. It would help to determine what is missing in the market and how the initiative would address that gap.
- Data collection should be set from the start to allow for more robust evaluations. Systematically collecting information about user numbers and engagement metrics (including time spent and bounce rates) would assist with value-for-money calculations.

Limitations

1. Limited stakeholders shared thoughts and insights about the three initiatives separately. Given that most users could not differentiate some of the initiatives, some comments about the Growth Platform likely referred to DBA/Founder's Network. Because the Growth Platform only launched six months prior to this evaluation, users might have had limited exposure to all its abilities and benefits.
 2. Some Growth Platform features were not yet introduced. Including future features might have changed some stakeholders' views about the programme's benefits.
 3. Data provided for Founders' Network was limited and included information about other initiatives.
 4. Metrics about the Growth Platform were not comparable with DBA and the Founders' Network, limiting the assessment of the improvement in outcomes.
-

4.2 EEM/SEMs

Key findings and recommendations

Process evaluation

Most past recommendations were implemented, leading to improvements in the EEM/SEM processes, but some limitations still remained. The evaluation, albeit based on limited stakeholders' views, showed that:

- Team restructure provided further support to EEM/SEMs. However, SEMs still appeared to be stretched, and the structure was prone to leave gaps in the case of staff turnover.
- There were different routes for SEMs to identify potential users. However, there is no clear and consistent way to monitor the reach.
- There is evidence of SEMs cross-promoting Tech Nation's initiatives. However, it is not clear whether this is systematic.
- SEMs also produced new initiatives tailored to the company's needs. However, SEMs users flagged time constraints to join these.
- SEMs worked to provide more regional-specific programmes. However, stakeholders' reception of SEMs' focus on region-specific issues is mixed.
- SEMs provided a mix of online and in-person sessions. The latter seems particularly important for networking.
- Tech Nation started recording SEMs data consistently in September 2022.

Impact evaluation:

- Limited data availability restricted the assessment of most of the outcomes we identified in the logic model. In particular, given that data on user numbers was unavailable, the assessment focused on the number of National Leadership Networks (NLN) and one-to-one sessions, which was also limited. Although it was impossible to assess the impacts quantitatively, stakeholders had a positive view and believed they benefited from both activities.
- Overall, interviews show that SEMs users had a positive experience when engaging with their SEMs. They appreciated the support received from EEM/SEM and the various networking opportunities the initiative enabled.

Recommendations:

- We recommend setting-up future initiatives similar to SEMs with a high-level framework, which would:
 - Set out the main objectives of the activities, the expected outputs and the outcomes.
 - Help identify from the start the metrics that can be collected to track and monitor these activities.
 - Be flexible to activity variation in each region to reflect local barriers. Building this on a high-level strategy that will allow for more consistent objectives and metrics to monitor the progress of those activities.
-

4.2.1 Objectives of the initiative

In 2019, Tech Nation launched its EEMs initiative. There were eleven EEMs, each responsible for delivery in one of the UK's nations or regions, aiming to help digital tech founders across the UK and increase Tech Nation's regional reach. In October 2020, the EEM team structure evolved from one Head of Entrepreneur Engagement and eleven EEMs to having one Head of SEMs and two Senior EEMs, each managing and supporting half of the eleven EEMs. In January 2022, the EEM initiative evolved into SEMs to reflect the increasing focus of Tech Nation towards scaleup companies and engagement managers' focus on national networks in addition to regional ones. Since FY 2022/23, SEMs began leading the planning and delivery of the Rising Stars competition.

As of January 2022, the SEMs' activities included the following:

- **One-to-one sessions** with company leaders (such as Coffee Mornings sessions). The support provided depended on the firm's needs. For example, one SEMs user interviewed mentioned receiving advice on which Tech Nation accelerator programme would be most suitable for them, support during the programme application process, help in developing their pitches for investment and guidance on finding new funding routes.
- Promotion of **regional events** and other Tech Nation initiatives that might interest tech companies EEM/SEMs are engaging with.

- The organisation of **networking sessions**. Since December 2021, SEMs have coordinated regional and national networking sessions, NLN,⁹⁷ and Regional Groups.⁹⁸ These are cross-regional and regional groups aimed at connecting C-suite managers across the UK. These sessions are conducted in-person and online at the SEMs discretion.

Given the varying regional needs of tech companies, SEMs had some freedom to run their network as they see fit for the region.

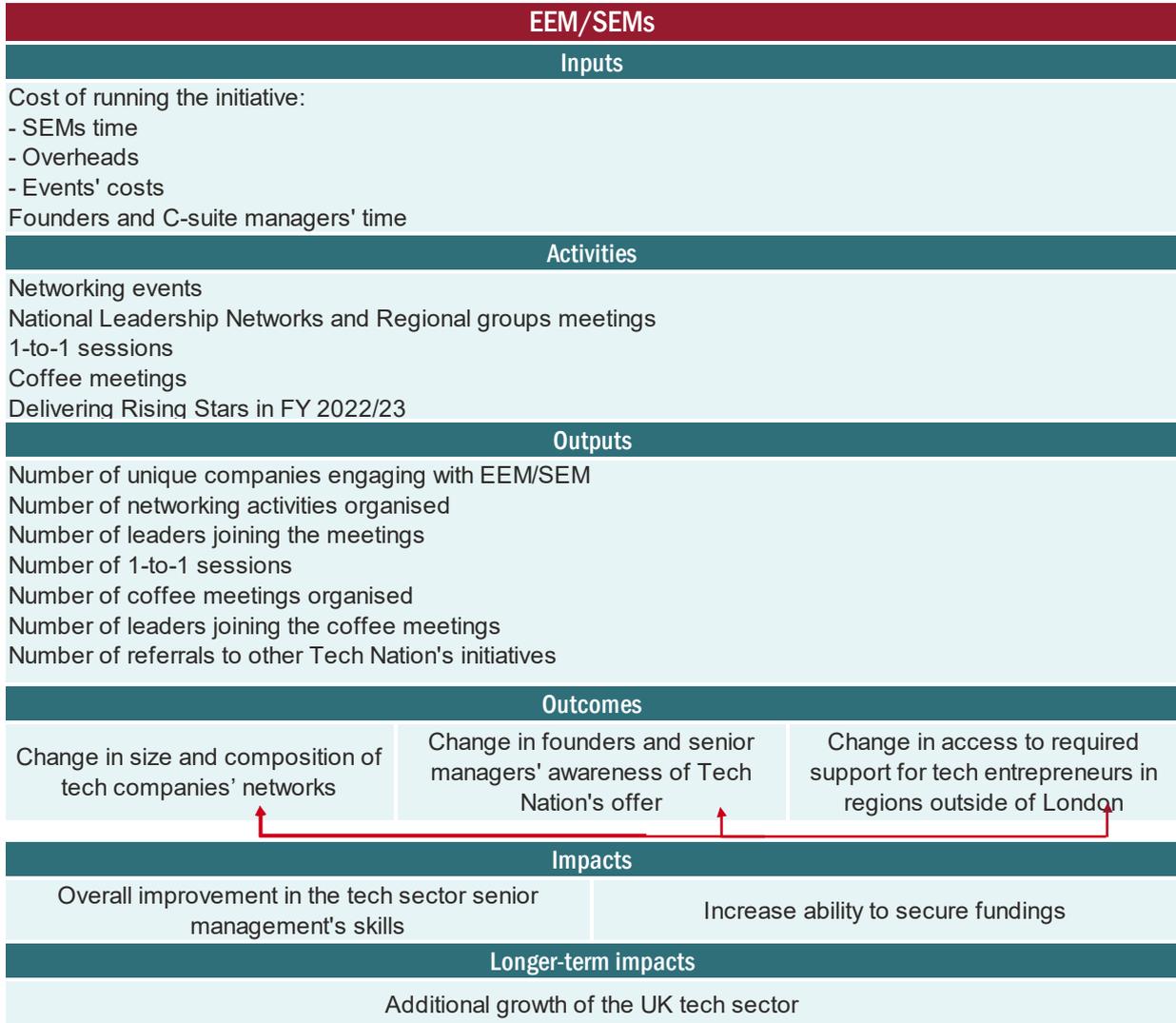
4.2.2 Theory of Change and logic model

Figure 17 below presents the logic model for SEMs. We based the model on an overarching logic model designed by Tech Nation (see Annex F) and conversations with Tech Nation staff.

⁹⁷ National Leadership Networks are role-specific groups that bring together different members of scaling leadership teams to network and openly discuss their challenges in a confidential setting. At the moment, there are eight groups for Business development, CFOs, CMOs, COO, CTOs, People leaders, Tech Ecosystem and Female founders/CEOs.

⁹⁸ The regional Groups run during the evaluation period are located in South West, South East, North West, North East, Scotland and Yorkshire. There is also a cross-regional *Tech Ladies* group across the East and South East.

Figure 17 EEM/SEMs logic model



Source: Frontier Economics.

Note: Based on the Theory of Change provided by Tech Nation and further edits based on conversations with stakeholders.

The main inputs of the SEM initiative are:

- the financial resources required for the programme; and
- the time that SEMs and SEM users (senior management of reached companies) dedicate to the initiative.

As mentioned in section 3.1, the main activities generated by SEMs are the organisation of one-to-one sessions with founders, events and networking sessions. Therefore, the outputs generated by the initiatives are the number of activities being run and the number of participating companies.

These outputs are expected to directly affect the size and composition of the companies' network and the awareness of wider Tech Nation offerings. Moreover, since SEMs aim to increase Tech Nation's presence

across the UK, support is predominantly provided to companies outside London, potentially leading to greater changes in non-London areas.

As a result, we expect an improvement in the tech sector's senior management skills. We expect this to occur through SEMs' direct support and through learning. Thanks to the networking events SEMs promote, companies' founders and senior managers can compare their experiences and learn from each other. Lastly, this is expected to generate additional growth in the UK sector in the longer term.

4.2.3 Process evaluation

The process evaluation follows the approach set in section 2.1 and aims to address the following questions:

1. How well did the changes in the initiative address the previous evaluation recommendations, and did the changes create additional process findings?
2. Did our stakeholder engagement point out other findings on the initiatives' delivery?
3. How did the delivery of the initiatives adapt to Covid-19?

We address each question below and follow with the conclusion and recommendations for the future. We based the insights below on interviews with Tech Nation staff, nine users and external stakeholders.

Assessment of the changes that occurred

When the previous evaluation of Tech Nation's activities was carried out, the EEM/SEMs initiative was in its early stages. Therefore, this initiative was not in the scope of the previous evaluation, and formal recommendations were not given. However, internal discussions on how EEMs could evolve and contribute to Tech Nation's impact were provided.

Given that the EEM/SEMs initiative was launched to increase Tech Nation's regional reach, we previously recommended that SEMs would develop regional-specific programmes. Tech Nation informed us that over this evaluation period, SEMs launched regional peer groups (Regional Groups) in South West, South East, North West, North East, Scotland and Yorkshire, and also launched a Tech Ladies group across the East and South East. These meetings bring together different tech sector leaders operating in a region to network and discuss challenges confidentially. In FY 2022/23, Tech Nation also increased its regional focus by giving EEM/SEMs leadership over the Rising Stars programme and introducing it to the competition city-winners (see section **Error! Reference source not found.**). Lastly, SEMs also included collaboration with regional Tech Ecosystem and Business development groups, organisations whose role is to support scaleups in their region on a wider ecosystem level.

Stakeholders we spoke to were mixed on whether the changes achieved their goal: creating the required regional focus. One SEMs user and one stakeholder from an external network felt that Tech Nation was well embedded in their regions. That said, another one felt this was not the case, suggesting that SEMs should improve their collaboration with other regional networks and focus more on region-specific issues. In addition to the regional level, two other users suggested that SEMs could focus on local/city levels to allow the creation of networks of companies operating in the same area.

It was also recommended that EEM/SEMs consider whether any of Tech Nation's initiatives (new and existing) would be helpful to the founders they engage with. Over the evaluation period, Tech Nation found that SEMs activities and relationships were key to ensuring company awareness of the wider Tech Nation offering. That said, it is not clear if other Tech Nation offerings (Growth Platform, DBA, Research and Insight, etc.) were systematically offered, where relevant. In fact, two of the four non-Growth Programme users interviewed were unaware of Tech Nation initiatives, suggesting further opportunities could have been suggested. We note that this is based on a limited view of a couple of users. Moreover, Tech Nation explained that EEM/SEM keep track of the challenges faced by the companies they support, which led to the creation of NLN in December 2021.

NLNs are role-specific groups that bring together different members of scaling leadership teams to network and openly discuss their challenges in a confidential setting. At the moment, there are eight groups for Business development, CFOs, CMOs, COO, CTOs, People leaders, Tech Ecosystem and Female founders/CEOs. However, some SEMs users mentioned the lack of time to attend all meetings proposed by their SEMs.

Lastly, in the previous evaluation, it was suggested that Tech Nation would ensure enough support to EEM/SEMs. In response, Tech Nation explained that the EEM/SEMs team structure evolved in October 2020, bringing two Senior SEMs to the team to manage and support half of the SEMs, each. However, Tech Nation staff also mentioned that SEMs are still stretched to try and cover very diverse and large regions. Moreover, it was also noted that, given the current team structure, turnover in SEMs staff could lead to short-term gaps with no on-the-ground regional help. This was expected to have a material impact on SEMs services. One stakeholder operating in another national network also flagged this. The stakeholder struggled to understand whom to talk to in other regions due to the turnover of staff and a perceived limited connection of SEMs at a national level. Moreover, Tech Nation staff reported that the collaboration between the EEM/SEMs team and other Tech Nation teams has increased since 2019.

Other findings on the delivery of the initiatives

Discussions with stakeholders reveal further process findings unrelated to past recommendations. These included:

Routes to identify stakeholders

- Tech Nation staff believed that the SEMs network is critical for identifying target companies in each region for Tech Nations initiatives. However, there is no clear way to monitor how well SEMs identify relevant local companies and the overall SEMs' level of engagement with the wider UK tech ecosystem. In particular, there were no records of the number of unique companies/founders reached in each region. SEMs users did not provide views on how simple the engagement was for them. This could be due to a lack of issues or a restricted interviewee sample.

Data collection

- For most of the evaluation period, there was no system to centrally record data about the activities conducted by SEMs and the companies they engaged with. Tech Nation staff informed us that in June 2022, they started storing and processing the data centrally using HubSpot. As such, many statistics

were unavailable, such as the number of unique companies/founders engaged with each SEM. Because of this, at the moment, it is impossible to draw a complete picture of the impact generated by SEMs' activities. Moreover, the lack of consistent historical data prevents observation of the evolution of SEMs' activities over the full evaluation period.

Adapting to COVID-19

The evaluation period includes FY 2020/21 to FY 2022/23 and, therefore, also covers the COVID-19 outbreak, which impacted on how SEMs interacted with users. Tech Nation staff mentioned that in FY 2019/20, most meetings were held in person. As expected, during FY 2020/21, all sessions were online. Tech Nation staff noted that virtual meetings were especially beneficial for SEMs operating in wide regions, as they could save the time previously used to travel. Another SEMs user highlighted the same benefit, saying the virtual approach created new opportunities in the tech sector. On the other hand, both Tech Nation staff and SEMs users found that meeting in person provided opportunities for building stronger ties. Lastly, Tech Nation staff did not feel that a remote and then hybrid approach saved costs as resources were diverted to delivering more online activities.

Process evaluation conclusions and future recommendations

Conclusions

Most past recommendations were implemented, leading to improvements in the EEM/SEMs processes, but some limitations still occurred. The evaluation, albeit based on limited stakeholders' views, showed that:

- Team restructure provided further support to EEM/SEMs. However, SEMs still appeared to be stretched, and the structure was prone to leave gaps in case of staff turnover.
 - There were different routes for SEMs to identify potential users. However, there is no clear and consistent way to monitor the reach.
 - There is evidence of SEMs cross-promoting Tech Nation's initiatives. However, it is not clear whether this is systematic.
 - SEMs also produced new initiatives tailored to the company's needs. However, SEMs users flagged time constraints to join these.
 - SEMs worked to provide more regional-specific programmes. However, stakeholders' reception of SEMs focus on region-specific issues are mixed.
 - SEMs provided a mix of online and in-person sessions. The latter seems particularly important for networking.
 - Tech Nation started recording SEMs data consistently in September 2022.
-

Recommendations

We recommend setting up future initiatives that are similar to SEMs with a high-level framework, which would:

- Set out the main objectives of the activities, the expected outputs and the outcomes of the activities.
- Help identify the metrics that can be collected to track and monitor these activities from the start.
- Be flexible for variation in activities in each region to reflect the specific local barriers, which is built on a high-level strategy that will allow for more consistent objectives and metrics to monitor the progress of those activities.

4.2.4 Impact evaluation

To assess the impact of EEM/SEMs, we would like to answer the following questions:

1. How many individuals/companies were impacted by EEM/SEMs' work?
2. What were the benefits to those individuals/companies in particular (e.g. have their networks grown, and how many sessions have they received)?

To answer the first question, we would like to assess the level and number of individuals/companies that EEM/SEMs were interacting with over the evaluation period. As mentioned in the previous section, Tech Nation improved its data collection strategy in June 2022. However, many statistics were not recorded, including the number of unique users/companies each SEM works with.

As for the second question, we would like to assess users' engagement levels with SEMs. However, the number of unique users was unavailable; therefore, engagement levels were unknown.

In our assessment of these two questions, we utilise the information that Tech Nation was able to provide, which included:

- The monthly number of NLN and Regional Groups attendees between September 2022 and January 2023 – a proxy to the reach of SEMs over that time.
- The acceptance and decline rates of NLN invites for the January 2023 sessions – a proxy for the level of engagement and how much benefit is being extracted from those sessions.
- The number of monthly one-to-one sessions run by SEMs between April 2022 and February 2023 – another proxy for assessing the reach of SEMs' activities.

This data analysis is complemented by feedback provided by SEMs.

Given the data limitations mentioned above, the impacts presented below only refer to those generated by NLNs, Regional groups, and one-to-one sessions. Other activities organised by SEMs, like morning coffee meetings and other events, may have generated further impacts. However, Tech Nation did not record data on these activities, and only a limited number of stakeholders mentioned them.

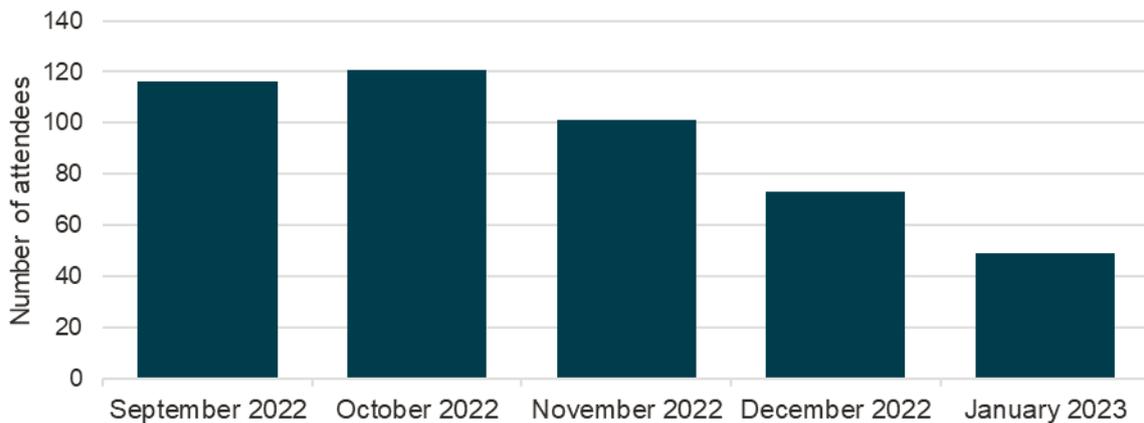
We explore each of the available data points separately below.

National Leaders Networks and Regional Groups sessions

The NLN was launched in December 2021. Around the same period, EEM/SEMs started running Regional Groups. SEMs ran 16 sessions in FY 2021/22 and 59 in FY 2022/23.

Tech Nation recorded that, on average, each NLN had 10-15 attendees each month, and each Regional Group had 5-10 attendees per month. Figure 18 below shows the monthly attendees of NLN and Regional Groups. Between September 2022 and November 2022, a period in which SEMs ran approximately 12 sessions per month, the total monthly number of attendees was around 100. In December 2022 and January 2023, attendees were roughly 50. Tech Nation explained that the fewer attendees in the latter period are mostly the result of meetings not occurring due to clashes with the winter holidays (around ten meetings occurred in this period, two fewer than the previous period) and fewer participants attending the meetings.

Figure 18 NLN and Regional groups attendees



Source: Frontier Economics using Tech Nation data.

Note: Tech Nation was not able to split between the number of NLN and Regional group meetings.

Unfortunately, the data provided did not allow us to calculate the number of unique individuals/companies attending the sessions. Because of this and the lack of data on similar initiatives, it is impossible to compare NLN and Regional Groups against external benchmarks.⁹⁹ However, four SEM users interviewed appreciated the creation of these groups as it allowed them to learn from experienced managers and understand what to expect for their company's growth. On the other hand, one SEMs user found that more consistent engagement from the other participants would have helped build more meaningful relationships. This suggests that the benefits derived from these groups also depend on the region and the companies joining.

Overall, the stakeholders interviewed had a positive experience with the group sessions and found that they positively impacted their network. Since literature¹⁰⁰ suggests that networks influence the growth of a small

⁹⁹ Our desk research did not reveal a similar programme that can be used as a benchmark for EEM/SEMs.

¹⁰⁰ <https://link.springer.com/article/10.1007/BF01108617>.

business, the data indicates that over the second part of FY 2022/23, SEMs group sessions may have positively impacted the attendees.

One-to-one sessions

Tech Nation data shows that between April 2022 and the end of January 2023,¹⁰¹ SEMs had 1,788 one-to-one sessions with company founders and senior managers.¹⁰² However, the data does not present the number of companies that benefited from this service. Therefore, it is impossible to assess how the activities were run and the benefits that may have arisen for a single company. Nevertheless, three SEMs users provided positive feedback on the one-to-one sessions and the SEMs' proactiveness. In particular, they found the support received when preparing their pitches and applying to Growth Programmes and other accelerators helpful. One stakeholder appreciated the support in finding routes to funding: '[Our SEM] has done a good job in terms of meeting [with] us, understanding what we do and looking at opportunities for us. [They] have been a good advocate for us and helped us leverage opportunities.'

Distributional analysis

Figure 19 below illustrates the regional distribution of one-to-one SEM sessions between June 2022 and February 2023. The data shows that London sessions accounted for only 7% of the sessions, and Yorkshire received the highest share with 14%.

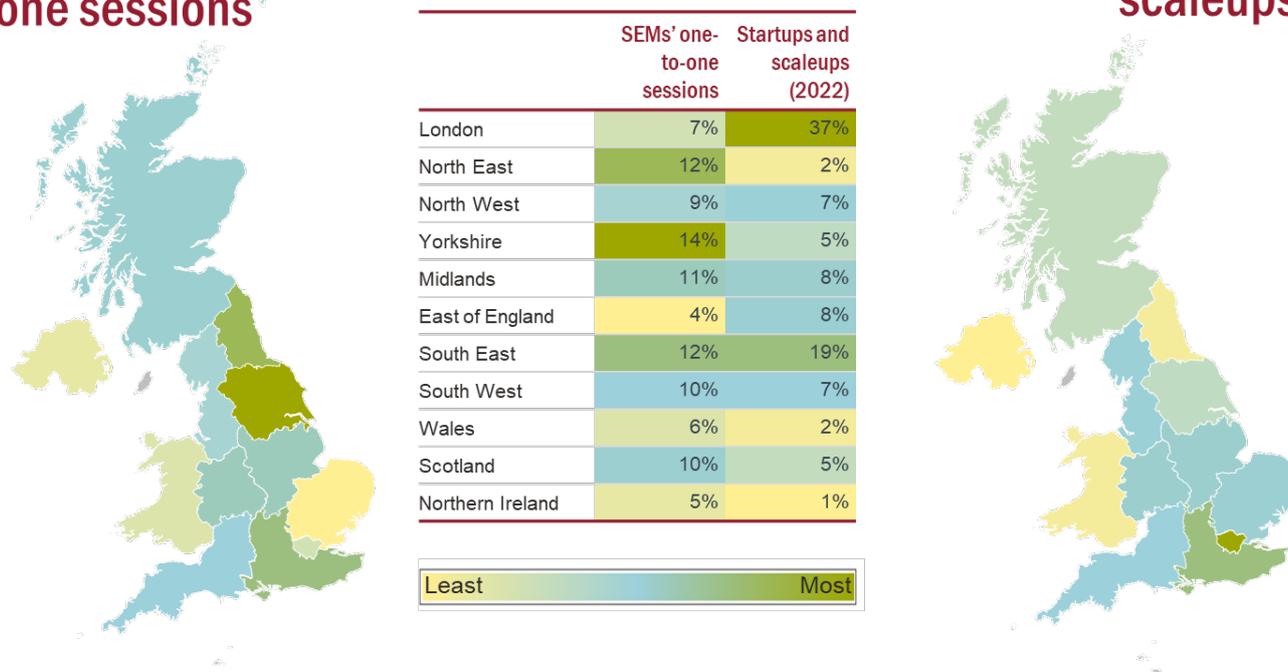
¹⁰¹ FY 2022/23 covers data recorded until the end of February 2023. FY 2022/23 data was recorded manually by SEMs between April and June 2022 and automatically through the Hubspot ticketing system from June onwards. FY 2020/21 and FY 2021/22 data is derived from automatic Hubspot tracking of SEMs calendar events. For this reason, Tech Nation noted that the FY 2020/21 and FY 2021/22 data are likely also to count group sessions.

¹⁰² From April 2022 to the end of Jan 2023.

Figure 19 SEMs one-to-one sessions in 2022

SEMs' one-to-one sessions

UK Startups and scaleups



Source: Frontier Economics using Tech Nation and BSD ONS data.

Note: The chart illustrates the distribution of SEMs one-to-one sessions that occurred between June 2022 and February 2023. Numbers may not add to one due to rounding.

Some areas had a lower share of sessions compared to the rest. Only 4% to 6% of the sessions were run in the East of England, Northern Ireland and Wales, while 12% to 14% were held in Yorkshire, North East and South East. Different levels of the tech sector presence in these regions may explain these differences. Indeed, the more extensive the pool of firms the SEMs can contact and engage with, the larger the network of entrepreneurs that SEMs could potentially reach. For example, 12% of one-to-one sessions occur in the South West, where 19% of all UK tech scaleups and startups are located.¹⁰³ On the other hand, lower numbers of one-to-one sessions occurred in areas such as Northern Ireland and Wales, where only 1% and 2% of tech scaleups and startups are located, respectively. Moreover, Tech Nation staff mentioned that the position of the SEM in the East of England was vacant from June 2022 until September 2022, which could

¹⁰³ The annual number of tech startups has been identified as those companies in the BSD dataset with SIC code 62, in their first year of activity and with less than five employees. The annual number of tech scaleups have been identified as those companies in the BSD dataset with SIC code 62, have achieved growth of at least 20% or more in either employment or turnover year on year for at least two years and have a minimum employee count of 10 at the beginning of the observation period. The approach to identifying scaleup firms is based on Tech Nation's definition of scaleups: <https://technation.io/news/what-is-a-scaleup/>. To estimate the number of founders and C-suite leaders, we have assumed that companies have, on average, 1.5 founders and four other leaders (CEO/MD, CTO, CFO and COO). We use SIC code 62 - Computer programming, consultancy and related activities - as we expect leaders from this sector to be Tech Nation's primary target. We note this definition is narrower than the definition used in the econometrics approach (SIC J) as a wider grouping allows to capture exposure in regression and estimate the VfM.

explain the lower number of sessions in that region. Tech Nation mentioned similar constraints in Wales and Northern Ireland, where SEMs working in these areas covered other jobs with competing priorities.

As intended, the SEMs operated across all nations and regions of the UK. The data also show discrepancies across regions, which could be explained by SEMs staff vacancies and turnover, as well as regional differences. To date, no data is available on the number of companies engaging with Tech Nation's SEMs, and it is only possible to draw a partial picture of SEMs coverage.

Impact evaluation conclusions and limitations

Conclusions

- Limited data availability restricted the assessment of most of the outcomes identified in the logic model. In particular, given that data on the number of users was unavailable, the assessment focused on the number of NLN and one-to-one sessions, which was also limited. Even though it was impossible to evaluate the impacts quantitatively, stakeholders had a positive view and believed they benefited from both activities.
 - Overall, interviews show that SEMs users had a positive experience engaging with their SEMs. They appreciated the support from EEM/SEMs and the various networking opportunities the initiative enabled.
 - Based on this, it is reasonable to assume that SEMs' activities positively impacted the companies participating in the initiative, but it is impossible to quantify this impact.
-

4.3 Research and Insight (R&I)

Key findings and recommendations

Process evaluation

- Collection of required metrics was put in place.
- Processes were put in place to improve the quality of the information that is provided by R&I. To maintain a high level of content provided, Tech Nation diversified R&I's content which was also changing with the perceived needs of the sector.

Recommendation:

- Future DSIT-funded initiatives keep track of the needs of the sector, making sure that reports are helpful for the intended audience.

Impact evaluation

- The consolidation of reports (to have fewer but more impactful ones) has led to increased user engagement and potentially to a wider impacted audience through increased media clippings.
 - This view is also corroborated by the positive view from stakeholders, which identified the benefits of R&I to be the ones that Tech Nation was aiming for.
-

4.3.1 Objectives of the initiatives

Research and Insight (R&I) is a name given here to the wide online Tech Nation offerings including reports and blogs. Those documents present Tech Nation's thought leadership by using data, research and analysis on the UK's digital economy which allows access to information, insights and intel aimed at optimising acceleration of the UK tech sector through evidence base policies and investments.

4.3.2 Theory of Change and Logic Model

A logic model is a visual representation of the Theory of Change and is helpful in clearly setting up the activities and outcomes of the input that create the foreseen impacts from the initiative. Figure 20 below presents the logic model of this initiative. It is based on the logic model covering all initiatives Tech Nation provided (see Annex F.) and conversations with Tech Nation staff.

Figure 20 Research and Insight logic model

Research and Insights		
Inputs		
Cost of running the initiative: - researchers' time - overhead costs - IT equipment costs - maintenance staff - licensing costs - data access costs Readers' time		
Activities		
Readers have access to researches and articles on the Digital Sector		
Outputs		
Number of articles published (Reports, Blogs, etc.) Number of readers - by location - by age - by gender Number of reactions (likes and sharing) Bounce rates Engagement on social media Average time spent on the Website		
Outcomes		
Greater awareness of the size and characteristics of the UK tech ecosystem (within the UK and internationally)		
Short-term impacts		
Improvement of awareness about the digital sector for investors	Policymakers are better informed on the UK tech sector	Data and insight can be used by other researchers on the UK tech sector
Medium-term impacts		
Better informed policies for the UK tech sector	Better informed investment decisions on the UK digital sector	

Source: Frontier Economics.

The logic model shows that the inputs for this initiative include several items, with activities being mainly the creation of the reports and blogs and users' engagement with them.

The outcomes of the initiative are focused on increased awareness about the UK digital sector. The benefits realised in different areas, policy making, investment and overall information availability. External stakeholders also confirmed those benefits. For example, one stakeholder mentioned that they had used the Tech Nation reports on engaging with external policymakers and investors and that this positively impacted the discussion and possibly further decisions.

The following section explores the changes in the processes that occurred during the evaluation period, how the previous recommendations were implemented, and recommendations that future DSIT-funded activities should consider if they wish to undertake a similar initiative.

4.3.3 Process evaluation

The process evaluation aims to answer the following questions about the R&I initiative:

- How well did the changes in the initiative address the previous evaluation recommendations, and have those changes created additional process findings?
- Has our stakeholder engagement pointed out other findings on the delivery of these initiatives?
- How has the delivery of the initiatives adapted to Covid-19?

We address each of those questions below and follow with the conclusion and recommendations for the future. The insights presented below are based on interviews with Tech Nation staff and four users and external stakeholders.¹⁰⁴

Assessment of the changes that occurred

Over the evaluation period, Tech Nation implemented various changes in the R&I initiative. In particular:

Improvement of data analysis and overall quality of the reports

During the evaluation period, Tech Nation aimed to improve the quality of the data analysis that was conducted for its reports and blogs. As part of this, Tech Nation hired in-house data scientists and started using more Artificial Intelligence (AI) tech, which allowed analysis of bigger datasets and programmatic analysis and headlines. Tech Nation staff suggested that those changes increased the robustness of the reports. It was also mentioned that team skills were enhanced over the period with training to keep up with cutting-edge data science and innovative techniques, though it was noted that this was an improvement in the process.

As part of an overall move toward higher-quality reports, we understood that the number of reports published was reduced. The main aim was to focus on the most impactful messaging and increase the quality of the published report (quality over quantity). Stakeholders did not comment on this improvement, although we note that it is based on a discussion with 3 Tech Nation staff and 4 users of R&I.

Diversification of the R&I content

We understand that the content covered in the reports has been diversified. That diversification included several aspects:

- Higher focus was given to the analysis of regions that are working with SEMs to help users with robust and bespoke research and insights. The research reflected trends and insights from across the UK and identified contributors towards levelling up the tech sector outside of London. One stakeholder did mention that more regional or 'niche' information would have been desirable.
- More focus on the human side of the sector, including reports about skills, culture and Equality Diversity and Inclusion (EDI). Overall, the content of R&I became more adaptable and changed from report to report to ensure it is useful and provides value to readers with core strands of information to enable year-on-year comparison.

¹⁰⁴ See Annex A for further details on the stakeholder engagement.

- Content became more accessible through easier and clearer language, as well as including content in audio and video.

Improved data collection

In the previous evaluation, we recommended that Tech Nation defines specific metrics for tracking the impact of its R&I initiative over time. For outputs, these metrics were recommended to go beyond website unique visitors and page impressions to explore bounce rates.¹⁰⁵ Overall, the data collection for R&I was satisfactory, allowing for the evaluation of the trends in the number of visitors as well as some metrics on engagement.

Adapting to COVID-19

As explained above, Tech Nation's R&I moved toward improved and higher quality reports over the evaluation period, which realises the utilisation of large online datasets. Tech Nation staff reported that with the onset of the pandemic, it was difficult to get access to some of those sources, limiting the ability to conduct the required research. In particular, the ONS secure data platform was not accessible for a long time, given that before the pandemic, it could have been accessed from ONS facilities.

Process evaluation conclusions and future recommendations

Given the above, we conclude that from a process evaluation point of view:

1. A collection of required metrics was put in place.
2. Processes were put in place to improve the quality of the information that is provided by R&I. To maintain a high level of content provided, Tech Nation diversified R&I's content which was changing with the perceived needs of the sector.

We recommend that future DSIT-funded initiatives keep track of the needs of the sector, making sure that reports are helpful for the intended audience.

4.3.4 Impact evaluation

As mentioned in the previous section, Tech Nation improved its data collection on R&I over the evaluation period. In this impact evaluation, we are mainly interested in understanding:

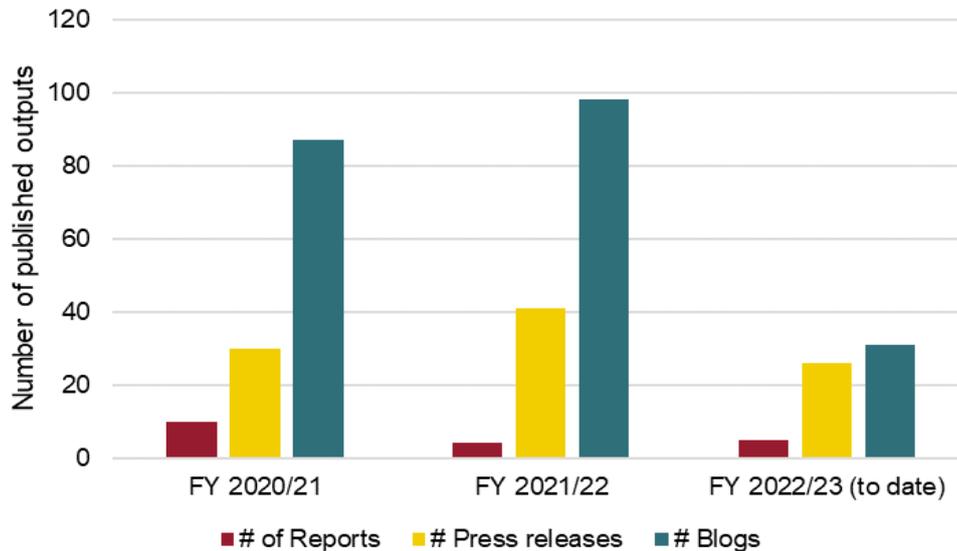
- How did the number of users interacting with R&I change?
- Was there a change in users' engagement with R&I outputs?

Answering these will help assess if the move to fewer reports but at a higher quality has created greater engagement for users. We used monitoring data provided by Tech Nation to assess trends over the evaluation period, which were supplemented with views gathered from stakeholders about the impacts R&I may have created for them.

¹⁰⁵ Bounce rate is the percentage of visitors to a particular website who navigate away from the site after viewing only one page.

Figure 21 presented Tech Nation data on R&I, which corroborates the decrease in R&I outputs over the evaluation period. Reports decreased from ten in FY 2020/21 to four in 2021/22 and five in 2022/23.¹⁰⁶ We also observe a similar trend in the number of press releases and blogs.

Figure 21 Number of selected R&I published outputs over the evaluation period



Source: Frontier Economics based on Tech Nation data.

To assess the anticipated increase in the quality of R&I outputs, we investigate the trends in R&I engagement metrics.

Tech Nation data shows that Press Clippings¹⁰⁷ of Tech Nation information have increased from 1,455 in FY 2020/21 to 3,970 in FY 2021/22. Although data for FY 2022/23 indicate only 2,256 Press Clippings, given that this is only reporting data up to January 2023, it is expected that the FY 2022/23 final annual number would have been higher. This suggests a positive change and an increase in the interest of the target audiences (Press Clippings report information that is deemed to be of wider interest). In addition, Press Clippings increase the reach of Tech Nation analysis and, as such, increase R&I's impact over the evaluation period.

Other positive engagement data shows that the bounce rate, which is the percentage of visitors who navigate away from the site after viewing only one page, has decreased steadily over the years (from 31% to 27% and to 25%). This decrease indicated that users are much more engaged with the R&I information and are less likely to leave the site after viewing one page. Related to that, the average time spent on the website has also increased slightly (from 3 minutes and 8 seconds to 3 minutes and 37 seconds to 3 minutes and 23 seconds). These positive trends suggest that the content published may have been more relevant and useful to the audience it reached.

¹⁰⁶ We note that information for 2022/23 only includes publications up to January 2023.

¹⁰⁷ Is a measure of how many times a certain company has been mentioned in either print, online, or broadcast media.

At the same time, we find an increase in the number of unique visitors between FY 2020/21 to FY 2021/22 (from 507,000 to 537,000), followed by a decrease in FY 2022/23 (to 327,000 to January 2023 and an estimated 436,000 for the year to March 2023).¹⁰⁸ This may be explained by the decrease in the amount of content published, which is described above.

The potential impact created through the positive trends we see in the monitoring R&I data is also evidenced by the four stakeholders we interviewed. One stakeholder mentioned that the reports' cross-sectionally and depths made them unique compared to other tech reports. The same stakeholder said those reports were useful when engaging with international policymakers and investors as they provided an unbiased view of the UK tech sector that is written in a way that non-UK audiences can understand. Another stakeholder mentioned that they used the trends and statistics from the reports to understand better the UK sector for their own use.

Over the evaluation period, we conclude that from an impact point of view:

1. The consolidation of reports to have fewer but more impactful ones has led to increased user engagement and potentially to a wider impacted audience through increased Press Clippings.
2. This view is also collaborated by the positive view from stakeholders, which identified the benefits of R&I to be the ones that Tech Nation was aiming for.

¹⁰⁸ The estimate of 436,000 has been generated assuming that the number of unique visitors per month in February and March would have been the same as the average number of monthly visitors between April 2022 and January 2023 ($327,000/12=27,250$).

5 Conclusions

This evaluation has identified positive impacts of the activities funded by DSIT and undertaken by Tech Nation for both groups of initiatives being evaluated (Growth Programmes and Rising Stars; other initiatives). Evidence on impact was most limited for Tech Nation's learning and networking offer, but this was partly due to a significant change of this offer taking place during the evaluation period, making it challenging to evaluate those initiatives.

5.1 Growth Programmes and Rising Stars

We find that Tech Nation's Growth Programmes had a substantial positive impact on the growth of participating firms. We estimate that participating in a Growth Programme led to an increase of 27% in employment in the first year after programme completion. This additional employment growth increases to 37% in the second year and 38% in the third.¹⁰⁹ The size of these effects is consistent across different years of delivery.¹¹⁰

We estimate that this additional employment growth has generated substantial additional GVA. Focussing conservatively on effects in the first and second year after participation, we estimate that delivery of the programmes in FY 2020/21 has generated around £34m in additional GVA.¹¹¹ Additional benefits are also likely to materialise as a result of the delivery of the programmes in FY 2021/22 and FY 2022/23.

Limitations in the data on the cost of these programmes mean that we cannot confidently estimate a benefit-cost ratio. That said, it is likely that the benefit was significantly higher than the cost of delivery as the total annual value of the grant funding provided by DSIT.

We could not confidently quantify the impact of Rising Stars due to the relatively small scale of the initiative compared to the broader group of Growth Programmes.

5.1.1 Learning and networking initiatives

This area of Tech Nation's offering underwent significant change over the evaluation period. The Growth Platform replaced DBA and Founders' Network in an effort to consolidate Tech Nation's offer and make it more relevant and targeted to Tech Nation's key audiences. As the Growth Platform was only launched recently (June 2022), we have relatively limited evidence of the process of delivery and its impact. The evidence available indicates that the Growth Platform was reaching a relatively large number of potential beneficiaries (3,095 users), outperforming the Founders' Network in its reach. Interviews with stakeholders

¹⁰⁹ We could not estimate longer term effects of the programmes (four years plus) as sufficient time has not yet elapsed since programme completion. We also estimated the impact of the programmes on firms' turnover, but results were inconclusive due to limitations in turnover data.

¹¹⁰ Therefore, the figures reported in this summary are the average impact across all years of the evaluation, which are our most robust estimates since they are based on a larger sample size of participating firms compared to year-specific estimates.

¹¹¹ In line with best practice in impact evaluation, we do not assume that the employment generated by the programmes was entirely additional, but, more conservatively, that the additional employees of Tech Nation firms would have been in jobs generating lower GVA if not for the programmes. Our methodology is explained in detail in 3.4.2 and the full analysis including what impacts were included can be found in C.2.

identified that the sign-up process could be lengthy, and some interviewees struggled to identify how they could have benefitted from the platform. However, this is based on a small number of interviewees (five) who had engaged with the initiative.

Scaleup Engagement Managers

We found that Scaleup Engagement Managers (SEMs) reached a significant number of beneficiaries across all nations and regions of the UK. In the FY 2022/23, the 12 SEMs had a total of 1,788 one-to-one sessions with scaleup founders and senior managers and organised 59 regional and national networking sessions, which typically involved 5-10 and 10-15 founders and senior managers, respectively.

The beneficiaries we spoke to as part of the evaluation highly valued the networking opportunities and one-to-one sessions provided by SEMs. Some possible improvements were identified around the increasing team resilience to staff turnover and the need for better and more consistent data collection.

Research and Insight

Over the evaluation period, Tech Nation decided to reduce the number of research and insight outputs (blogs and reports) with the aim of focussing on fewer, higher-impact pieces of content. Measures of engagement with Tech Nation's outputs trended up during the evaluation period, suggesting that this strategy was successful. More broadly, stakeholders held a positive view of Tech Nation's research and insight, with particular benefits around informing policymakers (in the UK and abroad) and international investors in the UK tech sector.

Overarching themes

Recommendations from a similar evaluation of Tech Nation's activities, conducted in 2019, were implemented, with some exceptions regarding: the formal definition of some initiatives' objectives, identification of intended outcomes of some initiatives and systematic recording of key outcomes useful for monitoring and evaluation. In addition, overhead costs were not systematically allocated to each initiative, limiting our ability to conduct a full value-for-money assessment.

Over the evaluation period, Tech Nation made several changes to its initiatives and successfully increased its regional reach. The proportion of Growth Programme participants from non-London regions increased over the evaluation period, but half of the participants were still located in London in FY 2022/23.

Recommendations

Our evaluation suggests a number of recommendations for the future delivery of activities in support of digital startups and scaleups funded by DSIT and for the future monitoring and evaluation of those activities. Following an open competition, the DSIT grant for the next funding support period (FY 2023/24-FY 2024/25) was awarded to Barclays Eagle Labs. Therefore, our recommendations are about the future delivery of activities similar to those undertaken by Tech Nation in FYs 2020/21 to 2022/23.

Recommendations for future delivery

- The delivery of Growth Programmes generates significant benefits. We found that both sector-specific Growth Programmes (such as Cyber and Applied AI) and programmes targeting firms at specific stages of growth across all sectors (such as Upscale or Future Fifty) can be effective in stimulating firm growth and, therefore, both could be considered as part of future initiatives.
- Online platforms that combine personalised online networking and learning on a single platform should be considered, as they have the potential to reach a large number of beneficiaries. It would be beneficial to allow different types of users to easily access different and personalised content, but this needs to be traded off against requesting too much information from users at the sign-up stage.
- Future DSIT grant recipients might be well placed to continue the research about the UK tech sector, which, together with sector insights gathered through acceleration programmes, can add valuable intel for policymakers and future investors.

Recommendations for future monitoring and evaluation:

- Across all initiatives, an evaluation framework and monitoring strategy should be defined – as early as possible. At a minimum, this should include:
 - Preparation of logic models for each initiative. This would help identify the aims and intended benefits of each initiative.
 - Defining monitoring and evaluation metrics and a data collection strategy. Data collection should include, at a minimum, data on reach (e.g. unique number of users), engagements (e.g. number of sessions attended) and users' personal characteristics.
- Cost data should be allocated to each initiative separately, including a clear recording of investment costs and overhead costs per initiative.

Annex A Stakeholders selection and contact approach

One source of information used for the process and impact evaluation findings presented in this report is based on information gathered through a stakeholder engagement exercise. In this annex, we summarise:

- the approach that we took to select and contact the stakeholders;
- the number of stakeholders that commented on each Tech Nation initiative; and
- the topics covered when conducting the interviews.

We relied on DSIT and Tech Nation support to identify and contact the stakeholders interviewed. It is possible to see the Growth Programmes alumni on Tech Nation's website. However, as expected, we did not have contacts within those companies to arrange the interviews. Moreover, we did not have data on which companies used the other services provided by Tech Nation. For this reason, the approach taken to identify the stakeholders was the following:

- **Tech Nation staff:** Tech Nation provided the names and contact details of these stakeholders.
- **Growth Programme participants:** Frontier randomly selected the companies to interview, and Tech Nation provided their contacts. However, given that not all contacted individuals responded, Tech Nation suggested three additional companies that were contacted.
- **Users of other Tech Nation initiatives:** Tech Nation provided the names and contacts of these stakeholders.
- **External stakeholders:** Tech Nation and DSIT identified these stakeholders.

Once the stakeholders were identified, DSIT contacted them through an agreed-upon email. After the stakeholders agreed to participate, Frontier Economics set up and conducted the interviews independently. The interviews were conducted under full confidentiality, and consent was collected via email from stakeholders to include the quotes in the paper before publication.

A.1 Tech Nation initiatives covered by stakeholder engagement

For this evaluation, we conducted 20 interviews across four different groups of stakeholders:

- Tech Nation staff: six interviewees.
- Growth Programme participants: five interviewees.
- Users of other Tech Nation initiatives: four interviewees.
- External stakeholders (e.g. local policymakers) and stakeholders in regional clusters: five interviewees.

Interviews with each stakeholder aimed to cover all Tech Nation initiatives the stakeholder was aware of. Table 10 below summarises the number of stakeholders that commented on each initiative. Please note that given the limited number of interviews in the scope of the evaluation and the ability to reach relevant stakeholders, not all Growth Programmes were included in the conversations. Since the nature of Growth Programme initiatives implementation is similar across those programmes, it was agreed with DSIT and Tech Nation that the views collected are representative of Growth Programmes initiatives as a whole.

Table 10 Number of interviewees per initiative – by stakeholder type

Interview type	Growth Programmes and Rising Stars	Founders ' Networks	DBA	Growth Platform	EEM/ SEMs	Research and Insights	Total
Growth Programme user	5	1	0	1	2	0	5
Non-Growth Programme user	1	1	0	1	4	0	4
Tech Nation staff	4	1	1	3	1	2	6
External Stakeholder	5	0	0	0	2	4	5

Source: Frontier Economics.

Note: Totals do not sum across the rows, as stakeholders were able to discuss more than one initiative.

A.2 Topics covered during the interview

Interviews were based on a semi-structured topic guide agreed upon with DSIT and were conducted independently by Frontier Economics.

A semi-structured interview is a data collection tool with a predetermined framework around the topics, but questions are not set in order or phrasing. The topic guide covered questions to gain insight into both the process and the impacts of a given intervention. Overall, each interview covered the following topics:

- **Information about the stakeholder:** depending on the stakeholder, this covered the stakeholder’s role within Tech Nation, the characteristics of the stakeholder’s business or the stakeholder’s role in the UK Tech sector.
- Confirmation of the Tech Nation initiatives that the stakeholder is aware of (or, in the case of Tech Nation staff, they are most related to).
- **For Growth Programmes and Non-Growth Programmes users:** the following was discussed for each of the initiatives of which the stakeholders were aware:
 - Expectations about the initiative before joining
 - The benefits that the initiative generated
 - Aspects of the initiative that were helpful
 - Aspects of the initiative that could have been improved

- Whether the stakeholder would have used another similar initiative not provided through Tech Nation
- **For Growth Programmes only:** Overall assessment of the programme after completion.
- **For Tech Nation staff:** the following was discussed for each initiative the stakeholder supported:
 - Aspects of the initiative that were helpful
 - Aspects of the initiative that could have been improved
 - The main learnings from the programme, including challenges due to COVID-19 and any differences, such as moving from in-person support to virtual support
 - The main benefits for participants in the programme
 - The applications process for the programme
 - Which previous recommendations have been taken into account, and what is their impact
- **For external stakeholders:** given the different natures of the stakeholders in this group. The interviews depended on the level of awareness of Tech Nation initiatives. Overall, it was agreed to cover the following:
 - Reasons the stakeholder or companies in their network engage with Tech Nation
 - The overall experience with these initiatives and Tech Nation

Each interview lasted one hour. If stakeholders were aware of more than one initiative, the interview focussed first on the initiative they were more familiar with and then touched upon the remaining ones.

Annex B Tech Nation initiatives in scope of the evaluation

As explained in section 2, the number and nature of Tech Nation’s activities changed over the years of the evaluation period. This annex first describes the Growth Programmes and Rising Stars initiative and non-Growth Programme initiatives.

B.1 Growth Programmes and Rising Stars

As explained in section 2, Growth Programmes include seven initiatives. Some are sector-specific, and some are not. Table 11 presents the sector-specific programmes, and Table 12 the non-sector-specific ones. For each Growth Programme, the tables present the version included in the evaluation period (together with their start and end dates) and further details about each initiative.

Table 11 Sector-specific Growth Programmes versions in the scope of the evaluation

Programme	Version in scope	Start and end dates	Offering
Applied AI ¹¹²	2	21/09/2020 – 15/03/2021	Mid-stage programme focusing on helping companies pre-Series A to scale in the Applied AI sector. The number of supported companies increased in FY 2022/23.
	3	06/09/2021 – 23/03/2022	
	4	06/10/2022 – TBC (as per writing this report)	
Cyber ¹¹³	2	23/04/2020 – 12/10/2020	The UK’s national scaleup programme for the cyber security sector, Tech Nation Cyber, was aimed at tech companies ready for growth, at home and abroad.
Fintech ¹¹⁴	3	21/09/2020 – 14/04/2021	Mid-stage programme focusing on helping companies pre-Series A to scale in the Fintech sector. The number of supported companies increased in FY 2022/23.
	4	06/09/2021 – 23/03/2022	

Source: Frontier Economics.

¹¹² Eligibility criteria: 1. Have Artificial Intelligence at the core of value proposition and key product, not an excess feature. 2 Seed to Series A (or no more than £1.5m annual recurring revenue). 3. Take into account ethical considerations.

¹¹³ Eligibility criteria: no longer available.

¹¹⁴ Eligibility criteria: Have headquarters in the UK: 1. Digital tech with Fintech or Insurtech product or service to sell. 2. The company is at Seed to Series A funding stage. 3. If the company is self-funded, the minimum annual revenue is £100k and the maximum is £1.5m. 4. Open to all B2B, B2C and B2B2C companies. 5. The company is more than 1 year old.

Table 12 Non-Sector-specific Growth Programmes versions in the scope of the evaluation

Programme	Version in scope	Start and end dates	Offering
Libra ¹¹⁵	1	06/09/2021 – 23/03/2022	Early-stage six-month programme focused on helping ethnic minorities to scale and overcome initial growth and investment challenges. Earlier cohorts were focused on black founders.
	2	07/09/2022– TBC	
Upscale ¹¹⁶	6	27/01/2021 – 29/07/2021	Mid-stage six-month programme that delivers 30 hours of support aimed at helping leadership teams scale rapidly after having gained traction in their market. The number of supported companies increased in FY 2022/23.
	7	06/09/2021 – 23/03/2022	
	8	07/09/2022 – TBC	
Future Fifty ¹¹⁷	8	26/03/2020– 08/12/2020	Late-stage programme focusing on peer-to-peer learning and growth support for companies' leadership teams at an advanced funding stage.
	9	22/03/2021 – TBC	
	10	06/09/2021– TBC	
	11	22/09/2022 – TBC	

Source: Frontier Economics based on information and data from Tech Nation.

To participate in a Growth Programme, participants have to be eligible (as mentioned in the footnotes for each Growth Programme above). After applying to the programmes, participants were scored on a series of eligibility criteria. Those included:¹¹⁸

- 1. Value Proposition** – How strong is the company's value proposition? Assess whether the company addresses a big problem and if they have the ability to solve it or a small market/problem.
- 2. Competitive Advantage** – Does the company have a competitive advantage in delivering this value proposition? Assess whether the company has a competitive advantage: technology, personnel, speed to market, etc.
- 3. Traction** – What traction has the company achieved to date that exhibits demand for their solution? Assess the level of traction the company has demonstrated to date, including revenue, partnerships, key clients and awards.

¹¹⁵ Eligibility criteria: 1. Must have at least one (self-identified) ethnic minority founder in the founding team, from the following ethnic minorities: Black, South Asian, East Asian or Arab. 2. The founder can be multiracial, as long as this includes the ethnic minorities specified above. 3. A digital/tech-enabled tech business with a product or service. 4. The company is Seed to Series A funding stage. It can have raised up to £10 million, or bootstrapped, with maximum annual revenue below £1.5M. 5. Pre-seed stage companies are accepted, as long as they are able to demonstrate market traction. 6. Sector agnostic. 7. At least one active client or pilot.

¹¹⁶ Eligibility criteria: 1. Venture Capital backed, having raised Series A round or, if revenue focused, generating revenue of £1.5m – £5m.

¹¹⁷ Eligibility criteria: 1. Series B+ funding stage or, if revenue focused, generating annual revenues over £5m. 2. Achieving 50% year-on-year growth.

¹¹⁸ Scoring criteria as provided by Tech Nation.

4. **Potential to Scale** – Is the addressable market large enough? Does this company have a business model and technology that can scale rapidly?
5. **Team** – Is the team right to deliver on this vision? Do they have the correct balance of experience and expertise?
6. **Programme Suitability** – Does this company represent the best of the UK Ecosystem, and will it benefit from the Tech Nation programme?

Each Growth Programme had a predefined number N of open positions in each version. The N number of firms with the highest score would be accepted into the programme. The next N number of firms were marked as Highly Commendable Applicants (HCA).

In addition to the Growth Programme, the Rising Stars initiative was a competition aimed at early-stage firms. The competition's latest version (fifth) comprised four stages in which qualifying companies receive support and exposure opportunities. The four stages included:

- City Winner – 132 firms are chosen from each city. This stage was only introduced in the latest version, launched in April 2022, to increase regional participation.
- Regional Winner – 55 firms are chosen in each region out of the city winner.
- Finalists – 20 are chosen from the regional winners.
- Winners – 10 companies are selected from the finalists.

To increase the regional impact of Rising Stars, the last version of Rising Stars, launched in April 2022, was delivered by SEMs.¹¹⁹

Each stage of the competition involves additional sessions. Overall, the competition aims to provide pitch training, coaching and masterclasses to the companies. It also offers opportunities to meet investors, accelerators, entrepreneurs and corporate leaders in the UK tech community and develop a network. Moreover, Tech Nation provides content campaigns and press coverage for companies passing each stage of the competition.

B.2 Non-Growth Programmes

Table 13 presents the rest of the DSIT-funded non-Growth Programmes that were part of the evaluation scope.

¹¹⁹ SEMs delivery of Rising Stars involved organising in-person events across the UK, securing commercial partners, taking care of the Rising Stars outreach, supporting the winners and planning and delivering all the sessions that are part of Rising Stars offering.

Table 13 Non-Growth Programmes versions in the scope of the evaluation

Initiatives included	FYs in scope	Description
Digital Business Academy (DBA)	FY 2020/21	DBA courses provide tips from experts and powerful tech entrepreneurs that will help obtain the digital skills needed to reach the business goals of startups and scaleups in the UK.
	FY 2021/22	
	FY 2022/23	Excluded (programme not funded by DSIT).
Founders' Network (incl. KIN)	FY 2020/21	A Slack community built for startup/scaleup founders designed for creating a peer-to-peer networking space.
	FY 2021/22	A Slack community built for startup/scaleup founders designed for creating a peer-to-peer networking space. In this FY, Knowledge Insight Network (KIN), a platform solely for alumni and cohort companies' employees, was also developed.
	FY 2022/23	Excluded (programme not funded by DSIT).
Growth Platform	FY 2020/21	Excluded (programme did not exist).
	FY 2021/22	Development of the initiative started in April 2021, mainly focusing on user research.
	FY 2022/23	The Growth Platform launched at London Tech Week in June – a digital, personalised scaling network and learning platform, providing support and knowledge sharing to thousands of senior leaders.
EEM/SEMs	FY 2020/21	Entrepreneur Engagements Managers in 11 locations across the UK focused on working closely with founders to help them scale their businesses by linking them into Tech Nation's wider offerings and providing introductions, signposting and relevant content. In FY 2022/23 Rising Stars competition was moved to be led by SEMs.
	FY 2021/22	
	FY 2022/23	
Research and Insight	FY 2020/21	<p>Reports: Tech Nation reports are data-driven analyses and research aimed at informing policy and practice about the UK and global tech economy – from providing a yearly state of the Tech Nation and regular ecosystem updates to thematic reports on areas such as people and skills and sector-specific deep dives.</p> <p>Blogs: This is the go-to resource for short, accessible posts on startup stories, how-to guides, data and programme updates.</p>

Source: Frontier Economics.

Note: Initiative descriptions were provided by Tech Nation.

Annex C Econometric methodology

C.1 Econometric approach for impact estimation

As explained in 3.4.1, we used the Propensity Score Matching (PSM) technique to assess the impact on growth that participation in the Growth Programmes had. The PSM is a robust analytical approach aimed at finding a very similar control group to the treatment group by identifying the firms that have not participated but had a high likelihood of being part of the Growth Programmes. This statistical method has two main stages:

1. Estimation of propensity scores: this involves predicting the likelihood (propensity) of firm participation in the initiative being evaluated based on their observable characteristics.
2. Estimation of average effects: comparing the outcomes of participating firms to those of non-participating firms that are most similar in terms of their propensity scores (i.e. most similar in the characteristics that are important predictors of participation in the initiative).¹²⁰

The first assumption cannot be tested empirically, but we check whether the PSM procedure has removed all observable differences between treated and control firms (shown in C.2 below).

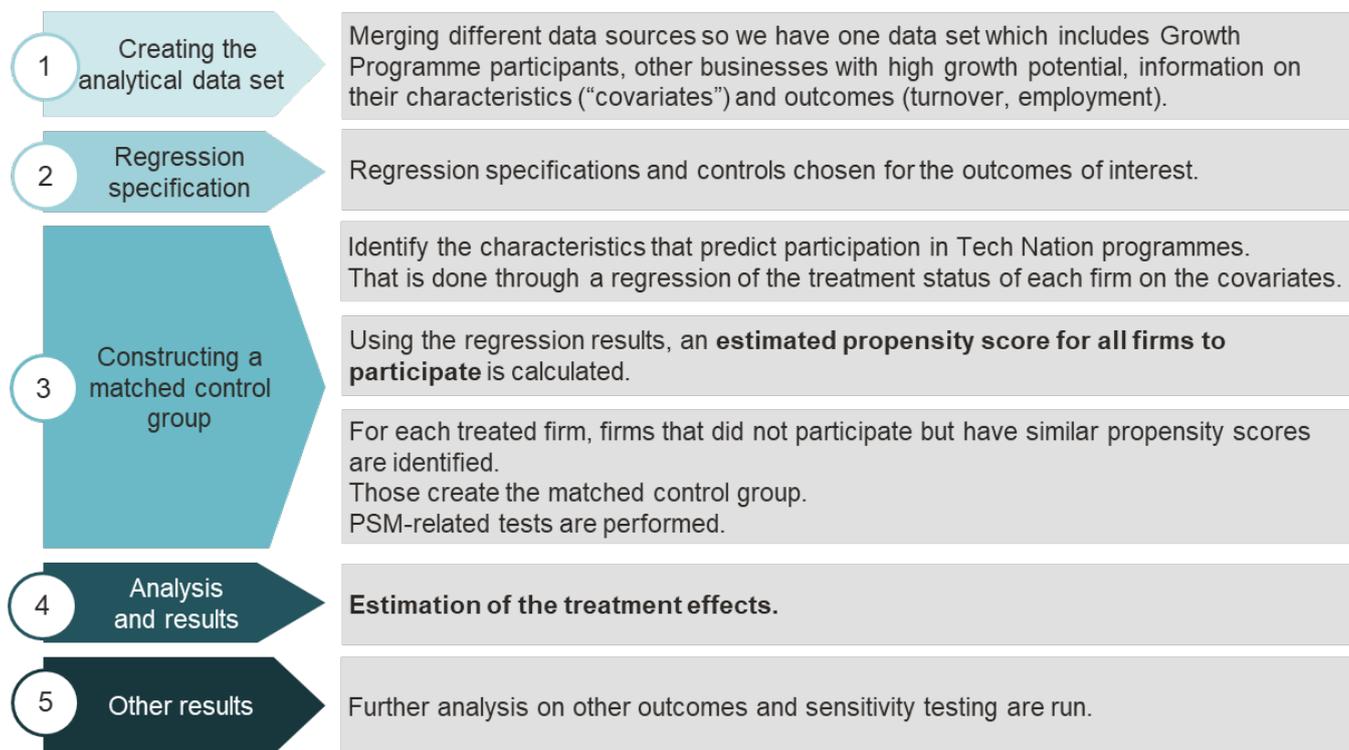
There are also two main conditions for undertaking a PSM analysis:

1. Conditional independence assumption: means that once a control group is identified through their propensity scores, the assignment of the treatment is as good as being a random allocation.
2. Common support condition: means there is an overlap between treated and non-treated in terms of propensity scores. In other words, there are enough control firms in the data whose propensity score is close to the treated propensity scores.

We undertake five main steps to achieve those two stages, as shown in Figure 22 below.

¹²⁰ PSM is ranked as a robust method 3 (out of 5) on the Scientific Maryland Scale (SMS) - see <https://whatworksgrowth.org/resources/the-scientific-maryland-scale/> for a description of different levels.

Figure 22 Steps in the PSM analysis



Source: Frontier Economics.

The analytical steps are taken for each cut of the analysis that is either discussed in the main results section, part of other results or part of the sensitivities that we have undertaken. This section describes the steps, and the following annex section describes the results.

1. Creating the analytical data set

Before undertaking the PSM analyses, we combined relevant data sets into one. In particular, we use firm-level data for both treated and non-treated firms. The final data included mainly information about:

- Treatment status
- Characteristics of the firm
- Outcome variables

The analysis brings in variables from a number of different data sets, with the aim of gaining reliable and complete indicators of performance over time, a rich set of variables that can be used to predict participation in Tech Nation programmes or control for trends in performance, and having sufficient sample sizes to be confident in robustly estimating impacts.

There are three main data sets used for this analysis. We describe each below.

Treatment data

Description of the data set: A proprietary data set that was compiled by Tech Nation and shared with Frontier Economics. Includes all firms that have applied to one of Tech Nations' Growth Programmes and

Rising Stars from FY 2014/2015 until FY 2022/23. Two distinct files were provided: a file containing all participants for the full period; a file for more recent years, including accepted applicants, rejected applicants and (unsuccessful) Highly Commendable Applicants (HCA)¹²¹ ¹²² Some companies may appear more than once in the data set, for example, if they participate in multiple programmes or make multiple applications.

Pre-merge cleaning steps: Several steps are taken to prepare the data set:

- 1. Flagging firm's participation:** Since firms might appear twice in the data, the following steps are taken to identify the right participation programme for each firm:
 - Flag observations for non-grant-funded programmes,¹²³ which will be dropped from any subsequent analysis.
 - Define the first programme a firm is accepted on as its 'main' episode of treatment, i.e. do not analyse subsequent episodes of treatment.¹²⁴
 - For the purposes of the main analysis, we do not specifically flag (i.e. drop or retain) rejected or HCA cases, and those are used as part of the possible control pool firms.
- 2. Flagging Highly Commendable Applicants (HCA)¹²⁵ for each Growth Programme:** For a sensitivity test, where treated firms are compared to HCA firms instead of the PSM-matched set, we need to use the following step to identify those in the data.
 - i. Where a firm appears as HCA in one year and is subsequently accepted onto a different programme, it is dropped as an HCA case (as it subsequently received treatment, so does not form a viable counterfactual), but the corresponding acceptance case is still used.
- 3. Other cleaning steps:**
 - i. The start and end dates for one programme are corrected where they are erroneous. For example, Rising Stars version 3 originally had a start date of 29/07/2021 and an end date of 31/03/2021. The start date was corrected to 29/07/2020.

We use the variables in the table below in our analysis.

¹²¹ Tech Nation had a flag to mark firms that were 'Highly Commendable Applicants' (HCA) but were not selected as participants in the Growth Programmes. Tech Nation scores applicants for the Growth Programme on several parameters. The second X number of firms with the highest scores receive an HCA flag. For example, if there are 30 places for a given programme, applicants with 31 to 60 highest scores would be marked as HCA and the 1 to 30 highest scores would be accepted to the programme.

¹²² Although the applicant data goes as far back as FY2016/17, highly commendable applicants are only captured from FY2019/20 onwards.

¹²³ The files include information for Net Zero X and Advanced Scaling Leaders, which are outside the scope of this evaluation.

¹²⁴ Overall, from FY2018/19 onwards, the data contains 1100 acceptances, of which 1047 are first acceptances and 53 are second acceptances.

¹²⁵ Tech Nation had a flag to mark firms that were 'Highly Commendable Applicants' (HCA) but were not selected as participants in the Growth Programmes. Tech Nation scores applicants for the Growth Programme on several parameters. The second X number of firms with the highest scores receive an HCA flag. For example, if there are 30 places for a given programme, applicants with 31 to 60 highest scores would be marked as HCA and the 1 to 30 highest scores would be accepted to the programme.

Table 14 Treatment data set

Variable	Description	Usage
Acceptance dummy	Dummy for acceptance on any Tech Nation Growth Programme	Used to identify treatment effect
Competition dummy	Dummy for competition programmes (in particular Rising Stars)	Used to exclude competition programmes where relevant
Growth Programme dummy	Dummy for Growth Programmes	Used to exclude Growth Programmes where relevant
Non-DSIT-funded programmes dummy	Dummy for non-DSIT-funded programmes	Used to exclude these from analysis
Non-Sectoral programmes dummy	Dummy for programmes including Future Fifty, Upscale and Libra	Used to focus analysis for Growth Programme sub-splits
Sector-specific Growth Programmes dummy	Dummy to include sector-specific programmes: Applied AI, Fintech, NetZero and Cyber. Non-sector-specific programmes: Libra, Upscale and Future Fifty.	Used to focus analysis for Growth Programme sub-splits

Source: Frontier Economics.

Beahurst data

Description of the data set: Beahurst is a proprietary database covering startup and high-growth firms, populated using web-crawling of many sources and regulatory filings. Beahurst incorporates details from Companies House, accounts, information on equity and debt funding, participation in accelerator programmes and detailed sector and ‘buzzword’ designations that capture a firm’s business activities. These flags are considerably more nuanced than Standard Industrial Classification (SIC) codes, capturing activities such as cybersecurity and Fintech. Inclusion in Beahurst is a strong identifier of firms being similar to Tech Nation firms. The rich set of variables further focuses on suitable comparators for participant firms.

Extraction: Beahurst has monthly download limits, so it is necessary to extract data repeatedly and build up a sample of sufficient size. Without being able to download all of the data, it is necessary to ensure that the data extracted is representative and is not skewed in any systematic way. We, therefore, adopt a randomised extraction strategy. This is done by utilising the full Companies House data set and randomly splitting each SIC code into a series of tranches. These are then searched for in Beahurst. For relevant SIC codes (any 5-digit code that gives 4+ Tech Nation participants) and firms established since 2007, we are able to search 75% of firms in Beahurst and return all corresponding search results. This resulted in a dataset of around 26.4k firms.

Pre-merge cleaning steps: The main cleaning step involves processing variables and removing large free-text fields that result in cumbersome file size and coding variables to be easy to use in the econometric

analysis. Only a subset of a large number of variables is retained. In the case of sector and buzzword flags, these fields are dropped if the sector has fewer than 50 firms.

We use the variables in the Table 15 below in our analysis.

Table 15 Beauhurst data set main variables

Variable	Description	Usage
Technology IP	Dummy for technology/IP-based company	Control variable
Fintech	Dummy for a fintech company	Control variable
AI	Dummy for an artificial intelligence company	Control variable
Analytics	Dummy for analytics company	Control variable
Software	Dummy for a software company	Control variable
Cybersecurity	Dummy for cybersecurity company	Control variable
Accelerator past three years	Dummy for accelerator participation in 3 years preceding baseline year	Control variable
Accelerator same year	Dummy for accelerator participation in the baseline year	Control variable

Source: Frontier Economics.

ONS BSD data

Description: The Business Structure Database (BSD) provides annual snapshots covering all VAT or PAYE-registered businesses compiled from the Inter-Departmental Business Register (IDBR). It covers the vast majority of UK economic activity and has data on employment and turnover outcomes taken from HMRC, as well as sector and geography variables from the Companies House filings. The BSD is extracted annually, with a snapshot date at the end of March. At the time of our analysis, the most recent BSD available was 2022.

Note there are time lags in the BSD data, with PAYE employment being the average of the 4-quarters leading up to the snapshot and turnover covering the previous financial year, and thus needing to be ‘de-lagged’.¹²⁶ A key advantage of the BSD is its comprehensive coverage across companies and over time, which allows for longitudinal analysis.

Pre-merge cleaning steps: The key step in cleaning the BSD is ensuring that variables are formatted consistently across years so that a longitudinal data set can be built up. Some variables, such as geographic identifiers, have different coding over time, so it is necessary to use output area lookups to generate consistent geographic identifiers.

¹²⁶ For example, for the BSD 2022, the PAYE would cover Q2 2021, Q3 2021, Q4 2021 and Q1 2022, and turnover would run from April 2020 to April 2021.

We use the variables in the Table 16 below in our analysis.

Table 16 Beauhurst data set main variables

Variable	Description	Usage
Paye_jobs	Number of PAYE employees	Outcome and control variable (level at baseline and prior growth).
Turnover	Turnover	Control variable (level at baseline)
Survival	Dummy variable for survival 'n' years after	Outcome variable
SIC58_63	Dummy for SIC codes 58-63	Control variable
Age	Age in years of firm	Control variable
London	Dummy for London location	Control variable
SE	Dummy for South East location	Control variable
North	Dummy for North location (NE, NW, Y)	Control variable

Source: Frontier Economics.

Other auxiliary data sets

Two data sets are used to give some additional geographic data to better control for local area characteristics.

Table 17 Other data sets used

Data set	Description	Variables in usage
BEIS/NESTA innovation indicators	Set of indicators measuring innovation drivers at the NUTS12 level	Several variables were considered in sensitivity analysis: population % with education level NVQ4+, broadband speed, the share of the population with STEM occupation, Innovate UK funding per head of population, research funding per head of population and number of academic spinoffs per head of population.
ONS local area classification	Output-area level clustering on the basis of economic and sociodemographic factors	Dummy variable for areas designed as cosmopolitan student neighbourhoods.

Source : Frontier Economics.

Merging and selecting firms into baselines

These data sets are linked using the firms' Companies House Reference Number ('CRN'), which uniquely identifies companies in each data set, thus allowing them to be linked.

As the data take place within the ONS Secure Research Service platform, all data are pseudonymised, which means that the merging is done using the enterprise reference number ('entref') rather than the CRN.¹²⁷ For this to be done, the Tech Nation programme data and Beauhurst must first be 'ingested' into the Secure Research Service (SRS) platform and matched to entrefs. This procedure has an 85% match rate for Beauhurst and an 80% match rate for the Tech Nation programme data. Note that some of the non-matches may reflect new firms that did not yet appear in the BSD 2022 but may subsequently appear.

Over the merging steps, some observations are dropped. The final merged data set includes 814 treated firms (705 growth and 109 competition) with baseline years from BSD 2018 to BSD 2021. The dataset has 20,765 control firms.

Allocation of firms to baseline BSD report year

The impact is estimated by measuring outcomes relative to a 'pre-treatment' baseline year. Thus T+1 is one after baseline, T+2 is two years after baseline, and T+3 is three years following. By necessity, the baseline date will be a BSD snapshot date, e.g. the BSD 2020.

Note that Tech Nation programmes can start and end at different points in the year, so baseline allocation is not always straightforward. Following detailed scoping, we determined that the most appropriate strategy is to use the BSD date nearest to the programme start date. In most cases, this means that the BSD snapshot corresponding to the calendar year of the programme start is used, e.g. for 2018 programmes, the BSD 2018 is used.

Table 18 Programme version allocation to baseline BSD report years

Programme	version	start date	BSD baseline
Applied AI	1	12/09/2019	2019
Applied AI	2	21/09/2020	2020
Applied AI	3	06/09/2021	2021
Applied AI	4	06/10/2022	2023
Cyber	1	17/04/2019	2019
Cyber	2	23/04/2020	2020
Fintech	1	11/09/2018	2018
Fintech	2	24/10/2019	2020

¹²⁷ Note that the analysis takes place in the ONS Secure Research Service platform where, for confidentiality purposes, the CRN is pseudonymised using an enterprise reference number ('entref').

Programme	version	start date	BSD baseline
Fintech	3	21/09/2020	2020
Fintech	4	06/09/2021	2021
Fintech	5	28/09/2022	2022
Future Fifty	6	07/03/2018	2018
Future Fifty	7	27/03/2019	2019
Future Fifty	8	26/03/2020	2020
Future Fifty	9	22/03/2021	2021
Future Fifty	10	06/09/2021	2021
Future Fifty	11	22/09/2022	2022
Libra	1	06/09/2021	2021
Libra	2	07/09/2022	2022
Net Zero	1	28/09/2020	2020
Net Zero	2	06/09/2021	2021
Net Zero	3	21/09/2022	2022
Rising Stars	1	19/09/2018	2018
Rising Stars	2	12/09/2019	2019
Rising Stars	3	29/07/2020	2020
Rising Stars	4	25/11/2021	2022
Rising Stars	5	01/11/2022	2023
Upscale	3	25/01/2018	2018
Upscale	4	25/01/2019	2019
Upscale	5	06/02/2020	2020
Upscale	6	27/01/2021	2021
Upscale	7	06/09/2021	2021
Upscale	8	07/09/2022	2022

Source: Frontier Economics.

2. Control variables and specification of the analysis

As mentioned in section 3.4.1, various control variables were included in the analysis in particular:

1. **Firm size at baseline:** Many of Tech Nations' programmes target mid and late-stage ventures, and therefore, we expected participants to be, on average, larger than the firms in the Beauhurst data set (as also found in the previous evaluation).

2. **Prior to participation growth:** Tech Nation programmes select firms that have a high growth potential. For our analysis, we are only comparing Growth Programme participants to firms included in the Beauhurst data set, which have also been identified as (potential) high-growth firms. However, to ensure that we do not erroneously attribute to Growth Programme participation pre-existing differences between participants and other firms in their growth, we include an explicit control for pre-baseline growth in the PSM first stage.
3. **Sectoral composition:** Many of Tech Nation’s programmes target firms operating in specific sectors (e.g. Fintech), so we include a number of variables from the Beauhurst data set to ensure that the sectoral composition of the control group is similar to the composition of Growth Programme participants.
4. **Other controls:** Consistent with the previous econometric evaluation of Tech Nation’s Growth Programmes, we include information on firms’ location, age (years since incorporation), participation in accelerator programmes and links to academia (whether the firm is an academic spin-out). We also control for the possibility that COVID-19 lockdowns may have disproportionately affected some firms’ outcomes by adding the proportion of workers in the firm’s sector that are able to work from home. The variables thus exploit the considerable range of information available in the data set.

The overarching specification of the PSM analysis is described in section 3.4.1.

Using that overarching specifications, we run the cuts that are mentioned in Table 19.

Table 19 Econometric analyses conducted for this evaluation

Analysis	Pooled	Annual (T+1, T+2 and T+3)
Main results	T+1, T+2 and T+3	2018, 2019, 2020 and 2021
Year-on-year growth	T+1 to T+2	N/A
Other results:		
Split by programme type (sectorial and non-sectorial)	T+1, T+2 and T+3	2018, 2019, 2020 and 2021
London based vs non-London based	T+1, T+2 and T+3	2018, 2019, 2020 and 2021
As main results, but participation in non-Tech Nation accelerator is flagged – if that happens in the same year ¹²⁸	T+1, T+2 and T+3	2018, 2019, 2020 and 2021
Sensitivities:		
Turnover	T+1, T+2 and T+3	2018, 2019 and 2020
Turnover per employee	T+1, T+2 and T+3	2018, 2019 and 2020

¹²⁸ In the main analysis, participation in non-Tech Nation accelerator control is flagged as in the three years before participation.

Analysis	Pooled	Annual (T+1, T+2 and T+3)
Survival rate	T+1, T+2 and T+3	2018, 2019 and 2020
HCA instead of the regular PSM (explained in C.2)	T+1, T+2 and T+3	N/A
Difference-in-Difference run	T+1, T+2 and T+3	N/A

Source: *Frontier Economics*.

The results (as well as some tests) of each run are described in C.2.

3. Identifying and constructing the matched control group

To identify a control group that is very similar to the treatment group, we do the following steps:

1. Defining and estimating the propensity score model:

The PSM analysis first assesses the impact of various pre-participation firm characteristics on firms' probability of participating in a Growth Programme. This is done by regressing the participation status of the firms in the fully combined data set for the baseline years 2018 to 2021.

As explained in section 3.4.1, we expected the most important characteristics driving selection into Growth Programmes to include the firm size at baseline, prior to participation growth and sectoral composition. We also include information on firms' location, age (years since incorporation), participation in accelerator programmes, links to academia (whether the firm is an academic spin-out) and the proportion of workers in the firm's sector that are able to work from home (as a COVID-19 impact proxy). The variables thus exploit the considerable range of information available in the data set.

The first stage of econometrics uses a probit regression¹²⁹ where the participation status is regressed over the characteristics that were identified above. The result of these steps provides the weight that each characteristic bears in the probability of a given firm participating in the Growth Programmes.

The same set of characteristics is used in the PSM for each analysis cut. Given that some regressions are pooled while others look at different cuts of the data separately, the results of the first step in the PSM might differ between each run. For example, Table 20 below presents the first step PSM results for the pooled T+2. For each statistically significant characteristic, the table presents the impact directly on the participation probability.¹³⁰

¹²⁹ Probit regression, also called a probit model, is used to model dichotomous or binary outcome variables.

¹³⁰ A full set of the first set of PSM stage results with coefficients can be found in C.2.

Table 20 Balancing test results for the main run, pooled T+2

Characteristics	Negative/positive*
WFH**	Not Statistically significant
SIC 58 to 63 ***	Positive
Baseline employment size	Positive
Change in employment three years before participation	Positive
Younger than three years	Positive
Technology IP	Positive
Fintech	Positive
AI	Positive
Analytics	Not Statistically significant
Software	Not Statistically significant
Cybersecurity	Positive
Age of firm	Negative
2019	Not Statistically significant
2020	Positive
London	Positive
SE	Not Statistically significant
North	Not Statistically significant
Constant	Negative
Area with high student concentration	Not Statistically significant
Accelerator in the three years prior	Positive

Source: Frontier Economics based on ONS data.

Note: Full regression coefficients and statistical significance can be found in C.2.

* Statistical significance at 95% confidence interval.

** Working from home – the proportion of workers in the firm's sector that are able to work from home.

*** Standard Industrial Classification codes 58 to 63 refer to digital activities and specifically computer, audio-visual and information services. These are the closest SIC codes to the sectors targeted by Tech Nation activities.

We see that baseline employment and being part of an accelerator before the baseline year are positive and statistically significant factors on firms' probability of participating in the Growth Programmes. Sector identifiers are also statistically significant drivers, which is not surprising given that those are the sectors Tech Nation Growth Programmes are targeting. The age of the firms negatively impacts participation, which is also expected as the target are younger firms.

We retained some of the characteristics in the propensity score model even though their individual impact on the likelihood of participation is not statistically significant, but there is a conceptual rationale for their

inclusion as those logically should be impacting participation (for example, baseline turnover). This is because we wanted to ensure that our analysis controls for differences between treated and control firms in these characteristics, even though their impact on participation may be small or too ‘noisy’ to be statistically significant.

The main aim of this step of the analysis is to calculate the propensity of each firm to participate in the Tech Nation Growth Programmes, given its characteristics. On its own, the level of impact that each characteristic has does not impact the analysis, but the results provide the function that is used to estimate the propensity of both the firms that participated and those that have not.

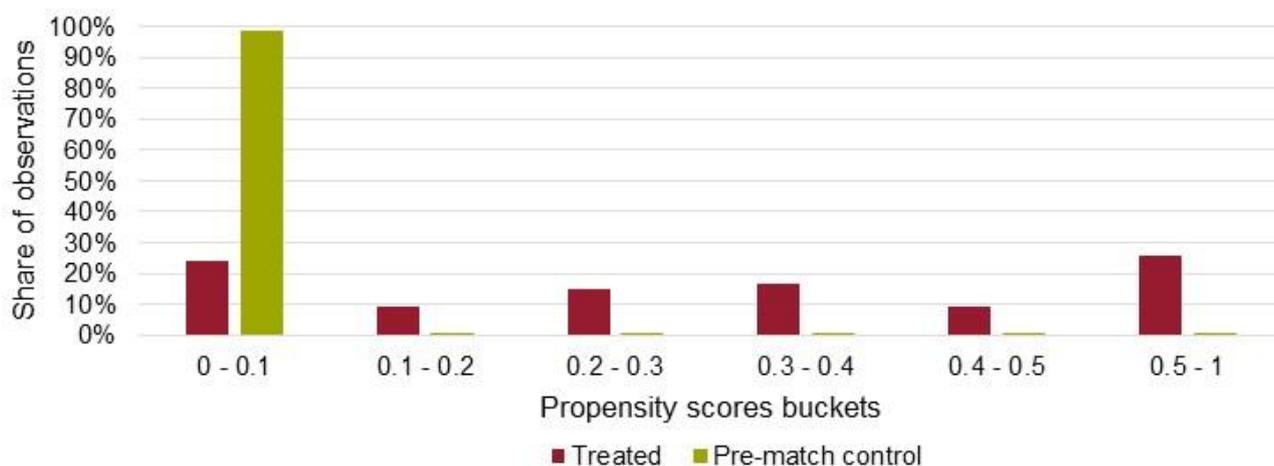
For selected runs mentioned in Table 19, we separately present the results of this first stage of the PSM in C.2.

2. Estimating the propensity scores:

We arrive at a propensity score for each observation using the previous step's results and each firm's specific characteristics on the clean data set.

Figure 23 below shows the distribution of propensity scores for the treatment group and the non-matched control group for the main run polled T+2.

Figure 23 Distribution of propensity scores for treatment and the non-matched control group



Source: Frontier Economics based on ONS data.

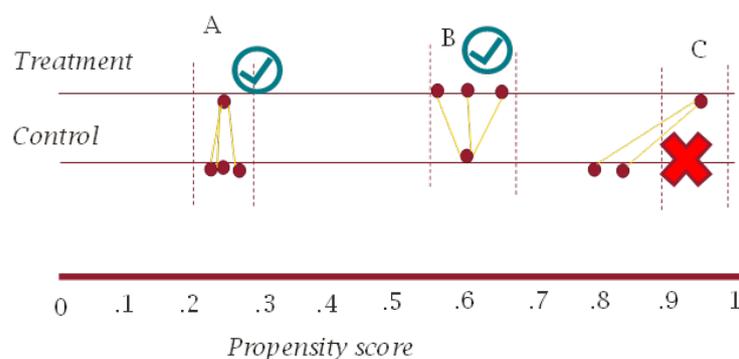
Unsurprisingly, the treatment group's substantial share is distributed toward the upper end of propensity scores. A substantial number of the treated firms also have an overall low propensity score, indicating that firms look very similar to the untreated population in the data set selected for the Growth Programmes. The full sample presents a distribution different from the treatment group's as nearly all non-treated firms are

concentrated near the lower end of the distribution.¹³¹ If we were to compare the change in outcomes of the full control population to that of participating firms, we would not be comparing very similar firms, which would lead to a biased impact estimate. We use the propensity score to find the most similar firms to the treatment group.

3. Identifying the matched control group:

There are several possible ways to identify the matched control group, with no approach clearly superior to others.¹³² In this case, we chose the approach where the matched control group consists of up to 10 firms with the closest propensity score to that of the treated firm (within one percentage point from the treated firms' propensity score if chosen). This approach is less computationally intensive than other matching algorithms (e.g. radius matching) while still ensuring that only the most similar firms are chosen through the restriction of having to be within 1 percentage point from the treated firm. Figure 24 illustrates this process.

Figure 24 Illustration of identifying the matched control groups



Source: Frontier Economics .

Option A shows that for each treatment firm, several control firms might be within 1 pp from the treated firms' score. If that is the case, up to 10 closest non-treated firms are chosen for the control group. Option B shows that one control firm can be considered a good candidate for several treated firms. Option C shows that for some treated firms, no control firms will satisfy the criteria chosen.¹³³ In cases such as C, those firms are dropped from the treatment group.¹³⁴

By the end of these steps, we get a cleaned data set that includes treated firms for which we have at least one control firm that is close in propensity, creating the matched control group of firms that did not participate in the Growth Programmes. Figure 25 shows the propensity distribution of those two groups.

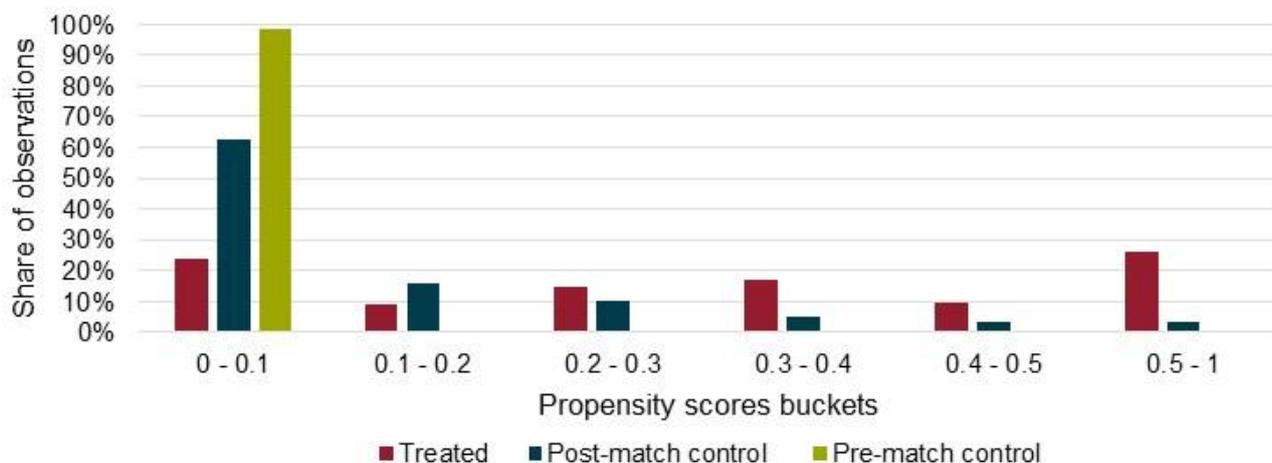
¹³¹ C.2 presents the statistical difference also of the characteristics between those two groups.

¹³² See for example Caliendo & Kopeinig, (2008), Some Practical Guidance for the Implementation of Propensity Score Matching. <https://docs.iza.org/dp1588.pdf>

¹³³ C.2 discusses the appropriateness of those two conditions and the sensitivity checks that were done on them.

¹³⁴ Across the regressions in the main analysis, as discussed in section 3.4.2, only 1%–2% of firms fall under this category. Overall, firms for this 'no control firm was found' tend to be larger at baseline.

Figure 25 Distribution of propensity scores for treatment and the matched control group



Source: Frontier Economics based on ONS data.

The matched control group’s propensity scores are now distributed more similarly to the treated group compared to the non-matched one. The fact that there is still a higher proportion of firms on the lower score distribution side is expected, given that most of the firms in the unmatched data set were situated there.

4. PSM tests

The results of the PSM matching are then tested for the following:

1. Common Support test:

As explained in section 3.4.1, the PSM identifies, for each treated firm, up to 10 closest control firms with a propensity score that is within one percentage point of the treated firm score. If no such control firm is found, that treated firm is dropped from the analysis.

In the main pooled PSM analyses that were conducted, only 1%–2% of firms were dropped due to not having a close enough control firm. These were firms with varying propensity scores as a result of being much larger at baseline than the general population and there being few firms of a similar size to compare against.

Due to the data security of the ONS platform where the analysis was conducted, most of the Common Support test results were not extractable from the platform.

2. Balancing test:

The PSM only identifies control firms similar to the treated firms in their propensity score. On its own, the propensity score does not ensure that the firms are similar across characteristics. Two firms can have similar propensity scores for different reasons. For example, one firm can get a high propensity

score because it has the right amount of baseline employees. In contrast, the other firms would have a similar propensity due to the right level of baseline turnover.

To ensure that the matched control group is as similar as possible to the treated group, we assess the difference in characteristics between the treated group, the pre-matched control group and the post-match control group.

As an example of this test, Table 21 presents the results of this test for the PSM of the T+2 pooled analysis.

Table 21 Balancing test for T+2 pooled PSM analysis

	Post-match treatment	Post-match	Post-match difference
WFH	0.6476	0.6486	0.953
SIC 58 to 63	0.5967	0.6201	0.601
Baseline employment size	2.8455	2.8956	0.706
Baseline turnover	6.0136	6.0932	0.742
Change in employment three years before participation	0.6201	0.5765	0.590
Younger than three years	0.5168	0.5195	0.954
Technology IP	0.8403	0.8543	0.672
Fintech	0.2479	0.2554	0.853
AI	0.2689	0.2549	0.729
Analytics	0.2437	0.2466	0.942
Software	0.3109	0.3401	0.498
Cybersecurity	0.1555	0.1645	0.788
Age of firm	5.1092	5.3955	0.495
London	0.5925	0.6076	0.737
SE	0.1050	0.1045	0.984
2018	2019.3	2019.2	0.711
Area with high student concentration	0.1933	0.1951	0.960
Accelerator in the three years prior	0.3277	0.3081	0.646

Source: Frontier Economics based on ONS data.

Note: Only results with * at the end of the P-value entry would be statistically significant.

The results show that post-matching treatment and control groups are not statistically different from each other with regard to those characteristics.

The PSM test was run a selected number of times. In most cases, due to disclosure rules of ONS, those results were not possible to extract for this report. That said, in all cases, the balancing test showed similar results to the one shown above for the main run pooled T+2 PSM run.

C.2 Impact analysis detailed results

In the following subsections, we present the detailed results of the econometrics analysis. We first show the results for the Growth Programmes analysis (main results, other results and sensitivity checks) and then show the detailed results for the Rising Stars competition. For each run, we show the first-stage probit results and the second-stage PSM treatment effect (as appears in the outputs before any transformations).

5.1.2 Growth Programmes

Main results

The specifications of those runs are:

- Dependent variable:
 - Employment: defined as log employment at T+X minus log employment at baseline.
- Dummy variable for participation: where 1 is assigned for firms that have participated and 0 to those that have not.
- Controls: As appears in Table 22.

We analyse a total of 12 runs: Pooled T+1, Pooled T+2, Pooled T+3, 2018 (T+1, T+2 and T+3), 2019 (T+1, T+2 and T+3), 2020 (T+1 and T+2), 2021 (T+1).

The results of the probit step for the pooled analyses are presented in Table 22 below.

Table 22 Probit results for the Growth Programme main runs:

Characteristics	T+1	T+2	T+3
WFH	-0.3339455*	-0.2724071	-0.5258878*
SIC 58 to 63	0.0834241	0.1896641*	0.1248342
Baseline employment size	0.2915545*	0.3313044*	0.3139249*
Baseline turnover	-0.0189253	-0.0129394	-0.0005086
Change in employment three years before participation	0.2070285*	0.1729268*	0.1288715

Characteristics	T+1	T+2	T+3
Younger than three years	0.3174263*	0.2648285*	0.1268428
Technology IP	0.479672*	0.4526834*	0.6419787*
Fintech	0.4600843*	0.5788587*	0.486144*
AI	0.3872599*	0.4604803*	0.500772*
Analytics	0.1136416	0.1540929	0.057844
Software	-0.0802889	-0.1255848	-0.1477911
Cybersecurity	0.5581447*	0.7718461*	0.8870104*
Age of firm	-0.0459524*	-0.0503219*	-0.0479125*
2018			-0.0665532
2019	0.065644	0.0559322	
2020	0.193226*	0.2010676*	
2021	0.3423304*		
London	0.1811065*	0.195437*	0.3291448*
SE	-0.0133434	-0.0279645	0.0249015
North	-0.0764758	-0.2066521	-0.6342371*
Constant	-3.54794*	-3.721235*	-3.602858*
Area with high student concentration	0.2023873*	0.1775416	0.1901751
Accelerator in the three years prior	0.5169614*	0.4755054*	0.4386046*

Source: Frontier Economics based on ONS data.

Note: * Results are statistically significant at a 95% confidence interval.

The treatment effect results are presented in Table 23 below.

Table 23 PMS treatment effect results (not converted to logs) Growth Programmes main runs

Characteristics	T+1	T+2	T+3
Pooled	.237919912 *	.314260009 *	.321833473 *
2018	.177373775 *	.166893748 *	.3584381 *
2019	.291679454 *	.303834761 *	.237665965 *

Characteristics	T+1	T+2	T+3
2020	.232143929 *	.350555591 *	
2021	.267946047 *		

Source: Frontier Economics based on ONS data.

Note: * Results are statistically significant at a 95% confidence interval.

Employment changes Year-on-Year

The specifications of those runs are:

- Dependent variable:
 - Employment: defined as log employment at T+X minus log employment at the year before.
- Dummy variable for participation: where 1 is assigned for firms that have participated and 0 to those that have not.
- Controls: As appears in Table 24.

We analysed two runs: Pooled T+1 to T+2 and Pooled T+2 to T+3.

The treatment effect results for the pooled analysis are presented in Table 24 below.

Table 24 PMS treatment effect results (not converted to logs) Growth Programmes employment year-on-year changes

Characteristics	T+1 to T+2	T+2 to T+3
Pooled	9% *	3%

Source: Frontier Economics based on ONS data.

Note: * Results are statistically significant at a 95% confidence interval.

Other results

London versus non-London-based

The specifications of those runs are:

- Dependent variable:
 - Employment: defined as log employment at T+X minus log employment at baseline.
- Independent variables of interest:
 - Dummy variable for participation: where 1 is assigned for firms that have participated and 0 to those that have not.
- Controls: As appear in Table 25.

The runs are split between London-based firms and non-London-based firms. This is identified in the data on the basis of the Government Office Region provided in the BSD.

The results of the probit step for the pooled analyses are presented in Table 25 below.

Table 25 Probit regression results – London versus non-London

Characteristics	T+1	T+2	T+3
London			
WFH	-0.1497142	-0.3379366	-0.5383708
SIC 58 to 63	-0.0317225	0.1133106	0.0271626
Baseline employment size	0.2934222*	0.3186071*	0.3269674*
Baseline turnover	0.0105718	0.0292878	0.0274334
Change in employment three years before participation	0.228372*	0.2300165*	0.1929026*
Younger than three years	0.5124497*	0.4580396*	0.3297746
Technology IP	0.3638744*	0.359326*	0.5123854*
Fintech	0.3750296*	0.4446065*	0.4369235*
AI	0.3209328*	0.3645317*	0.4143719*
Analytics	0.1345398	0.2008721	0.2346185
Software	-0.1108746	-0.2051455	-0.202317
Cybersecurity	0.464391*	0.6800158*	0.7901764*
Age of firm	-0.0489555*	-0.0541812*	-0.054543*
2018	-0.0169487	-0.0200682	
2019			0.0116104
2020	0.0795431	0.08455	
2021	0.2160442*		
Constant	-3.465357*	-3.558474*	-3.434533*
Accelerator in the three years prior	0.5217523*	0.4970426*	0.42303*
Non-London			
WFH	-0.6098094*	-0.2480971	-0.7208326

Characteristics	T+1	T+2	T+3
SIC 58 to 63	0.2368344*	0.3102001*	0.3399286
Baseline employment size	0.3094604*	0.3704012*	0.3418002*
Baseline turnover	-0.056561*	-0.0746493*	-0.0542133
Change in employment three years before participation	0.1840213*	0.0927372	-0.0275744
Younger than three years	0.116857	0.0361569	-0.1612128
Technology IP	0.6001264*	0.5505076*	0.9207118*
Fintech	0.6546988*	0.8942221*	0.6994067*
AI	0.481745*	0.6355513*	0.674499*
Analytics	0.1004114	0.1182994	-0.2610081
Software	-0.0296865	-0.0270632	-0.0708127
Cybersecurity	0.6633348*	0.9268192*	1.06592*
Age of firm	-0.0463733*	-0.049301*	-0.04706*
2018		-0.1436249	-0.1760794
2019	0.1722374		
2020	0.3594472*	0.2173315	
2021	0.5299316*		
SE	-0.0066577	-0.0126132	0.0514437
North	-0.0734584	-0.185866	-0.6259665
Constant	-3.501607*	-3.594144*	-3.464998*
Area with high student concentration	0.249098*	0.2148453	0.2530011
Accelerator in the three years prior	0.5153014*	0.4698714*	0.4838406*

Source: Frontier Economics based on ONS data.

Note: * Results are statistically significant at a 95% confidence interval.

The treatment effect results for all analyses are presented in Table 26 below.

Table 26 PMS treatment effect results (not converted to logs) – London versus non-London

Year	Scenario	T+1	T+2	T+3
Pooled	London	.277047678 *	.337648839 *	.353929057 *
	Non-London	.221702055 *	.164127382 *	.194891005
2018	London	.217513444 *	.292154471 *	.29435895 *
	Non-London	.195891108	.353878256	.248319624
2019	London	.257752207 *	.327561484 *	.338459114 *
	Non-London	.247363269 *	.128210347	.066116541
2020	London	.300695032 *	.467447674 *	
	Non-London	.11321359	.19838372 *	
2021	London	.214058805 *		
	Non-London	.231478175 *		

Source: Frontier Economics based on ONS data.

Note: * Results are statistically significant at a 95% confidence interval.

Sectorial versus non-sectorial programmes

The specifications of those runs are:

- Dependent variable:
 - Employment: defined as log employment at T+X minus log employment at baseline.
- Independent variables of interest:
 - Dummy variable for participation: where 1 is assigned for firms that have participated and 0 to those that have not.
- Controls: As appear in Table 27.

The runs are split between the type of programme as defined in section 3.4.3.

We analysed a total of 12 runs: Pooled T+1, Pooled T+2, Pooled T+3, 2018 (T+1, T+2 and T+3), 2019 (T+1, T+2 and T+3), 2020 (T+1 and T+2), 2021 (T+1).

The results of the probit step for the pooled analyses are presented in Table 27 below.

Table 27 Probit results – Sector versus non-sector specific

Characteristics	T+1	T+2	T+3
	Sector-specific		

Characteristics	T+1	T+2	T+3
WFH	-0.3259195	-0.0241093	-0.4854368
SIC 58 to 63	0.0913537	0.2018805	0.2468258
Baseline employment size	0.224474*	0.26313*	0.1533966
Baseline turnover	-0.0739792*	-0.0724757*	-0.0646668
Change in employment three years before participation	0.01447	-0.044513	-0.0408144
Younger than three years	0.3041829*	0.2120868	0.1052994
Technology IP	0.2398862*	0.1501799	0.2511551
Fintech	0.6167309*	0.8605534*	0.8533248*
AI	0.4554803*	0.5464889*	0.7248843*
Analytics	0.1794118*	0.2602343*	0.2697302
Software	-0.0417242	-0.0823786	-0.1669419
Cybersecurity	0.6730832*	0.9939129*	1.177908*
Age of firm	-0.0455699*	-0.0513734*	-0.0281207
2018	-0.3533654*	0.3639669*	-0.3830703*
2019			
2020	0.2372434*	0.6460878*	
2021	0.3314203*		
SE	0.035534	0.0686034	0.0038843
North	0.0422042	-0.205186	-0.4385059
Constant	-0.1142018	-3.856418*	-3.216325*
Area with high student concentration	-3.132585*	0.277857*	0.2273078
Accelerator in the three years prior	0.2359745*	0.6788971*	0.775299*
Non-sector-specific			
WFH	-0.3108232	-0.3827184	-0.4936834
SIC 58 to 63	0.0742726	0.1954923	0.0940075
Baseline employment size	0.2984983*	0.3313991*	0.3506299*

Characteristics	T+1	T+2	T+3
Baseline turnover	0.0573224*	0.0571485*	0.0391662
Change in employment three years before participation	0.246525*	0.2283327*	0.1615343*
Younger than three years	0.1234954	0.1333796	0.0993217
Technology IP	0.6976507*	0.7204261*	0.879425*
Fintech	0.2222835*	0.3291269*	0.4060101*
AI	0.2335493*	0.3544331*	0.3203762
Analytics	0.0076272	0.0240723	-0.0835536
Software	-0.0568306	-0.1123929	-0.1113411
Cybersecurity	0.2770857	0.3336536	0.4959284*
Age of firm	-0.054674*	-0.05922*	-0.0605101*
2019	-0.1012271	-0.0905278	-0.0848137
2020	-0.136728	-0.1311228	
2021	0.075955		
London	0.3005302*		
SE	-0.1110476	-0.3454151*	-0.2525906
North	-0.0316926	-0.3490138	-0.9786117*
Constant	-4.144295*	-3.984753*	-3.852976*
Area with high student concentration	0.1351575	-0.0730407	-0.0301527
Accelerator in the three years prior	0.3493651*	0.1525683	0.1363716

Source: Frontier Economics based on ONS data.

Note: * Results are statistically significant at a 95% confidence interval.

The treatment effect results for all analyses are presented in Table 28 below.

Table 28 PSM treatment effect results (not converted to logs)

Year	Scenario	T+1	T+2	T+3
Pooled	Non-sector-specific	.234798888 *	.300831934 *	.247526391 *
	Sector-specific	.271537644 *	.296429698 *	.347056143 *
2018	Non-sector-specific	.199970478 *	.233124811 *	.327536816 *
	Sector-specific	.312966193 *	.017756665	
2019	Non-sector-specific	.259629235 *	.316014469 *	.186018024
	Sector-specific	.367185294 *	.36879477 *	.422268694 *
2020	Non-sector-specific	.244953531 *	.347812583 *	
	Sector-specific	.212255018 *	.308206775 *	
2021	Non-sector-specific	.244870568 *		
	Sector-specific	.304457006 *		

Source: Frontier Economics based on ONS data.

Note: * Results are statistically significant at a 95% confidence interval.

Sensitivity runs

Different identification of non-Tech Nation acceleration participation approach

The specifications of those runs are:

- Dependent variable:
 - Employment: defined as log employment at T+X minus log employment at baseline.
- Independent variables of interest:
 - Dummy variable for participation: where 1 is assigned for firms that have participated and 0, to those that have not.
- Controls: Unlike in the main results, where the ‘accepted to an accelerator’ dummy refers to participation in an accelerator up to three years before participation in Tech Nation programmes, in this run, a dummy is included to indicate if participation happened during the same year.

We analysed a total of 12 runs: Pooled T+1, Pooled T+2, Pooled T+3, 2018 (T+1, T+2 and T+3), 2019 (T+1, T+2 and T+3), 2020 (T+1 and T+2), 2021 (T+1).

The results of the probit step for the pooled analyses are presented in Table 29 below.

Table 29 Probit results – Accelerator sensitivity

Characteristics	T+1	T+2	T+3
	Accelerator sensitivity		
WFH	-0.2956325	-0.2170458	-0.435373
SIC 58 to 63	0.0265367	0.1498414	-0.0063969
Baseline employment size	0.3114056*	0.40611*	0.3998196*
Baseline turnover	-0.0311456	-0.0007557	0.0079712
Change in employment three years before participation	0.2025488*	0.117057	0.0492526
Younger than three years	0.2724202*	0.1577835	-0.0670626
Technology IP	0.4929495*	0.549115*	0.6998524*
Fintech	0.4966599*	0.6745635*	0.4581673*
AI	0.3524553*	0.5447659*	0.6556659*
Analytics	0.0927429	0.1551053	0.1010656
Software	-0.0955594	-0.2045516	-0.2206438
Cybersecurity	0.462352*	0.7567088*	0.9776586*
Age of firm	-0.0394794*	-0.0561968*	-0.0634973*
2018			-0.2891756*
2019	0.2399054*	-0.2170458	
2020	0.4733743*	0.5521495*	
2021	0.691265*		
London	0.2417476*	0.3814562*	0.5754336*
SE	0.0717416	0.1398413	0.2380435
North	0.0537655	0.0339981	-0.4685186
Constant	-4.144472*	-4.898847*	-4.378415*
Accelerator in the same year	1.918865*	2.226143*	0.1010656
Area with high student concentration	0.2226319*	0.1940293	2.075561*

Source: Frontier Economics based on ONS data.

Note: * Results are statistically significant at a 95% confidence interval.

The treatment effect results for all analyses are presented in Table 30 below.

Table 30 PMS treatment effect results (not converted to logs) – Accelerator sensitivity

Year	Scenario	T+1	T+2	T+3
Pooled	Main run	.237919912 *	.314260009 *	.321833473 *
	Accelerator sensitivity	.207560112 *	.223949058 *	.205158041 *
2018	Main run	.177373775 *	.166893748 *	.3584381 *
	Accelerator sensitivity	.112793932	.016919539	.194165697
2019	Main run	.291679454 *	.303834761 *	.237665965 *
	Accelerator sensitivity	.284347167 *	.21257454 *	.177724516
2020	Main run	.232143929 *	.350555591 *	
	Accelerator sensitivity	.237237442 *	.345938795 *	
2021	Main run	.267946047 *		
	Accelerator sensitivity	.20281759 *		

Source: Frontier Economics based on ONS data.

Note: * Results are statistically significant at a 95% confidence interval.

The results show that participating in the Growth Programmes still generates a higher impact than not participating in a Tech Nation accelerator programme, although lower – compared to the main analysis results.

The reduction in the treatment effect with this specification might be due to the fact that some impacts are captured by the future participation of firms in other accelerator programmes. In this case, the main estimated impacts shown earlier in this section may be overestimating the true impact of Tech Nation. However, it is also possible that the treatment effects shown in the table above are underestimating the true impact of Tech Nation.

If Tech Nations' participants also participated in another accelerator in the same year, the seen reduction in the treatment effect would indicate that some of Tech Nations' impact is incorporated into the impacts of other accelerators – a negative bias of the treatment effect.

Overall, the sensitivity showed that even in a more stringent specification, which has a high likelihood to bias the results negatively, the impact of participation in Tech Nation's Growth Programmes is still positive, high and statistically significant.

Turnover

The specifications of those runs are:

- Dependent variable:
 - Turnover: defined as log turnover at T+X minus log employment at baseline.
- Independent variables of interest:
 - Dummy variable for participation: where 1 is assigned to firms that have participated and 0 to those that have not.
- Controls: As appear in Table 31.

We analysed a total of 9 runs: Pooled T+1, Pooled T+2, Pooled T+3, 2018 (T+1, T+2 and T+3), 2019 (T+1 and T+2), 2020 (T+1). This is different to the employment analysis, as turnover information in the BSD reports has a one-year lag, so a BSD file for a given year would report the total turnover in the 12 months prior to the *end of March of the year before*. For example, BSD 2020 would include firms' average employment in the four quarters before the end of March 2019. The latest available BSD annual file is BSD 2022. That means the latest available turnover information is for the end of March 2021.

The results of the probit step for the pooled analyses are presented in Table 31 below.

Table 31 Probit results – Turnover

Characteristics	T+1	T+2	T+3
WFH	-0.2592134	-0.5616779*	-0.6542181
SIC 58 to 63	0.1919533*	0.1070401	0.2498132
Baseline employment size	0.3354793*	0.3162829*	0.3847657*
Baseline turnover	-0.0119375	-0.0008221	-0.0081161
Change in employment three years before participation	0.1794465*	0.145857	0.2676508*
Younger than three years	0.2698978*	0.1217031	0.3076657
Technology IP	0.4287079*	0.6401191*	0.6789411*
Fintech	0.5784742*	0.5054235*	0.7910628*
AI	0.4585262*	0.4906472*	0.2485771
Analytics	0.162848	0.0870841	0.0454546
Software	-0.1069486	-0.1246187	-0.1880646
Cybersecurity	0.7849401*	0.8818663*	0.5730636*
Age of firm	-0.0511628*	-0.0483058*	-0.0450028*
2018		-0.0564592	
2019	0.0613195		
2020	0.1921605*		

Characteristics	T+1	T+2	T+3
London	0.1862736*	0.3019234*	0.4999534*
SE	-0.0210487	0.0504029	0.3195638
North	-0.2132184	-0.6402932*	
Constant	-3.74753*	-3.604227*	-4.136817*
Area with high student concentration	0.1616061	0.1697252	0.2788223
Accelerator in the three years prior	0.4824697*	0.4459679*	0.2476513

Source: Frontier Economics based on ONS data.

Note: * Results are statistically significant at a 95% confidence interval.

Turnover data was available only one year back. As such, the Turnover analysis is not possible for baseline 2021.

The treatment effect results for all analyses are presented in Table 32 below.

Table 32 PMS treatment effect results (not converted to logs) - Turnover

Year	T+1	T+2	T+3
Pooled	.2583648 *	.154872547	.558062208
2018	.39225045	.302870754	.558062208
2019	.22777338	.107113102	
2020	.243187364		
2021			

Source: Frontier Economics based on ONS data.

Note: * Results are statistically significant at a 95% confidence interval.

The turnover results were much less conclusive than those of employment presented in the main report – section 3.4.2. Those results are not surprising given, as explained in the main section 3.4.2, that turnover can be quite volatile from year to year, especially for startups and scaleups. As such, the results of the turnover analysis are not particularly reliable.

Turnover per employee

The specifications of those runs are:

- Dependent variable:
 - Turnover per employee is defined as the changes in the total turnover in a year, over the total number of employees in year X after participation, compared to the same metric at baseline.
- Independent variables of interest:
 - Dummy variable for participation: where 1 is assigned for firms that have participated and 0 to those that have not.

- Controls: As appear in Table 33 below.

We analysed 9 total runs: Pooled T+1, Pooled T+2, Pooled T+3, 2018 (T+1, T+2 and T+3), 2019 (T+1 and T+2), 2020 (T+1).

The results of the probit step for the pooled analyses are presented in Table 33 below.

Table 33 Probit results – Turnover per employee

Characteristics	T+1	T+2	T+3
WFH	-0.2633922	-0.5754411*	-0.5974619
SIC 58 to 63	0.1953182*	0.1126917	0.2733092
Baseline employment size	0.3332812*	0.311263*	0.3851765*
Baseline turnover	-0.0126555	-0.0013647	-0.0066432
Change in employment three years before participation	0.1789606*	0.1457626	0.2623137*
Younger than three years	0.2685025*	0.1231112	0.334433
Technology IP	0.4258344*	0.6379031*	0.6778274*
Fintech	0.5803071*	0.5096524*	0.7519658*
AI	0.4587946*	0.4907793*	0.2657716
Analytics	0.1628378	0.086417	-0.0233913
Software	-0.1096372	-0.1295696	-0.2256004
Cybersecurity	0.7856186*	0.8822165*	0.579805*
Age of firm	-0.0508112*	-0.0476769*	-0.0445238*
2018		-0.0544027	
2019	0.060557		
2020	0.1908136*		
London	0.1861456*	0.3045076*	0.5142526*
SE	-0.0237822	0.04677	0.2564658
North	-0.2142447	-0.6398879*	#VALUE!
Constant	-3.726707*	-3.571219*	-4.173121*
Area with high student concentration	0.1598412	0.1683037	0.2929359
Accelerator in the three years prior	0.4791131*	0.4407533*	0.255004

Source: Frontier Economics based on ONS data.

Note: * Results are statistically significant at a 95% confidence interval.

The treatment effect results for all analyses are presented in Table 34 below.

Table 34 PMS treatment effect results (not converted to logs) – Turnover per employee

Year	T+1	T+2	T+3
Pooled	-.015836153 *	-.223776321	.343340155
2018	.174211138	.157733892	.343340155
2019	.163421434	.211194686	
2020	.037795789		
2021			

Source: Frontier Economics based on ONS data.

Note: * Results are statistically significant at a 95% confidence interval.

Turnover data was available only one year back. As such, the Turnover analysis is not possible for baseline 2021.

Our analysis showed that there was no statistically significant change in the turnover per employee over this time. These results further suggested that changes in the growth of the firms would be initially correlated with the increase in the number of employees, and the impact on the economy can then be measured as the additional GVA created by the growth in firms' employment.

Survival rate

The specifications of those runs are:

- Dependent variable:
 - Survival is defined as 1 for a firm active at baseline and active at T+X, 0 for a firm inactive at baseline and inactive at T+X
- Independent variables of interest:
 - Dummy variable for participation: where 1 is assigned for firms that have participated and 0 to those that have not.
- Controls: As appear in Table 35. Unlike the main results, for survival rates, we add employment bands to control for the size of the firms, which allows for newer firms to be included in the analysis (whereas a logarithmic number of jobs approach would drop firms with zero employment from the analysis)

We analysed a total of 12 runs: Pooled T+1, Pooled T+2, Pooled T+3, 2018 (T+1, T+2 and T+3), 2019 (T+1, T+2 and T+3), 2020 (T+1 and T+2), 2021 (T+1).

The results of the probit step for the pooled analyses are presented in Table 35 below.

Table 35 Probit results – Survival rate

Characteristics	T+1	T+2	T+3
WFH	-0.2730867*	-0.2228907	-0.4240975*
SIC 58 to 63	0.0126616	0.0942975	0.0045238
Change in employment three years before participation	0.2496583*	0.2431122*	0.2249657*
Younger than three years	0.4198428*	0.4539863*	0.3890817*
Technology IP	0.4840107*	0.4244869*	0.5638127*
Fintech	0.4836428*	0.6120816*	0.5406405*
AI	0.4171823*	0.5010393*	0.4701903*
Analytics	0.1175692*	0.1671745*	0.1814226*
Software	-0.045846	-0.0829566	-0.0732936
Cybersecurity	0.5014852*	0.7150906*	0.7971655*
Age of firm	-0.0265567*	-0.0186412*	-0.0116485
2018	-0.0413005	-0.0377888	-0.039347
2020	0.1300078*	0.1282219*	
2021	0.295483*		
London	0.1669278*	0.1567951*	0.2483084*
SE	-0.0603988	-0.090439	-0.0445934
North	-0.076296	-0.2056873	-0.5161181*
Constant	-3.828241*	-3.998373*	-3.901291*
Area with high student concentration	0.2112933*	0.1809623*	0.182837
PAYA Band 2	0.3925792*	0.3527382*	0.2722009*
PAYA Band 3	0.9994714*	1.11905*	1.05934*
PAYA Band 4	1.271084*	1.38241*	1.323619*

Source: Frontier Economics based on ONS data.

Note: * Results are statistically significant at a 95% confidence interval.

PAYA Bands are used in this case to better capture the survival of small firms with no employment in later years.

The treatment effect results for all analyses are presented in Table 36 below.

Table 36 PMS treatment effect results (not converted to logs) – Survival rate

Year	T+1	T+2	T+3
Pooled	.029039301 *	.037410072 *	.04137931 *
2018	.026984127 *	.031746032	.062981859
2019	.033333333 *	.018518519	.039506173
2020	.032061069 *	.058015267 *	
2021	.025139665 *		

Source: Frontier Economics based on ONS data.

Note: * Results are statistically significant at a 95% confidence interval.

Our analysis showed positive and statistical significance of participation on firms’ survival rates. A difficulty interpreting these impacts is that the point of measurement of the T+1 snapshot may be very near to, or coincide with, the period of the programme. Since being active is a prerequisite for participation in the programme, the fact a firm is participating will be linked with a higher likelihood of survival, above and beyond any programme impact.

HCA

This is a separate analysis in which we compare the performance of Tech Nation-supported firms with that of Highly Commendable Applicants (HCA). This is intended to follow a Regression Discontinuity Design (RDD) approach where firms on either side of an arbitrary criterion are considered otherwise similar, thus forming a suitable control group. This is normally done using exact numerical thresholds and exploring the local effect around that threshold. However, the data provided did not have such numerical scores. The closest we could come to identifying a group of similar unsuccessful firms was to focus on the HCAs. Only from FY 2019/20 do programmes report the HCA designation.

In this analysis, the data set consists of accepted firms and HCAs, so we directly compare outcomes for the two groups.

Note that the sample sizes are considerably smaller than in the main PSM. Despite the hypotheses that they should be similar, we are not sure to find a good HCA match with similar relevant characteristics. Given the much smaller sample sizes, using fewer control variables is appropriate, as they would otherwise result in overfitting. We, therefore, pursue simple regression models, including programme and time dummies.

The specifications of those runs are:

- Dependent variable:
 - Employment: defined as log employment at T+X minus log employment at baseline.
- Independent variables of interest:
 - Dummy variable for participation: where 1 is assigned to firms that have participated and 0 to those that have not.

- Controls: programme and time dummies in pooled runs.

We analysed three runs: Pooled T+1, T+2 and T+3

Table 37 presents the treatment effect results.

Table 37 PMS treatment effect results (not converted to logs) – HCA sensitivity check

Year	T+1	T+2	T+3
Pooled	.091320493*	.177395566	.052164313

Source: Frontier Economics based on ONS data.

Note: * Results are statistically significant at a 95% confidence interval.

Given the small sample sizes of the HCA analysis, the analysis was only conducted on pooled observations over the years. The results also show inconsistent and volatile results that might indicate sample sizes too small for a comprehensive analysis.

Difference-in-Difference (DiD) runs

As a sensitivity, we also run a DiD regression, directly regressing the change in log employment X years after baseline against the same set of controls used in the main PSM. This also allows us to use interaction terms to test whether treatment effects are different depending on whether the treated firm is in London or is part of a sector-specific programme.

The regression specification is then:

- Dependent variable:
 - Employment: defined as log employment at T+X minus log employment at baseline.
- Independent variables of interest:
 - Dummy variable for participation: where 1 is assigned for firms that have participated and 0 to those that have not.
 - Dummy variables for treated firms in London and treatment in sector-specific programmes to test for differential effect.
- Controls: programme and time dummies in pooled runs.

We analysed three runs: Pooled T+1, T+2 and T+3

Table 38 presents the regression results.

Table 38 DiD regression results

Variable	T+1	T+2	T+3
WFH	-.0113094	-.0177869	-.0013352
SIC 58 to 63	-.0128855*	-.0241718*	-.0264245*
Baseline employment size	-.0515366*	-.093268*	-.1273555*
Baseline turnover	.0353303*	.0554377*	.0723962*
Change in employment three years before participation	.0681316*	.0891992*	.1059243*
Younger than three years	.1927688*	.2959862*	.3570752*
Technology IP	.0328517*	.0469511*	.0562987*
Fintech	.0093907	.0343068	.049449
AI	.0405533*	.0650612*	.1130012*
Analytics	.021663*	.0544376*	.0793798*
Software	.0222604*	.0489114*	.0794197*
Cybersecurity	.0039454	.0221638	.0259842
Accelerator before participation	-.0244681*	-.0487015*	-.0751113*
Age of firm	-.0026108*	-.003425*	-.0041351*
2018			
2019	-.0208018*	-.0475163*	-.0152486
2020	-.0408744*	-.0214401*	
2021	.0142953*		
Areas with high student concentration	.0196113*	.0429745*	.0720842*
Treatment effect	.206786*	.1697283*	.1271348
Being part of the sector-specific programme	.0225691	.0716351	.1580309
Based in London	.0786205	.1958883*	.191559

Source: Frontier Economics based on ONS data.

Note: * Results are statistically significant at a 95% confidence interval.

The results of the regression show that at 95% confidence interval, the programme type (sector-specific or not sector-specific programmes) does not have a statistical impact on employment across all years. Being based in London shows statistical significance in T+2 but not in other years.

Rising Stars

Main results

Similar to the main results for the Growth Programmes, by only including participation in the various Rising Stars competitions.

The specifications of those runs are:

- Dependent variable:
 - Employment: defined as log employment at T+X minus log employment at baseline.
- Independent variables of interest:
 - Dummy variable for participation: where 1 is assigned for firms that have participated and 0 to those that have not.
- Controls: As appears in Table 39. To account for the fact that some firms in Rising Stars are very new and may have zero employment at the BSD baseline year, we use a 'zero-dummy' approach where missing log employment is replaced with a zero and an additional dummy variable is used to mark these observations (and likewise with turnover), allowing these firms to enter the sample.

We analysed 12 total runs: Pooled T+1, Pooled T+2, Pooled T+3, 2018 (T+1, T+2 and T+3), 2019 (T+1, T+2 and T+3), 2020 (T+1 and T+2), 2021 (T+1).

The results of the probit step for the pooled analyses are presented in Table 39 below.

Table 39 Probit results for Rising Stars main runs

Characteristics	T+1	T+2	T+3
WFH	0.1082421	0.1121568	0.1082421
SIC 58 to 63	0.1646708	0.2083413*	0.1646708
Technology IP	0.707078*	0.4976626*	0.707078*
Fintech	-0.0851426	-0.0774853	-0.0851426
AI	0.429972*	0.2611866*	0.429972*
Analytics	0.0566611	0.0918881	0.0566611
Software	-0.030635	0.1430797	-0.030635
Cybersecurity	0.0426201	0.0443148	0.0426201
Age of firm	-0.1434242*	-0.1080386*	-0.1434242*
2019	0.0685147	0.0751382	0.1082421
2020		0.2630948*	
Constant	-3.191747*	-3.056033*	-3.191747*

Characteristics	T+1	T+2	T+3
Baseline employment (missing employment replaced with a zero)	0.0027941	-0.0136843	0.0027941
Younger than three years	-0.2156764	-0.0136843	0.0027941
Dummy for firms that were zeroed due to missing employment	-1.001299*	-0.1923804	-0.2156764

Source: Frontier Economics based on ONS data.

Note: * Results are statistically significant at a 95% confidence interval.

The treatment effect results for all analyses are presented in Table 40 below.

Table 40 PSM treatment effect results (not converted to logs) Rising Stars main runs

Characteristics	T+1	T+2	T+3
Pooled	.83956	1.48444444	4.62608696 *
2018	.947619048	2.83809524	7.86190476 *
2019	-.411538462	-.257692308	1.784
2020	1.625	2.72093023	

Source: Frontier Economics based on ONS data.

Note: * Results are statistically significant at a 95% confidence interval.

Sensitivity runs

Similar to the main results for the Growth Programmes, by only including participation in the various Rising Stars competitions.

The specifications of those runs are:

- Dependent variable:
 - Employment: defined as log employment at T+X minus log employment at baseline.
- Independent variables of interest:
 - Dummy variable for participation: where 1 is assigned for firms that have participated and 0 to those that have not.
- Controls: Rather than using a 'zero-dummy' variable to control for size, we use employment bands for 0, 1-10, 11-50, etc., thus allowing very new firms to be included in the sample.

We analysed 12 total runs: Pooled T+1, Pooled T+2, Pooled T+3, 2018 (T+1, T+2 and T+3), 2019 (T+1, T+2 and T+3), 2020 (T+1 and T+2), 2021 (T+1).

The treatment effect results from all runs are presented in Table 41 below.

Table 41 PSM treatment effect results (not converted to logs) Rising Stars sensitivity

Characteristics	T+1	T+2	T+3
Pooled	.627472527	1.13777778	3.64347826
2018	1.3047619	3.79047619 *	8.77142857 *
2019	-.734615385	-1.04230769	-.736
2020	1.125	1.57209302	

Source: *Frontier Economics based on ONS data.*

Note: * *Results are statistically significant at a 95% confidence interval.*

Annex D Cost allocation

The cost information was provided by Tech Nation for the years in the evaluation period FY 2020/21, FY 2021/22 and FY 2022/23. The data included:

1. operational costs for each DSIT-funded initiative;
2. overhead costs that were related to all Growth Programmes combined; and
3. overhead costs that were related to all DSIT-funded initiatives.

To conduct a VfM or break-even analysis, the total costs (operational, overheads and investment costs) have to be allocated properly to each initiative. We understood from Tech Nation that at the time of the evaluation, allocating all overhead costs to each initiative was impossible.

To address this issue, we have undertaken a simple approach:

1. Overhead costs related to the Growth Programmes were redistributed to each Growth Programme (excluding Rising Stars) using the share that each represented out of the total operations costs of the Growth Programmes in a given year.
2. Overhead costs related to all DSIT-funded initiatives were redistributed to each initiative using the share that each represented out of the total operations costs in a given year.

Table 42 presents those calculations and the final estimated cost for each year and initiative. Please note that some cost categories include overheads that were not recorded separately, which means that the total estimated costs are only indicative and are likely to differ from the actual costs.

Table 42 Cost allocation

Initiative	Actual recorded costs as received			Reallocated overhead costs that were indicated to be related to all DSIT-funded initiatives)			Reallocated overhead that related only to the Growth Programmes			Final cost allocation		
	20/21	21/22	22/23	20/21	21/22	22/23	20/21	21/22	22/23	20/21	21/22	22/23
Future Fifty	£86,470	£98,069	£47,573	£112,572 (3.0%)	£119,710 (3.0%)	£31,320 (2.0%)	£32,255 (15.0%)	£31,444 (18.0%)	£329,544 (35.0%)	£231,297	£249,222	£408,437
Upscale	£80,939	£116,655	£16,581	£105,372 (3.0%)	£142,397 (4.0%)	£10,916 (1.0%)	£30,192 (14.0%)	£37,403 (22.0%)	£114,855 (12.0%)	£216,503	£296,455	£142,351
Fintech	£94,576	£76,404	£14,465	£123,126 (3.0%)	£93,264 (3.0%)	£9,523 (1.0%)	£35,279 (16.0%)	£24,497 (14.0%)	£100,201 (11.0%)	£252,981	£194,165	£124,189
Applied AI	£91,332	£100,368	£15,015	£118,901 (3.0%)	£122,517 (3.0%)	£9,885 (1.0%)	£34,068 (16.0%)	£32,181 (19.0%)	£104,013 (11.0%)	£244,301	£255,067	£128,913
Libra	£0	£89,978	£21,826	£ (0.0%)	£109,834 (3.0%)	£14,369 (1.0%)	£ (0.0%)	£28,850 (17.0%)	£151,189 (16.0%)	£0	£228,662	£187,384
Net Zero	£99,375	£55,092	£19,873	£129,373 (4.0%)	£67,250 (2.0%)	£13,083 (1.0%)	£37,069 (17.0%)	£17,664 (10.0%)	£137,661 (15.0%)	£265,817	£140,007	£170,617
DBA	£91,596	£70,977	£0	£119,246 (3.0%)	£86,639 (2.0%)	£ (0.0%)	£ (0.0%)	£ (0.0%)	£ (0.0%)	£210,842	£157,616	£0
Founders' Network and EEM/SEMs	£771,441	£647,410	£429,866	£1,004,314 (27.0%)	£790,277 (22.0%)	£283,001 (22.0%)	£ (0.0%)	£ (0.0%)	£ (0.0%)	£1,775,755	£1,437,688	£712,867
Growth Platform	£185,128	£395,774	£568,632	£241,012 (7.0%)	£483,111 (14.0%)	£374,356 (29.0%)	£ (0.0%)	£ (0.0%)	£ (0.0%)	£426,139	£878,885	£942,988
Rising Stars	£126,044	£138,871	£32,656	£164,092 (4.0%)	£169,516 (5.0%)	£21,499 (2.0%)	£ (0.0%)	£ (0.0%)	£ (0.0%)	£290,136	£308,387	£54,155

	Actual recorded costs as received			Reallocated overhead costs that were indicated to be related to all DSIT-funded initiatives)			Reallocated overhead that related only to the Growth Programmes			Final cost allocation		
Research and Insight	£1,074,408	£1,116,447	£807,620	£1,398,736 (38.0%)	£1,362,819 (38.0%)	£531,693 (41.0%)	£ (0.0%)	£ (0.0%)	£ (0.0%)	£2,473,144	£2,479,266	£1,339,314
Total operational	£2,824,690	£2,906,046	£1,974,107									
Overheads	£3,677,370	£3,547,335	£1,299,645									
Overheads for Growth Programmes only	£214,886	£172,040	£937,463									
Total	£6,716,946	£6,625,421	£4,211,215							£5,771,864	£5,630,511	£3,407,325

Source: Frontier Economics based on Tech Nation data.

Note: The allocation procedure was agreed upon with Tech Nation and DSIT.

Annex E VfM analysis methodology

The VfM aims to assess the monetary value of the impacts versus the costs of the initiative. VfM requires the ability to estimate the monetary value of the activity impact, which can then be compared to the full costs of running the activity. Using the impact estimates from the econometric exercise, we have undertaken an indicative VfM analysis for the Growth Programmes and Rising Stars.¹³⁵

A VfM analysis follows three main steps:

1. Estimate the monetary value of the initiative’s impact – described in detail below.
2. Assess the costs of the initiative – described in Annex A .
3. Compare the monetary value of the benefits to the costs – described in section 3.4.4.

This annex focuses mainly on the first step of the VfM analysis, which requires several sub-steps, as presented in Figure 26.

Figure 26 Analytical approach to estimating the Growth Programme VfM



Source: Frontier Economics.

We explain in detail the calculations that were part of each of those steps below:

E.1 Estimated percentage increase in employment:

This is based on the results of the econometrics analysis. Since the evaluation period included three years of participation and up to three years of lagged impacts, a decision about what results will be used for each impact possibility has been discussed and agreed upon.

The allocation is shown in Table 43 below.

¹³⁵ For the rest of the programmes, where other information about impacts might be available but limited, a break-even analysis might be conducted.

Table 43 Allocation of econometric results to Growth Programmes in the evaluation scope

Year of programme participation	T+X	Year of regression to be used	Comments
2020/21	T+1	2020	Impacts have been realised, and the impact was directly estimated in the econometric analysis.
	T+2	2020	
	T+3	Pooled	None of those impacts is yet to realise. Using the pooled results for T+3 is indicative of the potential future impact if one assumes that the impacts for the programmes would be roughly similar to the average across the years in the econometric analysis.
2021/22	T+1	2021	Impacts have been realised, and the impact was directly estimated in the econometric analysis.
	T+2	Pooled	None of those impacts is yet to realise. Using the pooled results for T+2 and T+3 is indicative of the potential future impact if one assumes that the impacts for the programmes would be roughly similar to the average across the years in the econometric analysis.
	T+3	Pooled	
2022/23	T+1	Pooled	None of the impacts is yet to realise. None of the firms that participated was part of any of the econometric analyses. Using the pooled results is indicative of the potential future impact if one assumes that the impacts for the programmes would be roughly similar to the average across the years in the econometric analysis.
	T+2	Pooled	
	T+3	Pooled	

Source: Frontier Economics.

E.2 Average baseline employment

This is based on BSD data. The average number of employees for participants in the Growth Programmes was calculated.

The results are presented in Table 44.

Table 44 Average baseline number of employees per participating firm

FY	Programme name	The average number of employees at baseline
2020/21	Future Fifty	113.48
	Upscale	32.17
	Fintech	9.55
	Applied AI	7.55
	Cyber	10.64
	Net Zero	7.21
2021/22	Future Fifty	97.74
	Upscale	32.59
	Fintech	6.52
	Applied AI	6.78
	Libra	2.61
	Net Zero	4.77
2022/23	Future Fifty	105.61
	Upscale	32.38
	Fintech	8.04
	Applied AI	7.16
	Libra	2.61
	Net Zero	5.99

Source: Frontier Economics based on BSD data.

Since there was no data for baseline 2022 (that would only be available at BDS 2023), we use the average baseline employment for 2020 and 2021 and apply this to the 2022 baseline.

E.3 The number of participating firms:

Based on Tech Nation participation data, the number of participating firms was calculated. The results are presented in Table 45.

Table 45 Number of participating firms in each programme

FY	Programme name	The average number of employees at baseline
2020/21	Future Fifty	22
	Upscale	33
	Fintech	31
	Applied AI	32
	Cyber	22
	Net Zero	30
	2021/2022	Future Fifty
Upscale		31
Fintech		30
Applied AI		32
Libra		30
Net Zero		32
2022/23		Future Fifty
	Upscale	35
	Fintech	50
	Applied AI	35
	Libra	40
	Net Zero	35

Source: Frontier Economics based on treatment data provided by Tech Nation.

E.4 Additional net GVA per employee:

We base our approach on the method that was used and agreed upon with DSIT and Tech Nation as follows:

- 1. Identify the output/job in the SIC J sector (Information and Communication):** Using ONS productivity estimations per job, we identify the output level in the sector where we expect most of the Growth Programme participants to be included. Output in this data set is the GVA per full-time job and is indicated to be £86,057.77 and £92,466.41 for 2020 and 2021, respectively.¹³⁶

¹³⁶ Output per job, UK - Table 19.

<https://www.ons.gov.uk/economy/economicoutputandproductivity/productivitymeasures/datasets/outputperjobuk/current>.

2. **Identify the output/job of where employees are most likely to switch from:** Using Tech Nation's internal information about the sectors from where employees that enter SIC J switched, we can calculate the weighted average output per job for additional employees that come from another sector.

Table 46 presents the results of this exercise:

Table 46 Switchers to SIC J and their salaries

Sector	% joiners *	Output per job in that SIC – 2020 **	Output per job in that SIC – 2021**	Weighted – 2020	Weighted – 2021
A & B	1%	£36,086	£45,158	£289.27	£361.99
C	7%	£71,485	£82,176	£4,799.08	£5,516.82
D	2%	£198,548	£242,663	£3,382.07	£4,133.53
E	1%	£126,905	£130,638	£1,653.08	£1,701.69
F	2%	£50,148	£58,533	£1,055.21	£1,231.65
G	19%	£40,418	£45,816	£7,735.29	£8,768.36
H	2%	£37,995	£42,513	£875.63	£979.77
I	5%	£16,174	£22,027	£826.54	£1,125.63
K	8%	£151,366	£164,235	£12,285.22	£13,329.71
L	1%	£426,943	£435,437	£2,994.59	£3,054.17
M	20%	£51,335	£57,533	£10,236.15	£11,472.09
N	12%	£32,975	£37,849	£4,064.08	£4,664.75
O	4%	£67,026	£72,273	£2,955.06	£3,186.37
P	8%	£42,392	£46,745	£3,185.74	£3,512.87
Q	2%	£37,651	£41,093	£792.26	£864.69
R	4%	£24,548	£30,913	£934.70	£1,177.04
S	2%	£36,076	£34,561	£686.81	£657.97
Weighted average for switchers				£58,750.81	£65,739.10

Source: Frontier Economics.

Note: * % of joiners into SIC J from other SIC codes – as provided by DSIT.

** Output per job–, UK – [Table 19](#).

Identify the proportion of the additional workers that have switched from a different sector: some of the additional workers would have switched to the participating firms from a position in the same sector. Those employees would not generate additional productivity

impacts. ¹³⁷ To find their percent, we use the ONS job transition information (based on ONS ASHE data sets) and identify the percent of employees that switched jobs from another sector out of the total employees that switched jobs in SIC J. ¹³⁸ This calculation reveals that 41% of switchers come from non-SIC J codes.

Table 47 presents the calculation of the additional net GVA per employee given the information above.

Table 47 Calculation of additional productivity

Item	2020	2021
Weighted non-SIC J switcher output per job	£58,750.81	£65,739.10
SIC J output per job	£86,057.77	£92,466.41
Difference	£27,306.96	£26,727.31
% of total job switchers to SIC J whose previous job was in a different SIC code	41%	41%
Additional productivity per job created by Growth Programme participants	£11,153.55	£10,916.79

Source: Frontier Economics, based on ONS information.

Those additional net GVA per employee is further inflated to 2022 using the ONS CHIP data ¹³⁹ and assuming a 3.5% inflation for 2023-2025.

¹³⁷ We acknowledge that these workers may be generating productivity impacts if Tech Nation participants are more productive than the average tech firm in SIC J, but since we are unable to verify this, we assume conservatively no additional productivity impact for those that switched within SIC J.

¹³⁸ Calculating the total number of employees that switched within SIC J and those that came from non-SIC-J into SIC J in 2018.

¹³⁹ <https://www.ons.gov.uk/economy/inflationandpriceindices/timeseries/l522/mm23>.

Annex F Original Tech Nation logic model

Figure 27 Original Tech Nation logic model

Inputs
<ul style="list-style-type: none"> • Human capital • Specialist expertise • Brand equity • Data • Private Sector Funding • Growth Platform (GP) • Partner contributions • Content and related Intellectual Property
Activities
<ul style="list-style-type: none"> • Growth Platform (GP) online community, service delivery and engagement • Programmes split by growth stage, sector and demographic • Data, insights and report generation • Communications Campaigns • Event management and delivery • Competition and company showcase delivery • Peer-to-peer communities and advisory groups • Relationship management with advisors, coaches, mentors and alumni members • Partnership development and management • Performance management, monitoring and reporting
Outputs
<ul style="list-style-type: none"> • Generate £600m GVA from growth & sector programmes • £15 return on every £1 invested by Govt (ROI) • 13,600 new jobs created from growth & sector programmes • 4000 companies supported by Tech Nation and partners • 25% of all relevant startups and scaleups in the UK that are registered on the Growth Platform • For all programme cohorts: <ul style="list-style-type: none"> - 55% of companies based outside of London - 30% of companies have female founders • 11 Scaleup Engagement Managers (SEMs) in 12 regions across the UK: <ul style="list-style-type: none"> - 2,000 1-2-1s per year • 4 campaigns and 4 publically accessible research reports generating 1BN media impressions per year • >30 private sector partners & > 30 regional partners • 2mn page views per year <p>Growth Platform Outputs</p> <ul style="list-style-type: none"> • Total registered users • Total number of companies using the Growth Platform • Monthly unique visitors to the site • Active users 30 days • Active users 60 days • Average time on site • Connections made during the last 30 days • Number of messages sent • Number of events registered for • Number of articles read

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Outcomes

- An increase in the growth of the UK digital sector
- Growth is promoted across UK regions
- Increasing access to jobs and, therefore, greater employment opportunities in the sector
- Increase in net employment (growth in businesses means employing more people);
- Increase in the growth of the UK digital sector (numbers of companies; turnover);
- The UK maintains and grows its dominant position as a global leader in tech

- Regional support networks for tech startups and scaleups grow and become more developed
- Support is tailored to local needs and tech specialisms
- Support is developed in partnership with local bodies and existing tech groups
- A more structured environment for funders is created
- Investors and experts connect and work better together
- Entrepreneur-to-entrepreneur engagement is further developed so they can learn from peers and stakeholders
- Better engagement and connectivity with key tech stakeholders across industry and government
- A greater understanding of regional and local challenges, successes and opportunities to further develop digital ecosystems policy
- More early-stage companies founders supported to develop skills to launch and grow businesses (e.g. pitch their businesses to investors);
- Easier for founders and their teams to access high-quality support (e.g. accessing relevant/tailored mentoring and advice).
- Tech startups and scaleups achieve stronger growth more quickly
- Founders and current and future employees will be better equipped with the skills to succeed in digital business
- A stronger, more positive signal is given to investors around the investability of supported early-stage companies

- A greater proportion of founders engaged from underrepresented cohorts, including those with protected characteristics
- Founders with lived experience of little or no access to capital and commercial and networking opportunities report that they are helped to access equal opportunity in their scale journey
- Reduction in existing inequality in the tech workforce
- Increase the diversity and accessibility of the sector
- Increase in the diversity of Growth Platform members, including those from non-traditional routes into the tech sector
- Increased interest and use in the Growth Platform by companies outside of London

- Better self-reporting from companies about their capacity and capability following engagement with Tech Nation
- Improved and stronger pipeline of UK-wide tech sector success stories
- Investor confidence in funding tech companies in UK regions and nations outside of London is boosted

Impact

- Tech startups and scaleups are supported to access business development and growth programme services, including tailored advice and skills training, leading to their accelerated growth with a particular focus on companies beyond London.
- Tech startups, scaleups and entrepreneurs, particularly from underrepresented groups across the UK, find it easier to access finance, talent and markets
- Key components of digital economies regionally (across investment, digital growth and innovation) are improved through tailored local programming, resulting in increases in digital prosperity.
- HM Government can better support the development of a robust evidence base for future policy change
- The UK maintains a dominant position as a global leader in tech

Source: Tech Nation (Frontier Economics format).

Annex G Quality assurance process

To ensure that the outputs of the analysis are correct, we put in place Quality Assurance (QA) procedures throughout the analytical process.

We used the Stata software package for the econometric analysis of the impacts. The results of the econometric regression were then used as inputs in a Microsoft Excel model. The model was used to translate the Stata regression results into readable results. The model was also used to translate the impacts into monetary values. The rest of the analysis (e.g. analysis of Tech Nation’s user data for the Growth Platform etc.) was also conducted in the Excel model.

G.1 QA of the Stata code

The QA process involved a line-by-line re-run of the code. This re-run checked that:

- the code was running correctly and without errors;
- the new datasets were being saved correctly at each stage, with the correct versions of the datasets being used at each of the different stages;
- the logic behind the code was appropriate and fit for the purpose;
- the data were cleaned correctly – this includes dropping duplicate observations or editing incorrect observations, so as not to influence the results;
- the data were manipulated correctly – including the calculation of new statistics;
- the outputs used in the reported tables matched the results of the analysis;
- the code was efficient; and
- the code was clear to the reader.

This QA process was carried out by a Frontier team member who was not involved in writing the original code. The QA results were then brought back to the project team for discussion. Where relevant, these discussions led to the project team updating the code and outputs accordingly until all the flagged issues were resolved.

G.2 Excel analysis

The QA process involved a test of all calculations throughout the data, and output sheets. These checks included:

- ensuring the logic and methodology of calculations – verified through internal discussions and applications of economic theory;
- making sure formulae were correct and used correct input cells;
- checking formulae had been applied correctly throughout relevant columns;
- making sure linked cells updated appropriately;

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- spot-checking output values of certain formulae (e.g. index-match) with their input values; and
- manually changing input cells to make sure output cells are updated accordingly and in the correct direction;

This QA process was carried out by a Frontier team member that was not involved in writing the code originally. The results of this QA were then brought back to the wider project team to discuss. Where relevant, these discussions led to the project team updating the code and outputs accordingly until all issues that had been flagged were resolved.

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