Annex: Econometric Analysis

This Annex sets out the results of a series of econometric analysis exploring the impacts of the Smart Grants programme on firms awarded funding between 2019/20 and 2024/25. The analysis makes use of longitudinal data on R&D spending, wages, GVA, employment, investments, and turnover derived from the Annual Business Survey (ABS), Business Expenditure on R&D Survey (BERD), the Business Structure Database (BSD), Annual Survey of Hours and Earnings (ASHE) and Pitchbook. The findings are based on comparisons between firms that were awarded funding and firms that applied but whose applications were declined.

1.1 Key findings

The econometric analysis completed as part of the evaluation of the Smart Grants programme found:

Impacts on firm R&D activity

The preferred results of the analysis indicated that the award of Smart Grant funding led – on average – to a 7.1 percent increase in R&D employment and a 5.4 percent increase in annual R&D expenditure (above expansions in activity that would have occurred in the absence of the programme). Effects on business R&D activity was persistent for at least 4 years post award, suggesting that the programme helped to crowd-in additional R&D investment beyond the lifetime of grants. The impact was exclusively driven by increases in UK based R&D activity with no leakage into overseas territories.

Impacts on firm growth

Smart Grants also stimulated the growth of companies funded. The preferred estimates indicated that Smart Grants increased the employment, turnover and GVA of funded firms by 4.3, 6.0 and 4.0 percent respectively. The analysis also found statistically significant increases in exports with Smart Grants linked to around a 3 percent increase in export revenue.

Impacts on productivity

In terms of productivity, the analysis found evidence that Smart Grants increased turnover and GVA per worker with the preferred estimates suggesting a 2.2 and 2.0 percent effect on firm efficiency that appeared two to three years following the award of the grant. Analysis also showed that Smart Grants had a positive effect on hourly earnings for workers employed by successful applicants of 1.5 percent.

Impacts on investment

Finally, the results also showed that Smart Grants led to a significant increase in external equity investment. The most robust models indicated that the grants increased cumulative equity investment by between 8.3 and 10 percent.

1.2 Outcomes of interest

The objectives of the Smart Grants programme are set out in the Business Case for the programme developed by Innovate UK:

- Generate a positive return for the UK economy through increased and improved SME R&D activity converting into positive GVA effects
- Increase growth of innovative UK companies at home and in international markets

- Encourage inclusive innovation resulting in a higher chance of commercial success and delivering benefits to all parts of society
- 20 percent of funded companies to secure private investment within five years of the completion of the grant to advance their business and scale up
- More companies accessing new markets and better positioning in the global supply chains of the future

To achieve these objectives, between 2019/20 and 2024/25, 1,688 projects were awarded a total of £531m of public funding through the Smart Grants programme. The headline outcomes that have been explored in the following analyses include:

- R&D expenditure and employment – to examine the effectiveness of grants in leveraging additional investment in R&D in the private sector.
- Employment, turnover, GVA, GVA per worker and turnover per worker – to examine the economic impacts of the grants awarded (with turnover per worker and GVA per worker used as proxy measures for productivity).
- Wages – to examine the impacts of grants awarded on workers' wages as an indicator for productivity.
- Investment – to examine the extent to which the Smart Gant programme was able to leverage investment into firms awarded funding through the programme and impacts on firm valuations.

1.3 Data

This section provides an overview of the data used in this analysis. The ABS, BERD, ASHE and BSD datasets were accessed via the ONS Secure Research Service.

Grant Data (Innovate UK)

Innovate UK supplied records of 23,309 lead applicants (and 3,865 collaborators) for Smart Grant funding submitted between February 2019 and April 2024. 3,480 of these were categorised as 'not applicable' for matching as they were RTOs or academic institutions that could not be linked to secondary data sources. These were excluded from the analysis. Many firms also submitted multiple applications for funding, and the final sample included details of 17,461 individual businesses.

Of the total 17,461, 16,382 records could be attached to company reference numbers (CRN) and were usable for linking. This left 13,594 lead and 2,788 collaborator applicants relating to 21,782 applications (1,295 successful applications and 20,487 declined applications). These Companies House Reference numbers were then used to support onward linking to the Interdepartmental Business Register and the datasets described below. Of the declined applications, 6,120 were considered 'high scoring' based on the definitions set out in section 1.4.2 below.

The data included the number of grants awarded, date of award and type of firm applying for leads and collaborators. Both lead and collaborators applicants were used in the analysis.

Annual Business Service (ABS)

The ABS is an annual mandatory survey of large firms (with 250 employees or more) and a sample survey of small and medium sized firms. The survey is used by ONS to generate estimates of total output (GVA) in the

economy and other macro-economic aggregates, but the micro-data could potentially be used to provide observations on GVA and generate estimates of productivity (including Total Factor Productivity). This dataset was primarily used to explore impacts on GVA and GVA per worker.

Data was obtained for a total of 3,072 applicants (326 successful applicants and 745 high scoring declined applicants). This gave an overall matching rate to the ABS of 19 percent. Data was obtained for 2015 to 2023 leaving 14,053 observations. Note that large firms accounted for 43 percent of all unique firms matched in the ABS. This represents a larger share of such firms represented in analysis using this data compared to the overall representation of large firm in the Smart Grant programme portfolio. However, sample sizes were sufficient to enable analysis by firm size implying limited implications for the external validity of analysis using the ABS.

Business Expenditure on Research and Development (BERD)

The BERD is an annual survey undertaken by ONS comprising a panel of known R&D performers and a random probability survey of other firms to capture information on their expenditure on R&D activities and related measures. This was used to construct an unbalanced longitudinal panel dataset describing the evolution of R&D activity amongst firms supported by Innovate UK. Data was obtained for 6,147 firms, 597 successful applicants and 1,340 high scoring declined (an overall matching rate of 38 percent). This left 28,218 observations over the 2015 to 2023 period.

The survey is delivered using random probability sampling. Consequently, it is assumed that the incomplete coverage of the population does not introduce systematic non-response or attrition bias. Note that large firms accounted for 31 percent of all unique firms matched in the BERD. This again represents a larger share of such firms represented in analysis using this data compared to the overall representation of large firm in the Smart Grant programme portfolio. However, sample sizes were sufficient to enable analysis by firm size implying limited implications for the external validity of analysis using the BERD.

Business Structure Database (ONS)

The Business Structure Database is annual snapshot of the Interdepartmental Business Register, providing measures of employment and turnover for all firms registered for VAT and PAYE, and covers 99 percent of economic activity in the UK. The underlying data is drawn from both administrative data (VAT and PAYE returns to HMRC) and ONS' regular surveys (the Business Register Employment Survey and the Annual Business Survey).

In total 15,403 firms applying for Smart Grants were matched to the BSD (1,096 successful and 5,849 high scoring declined). This leaves an overall matching rate of 94 percent and of the population of firms awarded grants. Data was extracted for the 2015 to 2024 period.

The data (particularly observations of turnover) is associated with reporting lags, and in some cases, measures of turnover may be two years out of date. Given the concentration of grants in the later years of the timeframe of interest, this is likely to lead to an understatement of their effects on turnover.

Annual Survey of Hours and Earnings (ASHE)

The Annual Survey of Hours and Earnings (ASHE) provides annual observations of the wages of workers and is based on a 1% sample of employee jobs taken from HM Revenue and Customs' (HMRC's) Pay As You Earn (PAYE) records. The sample is approximately 300,000 workers, and the survey occurs annually.

Data for 8,401 workers was obtained across the 15,403 firms linked in the SRS with a total of 29,505 observations available across the 2015 to 2023 period.

PitchBook

The final sample for linking to PitchBook data included details of 11,944 individual businesses acting as leads. Of these:

1,325 were awarded (at least one) Smart Grant between 2019 and 2024.

3,794 were declined funding but submitted at least one 'potentially fundable' application that scored above 70 in the Independent Assessment.

6,825 were declined funding and did not submit an application that scored more than 70 in the Independent Assessment.

These records were linked to the PitchBook data platform that compiles records of disclosed investments in innovative companies – including investments by angels and high net worth individuals, venture capital funds, private equity funds, other private fundraising mechanisms (such equity crowdsourcing), and fundraising on public capital markets.

Dats was assigned to Industrial Strategy 8 sectors using the SIC code of relevant businesses in the BSD. The DBT defined definitions listed on gov.uk were used for assignment with the mapping set out in the table in the appendix to this document.[1]

1.4 Analytical strategy

1.4.1 Selection bias

A robust quantitative assessment of impact requires comparisons between firms awarded funding through the Smart Grants programme with an appropriate group of firms that did not receive funding. Provided the group of unfunded firms can be considered equivalent to those receiving grants, trajectories in their performance can be taken to approximate what may have occurred in the absence of the Innovate UK funding. However, there are challenges in selecting an appropriate group of firms that did not benefit from the Smart Grants programme as those awarded funding can be expected to differ in systematic ways from those that were not. For example:

Self-selection

As the choice to apply to the programme is voluntary, applicants to the Smart Grants programme can be expected to differ in systematic ways to non-applicants. Firms that do not apply for funding might be assumed – on average – to display lower levels of innovative activity than those that sought funding. As such, comparisons between firms applying for Smart Grants and other firms are likely to overstate the

[1] DBT Industrial Strategy Sector Definitions List: Available at: https://www.gov.uk/government/publications/industrial-strategy/industrial-strategy-sector-definitions-list

impact of funding on R&D spending and longer-term growth as applicants might be expected to outperform non-applicants regardless of public support.

Competitive entry

The Smart Grants programme features a competitive application process that can be exploited to help mitigate some of these issues. Firms that submitted applications that were declined can be expected to share features in common with firms awarded grants – such as their motivations for seeking funding or the innovation intensity of their business. As such, comparisons between firms awarded funding and declined applicants will be less exposed to issues of bias driven by systematic differences between groups than comparisons with the wider business population.

However, this leaves residual problems of bias driven by potential systematic differences between those firms awarded funding and declined applicants. Funding is awarded on the basis of an independent assessment of the scientific, technical, managerial, economic, and commercial merits of the application. If the quality of the application reflects characteristics of the business that are likely to determine their long-run commercial performance – such as the commercial viability of the innovation or managerial strengths – then it may be reasonable to assume that successful applicants would have outperformed declined applicants without public funding.

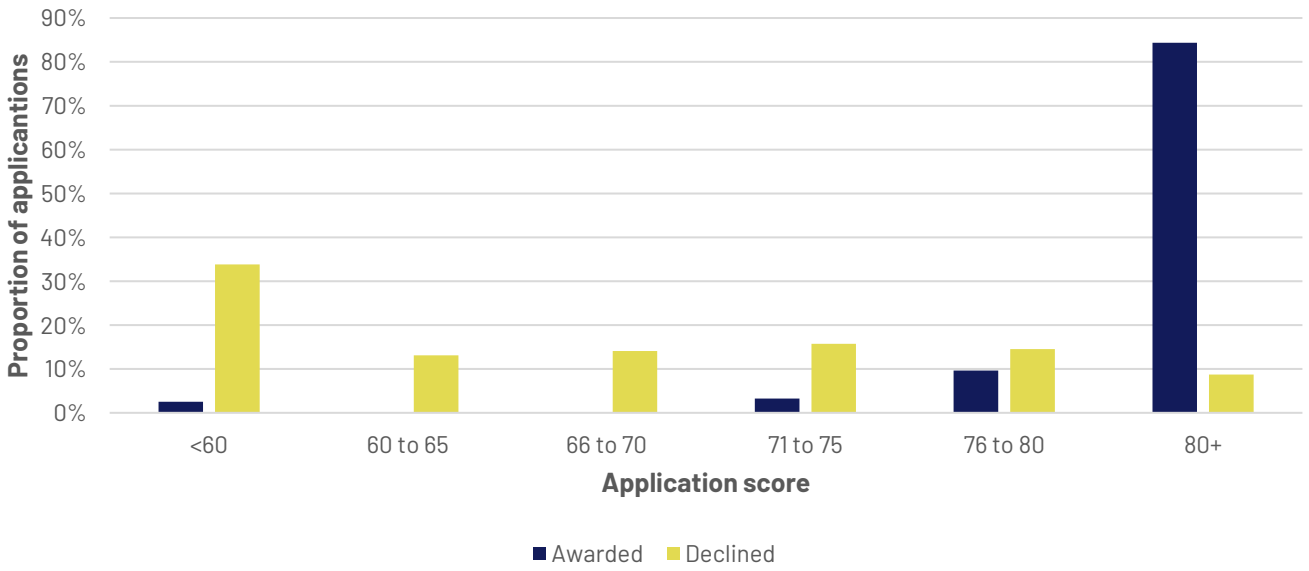
Given these issues, further steps are required to minimise the risk of biased comparisons – including refining the selection of comparators and using appropriate econometric methods. Details of these steps are set out in the following sections.

1.4.2 Declined applicants

A counterfactual sample of firms was constructed from the pool of 17,690 declined applications to the Smart Grants programme since February 2019. This approach helps address issues of self-selection, as both successful and declined applicants can be assumed to share similar characteristics motivating their application for support and represents an improvement on drawing a counterfactual from the general business population. On the assumption that the score given in the independent assessment reflects underlying merits of the project proposal (or other firm characteristics, such as its ability to co-ordinate a high-quality application), a counterfactual formed of high scoring declined applicants would provide a more robust counterfactual as it can control for these unobserved characteristics that may differ systematically across the pool of firms awarded grants and the declined pool overall.

Analysis of the scores awarded to project applications since February 2019 showed that a total of 6,427 applications were submitted that scored above 70 (typically considered a passing score for other Innovate UK programmes) but were not awarded fundings and 1,439 declined applications scored 80 or higher but were not awarded funding.

Figure 1.1: Score distribution of applications between February 2019 and April 2024



Source: Ipsos UK analysis of IUK monitoring information

The comparability of high scoring declined was examined using the data available in the SRS. The tables below indicate that there were limited differences between the groups of applicants receiving grants and those high scoring declined applicants. However, statistically significant differences are observed between those firms awarded grants and the whole group of declined applicants. Declined applicants were more likely to be micro or small with fewer large firms. They were also less likely be from the clean energy and creative industries and more likely to be from the financial services and profession and business services sectors.

Table 1.1: Sector and size composition of applicants

	Awarded grants	High scoring declined applicants	Declined applicants
Size			
Micro	65%	67%	73%*
Small	15%	12%	8%*
Medium	13%	14%	15%
Large	7%	7%	4%*
Sector			
Advanced Manufacturing	15%	16%	13%
Clean Energy Industries	12%	10%	8%*
Creative Industries	18%	16%	12%*
Defence	1%	1%	2%
Digital and Technologies	17%	15%	19%

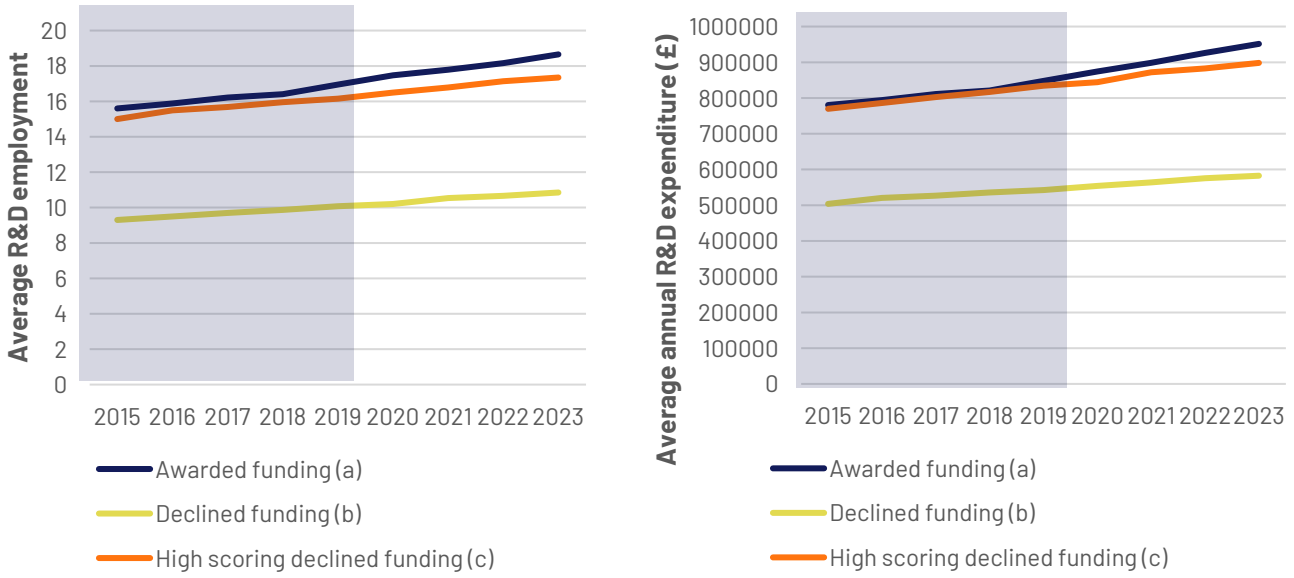
	Awarded grants	High scoring declined applicants	Declined applicants
Financial Services	6%	8%	12%*
Life Sciences	13%	14%	10%
Professional and Business Services	18%	20%	24%*

Source: Business Structure Database, ONS, Ipsos analysis. * indicates statistical difference from awarded grants.

Pre-application trends in the outcomes of interest are explored visually in the following figure. The figure below provides a visual examination of the past trends in R&D activity for each of the three groups and again indicates no significant differences between pre intervention trends for awarded and high scoring declined applicants whilst the overall group of declined applicants had lower R&D activity across the period more generally.

Both declined and high scoring declined applicants were taken forward as counterfactuals alongside internal comparisons described below. Note that comparisons between applicants awarded funding and high scoring declined applicants are considered considerably more robust given the greater equivalence of the groups.

Figure 1.2: Growth in R&D spending and employment between 2015 and 2023 – pre trend analysis



Source: Business Expenditure on R&D Survey, ONS, Ipsos analysis. Highlighted area is the pre trend period.

1.4.3 Internal Comparisons (Early vs Late)

As the grants in the scope of the analysis were awarded between 2019/20 and 2024/25, it was possible to avoid the issues associated with selecting a counterfactual group of non-beneficiary firms by taking advantage of the differences in the timing of individual applications. This involved using firms making successful applications for funding in later years as a counterfactual for successful applicants in earlier years, on the assumption that the effects of the grant should be visible amongst the latter group first. The benefit of this approach is that successful applicants for funding can be assumed to share similar unobserved characteristics both motivating their application for R&D funding and determining their

success. The table below outlines the number of individual applicants receiving grants by year since 2019/20 for whom data is available in the BSD.

Table 1.2: Firms awarded grants by year

	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25
Firms awarded grants	223	256	233	241	97	47

Source: Business Structure Database, ONS, and Ipsos UK analysis of IUK monitoring information

This approach provides an unbiased estimate of the impacts if there are no systematic differences between firms that made applications for funding at different points in time. However, results will be biased if there is a link between the timing of applications and the outcomes of interest. If there was a tendency to allocate funding to firms with greater growth potential in earlier years, then this would lead to an overstatement of the impacts of Innovate UK funding. This type of scenario could arise for several reasons. For example, the rules or targeting of the programme changed over time or the types of firms applying for funding changed dramatically through different rounds. There was no evidence to suggest either of these occurred in practice and although major external shocks (such as COVID-19) could have produced these types of changes e.g. if the programme faced more acute budget constraints during COVID for example, there may have been a tendency to allocate funding to projects with greater commercial potential in those years.

While it is not possible to fully test the assumptions underlying this design, comparisons have been made between the projects receiving funding across different years:

- **Size of applicant firm:** Analysis of the type of organisation awarded funding showed that the distribution remained relatively even between 2019/20 and 2023/24. The proportion of firms that were classified as micro did, however, rise to 72 percent in 2023/24. There were statistically fewer large firms awarded grants in the later years of 2022/23 and 2023/24 as a proportion of the group awarded grants, however the size of this group remained small as a percentage of the total.
- **Sector of applicant firm:** Analysis of the applicant sector indicated very few differences between years in the BSD. The only statistically significant difference arose for the proportion of creative industries in the 2023/24 group.

Table 1.3: Size and type of organisation awarded funding by competition year

	Year of competition				
Size	2019/20	2020/21	2021/22	2022/23	2023/24
Micro	62%	64%	66%	65%	72%*
Small	13%	14%	16%	15%	12%

	Year of competition				
Medium	16%	14%	12%	15%	13%
Large	9%	8%	6%	5%*	3%*
Sector					
Advanced Manufacturing	16%	18%	14%	15%	17%
Clean Energy Industries	14%	12%	15%	10%	11%
Creative Industries	15%	14%	18%	20%	21%*
Defence	0%	1%	0%	2%	0%
Digital and Technologies	18%	19%	16%	17%	17%
Financial Services	3%	6%	3%	7%	8%
Life Sciences	14%	10%	18%	12%	8%
Professional and Business Services	20%	20%	16%	17%	18%

Source: Business Structure Database, ONS. Ipsos analysis. * indicate statistically significant difference from 2019/20 values at the 95 percent confidence level.

- **Location:** The largest proportion of grant awards went to organisations based in London in all years followed by the South East and East of England respectively. The proportion of firms awarded grants situated in each region are shown in the table below where there are few differences visible between years.

Table 1.4: Region of organisation awarded funding by competition year

	Year of competition				
	2019/20	2020/21	2021/22	2022/23	2023/24
East Midlands	7%	6%	5%	5%	4%*
East of England	13%	10%	12%	12%	11%
London	28%	29%	29%	27%	28%
North East	3%	4%	3%	3%	5%
North West	7%	9%	6%	9%	8%
Scotland	10%	6%	9%	8%	8%

	Year of competition				
South East	3%	4%	2%	3%	3%
South West	6%	7%	8%	7%	8%
Wales	4%	7%	6%	7%	5%
West Midlands	7%	6%	5%	5%	4%
Yorkshire and The Humber	13%	10%	12%	12%	11%

Source: Business Structure Database, ONS. Ipsos analysis. * indicate statistically significant difference from 2019/20 values at the 95 percent confidence level.

- **Baseline employment and turnover:** Analysis of the Business Structure Database also indicated no significant differences in the size of firms awarded funding across different years up to 2023/24 with respect to baseline turnover and employment as illustrated below. Firms awarded funding in 2023/24 appear to have been on average smaller both in terms of employment and turnover.

Table 1.5: Region of organisation awarded funding by competition year

	Year of competition				
	2019/20	2020/21	2021/22	2022/23	2023/24
Average employment size	75.3	78.6	79.1	77.9	65.3*
Average turnover	£1.45m	£1.40m	£1.58m	£1.51m	£1.39m*

Source: Ipsos UK analysis of Business Structure Database. * indicate statistically significant difference from 2019/20 values at the 95 percent confidence level.

Overall, the analysis did not indicate any widespread issues with different types of firms applying over years signalling the appropriateness of the use of the staggered treatment design.

1.4.4 Econometric approach

While the selection of comparison groups as described above helps address some sources of possible bias, there will be residual concerns regarding possible differences between groups of applicants that could distort comparisons (particularly since the dataset constructed contained little information on the characteristics of firms beyond other grant funding). Further steps to minimise possible sources of bias were taken by specifying the following econometric model:

$$Y_{it} = \alpha + \beta A_{it} + \partial X_{it} + \alpha^i + \alpha^t + \varepsilon_{it}$$

This model describes the relationship between the outcomes of interest (e.g. employment) for firm i in year t (Y_{it}) as a function of the cumulative number of awards received (A_{it}). As A_{it} is a cumulative value, the coefficient β measures the long-term effect of the programme. Where data permitted, controls were also added for the sector and region of the firm (X_{it}) as well as other grant funding received through other

programmes. The model is also given a fixed effects interpretation, allowing for both any unobserved differences between firms that do not change with time (α^i) and any unobserved time specific shocks (α^t) affecting all firms in the same period (e.g. a general improvement in fundraising conditions). All models were estimated with robust standard errors.

In addition to the above, a series of models were also constructed using an alternative staggered difference-in-difference (DiD) approach. The motivation for this approach comes from the potential that the two-way fixed effects type models (as described above) can be unreliable when effects are heterogenous, either between groups or over time.

To robustly estimate impacts with staggered treatment, we adopted a recent non-parametric estimator, developed by Callaway and Sant'Anna (2021).[2] The intuition behind this estimator is to compute different treatment effects for each group treated at different dates. The group-specific treatment effects can be averaged to present an overall treatment effect. The expression for the group specific treatment effects is:

$$ATT(g,t) = E\left[\left(\frac{G_g}{E[G_g]} - \frac{\frac{p_g(X)C}{1-p_g(X)}}{E\left[\frac{p_g(X)C}{1-p_g(X)}\right]}\right)Y_t - Y_{g-1}\right]$$

Where the weights, p , are propensity scores, G is a binary variable that is equal to one for firms first treated in year g, and C is a binary variable equal to one for firms in the potential counterfactual group, which never received a grant. The equation above gives the treatment effect at time t for the group of firms receiving grants at time g, and it is computed by comparing changes in outcomes for group g between periods $g-1$ to that of a control group of never treated firms (C).

Our chosen DiD estimator for staggered treatment effects was implemented in STATA using the user-written command 'csdid'. The main advantage of this approach in this case was the ability to produce event study charts illustrating impacts over time.

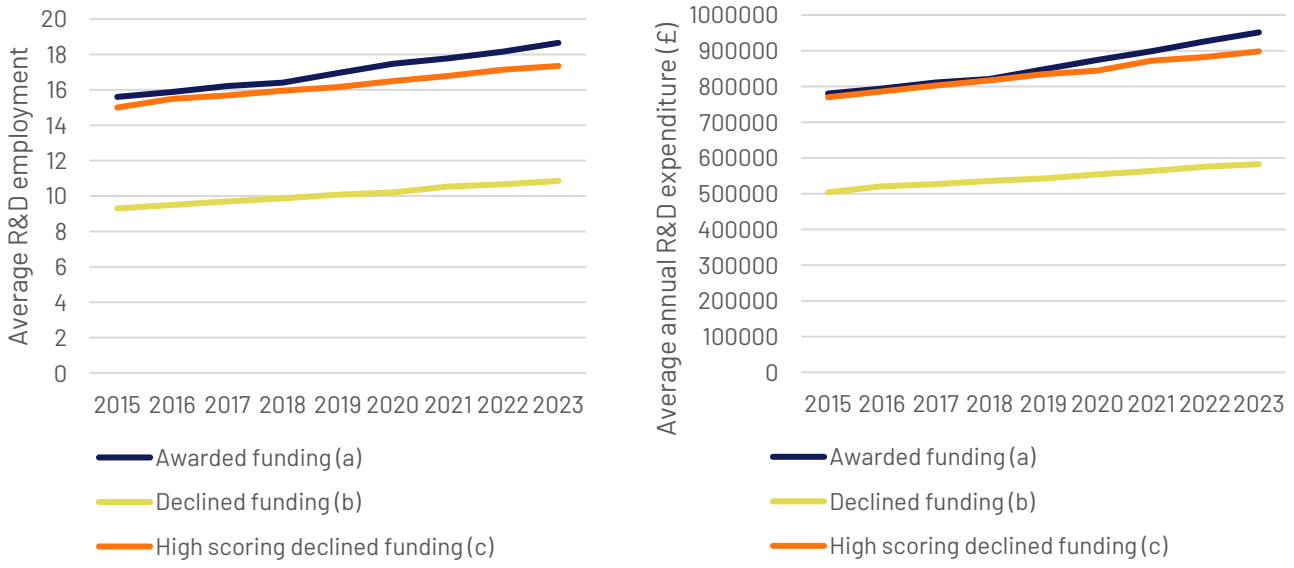
1.5 R&D spending and employment

Firms awarded Smart Grants saw an expansion in their R&D activity between 2019 and 2023:

- Annual R&D expenditure expanded by 22 percent between 2015 and 2023 (from £780,000 to £951,000 per annum on average) for firms awarded grants whilst annual spending rose by 16 percent for declined applicants and 1 percent for high scoring declined applicants.
- The number of R&D workers employed by firms receiving grants expanded at a similar rate of 20 percent, compared to 17 percent for declined applicants and 16 percent for high scoring declined applicants.

[2] Callaway, B. and Sant'Anna, P.H., 2021. Difference-in-differences with multiple time periods. *Journal of econometrics*, 225(2), pp.200-230.

Figure 1.3: Growth in R&D spending and employment between 2015 and 2023



Source: Business Expenditure on R&D Survey, ONS, Ipsos analysis.

Regression results

The overall findings are summarised in the table below. Basic comparisons (Model 1) between firms awarded grants and declined applicants suggested that grants led to a 28 percent increase in R&D spending and 27 percent increase in R&D employment, however, allowing for unobserved shocks affecting the R&D spending of all firms these estimates decrease to 16 and 13 percent respectively.

In the more robust specifications, utilising the high scoring declined applicant counterfactual or the staggered difference-in-difference specification focussing only on firms awarded grants, estimates of the impact on R&D spending were a 7.1 to 7.8 percent increase. Similarly, firms receiving grants see an increase in R&D employment of between 5.2 and 5.4 percent. All regression results quoted in the main report correspond to the staggered difference-in-difference results and where a range is provided, this is based on the spread between the estimates from the staggered difference-in-difference models (Model 4 in the below) and the comparisons to high scoring declined (Model 3 in the below).

Table 1.6: Estimated effects of Smart Grants on R&D spending and employment by 2023

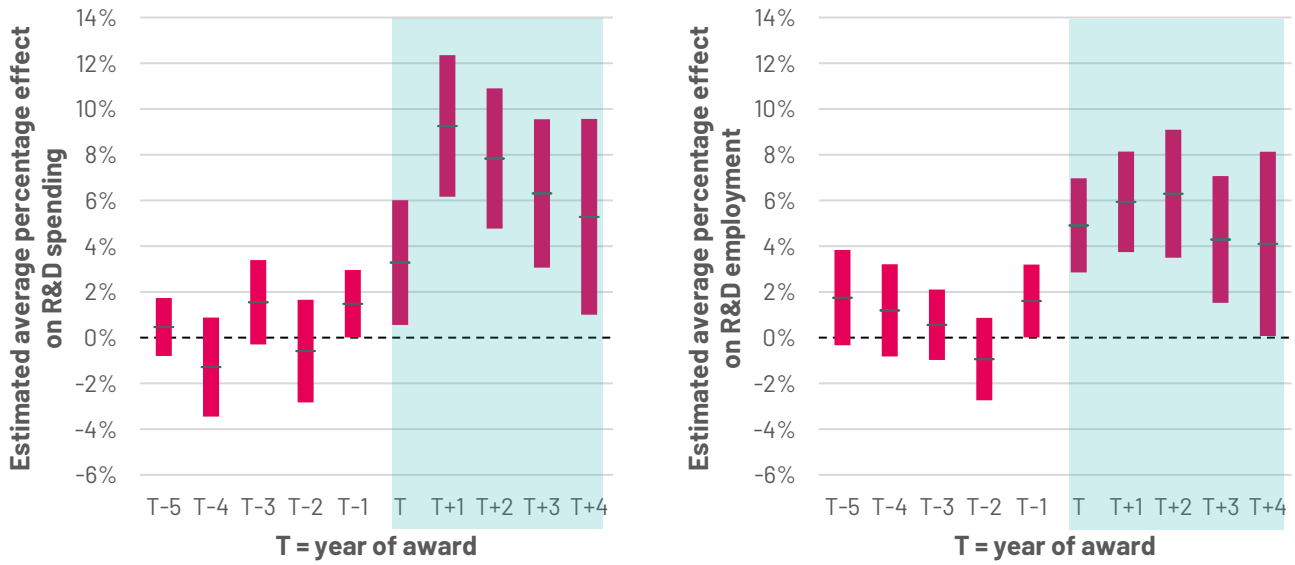
Model	Comparison group	Fixed effects	Time fixed effects	Estimated % impact on R&D spending per grant	Estimated % impact on R&D employment per grant	Observations
1	Declined applicants	Yes	No	0.281***	0.267***	27,473
				(0.652)	(0.573)	
2	Declined applicants	Yes	Yes	0.158***	0.134***	27,473
				(0.719)	(0.756)	
3	High scoring declined applicants	Yes	Yes	0.078***	0.052***	7,078

Model	Comparison group	Fixed effects	Time fixed effects	Estimated % impact on R&D spending per grant	Estimated % impact on R&D employment per grant	Observations
				(0.636)	(0.648)	
4	Staggered DiD	Yes	Yes	0.071***	0.054**	1,304

Source: Business Expenditure on R&D survey, ONS, Ipsos analysis. '***', '**' and '*' indicate whether the estimated result is statistically significant at the 99, 95 and 90 percent level respectively. R^2 in parentheses – not provided for staggered difference-in-difference.

The persistence of impacts on R&D spending and R&D employment was plotted using the regression results from the staggered DiD models. The figures below show that effects on both R&D outcomes were persistent for at least 4 years post award. The parallel trends assumption is key to the difference-in-difference setup which assumes that both treatment and control groups follow the same trend pre-intervention. This can be tested through examination of the estimated pre-treatment impacts. The pre trends F test (p=0.573 for R&D expenditure and 0.481 for R&D employment) did not indicate an issue with parallel trends here.

Figure 1.4: Persistence of effects from Smart Grants on R&D expenditure & R&D employment



Source: Business Expenditure on R&D survey, ONS, Ipsos analysis. Post grant period shaded light blue. Error bars indicate 95 percent confidence intervals.

The extent to which R&D activity took place overseas was explored by looking at the R&D expenditure placed within the UK or overseas. This showed no statistically significant impacts on overseas expenditure indicating that UK based spending accounted for all of the increase in R&D expenditure.

Table 1.7: Estimated effects of Smart Grants on R&D UK and overseas spending by 2023

Model	Comparison group	Fixed effects	Time fixed effects	Estimated % impact on UK R&D spending per grant	Estimated % impact on non-UK R&D spending per grant	Observations
1	Declined applicants	Yes	No	0.312***	-0.033	27,473
				(0.538)	(0.517)	
2	Declined applicants	Yes	Yes	0.149***	0.010	27,473
				(0.681)	(0.622)	
3	High scoring declined applicants	Yes	Yes	0.074***	0.018	7,078
				(0.540)	(0.575)	
3	Staggered DiD	Yes	Yes	0.068***	0.020	1,304

Source: Business Expenditure on R&D survey, ONS, Ipsos analysis. '***', '**' and '*' indicate whether the estimated result is statistically significant at the 99, 95 and 90 percent level respectively. R^2 in parentheses – not provided for staggered difference-in-difference

Results were also broken down by size of firm and sector, which are summarised below. This analysis showed:

- Industrial Strategy sectors: Across the IS8 sectors, effects were relatively similar with the exception of no statistically significant impacts detected for defence firms. Advanced manufacturing, clean energy and life sciences firms saw the largest proportional impacts on R&D expenditure and employment.
- Larger impacts on micro and small firms: Impacts on both R&D expenditure and R&D employment were also largest for micro and small firms when compared to medium and large sized firms.

Table 1.8: Estimated effects of Smart Grants on R&D expenditure and employment by 2023 – subgroup analyses

Model	Comparison group	Fixed effects	Time fixed effects	Estimated % impact per grant awarded		Observations
IS8 Sector				R&D spending	R&D employment	
Advanced manufacturing	High scoring declined applicants	Yes	Yes	0.083***	0.059***	1,132
	Staggered DiD	Yes	Yes	0.080***	0.058***	209
Clean energy	High scoring declined applicants	Yes	Yes	0.087***	0.058***	878
	Staggered DiD	Yes	Yes	0.081***	0.058***	162
Creative industries	High scoring declined applicants	Yes	Yes	0.056***	0.048***	1,246
	Staggered DiD	Yes	Yes	0.054***	0.049**	230
Defence	High scoring declined applicants	Yes	Yes	0.028	0.017	42
	Staggered DiD	Yes	Yes	0.020	0.019	8
Digital and technologies	High scoring declined applicants	Yes	Yes	0.068***	0.054***	1,232
	Staggered DiD	Yes	Yes	0.061**	0.054**	227
Financial services	High scoring declined applicants	Yes	Yes	0.066***	0.052***	382
	Staggered DiD	Yes	Yes	0.059**	0.051**	70
Life sciences	High scoring declined applicants	Yes	Yes	0.082***	0.059***	878
	Staggered DiD	Yes	Yes	0.080***	0.061***	162
Professional and business services	High scoring declined applicants	Yes	Yes	0.053***	0.049***	1,288

				Estimated % impact per grant awarded		
	Staggered DiD	Yes	Yes	0.048**	0.047**	237
Size						
Micro	High scoring declined applicants	Yes	Yes	0.084***	0.078***	4,657
	Staggered DiD	Yes	Yes	0.083***	0.076***	858
Small	High scoring declined applicants	Yes	Yes	0.080***	0.071***	991
	Staggered DiD	Yes	Yes	0.081***	0.073***	183
Medium	High scoring declined applicants	Yes	Yes	0.069***	0.054***	963
	Staggered DiD	Yes	Yes	0.067***	0.053***	162
Large	High scoring declined applicants	Yes	Yes	0.048***	0.038**	439
	Staggered DiD	Yes	Yes	0.045**	0.039*	81

Source: Business Expenditure on R&D survey, ONS, Ipsos analysis. '***', '**' and '*' indicate whether the estimated result is statistically significant at the 99, 95 and 90 percent level respectively.

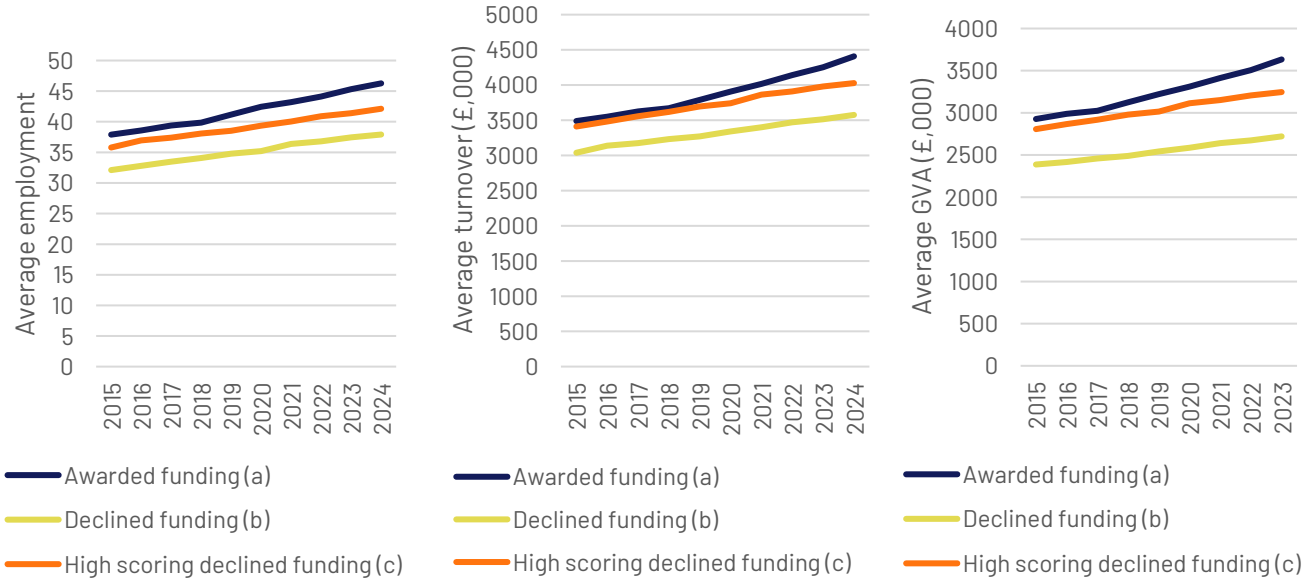
1.6 Employment, turnover and GVA

Impacts on employment and turnover were explored using the Business Structure Database (BSD), an annual snapshot of the Interdepartmental Business Register that provides yearly observations of employment and turnover of all firms registered for PAYE or VAT. GVA was explored using the Annual Business Survey (ABS). The below outlines the recent trends across these key variables amongst the firms receiving Smart Grants and those applying but not receiving grants. This indicated that:

- Employment and turnover: Firms that were awarded grants grew on average, both in terms of employment and turnover. Employment and turnover for successful applicants both rose by 21 percent and 27 percent respectively between 2015 and 2024, whilst high scoring unsuccessful firms grew at a slower rate of 17 percent and 19 percent for employment and turnover respectively.

- GVA: A similar trend was evident for GVA with increases between 2015 and 2023 larger for successful applicants relative to unsuccessful and high scoring unsuccessful.

Figure 1.5: Employment, turnover and GVA between 2015 and 2024



Source: Business Structure Database, ONS, Ipsos analysis.[3]

Regression results

The results of the econometric analysis are presented in the table below and indicated that the programme led to substantial impacts on the growth of applicants:

- Employment impacts: Smart Grants were estimated to have led to an on-going expansion in the employment of applicants of 4.3 percent.

[3] 50 percent trimmed means were used to reduce the influence of outliers. This removes the top 25 and bottom 25 percent of firms the mean calculation.

- Turnover: The findings also suggested that each grant led to an increase in the turnover of successful firms of around 6 percent. Turnover impacts begin to appear after two years and persisted for the next three years. This provides a strong indicator that the Smart Grants programme has been effective in supporting rapid commercialisation outcomes (and few evaluations of other Innovate UK programmes have shown turnover impacts being realised over these types of time horizon).

- GVA: The analysis suggested that each grant awarded led to an increase of around 4 percent in total firm output (GVA) – implying that the effects of the programme on commercialisation have translated into overall economic growth outcomes (i.e. firms are not simply meeting the additional demand by increasing their purchases of goods and services).

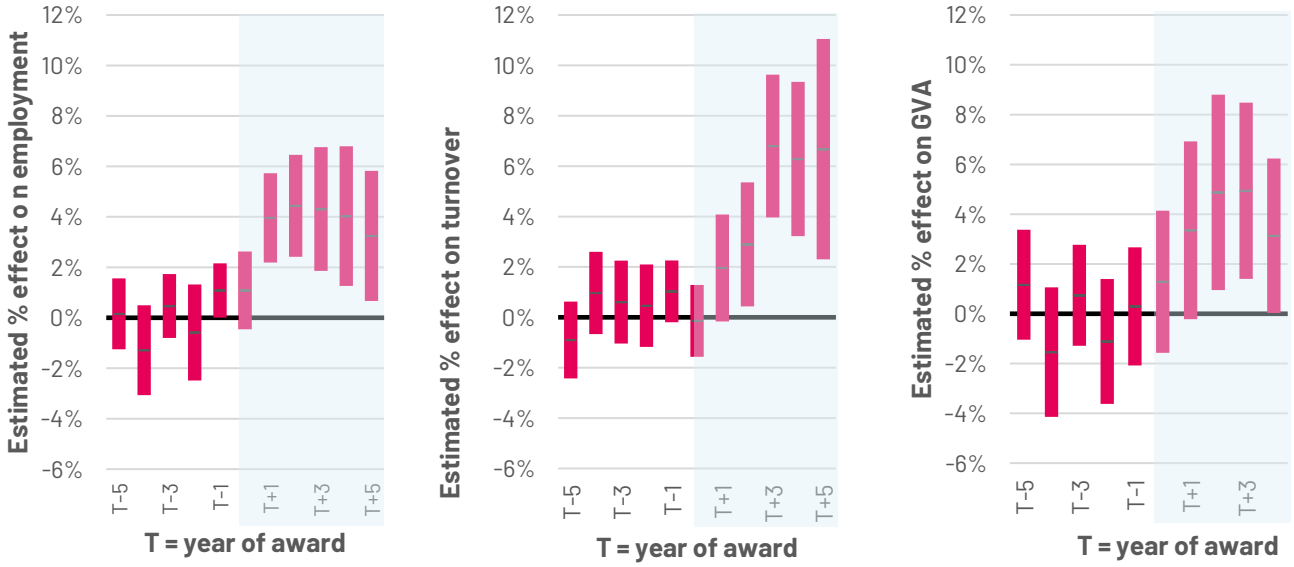
Table 1.9: Estimated effects of grants on employment, turnover and GVA

Model	Comparison group	Fixed effects	Time fixed effects	Estimated % impact on employment per grant	Estimated % impact on turnover per grant	Estimated % impact on GVA per grant
1	Declined applicants	Yes	No	0.260***	0.385***	0.264***
				(0.580)	(0.439)	(0.285)
2	Declined applicants	Yes	Yes	0.172***	0.203***	0.132***
				(0.674)	(0.553)	(0.309)
3	High scoring declined applicants	Yes	Yes	0.045***	0.068***	0.047***
				(0.699)	(0.581)	(0.326)
4	Staggered DiD	Yes	Yes	0.043***	0.063***	0.041***

Source: Business Structure Database and Annual Business Survey, ONS, Ipsos analysis. '***', '**' and '*' indicate whether the estimated result is statistically significant at the 99, 95 and 90 percent level respectively. R^2 in parentheses – not provided for staggered difference-in-difference

The Figure below illustrate the estimated persistence of impacts on employment, turnover and GVA described above, with the error bars indicating the 95% confidence intervals. Effects can be seen to persist for at least 4 to 5 years post award.

Figure 1.6: Estimated persistence of impacts on overall employment, turnover, and GVA



Source: Business Structure Database and Annual Business Survey, ONS, Ipsos analysis. Post grant effect period shaded light blue. Error bars indicate 95 percent confidence intervals.

Testing for pre-trend effects did not indicate statistically significant effects implying that the parallel trends assumption is not violated (p=0.463 for employment, 0.518 for turnover and 0.836 for GVA).

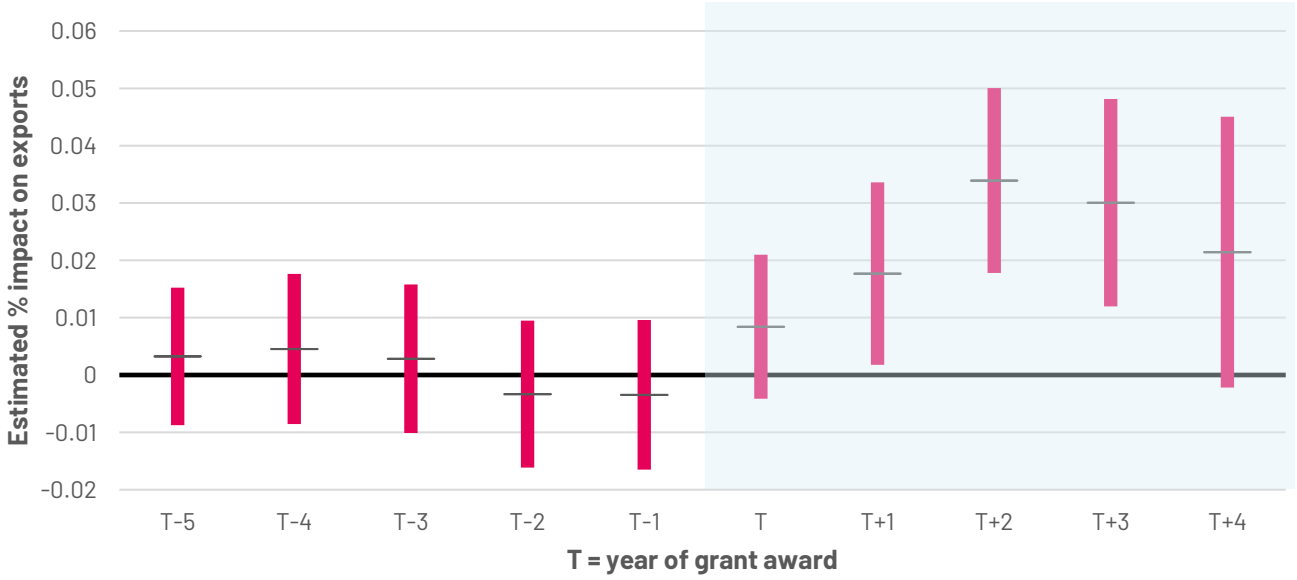
Exports were explored using the Annual Business Survey and examining the amount of income from within the UK versus overseas. The analysis found statistically significant increases in exports with Smart Grants linked to around a 3 percent increase in export revenue. Effects appeared from two years post award to three years post, suggesting that grants enabled firms to expand into export markets, albeit temporarily. However, it should be noted that there is a significant degree of uncertainty with effects at the extreme end of the period of interest given the sampling structure of the ABS and the relatively fewer grants for which 4 years post data is available.

Table 1.10: Estimated effects of grants on exports

Model	Comparison group	Fixed effects	Time fixed effects	Estimated % impact on export income per grant	Observations	R^2
1	Declined applicants	Yes	No	0.162***	12,471	0.654
2	Declined applicants	Yes	Yes	0.107***	12,471	0.710
3	High scoring declined applicants	Yes	Yes	0.031***	2,750	0.530
4	Staggered DiD	Yes	Yes	0.026**	1,339	-

Source: Annual Business Survey, ONS, Ipsos analysis. '***', '**' and '*' indicate whether the estimated result is statistically significant at the 99, 95 and 90 percent level respectively.

Figure 1.7: Estimated persistence of impacts on exports



Source: Annual Business Survey, ONS, Ipsos analysis. Post grant effect period shaded light blue. Error bars indicate 95 percent confidence intervals.

The pre trends F test indicated that there were no statistically significant pre trend effects supporting the parallel trends assumption (p=0.791).

Results were again broken down by size of firm and sector. This analysis showed:

- Industrial Strategy sectors: Similar to the R&D effects estimated in the preceding section, advanced manufacturing, clean energy and life sciences firms saw the largest proportional impacts on most outcomes included below, namely employment, turnover and GVA. Impacts on exports were less precisely estimated with some staggered difference in difference specification not identifying significant effects.
- Larger impacts on micro and small firms: As with the estimated impacts on R&D, effects were again larger for micro and small firms in particular with the exception of exports where both small and medium sized firms saw the largest increase with large firms not far behind.

Table 1.11: Estimated effects of Smart Grants on employment, turnover and GVA – subgroup analyses

Model	Comparison group	Fixed effects	Time fixed effects	Estimated % impact per grant awarded			
				Employment	Turnover	GVA	Exports
IS8 Sector							
Advanced manufacturing	High scoring declined applicants	Yes	Yes	0.048***	0.073***	0.050***	0.033**
	Staggered DiD	Yes	Yes	0.046***	0.067***	0.044**	0.028*
Clean energy	High scoring declined applicants	Yes	Yes	0.052***	0.078***	0.054***	0.036**
	Staggered DiD	Yes	Yes	0.049***	0.072***	0.047**	0.030*
Creative industries	High scoring declined applicants	Yes	Yes	0.044***	0.067***	0.046**	0.030*
	Staggered DiD	Yes	Yes	0.042**	0.062***	0.040**	0.025
Defence	High scoring declined applicants	Yes	Yes	0.009	0.014	0.009	0.006
	Staggered DiD	Yes	Yes	0.009	0.013	0.008	0.005
Digital and technologies	High scoring declined applicants	Yes	Yes	0.043**	0.065***	0.045**	0.029*
	Staggered DiD	Yes	Yes	0.041**	0.060***	0.039**	0.025
Financial services	High scoring declined applicants	Yes	Yes	0.041**	0.063***	0.043**	0.029*
	Staggered DiD	Yes	Yes	0.040**	0.058***	0.038*	0.024
Life sciences	High scoring declined applicants	Yes	Yes	0.052***	0.078***	0.054***	0.036**
	Staggered DiD	Yes	Yes	0.049***	0.072***	0.047***	0.030*
Professional and business services	High scoring declined applicants	Yes	Yes	0.040**	0.060***	0.041**	0.027*

				Estimated % impact per grant awarded			
	Staggered DiD	Yes	Yes	0.038**	0.055***	0.036**	0.023
Size							
Micro	High scoring declined applicants	Yes	Yes	0.056***	0.079***	0.059***	0.033***
	Staggered DiD	Yes	Yes	0.054***	0.075***	0.058***	0.028**
Small	High scoring declined applicants	Yes	Yes	0.051***	0.073***	0.049***	0.052***
	Staggered DiD	Yes	Yes	0.050***	0.073***	0.046***	0.049***
Medium	High scoring declined applicants	Yes	Yes	0.040**	0.054***	0.040**	0.043**
	Staggered DiD	Yes	Yes	0.041**	0.052***	0.039**	0.041**
Large	High scoring declined applicants	Yes	Yes	0.031*	0.037**	0.028*	0.036**
	Staggered DiD	Yes	Yes	0.029*	0.034*	0.025*	0.035*

Source: Business Structure Database and Annual Business Survey, ONS, Ipsos analysis. '***', '**' and '*' indicate whether the estimated result is statistically significant at the 99, 95 and 90 percent level respectively.

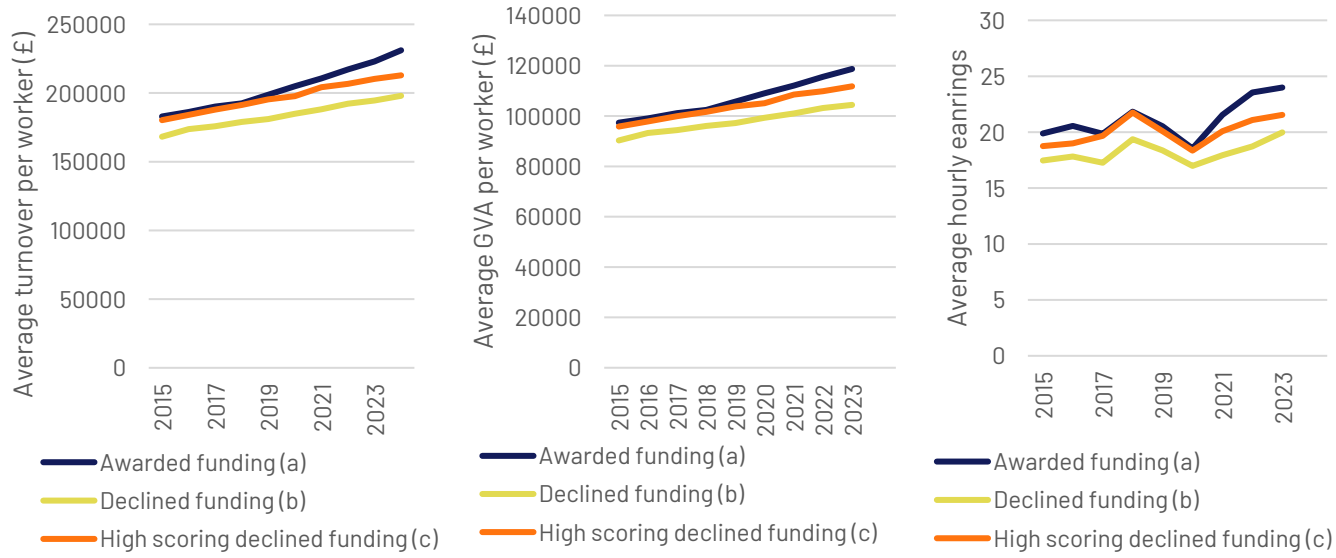
1.7 Productivity

The Business Structure database, Annual Business Survey and Annual Survey of Hours and Earnings were used to explore outcomes relating to productivity, namely turnover per worker, GVA per worker and wages.

Trends in these outcomes are shown below and show a steady increase in both turnover per worker and GVA per worker across this period with greater increase for firms awarded grants between 2019 and 2023/24 evident. The average GVA per worker of successful applicants rose by 24 percent compare to 14 percent for declined applicants and 16 for high scoring declined applicants.

Trends in wages over the same period were more variable with a pronounced dip evident in 2020 likely a consequence of the COVID-19 pandemic. However, over the same period, average hourly earnings for employees at successful applicants rose by 21 percent compared to 14 and 15 percent for declined and high scoring declined respectively.

Figure 1.8: Turnover per worker, GVA per worker and average hourly earnings between 2015 and 2023



Source: Business Structure Database, Annual Business Survey and Annual Survey of Hours and Earnings, ONS, Ipsos analysis.

Regression results

The overall findings of the analysis of wage,[4] turnover per worker and GVA per worker outcomes are summarised in the table below. The analysis found evidence of increases in both turnover and GVA per worker as a result of Smart Grant awards with the best estimates indicating a 2.2 and 2 percent increase

[4] Note that the analysis of wage impacts was based on workers that were employed by firms before and after the grant was awarded. This ensures that the results are not driven by changes in the composition of workers (e.g. firms employing more highly skilled workers as a result of the grant), however this significantly reduces sample size given the relatively small size of firms supported by the Smart Grants programme and the sampling criteria of the ASHE.

respectively. This indicates that the programme was successful in stimulating productivity as products began to be commercialised.

In terms of wage impacts, the results of the analysis showed that Smart Grants had a positive effect on hourly earnings for workers at successful applicants of 1.5 percent, though there were no significant effects on hours worked. This could be interpreted as a signal of productivity gains (as in competitive labour markets, a marginal increase in labour productivity should be reflected in a marginal increase in the wage). However, it may be that additional demand for workers has leaked into wage inflation (which is more difficult to interpret as a productivity effect). It is also possible that this may reflect a 'grant-sharing' effect (in which the firm rewards its employees for securing a grant) or that the programme pushed up equilibrium wage levels.

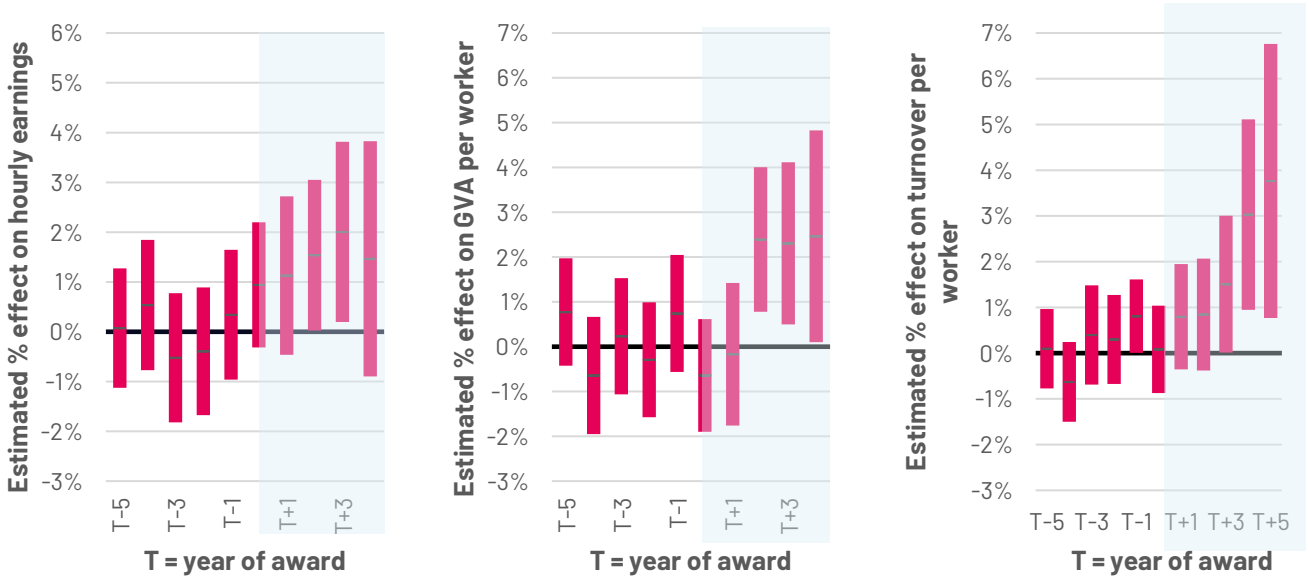
Table 1.12: Estimated effects of grants on turnover per worker, GVA per worker and hourly wages

Model	Comparison group	Fixed effects	Time fixed effects	Estimated % impact on turnover per worker per grant	Estimated % impact on GVA per worker per grant	Estimated % impact on hourly earnings per grant	Estimated % impact on hours worked per grant
1	Declined applicants	Yes	No	0.121***	0.090***	0.081***	0.002
				(0.291)	(0.194)	(0.501)	(0.010)
2	Declined applicants	Yes	Yes	0.104***	0.053**	0.032**	0.000
				(0.308)	(0.286)	(0.499)	(0.047)
3	High scoring declined applicants	Yes	Yes	0.025***	0.021**	0.018*	0.000
				(0.316)	(0.308)	(0.513)	(0.039)
4	Staggered DiD	Yes	Yes	0.022*	0.020*	0.015*	0.000

Source: Business Structure Database and Annual Business Survey, ONS, Ipsos analysis. '***', '**' and '*' indicate whether the estimated result is statistically significant at the 99, 95 and 90 percent level respectively. R^2 in parentheses – not provided for staggered difference-in-difference

Analysis of the persistence of the estimated impacts indicated that effects on turnover per worker arise from 3 years after a grant award persisting until at least 5 years post award whilst GVA per worker impacts appear from two years after lasting until 4 years post. Analysis of the wage impacts over time indicated that the onset of wage effects coincided with turnover and GVA per worker impacts and persist until 3 years after grant award. This implies that any potential productivity effect brought about through funded projects may be temporary, however there remains a significant degree of uncertainty attached to these results given the relative lack of employees at SMEs sampled consistently in the ASHE across the firms of interest

Figure 1.9: Persistence of productivity impacts



Source: Business Structure Database, Annual Business Survey and Annual Survey of Hours and Earnings, ONS, Ipsos analysis. Post grant effect period shaded light blue. Error bars indicate 95 percent confidence intervals.

Testing for pre-trend effects did not indicate statistically significant effects implying that the parallel trends assumption is not violated (p=0.936 for hourly earnings, 0.838 for GVA per worker and 0.661 for turnover per worker).

Results for productivity outcomes were also broken down by size of firm and sector. This analysis showed:

- Industrial Strategy sectors: Statistically significant impacts were identified for all but the defence sector for turnover per worker and GVA per worker. In the most robust models, impact on turnover per worker ranged from 1.9 and 2.5 percent with Life sciences seeing the largest increase. This extended to GVA per worker with Life science firms seeing a 2.3 percent increase tied with clean energy firms. Effects on hourly earnings were more varied and, in some cases, not statistically significant, likely a consequence of reduced sample size when looking at individual sectors.

- Larger impacts on micro and small firms: Compared to the estimated impacts on R&D, effects were closer across the four categories of firm size in terms of productivity.

Table 1.13: Estimated effects of Smart Grants on employment, turnover and GVA – subgroup analyses

Model	Comparison group	Fixed effects	Time fixed effects	Estimated % impact per grant awarded			
IS8 Sector				Turnover per worker	GVA per worker	Hourly earnings	Hours worked
Advanced manufacturing	High scoring declined applicants	Yes	Yes	0.027***	0.022**	0.019**	0.000
	Staggered DiD	Yes	Yes	0.024**	0.021**	0.016*	0.000
Clean energy	High scoring declined applicants	Yes	Yes	0.029***	0.024**	0.021**	0.000
	Staggered DiD	Yes	Yes	0.025**	0.023**	0.017*	0.000
Creative industries	High scoring declined applicants	Yes	Yes	0.025***	0.021**	0.018**	0.000
	Staggered DiD	Yes	Yes	0.022**	0.020*	0.015*	0.000
Defence	High scoring declined applicants	Yes	Yes	0.005	0.004	0.004	0.000
	Staggered DiD	Yes	Yes	0.004	0.004	0.003	0.000
Digital and technologies	High scoring declined applicants	Yes	Yes	0.024**	0.020**	0.017**	0.000
	Staggered DiD	Yes	Yes	0.021**	0.019*	0.014*	0.000
Financial services	High scoring declined applicants	Yes	Yes	0.023**	0.019**	0.017**	0.000
	Staggered DiD	Yes	Yes	0.020*	0.018*	0.014*	0.000
Life sciences	High scoring declined applicants	Yes	Yes	0.029***	0.024**	0.021**	0.000
	Staggered DiD	Yes	Yes	0.025**	0.023**	0.017*	0.000
Professional and business services	High scoring declined applicants	Yes	Yes	0.022**	0.018**	0.016*	0.000

				Estimated % impact per grant awarded			
	Staggered DiD	Yes	Yes	0.019*	0.018*	0.013	0.000
Size							
Micro	High scoring declined applicants	Yes	Yes	0.028***	0.027***	0.021***	0.000
	Staggered DiD	Yes	Yes	0.026***	0.0025***	0.022***	0.000
Small	High scoring declined applicants	Yes	Yes	0.025**	0.022**	0.018**	0.000
	Staggered DiD	Yes	Yes	0.021*	0.022*	0.017*	0.000
Medium	High scoring declined applicants	Yes	Yes	0.023*	0.020*	0.017*	0.000
	Staggered DiD	Yes	Yes	0.020*	0.019	0.016	0.000
Large	High scoring declined applicants	Yes	Yes	0.024*	0.017*	0.018*	0.000
	Staggered DiD	Yes	Yes	0.022*	0.016	0.016	0.000

Source: Business Structure Database and Annual Business Survey, ONS, Ipsos analysis. '***', '**' and '*' indicate whether the estimated result is statistically significant at the 99, 95 and 90 percent level respectively.

An additional set of models was implemented to explore how the effects of Smart Grants varied across occupations. A series of models were implemented using combined groupings of 1-digit Standard Occupational Classification (SOC) codes. These were reduced to four major groupings for analysis. These encompassed:

- Managerial, professional and technical: Including SOC categories 1 to 3, these occupations cover managers, directors, officials, professional occupations and associate professional and technical occupations. Technical roles such as R&D jobs should be predominantly included in this category.
- Administrative, leisure and service occupations: Covering SOC codes 4, 6 and 7, this category covers all service-related occupations, including administrative and secretarial occupations, caring, leisure, sales and customer service roles.
- Skilled trades: SOC codes 5 and 8, covering skilled trade occupations and process, plant and machine operatives. Jobs involved in the production of goods will predominantly fall under this category.
- Elementary occupations: Covering only SOC code 9 – elementary occupations such as farm labourers, window cleaners and security guards.

The table below outlines the results of these analyses which show that the grants have variable effects on the earnings of workers across different occupations. Workers in higher skill occupations tended to see stronger growth in earnings than those in lower skill occupations. Those in managerial, professional and technical and in skilled trade occupations saw their earnings rise by around 2.2 percent in response to the grant whilst no effects were identified for those in lower-level service sector roles or those in the lowest skilled elementary occupations.

Table 1.14: Estimated effects of grants on hourly wages by occupation group

Model	Comparison group	Fixed effects	Time fixed effects	Managerial, professional and technical	Admin, leisure and service	Skilled trades	Elementary occupation
1	Declined applicants	Yes	Yes	0.114***	0.040**	0.092***	0.029*
				(0.184)	(0.286)	(0.273)	(0.174)
2	High scoring declined applicants	Yes	Yes	0.028***	0.012	0.021*	0.005
				(0.201)	(0.391)	(0.281)	(0.199)
3	Staggered DiD	Yes	Yes	0.022*	0.010	0.018*	0.003

Source: Annual Survey of Hours and Earnings, ONS, Ipsos analysis. '***', '**' and '*' indicate whether the estimated result is statistically significant at the 99, 95 and 90 percent level respectively. R^2 in parentheses – not provided for staggered difference-in-difference

1.8 Indirect impacts

A further set of analyses was completed exploring the indirect effects of Smart Grants at the local level. This was achieved by redefining the unit of analysis as the Output Areas located within a predefined distance from firms benefitting from the grants. The analysis is predicated on the assumptions that the

strength of the effects of the grants on economic activity within an area will depend on the number of firms located nearby receiving a grant (i.e. a dose-response relationship), and that the strength of these effects will vary by distance (a distance-decay relationship).

Using this approach, the local economic effects of Smart Grant activity and how these vary with distance, were explored:

- Local employment: The BSD offers longitudinal data on employment at an Output Area level which can be used to explore the extent of any local displacement or multiplier effects. In this case, if the estimated employment effects within a certain distance is smaller than the estimated direct effects of grants, this would provide prima facie evidence of local (net) displacement effects (with the reverse holding if the estimated local effect is positive).

- Productivity of local firms: The same data were also used to explore the extent of any local agglomeration effects by examining how far there is evidence of a positive effect on the productivity of firms located in proximate areas (as measured through turnover per worker).

- Number of local firms: The BSD also allows for the analysis of the number of local firms active in an area. This can be used to explore the extent of any start up activity or firm relocations which may or may not be driving productivity changes.

For this analysis estimates of the impact of the grants will be biased if applicants for grants tend to be located within existing clusters of innovative firms. As areas without nearby applicants for grant funding form the effective comparison group for the analysis, this approach could overstate the effects of grants, as existing clusters could be expected to grow more rapidly regardless of public intervention. This issue was mitigated by limiting the focus to only those areas near successful and high scoring declined applicants for funding (within 10km or 20km of successful and declined applicants).

The estimating equation for the spatial analysis is as follows:

$$y_{it} = \alpha + \left(\beta^1 T_{it}^{0-1km} + \beta^2 T_{it}^{1-5km} + \beta^3 T_{it}^{5-10km}\right) + \rho \cdot X_{it} \cdot t + \alpha^i + \alpha^t + u_{it}$$

This distance-decay model explains outcomes in area i in period t as a function of the cumulative number of grants awarded to firms located at greater distances from area i (T_{it}^{j}):

- Here, the parameter β^1 captures the direct effect of the grants in the areas in which firms are located. These can be compared directly with estimates of the firm level impacts of the grants to draw inferences on the net local impacts of Innovate UK grant funding (e.g. if area level effect on employment is smaller than the firm level effect, this would imply that grant supported firms have expanded by drawing resources away from other local firms).

- The parameters β^2 and β^3 capture the effects of grants awarded to firms located at distances of up to 1km, 1km to 5km and 5km to 10km respectively. Positive coefficients indicate positive spillover effects - e.g. if grants have encouraged agglomeration of economic activity. Negative coefficients would be interpreted as a signal that grant funding has crowded out or displaced economic activity in nearby areas.

Results

The results of the econometric analysis suggested that:

- Local economic performance: The evidence indicated that Smart Grants had a positive net economic impact on local economic growth and productivity. The impacts included:
  - Increased activity proximate to successful firms: Each grant led to a 0.4 percent increase in the number of jobs in Output Areas within 2km of the grant recipient and a 0.7 percent increase in the turnover of firms based in the same area. Impacts on turnover per worker of around 0.35 percent were present from 2 years post award and persisted for at least another two years. These area level impacts are broadly comparable to those observed amongst the firms receiving funding, suggesting that any displacement or crowding out effects at the very local level were negligible.
  - Limited impacts within proximate areas: There was limited evidence of positive economic impacts at distances of 2km to 10km from those awarded funding. A small effect was identified in OAs 5km to 10km away three years post award on employment and turnover of 0.1 and 0.2 percent respectively.
- Clustering: There was no evidence of Smart Grants encouraging firms to locate to the areas in which grant recipients were located suggesting limited local clustering.

These findings suggest that the firm level economic impacts of Smart Grants have not come at the expense of local competitors and the lack of significant local economic spillovers is indicative of regional, national, or international supply chains. These impacts are summarised in the table below.

Table 1.15: Estimated indirect effects of Smart Grants by 2024

		Estimated % impact per grant			
Distance from grant recipient	Comparison group	Employment	Turnover	Turnover per worker	Number of firms
Within 2km	High scoring declined	0.005**	0.008**	0.002*	0.001
1km to 5km	High scoring declined	0.002	0.001	-0.000	0.000
5km to 10km	High scoring declined	-0.001	0.000	0.001	0.001
R^2		0.746	0.588	0.492	0.550
Observations		2,048,892	2,048,892	2,048,892	2,048,892

Source: Business Structure Database, ONS, Ipsos analysis. '***', '**' and '*' indicate whether the estimated result is statistically significant at the 99, 95 and 90 percent level respectively.

Analysis was also undertaken to explore the effects on OAs of varying levels of productivity before the programme began. Baseline productivity (GVA per worker) was used to segment Lower Super Output Areas (LSOAs) into three equal groups, one containing the lowest third in terms of estimated GVA per worker in 2019, a second with the middle third and a third containing the most productive areas in 2019. The

econometric modelling approach was then applied to explore differences in effects across employment, turnover and turnover per worker for these three types of areas. The analysis indicated negligible differences in the estimated significance and scale of effects across these areas (summarised in the table below). This suggests that Smart Grants have helped all types of areas to grow and have neither narrowed or widened existing disparities across areas.

Table 1.16: Estimated indirect effects of Smart Grants by 2024 – baseline productivity

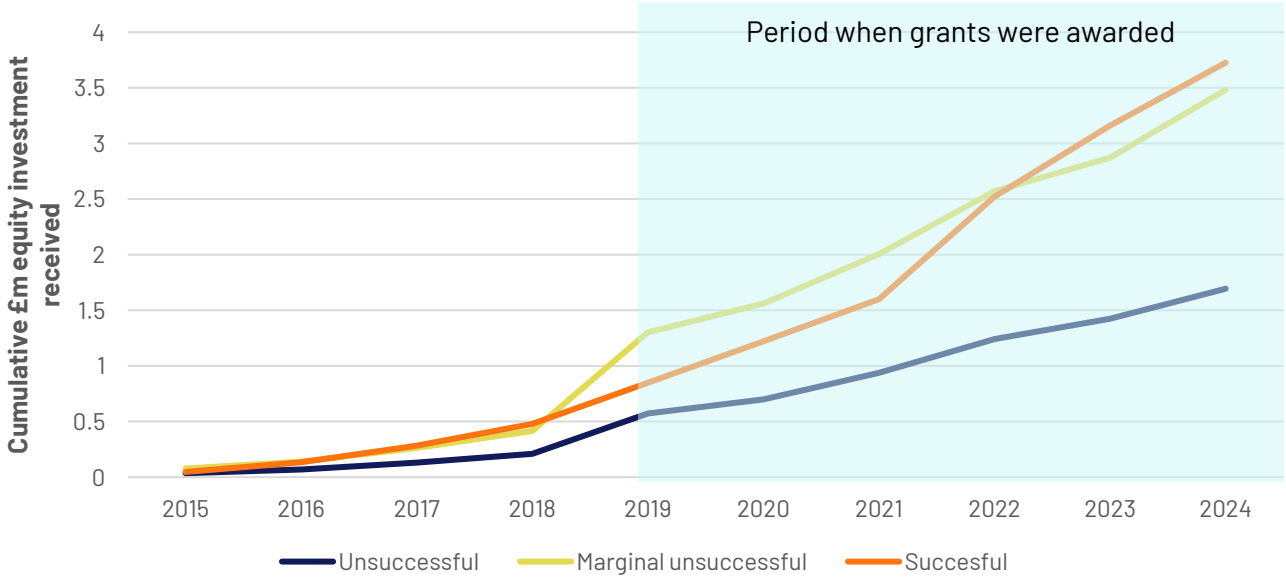
		Estimated % impact per grant			
Baseline productivity	Comparison group	Employment	Turnover	Turnover per worker	Number of firms
Low	High scoring declined	0.005**	0.007**	0.001*	0.002
Medium	High scoring declined	0.004**	0.007**	0.002*	0.001
High	High scoring declined	0.007**	0.008**	0.001*	0.001

Source: Business Structure Database, ONS, Ipsos analysis. '***', '**' and '*' indicate whether the estimated result is statistically significant at the 99, 95 and 90 percent level respectively.

1.9 Investment analysis

Pitchbook data was used to explore the impacts of Smart Grants on investment and firm valuations. Initial analysis of the matched data on firm investments highlighted some significant differences between the group of declined applicants and those awarded grants in terms of past investments. The chart below shows that firms awarded grants received more equity investment in years prior to those in which grants were awarded. Firms that scored above 70 in the assessment process but were declined funding however more closely match those awarded funding in terms of prior equity investment.

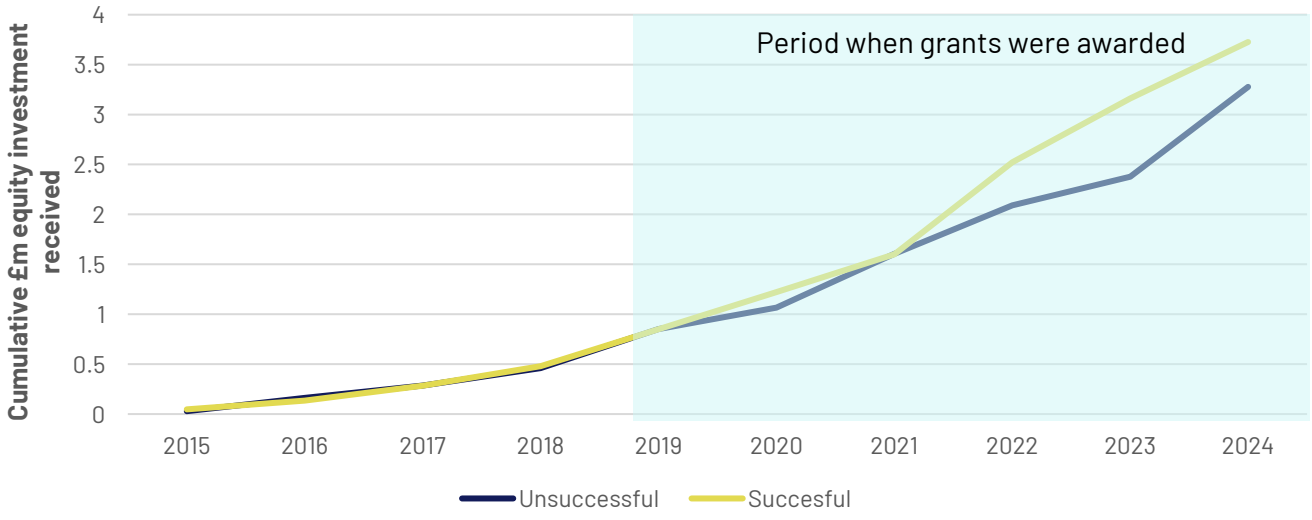
Figure 1.10: Average annual £m equity investment in firms awarded and declined grant



Source: PitchBook. Ipsos defined user query. Lead applicants only.

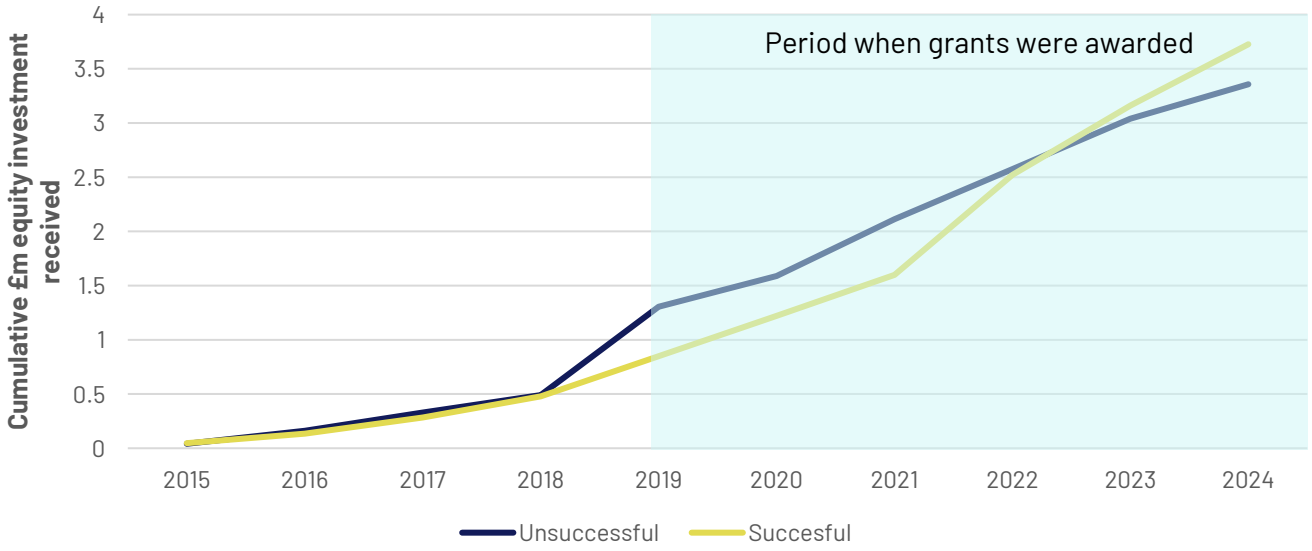
Simple comparisons between firms awarded grants and these two comparison groups as is would therefore be potentially biased, particularly comparing to the pool of all firms declined funding. To mitigate this, a Propensity Score Matching (PSM) procedure was implemented to reduce the differences in pre-award period investment. A total of two models were implemented, one matching firms awarded grants with a comparable group of firms from all declined applicants and a second matching firms awarded grants to a group of comparable high scoring declined applicant firms. The charts below show the improvement made by the matching process with the gaps in cumulative investment in previous years more closely matched between treatment and control groups. Comparisons to a matched group of high-scoring applicants are preferred given the greater closeness in prior investment activity.

Figure 1.11: Average annual £m equity investment in matched firms awarded and declined grants



Source: PitchBook. Ipsos defined user query. Lead applicants only.

Figure 1.12: Average annual £m equity investment in firms awarded grants and high scoring matched declined firms



Source: PitchBook. Ipsos defined user query. Lead applicants only.

Econometric analysis

The strength of the impacts of the grants awarded were explored in series of econometric analyses comparing the performance of firms awarded grants to declined applicants using two-way fixed effects modelling and the staggered DiD method described above. The results of these analyses indicated that:

Smart Grants led to increased equity investment

The models implemented indicated that Smart Grants led to a significant increase in cumulative equity investment for firms receiving them. The models comparing firms receiving grants to those declined identified an effect of 15.3 percent, once controls were implemented for firm and time fixed effects, whilst more robust comparisons to firms that were declined but scored over 70 in the assessment suggested the effect size was closer to 12.5 percent. The most robust models indicated an effect size of between 8.3 and 10 percent. This suggests that the Smart Grant programme was successful in leveraging additional equity funding for firms successful in their application.

Mixed evidence of impact on firm valuations

The estimated impacts on the valuations of firms receiving Smart Grants were varied. Comparisons to matched declined applicants suggested that each grant led to a 9.3 percent increase in the value of recipient firms (when accounting for firm and time fixed effects), however the effect size was slightly higher when using matched high scoring declined applicants as the counterfactual at 12.8 percent. However, both of the staggered difference-in-difference models implemented found weaker impacts with only model 6a (including both high-scoring declined applicants and not yet treated applicants) finding any effect weakly significant and estimated at 10.3 percent.

Table 1.17: Estimated impacts of Smart Grants on equity investment by 2024

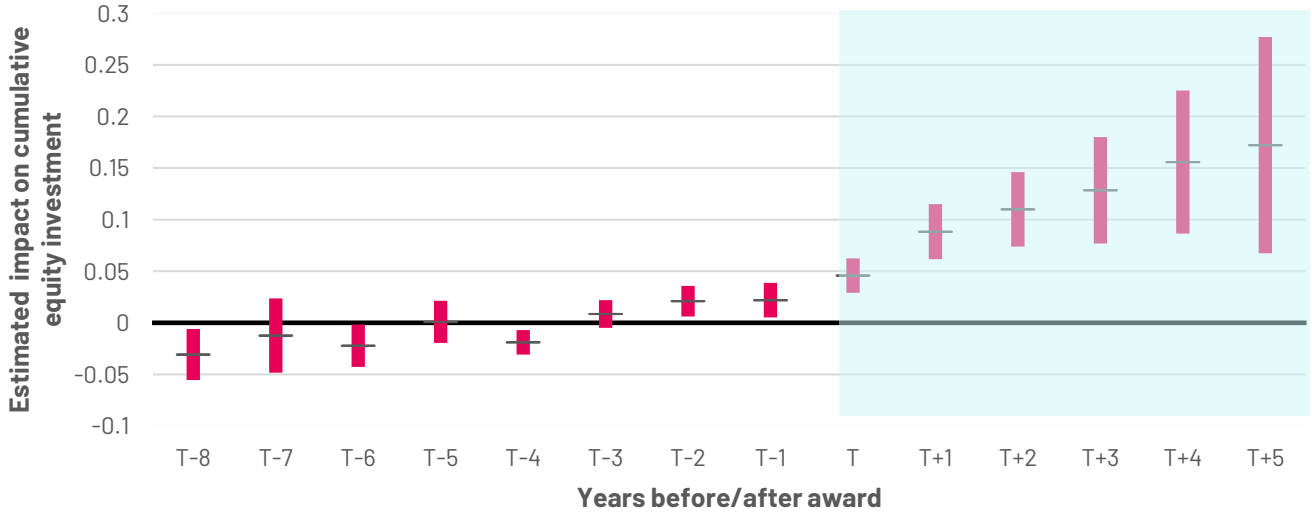
Model	Comparison group	Fixed effects	Time fixed effects	Estimated % impact on cumulative equity investment	Estimated % impact on firm valuations
1	All declined applicants	No	No	31.7***	34.2***
2	All declined applicants	Yes	No	35.7***	70.6***
3	All declined applicants	Yes	Yes	15.3***	9.32**
4	High scoring declined applicants	Yes	Yes	12.5***	12.8***
5	Successful applicants only	Yes	Yes	13.9***	11.7**
6a	Staggered DiD[5]	Yes	Yes	10.0***	10.3*
6b	Staggered DiD[6]	Yes	Yes	8.32**	22.1

Source: Pitchbook. Ipsos analysis. '***', '**' and '*' indicate whether the estimated result is statistically significant at the 99, 95 and 90 percent level respectively.

The impact on equity investment was shown to be persistent with effects lasting for at least three years post award. Using the model estimated in 6a above, the effects are shown to last at least four years post award and may potentially extend further as shown in the first panel below. Restricting the counterfactual pool further to just successful applicants as in model 6b in the table above, the persistence falls to three years post award with this illustrated in the second panel.

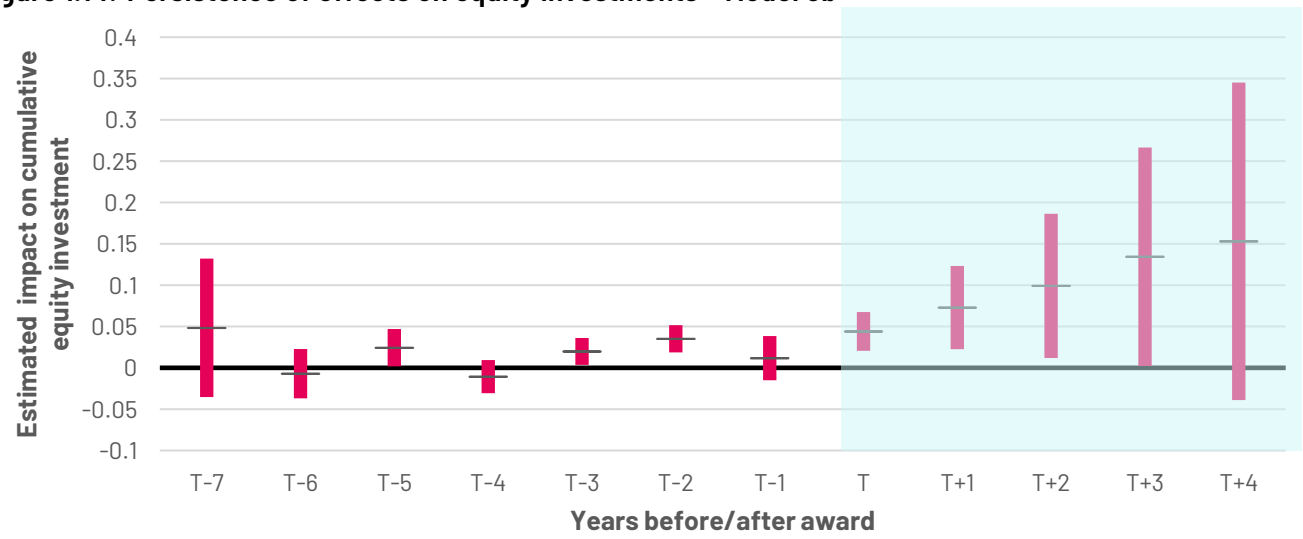
[5] Using high scoring declined applicants and not yet treated successful applicants as the counterfactual.
[6] Using just not yet treated successful applicants as the counterfactual.

Figure 1.13: Persistence of effects on equity investments – Model 6a



Source: PitchBook. Ipsos defined user query. Lead applicants only. T equals year grant awarded. Post grant effect period shaded light blue. Error bars indicate 95% confidence intervals.

Figure 1.14: Persistence of effects on equity investments – Model 6b



Source: PitchBook. Ipsos defined user query. Lead applicants only. T equals year grant awarded. Post grant effect period shaded light blue. Error bars indicate 95% confidence intervals.

Annex B: Economic evaluation

This annex sets out the derivation of the aggregate impacts used in the economic evaluation of the Smart Grants programme. The findings from the econometric analysis presented in Annex A formed the basis of a HMT Green Book compliant cost benefit exercise detailed below and in the main report.

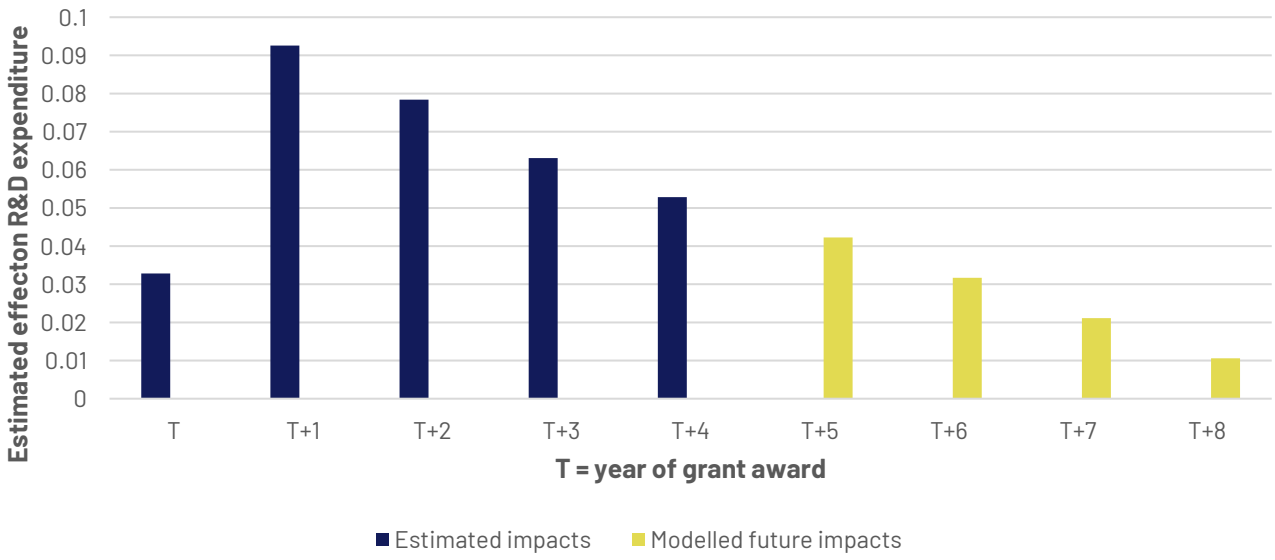
The econometric analysis highlighted that the Smart Grants programme produced positive impacts on outcomes such as R&D expenditure that persisted for up to four years following the award of the grants. This creates some challenges for the analysis, as it there is some uncertainty around how far these impacts may persist further into the future. As such, the total effect on outcomes was estimated over the following time horizons:

- Impacts over the duration of the grant: Based on Innovate UK, Smart Grant awards had a median duration of 17 months (assumed to be two years for the purposes of this analysis).
- Impacts to date: As the impacts of the programme appeared to endure beyond the lifetime of the grant, a second set of analyses focuses on the impacts of the programme over the timeframe of the evaluation (i.e. 2019/20 to 2024/25). These analyses do not incorporate any possible future impacts of the programme.
- Future impacts: The final set of analysis incorporated estimates of the potential future impacts of the programme on the key outcomes. This involved two sets of assumptions. Firstly, it was assumed that the future effects of more recent grants would evolve in line with older grants – implying that the time distribution of impacts estimated using the econometric analysis could be generalised to all grants in the portfolio (noting that the estimated effects of the programme on outcomes four years post-award were largely based on the earliest cohorts of firms). Additionally, it was assumed that effects would continue to persist for a further five years, decaying at a rate of 20 percentage points per annum.

1.9.2 R&D expenditure

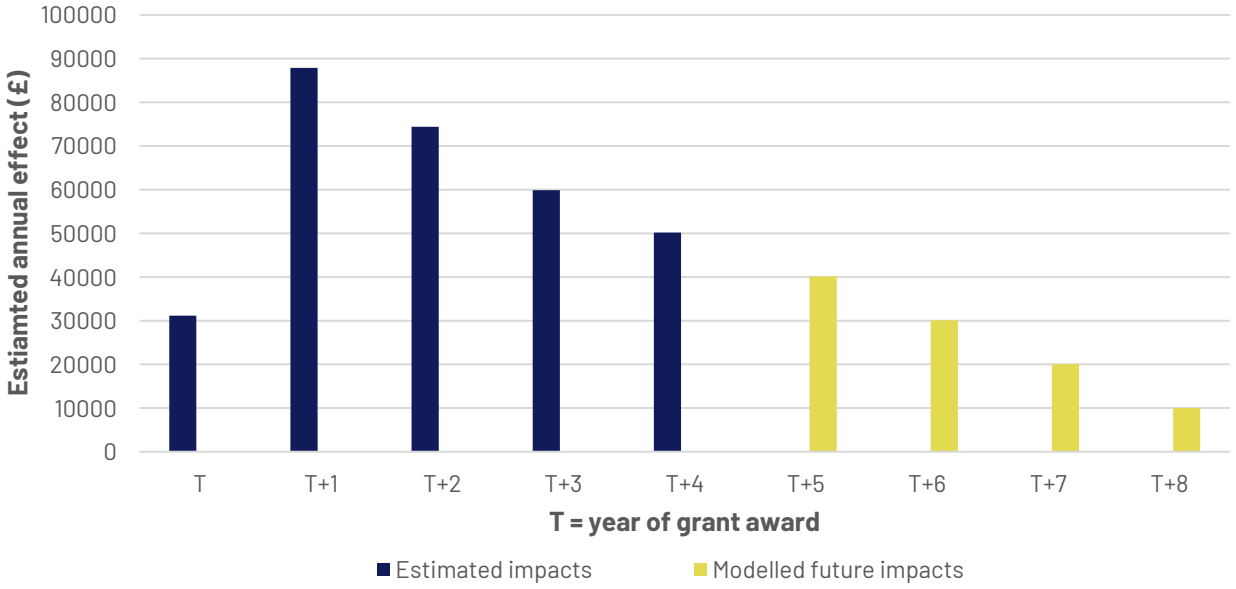
The econometric modelling indicated that each Smart Grant produced impacts on R&D spending from the year of award to four years after (the farthest point for which the data allows effects to be estimated for in the BERD). Given the trend in estimated effects observed until T+4, it would be reasonable to assume that effects do not disappear immediately after but persist for some years past this. An assumption was then made that the effects would continue for another five years but would decay linearly to zero over this period. The figure below illustrates the estimated annual effects until four years post award and the estimated future effects using the above approach.

Figure 1.15: Estimated annual effects on R&D expenditure and modelled future effects



Source: Business Expenditure on R&D, ONS, Ipsos analysis.

Figure 1.16: Effects on R&D expenditure per grant



Source: Business Expenditure on R&D, ONS, Ipsos analysis.

An estimate of the total impact on R&D spending to 2024/25 was derived by taking the average annual R&D spending of firms receiving Smart Grants at the time of grant award[7] (£949,331) and applying the time profile of estimated effects and grants awarded. This is illustrated in the table below and shows that Smart Grants awarded between 2019/20 and 2024/25 led to an estimated overall increase in R&D spending of £550m by

[7] 50 percent trimmed means were used to reduce the influence of outliers. This removes the top 25 and bottom 25 percent of R&D performers from the mean calculation.

the end of 2024/25 (£697m by the end of 2028/29 – the farthest point at which R&D spending impacts can be estimated at present). Including future impacts, it is estimated that Smart Grants will lead to an overall increase in R&D spending of £897m by the end of 2032/33. This estimate does not account for the possibility that the programme placed pressure on prices, leading to reductions in R&D activity elsewhere in the economy.

Table 1.18: Total R&D spending impacts by year since award (£m)

Year funded	Baseline R&D spend (£m)	Grants by year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	Total
2019	0.95	503	16	44	37	30	25	20	15	10	5	0	0	0	0	0	**203**
2020	0.95	604	0	19	53	45	36	30	24	18	12	6	0	0	0	0	**244**
2021	0.95	546	0	0	17	48	41	33	27	22	16	11	5	0	0	0	**220**
2022	0.95	566	0	0	0	18	50	42	34	28	23	17	11	6	0	0	**229**
2023	0.95	214	0	0	0	0	7	19	16	13	11	9	6	4	2	0	**86**
2024	0.95	214	0	0	0	0	0	7	19	16	13	11	9	6	4	2	**86**
Total			**16**	**61**	**100**	**126**	**137**	**126**	**109**	**84**	**60**	**39**	**22**	**11**	**4**	**1**	**897**

Source: Business Expenditure on R&D, ONS, Ipsos analysis. Light blue shading represents effects over the lifetime of grants, dark blue effects as estimated and yellow are forecast based on assumption.

Table 1.19: Total R&D spending impacts

Effects on R&D spending during the grant lifetime (£m)	Effects on R&D spending between 2019/20 and 2024/25 (£m)	Effects on R&D spending between 2019/20 and 2032/33 (£m)
315	550	897

Source: Business Expenditure on R&D, ONS, Ipsos analysis.

Monitoring data indicated that the total project costs at the end of 2024/25 were £747m, of which £403m was funded by the public sector. Over the lifetime of Smart projects (assuming 17 months as indicated in the transparency data),[8] estimated total impacts on R&D spending totalled £315m which implies that 78 percent of spending would not have occurred in the absence of the programme (implying deadweight of 22 percent).

The Smart Grants programme was also shown to have 'crowded-in' additional R&D spending beyond the lifetime of the grant with an overall impact on R&D spending of £1.58 per £1 of public spend to date (expected to rise to £2.65 per £1 of public spend by 2032/33). This gives a leverage ratio of £0.58 of private R&D spending per £1 of public spend to date which is also expected to rise to £1.65 of private R&D spending leveraged per £1 public spend by 2032/33.

Table 1.20: Total R&D spending impacts

	Total R&D spending impact (£m)	Public spend(£m)	Implied increase in private R&D spend (£m)	Leverage ratio
2019/20 to 2024/25	636	403	233	0.58
2019/20 to 2032/33	1,069	403	666	1.65

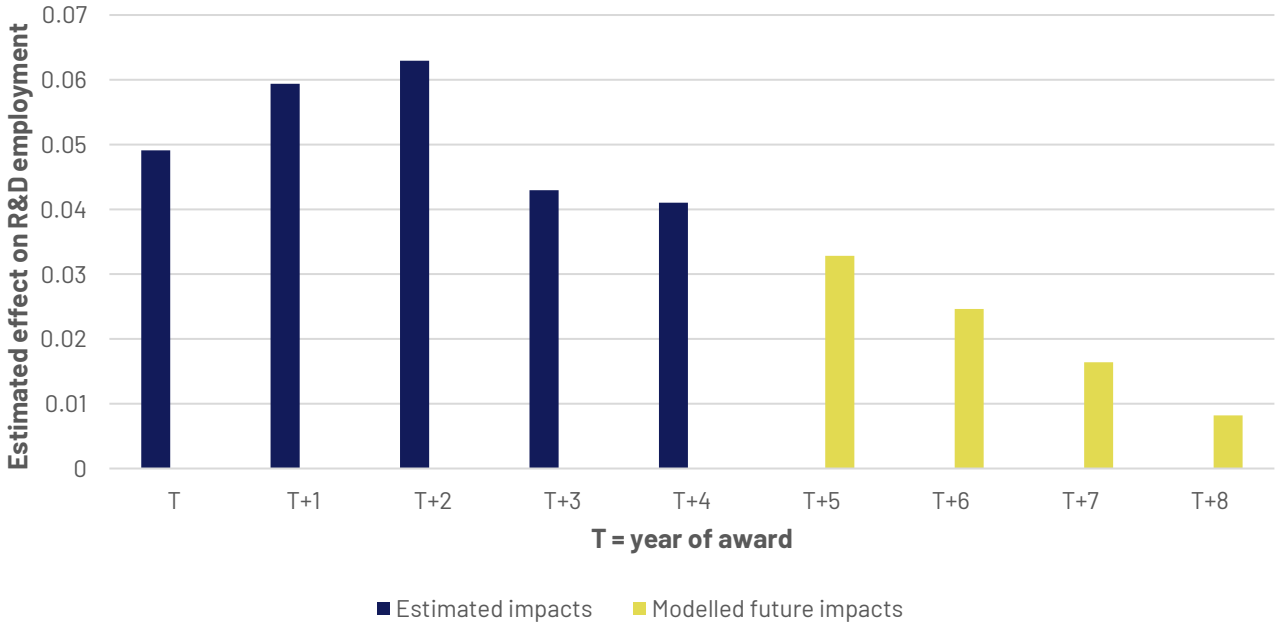
Source: Business Expenditure on R&D, ONS, Ipsos analysis.

1.9.3 R&D employment

The econometric modelling indicated that each Smart Grant produced impacts on R&D employment from the year of award to four years after (the farthest point for which the data allows effects to be estimated for in the BERD). An assumption was again made that the effects would continue for another five years but would decay linearly to zero over this period. The figure below illustrates the estimated annual effects until four years post award and the estimated future effects using the above approach.

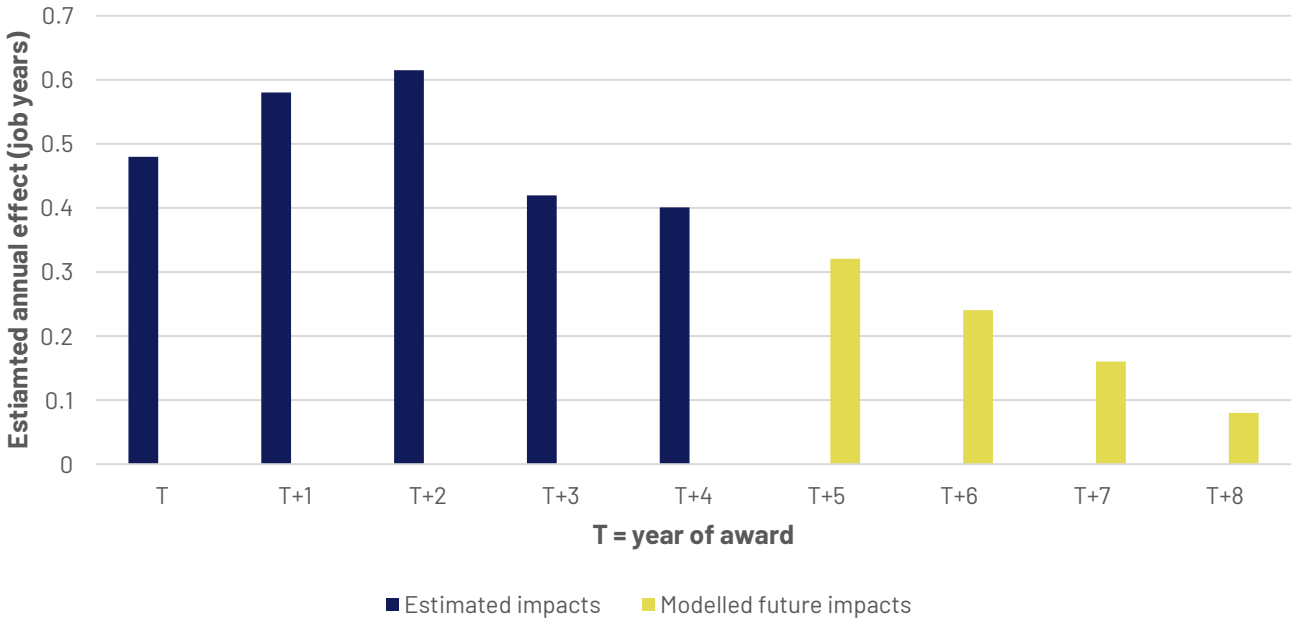
[8] For the purposes of calculating the leverage ratio, two years of post-award impacts are used given the BERD is an annual dataset and the 17 months will stretch into two annual cross sections.

Figure 1.17: Estimated annual effects on R&D employment and modelled future effects



Source: Business Expenditure on R&D, ONS, Ipsos analysis.

Figure 1.18: Effects on R&D employment years per grant



Source: Business Expenditure on R&D, ONS, Ipsos analysis.

An estimate of the total impact on R&D employment to 2024/25 was derived by taking the average annual R&D employment of firms receiving Smart Grants at the time of grant award[9] (9.8) and applying the time

[9] 50 percent trimmed means were used to reduce the influence of outliers. This removes the top 25 and bottom 25 percent of R&D performers from the mean calculation.

profile of estimated effects and grants awarded. This is illustrated in the table below and shows that Smart Grants awarded between 2019/20 and 2024/25 led to an estimated overall increase in R&D employment years of 5,184 by the end of 2024/25 (6,605 by the end of 2028/29 – the farthest point at which R&D employment impacts can be estimated at present). Including future impacts, it is estimated that Smart Grants will lead to an overall increase in R&D employment years of 8,727 by the end of 2032/33.

Table 1.21: Total R&D employment impacts by year since award (£m)

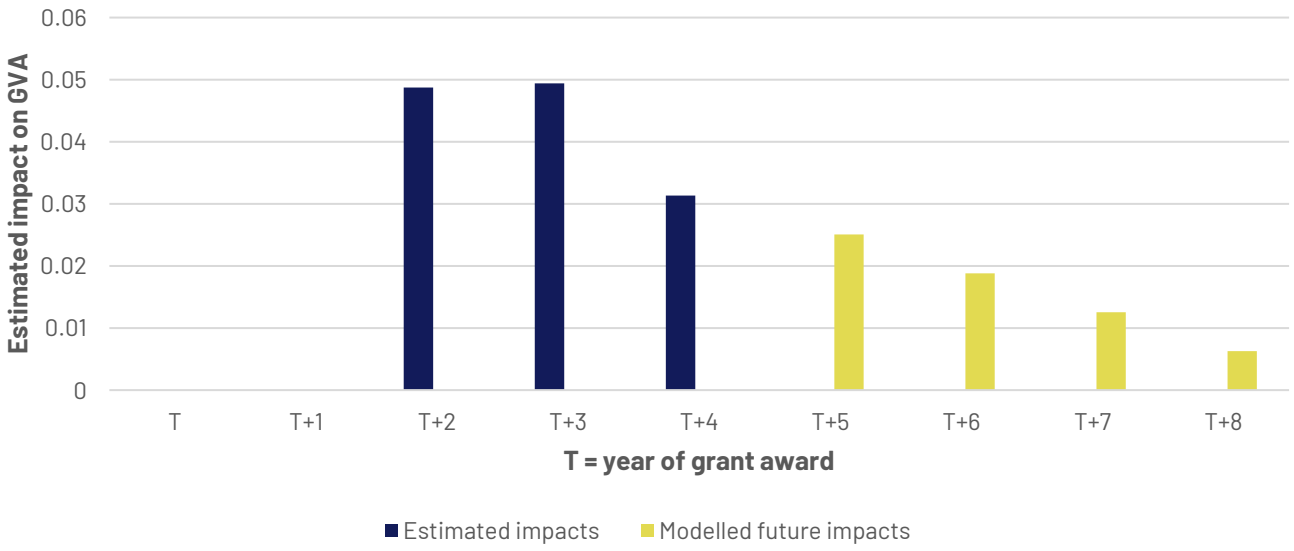
Year funded	Baseline R&D employment	Grants by year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	Total
2019	9.8	503	241	292	309	211	202	0	0	0	0	0	0	0	0	0	**1255**
2020	9.8	604	0	290	350	371	253	242	0	0	0	0	0	0	0	0	**1507**
2021	9.8	546	0	0	262	317	336	229	219	0	0	0	0	0	0	0	**1363**
2022	9.8	566	0	0	0	272	328	348	237	227	0	0	0	0	0	0	**1412**
2023	9.8	214	0	0	0	0	103	124	132	90	86	0	0	0	0	0	**534**
2024	9.8	214	0	0	0	0	0	103	124	132	90	86	0	0	0	0	**534**
Total			**241**	**582**	**922**	**1171**	**1222**	**1046**	**712**	**448**	**176**	**86**	**0**	**0**	**0**	**0**	**6605**

Source: Business Expenditure on R&D, ONS, Ipsos analysis. Light blue shading represents effects over the lifetime of grants, dark blue effects as estimated and yellow are forecasted.

1.9.4 Total impact on overall output (GVA)

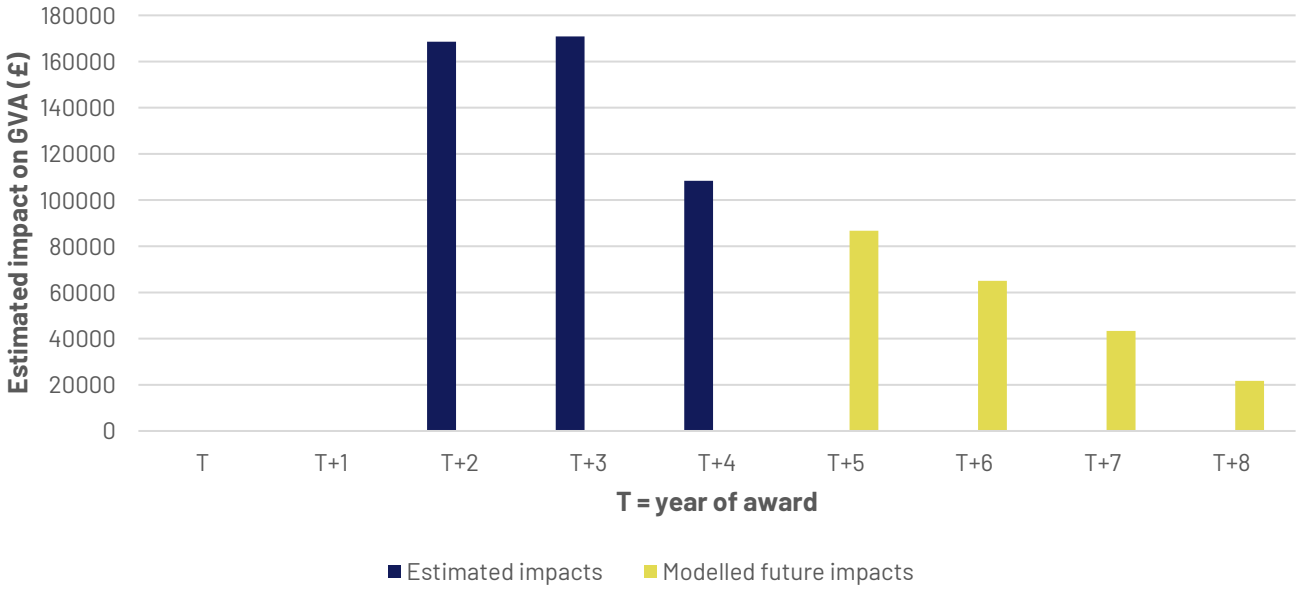
The econometric modelling found that each Smart Grant produced impacts on overall GVA from two years post award and persisting for at least another two years (to farthest point for which the data allows effects to be estimated for in the ABS). Following the example with R&D spending impacts, it was assumed that the effects would continue for another five years but would decay linearly to zero over this period. The figure below illustrates the estimated annual effects on GVA until four years post award and the estimated future effects using the above approach.

Figure 1.19: Estimated annual effects on total GVA and modelled future effects



Source: Annual Business Survey, ONS, Ipsos analysis.

Figure 1.20: Estimated effect on GVA per grant



Source: Annual Business Survey, ONS, Ipsos analysis.

An estimate of the total impact on GVA to 2024/25 was derived by taking the average annual GVA of firms receiving Smart Grants at the time of grant award[10] (£3,459,402) and applying the time profile of estimated effects and grants awarded. This is illustrated in the table below and shows that Smart Grants awarded between 2019/20 and 2024/25 led to an estimated overall increase in GVA of £820m by the end of 2024/25. This equates to £1.82 in additional GVA per £1 of public spending. Including future impacts, it is estimated that Smart Grants will lead to an overall increase in GVA of £1.8bn by the end of 2032/33. This would equate to £3.92 of GVA per £1 of public spending. It should be noted that these GVA based metrics should not be taken as a measure of economic 'benefit' as they do not account for possible offsetting effects (such as the displacement of domestic competitors) or the investment costs incurred by the private sector in bringing these growth outcomes about.

[10] 50 percent trimmed means were used to reduce the influence of outliers. This removes the top 25 and bottom 25 percent of R&D performers from the mean calculation.

Table 1.22: Total GVA impacts by year since award (£m)

Year funded	Baseline GVA (£m)	Grants by year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	Total
2019	3.5	503	0	0	85	86	55	44	33	22	11	0	0	0	0	0	**334**
2020	3.5	604	0	0	0	102	103	65	52	39	26	13	0	0	0	0	**401**
2021	3.5	546	0	0	0	0	92	93	59	47	36	24	12	0	0	0	**363**
2022	3.5	566	0	0	0	0	0	95	97	61	49	37	25	12	0	0	**376**
2023	3.5	214	0	0	0	0	0	0	36	37	23	19	14	9	5	0	**142**
2024	3.5	214	0	0	0	0	0	0	0	36	37	23	19	14	9	5	**142**
Total			**0**	**0**	**85**	**188**	**250**	**298**	**277**	**242**	**181**	**115**	**69**	**35**	**14**	**5**	**1,759**

Source: Annual Business Survey, ONS, Ipsos analysis. Light blue shading represents effects over the lifetime of grants, dark blue effects as estimated and yellow are forecasted.

Table 1.23: Total GVA impacts

Effects on GVA between 2019/20 and 2024/25 (£m)	Effects on GVA 2019/20 and 2032/33 (£m)
408	818

Source: Business Expenditure on R&D, ONS, Ipsos analysis.

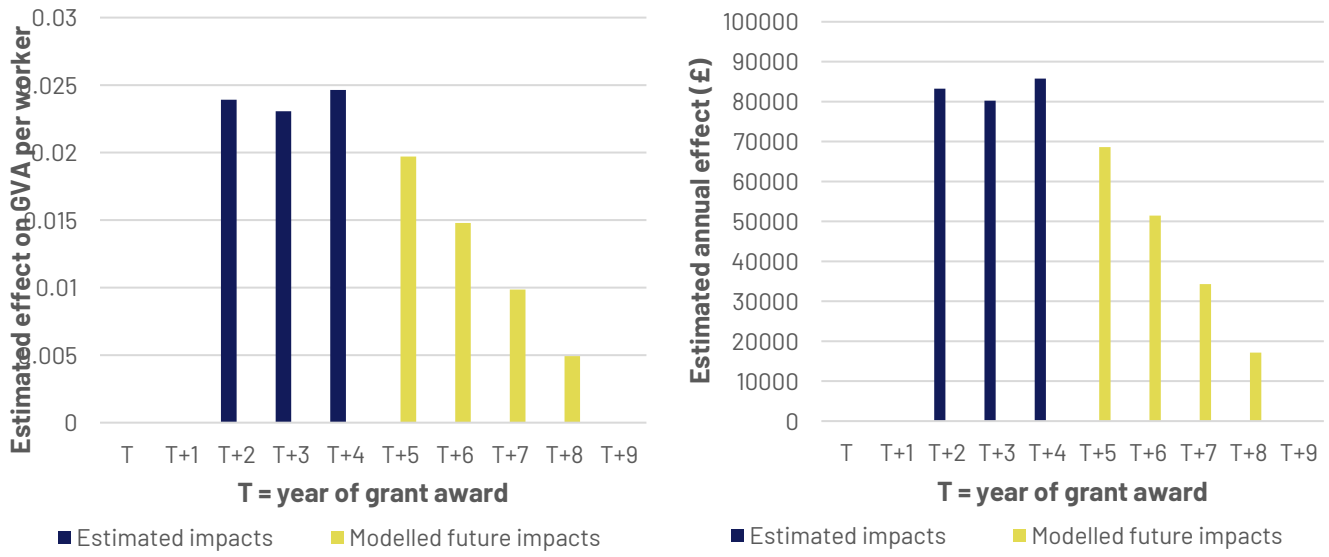
Productivity gains

The principal benefits of the programme related to the productivity gains associated with the grants:

Short-term improvements in productivity/profitability

The econometric findings indicated that Smart Grants have a statistically significant and temporary effect on GVA per worker of around 2.4 percent from two years post award to four years post. Assuming that the estimated effects on GVA per worker persist but decay linearly to zero over five years past T+4, the value of these productivity gains was estimated based on average employment at the point at which Smart Grants were awarded (42 - to avoid double counting any productivity gains associated with the item below) x average baseline GVA per worker across the pool of firms receiving funding (£112,364) x estimated effect on GVA per worker. This gives an impact per grant of £573,579.

Figure 1.21: Estimated annual effects on GVA per worker and modelled future effects



Source: Annual Business Survey, ONS, Ipsos analysis.

These estimates were then applied to each cohort of grants awarded between 2019/20 and 2024/25, to reach an estimate of the total additional productivity gains (and discounted in line with the recommended rate of social time preference of 3.5 percent). By the end of 2024/25, short term productivity improvements associated with Smart Grants were estimated at £610m (£529m in present value). The lifetime value of these benefits (up to 2028/29 for currently funded projects) was estimated at £900m (£754m in present value). By 2032/33, this rises to an estimated £1.5bn in productivity improvements (£1.2bn in present value).

Table 1.24: Total short term GVA per worker impacts by year since award (£m)

Year funded	Baseline employment	Baseline GVA per worker (£m)	Grants by year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	Total
2019	42	0.11	503	0	0	57	55	59	47	35	24	12	0	0	0	0	0	**289**
2020	424	0.11	604	0	0	0	69	66	71	57	42	28	14	0	0	0	0	**347**
2021	42	0.11	546	0	0	0	0	62	60	64	51	38	26	13	0	0	0	**313**
2022	42	0.11	566	0	0	0	0	0	64	62	66	53	40	26	13	0	0	**325**
2023	42	0.11	214	0	0	0	0	0	0	24	23	25	20	15	10	5	0	**123**
2024	42	0.11	214	0	0	0	0	0	0	0	24	23	25	20	15	10	5	**123**
Total				**0**	**0**	**57**	**124**	**187**	**242**	**242**	**231**	**180**	**124**	**74**	**38**	**15**	**5**	**1,519**

Source: Annual Business Survey, ONS, Ipsos analysis. Light blue shading represents effects over the lifetime of grants, dark blue effects as estimated and yellow are forecasted.

Table 1.25: Total short term productivity benefits

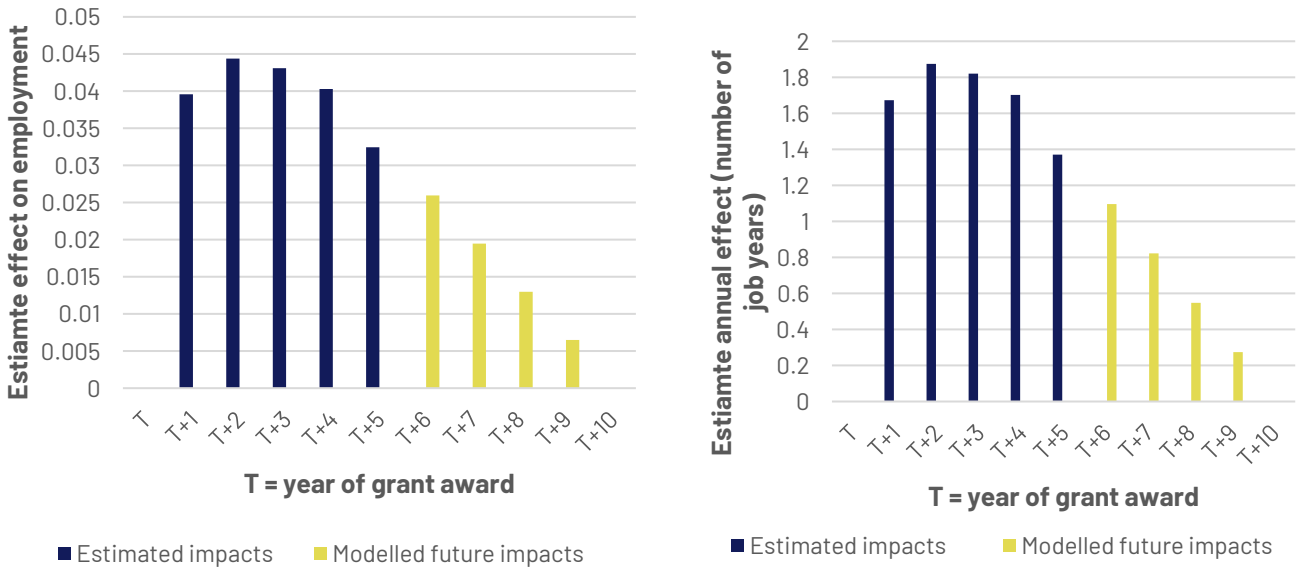
Effects on productivity between 2019/20 and 2024/25 (£m)		Effects on productivity between 2019/20 and 2032/33 (£m)	
Value (£m)	PV (£m)	Value (£m)	PV (£m)
610	529	1519	1221

Source: Annual Business Survey, ONS, Ipsos analysis.

- Output safeguarded by protecting high productivity jobs: The programme has also been effective in creating/safeguarding employment in more productive firms, offering higher wages than average for the sector:

  – Average impact per grant: The effect on employment per grant was estimated at between 3.2 and 4.4 percent enduring from one year post award to at least five years post. The total value of output created/safeguarded was generated by first calculating the number of job years created/safeguarded per grant implied by the econometric results. This was achieved by multiplying the baseline number of employees (42) by the estimated effect for each year post award. This led to an estimated total of 8.4 job years created/safeguarded per grant, assuming impact on employment also persist for five years beyond the estimation period, decaying linearly to zero.

Figure 1.22: Effects on employment per grant



Source: Business Structure Database, ONS, Ipsos analysis.

– Total impact on job years created/safeguarded: These estimates were then applied to each cohort of grants awarded between 2019/20 and 2024/25, to reach an estimate of the total additional number of job years safeguarded by the programme of 13,811 by 2024/25 and 29,595 by 2033/34 (when modelled future impacts are included).

Table 1.26: Total job year impacts by year since award (£m)

Year funded	Baseline employment	Grants by year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Total
2019	42	503	–	841	943	916	856	689	551	414	276	138	-	-	-	-	-	**5,624**
2020	42	604	–	-	1,010	1,132	1,099	1,028	828	662	497	331	166	-	-	-	-	**6,753**
2021	42	546	–	-	-	913	1,024	994	929	748	599	449	299	150	-	-	-	**6,105**
2022	42	566	–	-	-	-	947	1,061	1,030	963	776	621	465	310	155	-	-	**6,328**
2023	42	214	–	-	-	-	-	358	401	390	364	293	235	176	117	59	-	**2,393**
2024	42	214	–	-	-	-	-	-	358	401	390	364	293	235	176	117	59	**2,393**
Total			**–**	**841**	**1,953**	**2,961**	**3,926**	**4,130**	**4,098**	**3,578**	**2,900**	**2,196**	**1,458**	**871**	**448**	**176**	**59**	**29,596**

Source: Business Structure Database, ONS, Ipsos analysis. Light blue shading represents effects over the lifetime of grants, dark blue effects as estimated and yellow are forecasted

Table 1.27: Total employment impacts

Effects on job years between 2019/20 and 2024/25	Effects on R&D spending between 2019/20 and 2033/34 (£m)
13,811	29,596

Source: Business Structure Database, ONS, Ipsos analysis.

A baseline weighted average hourly wage was then calculated for firms that received a grant by applying the proportion of firms by industrial sector to the average baseline hourly wage before award. This is illustrated in the table below and resulted in a weighted baseline hourly wage for successful applicants of £26.71. The industrial profile of grant recipient firms was then applied to average wages by industry to generate the weighted average comparison (£20.50) from which a wage premium could be calculated (£6.21).[11]

[11] £26.71-£20.50

Table 1.28: Construction of wage premium by sector

Industrial sector	A Proportion of successful applicants by industrial sector	B Average baseline wages by industrial sector (successful applicants)	C Average wages by industrial sector (2019)	D=B -C Wage premium by sector
C: Manufacturing	28%	22.18	16.82	5.36
D: Electricity, Gas, Steam and Air Conditioning Supply	3%	27.17	21.98	5.19
E: Water Supply; Sewerage, Waste Management and Remediation Activities	6%	22.40	16.69	5.71
F: Construction	2%	21.96	17.6	4.36
G: Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	1%	17.48	14.14	3.34
H: Transportation and Storage	5%	20.95	16.18	4.77
I: Accommodation and Food Service Activities	2%	12.44	10.78	1.66
J: Information and Communication	20%	30.85	22.99	7.86
K: Financial and Insurance Activities	17%	36.54	28.47	8.07
M: Professional, Scientific and Technical Activities	9%	29.66	22.3	7.36
N: Administrative and Support Service Activities	1%	19.70	14.43	5.27
P: Education	2%	21.83	18.36	3.47
Q: Human Health and Social Work Activities	4%	18.73	16.4	2.33

Source: ASHE, ONS, Ipsos analysis.

- A 35-hour work week for 52 weeks was then assumed to give an estimated wage premium of £11,308[12] per job year for each grant awarded. The total value of the productivity benefit from the creation/safeguarding of more productive jobs was then calculated by multiplying the number of jobs years created/safeguarded by the estimated uplift (£11,308) and the discount factor.

[12] 6.71*35*52

Table 1.29: Total GVA impacts from creation/safeguarding of high value jobs by year since award (£m)

Year funded	Wage premium	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Total
2019	11308	0	10	11	10	10	8	6	5	3	2	0	0	0	0	0	**64**
2020	11308	0	0	11	13	12	12	9	7	6	4	2	0	0	0	0	**76**
2021	11308	0	0	0	10	12	11	11	8	7	5	3	2	0	0	0	**69**
2022	11308	0	0	0	0	11	12	12	11	9	7	5	4	2	0	0	**72**
2023	11308	0	0	0	0	0	4	5	4	4	3	3	2	1	1	0	**27**
2024	11308	0	0	0	0	0	0	4	5	4	4	3	3	2	1	1	**27**
Total		**0**	**10**	**22**	**33**	**44**	**47**	**46**	**40**	**33**	**25**	**16**	**10**	**5**	**2**	**1**	**335**

Source: Business Structure Database, Annual Business Survey and Annual Survey of Hours and Earnings, ONS, Ipsos analysis. Light blue shading represents effects over the lifetime of grants, dark blue effects as estimated and yellow are forecasted

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- Using this method, the total value of created/safeguarded output by the end of 2024/25 was estimated at £156m (£137m in present value) with lifetime benefit estimated at £335m (£261m in present value).

Table 1.30: Total benefits

	Total effects between 2019/20 and 2024/25 (£m)		Total effects between 2019/20 and 2033/34 (£m)	
	Value (£m)	PV (£m)	Value (£m)	PV (£m)
Short-term productivity	562	489	1,519	1,221
Created / safeguarded output	156	137	335	261
Total	718	626	1,854	1,482

Source: Ipsos analysis. Base year = 2019. 3.5% discount rate.

1.9.5 Public sector costs

Innovate UK provided a time profile of grant funding awarded since 2019. This is presented in the table below alongside the discounted value of these costs. Note that additional administrative costs associated with the programme were not available to the evaluation.

Table 1.31: Public sector grant costs (£m)

	2019/20	2020/21	2021/2022	2022/23	2023/24	2024/25	Total
Value of grant funding paid (£m)	3.2	49.3	85.4	100	103	61.7	403
Discounted value of grant funding paid (£m)	3.2	47.6	79.5	89.9	89.3	51.6	361
Discount factor	1.00	0.97	0.93	0.90	0.87	0.84	-

Source: Ipsos analysis. Base year = 2019. 3.5% discount rate.

2 Appendix A: IS8 assignment

Table 2.1: IS8 SIC code mapping

IS8 Sector	SIC code	Description
Advanced Manufacturing	20	Manufacture of chemicals and chemical products
	26	Manufacture of computer, electronic and optical products
	27	Manufacture of electrical equipment
	28	Manufacture of machinery and equipment not elsewhere classified
	29	Manufacture of motor vehicles, trailers and semi-trailers
	30	Manufacture of other transport equipment
Clean Energy Industries	8742	Energy Conservation & Management Consultants.
	8748-93	Energy Code Compliance Analysts.
	1711-31	Energy Management Systems & Product
	2711	Manufacture of electric motors, generators, transformers.
	2790	Manufacture of other electrical equipment (e.g., inverters).
	2720	Manufacture of batteries and accumulators (for storage).
	2732	Manufacture of electronic/electric wires and cables.
	5033-06	Energy Conservation Products (Wholesale).
	5074-07	Solar Energy Equipment/Systems (Wholesale).
	5211-36	Energy Conservation Products (Retail).
	1711-64	Wind Power (Installation/Services).
	8731-03	Solar Energy Research & Development.
Creative Industries	3212	Manufacture of jewellery and related articles
	58	Publishing activities
	59	Motion picture, video and television programme production; sound recording and music publishing activities
	60	Programming and broadcasting activities
	6201	Computer programming activities
	6202	Computer consultancy activities
	7021	Public relations and communication activities
	7111	Architectural activities
	731	Advertising
	741	Specialised design activities
	742	Photographic activities

IS8 Sector	SIC code	Description
	743	Translation and interpretation activities
	8552	Cultural education
	90	Creative, arts, and entertainment activities
	9101	Library and archive activities
	9102	Museum activities
Defence	254	Manufacture of weapons and ammunition
	304	Manufacture of military fighting vehicles
Digital and Technologies	261	Manufacture of electronic components and boards
	262	Manufacture of computers and peripheral equipment
	263	Manufacture of communication equipment
	264	Manufacture of consumer electronics
	26511	Manufacture of electronic instruments and appliances for measuring, testing, and navigation, except industrial process control equipment
	26512	Manufacture of electronic industrial process control equipment
	26513	Manufacture of non-electronic instruments and appliances for measuring, testing, and navigation, except industrial process control equipment
	26701	Manufacture of optical precision instruments
	268	Manufacture of magnetic and optical media
	2731	Manufacture of fibre optic cables
	2732	Manufacture of other electronic and electric wires and cables
	279	Manufacture of other electrical equipment
	465	Wholesale of information and communication equipment
	58	Publishing activities
	59	Motion picture, video, and television programme production; sound recording; music publishing activities
	60	Programming and broadcasting activities
	61	Telecommunications
	62	Computer programming, consultancy, and related activities
	63	Information service activities
	7112	Engineering activities and related technical consultancy
	712	Technical testing and analysis
	721	Research and experimental development on natural sciences and engineering
	951	Repair of computers and communication equipment

IS8 Sector	SIC code	Description
Financial Services	64	Financial service activities, except insurance and pension funding
	65	Insurance, reinsurance, and pension funding, except compulsory social security
	66	Activities auxiliary to financial services and insurance activities
Life Sciences	21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
	266	Manufacture of irradiation, electromedical, and electrotherapeutic equipment
	325	Manufacture of medical and dental instruments and supplies
	7211	Research and experimental development on biotechnology
Professional and Business Services	69	Legal and accounting activities
	70	Activities of head offices; management consultancy activities
	71	Architectural and engineering activities; technical testing and analysis
	72	Scientific research and development
	73	Advertising and market research
	74	Other professional, scientific, and technical activities
	77	Rental and leasing activities
	78	Employment activities
	82	Office administrative, office support, and other business support activities

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