Department for Business & Trade

APC Impact Evaluation

Technical annex

Contents

Introduction

This paper sets out the interim findings of a series of econometric analyses exploring the impacts of APC grant funding though APC rounds 1 through to 22 (including exceptional rounds) between 2013 and 2022. The analysis makes use of longitudinal data on R&D spending, wages, employment, GVA and turnover derived from the Annual Business Survey (ABS), Business Expenditure on R&D Survey (BERD), the Business Structure Database (BSD) and the Annual Survey of Hours and Earnings (ASHE).

Key findings

The results from the econometric analysis completed suggest that[1]:

- **R&D activity:** Grants for R&D awarded through the APC grant funding programme had a positive and persistent impact on the R&D activity of firms awarded grants (visible in both R&D expenditure and employment). Annual R&D expenditure by firms receiving grants was estimated to be 7% higher than would have been without the APC programme. Annual R&D employment was also estimated to be 12% higher than in the absence of the programme.

  Impacts on both R&D spending and employment were identified from one year post award and lasted for seven years. This is substantially longer than the typical duration of an APC project (3.3 years) and suggests that the APC funding had led to a significant amount of additional R&D activity beyond the initial APC project. This could be associated with the same technology developed through the APC project, but it may also be in part explained by additional projects and/or technologies developed off the back of the initial APC funded project.

  Impacts were larger for lead firms with an estimated 15% increase in annual R&D employment compared to 5% for collaborators than would have been the case in the absence of the programme. Annual R&D spending impacts were also only present for lead firms, implying an 11% increase above what they would have invested without APC funding.

  The analysis estimates that the programme led to a total increase in R&D spending of £1bn by the end of 2022. 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. The findings also imply that the programme has supported the creation or safeguarding of around 8,300 R&D job years (which compares with a gross figure of 14,800 expected at the application stage in VfM forms).

- **Capital expenditure:** APC grants led to a significant increase in net capital investment with firms receiving grants investing 25% more in facilities and physical assets than they would have in the absence of the programme. This effect occurs from 4 years after grant award and is present for 3 years. This would suggest that firms begin to expand R&D and/or manufacturing capabilities towards the end of APC projects in anticipation of technologies reaching commercialisation.

- **Growth impacts:** APC grants to businesses were also found to have impacts on overall business performance including overall employment, turnover and output (GVA[2]). Employment for lead applicants increased by 5% relative to the counterfactual whilst turnover increased by 8%. These impacts were persistent from 1 to 7 years post award and would indicate that firms expanded employment for production and had begun to see sales. Output (as measured by GVA and reported in section 1.7.2) also increased for both lead

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[1] All results presented here are based upon estimates obtained from the staggered difference in difference specifications. See section 1.5 and section 1.6 for details.

[2] GVA as measured in the Annual Business Survey is a measure of the income generated by businesses, industries or sectors, less the cost of goods and services used to create the income.

and collaborator applicants with lead firm output increasing by 10% and collaborator output increasing by 8%, relative to what they would have in the absence of APC funding.

Using the same method as for R&D jobs, results in an estimated 35,000 job years safeguarded or created by 2022. When compared to the effect of the programme on R&D jobs, this indicates that most of these positions are likely to be in non-R&D roles. It should be noted that these are gross additional rather than net additional effects and have not been adjusted for either displacement or crowding out.

- **Productivity impacts:** The analysis on employment, turnover and GVA implied a small increase in productivity from APC grant funding of around 2%. Some evidence for a productivity effect can also be found in the wage analysis which suggested that APC grants had a positive effect on hourly earnings of 1.6% on overall wages with no significant effect on hours worked. This could be interpreted as a signal of productivity gains but the possibility that additional demand for workers has produced wage inflation (which is more difficult to interpret as a productivity effect) cannot be ruled out. Using the estimated wage effects and assuming these represent productivity gains, APC funding led to an estimated £249.5m in GVA gains by 2022.

  A direct effect on GVA per worker of between 3.6 and 4% was, however, identified lasting for two years starting 3 years after a grant award.

- **Plant closures:** Analysis highlighted that a marginal share of firm performance impacts such as employment turnover and GVA impacts were achieved by preventing the closure of plants operated by successful applicants. Firms receiving APC funding closed 0.6% fewer plants within 3 years of receiving APC funding and 1.3% fewer within 5 years compared to what they would have in the absence of the APC programme.

- **Indirect impacts:** Analysis indicated that APC grant awards had a positive effect on the number of firms located in areas proximate to those in which firms receiving grants were located. These effects were largest in the output area in which the firms' receiving grants were located (7%) but were positive though smaller at greater distances. This indicates that APC grants have worked to produce clustering effects at the local level, with no evidence of net displacement effects within 10km. The findings from the wider economic activity analysis (including effects on employment, turnover and turnover per worker) indicated that the APC has produced positive spill-over effects for local economies. Given the evidence on firm relocations, it is assumed that some of this effect has come from the attraction of higher value activities to the area as well as the increase in output for existing firms. It should be noted that there will likely be corresponding negative effects on some more distant economies from which activities were relocated.

Key hypotheses

The APC funding competition has the potential to result in greater levels of economic activity through the following mechanisms:

- **R&D activity:** In the short to medium term, grants awarded through the programme could be expected to lead to increased levels of R&D spending. This assumes funding is not used to either fund activity that the private sector would have funded anyway (deadweight) or encourage the diversion of resources from parallel programmes of development activity (crowding out or displacement). Greater spending on R&D may induce some firms to increase their employment of workers, potentially those in R&D roles. However, greater R&D expenditure will not necessarily feed through to the recruitment of new workers to the

extent that the additional spending is placed with subcontractors or existing workers are redeployed. In these cases, the impact of additional spending on employment might be anticipated within the supply chain rather than at the level of firms applying for grant funding (known as multiplier effects).

- **Crowding out:** Greater demand for the required inputs to the R&D process - such as skilled labour - could place pressure on wages and other prices. This could have offsetting effects elsewhere in the economy by reducing demand for labour and other inputs amongst other firms. In a closed economy operating at full employment, any expansion in employment amongst firms receiving grants will be neutralised by these types of effect. However, employment may still rise in net terms if firms are able overcome labour supply constraints by attracting workers from overseas or if higher wages encourage the economically inactive to enter the labour market.

- **Exploitation:** In the long term, firms successfully developing their technologies may move into an exploitation phase in which they seek to commercialise the underlying technologies refined through the R&D process. The typical expectation is that APC funded technology will be integrated into new vehicle models. This could occur via the integration of the entire propulsion system or the integration of individual components into new vehicles. However, other R&D outputs could be exploited by recipients, such as the development of new manufacturing processes or software. To commercialise any R&D outputs, it is expected that firms will need to scale-up their operations to manufacture at scale. This may require additional funds from the firm or an external investor. Assuming firms can successfully launch new innovations to market, this would be expected to result in increases in sales or turnover, and employment and output (GVA). Conventional productivity of the firm will also potentially rise as it moves from investment in R&D to productive activities.

However, several factors make this process complex:

- **Product development timescales:** Product development timescales are long term in nature. While this evaluation covers a group of firms that received grants between 2013 and 2022, the timescales involved with bringing new automotive technologies to market are extensive. As such, it may be too early in the development process to expect significant commercialisation effects at this stage. External factors such as the COVID-19 pandemic and supply chain constraints may also have extended typical timeframes for development.

- **Resource requirements:** Completing the product development process may require a level of resources that cannot be brought to the project by an SME. SMEs may be well placed to develop a prototype power electronics component but will likely not have access to the resources and infrastructure needed to manufacture it in the required volumes for additional testing and validation. As such, the firms leading the initial development of the product may seek to license the technology to (or enter some other form of collaboration agreement with) a large OEM or Tier 1 firm with deeper resources to take forward development. Alternatively, the firm may seek to achieve an exit to such a company. In these cases, long term economic outcomes may be difficult to trace as production of the underlying technology will be taken forward by another firm.

- **Displacement and crowding out:** Where firms do successfully commercialise a new product, there are also offsetting effects that need to be accounted for. If firms claim market share from domestic competitors that produce alternatives, there may be corresponding loss of revenues, output and employment elsewhere in the UK. Even where sales are taken from overseas competitors, additional demand for labour and other inputs may put pressure

on wages and other prices, encouraging other firms to reduce their production. These effects need to be considered to develop an understanding of the net economic impacts involved.

Outcomes of interest

The key outcomes of interest 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. Our measure for R&D expenditure includes spending on R&D employment but is not disaggregated to spending items.

- **Employment, turnover, GVA and turnover per worker –** to examine the economic impacts of the grants awarded (with turnover per worker used as a proxy measure for productivity).

- **Wages and hours worked –** to examine the impacts of grants awarded on workers' wages as an indicator for productivity.

- **Capital expenditure–** to examine impacts of grants awarded in stimulating additional capital expenditure. The outcome variable for capital expenditure includes £ spending on significant capital investments if they are for R&D, facilities or production but does not include spending on inputs to production processes.

All prices used in the analysis were converted to 2023 prices for consistency.

Data

The following table provides an overview of the data used in this analysis. The BERD, ASHE and BSD datasets were accessed via the ONS Secure Research Service. Data from PitchBook was obtained using queries defined by Ipsos (and figures may not match PitchBook publications).

Table A.1 Datasets used in the analysis

Dataset	Description and role in study
APC funding/application data (APC)	The project sample included information on the firms applying for APC grants (including leads and collaborators). A total of 347 firms could be attached to company reference numbers (CRN) and were usable for linking. This was used to support onward linking to the Interdepartmental Business Register and the datasets described below. The data sent for matching included 247 firms that secured at least one grant and 118 that did not (see section 1.5 on counterfactual selection). The data included the number of grants awarded by year and as lead/collaborator as well as detail on application scores.
Business Expenditure on Research and Development Survey (ONS)	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 applying for APC funding. Data was obtained for 203 of the 347 firms (a matching rate of 59%), giving 1,871 observations over the 2010 to 2021 period. The BERD 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.
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% 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).

	319 of the 347 firms applying for funding (a matching rate of 92%) were successfully matched to the IDBR giving good coverage of the population of firms awarded APC grants. Data was extracted for the 2010 to 2022 period, giving a total of 3,988 observations.
	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 2,798 workers was obtained across the 319 firms linked in the SRS with 11,192 observations.
Annual Business Survey (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 can be used to provide observations on GVA, capital investment and GVA per worker.
	232 firms were matched to the ABS accounting for 67% of the 347 firms sent for linking. There were a total of 1,065 observations for analysis.

Counterfactual selection

To understand the additional effect of the programme, a counterfactual scenario needs to be developed describing what would have happened to APC applicants had they not received funding. However, as grants were allocated on a non-random basis, counterfactual selection needs to address potential selection bias issues, in other words, to ensure that systematic differences between organisations in the treatment and counterfactual groups are minimised as far as possible.

In the case of the APC, selection bias is potentially introduced at two stages:

- **Self-selection:** Applicants 'self-select' into the treatment by applying for APC competition funding. Applicants can be assumed to systematically differ from non-applicants in ways

that would influence comparisons. For example, non-applicants may not be exposed to the same financial constraints as those applying for funding, which could reflect unobserved characteristics of the applicant or project - such as the risk associated with technologies under development, anticipated profits levels, or managerial qualities. In this example, comparing non-applicant firms to those benefitting from APC funding would understate the effect of public support, as the former would - under normal conditions - be expected to outperform the latter. Alternatively, non-applicants may not have developed their own programme of R&D activity, meaning the comparison may now overstate any effects caused by public support.

- **Independent assessment process:** Independent assessment processes, completed by both Innovate UK and DBT, introduce an additional level of potential bias:

  - In the case of Innovate UK assessments, applications are judged primarily in terms of their scientific merits, technical feasibility, the quality of the team, and the strength of the commercial opportunity. If these judgements are made effectively, it may be expected that successful applicants would outperform unsuccessful applicants in the absence of public funding. However, to the degree that deadweight formed part of the deliberations of the assessors, the bias could potentially run the other way (though evidence gathered through other evaluations has suggested that considerations of additionality are not always the primary focus of independent assessors).

  - In the case of DBT assessments, applications are scrutinised on the extent to which the provide good value for money. This assessment is driven by expected changes in employment, skills and training, R&D spillovers, commercial and environmental benefits, discounted for measures of additionality, e.g. displacement and deadweight, and risk. These assessments are based on information provided by applicants, which is scrutinised by DBT analysts. As a result, there is a potential for bias to influence the result of the assessment either way. For example, organisations may have overstated the benefits expected from changes in R&D employment because of the project. Alternatively, benefits could be understated should the technology under assessment be integrated into a larger volume of vehicles produced than was projected.

A further challenge reflects the fact that most businesses receiving funding from the APC are large. This presents a set of issues. First, it may be the case that, given most firms have large R&D budgets, the relative size of APC project may be small (e.g. for example, in comparison to the entire portfolio of a large OEM. As a result, it may not be possible to observe the effects of the APC on businesses of this size. In some cases, OEMs that are particularly large present a challenge in that there may not be suitable comparators at all).

To minimise these issues associated with selection bias, two counterfactual selection approaches are utilised as described below.

Unsuccessful Applicants

This involves selecting a counterfactual from the group of unsuccessful competition applicants. It is assumed that this approach addresses self-selection issues, as both successful and unsuccessful applicants can be assumed to share similar characteristics motivating their APC funding application.

The approach leaves residual issues in terms of potential differences between successful and unsuccessful applicants and the influence this may have over the outcomes of interest. The design was further refined by focusing on those unsuccessful applicants submitting the highest scoring

applications. This assumes that the application score in the independent assessment and VfM assessment reflects the underlying merits of the project application (rather than solely the ability to develop high quality applications).

Pipeline Design (Early vs Late)

The pipeline design involves using successful applicants for APC funding in later years as a counterfactual for successful applicants in earlier years on the assumption that the effects of APC grants, if any, 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 APC funding and determining their success.

This approach will provide 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. For example, 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 associated with the allocation of APC funding.

Econometric approach

Sample selection decisions will not fully eliminate problems caused by the possible presence of systematic differences between successful and unsuccessful applicants, which could distort findings. To mitigate these issues, estimates of the impact of the programme were generated using 'two-way fixed effects' models as follows:

$$y_{it} = \alpha + \beta T_{it} + \rho \cdot X_{it} \cdot t + \alpha^i + \alpha^t + u_{it}$$

This model explains the relationship between the outcomes of interest for firm i in period t (y_{it}, such as R&D spending or employment) as a function of (a) the cumulative number of APC grants received or (b) the cumulative value of funding provided at the end of period t (T_{it}). The parameter β provides an estimate of the causal effect of the grants on the outcomes of interest. The model also controls for differential trends across the characteristics of the firms (e.g. its location, size, sector, captured by $X_{it} \cdot t$). These models are robust to any time invariant but unobserved differences between firms (α^i) and unobserved but time specific shocks (α^t).

The validity of findings partly depends on a parallel trends assumption - that firms receiving grants would have following a similar trajectory in the absence of the programme to the comparison group. This cannot be fully tested but support for this assumption can be obtained by implementing an 'event study' that tests whether firms receiving funding followed similar trends prior to receiving funding.

This 'two-way fixed effects' model has also been commonly used to estimate the causal effects of programmes in a wide variety of circumstances where 'treatment' is staggered over time and is irreversible (i.e. firms receiving APC grants in different years). However, research in 2021 has

indicated that these types of models can produce misleading findings under certain conditions (e.g. if the effects of programmes are variable across different firms)[3].

The robustness of results were probed by applying alternative estimators that have been proposed as robust to these issues. This will involve the application of the extension of difference in differences models to multi-period data proposed by Callaway and Sant'Anna (2019). This involves the application of the standard (two period) difference-in-difference estimator for each cohort of firms and every post-treatment period (with the group of untreated firms - including yet to be treated firms - forming the control group for these analyses). The estimated effect of the programme is established by taking a weighted average of these treatment effects[4].

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'. Given the potential drawbacks of the two-way fixed effects models, these results are considered the most robust.

Control variables for all firm level regressions included region, an indicator for whether the immediate owner was a foreign owned company (dummy variable equal to one if the company was owned by a foreign entity) and the cumulative sum of other Innovate UK funding received. Worker level regressions for wage estimates included the sector of the firm and occupation of the worker.

Differences between successful and unsuccessful applicants

The BSD and BERD data were used to explore any differences between the firms awarded grants and those that applied but were not successful. The figures below outline these analyses and showed that:

- Firms awarded grants tended to be larger – with higher levers of turnover and employment before they applied for funding. Firms awarded funding were also characterised by higher levels of R&D activity (both in terms of spending and the number of R&D workers employed).

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[3] See Chaisemartin and D'Haltfoeuille (2022) Two Way Fixed Effects And Difference-in-Differences with Heterogenous Treatment Effects: A Survey. Or Baker, Larcker and Wang (2022) How much should we trust staggered difference-in-differences estimates?. Journal of Financial Economics.

[4] See Callaway and Sant'Anna (2019) Difference-in-Differences with Multiple Time Periods

- High scoring unsuccessful applicants were more similar to successful applicants – in general, applicants scoring highly on their project application but not ultimately successful were more similar to those awarded grants in almost every characteristic measured. However, differences remained and firms not receiving funding were smaller.

Figure A.1 Characteristics of successful and unsuccessful applicants for APC funding
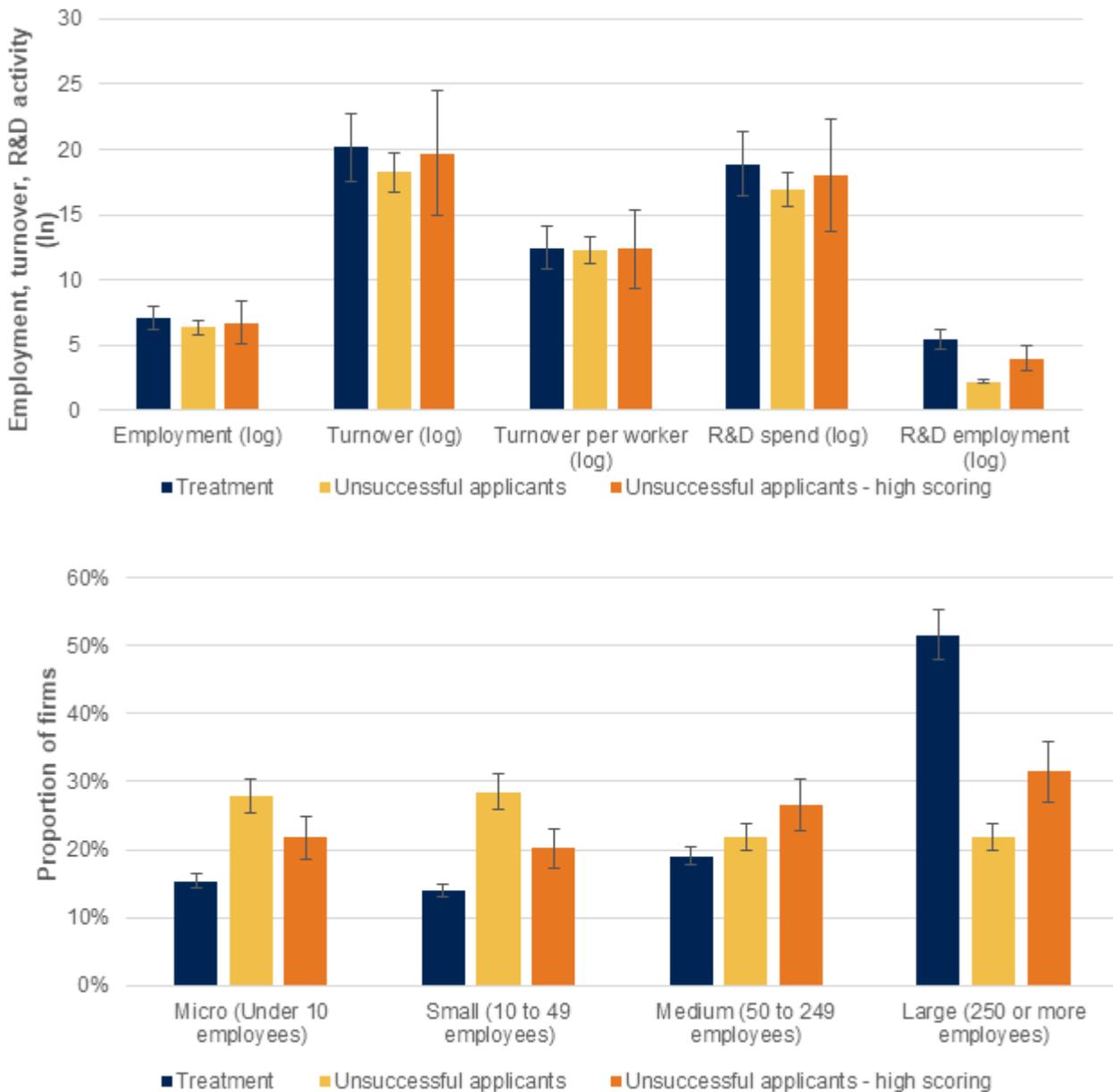
Pipeline model validity and parallel trends

The pipeline approach outlined above will produce unbiased findings if there are no systematic differences between firms awarded funding at different points in time. This section provides some

analysis of the observed characteristics of firms supported in different years to explore the validity of this assumption.

The analyses below are based on data compiled from the BSD and there is still a possibility that there are unobserved differences between firms that could introduce bias. This possibility (by definition) cannot be tested and should be borne in mind when considering the findings that follow.

The following set of charts show the average employment, turnover, turnover per worker, R&D employment and annual R&D spending of firms before grant for firms receiving grants in each year between 2013 and 2021. There were some statistically significant differences in these variables across firms receiving funding in different years. However, no clear patterns were identifiable. This implies that the pipeline approach may be subject to some bias in an unknown direction.

Figure A.2 Average employment, turnover and turnover per worker by year of grant award
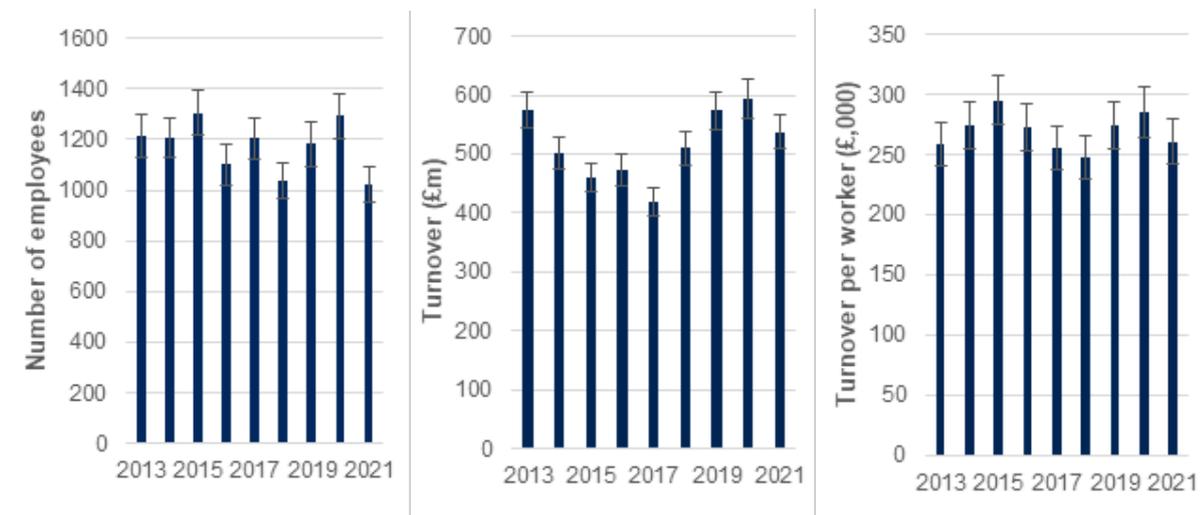
Source: Business Structure Database, ONS, Ipsos analysis. Error bars indicate 95% confidence intervals. All £ values are 2023 prices.

Figure A.3 Average R&D employment and R&D spend by year of grant award
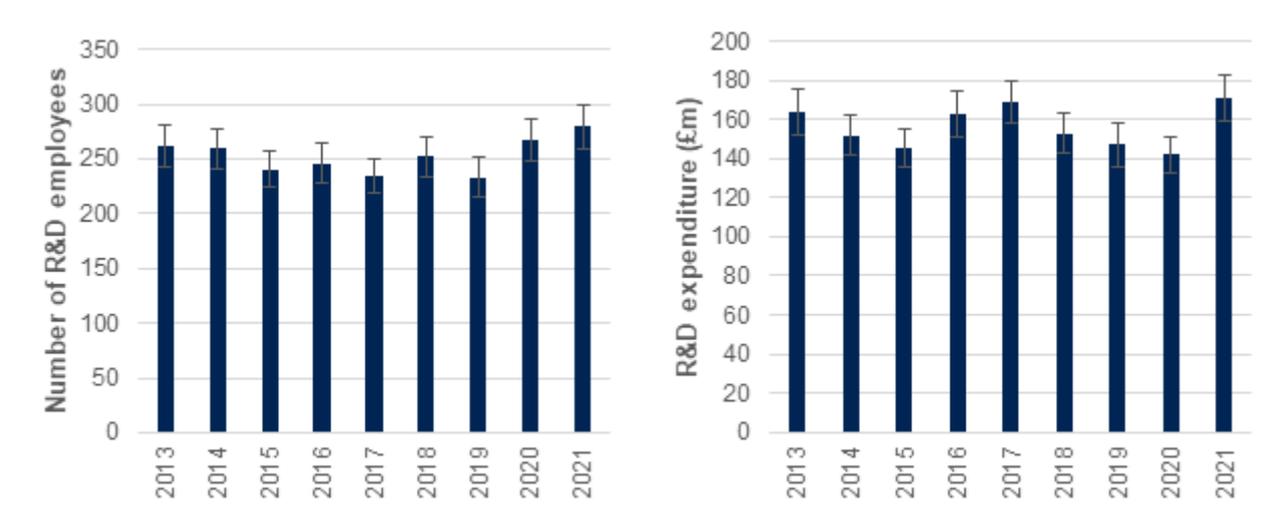
Source: Business Expenditure on R&D survey, ONS, Ipsos analysis. Error bars indicate 95% confidence intervals. All £ values are 2023 prices.

The degree to which any remaining differences may bias the results of difference-in-differences or fixed effects models depends on the extent to which the parallel trends assumption holds (i.e. that the declined applicants would have followed similar trends to those awarded grants in the absence of the programme). This cannot be established directly, but evidence in support of the assumption can be obtained by testing for the presence of differential trends before the programme. The built-in test for differences in pre-trends was implemented using the 'csdid' STATA program - this indicated that for all outcomes it was not possible to reject the null hypothesis that differences pre-trends were equal to zero (with p-values being greater than 5%). The parallel trends assumption was therefore considered to hold and staggered DiD estimates are considered valid and robust.

The chart below shows the estimated pre-trend effects for the R&D employment and expenditure outcomes.

Figure A.4 Pre-trend effects on R&D employment and expenditure
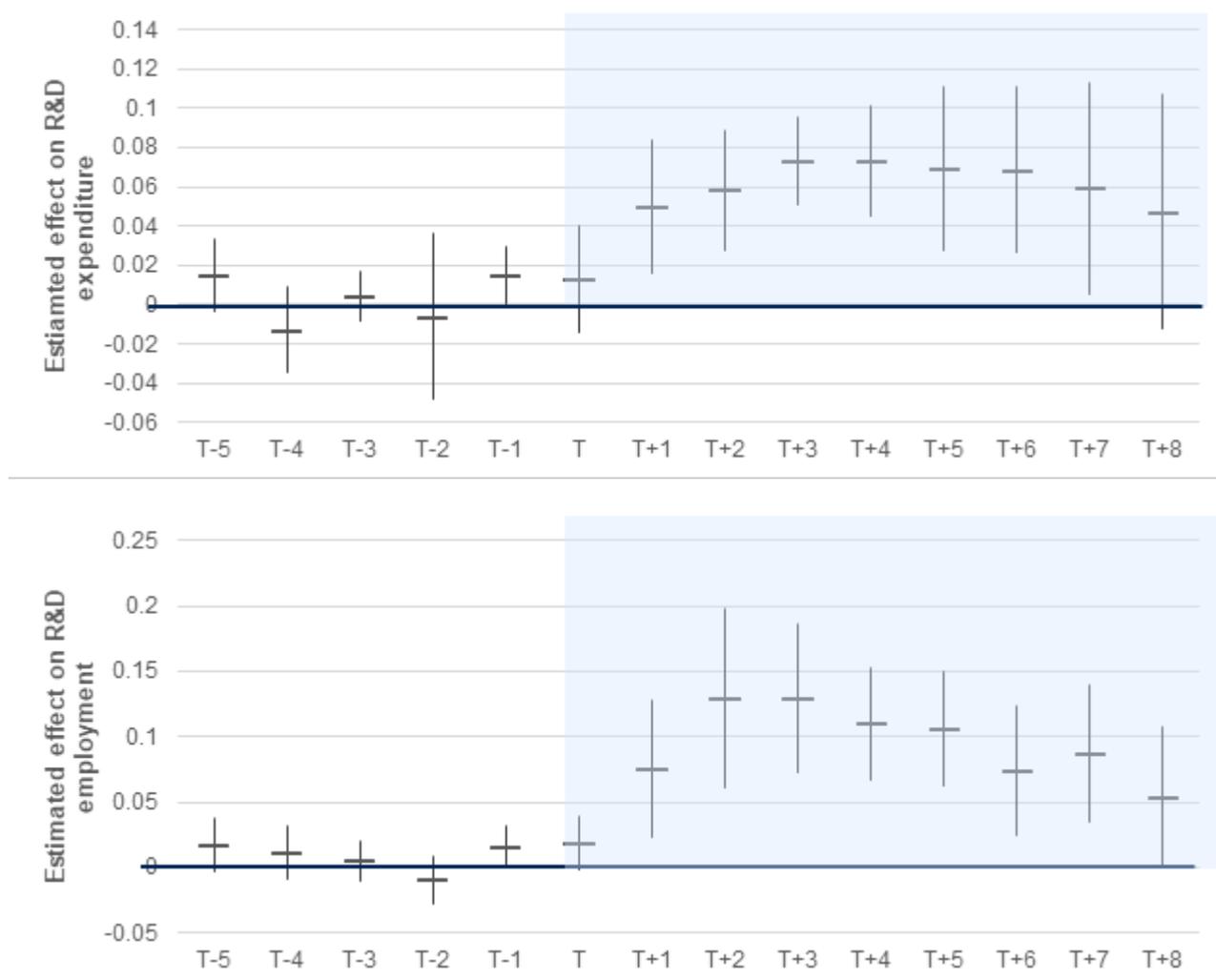
Source: Business Expenditure on R&D survey, ONS, Ipsos analysis. Post grant effect period shaded light blue. T equals year grant awarded. Error bars indicate 95% confidence intervals for coefficients.

Results

The sections below present the results of the econometric analysis using the ABS, BERD, BSD and ASHE.

For each outcome, results are presented for all relevant models as specified in section 1.6. The model numbers follow a consistent pattern:

- **Model 1:** Presents the results using all declined applicants as the counterfactual with firm level fixed effects applied. This specification does not control for time specific unobserved factors that affect all firms e.g. the COVID-19 pandemic.

- **Model 2:** Expands upon the above by including time fixed effects in addition to the firm level fixed effects. This accounts for time specific unobserved effects such as the pandemic and is therefore more robust than the above.

- **Model 3:** Implements model two with the high scoring unsuccessful applicant used as the control group instead of all unsuccessful firms. The advantage of this specification is that high scoring unsuccessful applicants could be considered more similar to successful applicants in terms of the quality of the proposed project. However, the sample size is reduced when restricting the pool of unsuccessful comparators.

- **Model 4**: The fourth specification applies the pipeline approach described in section 1.1.2 in which firms receiving grants later are compared to firms receiving grants earlier. Firms treated at different points could be considered better comparisons than unsuccessful applicants, however the issues with two-way fixed effects models described in section 1.1.2 imply an alternative is required.

- **Model 5:** Implements the proposed staggered difference-in-difference approach to address the theoretical weakness with two-way fixed effects.

Each specification from model two through to model five has its own advantages and disadvantages with results provided for each in turn to allow for comparison across them. For each regression, the adjusted R2 is provided where appropriate. Results for models three to five could be considered most robust given the ex-ante stronger theoretical justification for the control groups, with model five perhaps the most robust given that it uses the same counterfactual as specification four but accounts for the potential for heterogenous effects that may bias results. No alpha corrections have been applied to account for multiple testing and the statistical significance of coefficients across models are considered together when assessing the strength of impacts.

R&D activity

R&D spending and employment

Analysis of past trends in R&D activity shows that the firms that secured a grant saw their R&D employment and annual expenditure increase, whilst for firms that did not secure a grant activity remained stable:

- **R&D employment:** Firms securing APC grants saw R&D employment increase by 16% on average (from 210 to 244) between 2010 and 2021. R&D employment for firms that did not

receive grants increased slightly from 8 to 9 jobs on average over the same period. High scoring unsuccessful applicants also saw an increase from 53 to 55 (4%).

- **R&D expenditure:** Average R&D expenditure rose consistently between 2010 and 2021 for firms that received APC grants (from £139m to £215m – 54%), in comparison to growth of £3m (17%) amongst unsuccessful applicants. High scoring unsuccessful applicants saw average R&D spending rise from £54m to £64m (28% increase) over the same period.

Figure A.5 Trends in R&D activity for successful and unsuccessful applicants
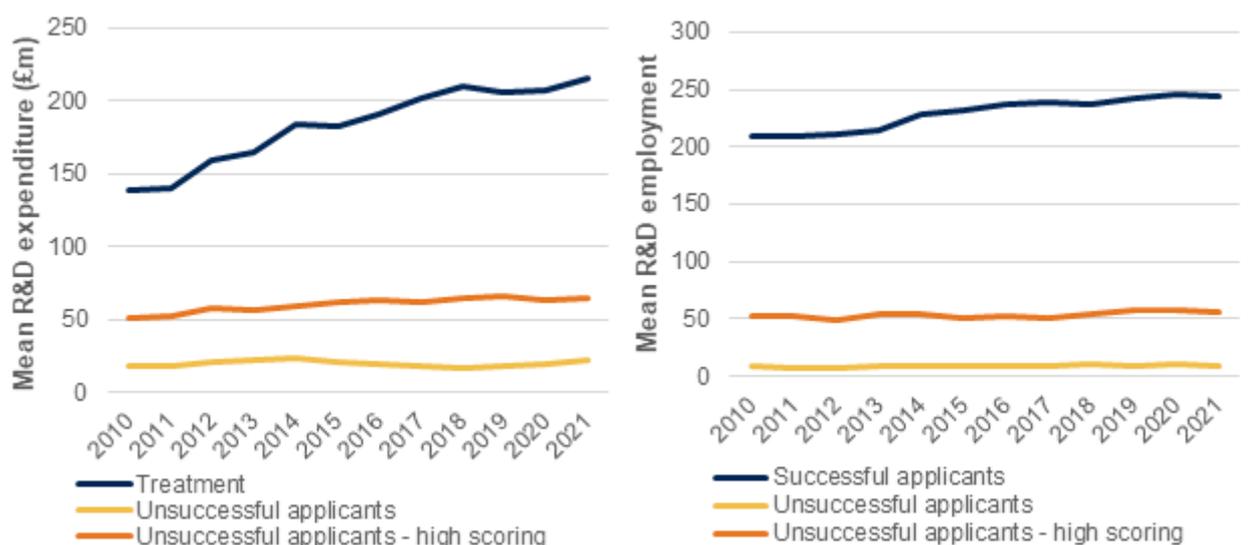
Source: Business Expenditure on R&D survey, ONS, Ipsos analysis. All £ values are 2023 prices.

Regression results

The overall findings are summarised in the table below:

- These suggest that the APC grants had an impact on both R&D expenditure and employment at the overall level with strongly to weakly significant effects identified across model specifications. In the specifications using high scoring declined applicants or the pipeline approach, the impact on R&D expenditure was estimated at between 10 and 12% with the staggered difference-in-difference model using the pipeline counterfactual (model 5) giving an estimated effect of 7%. For R&D employment, APC grants appeared to lead to a weakly significant increase of 12% overall using the results from the model 5 below. These results imply a degree of additionality associated with the APC funding.

- These findings compare favourably to findings from the interim evaluation in which no effects were found at the overall level. Compared to other studies evaluating the impact of grant funding for R&D activity, such as the Impact Review of Collaborative R&D Grants and Feasibility Studies[5], the effects identified below are larger. For example, the Impact Review

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[5] Which employed equivalent methods to assess the effectiveness of Innovate UK grant funding awarded between 2012 and 2016 (with the period of analysis running to 2020

pointed to a 4.9 to 5.8% on-going effect on annual R&D spending and a 4.2 to 7.7% effect on R&D employment.

Table A.2 Estimated effects of APC grants on R&D spending and employment by 2021 – overall findings

Model	Comparison group	Fixed effects	Time fixed effects	Coeff.	T-stat	P value	Confidence (95%) Lower	interval Upper	Adjusted R^2
						Estimated % impact on R&D spending per grant			
1	Declined applicants	Yes	No	0.210***	4.513	0.000	0.119	0.301	0.323
2	Declined applicants	Yes	Yes	0.173***	4.352	0.000	0.095	0.251	0.377
3	High scoring declined applicants	Yes	Yes	0.126**	2.331	0.021	0.020	0.232	0.352
4	Awarded grants only	Yes	Yes	0.097*	1.669	0.063	-0.017	0.211	0.259
5	Staggered DiD	Yes	Yes	0.074*	1.479	0.085	-0.024	0.172	-
						Estimated % impact on R&D employment per grant			
1	Declined applicants	Yes	No	0.195***	4.224	0.000	0.105	0.285	0.301
2	Declined applicants	Yes	Yes	0.181***	5.625	0.000	0.118	0.244	0.312
3	High scoring declined applicants	Yes	Yes	0.144**	2.421	0.018	0.027	0.261	0.384
4	Awarded grants only	Yes	Yes	0.143**	2.046	0.034	0.006	0.280	0.328
5	Staggered DiD	Yes	Yes	0.122*	1.777	0.053	-0.013	0.257	-

Source: Business Expenditure on R&D survey, ONS, Ipsos analysis. '***', '**' and '*' indicate alpha levels of 0.01, 0.05 and 0.1 respectively.

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 not permanent but persisted for several years. Effects on R&D spending were estimated to last for 7 years after receiving funding with impacts on R&D employment estimated to last for 8 years. This is substantially longer than the typical duration of an APC project (3.3 years) though, suggesting that the APC had led to a significant amount of additional R&D activity beyond the initial APC project. This could be associated with the same technology developed through the APC project, but it may also be in part explained by additional projects and/or technologies developed off the back of the initial APC funded project.

Note that the precision of estimated effects worsens the longer after award in these persistence analyses and all that follow in later sections. This is because the number of projects with outcome data available for all periods reduces the more periods that are included post award.

Figure A.6 Persistence of effects on R&D expenditure
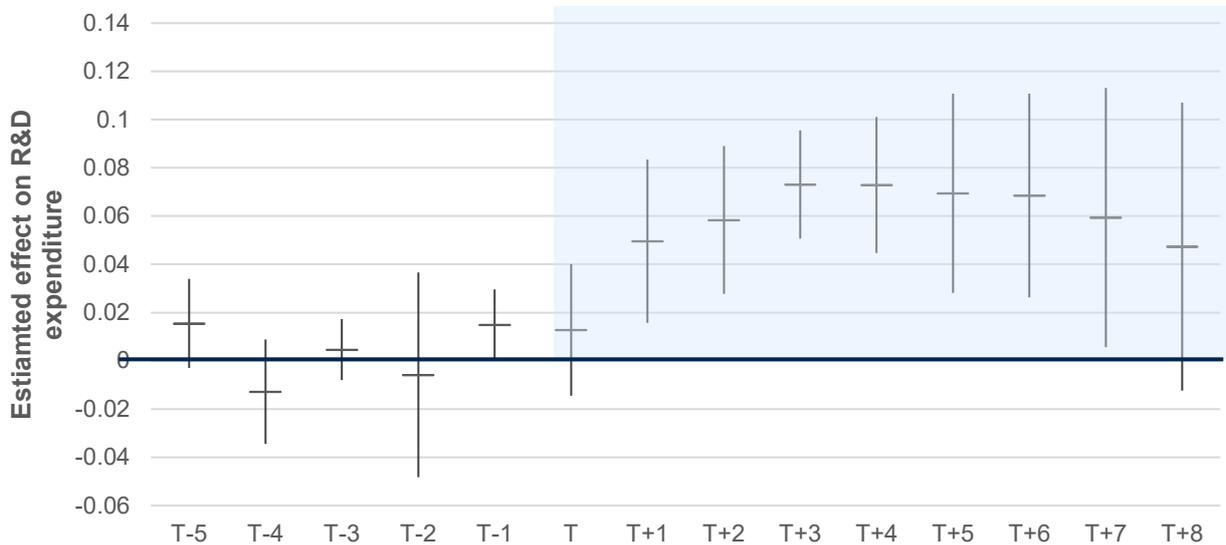
Source: Business Expenditure on R&D survey, ONS, Ipsos analysis. Post grant effect period shaded light blue. Error bars indicate 95% confidence intervals.

Figure A.7 Persistence of effects on R&D employment
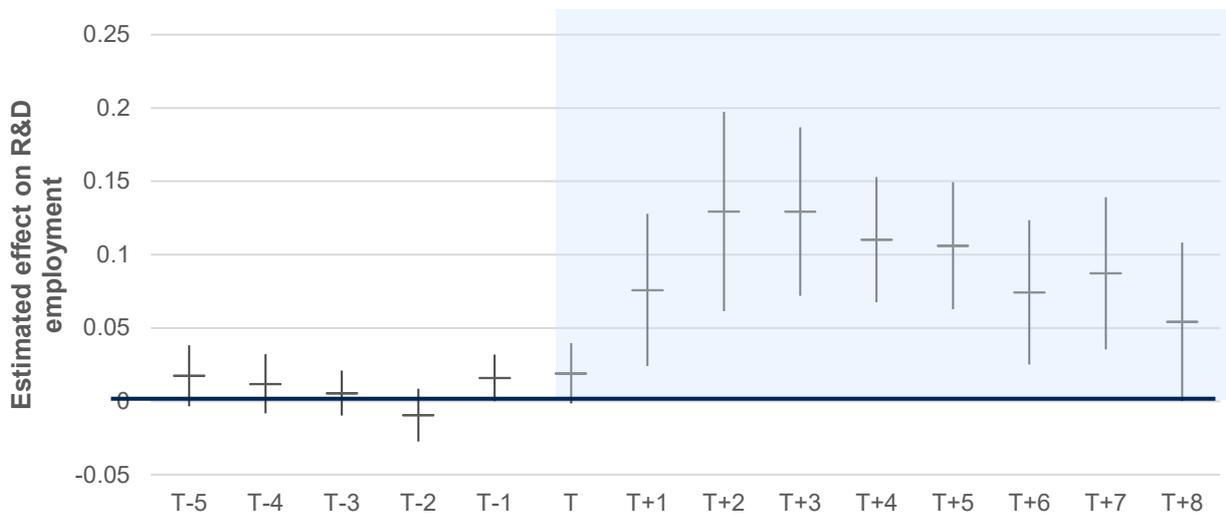
Source: Business Expenditure on R&D survey, ONS, Ipsos analysis. T equals year grant awarded. Post grant effect period shaded light blue. Error bars indicate 95% confidence intervals.

Results were also broken down by role in the project which are summarised below. These findings indicated that APC grants had a larger positive effect on the R&D employment and spending of those firms leading the project compared to collaborators. In terms of R&D employment, large firms saw a 15% increase compared to 5% for collaborators in the most robust models. R&D spending impacts were only present for lead firms in the more robust specification implying an 11 to 16% increase for leads.

An increase in R&D employment but not R&D expenditure for collaborators may suggest that these firms were more likely to bring in R&D activity that would otherwise be externalised. These firms

were also often SMEs and supply chain companies who may count income received from grants or from lead applicants as turnover. This requires further exploration.

Table A.3 Estimated effects of APC grants on R&D expenditure and employment by 2021 – lead applicants

Model	Comparison group	Fixed effects	Time fixed effects	Coeff.	T-stat	P value	Confidence interval (95%)		Adjusted R^2
							Lower	Upper	
Estimated % impact on R&D spending per grant									
1	Declined applicants	Yes	No	0.251***	2.894	0.008	0.081	0.421	0.395
2	Declined applicants	Yes	Yes	0.194***	2.764	0.010	0.056	0.332	0.375
3	High scoring declined applicants	Yes	Yes	0.163**	1.919	0.042	0.120	0.206	0.338
4	Awarded grants only	Yes	Yes	0.148**	2.011	0.036	0.113	0.183	0.241
5	Staggered DiD	Yes	Yes	0.108**	1.825	0.049	0.055	0.161	-
Estimated % impact on R&D employment per grant									
1	Declined applicants	Yes	No	0.237***	4.827	0.000	0.141	0.333	0.448
2	Declined applicants	Yes	Yes	0.202***	4.673	0.000	0.117	0.287	0.399
3	High scoring declined applicants	Yes	Yes	0.164***	3.716	0.002	0.078	0.250	0.375
4	Awarded grants only	Yes	Yes	0.167***	4.144	0.001	0.088	0.246	0.333
5	Staggered DiD	Yes	Yes	0.151**	2.359	0.020	0.026	0.276	-

Source: Business Expenditure on R&D survey, ONS, Ipsos analysis. '***', '**' and '*' indicate alpha levels of 0.01, 0.05 and 0.1 respectively.

Table A.4 Estimated effects of APC grants on R&D expenditure and employment by 2021 – collaborator applicants

Model	Comparison group	Fixed effects	Time fixed effects	Coeff.	T-stat	P value	Confidence interval (95%) Lower	Upper	Adjusted R^2
Estimated % impact on R&D spending per grant									
1	Declined applicants	Yes	No	0.103**	1.850	0.047	0.006	0.212	0.288
2	Declined applicants	Yes	Yes	0.771*	1.800	0.051	-0.068	1.610	0.225
3	High scoring declined applicants	Yes	Yes	0.053*	1.621	0.068	-0.029	0.135	0.213
4	Awarded grants only	Yes	Yes	0.032	1.132	0.142	-0.214	0.278	0.240
5	Staggered DiD	Yes	Yes	0.034	1.255	0.119	-0.152	0.220	-
Estimated % impact on R&D employment per grant									
1	Declined applicants	Yes	No	0.139***	2.972	0.007	0.047	0.231	0.257
2	Declined applicants	Yes	Yes	0.102**	2.389	0.019	0.018	0.186	0.231
3	High scoring declined applicants	Yes	Yes	0.088**	2.183	0.027	0.009	0.167	0.192
4	Awarded grants only	Yes	Yes	0.082**	2.252	0.024	0.011	0.153	0.178
5	Staggered DiD	Yes	Yes	0.054*	1.640	0.066	-0.011	0.119	-

Source: Business Expenditure on R&D survey, ONS, Ipsos analysis. '***', '**' and '*' indicate alpha levels of 0.01, 0.05 and 0.1 respectively.

The BERD was also used to explore the location of R&D spending as it includes variables describing the total amount of expenditure within the UK and outside of the UK. The results of this analysis are presented below.

The findings highlighted an estimated 6% impact on R&D spending in the UK with no impacts identified on non-UK based R&D. This provides clear evidence of APC funding being spent in the UK within UK based firms and suggest that the programme anchored R&D within the UK.

Table A.5 Estimated effects of APC grants on R&D expenditure by location of expenditure

Model	Comparison group	Fixed effects	Time fixed effects	Coeff.	T-stat	P value	Confidence interval (95%)		Adjusted R²
							Lower	Upper	
Estimated % impact on UK based R&D spending per grant									
1	Declined applicants	Yes	No	0.197***	4.144	0.001	0.197	0.197	0.311
2	Declined applicants	Yes	Yes	0.155***	3.716	0.002	0.154	0.156	0.343
3	High scoring declined applicants	Yes	Yes	0.101**	2.228	0.025	0.079	0.123	0.310
4	Awarded grants only	Yes	Yes	0.086*	1.690	0.061	-0.014	0.186	0.234
5	Staggered DiD	Yes	Yes	0.062*	1.456	0.088	-0.021	0.145	-
Estimated % impact on non-UK based R&D spending per grant									
1	Declined applicants	Yes	No	0.094***	3.169	0.005	0.091	0.097	0.399
2	Declined applicants	Yes	Yes	0.090*	1.534	0.078	-0.010	0.190	0.308
3	High scoring declined applicants	Yes	Yes	0.058	0.947	0.183	-0.321	0.437	0.343
4	Awarded grants only	Yes	Yes	0.052	0.860	0.205	-0.067	0.171	0.303
5	Staggered DiD	Yes	Yes	0.037	0.622	0.274	-0.080	0.154	-

Source: Business Expenditure on R&D survey, ONS, Ipsos analysis. '***', '**' and '*' indicate alpha levels of 0.01, 0.05 and 0.1 respectively.

Total impact to 2022

The models described above indicated that each APC grant produced impacts on R&D spending from one year after award to seven years after. Estimates of total impact to 2022 were therefore derived by:

- Taking the average annual R&D spending of large firms and SMEs awarded APC grants (£12.9m and £0.5m respectively) and weighting these values by the share of large firms and SMEs leading APC projects (79 and 21% respectively).

- This gives a conservative estimate of the average pre-programme annual R&D spending of applicants of £10.3m.

- Grossing these estimates up to the population of firms awarded grants (using the time profile of estimated impacts) produces an estimate of the overall impact of the programme on R&D spending of £1bn by the end of 2022. 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.

Monitoring data indicated that the total project costs at the end of 2022 were £750m, of which £327m was funded by the public sector. Over the lifetime of APC projects (assuming an average length of three years), estimated total impacts on R&D spending totalled £500m which implies that 67% of spending would not have occurred in the absence of the programme (implying deadweight of 33%). However, this was clearly more than offset by additional R&D activity leveraged following project completion. Using the estimated impact of the programme on R&D spending suggested that the programme leveraged £2.20 of additional private R&D spend per £1 of public sector spending by 2022/23.

The findings also imply that the programme has supported the creation or safeguarding of around 8,300 R&D job years (which compares with a gross figure of 14,800 expected at the application stage in VfM forms). This was calculated using estimates of impacts on leads and collaborators separately in the tables below. Average R&D employment for lead and collaborators firms was obtained using 50% trimmed means.

Table A.6 Estimated R&D expenditure impacts of APC grant funding

| Year funded | Baseline R&D spend (£m) | Number of awards | Estimated impact on R&D spending (£m) – by year | | | | | | | | | | Total (£m) |
			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
2013	10.3	25	0	12	14	17	16	15	14	12	0	0	101
2014	10.3	46	0	0	22	25	30	29	27	25	21	0	179
2015	10.3	29	0	0	0	13	15	18	18	16	15	13	109
2016	10.3	95	0	0	0	0	42	48	58	56	51	49	303
2017	10.3	28	0	0	0	0	0	12	14	16	16	15	72
2018	10.3	47	0	0	0	0	0	0	19	22	27	26	94
2019	10.3	74	0	0	0	0	0	0	0	30	34	40	104
2020	10.3	88	0	0	0	0	0	0	0	0	34	38	72
2021	10.3	38	0	0	0	0	0	0	0	0	0	14	14
2022	10.3	21	0	0	0	0	0	0	0	0	0	0	0
Total			0	12	36	55	104	122	149	177	198	195	1048

Source: Business Expenditure on R&D survey, ONS, Ipsos analysis. All £ values are 2023 prices.

Table A.7 Estimated R&D employment impacts of APC grant funding – leads

| Year funded | Baseline R&D employment | Cumulative number of awards to leads | Estimated impact on R&D employment (job years) – by year | | | | | | | | | | Total |
			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
2013	79	4	0	26	47	54	51	50	41	30	232	0	532
2014	79	7	0	0	46	83	94	90	88	71	52	407	931
2015	79	6	0	0	0	40	71	81	77	75	61	44	449

Year funded	Baseline R&D employment	Cumulative number of awards	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
2016	79	15	0	0	0	0	99	177	202	193	188	152	1012
2017	79	5	0	0	0	0	0	33	59	67	64	63	287
2018	79	8	0	0	0	0	0	0	53	95	108	103	358
2019	79	12	0	0	0	0	0	0	0	79	142	162	383
2020	79	15	0	0	0	0	0	0	0	0	99	177	277
2021	79	7	0	0	0	0	0	0	0	0	0	46	46
2022	79	4	0	0	0	0	0	0	0	0	0	0	0
Total			0	26	94	176	316	431	520	610	946	1154	4274

Source: Business Expenditure on R&D survey, ONS, Ipsos analysis. All £ values are 2023 prices.

Table A.8 Estimated R&D employment impacts of APC grant funding – collaborators

Year funded	Baseline R&D employment	Cumulative number of awards to collaborators	Estimated impact on R&D employment (job years) – by year										Total
			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
2013	46	21	0	38	62	60	56	41	33	29	19	0	338
2014	46	39	0	0	71	115	112	105	77	61	54	35	628
2015	46	23	0	0	0	42	68	66	62	45	36	32	350
2016	46	80	0	0	0	0	146	235	229	215	157	124	1106
2017	46	23	0	0	0	0	0	42	68	66	62	45	282
2018	46	39	0	0	0	0	0	0	71	115	112	105	402
2019	46	62	0	0	0	0	0	0	0	113	182	178	473
2020	46	73	0	0	0	0	0	0	0	0	133	214	347
2021	46	31	0	0	0	0	0	0	0	0	0	56	56
2022	46	17	0	0	0	0	0	0	0	0	0	0	0
Total			0	38	133	217	381	489	539	643	754	789	3983

Source: Business Expenditure on R&D survey, ONS, Ipsos analysis. All £ values are 2023 prices.

Direct business performance impacts

The following section provides the results of the analysis of the impacts on business performance for firms receiving APC grants.

Capital expenditure and GVA

The Annual Business Survey (ABS) was used to provide direct estimates of the impact of the programme on output (GVA), productivity (GVA per worker), employment and net capital investment. The results indicated significant impacts on employment, net capital expenditure and overall output (as measured by GVA):

- **Net expenditure on capital**: Models 4 and 5 identified a weakly significant statistical effect on net capital expenditure of around 25%. This is significant at the p = 0.1, and in combination with the estimated effects in models 1 through 3, this suggests a significant degree of capital investment from recipient firms.

- **Employment**: Estimated effects on employment in the ABS ranged from 9% to 5% with the most robust specification estimating a 5% increase.

- **GVA**: In terms of overall output, the most robust specification indicated an effect of 10% implying a corresponding increase in output from APC grants. However, no impacts were found on output per worker.

Table A.9 Estimated effects of APC grants on net capital expenditure, GVA and GVA per worker by 2021 – overall results

Model	Comparison group	Fixed effects	Time fixed effects	Coeff.	T-stat	P value	Confidence interval (95%)		Adjusted R^2
							Lower	Upper	
Estimated % impact on capital expenditure per grant awarded									
1	Declined applicants	Yes	No	0.320***	2.894	0.008	0.103	0.537	0.463
2	Declined applicants	Yes	Yes	0.323**	2.101	0.031	0.022	0.624	0.477
3	High scoring declined applicants	Yes	Yes	0.273*	1.788	0.052	-0.026	0.572	0.396
4	Awarded grants only	Yes	Yes	0.251*	1.631	0.067	-0.051	0.553	0.389
5	Staggered DiD	Yes	Yes	0.247*	1.669	0.063	-0.043	0.537	-
Estimated % impact on GVA per grant awarded									
1	Declined applicants	Yes	No	0.152***	3.301	0.004	0.062	0.242	0.364
2	Declined applicants	Yes	Yes	0.136***	3.472	0.003	0.059	0.213	0.410
3	High scoring declined applicants	Yes	Yes	0.138**	2.120	0.030	0.010	0.266	0.395
4	Awarded grants only	Yes	Yes	0.102*	1.754	0.055	-0.012	0.216	0.352
5	Staggered DiD	Yes	Yes	0.096*	1.710	0.059	-0.014	0.206	-
Estimated % impact on GVA per worker per grant awarded									
1	Declined applicants	Yes	No	0.034	1.353	0.103	-0.015	0.083	0.101

2	Declined applicants	Yes	Yes	0.028	1.238	0.122	-0.016	0.072	0.125
3	High scoring declined applicants	Yes	Yes	0.030	0.761	0.232	-0.047	0.107	0.147
4	Awarded grants only	Yes	Yes	0.023	0.707	0.248	-0.041	0.087	0.121
5	Staggered DiD	Yes	Yes	0.018	0.619	0.275	-0.039	0.075	-
Estimated % impact on employment per grant awarded									
1	Declined applicants	Yes	No	0.093***	4.882	0.000	0.056	0.130	0.384
2	Declined applicants	Yes	Yes	0.071***	4.222	0.000	0.038	0.104	0.322
3	High scoring declined applicants	Yes	Yes	0.074***	3.716	0.002	0.035	0.113	0.361
4	Awarded grants only	Yes	Yes	0.048**	2.331	0.021	0.008	0.088	0.302
5	Staggered DiD	Yes	Yes	0.045*	1.732	0.057	0.006	0.096	-

Source: Annual Business Survey, ONS, Ipsos analysis. '***', '**' and '*' indicate alpha levels of 0.01, 0.05 and 0.1 respectively.

The impacts on net capital spending were not persistent and did not take hold until 4 years after an APC grant was awarded, as evidenced in the figure below where coefficients only become statistically significant (indicated by lower bound error bar being above zero) at T+4 until T+7. GVA impacts also begin to appear after 3 years and persist until around least 7 years past project award. This suggests that firms began to expand facilities in anticipation of production towards the end projects or just after projects had completed given an average length of project of 3.3 years.

Figure A.8 Persistence of effects on net capital expenditure, GVA and GVA per worker
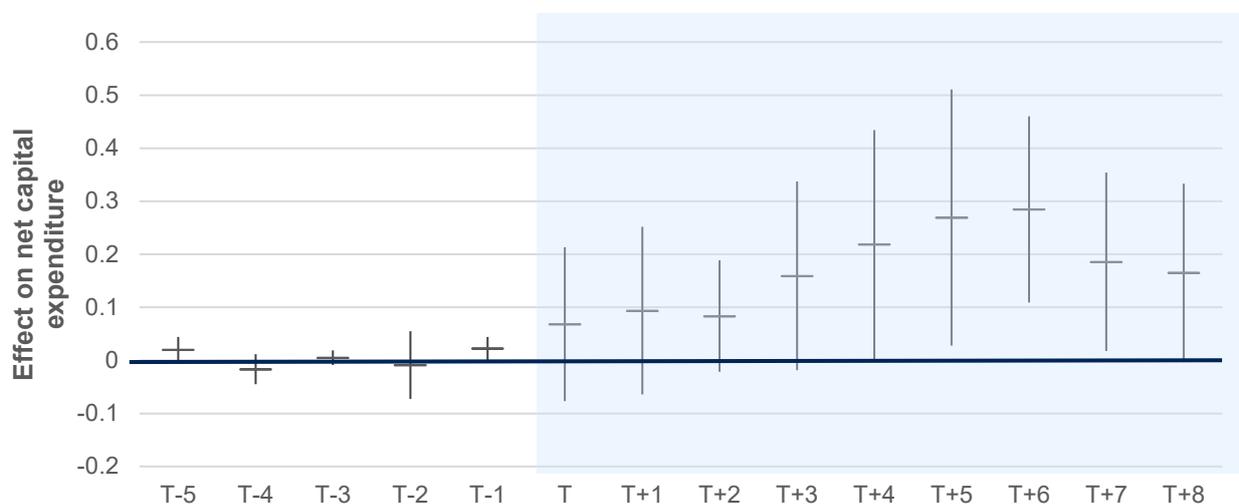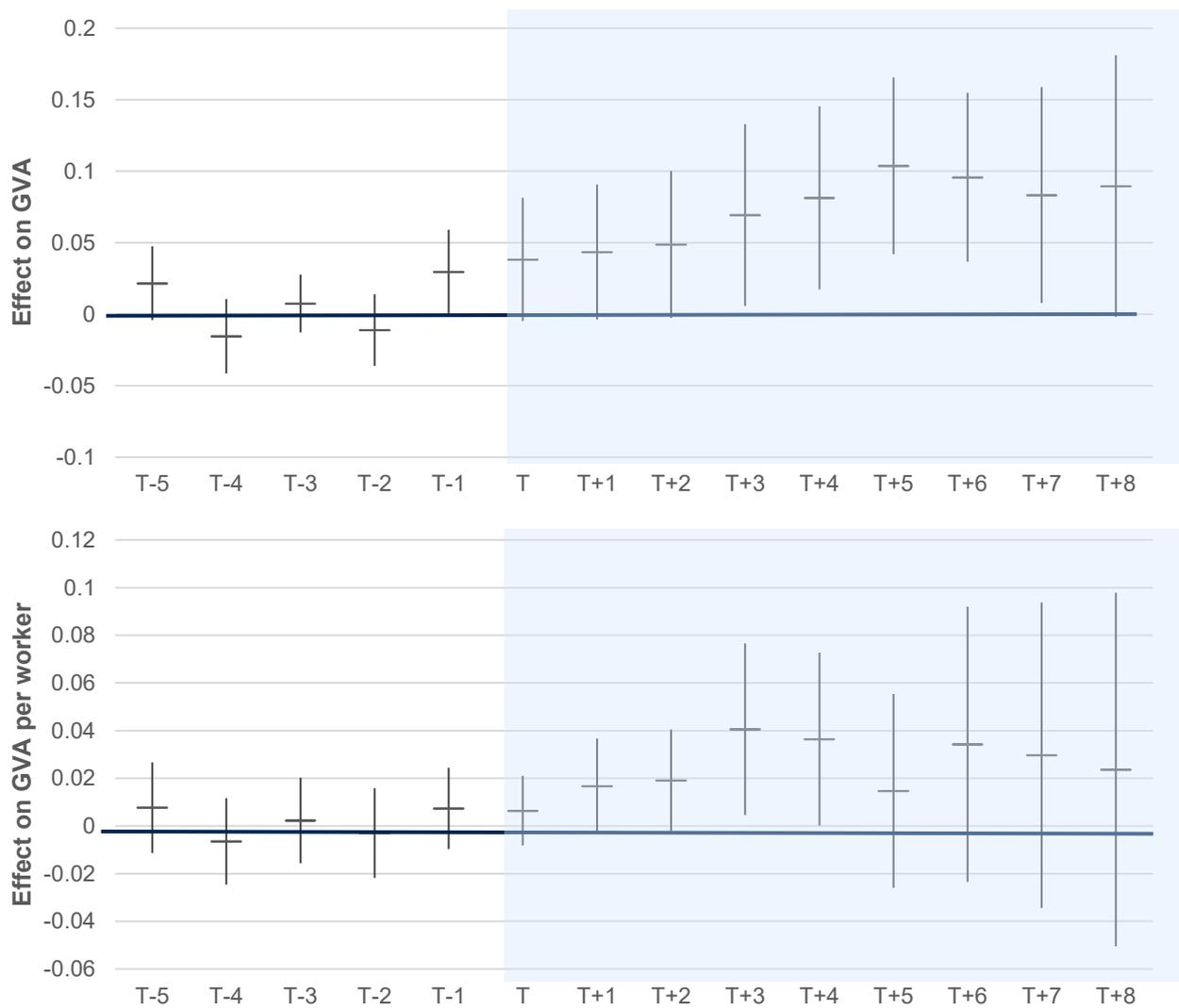
Source: Annual Business Survey, ONS, Ipsos analysis. T equals year grant awarded. Post grant effect period shaded light blue. Error bars indicate 95% confidence intervals.

Impacts by role

Impacts were also observed in restricted models that examined the effects by firm role. Capital expenditure impacts were consistent across robust models for lead applicants with effects ranging from between 20 to 25%, whilst effects for collaborators were similar in size (between 21 and 25%) they were not corroborated by the most robust staggered difference-in-difference model in which no statistically significant impact was identified.

GVA impacts were also consistently estimated at between 10 and 13% for leads and 8 to 14% for collaborators. The range for collaborators likely comes from the smaller sample size of such firms. No effects were again identified on GVA per worker.

Table A.10 Estimated effects of APC grants on net capital expenditure, GVA and GVA per worker by 2021 – lead applicants

Model	Comparison group	Fixed effects	Time fixed effects	Coeff.	T-stat	P value	Confidence interval (95%)		Adjusted R^2
							Lower	Upper	
Estimated % impact on capital expenditure per grant awarded									
1	Declined applicants	Yes	No	0.274***	2.894	0.008	0.088	0.460	0.462
2	Declined applicants	Yes	Yes	0.281**	2.389	0.019	0.050	0.512	0.449
3	High scoring declined applicants	Yes	Yes	0.242**	2.082	0.032	0.014	0.470	0.374
4	Awarded grants only	Yes	Yes	0.210**	1.890	0.044	0.008	0.428	0.352
5	Staggered DiD	Yes	Yes	0.195*	1.612	0.069	-0.042	0.432	-
Estimated % impact on GVA per grant awarded									
1	Declined applicants	Yes	No	0.183***	3.169	0.005	0.070	0.296	0.310
2	Declined applicants	Yes	Yes	0.155**	2.183	0.027	0.016	0.294	0.336
3	High scoring declined applicants	Yes	Yes	0.134**	1.919	0.042	0.001	0.065	0.329
4	Awarded grants only	Yes	Yes	0.115*	1.568	0.074	-0.011	0.099	0.383
5	Staggered DiD	Yes	Yes	0.103*	1.612	0.069	-0.015	0.153	-
Estimated % impact on GVA per worker per grant awarded									
1	Declined applicants	Yes	No	0.022	0.943	0.184	-0.024	0.068	0.183
2	Declined applicants	Yes	Yes	0.029	1.227	0.124	-0.017	0.075	0.201
3	High scoring declined applicants	Yes	Yes	0.026	1.033	0.163	-0.120	0.388	0.141
4	Awarded grants only	Yes	Yes	0.019	0.910	0.192	-0.133	0.363	0.103
5	Staggered DiD	Yes	Yes	0.015	0.939	0.185	-0.112	0.318	-

Source: Annual Business Survey, ONS, Ipsos analysis. '***', '**' and '*' indicate alpha levels of 0.01, 0.05 and 0.1 respectively.

Table A.11 Estimated effects of APC grants on net capital expenditure, GVA and GVA per worker by 2021 – collaborator applicants

Model	Comparison group	Fixed effects	Time fixed effects	Coeff.	T-stat	P value	Confidence interval (95%)		Adjusted R^2
							Lower	Upper	
Estimated % impact on capital expenditure per grant awarded									
1	Declined applicants	Yes	No	0.318***	3.301	0.004	0.129	0.507	0.374
2	Declined applicants	Yes	Yes	0.263**	1.979	0.038	0.003	0.523	0.331
3	High scoring declined applicants	Yes	Yes	0.254*	1.551	0.076	-0.067	0.575	0.294
4	Awarded grants only	Yes	Yes	0.213*	1.518	0.080	-0.062	0.488	0.288
5	Staggered DiD	Yes	Yes	0.233	1.353	0.103	-0.105	0.571	-
Estimated % impact on GVA per grant awarded									
1	Declined applicants	Yes	No	0.253***	4.144	0.001	0.133	0.373	0.351
2	Declined applicants	Yes	Yes	0.169***	3.301	0.004	0.069	0.269	0.320
3	High scoring declined applicants	Yes	Yes	0.142**	2.205	0.026	0.016	0.268	0.305
4	Awarded grants only	Yes	Yes	0.101*	1.612	0.069	-0.022	0.224	0.322
5	Staggered DiD	Yes	Yes	0.083*	1.486	0.084	-0.026	0.192	-
Estimated % impact on GVA per worker per grant awarded									
1	Declined applicants	Yes	No	0.047	1.302	0.111	-0.024	0.118	0.113
2	Declined applicants	Yes	Yes	0.044	0.964	0.179	-0.046	0.134	0.195
3	High scoring declined applicants	Yes	Yes	0.032	0.943	0.184	-0.035	0.099	0.095
4	Awarded grants only	Yes	Yes	0.024	0.875	0.201	-0.030	0.078	0.104
5	Staggered DiD	Yes	Yes	0.021	0.779	0.227	-0.032	0.074	-

Source: Annual Business Survey, ONS, Ipsos analysis. '***', '**' and '*' indicate alpha levels of 0.01, 0.05 and 0.1 respectively.

Total impact on net capital investment

Analysis of the ABS suggested that the average net capital spending of firms supported by the APC in 2013 was £3.5m. However, this average is biased upwards by large firms, and was adjusted downwards based on the ratio of employment across all firms awarded grants (71 employees, based on the BSD) and those appearing in the ABS (522 employees). This gave an

adjusted estimate of net capital investment spending of £474,000. Applying this to the estimated effects of the programme over the four years these were identified for in the analysis gives a total impact on total net capital investment of £395m based on the most robust estimates of impact. This implies that every £1 in public grant funding awarded led to £1.21 in capital spending.

Employment, turnover and turnover per worker

Impacts on employment, turnover and turnover per worker were all explored using the BSD. Analysis of the recent trends across these variables amongst the firms receiving APC grants and those applying but not receiving grants showed:

- **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 12% between 2010 and 2022 whilst unsuccessful firms grew at a slower rate of between 4 and 8% in employment and turnover respectively. High scoring applicants not receiving funding saw a greater increase in employment on average than all unsuccessful applicants at 5% but only saw average growth of 5% in turnover.

- **Productivity**: Between 2010 and 2022, productivity (as measured by turnover per worker) for all groups of firms varied from year to year but remained somewhat stable over the whole period.

Figure A.9 Employment, turnover and turnover per worker between 2010 and 2022
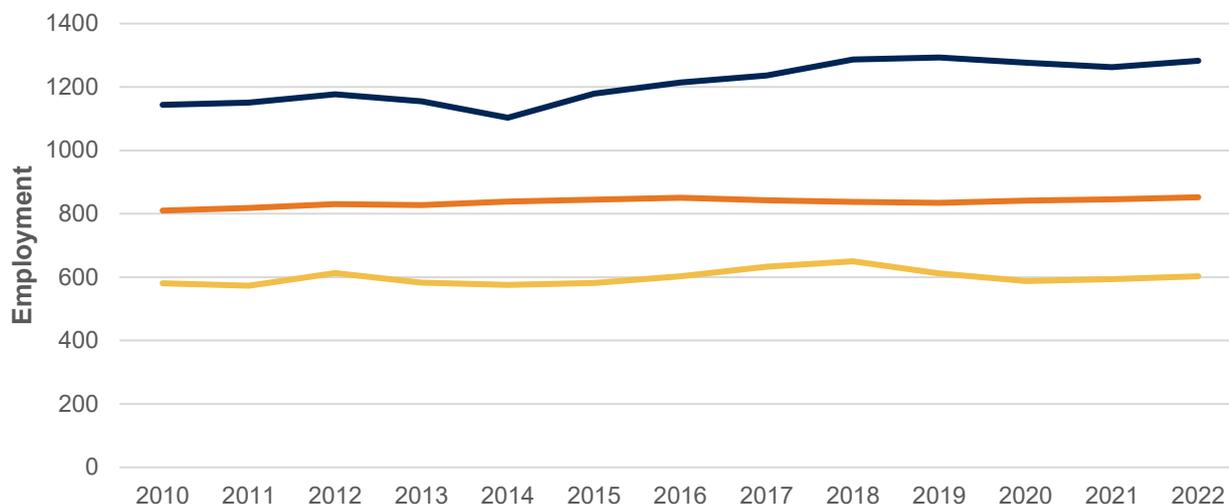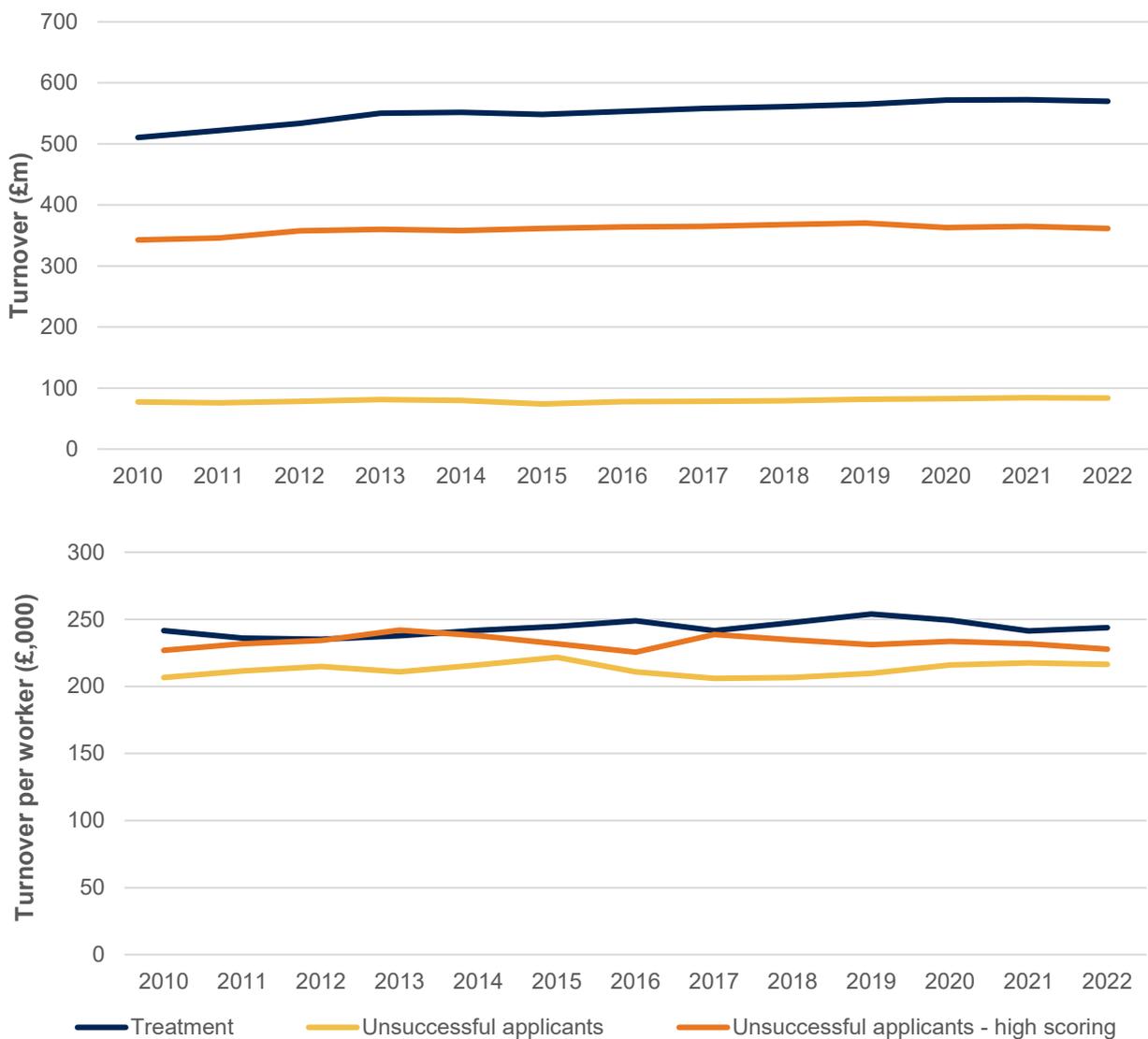
Source: Business Structure Database, ONS, Ipsos analysis. All £ values are 2023 prices.

Regression results

The results of the econometric analysis are presented in the table below. Overall, the most robust findings find a weakly significant effect on employment and turnover at the overall level. The results implied 5 to 8% increase in employment and an 8 to 10% increase in turnover when focusing on the more robust specifications in models 3, 4 and 5.

No effects were found on turnover per worker (examined as a proxy for productivity). However, estimated effects on employment and turnover in models 3 through 5 do imply a productivity effect of between 2 to 3%. For example, in the most robust model (model 5), employment was estimated to increase by 5% whilst turnover was estimated to increase by 7%, implying a 2% increase in turnover per worker.

Table A.12 Estimated effects of APC grants on employment, turnover and turnover per worker by 2022 – overall results

Model	Comparison group	Fixed effects	Time fixed effects	Coeff.	T-stat	P value	Confidence interval (95%)		Adjusted R^2
							Lower	Upper	
Estimated % impact on employment per grant awarded									
1	Declined applicants	Yes	No	0.102***	4.144	0.001	0.054	0.150	0.462
2	Declined applicants	Yes	Yes	0.086***	3.716	0.002	0.041	0.131	0.448
3	High scoring declined applicants	Yes	Yes	0.084**	2.205	0.026	0.009	0.159	0.402
4	Awarded grants only	Yes	Yes	0.051*	1.690	0.061	-0.008	0.110	0.435
5	Staggered DiD	Yes	Yes	0.053*	1.456	0.088	-0.018	0.124	-
Estimated % impact on turnover per grant awarded									
1	Declined applicants	Yes	No	0.139***	4.622	0.000	0.080	0.198	0.274
2	Declined applicants	Yes	Yes	0.143***	4.144	0.001	0.075	0.211	0.283
3	High scoring declined applicants	Yes	Yes	0.097**	2.277	0.023	0.014	0.180	0.249
4	Awarded grants only	Yes	Yes	0.095*	1.732	0.057	-0.013	0.203	0.251
5	Staggered DiD	Yes	Yes	0.076*	1.526	0.079	-0.022	0.174	-
Estimated % impact on turnover per worker per grant awarded									
1	Declined applicants	Yes	No	0.028	1.346	0.104	-0.013	0.069	0.194
2	Declined applicants	Yes	Yes	0.046	1.084	0.152	-0.037	0.129	0.163
3	High scoring declined applicants	Yes	Yes	0.016	0.860	0.205	-0.020	0.052	0.177
4	Awarded grants only	Yes	Yes	0.025	0.622	0.274	-0.054	0.104	0.152
5	Staggered DiD	Yes	Yes	0.022	0.734	0.240	-0.037	0.081	-

Source: Business Structure Database, ONS, Ipsos analysis. '***', '**' and '*' indicate alpha levels of 0.01, 0.05 and 0.1 respectively.

Impacts on employment were present from one year after APC award with the estimated impact peaking after seven years at around 6%. This pattern mirrors that found for R&D employment. Turnover impacts begin to appear after three years and persist for the next five at least[6]. These findings would suggest that firms receiving APC funding have been able to expand their operations shortly after award, increasing employment in production roles and generate revenue as a result of APC funded projects.

Figure A.10 Persistence of effects on employment and turnover
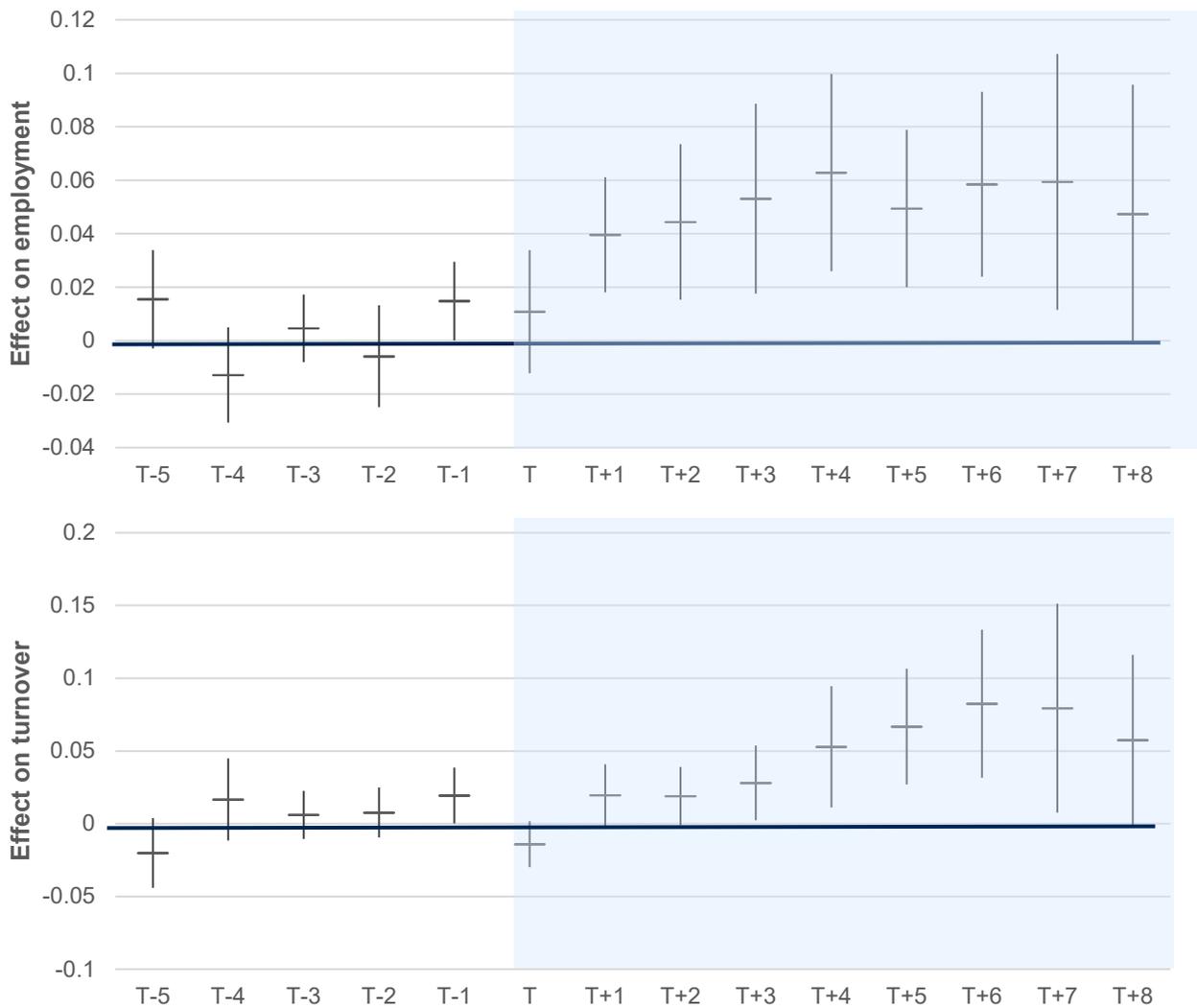
Source: Business Structure Database, ONS, Ipsos analysis. T equals year grant awarded. Post grant effect period shaded light blue. Error bars indicate 95% confidence intervals.

Impacts by role

When exploring effects by the role of firms on projects, it appears to be the case that effects on both employment and turnover are only present for lead applicants in the most robust

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[6] Effects appear to disappear after 8 years, however the small sample over which effects at 8 years after award can be estimated over means that errors here are large and may mask effects still present past this point. Further analysis in the future would need to assess this persistence.

specifications. These effects are also only weakly significant. Once again, no impacts on turnover per worker were identified.

These results imply that lead applicants had begun scaling up and benefitting from the commercialisation and production of vehicles following APC project completion. However, the lack of impacts for collaborators does not indicate similar scaling up activity from smaller partners. These firms may be part of the supply chain in many cases and as such this finding may be surprising. Sample sizes may play a role in this but further exploration of the relationships between leads and collaborators is warranted.

Table A.13 Estimated effects of APC grants on employment, turnover and turnover per worker by 2022 – lead applicants

Model	Comparison group	Fixed effects	Time fixed effects	Coeff.	T-stat	P value	Confidence interval (95%)		Adjusted R^2
							Lower	Upper	
Estimated % impact on employment per grant awarded									
1	Declined applicants	Yes	No	0.143***	3.062	0.006	0.051	0.235	0.501
2	Declined applicants	Yes	Yes	0.102**	2.183	0.027	0.010	0.194	0.490
3	High scoring declined applicants	Yes	Yes	0.086**	1.919	0.042	0.002	0.174	0.447
4	Awarded grants only	Yes	Yes	0.065**	1.963	0.039	0.000	0.130	0.430
5	Staggered DiD	Yes	Yes	0.051*	1.690	0.061	-0.008	0.110	-
Estimated % impact on turnover per grant awarded									
1	Declined applicants	Yes	No	0.183***	2.894	0.008	0.059	0.307	0.283
2	Declined applicants	Yes	Yes	0.149**	1.904	0.043	0.004	0.302	0.330
3	High scoring declined applicants	Yes	Yes	0.104**	1.963	0.039	0.000	0.208	0.294
4	Awarded grants only	Yes	Yes	0.098*	1.660	0.064	-0.018	0.214	0.263
5	Staggered DiD	Yes	Yes	0.075*	1.494	0.083	-0.023	0.173	-
Estimated % impact on turnover per worker per grant awarded									
1	Declined applicants	Yes	No	0.042	1.069	0.155	-0.035	0.119	0.190
2	Declined applicants	Yes	Yes	0.038	0.993	0.172	-0.037	0.113	0.231
3	High scoring declined applicants	Yes	Yes	0.019	0.943	0.184	-0.020	0.058	0.173

| 4 | Awarded grants only | Yes | Yes | 0.032 | 0.871 | 0.202 | -0.040 | 0.104 | 0.148 |
| 5 | Staggered DiD | Yes | Yes | 0.026 | 0.811 | 0.218 | -0.037 | 0.089 | - |

Source: Business Structure Database, ONS, Ipsos analysis. '***', '**' and '*' indicate alpha levels of 0.01, 0.05 and 0.1 respectively.

Table A.14 Estimated effects of APC grants on employment, turnover and turnover per worker by 2022 – collaborator applicants

Model	Comparison group	Fixed effects	Time fixed effects	Coeff.	T-stat	P value	Confidence interval (95%)		Adjusted R^2
							Lower	Upper	
Estimated % impact on employment per grant awarded									
1	Declined applicants	Yes	No	0.029*	1.471	0.086	-0.010	0.068	0.301
2	Declined applicants	Yes	Yes	0.030*	1.510	0.081	-0.009	0.069	0.372
3	High scoring declined applicants	Yes	Yes	0.024	1.321	0.108	-0.012	0.060	0.364
4	Awarded grants only	Yes	Yes	0.022	1.210	0.127	-0.014	0.058	0.321
5	Staggered DiD	Yes	Yes	0.027	1.084	0.152	-0.022	0.076	-
Estimated % impact on turnover per grant awarded									
1	Declined applicants	Yes	No	0.041	1.244	0.121	-0.024	0.106	0.300
2	Declined applicants	Yes	Yes	0.038	1.127	0.143	-0.028	0.104	0.283
3	High scoring declined applicants	Yes	Yes	0.037	1.098	0.149	-0.029	0.103	0.274
4	Awarded grants only	Yes	Yes	0.038	1.168	0.135	-0.026	0.102	0.281
5	Staggered DiD	Yes	Yes	0.035	1.002	0.170	-0.033	0.103	-
Estimated % impact on turnover per worker per grant awarded									
1	Declined applicants	Yes	No	0.027	0.883	0.199	-0.033	0.087	0.155
2	Declined applicants	Yes	Yes	0.020	0.730	0.241	-0.034	0.074	0.172
3	High scoring declined applicants	Yes	Yes	0.019	0.622	0.274	-0.041	0.079	0.128
4	Awarded grants only	Yes	Yes	0.018	0.730	0.241	-0.030	0.066	0.151
5	Staggered DiD	Yes	Yes	0.015	0.545	0.299	-0.039	0.069	-

Source: Business Structure Database, ONS, Ipsos analysis. '***', '**' and '*' indicate alpha levels of 0.01, 0.05 and 0.1 respectively.

Expenditure on UK and non-UK inputs

Econometric analysis was also completed using the amount of spending placed by firms in business within the UK and outside of the UK to explore impacts on imports in the production process. The analysis indicated that spending on goods and services by firms delivering APC project had risen overall with an 11% rise in pending to UK based firms and 5% in non-UK based firms. This implies a reduction in the import dependency of firms as a result of APC funding.

Table A.15 Estimated effects of APC grants on the location of intermediate and input goods and services

Model	Comparison group	Fixed effects	Time fixed effects	Coeff.	T-stat	P value	Confidence interval (95%)		Adjusted R²
							Lower	Upper	
Estimated % impact on spending on UK goods/services per grant awarded									
1	Declined applicants	Yes	No	0.144***	4.144	0.001	0.076	0.212	0.358
2	Declined applicants	Yes	Yes	0.132***	3.716	0.002	0.062	0.202	0.383
3	High scoring declined applicants	Yes	Yes	0.128***	3.716	0.002	0.060	0.196	0.361
4	Awarded grants only	Yes	Yes	0.131**	2.183	0.027	0.013	0.249	0.380
5	Staggered DiD	Yes	Yes	0.112**	1.904	0.043	0.003	0.227	-
Estimated % impact on spending on non-UK goods/services per grant awarded									
1	Declined applicants	Yes	No	0.103***	4.361	0.001	0.057	0.149	0.322
2	Declined applicants	Yes	Yes	0.072***	4.277	0.001	0.039	0.105	0.363
3	High scoring declined applicants	Yes	Yes	0.061***	2.972	0.007	0.021	0.101	0.353
4	Awarded grants only	Yes	Yes	0.055**	1.837	0.048	0.004	0.114	0.326
5	Staggered DiD	Yes	Yes	0.049*	1.603	0.070	-0.011	0.109	-

Source: Annual business Survey, ONS, Ipsos analysis. '***', '**' and '*' indicate alpha levels of 0.01, 0.05 and 0.1 respectively

Total impacts by 2022

The estimated effects on employment above were aggregated to the population of firms supported through the APC. It was estimated that the APC had led to the creation or safeguarding of a total 35,000 job years across supported applicants by the end of 2022. This was reached by applying a trimmed average baseline employment for lead firms (254) to the profile of grant awards to firms and the profile of estimated impacts by year. This is detailed in the table below.

Comparison with the R&D results indicates that most of these positions are non-R&D roles. It should be noted that these are gross additional rather than net additional effects and have not been adjusted for either displacement or crowding out.

Table A.16 Estimated employment impacts of APC grant funding

Year funded	Baseline employment	Number of awards	Estimated impact on overall employment by year										
			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
2013	254	25	0	314	408	463	525	504	498	440	0	0	3152
2014	254	46	0	0	578	751	853	966	927	916	809	0	5800
2015	254	29	0	0	0	365	473	537	609	584	577	510	3656
2016	254	95	0	0	0	0	1195	1551	1761	1996	1914	1891	10307
2017	254	28	0	0	0	0	0	352	457	519	588	564	2480
2018	254	47	0	0	0	0	0	0	591	767	871	987	3217
2019	254	74	0	0	0	0	0	0	0	930	1208	1371	3510
2020	254	88	0	0	0	0	0	0	0	0	1107	1437	2543
2021	254	38	0	0	0	0	0	0	0	0	0	478	478
2022	254	21	0	0	0	0	0	0	0	0	0	0	0
Total			0	314	987	1579	3046	3910	4842	6152	7074	7239	35143

Source: Business Structure Database, ONS, Ipsos analysis.

Wage impacts

The results of the analysis showed that APC grants had a positive effect on hourly earnings of 1.6 to 1.8% in the specifications using pipeline or high scoring unsuccessful counterfactuals, 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).

These analyses are based on workers that were employed by firms before and after the grant was awarded. As such, the results are not driven by changes in the composition of workers (e.g. firms employing more highly skilled workers because of the grant).

Table A.17 Estimated effects of APC grants on the hourly earnings of workers by 2022 – overall results

Model	Comparison group	Fixed effects	Time fixed effects	Coeff.	T-stat	P value	Confidence interval (95%)		Adjusted R^2
							Lower	Upper	
Estimated % impact on hourly wages per grant awarded									
1	Declined applicants	Yes	No	0.023***	4.627	0.000	0.013	0.033	0.294
2	Declined applicants	Yes	Yes	0.020***	4.144	0.001	0.011	0.029	0.287

3	High scoring declined applicants	Yes	Yes	0.018**	2.421	0.018	0.003	0.033	0.290
4	Awarded grants only	Yes	Yes	0.018**	2.161	0.028	0.002	0.034	0.263
5	Staggered DiD	Yes	Yes	0.016*	1.765	0.054	-0.002	0.034	-
Estimated % impact on hours worked per grant awarded									
1	Declined applicants	Yes	No	0.002	0.300	0.385	-0.011	0.015	0.133
2	Declined applicants	Yes	Yes	0.001	0.155	0.440	-0.012	0.014	0.175
3	High scoring declined applicants	Yes	Yes	0.001	0.282	0.392	-0.006	0.008	0.149
4	Awarded grants only	Yes	Yes	0.000	0.005	0.502	-0.076	0.076	0.103
5	Staggered DiD	Yes	Yes	0.000	0.215	0.583	-0.006	0.007	-

Source: Annual Survey of Hours and Earnings, ONS, Ipsos analysis. '***', '**' and '*' indicate alpha levels of 0.01, 0.05 and 0.1 respectively.

Analysis of the wage impacts over time indicated that wage effects coincide with employment impacts with an increase one year after award. Thereafter consistent effects ranging from 1.3 to 2.1% are present until impacts disappear 6 years after award. This implies that any potential productivity effect brought about through APC funded projects may be temporary.

Figure A.11 Persistence of effects on wages (hourly earnings)
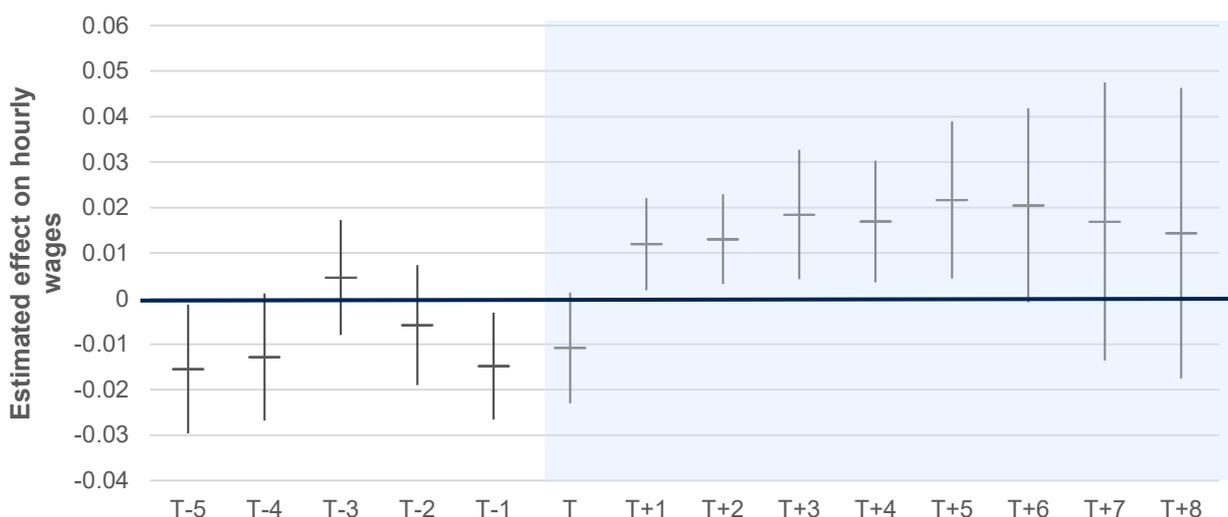
Source: Annual Survey of Hours and Earnings, ONS, Ipsos analysis. T equals year grant awarded. Post grant effect period shaded light blue. Error bars indicate 95% confidence intervals.

Analysis by role also indicated that the estimated effects on wages were restricted to lead applicants with no statistically significant impacts for collaborators.

Table A.18 Estimated effects of APC grants on hourly earnings of workers by 2022 – lead applicants

Model	Comparison group	Fixed effects	Time fixed effects	Coeff.	T-stat	P value	Confidence interval (95%)		Adjusted R^2
							Lower	Upper	
Estimated % impact on hourly wages per grant awarded									
1	Declined applicants	Yes	No	0.031***	3.062	0.006	0.011	0.051	0.318
2	Declined applicants	Yes	Yes	0.025**	2.359	0.020	0.004	0.046	0.281
3	High scoring declined applicants	Yes	Yes	0.020**	1.995	0.037	0.000	0.040	0.295
4	Awarded grants only	Yes	Yes	0.017*	1.669	0.063	-0.003	0.037	0.277
5	Staggered DiD	Yes	Yes	0.016*	1.534	0.078	-0.004	0.036	-
Estimated % impact on hours worked per grant awarded									
1	Declined applicants	Yes	No	0.002	0.258	0.401	-0.013	0.017	0.156
2	Declined applicants	Yes	Yes	0.001	0.202	0.422	-0.009	0.011	0.182
3	High scoring declined applicants	Yes	Yes	0.001	0.277	0.530	-0.024	0.026	0.105
4	Awarded grants only	Yes	Yes	0.000	0.255	0.598	-0.002	0.003	0.127
5	Staggered DiD	Yes	Yes	0.000	0.186	0.572	-0.004	0.005	-

Source: Annual Survey of Hours and Earnings, ONS, Ipsos analysis. '***', '**' and '*' indicate alpha levels of 0.01, 0.05 and 0.1 respectively.

Table A.19 Estimated effects of APC grants on hourly earnings of workers by 2022 – collaborator applicants

Model	Comparison group	Fixed effects	Time fixed effects	Coeff.	T-stat	P value	Confidence interval (95%)		Adjusted R^2
							Lower	Upper	
Estimated % impact on hourly wages per grant awarded									
1	Declined applicants	Yes	No	0.022	1.315	0.109	-0.011	0.055	0.241
2	Declined applicants	Yes	Yes	0.017	1.272	0.116	-0.009	0.043	0.265
3	High scoring declined applicants	Yes	Yes	0.016	1.152	0.138	-0.011	0.043	0.253
4	Awarded grants only	Yes	Yes	0.015	0.985	0.174	-0.015	0.045	0.226

| 5 | Staggered DiD | Yes | Yes | 0.013 | 0.947 | 0.183 | -0.014 | 0.040 | - |

	Estimated % impact on hours worked per grant awarded								
1	Declined applicants	Yes	No	0.001	0.054	0.521	-0.035	0.037	0.115
2	Declined applicants	Yes	Yes	0.001	0.088	0.534	-0.021	0.023	0.106
3	High scoring declined applicants	Yes	Yes	0.001	0.215	0.583	-0.008	0.010	0.093
4	Awarded grants only	Yes	Yes	0.000	0.319	0.622	-0.002	0.003	0.106
5	Staggered DiD	Yes	Yes	0.000	0.274	0.605	-0.002	0.002	-

Source: Annual Survey of Hours and Earnings, ONS, Ipsos analysis. '***', '**' and '*' indicate alpha levels of 0.01, 0.05 and 0.1 respectively.

An additional set of models were implemented to explore how the effects of APC 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 (using the staggered difference-in-difference model) which show that the grants have variable effects on the earnings of workers across different occupations. Those 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 between 2.6 and 3.2% 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 A.20 Estimated effects of APC grants on hourly earnings of workers by 2022 – analysis by occupation group

Model	Comparison group	Fixed effects	Time fixed effects	Coeff.	T-stat	P value	Confidence interval (95%)		Adjusted R^2
							Lower	Upper	
Managerial, professional, and technical									
1	Declined applicants	Yes	No	0.087***	3.508	0.002	0.038	0.136	0.310
2	Declined applicants	Yes	Yes	0.045***	3.283	0.004	0.018	0.072	0.318
3	High scoring declined applicants	Yes	Yes	0.030**	2.303	0.022	0.004	0.056	0.295
4	Awarded grants only	Yes	Yes	0.036**	2.228	0.025	0.004	0.068	0.267
5	Staggered DiD	Yes	Yes	0.032**	2.046	0.034	0.001	0.063	-
Skilled trades									
1	Declined applicants	Yes	No	0.055***	2.825	0.009	0.017	0.093	0.274
2	Declined applicants	Yes	Yes	0.034**	2.389	0.019	0.006	0.062	0.243
3	High scoring declined applicants	Yes	Yes	0.030**	2.252	0.024	0.004	0.056	0.271
4	Awarded grants only	Yes	Yes	0.025*	1.660	0.064	-0.005	0.055	0.248
5	Staggered DiD	Yes	Yes	0.026*	1.788	0.052	-0.002	0.054	-
Administrative, leisure and service occupations									
1	Declined applicants	Yes	No	0.016	0.875	0.201	-0.020	0.052	0.220
2	Declined applicants	Yes	Yes	0.010	0.707	0.248	-0.018	0.038	0.236
3	High scoring declined applicants	Yes	Yes	0.008	0.651	0.265	-0.016	0.032	0.201

Model	Comparison group	Fixed effects	Time fixed effects	Coeff.	T-stat	P value	Confidence (95%) Lower	Upper	Adjusted R²
4	Awarded grants only	Yes	Yes	0.010	0.690	0.253	-0.018	0.038	0.229
5	Staggered DiD	Yes	Yes	0.008	0.575	0.289	-0.019	0.035	-
Elementary occupations									
1	Declined applicants	Yes	No	0.049	0.013	0.495	-7.425	7.523	0.310
2	Declined applicants	Yes	Yes	0.037	0.069	0.473	-1.007	1.081	0.306
3	High scoring declined applicants	Yes	Yes	0.038	0.181	0.430	-0.374	0.450	0.294
4	Awarded grants only	Yes	Yes	0.034	0.075	0.471	-0.859	0.927	0.270
5	Staggered DiD	Yes	Yes	0.032	0.144	0.444	-0.402	0.466	-

Source: Annual Survey of Hours and Earnings, ONS, Ipsos analysis. '***', '**' and '*' indicate alpha levels of 0.01, 0.05 and 0.1 respectively.

Table A.21 Estimated effects of APC grants on hours worked by 2022 – analysis by occupation group

Model	Comparison group	Fixed effects	Time fixed effects	Coeff.	T-stat	P value	Confidence (95%) Lower	interval Upper	Adjusted R²
Managerial, professional, and technical									
1	Declined applicants	Yes	No	0.008	0.899	0.195	-0.009	0.025	0.201
2	Declined applicants	Yes	Yes	0.005	1.346	0.104	-0.002	0.012	0.215
3	High scoring declined applicants	Yes	Yes	0.004	0.943	0.184	-0.004	0.012	0.186
4	Awarded grants only	Yes	Yes	0.003	1.015	0.167	-0.003	0.009	0.177
5	Staggered DiD	Yes	Yes	0.003	1.084	0.152	-0.002	0.008	-
Skilled trades									
1	Declined applicants	Yes	No	0.010	0.875	0.201	-0.012	0.032	0.194
2	Declined applicants	Yes	Yes	0.006	1.108	0.147	-0.005	0.017	0.175

#									
3	High scoring declined applicants	Yes	Yes	0.003	1.002	0.170	-0.003	0.009	0.150
4	Awarded grants only	Yes	Yes	0.004	1.051	0.159	-0.003	0.011	0.163
5	Staggered DiD	Yes	Yes	0.002	0.947	0.183	-0.002	0.006	-
Administrative, leisure and service occupations									
1	Declined applicants	Yes	No	0.010	0.590	0.284	-0.023	0.043	0.181
2	Declined applicants	Yes	Yes	0.007	0.667	0.260	-0.014	0.028	0.202
3	High scoring declined applicants	Yes	Yes	0.005	0.545	0.299	-0.013	0.023	0.186
4	Awarded grants only	Yes	Yes	0.002	0.521	0.307	-0.006	0.010	0.181
5	Staggered DiD	Yes	Yes	0.002	0.503	0.313	-0.006	0.010	-
Elementary occupations									
1	Declined applicants	Yes	No	0.007	0.271	0.604	-0.044	0.058	0.153
2	Declined applicants	Yes	Yes	0.006	0.430	0.662	-0.021	0.033	0.149
3	High scoring declined applicants	Yes	Yes	0.004	0.545	0.701	-0.010	0.018	0.124
4	Awarded grants only	Yes	Yes	0.004	0.521	0.693	-0.011	0.019	0.111
5	Staggered DiD	Yes	Yes	0.001	0.476	0.678	-0.003	0.005	-

Source: Annual Survey of Hours and Earnings, ONS, Ipsos analysis. '***', '**' and '*' indicate alpha levels of 0.01, 0.05 and 0.1 respectively.

Total impacts by 2022

The total impact on GVA was estimated using the wage effect results presented above, under the assumption that wage gains can be treated as a productivity gain. An approximate estimate of the total associated GVA impact was derived by:

- **Effect on annual earnings:** Applying the estimated effect on wages for workers in lead applicants – 1.6% from the staggered DiD model - to hourly earnings and hours worked across the whole economy in 2013[7], gave an estimated impact on the average annual earnings of workers of £499[8].

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[7] The average worker earned £15.91 (in 2023 prices) and worked 37.7 hours per week in 2013.

[8] I.e. 0.016 x 15.91 x 37.7 x 52

- **Annual GVA gains per firm:** Applying this to the average number of workers employed by firms awarded grants in 2013 (1,144), gives an estimated annual GVA gain per firm of £571,000.

- **Cumulative effects**: This result was then applied to the cumulative number of grants awarded between 2013 and 2022 to give an estimate of the total GVA impact by 2022. This gave an estimated £249.5m in GVA gains by 2022, relative to a grant spend of £327m.

Table A.22 Estimated GVA impacts of APC grant funding by 2022 (wage effects)

Year	Number of grants awarded to leads	Cumulative number of grants awarded	Estimated GVA gain (£m)
2013	4	4	2.3
2014	7	11	6.3
2015	6	17	9.7
2016	15	32	18.3
2017	5	37	21.1
2018	8	45	25.7
2019	12	57	32.5
2020	15	72	41.1
2021	7	79	45.1
2022	4	83	47.4
Total	**83**		**249.5**

Source: Ipsos analysis. GVA gains estimated based on the estimated annual impact of APC grant funding on annual earnings per firm (£571,000) and the cumulative number of grants awarded. All £ values are 2023 prices.

Firm structure impacts

The Business Structure Database (BSD) data provides information on company structure including details of the number and locations of 'local units', that was used to explore the effectiveness of the programme in safeguarding economic activity in more detail. The same method was applied to examine the number of plants operated by firms receiving APC funding. However, an alternative model was required to examine the outcomes below:

- Number of new plants established by firms receiving APC funding

- Number of plant closures by firms receiving APC funding

Poisson and Negative Binomial are both regression techniques designed for outcome variables that take the form of count variables like these. The standard specification used is presented below:

$$y_i^x = e^{\alpha + X_i\beta + \partial APC_i + \varepsilon_{it}} = e^{\alpha} * e^{X_i\beta} * e^{\partial APC_i} * e^{\varepsilon_{it}}$$

$$\log(y_i^x) = \alpha + X_i\beta + \partial APC_i + \varepsilon_{it}$$

In this model, y_i is a count variable taking the value of the number of plants opened or closed over a specified timeframe. For the purposes of this analysis, we have specified 1 year, 3 years and 5 years after grant for successful firms and 1, 3 and 5 years after first application for unsuccessful applicants. A dummy variable for APC grant funding (APC_i) identifies treatment with the parameter ∂ capturing its estimated impact on the outcome. These models used all unsuccessful firms as control firms. The number of plant openings/closures was extremely limited when the counterfactual pool was restricted to high scoring unsuccessful applicants or just applicants successful at different times.

The table below presents the results of these analyses. This indicated that APC funding had led to an increase in the number of plants operated by successful applicants when compared to unsuccessful applicants (of around 2.1%) but that this was accounted for, at least in part, by a reduction in the number of plants closed relative to the counterfactual. The analysis found that firms receiving APC funding closed 0.6 to 0.8% fewer plants within 3 years of receiving APC funding and 1.3 to 1.5% fewer within 5 years. However, effects for within 3 years are only weakly significant, possible related to the comparatively fewer plant closures occurring in this period.

Whilst this would suggest that the APC has safeguarded some UK jobs and output, the evidence for an increased number of plants operated by APC funded firms is less clear with only small statistically significant effects found on the number of plants opened within 5 years. These models implied that APC funded firms opened 0.6 to 0.7% more plants within 5 years of receiving funding compared to unsuccessful applicants.

Table A.23 Estimated effects of APC grants on plants operated

Model number	Comparison group/model	Fixed effects	Time fixed effects	Estimated % impact per grant awarded		
				Number of plants operated	Number of plants opened	Number of plants closed
Number of plants operated in total						
1	High scoring declined applicants	Yes	Yes	0.031***	-	-
2	Awarded grants only	Yes	Yes	0.026**	-	-
3	Staggered DiD	Yes	Yes	0.021**	-	-
Number of plants open or closed in 12 months						
4	Poisson	Yes	N/A	-	0.000	-0.001
5	Negative Binomial	Yes	N/A	-	0.000	-0.002
Number of plants open or closed in 36 months						
6	Poisson	Yes	N/A	-	0.004	-0.008*
7	Negative Binomial	Yes	N/A	-	0.005	-0.006*
Number of plants open or closed in 60 months						
8	Poisson	Yes	N/A	-	0.007*	-0.015***
9	Negative Binomial	Yes	N/A	-	0.006*	-0.013***

Indirect effects

A further set of analyses were completed exploring the indirect effects of APC 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 APC 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 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). These effects were also broken down by sector (tradable and non-tradable services, manufacturing, and construction) to establish how far the grants have altered the sector distribution of local employment in a future update.

- **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.

- **Wages**: The ASHE panel data was used to determine how far any local spill-over effects are visible in the earnings of workers. While effects of this nature could potentially be interpreted as a productivity effect (based on that in perfect labour markets, a marginal increase in productivity should be reflected in a marginal increase in the wage), they could also represent price effects driven by greater demand for skills that may be scarce locally.

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 unsuccessful applicants for funding (say within 10km or 20km of successful and unsuccessful applicants). Further robustness checks were also be implemented by limiting the sample to just those postcodes near successful applicants for funding (replicated the Early Vs Late approach set out above).

The estimating equation for the spatial analysis is as follows:

$$y_{it} = \alpha + \left(\beta^1 T_{it}^{0-1km} + \beta^2 T_{it}^{1-5km} + \beta^3 T_{it}^{5-10km} + \beta^4 T_{it}^{10-20km}\right) + \rho \cdot X_{it} \cdot t + \alpha^i + \alpha^t + u_{it}$$

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 APC funding (e.g. if area level effect on employment is smaller than the firm level effect, this would imply that the APC supported firms have expanded by drawing resources away from other local firms).

- The parameters β^2, β^3 and β^4 capture the effects of grants awarded to firms located at distances of 1 to 5km, 5 to 10km and 10 to 20km 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 APC has crowded out or displaced economic activity in nearby areas.

Results

The results of the econometric analysis are presented in the table below. These suggest:

- **Clustering**: The results show that the grant awards had a positive effect on the number of firms located in areas proximate to those awarded grants. These effects were largest in the output area in which the firms' receiving grants were located (7 to 8%) but were positive though smaller at greater distances. This indicates that APC grants have worked to produce clustering effects at the local level, with no evidence of net displacement effects within 10km.

- **Local economic performance**: The evidence indicate that APC grants had a positive net economic impact on local economic growth and productivity. The impacts included:

  - **Increased activity within the OA of the firm**: Each grant led to a 12 to 14% increase in the number of jobs in the OA in which the applicant was located, and a 15 to 17% increase in the turnover of firms based in the area. No significant impacts were identified for turnover per worker. These impacts are broadly comparable to those observed amongst those applying for funding, suggesting that any displacement or crowding out effects at the very local level were negligible.

  - **Increased activity within proximate areas**: There were also positive economic impacts at distances of 1km to 10km from those awarded funding. Larger effects were observed at distances of 5km to 10km than between 1km and 5km, and there was no evidence of net displacement or crowding-out effects locally.

These findings indicate that the APC has produced positive spill-over effects for local economies. Given the evidence on firm relocations, it is assumed that some of this effect has come from the attraction of higher value activities to the area as well as the increase in output for existing firms. It should be noted that there will likely be corresponding negative effects on some local economies from which activities were relocated.

Table A.24 Estimated indirect effects of APC grant awards - Comparisons between Output Areas within 10km of successful and unsuccessful applicants

Outcome	Coeff.	T-stat	P value	Confidence interval (95%) Lower	Upper
Employment					
In OA	0.137***	3.716	0.002	0.065	0.209
Within 1km	0.006	1.142	0.140	-0.004	0.016
1km to 5km	0.005**	1.669	0.063	-0.001	0.011

	Coeff.	T-stat	P value	Lower	Upper
5km to 10km	0.001***	2.972	0.007	0.000	0.002
Turnover					
In OA	0.174***	4.144	0.001	0.092	0.256
Within 1km	0.009*	1.420	0.093	-0.003	0.021
1km to 5km	0.007**	1.948	0.040	0.000	0.014
5km to 10km	0.003***	2.825	0.009	0.001	0.005
Turnover per worker					
In OA	0.034	0.864	0.204	-0.043	0.111
Within 1km	0.002	0.594	0.283	-0.005	0.009
1km to 5km	0.003	0.548	0.298	-0.008	0.014
5km to 10km	0.003	0.700	0.250	-0.005	0.011
Number of firms					
In OA	0.081***	3.062	0.006	0.029	0.133
Within 1km	0.007*	1.464	0.087	-0.002	0.016
1km to 5km	0.004*	1.660	0.064	-0.001	0.009
5km to 10km	0.006***	2.894	0.008	0.002	0.010

Source: Ipsos analysis. ***, **, and * indicate that the estimated coefficient was significant at the 99%, 95%, and 90% level of confidence respectively. All models were estimated with fixed effects and unobserved time specific shocks. Staggered Difference-in-Difference approach used for all results presented

Table A.25 Estimated indirect effects of APC grant awards - Comparisons restricted to Output Areas within 10km of successful applicants only

	Coeff.	T-stat	P value	Confidence interval (95%)	
Outcome				Lower	Upper
Employment					
In OA	0.118***	3.301	0.004	0.048	0.188
Within 1km	0.005	1.060	0.157	-0.004	0.014
1km to 5km	0.006*	1.502	0.082	-0.002	0.014
5km to 10km	0.001***	2.825	0.009	0.000	0.002
Turnover					
In OA	0.151***	3.472	0.003	0.066	0.236
Within 1km	0.010	1.278	0.115	-0.005	0.025
1km to 5km	0.005**	1.631	0.067	-0.001	0.011
5km to 10km	0.001***	2.894	0.008	0.000	0.002
Turnover per worker					
In OA	0.044	0.696	0.251	-0.080	0.168
Within 1km	0.003	0.560	0.294	-0.008	0.014
1km to 5km	0.004	0.521	0.307	-0.011	0.019
5km to 10km	0.000	0.506	0.312	-0.001	0.001
Number of firms					
In OA	0.067***	2.972	0.007	0.023	0.111

Within 1km	0.008	1.340	0.105	-0.004	0.020
1km to 5km	0.004*	1.594	0.071	-0.001	0.009
5km to 10km	0.004***	2.972	0.007	0.001	0.007

Source: Ipsos analysis. ***, **, and * indicate that the estimated coefficient was significant at the 99%, 95%, and 90% level of confidence respectively. All models were estimated with fixed effects and unobserved time specific shocks. Staggered Difference-in-Difference approach used for all results presented

Table A.26 Estimated effects of APC grants on R&D spending and employment by 2021 – overall findings

	R&D expenditure								R&D employment							
	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value
Model	Declined applicants		Declined applicants		High scoring declined		Awarded grants only		Declined applicants		Declined applicants		High scoring declined		Awarded grants only	
FE	No		Yes		Yes		Yes		No		Yes		Yes		Yes	
treatment	0.210	0.000	0.173	0.000	0.126	0.021	0.097	0.063	0.195	0.000	0.181	0.000	0.144	0.018	0.143	0.034
2.firm_size	-0.826	0.000	-0.857	0.000	-0.695	0.000	0.162	0.144	-0.717	0.000	-0.451	0.000	0.266	0.008	-0.645	0.000
3.firm_size	-2.927	0.000	-3.024	0.000	-2.408	0.000	0.616	0.000	-2.762	0.000	-2.189	0.000	0.573	0.000	-2.801	0.000
4.firm_size	-1.838	0.000	-1.910	0.000	-1.586	0.000	0.324	0.011	-1.715	0.000	-1.339	0.000	0.377	0.001	-1.715	0.000
2013.y	-	-	-0.001	0.947	0.045	0.330	0.047	0.306	-	-	0.066	0.070	0.054	0.125	0.020	0.420
2014.y	-	-	0.016	0.366	0.071	0.126	0.055	0.226	-	-	0.115	0.001	0.066	0.057	0.042	0.088
2015.y	-	-	0.040	0.029	0.042	0.376	0.002	0.960	-	-	0.113	0.001	0.035	0.313	0.068	0.008
2016.y	-	-	0.087	0.000	0.076	0.133	-0.011	0.829	-	-	0.115	0.001	-0.008	0.824	0.137	0.000
2017.y	-	-	0.134	0.000	0.132	0.012	-0.002	0.965	-	-	0.141	0.000	-0.024	0.490	0.193	0.000
2018.y	-	-	0.140	0.000	0.129	0.014	-0.010	0.841	-	-	0.131	0.000	-0.036	0.306	0.196	0.000
2019.y	-	-	0.141	0.000	0.080	0.134	-0.062	0.236	-	-	0.114	0.001	-0.066	0.057	0.206	0.000
2020.y	-	-	0.235	0.000	0.150	0.037	-0.086	0.221	-	-	0.091	0.055	-0.181	0.000	0.342	0.000
2.imm_foc_cd	-0.022	0.175	0.269	0.000	0.365	0.000	0.096	0.218	0.297	0.000	0.185	0.000	-0.112	0.026	0.379	0.000
2.sector	-0.047	0.554	0.275	0.000	0.423	0.000	0.148	0.101	0.292	0.000	0.132	0.025	-0.159	0.005	0.380	0.000
3.sector	-0.300	0.000	0.008	0.803	-0.066	0.425	-0.073	0.361	-0.021	0.371	-0.167	0.013	-0.146	0.024	0.018	0.712
4.sector	0.098	0.061	0.429	0.012	1.675	0.000	1.246	0.004	-0.203	0.063	-0.933	0.003	-0.730	0.015	-0.098	0.786
5.sector	-0.124	0.000	-0.191	0.136	-0.994	0.003	-0.802	0.014	0.128	0.308	-1.056	0.003	-1.184	0.001	0.028	0.868
6.sector	-0.047	0.508	0.060	0.592	1.407	0.000	1.346	0.000	0.018	0.868	-0.833	0.008	-0.852	0.005	0.050	0.844
7.sector	-0.250	0.103	-0.241	0.000	-0.175	0.186	0.066	0.609	-0.163	0.000	-0.240	0.033	-0.077	0.481	-0.346	0.000
8.sector	-0.085	0.003	-0.201	0.050	-0.211	0.432	-0.009	0.972	-0.090	0.318	0.155	0.545	0.246	0.323	-0.228	0.065
9.sector	-1.349	0.000	-0.630	0.118	3.449	0.001	4.079	0.000	-0.300	0.088	-0.153	0.759	0.147	0.762	-0.717	0.121
10.sector	0.209	0.038	-0.244	0.000	-0.873	0.000	-0.630	0.000	-0.036	0.311	-0.518	0.000	-0.482	0.000	-0.124	0.066

	coef	p	coef	p	coef	p	coef	p	coef	p	coef	p	coef	p	coef	p
11.sector	-0.107	0.000	-1.549	0.000	-4.637	0.000	-3.088	0.000	-1.137	0.000	-3.018	0.000	-1.881	0.000	-1.810	0.000
12.sector	-0.147	0.000	-0.134	0.001	-0.689	0.000	-0.556	0.000	-0.081	0.004	-0.364	0.000	-0.283	0.000	-0.118	0.019
13.sector	-0.377	0.146	-0.154	0.005	-0.553	0.000	-0.399	0.004	-0.130	0.000	-0.209	0.044	-0.079	0.430	-0.187	0.004
14.sector	-0.222	0.031	-0.467	0.009	-2.245	0.000	-1.779	0.000	-0.139	0.213	-1.859	0.000	-1.721	0.000	-0.651	0.002
15.sector	0.076	0.392	0.195	0.306	-1.524	0.002	-1.718	0.000	0.060	0.539	-1.051	0.000	-1.111	0.000	0.158	0.429
16.sector	-0.169	0.179	-0.339	0.082	4.124	0.000	4.463	0.000	-0.185	0.211	0.746	0.075	0.931	0.022	-0.526	0.070
17.sector	-0.143	0.007	-0.280	0.007	0.035	0.899	0.314	0.238	-0.094	0.176	-0.092	0.638	0.001	0.995	-0.154	0.267
2.region	0.042	0.538	-0.138	0.288	-0.925	0.007	-0.787	0.018	-0.282	0.007	-0.695	0.020	-0.413	0.154	-0.299	0.062
3.region	-0.044	0.518	-0.206	0.086	-0.908	0.004	-0.702	0.022	-0.341	0.001	-0.608	0.037	-0.267	0.345	-0.273	0.092
4.region	0.042	0.538	-0.294	0.023	-0.948	0.005	-0.654	0.047	-0.361	0.001	-0.791	0.008	-0.429	0.136	-0.452	0.004
5.region	0.007	0.914	-0.237	0.062	-1.152	0.001	-0.915	0.005	-0.214	0.045	-0.923	0.002	-0.709	0.016	-0.307	0.049
6.region	0.085	0.190	-0.122	0.315	-1.095	0.001	-0.973	0.002	-0.231	0.022	-1.088	0.000	-0.856	0.002	-0.325	0.028
7.region	0.033	0.603	-0.284	0.019	-0.945	0.003	-0.661	0.032	-0.269	0.007	-0.909	0.001	-0.640	0.020	-0.476	0.001
8.region	0.143	0.022	-0.058	0.627	-0.896	0.004	-0.838	0.006	-0.156	0.119	-0.672	0.018	-0.516	0.061	-0.230	0.121
9.region	0.013	0.843	-0.075	0.570	-1.158	0.001	-1.083	0.001	-0.399	0.000	-1.125	0.000	-0.726	0.011	-0.340	0.037
10.region	0.066	0.377	-0.132	0.319	-1.209	0.000	-1.077	0.001	-0.255	0.026	-1.515	0.000	-1.260	0.000	-0.091	0.595
11.region	0.166	0.023	-0.204	0.201	-0.578	0.165	-0.374	0.358	-0.006	0.954	-0.680	0.031	-0.673	0.027	-0.014	0.954
12.region	-0.343	0.121	-0.339	0.082	4.124	0.000	4.463	0.000	-0.185	0.211	0.746	0.075	0.931	0.022	-0.526	0.070
13.region	0.212	0.567	0.195	0.306	-1.524	0.002	-1.718	0.000	0.060	0.539	-1.051	0.000	-1.111	0.000	0.158	0.267
Constant	4.833	0.000	5.295	0.000	10.010	0.000	4.713	0.000	4.797	0.000	9.096	0.000	4.299	0.000	4.946	0.000
R-squared		0.323		0.377		0.352		0.259		0.301		0.312		0.384		0.328

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

Table A.27 Estimated effects of APC grants on R&D expenditure by location of expenditure

	R&D expenditure (UK based)								R&D expenditure (non-UK based)							
	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value
Model	Declined applicants		Declined applicants		High scoring declined		Awarded grants only		Declined applicants		Declined applicants		High scoring declined		Awarded grants only	
FE	No		Yes		Yes		Yes		No		Yes		Yes		Yes	
treatment	0.197	0.001	0.155	0.002	0.101	0.025	0.086	0.061	0.094	0.005	0.090	0.078	0.058	0.183	0.052	0.205
2.firm_size	-0.851	0.000	-0.883	0.000	-0.716	0.000	0.167	0.148	-0.739	0.000	-0.465	0.000	0.274	0.008	-0.664	0.000
3.firm_size	-3.015	0.000	-3.115	0.000	-2.480	0.000	0.634	0.000	-2.845	0.000	-2.255	0.000	0.590	0.000	-2.885	0.000
4.firm_size	-1.893	0.000	-1.967	0.000	-1.634	0.000	0.334	0.012	-1.766	0.000	-1.379	0.000	0.388	0.001	-1.766	0.000
2013.y	-	-	-0.001	0.975	0.047	0.340	0.048	0.315	-	-	0.068	0.072	0.056	0.129	0.021	0.433
2014.y	-	-	0.016	0.377	0.073	0.130	0.056	0.233	-	-	0.118	0.001	0.068	0.059	0.044	0.090
2015.y	-	-	0.041	0.030	0.043	0.387	0.002	0.989	-	-	0.116	0.001	0.036	0.322	0.070	0.009
2016.y	-	-	0.090	0.000	0.078	0.137	-0.011	0.854	-	-	0.118	0.001	-0.008	0.849	0.141	0.000
2017.y	-	-	0.138	0.000	0.136	0.012	-0.002	0.994	-	-	0.145	0.000	-0.025	0.505	0.199	0.000
2018.y	-	-	0.144	0.000	0.133	0.015	-0.011	0.866	-	-	0.135	0.000	-0.037	0.315	0.202	0.000
2019.y	-	-	0.145	0.000	0.082	0.138	-0.063	0.243	-	-	0.117	0.001	-0.068	0.059	0.212	0.000
2020.y	-	-	0.242	0.000	0.155	0.038	-0.088	0.228	-	-	0.094	0.057	-0.186	0.000	0.352	0.000
2.imm_foc_cd	-0.022	0.180	0.277	0.000	0.376	0.000	0.099	0.225	0.306	0.000	0.191	0.000	-0.115	0.027	0.390	0.000
2.sector	-0.048	0.571	0.283	0.000	0.436	0.000	0.152	0.104	0.301	0.000	0.136	0.026	-0.164	0.006	0.391	0.000
3.sector	-0.309	0.000	0.008	0.827	-0.067	0.438	-0.075	0.372	-0.022	0.382	-0.172	0.013	-0.150	0.025	0.019	0.733
4.sector	0.101	0.062	0.442	0.013	1.725	0.000	1.283	0.005	-0.209	0.065	-0.961	0.003	-0.752	0.015	-0.101	0.810
5.sector	-0.128	0.000	-0.197	0.140	-1.024	0.003	-0.826	0.015	0.132	0.317	-1.088	0.003	-1.220	0.001	0.029	0.894
6.sector	-0.048	0.523	0.062	0.610	1.449	0.000	1.386	0.000	0.019	0.894	-0.858	0.008	-0.878	0.005	0.051	0.869
7.sector	-0.258	0.106	-0.248	0.000	-0.180	0.192	0.068	0.627	-0.168	0.000	-0.247	0.034	-0.079	0.495	-0.356	0.000
8.sector	-0.088	0.003	-0.207	0.051	-0.217	0.445	-0.009	1.001	-0.093	0.328	0.160	0.561	0.253	0.333	-0.235	0.067
9.sector	-1.389	0.000	-0.649	0.122	3.552	0.001	4.201	0.000	-0.309	0.091	-0.158	0.782	0.151	0.785	-0.739	0.125

10.sector	0.215	0.039	-0.251	0.000	-0.899	0.000	-0.649	0.000	-0.037	0.320	-0.534	0.000	-0.496	0.000	-0.128	0.068
11.sector	-0.110	0.000	-1.595	0.000	-4.776	0.000	-3.181	0.000	-1.171	0.000	-3.109	0.000	-1.937	0.000	-1.864	0.000
12.sector	-0.151	0.000	-0.138	0.001	-0.710	0.000	-0.573	0.000	-0.083	0.004	-0.375	0.000	-0.291	0.000	-0.122	0.019
13.sector	-0.388	0.150	-0.159	0.005	-0.570	0.000	-0.411	0.005	-0.134	0.000	-0.215	0.045	-0.082	0.443	-0.193	0.005
14.sector	-0.229	0.032	-0.481	0.010	-2.312	0.000	-1.832	0.000	-0.143	0.219	-1.915	0.000	-1.773	0.000	-0.671	0.002
15.sector	0.078	0.404	0.201	0.315	-1.570	0.002	-1.770	0.000	0.062	0.555	-1.083	0.000	-1.144	0.000	0.163	0.442
16.sector	-0.174	0.184	-0.349	0.084	4.248	0.000	4.597	0.000	-0.191	0.217	0.768	0.077	0.959	0.023	-0.542	0.072
17.sector	-0.147	0.007	-0.288	0.008	0.036	0.926	0.323	0.245	-0.096	0.181	-0.095	0.657	0.001	1.025	-0.159	0.275
2.region	0.043	0.554	-0.142	0.297	-0.953	0.007	-0.811	0.019	-0.290	0.008	-0.716	0.021	-0.425	0.159	-0.308	0.064
3.region	-0.045	0.534	-0.212	0.089	-0.935	0.004	-0.723	0.023	-0.351	0.001	-0.626	0.038	-0.275	0.355	-0.281	0.095
4.region	0.043	0.554	-0.303	0.023	-0.976	0.005	-0.674	0.048	-0.372	0.001	-0.815	0.008	-0.442	0.140	-0.466	0.004
5.region	0.008	0.941	-0.244	0.064	-1.187	0.001	-0.942	0.005	-0.220	0.046	-0.951	0.002	-0.730	0.016	-0.316	0.051
6.region	0.087	0.196	-0.126	0.324	-1.128	0.001	-1.002	0.002	-0.238	0.023	-1.121	0.000	-0.882	0.002	-0.335	0.029
7.region	0.034	0.621	-0.293	0.019	-0.973	0.003	-0.681	0.033	-0.277	0.007	-0.936	0.001	-0.659	0.020	-0.490	0.002
8.region	0.147	0.023	-0.060	0.646	-0.923	0.005	-0.863	0.007	-0.161	0.123	-0.692	0.019	-0.531	0.063	-0.237	0.125
9.region	0.013	0.868	-0.077	0.587	-1.193	0.001	-1.115	0.001	-0.411	0.000	-1.159	0.000	-0.748	0.012	-0.350	0.038
10.region	0.068	0.388	-0.136	0.329	-1.245	0.000	-1.109	0.001	-0.263	0.026	-1.560	0.000	-1.298	0.000	-0.093	0.613
11.region	0.171	0.024	-0.210	0.207	-0.595	0.170	-0.385	0.369	-0.007	0.983	-0.700	0.031	-0.693	0.028	-0.015	0.983
12.region	-0.353	0.125	-0.349	0.084	4.248	0.000	4.597	0.000	-0.191	0.217	0.768	0.077	0.959	0.023	-0.542	0.072
13.region	0.218	0.584	0.201	0.315	-1.570	0.002	-1.770	0.000	0.062	0.555	-1.083	0.000	-1.144	0.000	0.163	0.275
Constant	4.978	0.000	5.454	0.000	10.310	0.000	4.854	0.000	4.941	0.000	9.369	0.000	4.428	0.000	5.094	0.000
R-squared		0.311		0.343		0.310		0.234		0.399		0.308		0.343		0.303

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

Table A.28 Estimated effects of APC grants on net capital expenditure and GVA by 2021 – overall results

	Capital expenditure								Gross value added							
	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value
Model	Declined applicants		Declined applicants		High scoring declined		Awarded grants only		Declined applicants		Declined applicants		High scoring declined		Awarded grants only	
FE	No		Yes		Yes		Yes		No		Yes		Yes		Yes	
treatment	0.320	0.008	0.323	0.031	0.273	0.052	0.251	0.067	0.152	0.004	0.136	0.003	0.138	0.030	0.102	0.055
2.firm_size	-0.909	0.000	-0.943	0.000	-0.765	0.000	0.178	0.158	-0.789	0.000	-0.496	0.000	0.293	0.009	-0.710	0.000
3.firm_size	-3.220	0.000	-3.326	0.000	-2.649	0.000	0.678	0.000	-3.038	0.000	-2.408	0.000	0.630	0.000	-3.081	0.000
4.firm_size	-2.022	0.000	-2.101	0.000	-1.745	0.000	0.356	0.012	-1.887	0.000	-1.473	0.000	0.415	0.001	-1.887	0.000
2013.y	-	-	-0.001	1.042	0.050	0.363	0.051	0.337	-	-	0.072	0.077	0.059	0.138	0.022	0.462
2014.y	-	-	0.018	0.403	0.078	0.139	0.060	0.249	-	-	0.127	0.001	0.072	0.062	0.047	0.097
2015.y	-	-	0.044	0.032	0.046	0.414	0.003	1.056	-	-	0.124	0.001	0.038	0.344	0.075	0.009
2016.y	-	-	0.096	0.000	0.084	0.146	-0.012	0.912	-	-	0.127	0.001	-0.008	0.906	0.151	0.000
2017.y	-	-	0.147	0.000	0.145	0.013	-0.002	1.062	-	-	0.155	0.000	-0.026	0.539	0.212	0.000
2018.y	-	-	0.154	0.000	0.142	0.016	-0.011	0.925	-	-	0.144	0.000	-0.039	0.337	0.216	0.000
2019.y	-	-	0.155	0.000	0.088	0.147	-0.068	0.260	-	-	0.125	0.002	-0.073	0.063	0.227	0.000
2020.y	-	-	0.259	0.000	0.165	0.041	-0.094	0.243	-	-	0.101	0.061	-0.199	0.000	0.376	0.000
2.imm_foc_cd	-0.024	0.193	0.296	0.000	0.402	0.000	0.105	0.240	0.327	0.000	0.204	0.000	-0.123	0.029	0.417	0.000
2.sector	-0.052	0.609	0.303	0.000	0.465	0.000	0.163	0.111	0.321	0.000	0.145	0.028	-0.175	0.006	0.418	0.000
3.sector	-0.330	0.000	0.009	0.883	-0.072	0.468	-0.081	0.397	-0.023	0.408	-0.184	0.014	-0.161	0.027	0.020	0.783
4.sector	0.108	0.067	0.472	0.014	1.843	0.000	1.371	0.005	-0.223	0.069	-1.026	0.003	-0.803	0.016	-0.108	0.865
5.sector	-0.136	0.000	-0.210	0.150	-1.093	0.003	-0.882	0.016	0.141	0.339	-1.162	0.003	-1.302	0.001	0.031	0.955

6.sector	-0.051	0.559	0.066	0.651	1.548	0.000	1.481	0.000	0.020	0.955	-0.916	0.009	-0.937	0.006	0.054	0.928
7.sector	-0.275	0.113	-0.265	0.000	-0.193	0.205	0.072	0.670	-0.179	0.000	-0.264	0.037	-0.084	0.529	-0.381	0.000
8.sector	-0.094	0.003	-0.221	0.054	-0.232	0.475	-0.010	1.069	-0.099	0.350	0.171	0.600	0.271	0.355	-0.251	0.071
9.sector	-1.484	0.000	-0.693	0.130	3.794	0.001	4.487	0.000	-0.330	0.097	-0.168	0.835	0.162	0.838	-0.789	0.133
10.sector	0.230	0.042	-0.268	0.000	-0.960	0.000	-0.693	0.000	-0.040	0.342	-0.570	0.000	-0.530	0.000	-0.136	0.073
11.sector	-0.118	0.000	-1.704	0.000	-5.101	0.000	-3.397	0.000	-1.251	0.000	-3.320	0.000	-2.069	0.000	-1.991	0.000
12.sector	-0.162	0.000	-0.147	0.001	-0.758	0.000	-0.612	0.000	-0.089	0.004	-0.400	0.000	-0.311	0.000	-0.130	0.021
13.sector	-0.415	0.161	-0.169	0.006	-0.608	0.000	-0.439	0.005	-0.143	0.000	-0.230	0.048	-0.087	0.473	-0.206	0.005
14.sector	-0.244	0.034	-0.514	0.010	-2.470	0.000	-1.957	0.000	-0.153	0.234	-2.045	0.000	-1.893	0.000	-0.716	0.003
15.sector	0.084	0.431	0.215	0.337	-1.676	0.002	-1.890	0.000	0.066	0.593	-1.156	0.000	-1.222	0.000	0.174	0.472
16.sector	-0.186	0.197	-0.373	0.090	4.536	0.000	4.909	0.000	-0.204	0.232	0.821	0.083	1.024	0.024	-0.579	0.077
17.sector	-0.157	0.008	-0.308	0.008	0.038	0.989	0.345	0.262	-0.103	0.194	-0.102	0.702	0.001	1.095	-0.169	0.294
2.region	0.046	0.592	-0.152	0.317	-1.018	0.007	-0.866	0.020	-0.310	0.008	-0.765	0.022	-0.454	0.169	-0.329	0.069
3.region	-0.048	0.570	-0.227	0.095	-0.999	0.004	-0.772	0.024	-0.375	0.001	-0.669	0.041	-0.294	0.380	-0.300	0.102
4.region	0.046	0.592	-0.323	0.025	-1.043	0.005	-0.719	0.051	-0.397	0.001	-0.870	0.009	-0.472	0.150	-0.497	0.005
5.region	0.008	1.005	-0.261	0.069	-1.267	0.001	-1.007	0.005	-0.235	0.050	-1.015	0.003	-0.780	0.017	-0.338	0.054
6.region	0.093	0.209	-0.134	0.347	-1.205	0.001	-1.070	0.002	-0.254	0.024	-1.197	0.000	-0.942	0.002	-0.358	0.031
7.region	0.036	0.663	-0.312	0.021	-1.040	0.003	-0.727	0.035	-0.296	0.008	-1.000	0.001	-0.704	0.022	-0.524	0.002
8.region	0.157	0.025	-0.064	0.690	-0.986	0.005	-0.922	0.007	-0.172	0.131	-0.739	0.020	-0.568	0.067	-0.253	0.133
9.region	0.014	0.927	-0.082	0.627	-1.274	0.001	-1.191	0.001	-0.439	0.000	-1.238	0.000	-0.799	0.013	-0.374	0.041
10.region	0.073	0.415	-0.145	0.351	-1.330	0.000	-1.185	0.002	-0.281	0.028	-1.667	0.000	-1.386	0.000	-0.100	0.655
11.region	0.183	0.025	-0.224	0.221	-0.636	0.182	-0.411	0.394	-0.007	1.049	-0.748	0.034	-0.740	0.030	-0.016	1.049

12.region	-0.377	0.133	-0.373	0.090	4.536	0.000	4.909	0.000	-0.204	0.232	0.821	0.083	1.024	0.024	-0.579	0.077
13.region	0.233	0.624	0.215	0.337	-1.676	0.002	-1.890	0.000	0.066	0.593	-1.156	0.000	-1.222	0.000	0.174	0.294
Constant	5.316	0.000	5.825	0.000	11.011	0.000	5.184	0.000	5.277	0.000	10.006	0.000	4.729	0.000	5.441	0.000
R-squared		0.463		0.477		0.396		0.389		0.364		0.410		0.395		0.352

Source: Annual Business Survey, ONS, Ipsos analysis.

Table A.29 Estimated effects of APC grants on GVA per worker and employment by 2021 – overall results

	GVA per worker								Employment							
	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value
Model	Declined applicants		Declined applicants		High scoring declined		Awarded grants only		Declined applicants		Declined applicants		High scoring declined		Awarded grants only	
FE	No		Yes		Yes		Yes		No		Yes		Yes		Yes	
treatment	0.034	0.103	0.028	0.122	0.030	0.232	0.023	0.248	0.093	0.000	0.071	0.000	0.074	0.002	0.048	0.021
2.firm_size	-0.892	0.000	-0.926	0.000	-0.751	0.000	0.175	0.156	-0.774	0.000	-0.487	0.000	0.287	0.009	-0.697	0.000
3.firm_size	-3.161	0.000	-3.266	0.000	-2.601	0.000	0.665	0.000	-2.983	0.000	-2.364	0.000	0.619	0.000	-3.025	0.000
4.firm_size	-1.985	0.000	-2.063	0.000	-1.713	0.000	0.350	0.012	-1.852	0.000	-1.446	0.000	0.407	0.001	-1.852	0.000
2013.y	-	-	-0.001	1.023	0.049	0.356	0.050	0.330	-	-	0.071	0.075	0.058	0.135	0.022	0.454
2014.y	-	-	0.017	0.395	0.076	0.136	0.059	0.244	-	-	0.124	0.001	0.071	0.061	0.046	0.095
2015.y	-	-	0.043	0.031	0.045	0.406	0.002	1.037	-	-	0.122	0.001	0.037	0.338	0.073	0.009
2016.y	-	-	0.094	0.000	0.082	0.144	-0.012	0.895	-	-	0.124	0.001	-0.008	0.890	0.148	0.000
2017.y	-	-	0.145	0.000	0.143	0.013	-0.002	1.042	-	-	0.152	0.000	-0.026	0.529	0.208	0.000
2018.y	-	-	0.151	0.000	0.139	0.016	-0.011	0.908	-	-	0.141	0.000	-0.038	0.330	0.212	0.000
2019.y	-	-	0.152	0.000	0.086	0.145	-0.066	0.255	-	-	0.123	0.002	-0.071	0.062	0.222	0.000
2020.y	-	-	0.254	0.000	0.162	0.040	-0.093	0.239	-	-	0.099	0.060	-0.195	0.000	0.369	0.000
2.imm_foc_cd	-0.023	0.189	0.291	0.000	0.394	0.000	0.103	0.235	0.321	0.000	0.200	0.000	-0.121	0.029	0.409	0.000
2.sector	-0.051	0.598	0.297	0.000	0.457	0.000	0.160	0.109	0.315	0.000	0.143	0.027	-0.172	0.006	0.410	0.000
3.sector	-0.324	0.000	0.008	0.867	-0.071	0.459	-0.079	0.390	-0.023	0.401	-0.180	0.014	-0.158	0.026	0.020	0.769
4.sector	0.106	0.065	0.463	0.013	1.809	0.000	1.346	0.005	-0.219	0.068	-1.008	0.003	-0.788	0.016	-0.106	0.849
5.sector	-0.134	0.000	-0.206	0.147	-1.074	0.003	-0.866	0.016	0.138	0.333	-1.140	0.003	-1.279	0.001	0.030	0.937

6.sector	-0.050	0.549	0.065	0.639	1.520	0.000	1.454	0.000	0.020	0.937	-0.900	0.008	-0.920	0.005	0.053	0.912
7.sector	-0.270	0.111	-0.260	0.000	-0.189	0.201	0.071	0.658	-0.176	0.000	-0.259	0.036	-0.083	0.519	-0.374	0.000
8.sector	-0.092	0.003	-0.217	0.053	-0.228	0.467	-0.010	1.050	-0.097	0.343	0.167	0.589	0.266	0.349	-0.246	0.070
9.sector	-1.457	0.000	-0.680	0.127	3.725	0.001	4.405	0.000	-0.324	0.095	-0.165	0.820	0.159	0.823	-0.774	0.131
10.sector	0.226	0.041	-0.264	0.000	-0.943	0.000	-0.680	0.000	-0.039	0.336	-0.559	0.000	-0.521	0.000	-0.134	0.072
11.sector	-0.116	0.000	-1.673	0.000	-5.008	0.000	-3.335	0.000	-1.228	0.000	-3.259	0.000	-2.031	0.000	-1.955	0.000
12.sector	-0.159	0.000	-0.145	0.001	-0.744	0.000	-0.600	0.000	-0.087	0.004	-0.393	0.000	-0.306	0.000	-0.127	0.020
13.sector	-0.407	0.158	-0.166	0.005	-0.597	0.000	-0.431	0.005	-0.140	0.000	-0.226	0.047	-0.086	0.464	-0.202	0.005
14.sector	-0.240	0.033	-0.504	0.010	-2.425	0.000	-1.921	0.000	-0.150	0.230	-2.008	0.000	-1.859	0.000	-0.703	0.003
15.sector	0.082	0.423	0.211	0.330	-1.646	0.002	-1.855	0.000	0.065	0.582	-1.135	0.000	-1.200	0.000	0.171	0.463
16.sector	-0.183	0.193	-0.366	0.089	4.454	0.000	4.820	0.000	-0.200	0.228	0.806	0.081	1.005	0.024	-0.568	0.075
17.sector	-0.154	0.008	-0.302	0.008	0.037	0.971	0.339	0.257	-0.101	0.190	-0.100	0.689	0.001	1.075	-0.166	0.288
2.region	0.045	0.581	-0.149	0.311	-0.999	0.007	-0.850	0.019	-0.305	0.008	-0.751	0.022	-0.446	0.166	-0.323	0.067
3.region	-0.047	0.559	-0.222	0.093	-0.981	0.004	-0.758	0.024	-0.368	0.001	-0.657	0.040	-0.288	0.373	-0.295	0.100
4.region	0.045	0.581	-0.318	0.024	-1.024	0.005	-0.706	0.050	-0.390	0.001	-0.854	0.008	-0.463	0.147	-0.488	0.005
5.region	0.008	0.987	-0.256	0.067	-1.244	0.001	-0.988	0.005	-0.231	0.049	-0.997	0.003	-0.766	0.017	-0.332	0.053
6.region	0.092	0.205	-0.132	0.340	-1.183	0.001	-1.051	0.002	-0.249	0.024	-1.175	0.000	-0.924	0.002	-0.351	0.030
7.region	0.035	0.651	-0.307	0.020	-1.021	0.003	-0.714	0.035	-0.291	0.008	-0.982	0.001	-0.691	0.021	-0.514	0.002
8.region	0.154	0.024	-0.063	0.677	-0.968	0.005	-0.905	0.007	-0.168	0.129	-0.726	0.020	-0.557	0.066	-0.248	0.131
9.region	0.014	0.910	-0.081	0.616	-1.251	0.001	-1.170	0.001	-0.431	0.000	-1.215	0.000	-0.784	0.012	-0.367	0.040
10.region	0.071	0.407	-0.143	0.345	-1.306	0.001	-1.163	0.002	-0.275	0.028	-1.636	0.000	-1.361	0.000	-0.098	0.643
11.region	0.179	0.025	-0.220	0.217	-0.624	0.178	-0.404	0.387	-0.007	1.030	-0.734	0.033	-0.727	0.029	-0.015	1.030

12.region	-0.370	0.131	-0.366	0.089	4.454	0.000	4.820	0.000	-0.200	0.228	0.806	0.081	1.005	0.024	-0.568	0.075
13.region	0.229	0.612	0.211	0.330	-1.646	0.002	-1.855	0.000	0.065	0.582	-1.135	0.000	-1.200	0.000	0.171	0.288
Constant	5.220	0.000	5.719	0.000	10.811	0.000	5.090	0.000	5.181	0.000	9.824	0.000	4.643	0.000	5.342	0.000
R-squared		0.101		0.125		0.147		0.121		0.384		0.322		0.361		0.302

Source: Annual Business Survey, ONS, Ipsos analysis.

Table A.30 Estimated effects of APC grants on employment and turnover by 2022 – overall results

	Employment								Turnover							
	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value
Model	Declined applicants		Declined applicants		High scoring declined		Awarded grants only		Declined applicants		Declined applicants		High scoring declined		Awarded grants only	
FE	No		Yes		Yes		Yes		No		Yes		Yes		Yes	
treatment	0.102	0.001	0.086	0.002	0.084	0.026	0.051	0.061	0.139	0.000	0.143	0.001	0.097	0.023	0.095	0.057
2.firm_size	-0.950	0.000	-0.986	0.000	-0.799	0.000	0.186	0.166	-0.825	0.000	-0.519	0.000	0.306	0.009	-0.742	0.000
3.firm_size	-3.366	0.000	-3.478	0.000	-2.769	0.000	0.708	0.000	-3.176	0.000	-2.517	0.000	0.659	0.000	-3.221	0.000
4.firm_size	-2.114	0.000	-2.197	0.000	-1.824	0.000	0.373	0.013	-1.972	0.000	-1.540	0.000	0.434	0.001	-1.972	0.000
2013.y	-	-	-0.001	1.089	0.052	0.380	0.054	0.352	-	-	0.076	0.080	0.062	0.144	0.023	0.483
2014.y	-	-	0.018	0.421	0.081	0.145	0.063	0.260	-	-	0.132	0.001	0.076	0.065	0.049	0.101
2015.y	-	-	0.046	0.033	0.048	0.432	0.003	1.104	-	-	0.130	0.002	0.040	0.360	0.078	0.009
2016.y	-	-	0.100	0.000	0.088	0.153	-0.012	0.953	-	-	0.132	0.001	-0.009	0.948	0.158	0.000
2017.y	-	-	0.154	0.000	0.152	0.014	-0.003	1.110	-	-	0.162	0.000	-0.027	0.564	0.222	0.000
2018.y	-	-	0.161	0.000	0.148	0.017	-0.012	0.967	-	-	0.151	0.000	-0.041	0.352	0.225	0.000
2019.y	-	-	0.162	0.000	0.092	0.154	-0.071	0.271	-	-	0.131	0.002	-0.076	0.066	0.237	0.000
2020.y	-	-	0.270	0.000	0.173	0.043	-0.099	0.254	-	-	0.105	0.064	-0.208	0.000	0.393	0.000
2.imm_foc_cd	-0.025	0.201	0.309	0.000	0.420	0.000	0.110	0.251	0.342	0.000	0.213	0.000	-0.129	0.030	0.436	0.000
2.sector	-0.054	0.637	0.316	0.000	0.486	0.000	0.170	0.116	0.336	0.000	0.152	0.029	-0.183	0.006	0.437	0.000
3.sector	-0.345	0.000	0.009	0.923	-0.075	0.489	-0.084	0.415	-0.024	0.427	-0.192	0.014	-0.168	0.028	0.021	0.819
4.sector	0.113	0.070	0.493	0.014	1.926	0.000	1.433	0.005	-0.233	0.072	-1.073	0.003	-0.840	0.017	-0.113	0.904
5.sector	-0.143	0.000	-0.220	0.156	-1.143	0.004	-0.922	0.017	0.147	0.354	-1.214	0.003	-1.362	0.001	0.032	0.998
6.sector	-0.054	0.584	0.069	0.681	1.618	0.000	1.548	0.000	0.021	0.998	-0.958	0.009	-0.980	0.006	0.057	0.971
7.sector	-0.288	0.118	-0.277	0.000	-0.201	0.214	0.076	0.700	-0.187	0.000	-0.276	0.038	-0.088	0.553	-0.398	0.000

8.sector	-0.098	0.003	-0.231	0.057	-0.243	0.497	-0.011	1.118	-0.104	0.366	0.178	0.627	0.283	0.371	-0.262	0.074
9.sector	-1.551	0.000	-0.725	0.136	3.966	0.001	4.691	0.000	-0.345	0.102	-0.176	0.873	0.169	0.876	-0.825	0.139
10.sector	0.240	0.044	-0.281	0.000	-1.004	0.000	-0.725	0.000	-0.042	0.358	-0.596	0.000	-0.554	0.000	-0.143	0.076
11.sector	-0.123	0.000	-1.781	0.000	-5.333	0.000	-3.551	0.000	-1.308	0.000	-3.471	0.000	-2.163	0.000	-2.082	0.000
12.sector	-0.169	0.000	-0.154	0.001	-0.792	0.000	-0.639	0.000	-0.093	0.004	-0.419	0.000	-0.325	0.000	-0.136	0.022
13.sector	-0.434	0.168	-0.177	0.006	-0.636	0.000	-0.459	0.005	-0.150	0.000	-0.240	0.050	-0.091	0.495	-0.215	0.005
14.sector	-0.255	0.035	-0.537	0.011	-2.582	0.000	-2.046	0.000	-0.160	0.245	-2.138	0.000	-1.979	0.000	-0.749	0.003
15.sector	0.087	0.451	0.224	0.352	-1.753	0.003	-1.976	0.000	0.069	0.620	-1.209	0.000	-1.278	0.000	0.182	0.493
16.sector	-0.194	0.206	-0.390	0.094	4.743	0.000	5.132	0.000	-0.213	0.243	0.858	0.086	1.071	0.025	-0.605	0.080
17.sector	-0.164	0.008	-0.322	0.008	0.040	1.034	0.361	0.274	-0.108	0.202	-0.106	0.734	0.001	1.144	-0.177	0.307
2.region	0.048	0.619	-0.159	0.331	-1.064	0.008	-0.905	0.021	-0.324	0.008	-0.799	0.023	-0.475	0.177	-0.344	0.072
3.region	-0.050	0.596	-0.237	0.099	-1.044	0.004	-0.807	0.026	-0.392	0.001	-0.699	0.042	-0.307	0.397	-0.314	0.106
4.region	0.048	0.619	-0.338	0.026	-1.090	0.006	-0.752	0.054	-0.415	0.001	-0.910	0.009	-0.493	0.156	-0.520	0.005
5.region	0.008	1.051	-0.273	0.072	-1.325	0.001	-1.052	0.006	-0.246	0.052	-1.061	0.003	-0.815	0.018	-0.353	0.057
6.region	0.098	0.219	-0.140	0.362	-1.259	0.001	-1.119	0.002	-0.266	0.026	-1.251	0.000	-0.984	0.002	-0.374	0.032
7.region	0.038	0.693	-0.327	0.022	-1.087	0.003	-0.760	0.037	-0.309	0.008	-1.045	0.002	-0.736	0.023	-0.547	0.002
8.region	0.164	0.026	-0.067	0.721	-1.030	0.005	-0.964	0.007	-0.179	0.137	-0.773	0.021	-0.593	0.070	-0.265	0.139
9.region	0.015	0.969	-0.086	0.656	-1.332	0.001	-1.245	0.001	-0.459	0.000	-1.294	0.000	-0.835	0.013	-0.391	0.043
10.region	0.076	0.434	-0.152	0.367	-1.390	0.001	-1.239	0.002	-0.293	0.030	-1.742	0.000	-1.449	0.000	-0.104	0.684
11.region	0.191	0.027	-0.235	0.231	-0.665	0.190	-0.430	0.412	-0.007	1.097	-0.782	0.035	-0.774	0.031	-0.016	1.097
12.region	-0.394	0.139	-0.390	0.094	4.743	0.000	5.132	0.000	-0.213	0.243	0.858	0.086	1.071	0.025	-0.605	0.080
13.region	0.244	0.652	0.224	0.352	-1.753	0.003	-1.976	0.000	0.069	0.620	-1.209	0.000	-1.278	0.000	0.182	0.307
Constant	5.558	0.000	6.089	0.000	11.512	0.000	5.420	0.000	5.517	0.000	10.460	0.000	4.944	0.000	5.688	0.000
R-squared		0.462		0.448		0.402		0.435		0.274		0.283		0.249		0.251

Source: Business Structure Database, ONS, Ipsos analysis.

Table A.31 Estimated effects of APC grants on turnover per worker by 2022 – overall results

	Turnover per worker							
	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value
Model	Declined applicants		Declined applicants		High scoring declined		Awarded grants only	
FE	No		Yes		Yes		Yes	
treatment	0.028	0.104	0.046	0.152	0.016	0.205	0.025	0.274
2.firm_size	-0.801	0.000	-0.831	0.000	-0.674	0.000	0.157	0.140
3.firm_size	-2.839	0.000	-2.933	0.000	-2.336	0.000	0.598	0.000
4.firm_size	-1.783	0.000	-1.853	0.000	-1.538	0.000	0.314	0.011
2013.y	-	-	-0.001	0.919	0.044	0.320	0.045	0.297
2014.y	-	-	0.016	0.355	0.068	0.122	0.053	0.219
2015.y	-	-	0.039	0.028	0.041	0.365	0.002	0.931
2016.y	-	-	0.084	0.000	0.074	0.129	-0.010	0.804
2017.y	-	-	0.130	0.000	0.128	0.012	-0.002	0.936
2018.y	-	-	0.136	0.000	0.125	0.014	-0.010	0.816
2019.y	-	-	0.137	0.000	0.077	0.130	-0.060	0.229
2020.y	-	-	0.228	0.000	0.146	0.036	-0.083	0.214
2.imm_foc_cd	-0.021	0.170	0.261	0.000	0.354	0.000	0.093	0.211
2.sector	-0.046	0.537	0.267	0.000	0.410	0.000	0.144	0.098

3.sector	-0.291	0.000	0.008	0.779	-0.064	0.412	-0.071	0.350
4.sector	0.095	0.059	0.416	0.012	1.625	0.000	1.209	0.004
5.sector	-0.120	0.000	-0.185	0.132	-0.964	0.003	-0.778	0.014
6.sector	-0.045	0.493	0.058	0.574	1.365	0.000	1.306	0.000
7.sector	-0.243	0.100	-0.234	0.000	-0.170	0.180	0.064	0.591
8.sector	-0.083	0.003	-0.195	0.048	-0.205	0.419	-0.009	0.943
9.sector	-1.309	0.000	-0.611	0.114	3.346	0.001	3.957	0.000
10.sector	0.203	0.037	-0.237	0.000	-0.847	0.000	-0.611	0.000
11.sector	-0.104	0.000	-1.503	0.000	-4.498	0.000	-2.995	0.000
12.sector	-0.143	0.000	-0.130	0.001	-0.668	0.000	-0.539	0.000
13.sector	-0.366	0.142	-0.149	0.005	-0.536	0.000	-0.387	0.004
14.sector	-0.215	0.030	-0.453	0.009	-2.178	0.000	-1.726	0.000
15.sector	0.074	0.380	0.189	0.297	-1.478	0.002	-1.666	0.000
16.sector	-0.164	0.174	-0.329	0.080	4.000	0.000	4.329	0.000
17.sector	-0.139	0.007	-0.272	0.007	0.034	0.872	0.305	0.231
2.region	0.040	0.522	-0.134	0.279	-0.897	0.006	-0.763	0.017
3.region	-0.042	0.502	-0.200	0.084	-0.881	0.004	-0.681	0.022
4.region	0.041	0.522	-0.285	0.022	-0.920	0.005	-0.634	0.045
5.region	0.007	0.887	-0.230	0.060	-1.117	0.001	-0.888	0.005
6.region	0.082	0.184	-0.118	0.306	-1.062	0.001	-0.944	0.002

7.region	0.032	0.585	-0.275	0.018	-0.917	0.003	-0.641	0.031
8.region	0.139	0.022	-0.057	0.608	-0.869	0.004	-0.813	0.006
9.region	0.013	0.818	-0.072	0.553	-1.123	0.001	-1.051	0.001
10.region	0.064	0.366	-0.128	0.309	-1.173	0.000	-1.045	0.001
11.region	0.161	0.022	-0.198	0.195	-0.561	0.160	-0.363	0.347
12.region	-0.333	0.117	-0.329	0.080	4.000	0.000	4.329	0.000
13.region	0.206	0.550	0.189	0.297	-1.478	0.002	-1.666	0.000
Constant	4.688	0.000	5.136	0.000	9.710	0.000	4.572	0.000
R-squared		0.194		0.163		0.177		0.152

Source: Business Structure Database, ONS, Ipsos analysis.

Table A.32 Estimated effects of APC grants on the location of intermediate and input goods and services

	UK goods and services								Non-UK goods and services							
	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value
Model	Declined applicants		Declined applicants		High scoring declined		Awarded grants only		Declined applicants		Declined applicants		High scoring declined		Awarded grants only	
FE	No		Yes		Yes		Yes		No		Yes		Yes		Yes	
treatment	0.144	0.001	0.132	0.002	0.128	0.002	0.131	0.027	0.103	0.001	0.072	0.001	0.061	0.007	0.055	0.048
2.firm_size	-0.900	0.000	-0.934	0.000	-0.758	0.000	0.177	0.157	-0.782	0.000	-0.492	0.000	0.290	0.009	-0.703	0.000
3.firm_size	-3.190	0.000	-3.296	0.000	-2.625	0.000	0.671	0.000	-3.011	0.000	-2.386	0.000	0.625	0.000	-3.053	0.000
4.firm_size	-2.003	0.000	-2.082	0.000	-1.729	0.000	0.353	0.012	-1.869	0.000	-1.460	0.000	0.411	0.001	-1.869	0.000
2013.y	-	-	-0.001	1.032	0.049	0.360	0.051	0.334	-	-	0.072	0.076	0.059	0.136	0.022	0.458
2014.y	-	-	0.017	0.399	0.077	0.137	0.060	0.246	-	-	0.125	0.001	0.072	0.062	0.046	0.096
2015.y	-	-	0.043	0.031	0.046	0.410	0.003	1.046	-	-	0.123	0.001	0.038	0.341	0.074	0.009
2016.y	-	-	0.095	0.000	0.083	0.145	-0.012	0.904	-	-	0.125	0.001	-0.008	0.898	0.149	0.000
2017.y	-	-	0.146	0.000	0.144	0.013	-0.002	1.052	-	-	0.154	0.000	-0.026	0.534	0.210	0.000
2018.y	-	-	0.153	0.000	0.141	0.016	-0.011	0.917	-	-	0.143	0.000	-0.039	0.334	0.214	0.000
2019.y	-	-	0.154	0.000	0.087	0.146	-0.067	0.257	-	-	0.124	0.002	-0.072	0.062	0.225	0.000
2020.y	-	-	0.256	0.000	0.164	0.041	-0.094	0.241	-	-	0.100	0.060	-0.197	0.000	0.373	0.000
2.imm_foc_cd	-0.024	0.191	0.293	0.000	0.398	0.000	0.104	0.238	0.324	0.000	0.202	0.000	-0.122	0.029	0.413	0.000
2.sector	-0.051	0.604	0.300	0.000	0.461	0.000	0.161	0.110	0.318	0.000	0.144	0.027	-0.173	0.006	0.414	0.000
3.sector	-0.327	0.000	0.009	0.875	-0.071	0.463	-0.080	0.393	-0.023	0.404	-0.182	0.014	-0.159	0.027	0.020	0.776
4.sector	0.107	0.066	0.468	0.013	1.826	0.000	1.358	0.005	-0.221	0.068	-1.017	0.003	-0.796	0.016	-0.107	0.857
5.sector	-0.135	0.000	-0.208	0.148	-1.083	0.003	-0.874	0.016	0.140	0.336	-1.151	0.003	-1.291	0.001	0.031	0.946
6.sector	-0.051	0.554	0.066	0.645	1.534	0.000	1.467	0.000	0.020	0.946	-0.908	0.009	-0.929	0.006	0.054	0.920
7.sector	-0.273	0.112	-0.263	0.000	-0.191	0.203	0.072	0.664	-0.178	0.000	-0.262	0.036	-0.084	0.524	-0.377	0.000
8.sector	-0.093	0.003	-0.219	0.054	-0.230	0.471	-0.010	1.059	-0.098	0.347	0.169	0.594	0.268	0.352	-0.249	0.071
9.sector	-1.470	0.000	-0.687	0.129	3.759	0.001	4.446	0.000	-0.327	0.096	-0.167	0.827	0.160	0.831	-0.782	0.132
10.sector	0.228	0.041	-0.266	0.000	-0.952	0.000	-0.687	0.000	-0.040	0.339	-0.565	0.000	-0.525	0.000	-0.135	0.072
11.sector	-0.117	0.000	-1.688	0.000	-5.054	0.000	-3.366	0.000	-1.239	0.000	-3.290	0.000	-2.050	0.000	-1.973	0.000

12.sector	-0.160	0.000	-0.146	0.001	-0.751	0.000	-0.606	0.000	-0.088	0.004	-0.397	0.000	-0.308	0.000	-0.129	0.020
13.sector	-0.411	0.159	-0.168	0.005	-0.603	0.000	-0.435	0.005	-0.142	0.000	-0.228	0.047	-0.086	0.469	-0.204	0.005
14.sector	-0.242	0.033	-0.509	0.010	-2.447	0.000	-1.939	0.000	-0.152	0.232	-2.026	0.000	-1.876	0.000	-0.710	0.003
15.sector	0.083	0.427	0.213	0.334	-1.661	0.002	-1.873	0.000	0.066	0.588	-1.146	0.000	-1.211	0.000	0.172	0.468
16.sector	-0.184	0.195	-0.370	0.089	4.495	0.000	4.865	0.000	-0.202	0.230	0.813	0.082	1.015	0.024	-0.573	0.076
17.sector	-0.156	0.008	-0.305	0.008	0.038	0.980	0.342	0.259	-0.102	0.192	-0.101	0.695	0.001	1.085	-0.168	0.291
2.region	0.045	0.586	-0.150	0.314	-1.008	0.007	-0.858	0.020	-0.307	0.008	-0.758	0.022	-0.450	0.168	-0.326	0.068
3.region	-0.047	0.565	-0.225	0.094	-0.990	0.004	-0.765	0.024	-0.372	0.001	-0.663	0.040	-0.291	0.376	-0.298	0.101
4.region	0.046	0.586	-0.320	0.025	-1.033	0.005	-0.713	0.051	-0.393	0.001	-0.862	0.009	-0.468	0.148	-0.493	0.005
5.region	0.008	0.996	-0.258	0.068	-1.256	0.001	-0.997	0.005	-0.233	0.049	-1.006	0.003	-0.773	0.017	-0.335	0.054
6.region	0.092	0.207	-0.133	0.343	-1.194	0.001	-1.061	0.002	-0.252	0.024	-1.186	0.000	-0.933	0.002	-0.354	0.031
7.region	0.036	0.657	-0.310	0.020	-1.030	0.003	-0.720	0.035	-0.293	0.008	-0.991	0.001	-0.698	0.022	-0.519	0.002
8.region	0.156	0.024	-0.064	0.683	-0.977	0.005	-0.913	0.007	-0.170	0.130	-0.732	0.020	-0.562	0.067	-0.251	0.132
9.region	0.014	0.919	-0.081	0.621	-1.262	0.001	-1.180	0.001	-0.435	0.000	-1.226	0.000	-0.791	0.012	-0.371	0.041
10.region	0.072	0.411	-0.144	0.348	-1.318	0.001	-1.174	0.002	-0.278	0.028	-1.651	0.000	-1.373	0.000	-0.099	0.649
11.region	0.181	0.025	-0.222	0.219	-0.630	0.180	-0.408	0.390	-0.007	1.040	-0.741	0.033	-0.734	0.029	-0.016	1.040
12.region	-0.374	0.132	-0.370	0.089	4.495	0.000	4.865	0.000	-0.202	0.230	0.813	0.082	1.015	0.024	-0.573	0.076
13.region	0.231	0.618	0.213	0.334	-1.661	0.002	-1.873	0.000	0.066	0.588	-1.146	0.000	-1.211	0.000	0.172	0.291
Constant	5.268	0.000	5.772	0.000	10.911	0.000	5.137	0.000	5.229	0.000	9.915	0.000	4.686	0.000	5.391	0.000
R-squared		0.358		0.383		0.361		0.38		0.322		0.363		0.353		0.326

Source: Annual business Survey, ONS, Ipsos analysis.

Table A.33 Estimated effects of APC grants on the hourly earnings of workers by 2022 – overall results

	Hourly earnings								Hours worked							
	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value
Model	Declined applicants		Declined applicants		High scoring declined		Awarded grants only		Declined applicants		Declined applicants		High scoring declined		Awarded grants only	
FE	No		Yes		Yes		Yes		No		Yes		Yes		Yes	
treatment	0.023	0.000	0.020	0.001	0.018	0.018	0.018	0.028	0.002	0.385	0.001	0.440	0.001	0.392	0.000	0.502
2.firm_size	-0.969	0.000	-1.006	0.000	-0.816	0.000	0.190	0.169	-0.841	0.000	-0.529	0.000	0.312	0.010	-0.757	0.000
3.firm_size	-3.435	0.000	-3.549	0.000	-2.826	0.000	0.723	0.000	-3.241	0.000	-2.569	0.000	0.672	0.000	-3.287	0.000
4.firm_size	-2.157	0.000	-2.242	0.000	-1.861	0.000	0.380	0.013	-2.013	0.000	-1.571	0.000	0.442	0.001	-2.013	0.000
2013.y	-	-	-0.001	1.111	0.053	0.387	0.055	0.359	-	-	0.077	0.082	0.063	0.147	0.024	0.493
2014.y	-	-	0.019	0.430	0.083	0.148	0.064	0.265	-	-	0.135	0.001	0.077	0.067	0.050	0.103
2015.y	-	-	0.047	0.034	0.049	0.441	0.003	1.127	-	-	0.133	0.002	0.041	0.367	0.080	0.010
2016.y	-	-	0.102	0.000	0.089	0.156	-0.013	0.973	-	-	0.135	0.001	-0.009	0.967	0.161	0.000
2017.y	-	-	0.157	0.000	0.155	0.014	-0.003	1.133	-	-	0.165	0.000	-0.028	0.575	0.227	0.000
2018.y	-	-	0.164	0.000	0.151	0.017	-0.012	0.987	-	-	0.154	0.000	-0.042	0.359	0.230	0.000
2019.y	-	-	0.165	0.000	0.093	0.157	-0.072	0.277	-	-	0.134	0.002	-0.078	0.067	0.242	0.000
2020.y	-	-	0.276	0.000	0.176	0.044	-0.101	0.259	-	-	0.107	0.065	-0.212	0.000	0.401	0.000
2.imm_foc_cd	-0.025	0.205	0.316	0.000	0.428	0.000	0.112	0.256	0.349	0.000	0.217	0.000	-0.131	0.031	0.445	0.000
2.sector	-0.055	0.650	0.323	0.000	0.496	0.000	0.174	0.119	0.343	0.000	0.155	0.029	-0.187	0.006	0.446	0.000
3.sector	-0.352	0.000	0.009	0.942	-0.077	0.499	-0.086	0.424	-0.025	0.435	-0.196	0.015	-0.171	0.029	0.021	0.836
4.sector	0.115	0.071	0.503	0.014	1.966	0.000	1.462	0.005	-0.238	0.074	-1.095	0.003	-0.857	0.017	-0.115	0.922

5.sector	-0.146	0.000	-0.224	0.160	-1.167	0.004	-0.941	0.017	0.150	0.361	-1.239	0.004	-1.390	0.001	0.033	1.019
6.sector	-0.055	0.596	0.071	0.695	1.651	0.000	1.580	0.000	0.022	1.019	-0.978	0.009	-1.000	0.006	0.058	0.991
7.sector	-0.293	0.121	-0.283	0.000	-0.205	0.218	0.077	0.715	-0.191	0.000	-0.282	0.039	-0.090	0.565	-0.406	0.000
8.sector	-0.100	0.003	-0.236	0.058	-0.248	0.507	-0.011	1.141	-0.106	0.373	0.182	0.640	0.289	0.379	-0.268	0.076
9.sector	-1.583	0.000	-0.739	0.138	4.048	0.001	4.787	0.000	-0.352	0.104	-0.180	0.891	0.173	0.894	-0.841	0.142
10.sector	0.245	0.044	-0.286	0.000	-1.025	0.000	-0.739	0.000	-0.043	0.365	-0.608	0.000	-0.566	0.000	-0.146	0.078
11.sector	-0.126	0.000	-1.818	0.000	-5.442	0.000	-3.624	0.000	-1.334	0.000	-3.542	0.000	-2.208	0.000	-2.124	0.000
12.sector	-0.173	0.000	-0.157	0.001	-0.809	0.000	-0.653	0.000	-0.094	0.004	-0.427	0.000	-0.332	0.000	-0.138	0.022
13.sector	-0.442	0.171	-0.181	0.006	-0.649	0.000	-0.468	0.005	-0.153	0.000	-0.245	0.051	-0.093	0.505	-0.219	0.005
14.sector	-0.261	0.036	-0.548	0.011	-2.635	0.000	-2.088	0.000	-0.163	0.250	-2.182	0.000	-2.020	0.000	-0.764	0.003
15.sector	0.089	0.460	0.229	0.359	-1.789	0.003	-2.016	0.000	0.071	0.633	-1.233	0.000	-1.304	0.000	0.185	0.503
16.sector	-0.198	0.210	-0.398	0.096	4.840	0.000	5.238	0.000	-0.217	0.248	0.876	0.088	1.093	0.026	-0.617	0.082
17.sector	-0.168	0.008	-0.329	0.009	0.041	1.055	0.369	0.279	-0.110	0.207	-0.108	0.749	0.001	1.168	-0.181	0.313
2.region	0.049	0.631	-0.162	0.338	-1.086	0.008	-0.924	0.021	-0.331	0.009	-0.816	0.023	-0.485	0.181	-0.351	0.073
3.region	-0.051	0.608	-0.242	0.101	-1.066	0.005	-0.824	0.026	-0.400	0.001	-0.714	0.043	-0.313	0.405	-0.320	0.108
4.region	0.049	0.631	-0.345	0.027	-1.113	0.006	-0.768	0.055	-0.424	0.001	-0.928	0.009	-0.503	0.160	-0.530	0.005
5.region	0.009	1.073	-0.278	0.073	-1.352	0.001	-1.074	0.006	-0.251	0.053	-1.083	0.003	-0.832	0.019	-0.360	0.058
6.region	0.100	0.223	-0.143	0.370	-1.285	0.001	-1.142	0.002	-0.271	0.026	-1.277	0.000	-1.005	0.002	-0.381	0.033
7.region	0.038	0.708	-0.333	0.022	-1.109	0.003	-0.776	0.038	-0.316	0.008	-1.067	0.002	-0.751	0.023	-0.559	0.002
8.region	0.168	0.026	-0.069	0.736	-1.052	0.005	-0.983	0.007	-0.183	0.140	-0.789	0.021	-0.606	0.072	-0.270	0.142
9.region	0.015	0.989	-0.088	0.669	-1.359	0.001	-1.271	0.002	-0.468	0.000	-1.320	0.000	-0.852	0.013	-0.399	0.044

10.region	0.078	0.442	-0.155	0.374	-1.419	0.001	-1.264	0.002	-0.299	0.030	-1.778	0.000	-1.479	0.000	-0.106	0.698
11.region	0.195	0.027	-0.239	0.236	-0.678	0.194	-0.439	0.420	-0.007	1.120	-0.798	0.036	-0.790	0.032	-0.017	1.120
12.region	-0.403	0.142	-0.398	0.096	4.840	0.000	5.238	0.000	-0.217	0.248	0.876	0.088	1.093	0.026	-0.617	0.082
13.region	0.249	0.665	0.229	0.359	-1.789	0.003	-2.016	0.000	0.071	0.633	-1.233	0.000	-1.304	0.000	0.185	0.313
2.occ	0.097	0.499	0.248	0.389	-1.938	0.003	-2.185	0.001	0.077	0.685	-1.337	0.000	-1.413	0.000	0.201	0.546
3.occ	-0.215	0.228	-0.431	0.104	5.245	0.000	5.676	0.000	-0.235	0.268	0.949	0.096	1.184	0.028	-0.669	0.089
4.occ	-0.182	0.009	-0.356	0.009	0.044	1.143	0.399	0.303	-0.119	0.224	-0.118	0.811	0.002	1.265	-0.196	0.340
5.occ	0.053	0.684	-0.175	0.366	-1.176	0.008	-1.001	0.023	-0.359	0.009	-0.884	0.025	-0.525	0.196	-0.380	0.079
6.occ	-0.055	0.659	-0.262	0.110	-1.155	0.005	-0.893	0.028	-0.434	0.001	-0.773	0.047	-0.340	0.439	-0.347	0.118
7.occ	0.053	0.684	-0.374	0.029	-1.206	0.006	-0.832	0.059	-0.459	0.001	-1.006	0.010	-0.546	0.173	-0.575	0.005
8.occ	0.009	1.162	-0.301	0.079	-1.465	0.001	-1.164	0.006	-0.272	0.057	-1.174	0.003	-0.902	0.020	-0.390	0.063
9.occ	0.108	0.242	-0.155	0.401	-1.393	0.001	-1.237	0.002	-0.294	0.028	-1.384	0.000	-1.089	0.003	-0.413	0.036
c.age	0.042	0.767	-0.361	0.024	-1.202	0.004	-0.841	0.041	-0.342	0.009	-1.156	0.002	-0.814	0.025	-0.605	0.002
i.gender	0.182	0.028	-0.074	0.797	-1.139	0.006	-1.066	0.008	-0.198	0.151	-0.855	0.023	-0.656	0.078	-0.292	0.154
Constant	5.672	0.000	6.214	0.000	11.748	0.000	5.531	0.000	5.630	0.000	10.675	0.000	5.045	0.000	5.805	0.000
R-squared		0.294		0.287		0.290		0.263		0.133		0.175		0.149		0.103

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

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