INNOVATION & RESEARCH CAUCUS

THE CONTRIBUTION OF INNOVATE UK TO UK FIRM PERFORMANCE:

The Effects of Innovate UK Funding on Firm-Level Total Factor Productivity

A follow-up report on IUK applicants for funding

IRC Report No. 069

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This document relates to IRC Project FFEE001: The Contribution of IUK to UK Firm Productivity Growth Follow-On work

Acknowledgements

This work was supported by Economic and Social Research Council (ESRC) grant ES/X010759/1 to the Innovation and Research Caucus (IRC) and was commissioned by Innovate UK. We are very grateful to the project sponsors at UK Research and Innovation (UKRI) for their input into this research. The interpretations and opinions within this report are those of the authors and may not reflect the policy positions of Innovate UK.

We would also like to acknowledge and appreciate the efforts of the IRC Project Administration Team for their support in preparing this report.

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Cite as: Wilson, N., Kacer, M. & Cowling, M. (2026). The Contribution of Innovate UK to UK Firm Performance: The Effects of Innovate UK Funding on Firm-Level Total Factor Productivity. Oxford, UK: Innovation and Research Caucus. IRC Report No. 069.

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SUMMARY

- This follow-up report extends the November 2024 study, The Contribution of IUK to UK Firm Growth and Performance, to one additional firm-level outcome not resolved within the original four-year post-grant window: productivity.
- The analysis uses the matched population of approximately 14,000 first-time IUK-funded companies, with grant cohorts initiated between 2005 and 2023, together with propensity-score matched non-recipient controls. The effect of funding on firm-level total factor productivity (TFP) is estimated using a stacked difference-in-differences design over a window spanning four years before and twelve years after the initial grant.
- TFP is recovered as the residual from industry-specific production functions estimated using the Wooldridge (2009) GMM control-function estimator. This improves on the appendix analysis in the 2024 report, which relied on a single economy-wide production function.
- In the preferred static specification, IUK funding is associated with a positive average post-funding TFP effect of approximately 2.8 per cent, statistically significant at the 10 per cent level.
- The dynamic estimates indicate a delayed productivity response. The effect is close to zero, and in some specifications slightly negative, during the first post-funding years. It becomes positive and statistically significant from year six, and remains positive through years seven to eleven, with estimated effects of approximately 5 to 9 per cent.
- The results support the interpretation advanced in the 2024 report: productivity gains from innovation funding materialise more slowly than effects on patenting, firm growth and equity finance, and are therefore likely to be missed within a conventional four-year evaluation window.
- Sub-sample estimates indicate a negative early association for firms aged 0-2 years at funding, consistent with a scale-up phase in which employment and assets rise before value added. The positive average TFP effect is clearest in lower-technology, less knowledge-intensive sectors; differences across the standard size classes are not pronounced, although finer asset-based bands reveal positive effects for the smallest firms and a negative effect for the very largest.
- The more granular heterogeneity analysis reported in the appendix sharpens this picture. The positive TFP effect is driven by older firms and by the smallest firms by assets, with a negative effect for the very largest firms. By sector it is concentrated in other service activities and manufacturing, with information and communication moving from negative in the early years to strongly positive later; among regions it is clearest in Wales.
- A second productivity measure, labour productivity (value added per employee), shows no average effect of funding. The contrast with the positive TFP effect indicates that the gain reflects a genuine improvement in total-factor efficiency, rather than a mechanical rise in value added per worker.

1. Introduction

The November 2024 report, The Contribution of IUK to UK Firm Growth and Performance: An Analysis of IUK Applicants for Funding,[1] presented a large-scale evaluation of Innovate UK (IUK) funding for UK businesses. The study examined 59,048 grants initiated between 2005 and 2023, from which a quantitative sample of more than 14,000 funded companies was constructed and matched to non-recipient controls drawn from the population of UK limited companies. Using a stacked difference-in-differences design, it estimated the effect of IUK funding across three outcome groups: innovative activity, measured by patents, innovations and patent value; firm growth and performance, measured by assets, turnover and employment; and the ability to attract venture capital and other equity finance.

Across these outcome groups, the estimated effects were positive. IUK-funded firms recorded more patents, around 21 per cent more than comparable controls, more innovations, 16 per cent, and substantially higher patent-portfolio value, 50 per cent. They also grew faster in assets, employment and turnover, and were modestly more successful in attracting equity finance. The effects accumulated over time and continued to build across the four-year post-funding window used in the main analysis.

The unresolved outcome was productivity. Total factor productivity (TFP) was examined only in the appendix, over the same four-year window, and the results were relatively inconclusive. In some specifications the estimated effect was small and negative; in the preferred specifications it was statistically insignificant. The report interpreted this null result as a timing issue: real value added need not rise faster than the employment and capital that funding induces, so measured productivity can remain flat, or be temporarily depressed, in the short run. The report therefore suggested that productivity effects might materialise beyond the four-year analysis window.

This follow-up study tests that interpretation directly. It retains the population, matching strategy and difference-in-differences framework of the 2024 report but makes two changes designed to identify a delayed productivity effect. First, the observation window is extended from four to twelve years after funding. Second, TFP measurement is refined by estimating a separate production function for each industry section, rather than imposing a single economy-wide production function. This allows the elasticities of capital and labour to differ across distinct production technologies. The remainder of the report sets out the rationale in Section 2, the data and method in Section 3, the TFP results in Section 4, the heterogeneity analysis in Section 5 and a complementary analysis of labour productivity in Section 6, before drawing together the implications in Section 7. Granular heterogeneity estimates and parallel-trends checks are reported in an appendix.

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[1] https://ircaucus.ac.uk/publications/the-contribution-of-innovate-uk-to-uk-firm-growth-and-performance-an-analysis-of-innovate-uk-applicants-for-funding/

2. Background: Productivity and the Timing of Innovation Returns

Raising productivity is the central economic rationale for public support of business innovation, but it is also the outcome on which the evaluation literature is most divided. The difficulty is partly conceptual and partly temporal. Innovation grants typically finance the development of new products, processes and services whose commercial returns accrue only after a prolonged and uncertain gestation period. In the interim, funding tends to raise measured inputs: firms hire researchers and engineers, and invest in equipment and intangible assets, before measured output responds. Since productivity is output relative to inputs, this sequencing can leave TFP flat, or temporarily lower, in the years immediately following an award, even when the underlying innovation process is productive.

The empirical record is correspondingly mixed. Studies that allow for differential effects by firm type and grant history tend to find the clearest results. Alexandre, Chaves and Portela (2025), using a regression-discontinuity design on Portuguese administrative data, find that a single investment grant raises labour productivity and that a second grant raises it further, particularly for micro and small firms, but they report no significant effect on total factor productivity. Other studies find limited or no productivity effects, while Gustafsson, Halvarsson and Tingvall (2020) show that less productive firms may be more likely to seek and obtain grants in the first place, which can bias simple comparisons downwards. The common result is that productivity effects, where present, are smaller, slower and more heterogeneous than effects on innovation inputs or headline growth.

Recent evidence strengthens this interpretation. The evaluation literature finds clearer effects of public innovation support on R&D, patenting, employment, investment and firm growth than on measured productivity, particularly over short windows. Meta-analytic evidence suggests that R&D subsidies and tax incentives generate additional private R&D, but that the average effects are modest and depend on programme design, firm characteristics and the time allowed for effects to materialise (Dimos and Pugh, 2016; Dimos et al., 2022). Quasi-experimental studies of R&D grants find positive effects on innovation, patenting, revenue, venture-capital attraction and firm-level outcomes, especially where grants relieve financing constraints or de-risk early-stage projects (Howell, 2017; Santoleri et al., 2024). UK evidence similarly finds that publicly funded R&D and innovation support can raise firm performance, but that the translation from innovation to productivity is indirect, heterogeneous and often mediated by growth, process change, organisational capability and spillovers (Vanino et al., 2019; Turner et al., 2020; Becker, Roper and Vanino, 2023). The wider innovation and industrial-policy literature makes the same point: policy should be evaluated against market failures, spillovers and sector-specific mechanisms, not only against short-run firm-level productivity effects (Bloom, Van Reenen and Williams, 2019; Criscuolo et al., 2019; Juhász, Lane and Rodrik, 2024; Myers and Lanahan, 2022).

This distinction is important for the present study. IUK funding may first appear in intermediate outcomes, such as patenting, employment, assets, turnover and equity finance, before it appears in TFP. The relevant empirical question is therefore not simply whether funded firms become more productive immediately, but whether productivity gains emerge once innovation effort has been absorbed into production, commercialisation and scale. That is precisely the question addressed by extending the observation window to twelve years.

Recent UK policy evidence points in the same direction. It places increasing weight on sector-specific innovation pathways, diffusion, scale-up and the long-run value of public R&D, rather than treating innovation support as a single undifferentiated intervention (Cambridge Industrial Innovation Policy, 2026; Department for Business and Trade, 2025; Department for Science, Innovation and Technology, 2025; Roper, 2024). This supports an evaluation design that allows both the timing and the sectoral route to productivity to differ across firms.

These observations shape the design of the present study. A credible test of whether IUK funding raises productivity requires a long observation window, sufficient for development effort to convert into commercialised output. The twelve-year window used here is considerably longer than the horizon typically used in this literature. It is also important to recognise that production technologies differ markedly across sectors. Pooling all firms into a single production function risks mismeasuring TFP for any given firm; estimating production functions by industry section addresses this directly. A final design choice concerns the productivity measure itself. Many earlier attempts to measure productivity, particularly in an evaluation setting, have had access to only enough data to examine labour productivity. This study deliberately targets the more demanding measure, total factor productivity, which isolates efficiency gains from changes in factor intensity, while also examining results through the labour productivity lens. Labour productivity results are reported for completeness.

3. Data and Methodology

3.1 Sample and Matching

The analysis uses the same sample as the 2024 report. Of the 59,048 IUK grants initiated between 2005 and 2023, the final estimation sample contains 14,414 first-time grant recipients with usable accounting data, after excluding unidentifiable recipients, non-business beneficiaries and second and subsequent grants to the same company. Financial characteristics are drawn from the Credit Management Research Centre / CreditSafe databases, which source historical accounts for the population of UK limited companies from Companies House. Each treated firm is matched, one year before funding, to four control companies that never received IUK funding, using nearest-neighbour propensity-score matching with replacement. This is the same matched

sample on which the innovation, growth and equity-finance results were estimated, making the productivity results directly comparable with those in the 2024 report.

3.2 Measuring Total Factor Productivity

Productivity is measured as TFP recovered from a firm-level production function. The starting point is the Cobb-Douglas form (Cobb and Douglas, 1928), $Y = A\, L^{\alpha}\, K^{\beta}$, which after logarithmic transformation gives an estimable equation in which log real value added (deflated by the aggregate GDP deflator) is regressed on log employment and log real fixed assets, with firm-level productivity entering as an unobserved term.

Because that unobserved productivity term is correlated with a firm's input choices, ordinary least squares yields biased and inconsistent input elasticities. In line with the control-function tradition of Olley and Pakes (1996) and Levinsohn and Petrin (2003), real cost of sales is used as a proxy for unobserved productivity, and the production function is estimated using the GMM approach of Wooldridge (2009).[2] For the present analysis, the single economy-wide production function used in the 2024 appendix is replaced by separate industry-section production functions, allowing the capital and labour elasticities to vary across production technologies.[3]

Table 1 reports the estimated elasticities by industry section. The estimates are precisely determined and economically plausible: the elasticity on fixed assets ranges from around 0.18 in mining and quarrying to 0.72 in information and communication, while the elasticity on employment is positive and significant in almost every section. Firm-level TFP is then computed as the residual from the relevant industry production function. This residual is the outcome variable in the difference-in-differences analysis that follows.

The sector-specific production functions are more than a technical refinement. They recognise that the relationship between capital, labour and value added differs across sectors, and that a single economy-wide production function risks confounding genuine productivity differences with differences in production technology. This matters particularly in an innovation-policy setting, where funded firms operate across manufacturing, digital, professional services, life sciences, creative industries and lower-technology activities. A productivity measure that allows input elasticities to vary by industry gives a clearer basis for asking whether funding changes firm performance, rather than merely reallocating firms across sectors with different production structures.

[2]Estimation uses the user-written Stata command prodest (Rovigatti and Mollisi, 2018), implementing the Wooldridge (2009) one-step GMM control-function estimator with real cost of sales as the proxy for unobserved productivity.

[3]Section K (financial and insurance activities) is excluded throughout, in line with the production-function literature.

Table 1. Estimated coefficients for firm-level production functions, by industry section

Sec.	Industry (NACE / UK SIC)	Fixed assets (log)	t	Employees (log)	t	Obs.
A	Agriculture, forestry & fishing	0.349***	(55.01)	0.123***	(7.11)	6,512
B	Mining & quarrying	0.183***	(24.32)	0.171***	(10.05)	5,308
C	Manufacturing	0.531***	(300.27)	0.133***	(46.88)	145,539
D	Electricity, gas, steam & air conditioning	0.301***	(37.02)	0.052***	(2.85)	3,486
E	Water supply, sewerage & waste	0.490***	(66.11)	0.175***	(11.66)	5,663
F	Construction	0.518***	(205.94)	0.080***	(21.24)	59,752
G	Wholesale & retail trade	0.529***	(341.38)	0.107***	(38.44)	136,652
H	Transportation & storage	0.531***	(176.75)	0.133***	(23.47)	27,917
I	Accommodation & food service	0.523***	(153.15)	0.126***	(18.72)	31,942
J	Information & communication	0.716***	(253.53)	0.092***	(26.89)	59,257
L	Real estate activities	0.461***	(96.54)	0.103***	(11.26)	16,687
M	Professional, scientific & technical	0.601***	(347.10)	0.112***	(36.36)	117,546
N	Administrative & support service	0.564***	(305.33)	0.110***	(30.24)	78,846
O	Public administration & defence	0.612***	(39.77)	0.025	(1.02)	967
P	Education	0.555***	(58.36)	0.065***	(5.25)	7,729
Q	Human health & social work	0.500***	(125.34)	0.111***	(18.29)	24,003
R	Arts, entertainment & recreation	0.537***	(86.17)	0.107***	(9.29)	14,008
S	Other service activities	0.552***	(137.12)	0.129***	(18.41)	22,639
T	Households as employers	0.555***	(13.01)	0.182**	(2.36)	328
U	Extraterritorial organisations	0.576***	(98.13)	0.074***	(7.93)	9,873

Notes: Dependent variable is log real value added. Coefficients are estimated separately for each industry section (NACE / UK SIC), using the Wooldridge (2009) GMM control-function estimator with real cost of sales as the productivity proxy. The estimation sample covers all UK companies with available data from 2000 to 2023, with at least two employees and positive fixed assets and value added, and excludes financial companies (section K). t-statistics in parentheses; * p<0.10, ** p<0.05, *** p<0.01.

This also links the analysis to the current industrial-strategy debate. UK policy is increasingly organised around sectors, clusters and routes to scale, rather than around a single undifferentiated model of firm growth (Competition and Markets Authority, 2025; Department for Business and Trade, 2025, 2026). Sectoral production functions therefore make the productivity estimates more policy-relevant: they allow the impact of innovation funding to be interpreted in relation to sector-specific routes to value creation,

including process improvement, technology adoption, commercialisation, supply-chain integration and the scaling of intangible assets.

3.3 Difference-in-Differences over an Extended Window

The effect of funding on TFP is estimated using the same stacked difference-in-differences design as the 2024 report. For each cohort, defined by firms funded in a given year and their matched controls, a window of observations is assembled around the funding event and the cohort-specific datasets are stacked. The extension here is the length of that window: firms are observed from four years before funding to twelve years after it, rather than over the four-year post-funding window used in the main 2024 analysis. Of course, sample size reduces for longer windows. Two specifications are reported. The static specification uses a single Post × treated interaction to capture the average post-funding effect. The dynamic specification uses separate interactions for each relative year, Year 0 to Year 12, to trace the path of the effect over time. The models are estimated with progressively richer controls and fixed effects, culminating in specifications with firm-level controls, cohort-company fixed effects and cohort-time fixed effects, with standard errors clustered by company and by time.

The same design is applied to two productivity measures. The first is total factor productivity, recovered as described above. The second is labour productivity, defined as log real value added per employee, which is examined as a complementary measure in Section 6. Pre-funding event-study coefficients are reported in the appendix (Figures A1 and A2). They are generally close to zero, although the TFP estimate four years before funding is negative; a joint test of the pre-treatment coefficients should be reported before drawing a firm conclusion on parallel trends. Heterogeneity is examined by re-estimating the preferred specifications on sub-samples defined by firm age, firm size, industry section, region and technology intensity. Section 5 summarises the total-factor-productivity results across these dimensions, and the full estimates are reported in the appendix.

4. The Effect of IUK Funding on Total Factor Productivity

Table 2 reports the main TFP estimates. Models 1-4 are the static specifications and models 5-8 are the dynamic specifications. In each block the specification becomes more demanding from left to right, with model 4 in the static block and model 8 in the dynamic block representing the preferred specifications.

Table 2. Estimated effects of IUK funding on total factor productivity

	1	2	3	4	5	6	7	8
	Static specification				*Dynamic specification*			
Post × treated	-0.0303 (-1.40)	-0.0104 (-0.53)	0.0197 (1.31)	0.0280* (1.97)				
Year 0 × treated					-0.0363* (-1.71)	- 0.0472** (-2.30)	0.0005 (0.03)	-0.0006 (-0.04)
Year 1 × treated					-0.0239 (-0.91)	-0.0327 (-1.31)	0.0128 (0.75)	0.0127 (0.78)
Year 2 × treated					-0.0218 (-0.78)	-0.0232 (-0.88)	0.0302 (1.49)	0.0337* (1.74)
Year 3 × treated					-0.0324 (-1.05)	-0.0306 (-1.06)	0.0068 (0.37)	0.0138 (0.79)
Year 4 × treated					-0.0591* (-1.79)	-0.0352 (-1.16)	-0.0072 (-0.35)	0.0074 (0.39)
Year 5 × treated					-0.0443 (-1.28)	-0.0110 (-0.35)	0.0241 (0.85)	0.0316 (1.14)
Year 6 × treated					-0.0575 (-1.61)	-0.0311 (-0.95)	0.0317 (1.47)	0.0452** (2.18)
Year 7 × treated					-0.0373 (-0.98)	0.0045 (0.13)	0.0593** (2.21)	0.0751*** (2.82)
Year 8 × treated					-0.0193 (-0.46)	0.0132 (0.34)	0.0583* (1.89)	0.0802** (2.53)
Year 9 × treated					-0.0867* (-1.90)	-0.0210 (-0.50)	0.0272 (0.94)	0.0534* (1.85)
Year 10 × treated					0.0057 (0.11)	0.0449 (0.94)	0.0608 (1.44)	0.0830* (1.96)
Year 11 × treated					0.0284 (0.50)	0.0647 (1.25)	0.0348 (1.14)	0.0593* (1.94)
Year 12 × treated					0.0602 (0.95)	0.0963* (1.67)	0.0060 (0.12)	0.0324 (0.75)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Regional / Industry / Time FE	No	Yes	No	No	No	Yes	No	No
Cohort-company FE	No	No	Yes	Yes	No	No	Yes	Yes
Cohort-time FE	No	No	Yes	Yes	No	No	Yes	Yes

Notes: The dependent variable is firm-level total factor productivity (the residual from the industry production functions in Table 1). Treated indicates IUK-funded firms; Post indicates the post-funding period. Models 1–4 report the static (Post × treated) specification; models 5–8 the dynamic specification, with separate interactions for each relative year. Controls comprise firm age and selected financial ratios. t-statistics in parentheses; * p<0.10, ** p<0.05, *** p<0.01.

The dynamic estimates show why the longer window matters. In the first five years after funding, the TFP effect is generally indistinguishable from zero and, in less saturated specifications, marginally negative. This is consistent with the mechanism set out in the 2024 report, in which inputs respond before value added. From year six onward, a positive and statistically significant effect emerges in the preferred specification (model 8) and is sustained through year eleven. The effect is approximately 4.6 per cent in year six, rising to 7.8 per cent in year seven and 8.4 per cent in year eight. It remains positive and statistically significant, in the range of about 5 to 9 per cent, through years nine to eleven. The point estimate for year twelve remains positive but is no longer statistically significant, reflecting the thinner sample at the end of the window.

The static and dynamic estimates together address the open question left by the 2024 report. The measured productivity return to IUK funding is positive but delayed. It is not visible within the four-year window on which most evaluations, including the main body of the 2024 study, are based, and becomes identifiable only once firms are observed six or more years after funding. This is consistent with the long gestation between innovation effort and commercialised output discussed in Section 2. It also cautions against interpreting an absence of short-run productivity effects as evidence that funding has had no productivity effect.

5. Heterogeneity By Age, Size, Sector, Region and Technology

To identify where productivity effects are concentrated, the preferred specification is re-estimated on sub-samples defined by firm age, firm size and the technology intensity of the sector. Table 3 reports the static heterogeneity results, with each sub-sample's average post-funding effect, its t-statistic and the number of observations. All sub-sample models include the full set of controls, cohort-company fixed effects and cohort-time fixed effects.

The table points to two main results. By age, firms aged two years or less at funding show a sizeable negative and statistically significant effect. Older age groups do not show statistically significant static effects. The negative coefficient for the youngest firms is best read as the input-ahead-of-output mechanism in its most acute form: very young firms scaling up after an award add employees and assets faster than they convert development effort into value added, depressing measured productivity over the period observed. The sub-sample is also the smallest, so the estimate should be interpreted with appropriate caution. By technology intensity, the effect is positive and significant for firms in lower-technology, less knowledge-intensive sectors, at around 3.8 per cent, but insignificant for high-technology and knowledge-intensive firms. One plausible explanation is that returns in the latter group accrue more slowly and may lie beyond even the extended window. Across the four size bands, there are no statistically significant differences.

Table 3. Heterogeneity of the TFP effect, static specification

Subsample	Post × treated	t-stat	Obs.
Age group			
0–2 years	-0.279**	(-2.42)	1,369
3–6 years	-0.0184	(-0.35)	5,660
7–12 years	0.0527	(1.40)	9,611
13+ years	0.0220	(1.54)	47,558
Size group			
Micro	0.104	(0.64)	1,333
Small	0.0527	(1.00)	9,488
Medium	0.0218	(1.39)	31,325
Large	0.0071	(0.30)	21,977
Technology intensity			
Low	0.0377**	(2.36)	49,984
High	0.0067	(0.28)	25,784

Notes: Each row reports the coefficient on Post × treated from the preferred static specification (corresponding to model 4 in Table 2) estimated on the relevant sub-sample. All models include firm-level controls and cohort-company and cohort-time fixed effects; standard errors are clustered by company and by time. t-statistics in parentheses; * p<0.10, ** p<0.05, *** p<0.01.

The dynamic heterogeneity results, reported in Table 4, are more granular but broadly consistent with the static evidence. The negative effect for the youngest firms is not confined to the first years after funding: it is negative and statistically significant in most years across the window, including the later years, where the youngest firms remain weakest. Positive effects elsewhere tend to strengthen with time, echoing the lagged pattern observed in the full sample.

Table 4. Heterogeneity of the TFP effect, dynamic specification

	Age group				*Size group*				*Technology intensity*	
	0–2 years	**3–6 years**	**7–12 years**	**13+ years**	**Micro**	**Small**	**Medium**	**Large**	**Low**	**High**
Year 0 × treated	-0.243** (-2.13)	-0.0789 (-1.28)	0.0586* (1.81)	-0.00823 (-0.57)	-0.0875 (-0.39)	0.00844 (0.17)	-0.00253 (-0.17)	0.00477 (0.19)	0.0150 (0.87)	-0.0388 (-1.44)
Year 1 × treated	-0.115 (-1.02)	0.0301 (0.53)	0.0715* (1.82)	-0.00740 (-0.46)	0.154 (0.74)	0.00557 (0.10)	0.00974 (0.46)	0.00263 (0.08)	0.0246 (1.23)	-0.0171 (-0.52)
Year 2 × treated	-0.135 (-0.93)	0.00826 (0.13)	0.0462 (0.78)	0.0275 (1.23)	0.00561 (0.02)	0.133* (1.89)	0.0199 (0.68)	-0.0345 (-1.27)	0.0591*** (2.97)	-0.0180 (-0.51)
Year 3 × treated	-0.391*** (-2.94)	-0.0384 (-0.57)	0.0941 (1.44)	0.0117 (0.64)	0.147 (0.90)	-0.0135 (-0.17)	0.0169 (0.90)	-0.0148 (-0.47)	0.0321 (1.62)	-0.0246 (-0.67)
Year 4 × treated	-0.157 (-0.72)	-0.0618 (-0.88)	-0.00491 (-0.06)	0.0242 (1.38)	0.142 (0.52)	0.0766 (1.10)	0.0198 (0.80)	-0.0265 (-0.62)	0.0335 (1.64)	-0.0404 (-1.05)
Year 5 × treated	-0.413** (-2.66)	-0.121 (-1.23)	-0.0277 (-0.29)	0.0509* (1.72)	0.114 (0.35)	-0.0320 (-0.38)	0.0178 (0.66)	0.0713 (1.44)	0.0535** (2.07)	-0.00886 (-0.18)
Year 6 × treated	-0.393*** (-2.91)	-0.00758 (-0.09)	0.0517 (0.94)	0.0393 (1.67)	0.504 (1.21)	0.0206 (0.33)	0.0510* (1.97)	0.0538 (1.52)	0.0450* (1.90)	0.0535 (1.39)
Year 7 × treated	-0.292* (-1.84)	0.0987 (0.98)	0.0296 (0.34)	0.0553** (2.31)	0.564 (1.54)	0.0746 (0.90)	0.0506 (1.70)	0.0826 (1.42)	0.0626** (2.39)	0.110** (2.28)
Year 8 × treated	-0.555* (-1.78)	-0.0523 (-0.43)	0.0956 (1.15)	0.0637* (1.95)	0.846** (2.58)	0.147 (1.58)	0.0542 (1.45)	-0.00692 (-0.12)	0.0711* (2.04)	0.103 (1.68)
Year 9 × treated	-0.426** (-2.70)	0.0862 (0.63)	0.0671 (0.77)	0.0235 (0.72)	0.299 (0.57)	0.0963 (1.03)	-0.00523 (-0.12)	0.0287 (0.78)	0.0397 (1.13)	0.0926* (1.74)
Year 10 × treated	-0.421** (-2.51)	0.0721 (0.53)	0.124 (1.19)	0.0651* (1.73)	-0.862* (-2.03)	0.270** (2.16)	0.0780* (1.78)	0.0182 (0.27)	0.0592 (1.28)	0.143* (1.86)
Year 11 × treated	-1.064* (-1.86)	0.0377 (0.33)	-0.0264 (-0.26)	0.0740* (2.01)	—	0.187 (1.16)	0.0283 (0.73)	0.0274 (0.33)	-0.00210 (-0.05)	0.181*** (2.97)
Year 12 × treated	-0.736* (-2.08)	0.0652 (0.68)	0.137 (1.10)	0.0312 (0.80)	-1.249** (-2.33)	0.233 (1.06)	0.108*** (3.10)	-0.0727 (-1.19)	0.00525 (0.10)	0.0983 (1.08)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

	Age group				*Size group*				*Technology intensity*	
	0–2 years	**3–6 years**	**7–12 years**	**13+ years**	**Micro**	**Small**	**Medium**	**Large**	**Low**	**High**
Regional / Industry / Time FE	No	No	No	No	No	No	No	No	No	No
Cohort-company FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,369	5,660	9,611	47,558	1,333	9,488	31,325	21,977	49,984	25,784

Notes: Each column reports the dynamic specification (corresponding to model 8 in Table 2) estimated on the relevant sub-sample, with separate interactions between the treatment indicator and each relative year (Year 0 to Year 12). Coefficients are shown with t-statistics in parentheses below. All models include firm-level controls and cohort-company and cohort-time fixed effects; standard errors are clustered by company and by time. A dash (—) denotes a coefficient that could not be estimated owing to insufficient identifying variation in that cell. t-statistics in parentheses; * p<0.10, ** p<0.05, *** p<0.01.

The sectoral pattern is particularly important. The positive and statistically significant effect in lower-technology and less knowledge-intensive sectors qualifies a narrow frontier-technology interpretation of innovation policy. It suggests that IUK funding can raise productivity through diffusion and application, not only through invention. In these sectors, grant support may accelerate process improvement, equipment upgrading, digital adoption, better production organisation and the commercial exploitation of knowledge that is already close to market. These channels are less visible in patent counts, but more likely to appear in measured value added once firms have absorbed the new capability.

The absence of a significant static TFP effect in high-technology and knowledge-intensive sectors should not be read as evidence that funding is ineffective in those activities. It is more plausibly a timing and measurement result. High-technology projects typically involve longer development cycles, greater intangible investment, more uncertain commercialisation paths and a wider gap between technical progress and recorded accounting output. Their early measurable effects may appear first in patents, skilled employment, assets, collaboration and equity finance, with TFP responding only after development has moved into repeatable commercial production.

The coarse sub-samples in Tables 3 and 4 can be cut more finely, across ten age bands, ten size bands defined by real total assets, the larger industry sections, the twelve UK regions and seven technology and knowledge-intensity classes. These granular estimates are reported in the appendix (Tables A1 to A5) and refine, rather than overturn, the account above.

By age (Table A1), the positive effect is concentrated in established firms. It is largest and statistically significant for firms aged thirty-five to forty-six years at funding, while the very youngest band, firms aged five years or less, shows mostly negative coefficients in the early post-funding years. This is consistent with the input-ahead-of-output mechanism: young firms scaling up after an award add employees and assets before value added responds.

By size (Table A2), a pattern emerges that is not visible in the standard size classes of Table 3. When firms are grouped by real total assets one year before funding, the effect is positive and economically large for the smallest firms, those with assets below two million pounds, and is also positive in the eight-to-twelve million and seventy-to-two-hundred-and-fifty million bands. It is negative for the very largest firms, those with assets above two hundred and fifty million pounds. The absence of a size gradient across the standard classes therefore masks genuine differences across the asset distribution.

By sector and region (Tables A3 and A4), the static effect is positive and significant in other service activities and in manufacturing, and the dynamic estimates show information and communication moving from negative in the first years to strongly positive later, as development converts into commercial output. Among regions, the effect is clearest and most strongly significant in Wales, with weaker positive signs in

Yorkshire and the Humber. By technology and knowledge intensity (Table A5), the positive static effects are found in medium-high and low-technology sectors and, weaker, in less knowledge-intensive services, while knowledge-intensive services become significant only in the later years.

Taken together, the sectoral and dynamic results suggest that sector matters for both evaluation and programme design. A single average productivity effect masks differences in production technology, absorptive capacity and the time required to convert innovation effort into commercial output. This is why the industry-specific production functions used in this report are central to the interpretation of the results, rather than merely a technical refinement.

6. Labour Productivity

The total factor productivity results above rest on a measure that nets out both labour and capital. As a complementary check, this section examines a second productivity measure, labour productivity, defined as log real value added per employee. It is constructed for the same matched sample and estimated with the same stacked difference-in-differences design over the same window, four years before to twelve years after funding. The pre-funding event-study coefficients for labour productivity are reported in the appendix (Figure A2); the displayed confidence intervals include zero, although a joint test of the pre-treatment coefficients should also be reported.

Table 5 reports the main labour-productivity estimates, in the same format as Table 2. In contrast to TFP, there is no average effect of IUK funding on labour productivity. The static coefficient in the preferred specification (model 4) is close to zero and statistically insignificant, and the dynamic estimates are insignificant in almost every year, with only isolated positive coefficients towards the end of the window. The contrast with the TFP results is the substantive finding of this section.

This contrast is informative rather than contradictory. Labour productivity measures value added per worker and takes no account of capital, whereas total factor productivity measures value added relative to both labour and capital. A pattern in which TFP rises while labour productivity does not is consistent with funded firms expanding employment and capital broadly in step with value added, so that output per worker changes little even as the efficiency with which all inputs are combined improves. The contrast is therefore consistent with a total-factor efficiency effect rather than a simple mechanical rise in value added per head, although the labour-productivity result does not independently identify the mechanism. It also reinforces the caution, set out in the 2024 report, against reading a flat single-factor productivity series as evidence that funding has had no productivity effect.

Table 5. Estimated effects of IUK funding on labour productivity

	1	2	3	4	5	6	7	8
	Static specification				*Dynamic specification*			
Post × treated	-0.0119 (-0.60)	-0.00228 (-0.12)	-0.00855 (-0.52)	0.00155 (0.10)				
Year 0 × treated					-0.0332 (-1.61)	-0.0353* (-1.76)	-0.0229 (-1.31)	-0.0216 (-1.32)
Year 1 × treated					-0.0336 (-1.32)	-0.0354 (-1.43)	-0.0210 (-1.22)	-0.0181 (-1.10)
Year 2 × treated					-0.0290 (-1.08)	-0.0266 (-1.02)	-0.0145 (-0.66)	-0.00751 (-0.35)
Year 3 × treated					-0.0311 (-1.07)	-0.0293 (-1.04)	-0.0286 (-1.41)	-0.0189 (-0.96)
Year 4 × treated					-0.0187 (-0.60)	-0.00768 (-0.26)	-0.0354 (-1.47)	-0.0210 (-0.91)
Year 5 × treated					-0.00208 (-0.07)	0.0114 (0.38)	0.00179 (0.06)	0.0124 (0.43)
Year 6 × treated					-0.0265 (-0.80)	-0.0130 (-0.41)	0.00629 (0.24)	0.0211 (0.83)
Year 7 × treated					-0.00275 (-0.08)	0.0208 (0.61)	0.0345 (1.13)	0.0527* (1.77)
Year 8 × treated					0.00294 (0.08)	0.0203 (0.55)	0.0278 (0.88)	0.0499 (1.52)
Year 9 × treated					-0.0354 (-0.84)	-0.00555 (-0.14)	0.0124 (0.40)	0.0366 (1.17)
Year 10 × treated					0.0308 (0.62)	0.0411 (0.87)	0.0488 (1.13)	0.0692 (1.61)
Year 11 × treated					0.0564 (1.09)	0.0666 (1.36)	0.0180 (0.43)	0.0410 (0.98)
Year 12 × treated					0.0998* (1.79)	0.108** (2.04)	0.0245 (0.39)	0.0470 (0.81)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Regional / Industry / Time FE	No	Yes	No	No	No	Yes	No	No
Cohort-company FE	No	No	Yes	Yes	No	No	Yes	Yes
Cohort-time FE	No	No	Yes	Yes	No	No	Yes	Yes

Notes: The dependent variable is firm-level labour productivity, defined as log real value added per employee. Treated indicates IUK-funded firms; Post indicates the post-funding period. Models 1–4 report the static (Post × treated) specification; models 5–8 the dynamic specification, with separate interactions for each relative year. Controls comprise firm age and selected financial ratios. t-statistics in parentheses; * p<0.10, ** p<0.05, *** p<0.01.

The labour-productivity heterogeneity results, reported in the appendix (Tables A6 to A10), broadly echo those for TFP. The clearest positive effects are again found among the smallest firms by assets and among firms aged between thirty-five and forty-six

years at funding, with a negative effect for the very largest firms and for the youngest firms in the early post-funding years. Section S, other service activities, and, in the later years, section J, information and communication, show the strongest sectoral effects. As with TFP, there is no systematic effect within the broad size classes or across most regions. The negative estimates for the residual "other or unknown" technology category should not be given a substantive interpretation.

7. Key Findings and Implications

The central result of this follow-up study is that IUK funding is associated with higher firm-level TFP, but only after a substantial lag. Extending the observation window from four to twelve years, and measuring TFP from industry-specific production functions, reveals a productivity effect that is absent in the short run, emerges from around the sixth year after funding, and is then sustained at economically meaningful magnitudes of roughly 5 to 9 per cent for several years.

There are three implications. First, evaluation horizons matter. Productivity is a lagging indicator of innovation support relative to patenting, growth and equity finance, all of which respond within the first four years. An evaluation that stops at four years will therefore tend to understate, and may entirely miss, the productivity effect. Initiatives such as large-scale innovation funding of this kind should be assessed over horizons of at least five to seven years, and ideally longer. Second, the short-run productivity dip for the youngest firms should be interpreted as part of the investment and scale-up process, not as evidence of failure. Third, the results reinforce, on the productivity margin, the broader conclusion of the 2024 report that IUK funding produces tangible firm-level benefits that accumulate over time.

A second strand of evidence reinforces these conclusions. When productivity is measured as labour productivity, value added per employee, there is no average effect of funding. Read alongside the positive total-factor-productivity effect, this indicates that funded firms raise the efficiency with which they combine labour and capital, rather than simply lifting output per worker, and confirms that the productivity gain is a genuine total-factor effect. The more granular heterogeneity analysis in the appendix also locates the effect more precisely. It is strongest among the smallest firms by assets and among established firms aged between thirty-five and forty-six years at funding, is negative for the very largest firms, and is concentrated in service and diffusion-oriented sectors and, regionally, in Wales. These patterns are consistent with a diffusion-led as much as a frontier-led route from public innovation support to measured productivity.

The sectoral results also connect the findings to the current industrial-strategy debate. They show that the productivity return to IUK funding is not confined to a frontier-technology model of innovation. Public support can raise measured productivity where innovation is embodied in adoption, process improvement and commercial scaling, as well as where it is embodied in formal R&D and patents. This argues for an evaluation framework that distinguishes between invention-led sectors, where returns are long-cycle and heavily

intangible, and diffusion-led sectors, where productivity gains may be more directly observable in firm accounts. The relevant policy question is therefore not simply whether innovation grants work in the aggregate, but where, through which mechanisms, and over what horizon they work.

The TFP results reported here can be reconciled formally with the four-year appendix estimates of the 2024 report to confirm that the longer window, rather than any change in sample, accounts for the difference in findings. The central result: the productivity return to innovation funding is real, material but slow to emerge.

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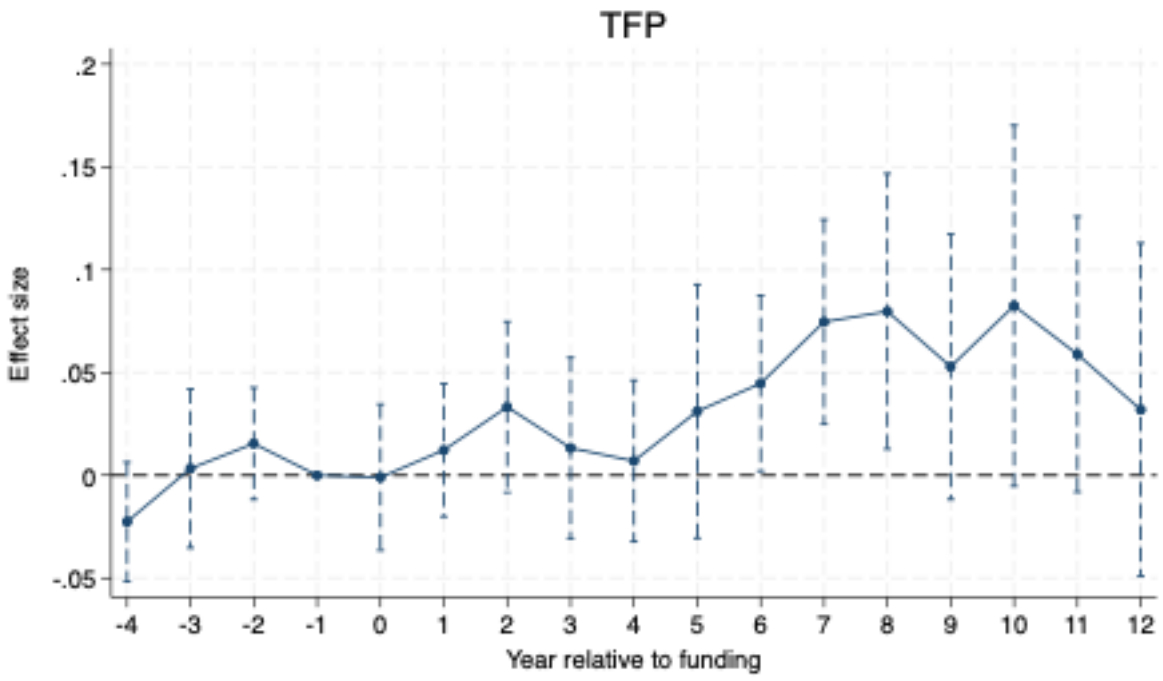
APPENDIX: Parallel-Trends Checks and Granular Heterogeneity

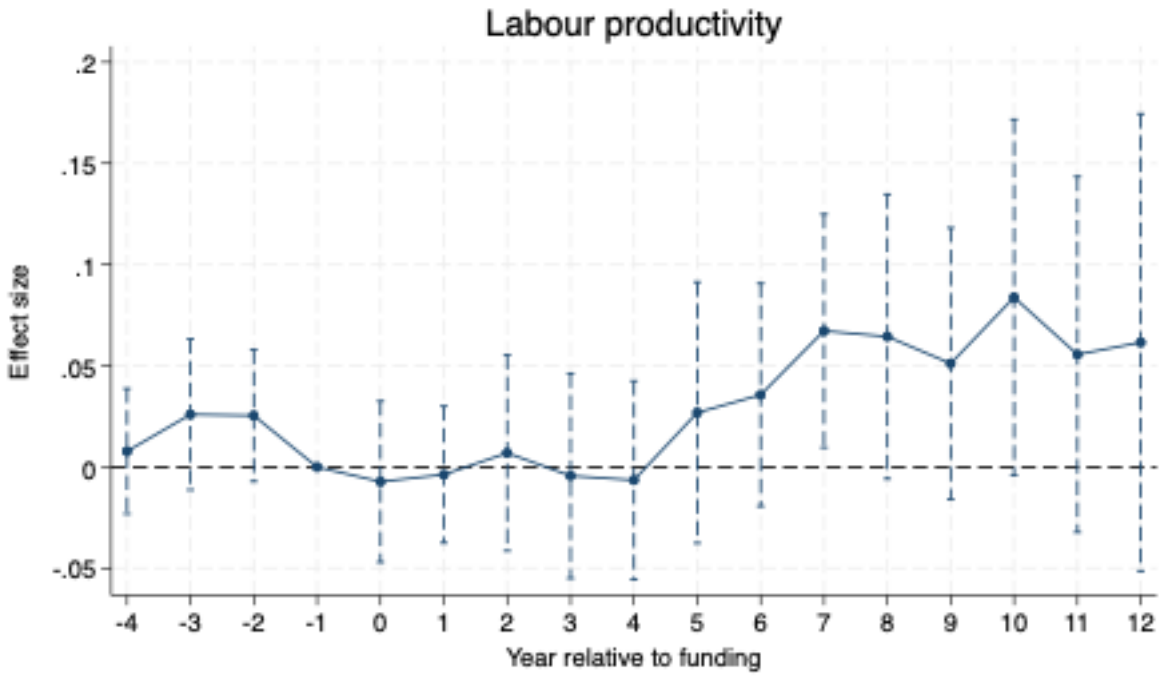
This appendix reports the pre-funding event-study checks underlying the difference-in-differences design and the full set of granular heterogeneity estimates summarised in Sections 5 and 6. Figures A1 and A2 show event-time treatment coefficients for total factor productivity and labour productivity relative to the omitted year before funding. Tables A1 to A5 give the granular total-factor-productivity heterogeneity estimates by firm age, firm size, industry section, region and technology intensity; their static and dynamic specifications correspond to models 4 and 8 in Table 2. Tables A6 to A10 give the corresponding labour-productivity estimates; their static and dynamic specifications correspond to models 4 and 8 in Table 5.

Figure A1. Parallel-trends check: total factor productivity



Note: The series show mean total factor productivity for IUK-funded firms and their matched controls around the funding event. Pre-funding differences are not statistically distinguishable from zero in the period before funding, consistent with the parallel-trends assumption.

Figure A2. Parallel-trends check: labour productivity



Note: The series show mean labour productivity (log real value added per employee) for IUK-funded firms and their matched controls around the funding event. Pre-funding differences are not statistically distinguishable from zero in the period before funding, consistent with the parallel-trends assumption.

Table A1. Total factor productivity, heterogeneity by firm age (age one year before funding)

	0-5 years	6-9 years	10-13 years	14-17 years	18-21 years	22-27 years	28-34 years	35-46 years	47-67 years	68+ years
Post × treated	-0.0602	0.0494	0.0119	0.0173	0.0351	0.0503	-0.0213	0.0898*	0.0223	0.00390
	(-1.30)	(1.18)	(0.22)	(0.41)	(0.83)	(1.19)	(-0.63)	(2.06)	(0.79)	(0.12)
Year 0 × treated	-0.0874	0.0257	0.0350	0.0494	-0.0339	-0.0117	-0.0597	0.0254	-0.0104	-0.0225
	(-1.47)	(0.63)	(0.60)	(1.20)	(-0.80)	(-0.28)	(-1.37)	(1.08)	(-0.38)	(-0.81)
Year 1 × treated	0.0349	0.0488	-0.00607	-0.00517	-0.00798	0.0378	-0.0683*	0.0783	-0.0130	-0.0133
	(0.57)	(0.85)	(-0.10)	(-0.08)	(-0.18)	(0.83)	(-1.75)	(1.36)	(-0.48)	(-0.36)
Year 2 × treated	0.0106	0.0787	0.0341	0.00980	0.0583	0.0654	0.0277	0.0658	-0.0125	-0.00117
	(0.17)	(1.03)	(0.34)	(0.16)	(1.03)	(1.09)	(0.55)	(1.02)	(-0.34)	(-0.02)
Year 3 × treated	-0.0946	0.110	-0.00225	0.0392	0.0618	0.0146	-0.0626	0.0541	-0.00880	0.0544
	(-1.33)	(1.47)	(-0.03)	(0.64)	(0.67)	(0.30)	(-1.07)	(1.00)	(-0.15)	(1.63)
Year 4 × treated	-0.0589	-0.0516	0.00642	0.0122	0.100*	0.0479	-0.0845	0.0877	-0.00600	0.0654
	(-0.66)	(-0.75)	(0.07)	(0.19)	(1.74)	(0.94)	(-1.57)	(1.42)	(-0.10)	(1.04)
Year 5 × treated	-0.192**	-0.0406	-0.00197	0.0119	0.0397	0.0757	0.0338	0.133*	0.0534	0.00921
	(-2.19)	(-0.45)	(-0.02)	(0.16)	(0.49)	(0.87)	(0.59)	(2.02)	(1.31)	(0.16)
Year 6 × treated	-0.131	0.0680	0.0181	-0.0362	0.0758	0.116	0.0310	0.0909	0.0788*	-0.0198
	(-1.70)	(0.96)	(0.27)	(-0.59)	(1.31)	(1.12)	(0.50)	(1.36)	(1.90)	(-0.26)
Year 7 × treated	0.0598	0.00800	0.0262	0.0505	0.0645	0.0968	0.0457	0.189**	0.0403	0.0621
	(0.61)	(0.11)	(0.18)	(0.68)	(0.77)	(0.98)	(0.79)	(2.29)	(0.80)	(0.75)
Year 8 × treated	-0.205	0.160	-0.0224	0.0466	0.0499	0.0828	0.0417	0.152*	0.0572	0.0497
	(-1.66)	(1.46)	(-0.21)	(0.53)	(0.58)	(0.92)	(0.57)	(1.98)	(0.70)	(0.63)
Year 9 × treated	-0.0179	0.0899	-0.00245	0.0483	-0.107	0.0428	0.0228	0.136*	0.0950	-0.0814
	(-0.13)	(0.92)	(-0.02)	(0.42)	(-0.95)	(0.59)	(0.26)	(1.73)	(1.16)	(-1.13)
Year 10 × treated	-0.0288	0.160	-0.0256	-0.0321	0.0753	0.228*	0.0327	0.178	0.159	-0.0352
	(-0.24)	(1.45)	(-0.21)	(-0.18)	(0.64)	(1.94)	(0.45)	(1.64)	(1.55)	(-0.50)

	0-5 years	6-9 years	10-13 years	14-17 years	18-21 years	22-27 years	28-34 years	35-46 years	47-67 years	68+ years
Year 11 × treated	-0.162	-0.0167	-0.0588	0.00482	0.199**	0.131	0.0254	0.245*	0.0790	-0.0159
	(-1.27)	(-0.12)	(-0.53)	(0.04)	(2.36)	(1.06)	(0.31)	(1.93)	(0.97)	(-0.14)
Year 12 × treated	-0.135	0.178	0.127	-0.149	0.116	0.0354	0.0323	0.152	0.178	-0.120
	(-1.12)	(1.04)	(1.27)	(-1.17)	(0.73)	(0.34)	(0.29)	(0.85)	(1.61)	(-1.59)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-company FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time
Observations	5,595	6,466	6,299	6,825	5,827	6,527	6,143	6,598	6,914	7,007

Notes: The dependent variable is firm-level total factor productivity. Each table reports stacked difference-in-differences estimates on the relevant sub-sample. The first two rows report the static specification (Post × treated and its t-statistic), corresponding to model 4 in Table 2; the remaining rows report the dynamic specification, corresponding to model 8, with separate interactions for each relative year (Year 0 to Year 12). All models include firm-level controls and cohort-company and cohort-time fixed effects; standard errors are clustered by company and by time. t-statistics in parentheses; * p<0.10, ** p<0.05, *** p<0.01.

Table A2. Total factor productivity, heterogeneity by firm size (real total assets one year before funding)

	Up to £2m	£2m – £4m	£4m – £6m	£6m – £8m	£8m – £12m	£12m – £20m	£20m – £32m	£32m – £70m	£70m – £250m	Over £250m
Post × treated	0.144*	-0.00440	0.0434	-0.0305	0.0616**	0.0309	-0.0121	-0.00208	0.0904**	-0.172**
	(1.83)	(.)	(1.27)	(-0.94)	(2.21)	(0.98)	(-0.30)	(-0.07)	(2.50)	(-2.48)
Year 0 × treated	0.0593	-0.0438	0.0376	-0.0181	0.0111	-0.0529	0.0211	0.0118	0.0477	-0.0563
	(0.60)	(.)	(0.86)	(-0.52)	(0.40)	(-1.65)	(0.66)	(0.29)	(1.44)	(-0.78)
Year 1 × treated	0.113	-0.0683	0.0224	-0.0691	0.0944**	0.0403	-0.0451	0.0365	-0.00135	-0.143
	(1.34)	(.)	(0.70)	(-1.39)	(2.65)	(0.90)	(-0.81)	(0.99)	(-0.03)	(-1.35)
Year 2 × treated	0.109	0.0236	0.154**	-0.0262	0.0926**	0.0460	-0.0851	-0.0217	0.0665	-0.239**
	(0.90)	(.)	(2.61)	(-0.44)	(2.18)	(0.75)	(-1.43)	(-0.57)	(1.06)	(-2.17)
Year 3 × treated	0.193**	-0.0892	0.0164	-0.0719	0.0776*	0.00216	0.0512	0.0162	0.0445	-0.184*
	(2.10)	(.)	(0.36)	(-1.69)	(1.87)	(0.04)	(0.95)	(0.30)	(0.92)	(-1.73)
Year 4 × treated	0.272**	-0.0136	0.0118	-0.0510	0.00621	0.0659	0.0340	-0.0376	0.124*	-0.300**
	(2.19)	(.)	(0.22)	(-1.15)	(0.14)	(1.64)	(0.50)	(-0.82)	(1.81)	(-2.30)
Year 5 × treated	0.0533	-0.0476	-0.0373	-0.0346	0.0455	0.0570	-0.0384	0.0705	0.167***	-0.112
	(0.32)	(.)	(-0.58)	(-0.61)	(1.09)	(1.07)	(-0.73)	(0.93)	(2.91)	(-1.15)
Year 6 × treated	0.182	0.0378	0.0240	0.00299	0.0764	0.116*	-0.0609	-0.0234	0.185*	-0.0776
	(1.33)	(.)	(0.50)	(0.05)	(1.55)	(2.00)	(-1.12)	(-0.33)	(2.06)	(-0.77)
Year 7 × treated	0.0306	0.0797	0.0473	0.0151	0.0733	0.116	0.0856	0.0273	0.222**	-0.222
	(0.09)	(.)	(0.65)	(0.15)	(1.62)	(1.55)	(1.12)	(0.34)	(2.41)	(-1.53)
Year 8 × treated	0.356*	0.126	0.121*	0.0160	0.0747	0.0606	-0.0828	-0.0281	0.183**	-0.274
	(1.80)	(.)	(1.80)	(0.16)	(1.27)	(0.83)	(-1.05)	(-0.43)	(2.23)	(-1.55)
Year 9 × treated	0.434	0.0849	-0.0164	-0.0211	-0.0392	-0.0309	-0.0636	-0.0347	0.126*	-0.183
	(1.60)	(.)	(-0.20)	(-0.34)	(-0.39)	(-0.56)	(-0.71)	(-0.31)	(1.94)	(-1.69)
Year 10 × treated	0.534**	0.126	0.0533	0.00435	0.181**	0.0314	0.0279	-0.0213	0.170	-0.320

	Up to £2m	£2m – £4m	£4m – £6m	£6m – £8m	£8m – £12m	£12m – £20m	£20m – £32m	£32m – £70m	£70m – £250m	Over £250m
	(2.14)	(.)	(0.48)	(0.05)	(2.19)	(0.46)	(0.34)	(-0.27)	(1.29)	(-1.45)
Year 11 × treated	0.196	0.101	0.0164	0.0206	0.148**	-0.0355	-0.0108	-0.0702	0.0429	-0.224*
	(0.38)	(.)	(0.13)	(0.21)	(2.30)	(-0.41)	(-0.13)	(-1.08)	(0.27)	(-1.75)
Year 12 × treated	0.806**	0.260	0.147	-0.00715	0.117	0.103	0.0532	-0.299*	0.0517	-0.467***
	(2.18)	(.)	(1.08)	(-0.08)	(1.51)	(1.06)	(0.41)	(-1.79)	(0.54)	(-3.84)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-company FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time
Observations	3,580	5,450	6,942	5,711	7,545	7,636	6008	6,920	7,120	7,288

Notes: The dependent variable is firm-level total factor productivity. Each table reports stacked difference-in-differences estimates on the relevant sub-sample. The first two rows report the static specification (Post × treated and its t-statistic), corresponding to model 4 in Table 2; the remaining rows report the dynamic specification, corresponding to model 8, with separate interactions for each relative year (Year 0 to Year 12). All models include firm-level controls and cohort-company and cohort-time fixed effects; standard errors are clustered by company and by time. t-statistics in parentheses; * p<0.10, ** p<0.05, *** p<0.01.

Table A3. Total factor productivity, heterogeneity by industry section

	A	C	E	F	G	H	J	M	N	S
Post × treated	0.147	0.0319*	-0.102	-0.0123	0.0377	0.0169	-0.0510	0.0413	0.0709	0.187*
	(0.82)	(1.98)	(-1.11)	(-0.19)	(0.74)	(0.13)	(-1.04)	(1.16)	(0.88)	(1.86)
Year 0 × treated	-0.0448	0.000428	0.00448	-0.0615	0.106	0.0749	-0.133**	-0.0291	0.101	-0.106
	(-0.25)	(0.02)	(0.05)	(-0.87)	(1.42)	(0.49)	(-2.80)	(-0.69)	(1.39)	(-0.74)
Year 1 × treated	0.155	0.0136	-0.0285	-0.0999	0.0570	0.0443	-0.0686	-0.00453	0.100	0.0688
	(1.14)	(0.74)	(-0.23)	(-0.98)	(0.87)	(0.28)	(-0.90)	(-0.09)	(0.87)	(0.43)
Year 2 × treated	0.0855	0.0301	-0.137	0.189	0.0366	0.0967	-0.147*	0.0475	0.0840	0.282**
	(0.34)	(1.67)	(-1.28)	(1.53)	(0.57)	(0.50)	(-1.75)	(0.93)	(0.68)	(2.36)
Year 3 × treated	0.460**	0.0328	-0.261*	-0.0682	-0.0154	-0.0261	-0.174**	0.0575	0.0135	0.385**
	(2.74)	(1.31)	(-1.83)	(-0.55)	(-0.21)	(-0.12)	(-2.24)	(1.20)	(0.08)	(2.27)
Year 4 × treated	0.255	0.0400*	-0.121	-0.116	0.0433	-0.127	-0.101	0.0131	-0.104	0.133
	(1.06)	(1.82)	(-0.94)	(-1.05)	(0.43)	(-0.94)	(-1.42)	(0.21)	(-0.80)	(0.69)
Year 5 × treated	-0.395	0.0492*	-0.0286	-0.0762	0.00926	-0.150	-0.170	0.101	0.0614	0.600**
	(-0.67)	(1.82)	(-0.19)	(-0.66)	(0.13)	(-1.05)	(-1.56)	(1.55)	(0.43)	(2.38)
Year 6 × treated	0.330	0.0238	0.00969	0.0561	0.0514	-0.0663	-0.0313	0.117*	0.150	0.583**
	(0.62)	(1.00)	(0.07)	(0.45)	(0.65)	(-0.36)	(-0.37)	(1.90)	(1.00)	(2.41)
Year 7 × treated	0.731**	0.0501*	-0.0360	0.00945	0.0191	0.0615	0.180	0.106	0.0572	0.304
	(2.57)	(1.98)	(-0.21)	(0.07)	(0.26)	(0.36)	(1.54)	(1.28)	(0.40)	(1.04)
Year 8 × treated	0.497	0.0597*	-0.245	0.131	0.0983	-0.0860	0.187	0.130	0.262*	0.331
	(0.86)	(1.92)	(-1.52)	(1.14)	(0.76)	(-0.63)	(1.47)	(1.72)	(1.80)	(1.41)
Year 9 × treated	0.262	0.0439	-0.320	0.124	-0.0633	0.190	0.126	0.122	-0.140	0.384**
	(0.30)	(1.12)	(-1.27)	(0.58)	(-0.52)	(1.07)	(1.23)	(1.39)	(-0.57)	(2.44)
Year 10 × treated	-0.377	0.0879*	-0.337	-0.00227	0.0318	-0.00117	0.355***	0.0679	0.242	0.422*
	(-0.58)	(2.03)	(-1.68)	(-0.03)	(0.16)	(-0.01)	(3.15)	(0.44)	(1.25)	(2.02)
Year 11 × treated	0.253	0.0605	-0.375*	-0.0879	-0.262*	-0.0398	0.412***	0.123	0.131	0.160
	(0.72)	(1.60)	(-1.74)	(-0.48)	(-1.93)	(-0.36)	(3.44)	(1.38)	(0.76)	(0.69)
Year 12 × treated	0.197	0.0543	-0.448	0.0658	-0.272	-0.159	0.142	0.111	0.0981	-0.154
	(0.42)	(1.21)	(-1.65)	(0.42)	(-1.40)	(-1.61)	(1.07)	(1.21)	(0.36)	(-0.79)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

	A	C	E	F	G	H	J	M	N	S
Cohort-company FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time
Observations	1,038	36,768	1,307	2,443	4,458	1,,299	6,919	13,247	3,235	1,350

Notes: The dependent variable is firm-level total factor productivity. Each table reports stacked difference-in-differences estimates on the relevant sub-sample. The first two rows report the static specification (Post × treated and its t-statistic), corresponding to model 4 in Table 2; the remaining rows report the dynamic specification, corresponding to model 8, with separate interactions for each relative year (Year 0 to Year 12). All models include firm-level controls and cohort-company and cohort-time fixed effects; standard errors are clustered by company and by time. t-statistics in parentheses; * p<0.10, ** p<0.05, *** p<0.01. Sections shown (those with at least 1,000 observations): A agriculture, forestry and fishing; C manufacturing; E water supply, sewerage and waste; F construction; G wholesale and retail trade; H transportation and storage; J information and communication; M professional, scientific and technical; N administrative and support service; S other service activities.

Table A4. Total factor productivity, heterogeneity by region

	East Midlands	East of England	London	North East	North West	Northern Ireland	Scotland	South East	South West	Wales	West Midlands	Yorkshire Humber
Post × treated	0.00676	-0.0161	0.0328	0.0283	0.0378	0.0346	0.0295	-0.00737	0.0146	0.206***	0.0477	0.0401
	(0.16)	(-0.35)	(0.85)	(0.58)	(1.23)	(0.49)	(0.67)	(-0.19)	(0.28)	(3.07)	(1.39)	(1.07)
Year 0 × treated	-0.0564	-0.0197	-0.0175	-0.00543	0.0599*	0.0620	-0.0340	-0.0139	-0.0482	-0.00414	0.0385	0.00126
	(-1.39)	(-0.35)	(-0.48)	(-0.12)	(1.79)	(0.56)	(-0.66)	(-0.39)	(-0.93)	(-0.08)	(0.96)	(0.03)
Year 1 × treated	-0.0503	0.0635	0.00219	-0.0126	0.0191	0.117	-0.0279	0.0398	0.0176	0.0981	0.0279	-0.0731*
	(-1.00)	(1.06)	(0.04)	(-0.17)	(0.61)	(1.28)	(-0.44)	(0.79)	(0.22)	(1.32)	(0.53)	(-1.75)
Year 2 × treated	0.0261	-0.00862	0.0426	-0.0480	0.0100	0.100	0.0162	-0.00634	0.0100	0.312***	0.0369	0.0506
	(0.40)	(-0.12)	(0.64)	(-0.58)	(0.16)	(1.20)	(0.29)	(-0.10)	(0.16)	(3.27)	(0.57)	(0.93)
Year 3 × treated	-0.0110	-0.0411	0.00790	0.0157	-0.0205	0.0272	-0.0191	-0.0681	0.0484	0.331**	0.103	0.0877
	(-0.12)	(-0.58)	(0.15)	(0.21)	(-0.47)	(0.21)	(-0.31)	(-1.10)	(0.70)	(2.66)	(1.60)	(1.19)
Year 4 × treated	-0.0219	-0.00893	-0.0285	0.00423	0.0287	-0.0732	0.0114	0.0265	-0.0676	0.182	0.0431	0.0470
	(-0.26)	(-0.14)	(-0.45)	(0.06)	(0.51)	(-0.65)	(0.15)	(0.48)	(-0.99)	(1.19)	(0.86)	(0.74)
Year 5 × treated	0.0185	-0.0756	0.0592	0.0859	0.0588	-0.0144	0.0235	-0.00688	-0.0512	0.225**	0.0939	0.0956
	(0.30)	(-1.03)	(1.05)	(0.81)	(1.07)	(-0.13)	(0.34)	(-0.08)	(-0.79)	(2.18)	(1.54)	(1.27)
Year 6 × treated	0.0594	-0.0995	0.0794	0.0455	0.0911	0.0481	0.106	-0.0416	-0.0150	0.277***	0.0641	0.0954
	(0.73)	(-1.59)	(1.16)	(0.44)	(1.49)	(0.56)	(1.38)	(-0.76)	(-0.16)	(3.26)	(1.01)	(1.11)
Year 7 × treated	0.0712	-0.0514	0.174**	0.182	0.0892	0.0108	0.187**	0.0277	-0.00715	0.364**	0.0212	0.102
	(0.76)	(-0.77)	(2.45)	(1.09)	(1.29)	(0.10)	(2.19)	(0.36)	(-0.06)	(2.38)	(0.38)	(1.33)
Year 8 × treated	0.109	0.0218	0.138	0.139	0.0417	-0.00492	0.164*	-0.0715	0.183	0.348***	0.0202	0.184**
	(1.14)	(0.27)	(1.37)	(1.47)	(0.56)	(-0.04)	(1.87)	(-0.99)	(1.42)	(3.07)	(0.32)	(2.37)
Year 9 × treated	0.00432	0.0246	0.0158	0.224	0.131**	0.00243	0.0432	-0.0630	0.215*	0.334***	0.00512	0.146*
	(0.04)	(0.27)	(0.23)	(1.13)	(2.08)	(0.02)	(0.41)	(-0.82)	(1.91)	(3.33)	(0.06)	(1.92)
Year 10 × treated	0.133	-0.0451	0.0728	0.114	0.0921	-0.0350	0.124	0.0174	0.280*	0.427***	0.0845	-0.00982
	(1.06)	(-0.42)	(0.61)	(0.68)	(1.05)	(-0.20)	(1.18)	(0.23)	(1.84)	(3.60)	(0.92)	(-0.12)

	East Midlands	East of England	London	North East	North West	Northern Ireland	Scotland	South East	South West	Wales	West Midlands	Yorkshire Humber
Year 11 × treated	0.111	0.0125	0.103	-0.0344	-0.0669	-0.0808	0.153	0.119	0.0287	0.286**	-0.0177	-0.108
	(1.01)	(0.13)	(1.30)	(-0.26)	(-0.70)	(-0.46)	(1.50)	(1.09)	(0.36)	(2.35)	(-0.19)	(-0.96)
Year 12 × treated	0.154	-0.0873	0.170*	0.0500	-0.0364	-0.291	0.104	-0.0609	-0.0630	0.228	0.110	0.102
	(1.24)	(-1.07)	(1.79)	(0.24)	(-0.36)	(-1.66)	(0.88)	(-0.72)	(-0.49)	(1.23)	(0.94)	(0.76)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-company FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time
Observations	5,858	7,263	12,338	2,627	7,507	2,127	4,753	121,90	5,279	2,527	7,010	5,976

Notes: The dependent variable is firm-level total factor productivity. Each table reports stacked difference-in-differences estimates on the relevant sub-sample. The first two rows report the static specification (Post × treated and its t-statistic), corresponding to model 4 in Table 2; the remaining rows report the dynamic specification, corresponding to model 8, with separate interactions for each relative year (Year 0 to Year 12). All models include firm-level controls and cohort-company and cohort-time fixed effects; standard errors are clustered by company and by time. t-statistics in parentheses; * p<0.10, ** p<0.05, *** p<0.01.

Table A5. Total factor productivity, heterogeneity by technology and knowledge intensity

	High technology	Medium-high technology	Medium low technology	Low technology	Knowledge-intensive services	Less knowledge intensive services	Other or unknown
Post × treated	-0.0195	0.0795**	0.00328	0.0574**	0.0103	0.0853*	-0.0613
	(-0.35)	(2.39)	(0.13)	(2.21)	(0.38)	(1.93)	(-1.11)
Year 0 × treated	-0.0201	0.0129	-0.00251	0.00259	-0.0413	0.0923	-0.0698
	(-0.27)	(0.35)	(-0.08)	(0.12)	(-1.38)	(1.61)	(-1.44)
Year 1 × treated	-0.0591	0.121***	-0.0410	0.0245	-0.0168	0.0632	-0.0141
	(-0.64)	(3.11)	(-1.07)	(0.92)	(-0.49)	(1.24)	(-0.20)
Year 2 × treated	-0.0148	0.0981*	0.0135	0.0243	-0.0184	0.112*	0.0332
	(-0.21)	(1.98)	(0.37)	(0.66)	(-0.47)	(1.90)	(0.45)
Year 3 × treated	-0.00725	0.0704	0.00261	0.0529	-0.0299	0.0803	-0.162**
	(-0.09)	(1.45)	(0.06)	(1.51)	(-0.73)	(1.46)	(-2.13)
Year 4 × treated	-0.0460	0.0949	0.0242	0.0875**	-0.0356	0.0480	-0.134
	(-0.57)	(1.56)	(0.64)	(2.76)	(-0.80)	(0.71)	(-1.47)
Year 5 × treated	-0.0752	0.0637	0.0164	0.0997*	-0.00225	0.104*	-0.0684
	(-0.96)	(1.15)	(0.47)	(1.86)	(-0.04)	(1.72)	(-0.62)
Year 6 × treated	-0.00936	0.0215	-0.0228	0.0892**	0.0686	0.115*	0.0339
	(-0.09)	(0.41)	(-0.48)	(2.10)	(1.54)	(1.79)	(0.38)
Year 7 × treated	0.0170	0.108*	0.0358	0.0714*	0.128**	0.123*	-0.00754
	(0.17)	(1.90)	(0.68)	(1.81)	(2.22)	(1.75)	(-0.06)
Year 8 × treated	-0.0992	0.122**	0.0565	0.0996**	0.140**	0.161	-0.105
	(-0.72)	(2.13)	(1.17)	(2.39)	(2.20)	(1.60)	(-1.04)
Year 9 × treated	0.00643	0.00898	-0.0220	0.169***	0.117*	0.0599	-0.0360
	(0.04)	(0.14)	(-0.43)	(3.18)	(1.91)	(0.63)	(-0.32)
Year 10 × treated	0.161	0.130	0.0577	0.119*	0.154	0.132	-0.172

	High technology	Medium-high technology	Medium low technology	Low technology	Knowledge-intensive services	Less knowledge intensive services	Other or unknown
	(0.70)	(1.70)	(0.78)	(1.74)	(1.59)	(1.06)	(-1.69)
Year 11 × treated	0.143	0.160*	-0.0178	0.0512	0.194**	-0.0655	-0.275**
	(0.77)	(1.86)	(-0.19)	(0.79)	(2.71)	(-0.83)	(-2.32)
Year 12 × treated	-0.00608	0.228**	0.00125	0.0310	0.111	-0.160	-0.125
	(-0.02)	(2.46)	(0.01)	(0.59)	(1.27)	(-1.26)	(-0.70)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-company FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time
Observations	3,507	7,493	12,798	12,969	22,276	10,289	6,435

Notes: The dependent variable is firm-level total factor productivity. Each table reports stacked difference-in-differences estimates on the relevant sub-sample. The first two rows report the static specification (Post × treated and its t-statistic), corresponding to model 4 in Table 2; the remaining rows report the dynamic specification, corresponding to model 8, with separate interactions for each relative year (Year 0 to Year 12). All models include firm-level controls and cohort-company and cohort-time fixed effects; standard errors are clustered by company and by time. t-statistics in parentheses; * p<0.10, ** p<0.05, *** p<0.01.

Table A6. Labour productivity, heterogeneity by firm age (age one year before funding)

	0-5 years	6-9 years	10-13 years	14-17 years	18-21 years	22-27 years	28-34 years	35-46 years	47-67 years	68+ years
Post × treated	-0.0789	0.0118	-0.0332	-0.00446	-0.0164	0.0400	-0.0568	0.0791*	0.0166	0.0144
	(-1.59)	(0.28)	(-0.51)	(-0.10)	(-0.35)	(0.85)	(-1.58)	(1.80)	(0.55)	(0.35)
Year 0 × treated	-0.119*	0.00783	0.0305	0.0428	-0.0757*	-0.0274	-0.0827*	-0.0125	-0.0191	-0.0363
	(-1.91)	(0.22)	(0.42)	(0.95)	(-1.75)	(-0.65)	(-1.94)	(-0.52)	(-0.62)	(-1.02)
Year 1 × treated	0.0156	0.00363	-0.0457	-0.0173	-0.0764	0.0152	-0.103**	0.0559	-0.0250	-0.0519
	(0.22)	(0.07)	(-0.58)	(-0.24)	(-1.52)	(0.30)	(-2.39)	(0.96)	(-0.83)	(-1.08)
Year 2 × treated	-0.0157	0.0172	0.00890	-0.0220	-0.0136	0.0414	-0.0164	0.0450	-0.0296	-0.0439
	(-0.22)	(0.25)	(0.08)	(-0.37)	(-0.24)	(0.59)	(-0.32)	(0.70)	(-0.85)	(-0.64)
Year 3 × treated	-0.125*	0.0487	-0.0583	0.0170	-0.0240	0.0136	-0.101*	0.0434	-0.00760	0.0533
	(-1.91)	(0.66)	(-0.69)	(0.27)	(-0.22)	(0.25)	(-1.73)	(0.83)	(-0.12)	(1.32)
Year 4 × treated	-0.0870	-0.106	-0.0631	-0.0229	0.0426	0.0515	-0.143*	0.0784	-0.00902	0.112
	(-0.94)	(-1.45)	(-0.55)	(-0.37)	(0.63)	(0.91)	(-2.05)	(1.04)	(-0.13)	(1.40)
Year 5 × treated	-0.217**	-0.0799	-0.0506	-0.0252	-0.0123	0.0850	0.00724	0.121*	0.0633	0.0463
	(-2.20)	(-0.97)	(-0.47)	(-0.30)	(-0.13)	(0.85)	(0.12)	(1.90)	(1.37)	(0.70)
Year 6 × treated	-0.159*	0.00905	-0.0569	-0.0676	0.0397	0.116	0.0334	0.0894	0.0890*	0.0308
	(-1.96)	(0.13)	(-0.74)	(-1.06)	(0.66)	(1.18)	(0.47)	(1.31)	(1.96)	(0.34)
Year 7 × treated	0.0645	-0.0769	-0.0789	0.0437	0.0142	0.0875	0.0327	0.208**	0.0497	0.131
	(0.57)	(-1.03)	(-0.47)	(0.53)	(0.16)	(0.89)	(0.57)	(2.22)	(0.96)	(1.22)
Year 8 × treated	-0.242*	0.130	-0.0745	0.0316	0.00442	0.0649	-0.0128	0.177**	0.0411	0.110
	(-1.97)	(1.30)	(-0.62)	(0.35)	(0.04)	(0.71)	(-0.15)	(2.40)	(0.36)	(1.14)
Year 9 × treated	-0.00624	0.0644	-0.0678	0.0262	-0.171	0.0175	-0.0360	0.177**	0.112	-0.0536
	(-0.05)	(0.71)	(-0.58)	(0.21)	(-1.41)	(0.21)	(-0.40)	(2.46)	(1.49)	(-0.54)
Year 10 × treated	0.0263	0.186	-0.0736	-0.133	0.0995	0.223**	-0.0150	0.183	0.125	0.00908
	(0.22)	(1.51)	(-0.59)	(-0.54)	(0.69)	(2.09)	(-0.17)	(1.70)	(1.47)	(0.10)

	0-5 years	6-9 years	10-13 years	14-17 years	18-21 years	22-27 years	28-34 years	35-46 years	47-67 years	68+ years
Year 11 × treated	-0.0716	0.0513	-0.214*	-0.0191	0.209*	0.173	-0.0550	0.285**	0.0437	0.0332
	(-0.52)	(0.41)	(-1.89)	(-0.15)	(1.84)	(1.23)	(-0.89)	(2.25)	(0.64)	(0.21)
Year 12 × treated	-0.110	0.315**	0.0750	-0.125	0.150	0.0380	-0.0128	0.177	0.146	-0.0412
	(-0.81)	(2.28)	(0.63)	(-1.00)	(0.80)	(0.29)	(-0.12)	(0.91)	(1.36)	(-0.47)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-company FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time
Observations	5,595	6,466	6,299	6,825	5,827	6,527	6,143	6,598	6,914	7,007

Notes: The dependent variable is firm-level labour productivity (log real value added per employee). Each table reports stacked difference-in-differences estimates on the relevant sub-sample. The first two rows report the static specification (Post × treated and its t-statistic), corresponding to model 4 in Table 2; the remaining rows report the dynamic specification, corresponding to model 8, with separate interactions for each relative year (Year 0 to Year 12). All models include firm-level controls and cohort-company and cohort-time fixed effects; standard errors are clustered by company and by time. t-statistics in parentheses; * p<0.10, ** p<0.05, *** p<0.01.

Table A7. Labour productivity, heterogeneity by firm size (real total assets one year before funding)

	Up to £2m	£2m – £4m	£4m – £6m	£6m – £8m	£8m – £12m	£12m – £20m	£20m – £32m	£32m – £70m	£70m – £250m	Over £250m
Post × treated	0.137	-0.0736	0.0305	-0.0842**	0.0218	-0.00946	-0.0283	-0.0506	-0.0168	-0.241**
	(1.67)	(-1.38)	(0.90)	(-2.72)	(0.83)	(-0.34)	(-0.68)	(-1.49)	(-0.46)	(-2.65)
Year 0 × treated	0.0603	-0.0918	0.0419	-0.0437	-0.00950	-0.0853***	0.0214	-0.0322	-0.00403	-0.0909
	(0.57)	(-1.47)	(1.01)	(-1.38)	(-0.34)	(-2.91)	(0.64)	(-0.80)	(-0.12)	(-1.15)
Year 1 × treated	0.107	-0.133**	0.0143	-0.0944*	0.0671	-0.0143	-0.0426	-0.00886	-0.0754	-0.255*
	(1.30)	(-2.22)	(0.44)	(-1.99)	(1.71)	(-0.34)	(-0.77)	(-0.21)	(-1.32)	(-1.83)
Year 2 × treated	0.117	-0.0334	0.136**	-0.0696	0.0331	-0.0104	-0.0986	-0.0928*	0.0134	-0.424**
	(0.89)	(-0.51)	(2.32)	(-1.25)	(0.75)	(-0.18)	(-1.63)	(-1.87)	(0.21)	(-2.77)
Year 3 × treated	0.139	-0.136	-0.00518	-0.0962**	0.0233	-0.0579	0.0358	-0.0243	-0.0541	-0.250*
	(1.41)	(-1.17)	(-0.11)	(-2.30)	(0.59)	(-1.15)	(0.58)	(-0.45)	(-0.94)	(-1.99)
Year 4 × treated	0.245*	-0.0703	-0.0178	-0.106**	-0.0678	0.0309	0.0107	-0.0693	0.0168	-0.414**
	(1.87)	(-0.74)	(-0.34)	(-2.35)	(-1.60)	(0.69)	(0.14)	(-1.35)	(0.23)	(-2.17)
Year 5 × treated	0.0226	-0.116	-0.0598	-0.104*	-0.00274	0.0249	-0.0445	0.0326	0.0440	-0.133
	(0.13)	(-1.31)	(-0.86)	(-1.80)	(-0.06)	(0.56)	(-0.88)	(0.40)	(0.73)	(-1.10)
Year 6 × treated	0.206	-0.0710	0.00947	-0.0661	0.0402	0.0731	-0.0867	-0.100	0.0521	-0.0537
	(1.59)	(-0.79)	(0.19)	(-1.08)	(0.80)	(1.28)	(-1.48)	(-1.31)	(0.56)	(-0.42)
Year 7 × treated	0.0381	-0.0289	0.0231	-0.0773	0.0549	0.0802	0.0561	-0.0314	0.0664	-0.251
	(0.11)	(-0.40)	(0.33)	(-0.82)	(1.18)	(1.07)	(0.70)	(-0.36)	(0.68)	(-1.14)
Year 8 × treated	0.390**	0.0181	0.103	-0.0943	0.0525	0.0154	-0.108	-0.0655	0.00872	-0.371
	(2.10)	(0.13)	(1.54)	(-0.98)	(0.82)	(0.22)	(-1.05)	(-0.90)	(0.09)	(-1.65)
Year 9 × treated	0.453*	0.00157	-0.0104	-0.127*	-0.102	-0.0588	-0.0892	-0.119	-0.0593	-0.186
	(1.78)	(0.01)	(-0.15)	(-2.01)	(-1.07)	(-0.96)	(-1.02)	(-1.17)	(-0.76)	(-1.20)
Year 10 × treated	0.510**	0.0344	0.0747	-0.122	0.135*	0.0278	-0.0453	-0.0533	-0.0553	-0.333

	Up to £2m	£2m – £4m	£4m – £6m	£6m – £8m	£8m – £12m	£12m – £20m	£20m – £32m	£32m – £70m	£70m – £250m	Over £250m
	(2.14)	(0.36)	(0.77)	(-1.47)	(2.03)	(0.43)	(-0.51)	(-0.80)	(-0.47)	(-1.03)
Year 11 × treated	0.112	-0.0481	-0.0263	-0.128	0.113*	-0.0140	-0.105	-0.101	-0.247	-0.154
	(0.23)	(-0.44)	(-0.25)	(-1.68)	(1.92)	(-0.17)	(-1.15)	(-1.46)	(-1.16)	(-0.97)
Year 12 × treated	0.733**	0.113	0.117	-0.156*	0.146*	0.131	-0.0112	-0.310*	-0.146	-0.314**
	(2.13)	(0.90)	(0.96)	(-1.80)	(1.93)	(1.33)	(-0.09)	(-1.83)	(-1.55)	(-2.10)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-company FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time
Observations	3,614	5,482	6,974	5,744	7,600	7,655	6,038	6,935	7,147	7,342

Notes: The dependent variable is firm-level labour productivity (log real value added per employee). Each table reports stacked difference-in-differences estimates on the relevant sub-sample. The first two rows report the static specification (Post × treated and its t-statistic), corresponding to model 4 in Table 2; the remaining rows report the dynamic specification, corresponding to model 8, with separate interactions for each relative year (Year 0 to Year 12). All models include firm-level controls and cohort-company and cohort-time fixed effects; standard errors are clustered by company and by time. t-statistics in parentheses; * p<0.10, ** p<0.05, *** p<0.01.

Table A8. Labour productivity, heterogeneity by industry section

	A	C	E	F	G	H	J	M	N	S
Post × treated	0.0789	0.0151	-0.161	-0.0663	0.0372	0.00488	-0.0487	-0.00206	0.0696	0.187**
	(0.45)	(0.87)	(-1.28)	(-0.96)	(0.63)	(0.04)	(-0.93)	(-0.05)	(.)	(2.14)
Year 0 × treated	-0.0411	-0.0193	-0.0257	-0.122	0.0987	0.0172	-0.123**	-0.0450	0.100	-0.144
	(-0.24)	(-1.07)	(-0.26)	(-1.59)	(1.15)	(0.11)	(-2.33)	(-0.91)	(0.72)	(-1.14)
Year 1 × treated	0.0958	-0.00887	-0.0697	-0.175*	0.0577	0.00772	-0.0628	-0.0561	0.0916	0.0358
	(0.64)	(-0.48)	(-0.48)	(-1.72)	(0.80)	(0.05)	(-0.80)	(-1.07)	(0.73)	(0.22)
Year 2 × treated	-0.161	0.00641	-0.243*	0.110	-0.00240	0.0705	-0.155*	-0.0161	0.0615	0.251**
	(-0.53)	(0.30)	(-1.78)	(0.84)	(-0.03)	(0.37)	(-1.81)	(-0.30)	(0.45)	(2.29)
Year 3 × treated	0.213	0.0104	-0.397	-0.124	-0.0116	-0.0603	-0.141*	0.0193	-0.0366	0.410**
	(1.06)	(0.39)	(-1.69)	(-0.94)	(-0.14)	(-0.29)	(-1.72)	(0.34)	(-0.15)	(2.45)
Year 4 × treated	0.206	0.0158	-0.163	-0.152	0.0533	-0.134	-0.102	-0.0179	-0.118	0.115
	(0.74)	(0.67)	(-0.84)	(-1.43)	(0.51)	(-1.08)	(-1.39)	(-0.25)	(-0.89)	(0.60)
Year 5 × treated	-0.250	0.0346	-0.0644	-0.0921	-0.00389	-0.146	-0.167	0.0774	0.105	0.604**
	(-0.58)	(1.24)	(-0.33)	(-0.78)	(-0.04)	(-1.08)	(-1.51)	(1.18)	(0.72)	(2.63)
Year 6 × treated	0.272	0.0115	-0.0501	0.000308	0.0468	-0.0482	-0.0244	0.0536	0.214	0.704***
	(0.80)	(0.45)	(-0.27)	(0.00)	(0.53)	(-0.33)	(-0.25)	(0.84)	(0.85)	(2.89)
Year 7 × treated	0.965**	0.0379	-0.0301	-0.0197	0.0611	0.134	0.173	0.0374	0.0965	0.297
	(2.64)	(1.27)	(-0.14)	(-0.14)	(0.70)	(0.97)	(1.53)	(0.43)	(0.62)	(0.92)
Year 8 × treated	0.429	0.0448	-0.251	0.121	0.116	-0.0204	0.142	0.0589	0.285	0.388*
	(0.93)	(1.43)	(-1.22)	(0.84)	(0.95)	(-0.18)	(1.11)	(0.65)	(1.66)	(1.85)
Year 9 × treated	0.0982	0.0487	-0.409	0.0919	-0.0258	0.241	0.0956	0.0678	-0.222	0.491***
	(0.14)	(1.28)	(-1.34)	(0.40)	(-0.20)	(1.47)	(0.92)	(0.69)	(-0.73)	(3.53)
Year 10 × treated	-0.604	0.0886**	-0.377	-0.0169	0.0657	0.0422	0.354***	0.0190	0.221	0.551**
	(-0.95)	(2.16)	(-1.54)	(-0.17)	(0.32)	(0.44)	(2.92)	(0.12)	(0.59)	(2.48)

	A	C	E	F	G	H	J	M	N	S
Year 11 × treated	-0.101	0.0554	-0.514**	-0.152	-0.213	0.0784	0.400***	0.0590	0.137	0.210
	(-0.30)	(1.18)	(-2.25)	(-0.91)	(-1.22)	(0.78)	(3.11)	(0.60)	(0.72)	(1.28)
Year 12 × treated	-0.296	0.0723	-0.547	0.0195	-0.218	-0.0508	0.165	0.0722	0.287	0.0302
	(-0.77)	(1.54)	(-1.65)	(0.12)	(-0.95)	(-0.57)	(1.10)	(0.73)	(0.25)	(0.16)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-company FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time
Observations	1,038	36,768	1,307	2,443	4,458	1,299	6,919	13,247	3,235	1,350

Notes: The dependent variable is firm-level labour productivity (log real value added per employee). Each table reports stacked difference-in-differences estimates on the relevant sub-sample. The first two rows report the static specification (Post × treated and its t-statistic), corresponding to model 4 in Table 2; the remaining rows report the dynamic specification, corresponding to model 8, with separate interactions for each relative year (Year 0 to Year 12). All models include firm-level controls and cohort-company and cohort-time fixed effects; standard errors are clustered by company and by time. t-statistics in parentheses; * p<0.10, ** p<0.05, *** p<0.01. Sections shown (those with at least 1,000 observations): A agriculture, forestry and fishing; C manufacturing; E water supply, sewerage and waste; F construction; G wholesale and retail trade; H transportation and storage; J information and communication; M professional, scientific and technical; N administrative and support service; S other service activities.

Table A9. Labour productivity, heterogeneity by region

	East Midlands	East of England	London	North East	North West	Northern Ireland	Scotland	South East	South West	Wales	West Midlands	Yorkshire Humber
Post × treated	0.0224	-0.0100	0.0170	-0.0353	0.0343	-0.0320	0.00957	-0.0451	-0.0181	0.0819	0.0319	-0.0175
	(0.42)	(-0.21)	(0.37)	(-0.67)	(0.94)	(-0.49)	(0.22)	(-1.08)	(-0.35)	(1.28)	(0.85)	(-0.43)
Year 0 × treated	-0.0696	-0.0406	-0.0220	-0.0178	0.0530	-0.000729	-0.0518	-0.0240	-0.0616	-0.0837	0.00446	-0.0281
	(-1.26)	(-0.70)	(-0.51)	(-0.36)	(1.29)	(-0.01)	(-1.05)	(-0.60)	(-1.13)	(-1.32)	(0.10)	(-0.60)
Year 1 × treated	-0.0611	0.0670	-0.0362	-0.0363	0.00190	0.0645	-0.0608	-0.00148	0.00467	0.00335	-0.00457	-0.115**
	(-0.99)	(1.07)	(-0.63)	(-0.46)	(0.06)	(0.71)	(-1.01)	(-0.03)	(0.06)	(0.04)	(-0.09)	(-2.65)
Year 2 × treated	0.0109	-0.0129	-0.00301	-0.0870	0.00296	0.0442	0.00424	-0.0642	-0.0440	0.187*	-0.00828	-0.00468
	(0.19)	(-0.19)	(-0.04)	(-0.96)	(0.05)	(0.54)	(0.07)	(-0.99)	(-0.67)	(1.96)	(-0.12)	(-0.08)
Year 3 × treated	-0.00490	-0.0286	0.0108	-0.0491	-0.00837	-0.0571	-0.0422	-0.128*	0.0198	0.148	0.0747	0.00683
	(-0.05)	(-0.40)	(0.18)	(-0.49)	(-0.17)	(-0.46)	(-0.71)	(-1.81)	(0.26)	(1.27)	(1.17)	(0.09)
Year 4 × treated	0.0165	0.00817	-0.0269	-0.0727	0.00687	-0.163	0.0113	-0.0252	-0.106	0.0583	0.0187	-0.0486
	(0.20)	(0.13)	(-0.34)	(-1.05)	(0.10)	(-1.53)	(0.16)	(-0.41)	(-1.41)	(0.44)	(0.38)	(-0.56)
Year 5 × treated	0.0415	-0.0435	0.0510	0.00571	0.0573	-0.0908	0.0255	-0.0410	-0.0828	0.115	0.0809	0.0405
	(0.66)	(-0.59)	(0.75)	(0.06)	(0.84)	(-0.74)	(0.45)	(-0.44)	(-1.25)	(1.30)	(1.33)	(0.58)
Year 6 × treated	0.0785	-0.0659	0.0902	-0.0669	0.0745	-0.0599	0.112	-0.0887	-0.0669	0.161*	0.0561	0.0183
	(1.04)	(-1.01)	(1.07)	(-0.77)	(0.93)	(-0.67)	(1.47)	(-1.41)	(-0.67)	(1.94)	(0.85)	(0.22)
Year 7 × treated	0.104	-0.0428	0.189**	0.0712	0.0760	-0.0612	0.173*	0.000605	-0.0900	0.224	0.0236	0.0472

	East Midlands	East of England	London	North East	North West	Northern Ireland	Scotland	South East	South West	Wales	West Midlands	Yorkshire Humber
	(1.33)	(-0.64)	(2.28)	(0.43)	(0.90)	(-0.61)	(2.02)	(0.01)	(-0.76)	(1.32)	(0.37)	(0.62)
Year 8 × treated	0.185	0.00384	0.0929	0.0410	0.0678	-0.0770	0.107	-0.119	0.118	0.214*	0.0469	0.120
	(1.63)	(0.05)	(0.80)	(0.46)	(0.85)	(-0.77)	(1.34)	(-1.54)	(0.95)	(1.80)	(0.78)	(1.68)
Year 9 × treated	0.0608	0.0428	-0.0319	0.102	0.185**	-0.0632	0.0307	-0.0990	0.170	0.163	0.0442	0.101
	(0.67)	(0.51)	(-0.41)	(0.57)	(2.16)	(-0.56)	(0.27)	(-1.25)	(1.59)	(1.44)	(0.47)	(1.47)
Year 10 × treated	0.214	-0.0244	0.0583	-0.0272	0.0946	-0.0509	0.0611	-0.0142	0.282*	0.152	0.156	-0.0754
	(1.65)	(-0.23)	(0.50)	(-0.15)	(0.99)	(-0.31)	(0.48)	(-0.17)	(1.83)	(1.13)	(1.66)	(-1.00)
Year 11 × treated	0.221*	0.0268	0.0776	-0.220	-0.0817	-0.101	0.0726	0.103	0.0249	0.115	0.0490	-0.214
	(1.75)	(0.28)	(0.85)	(-1.42)	(-0.65)	(-0.65)	(0.69)	(0.89)	(0.30)	(0.88)	(0.46)	(-1.42)
Year 12 × treated	0.261*	-0.0521	0.198*	-0.179	0.00239	-0.287	0.0648	-0.0361	-0.0579	0.0445	0.209	0.0278
	(1.89)	(-0.67)	(1.94)	(-0.76)	(0.02)	(-1.43)	(0.55)	(-0.36)	(-0.38)	(0.30)	(1.70)	(0.21)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-company FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time
Observations	5,879	7,293	12,556	2,634	7,519	2,130	4,757	12,220	5,281	2,527	7,050	5,976

Notes: The dependent variable is firm-level labour productivity (log real value added per employee). Each table reports stacked difference-in-differences estimates on the relevant sub-sample. The first two rows report the static specification (Post × treated and its t-statistic), corresponding to model 4 in Table 2; the remaining rows report the dynamic specification, corresponding to model 8, with separate interactions for each relative year (Year 0 to Year 12). All models include firm-level controls and cohort-company and cohort-time fixed effects; standard errors are clustered by company and by time. t-statistics in parentheses; * p<0.10, ** p<0.05, *** p<0.01.

Table A10. Labour productivity, heterogeneity by technology and knowledge intensity

	High technology	Medium-high technology	Medium low technology	Low technology	Knowledge-intensive services	Less knowledge intensive services	Other or unknown
Post × treated	-0.0325	0.0349	-0.0117	0.0315	-0.0151	0.0849	-0.161**
	(-0.53)	(0.96)	(-0.46)	(1.14)	(-0.51)	(1.72)	(-2.54)
Year 0 × treated	-0.0163	-0.0219	-0.0131	-0.0247	-0.0459	0.0818	-0.129***
	(-0.21)	(-0.55)	(-0.44)	(-0.98)	(-1.30)	(1.34)	(-3.04)
Year 1 × treated	-0.0995	0.0791*	-0.0615	0.000340	-0.0440	0.0472	-0.0775
	(-0.82)	(1.84)	(-1.63)	(0.01)	(-1.15)	(0.85)	(-0.93)
Year 2 × treated	-0.0228	0.0559	-0.0122	-0.00434	-0.0627	0.0819	-0.0719
	(-0.30)	(1.04)	(-0.31)	(-0.12)	(-1.55)	(1.31)	(-0.86)
Year 3 × treated	-0.0139	0.0159	-0.0131	0.0206	-0.0448	0.0637	-0.333***
	(-0.18)	(0.32)	(-0.29)	(0.55)	(-1.06)	(1.09)	(-3.16)
Year 4 × treated	-0.0450	0.0283	0.00663	0.0525	-0.0574	0.0432	-0.249**
	(-0.51)	(0.45)	(0.18)	(1.40)	(-1.12)	(0.54)	(-2.58)
Year 5 × treated	-0.0642	-0.00608	0.00829	0.0767	-0.0152	0.114	-0.170
	(-0.79)	(-0.11)	(0.24)	(1.35)	(-0.27)	(1.70)	(-1.49)
Year 6 × treated	0.0191	-0.0441	-0.0385	0.0778*	0.0375	0.145**	-0.107
	(0.18)	(-0.76)	(-0.84)	(1.87)	(0.73)	(2.08)	(-1.13)
Year 7 × treated	0.00209	0.0670	0.0169	0.0456	0.0846	0.167**	-0.109
	(0.02)	(1.19)	(0.32)	(1.07)	(1.37)	(2.12)	(-0.92)
Year 8 × treated	-0.133	0.0887	0.0276	0.0676	0.0826	0.188*	-0.221*
	(-0.96)	(1.37)	(0.56)	(1.53)	(1.15)	(1.95)	(-2.03)
Year 9 × treated	-0.0284	0.0114	-0.0255	0.158**	0.0666	0.0876	-0.144
	(-0.20)	(0.17)	(-0.50)	(2.71)	(1.02)	(0.87)	(-1.07)
Year 10 × treated	0.120	0.0796	0.0634	0.100	0.127	0.170	-0.312**

	High technology	Medium-high technology	Medium low technology	Low technology	Knowledge-intensive services	Less knowledge intensive services	Other or unknown
	(0.57)	(1.16)	(0.83)	(1.62)	(1.29)	(1.28)	(-2.71)
Year 11 × treated	0.0612	0.131*	-0.0108	-0.00105	0.152*	-0.0261	-0.409***
	(0.40)	(1.72)	(-0.11)	(-0.01)	(1.90)	(-0.26)	(-4.31)
Year 12 × treated	-0.0764	0.237**	0.0106	0.0339	0.0936	-0.0305	-0.187
	(-0.35)	(2.52)	(0.09)	(0.71)	(0.93)	(-0.16)	(-1.13)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-company FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time	Company, time
Observations	3,507	7,493	12,798	12,969	22,276	10,289	6,435

Notes: The dependent variable is firm-level labour productivity (log real value added per employee). Each table reports stacked difference-in-differences estimates on the relevant sub-sample. The first two rows report the static specification (Post × treated and its t-statistic), corresponding to model 4 in Table 2; the remaining rows report the dynamic specification, corresponding to model 8, with separate interactions for each relative year (Year 0 to Year 12). All models include firm-level controls and cohort-company and cohort-time fixed effects; standard errors are clustered by company and by time. t-statistics in parentheses; * p<0.10, ** p<0.05, *** p<0.01.

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