



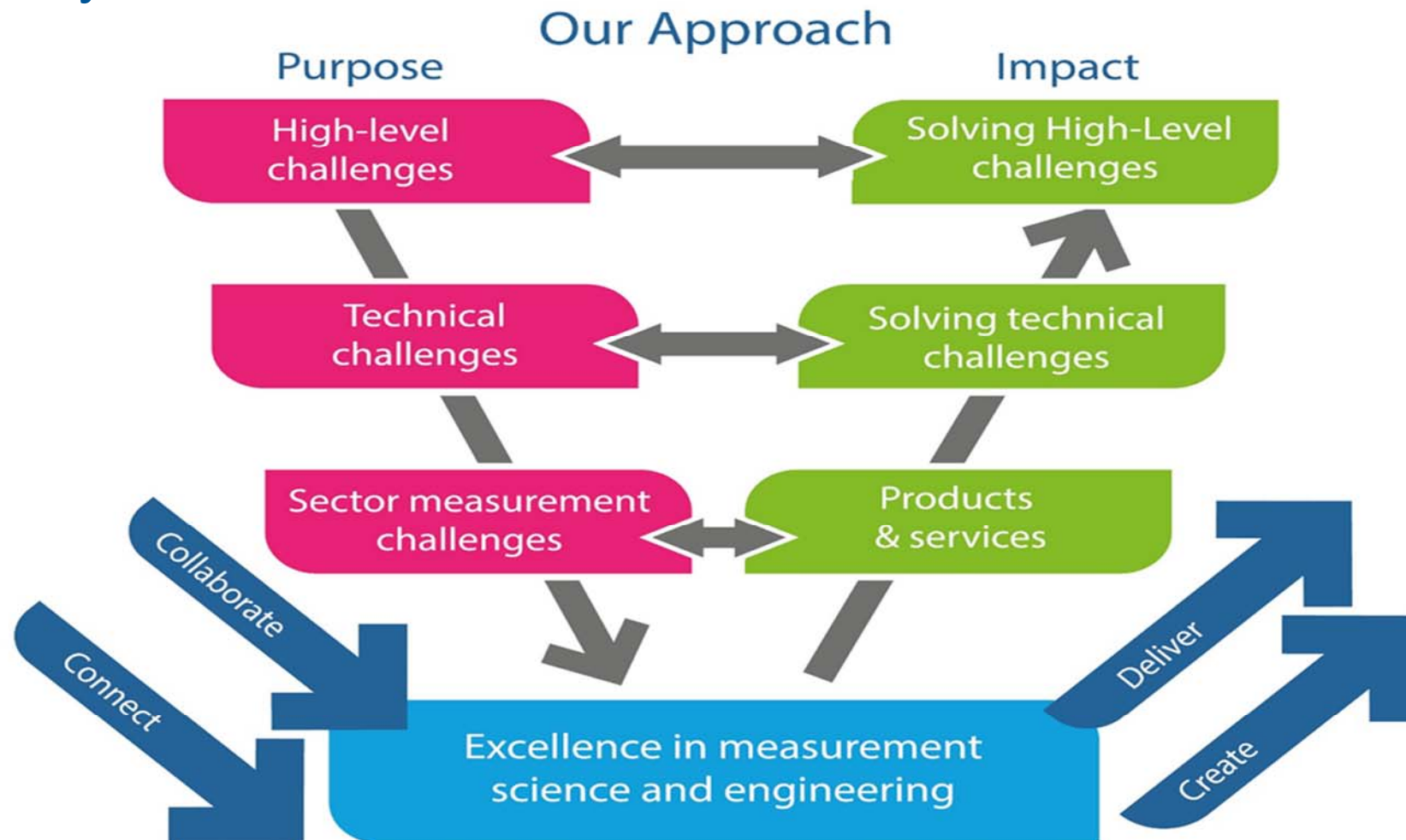
The impact of public support for innovation on firm level outcomes

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NPL's Focus on Impact

NPL's mission: to provide the underpinning measurement capability for UK prosperity and quality of life



Econometrics – One Method Among Many

Themes	Activities	Outputs	Outcomes	Impact
Research: Investing in world-leading measurement infrastructure.	Indicators	Indicators Case studies Peer Review	Indicators Case studies	
Trade & Regulation: Ensuring good standards and regulations	Indicators	Indicators Case studies	Case Studies Survey Modelling	Modelling
Innovation: Connecting with end-users to deliver impact	Indicators	Indicators Survey Case studies	Case Studies Survey Econometrics	Econometrics
Skills: Improving the UK's measurement skills		Indicators	Case Studies Survey	

Background to the Study

- Frontier Economics was commissioned by BEIS (Department for Business, Energy & Industrial Strategy) to study the economic impact of public sector support for private sector innovation.
- Focused on direct support delivered by Innovate UK and three labs that underpin the NMS.
 - Grants from Innovate UK (government innovation agency)
 - Paid services from NMS labs (NPL, LGC and NEL)
- This presentation will focus solely on the part of the analysis concerned with the NMS labs.
- The study assesses the effect on survival and employment up to four years after receipt of these forms of support.

Data linking based on CRNs and ENTREFs

Type	Source	Data Linking	Information
Binary “treatment” variable	Administrative records (invoices) from the labs.	Companies House Reference Numbers (CRN)	Payment for lab services.
Annual data on “outcomes”.	Business Structure Database maintained by the Office of National Statistics (ONS).	Enterprise Reference Numbers (ENTREF)	‘Survival’ equals remaining in database. Growth equals changes in headcount.
Key “control” variables.	Survey of businesses with R&D expenditure (BERD)	ENTREFs from the BERD database.	Being in BERD sample frame.
	Business Support Database	CRNs in Business Support Database.	Past use of other forms of public support.

Rubin causal model

- Rubin (1973) adopted the language of ‘treated’ and ‘untreated’ units, as found in medical control trials.
- Rubin argued that we should interpret causal statements as comparisons of potential outcomes: the outcome that occurs for a specific unit (e.g. firm) if it is treated versus the outcome that occurs for the same unit if it is not treated.
- As we can’t observe what would have happened had this unit been denied support, evaluations are essentially about finding a proxy for this ‘counterfactual’.

Propensity Score Matching

- Frontier's analysis was based on Propensity Score Matching (PSM):
 - Estimate the likelihood (propensity score) that a firm with a certain set of characteristics will opt into a particular treatment. That is, use NMS services.
 - Match treated firms to similar untreated firms on the basis of these propensity scores; where the matched untreated firms constitute the control group.
 - Differences between outcomes for treated firms and their matched controls are observed up to four years after treatment occurs.
- It was possible to find controls for about 970 out of the 2,300 firms that paid for services over a five year period.

Outcome variables

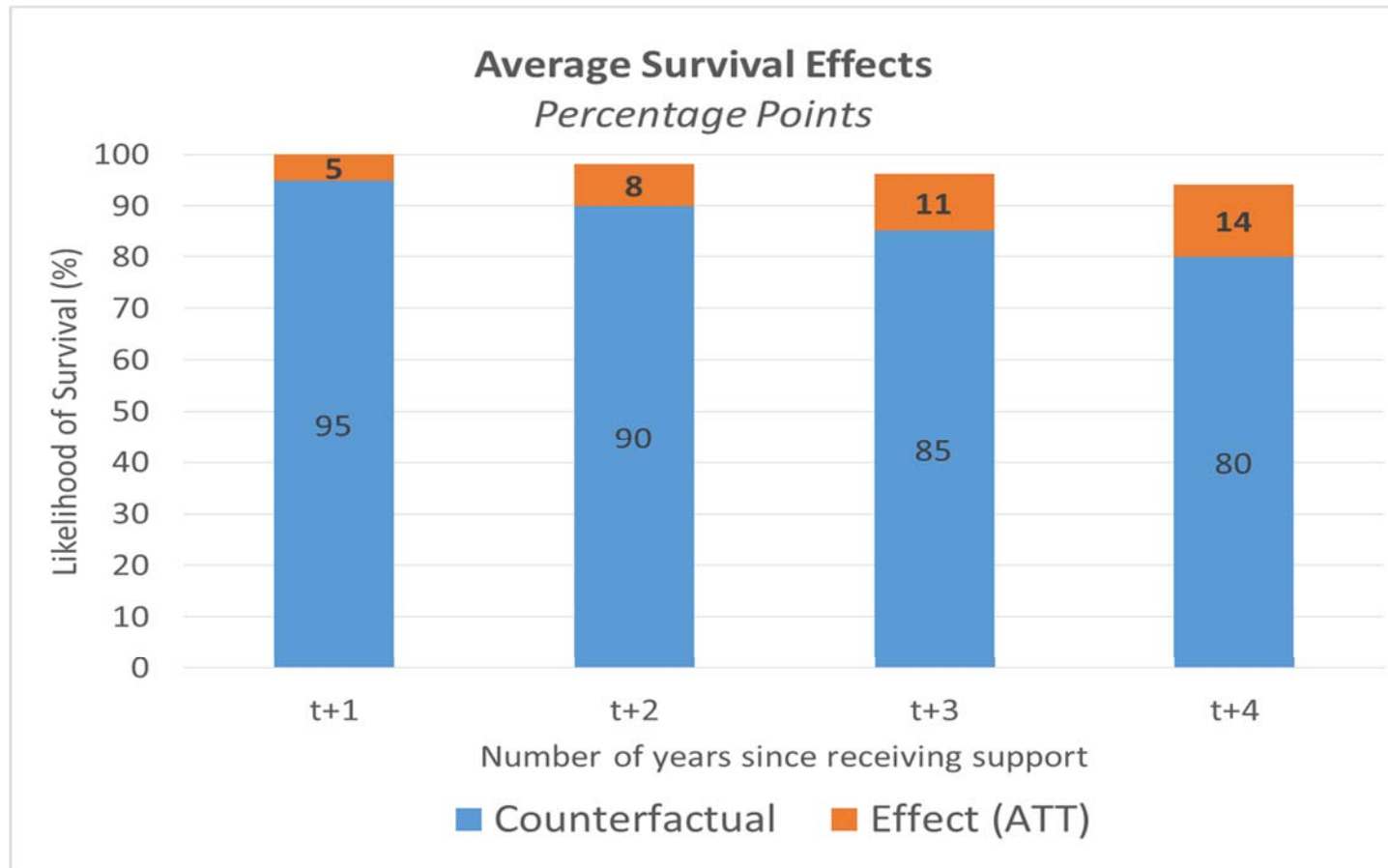
- The survival effect t-years after treatment, is found by subtracting the probability (in percentage points) that a treated firm is still active from the probability that its matched controls are still active.
- Frontier net off any difference in the initial number of employees (pre treatment) between the treated firms and their matched controls. This yields a difference-in-differences estimate for the impact of treatment on employment.

Assumptions are much like those for Regression (Ordinary Least Squares)

- The hope is that information on past R&D (and public support) is sufficient to limit the influence of confounding factors.
 - Ideally, there are no unobservable factors that effect both the likelihood of being treated and potential outcomes.
 - Hopefully, the general trend in employment - the number of new employees taken on per year - is the same for treated firms and their matched controls.
 - Finally, there is no subset of treated firms for whom opting into treatment was a total certainty (common support).

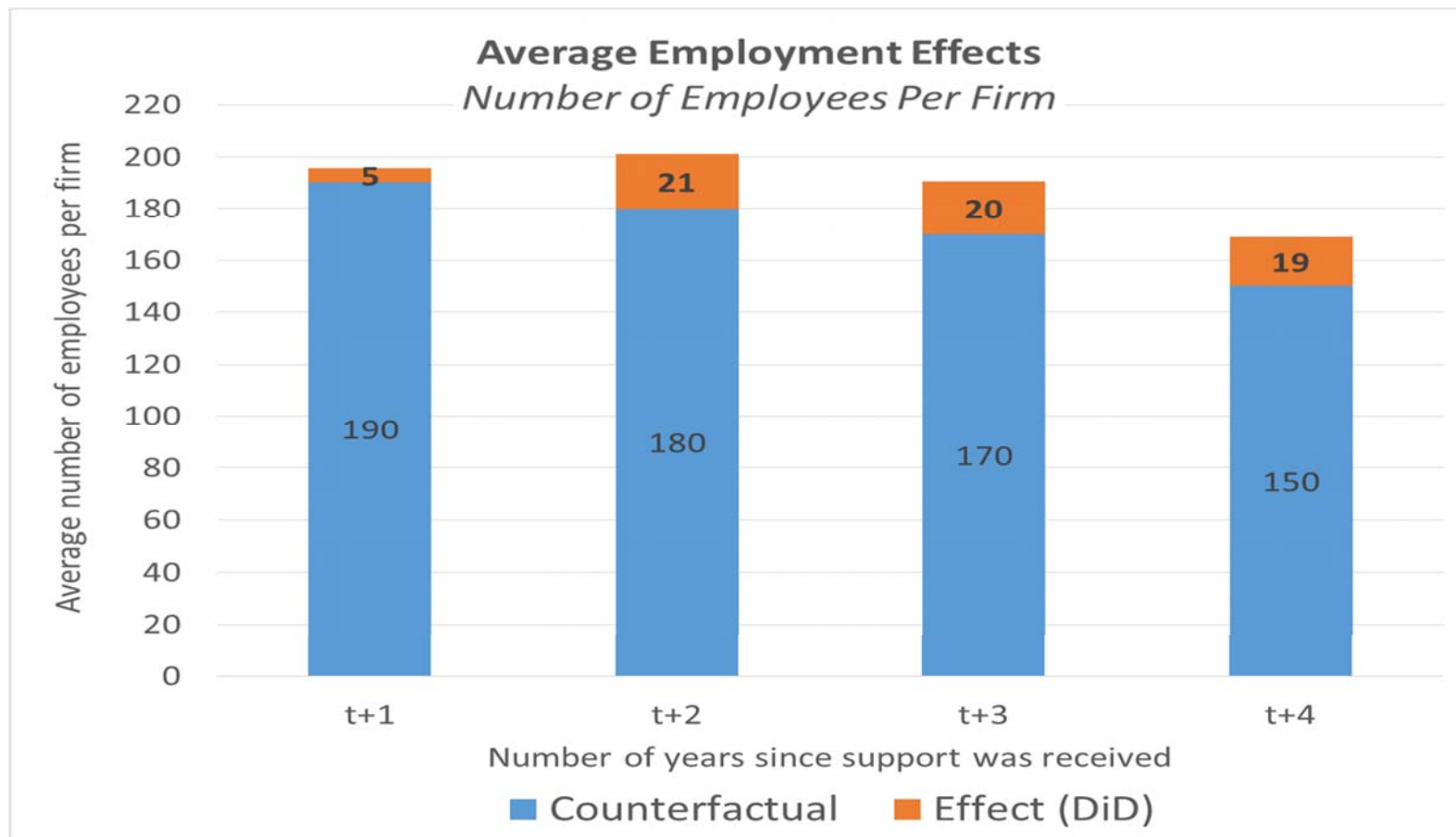
Survival Effects

- Among the matched control firms, the survival rates are around 95% after one year and 85% after three years. In contrast, survival is a virtual certainty for treated firms.
- Finally, survival effects are noticeably larger for young firms than for older firms.



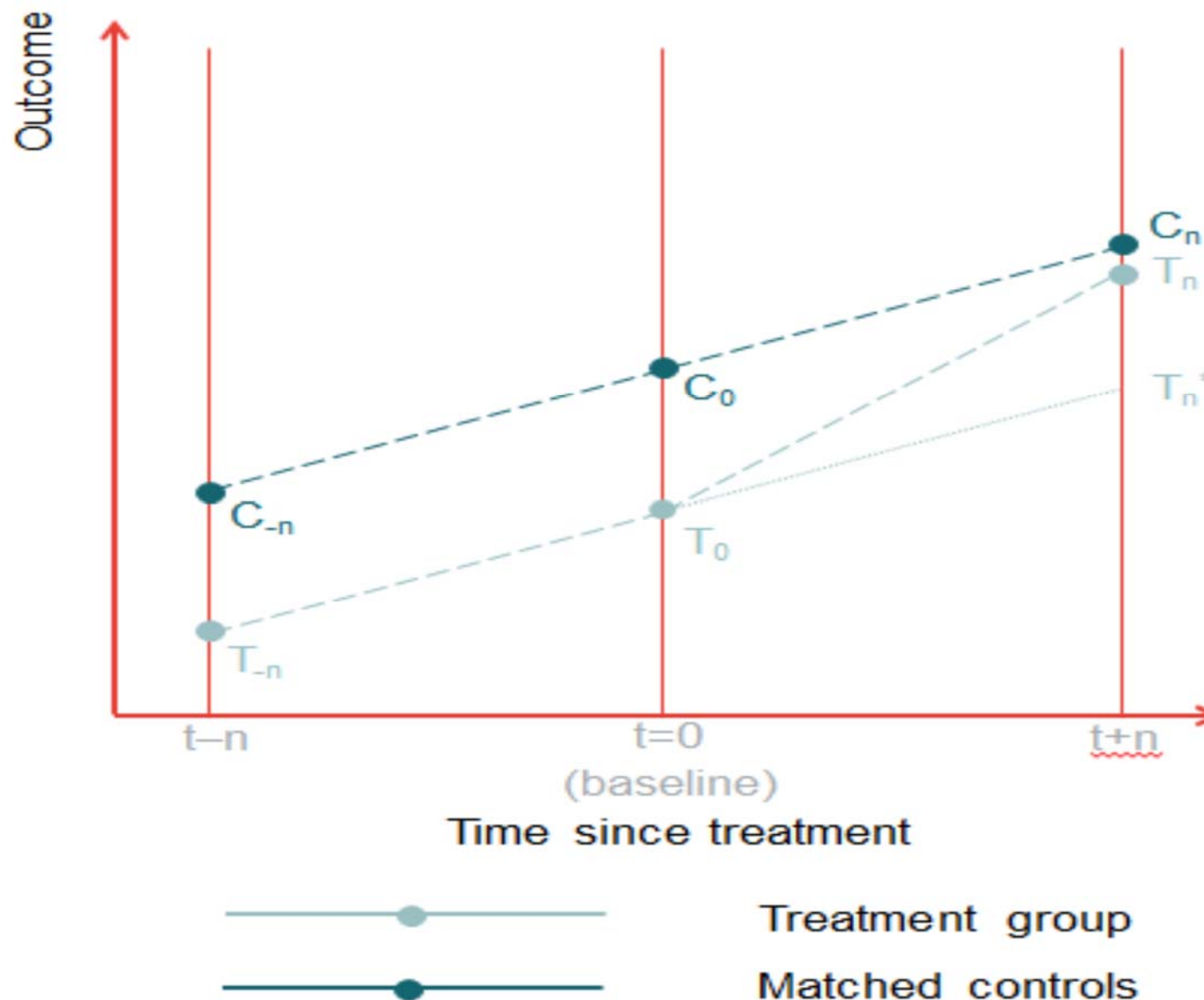
Employment Effects

- Positive employment effects occur three years after a firm received support - typically resulting in around 20 extra employees
- These employment effects equate to an increase in employment of around 12-13% against the corresponding counterfactual outcome.



Annex: Robustness Checks

Estimating the treatment effect: 'difference-in-differences'



Robustness Checks

- **Balancing tests:** Compare the typical value of a control variable in the treated group with its value for the matched untreated firms. Helps to check the similarity of treated firms and the matched untreated firms.
- **Common trends:** For the two years prior to treatment, the average number of employees taken on per year was about the same for the treated firms and their matched controls.