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

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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

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<td>Binary “treatment” variable</td>
<td>Administrative records (invoices) from the labs.</td>
<td>Companies House Reference Numbers (CRN)</td>
<td>Payment for lab services.</td>
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<td>Growth equals changes in headcount.</td>
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<tr>
<td>Key “control” variables</td>
<td>Survey of businesses with R&amp;D expenditure (BERD)</td>
<td>ENTREFs from the BERD database.</td>
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<td>Business Support Database</td>
<td>CRNs in Business Support Database.</td>
<td>Past use of other forms of public support.</td>
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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.