

The Business Case Model estimates the **value-for-money** of the NMS programme. The estimate is based on considering what would happen to **future costs and benefits** if the **NMS programme continues to operate at its current scale in the following year**. is a value-for-money assessment **using benefits found in an earlier econometric impact analysis**, and then compares those benefits to the identifiable costs of the programme with the following method:

1. Estimate the value of the benefits and costs (direct and indirect).
2. Calculate net-benefit generated by the programme.
3. Find the ratio of the net-benefit to the public funding provided through the NMS programme.

It should be noted that much of the cost is incurred in the first year, while the benefits are spread over the following **eight years**. Because of this, flows of future costs and benefits should be assessed in terms of '**present values**.' As people tend to **discount the future**, future benefits (costs) are worth less than present benefits (costs). Due to a time lag of T years means discounting the benefits (costs) by $1/(1 + \rho)^T$, where the conventional discount rate from **HMT's Green Book** is $\rho = 3.5\%$:

- £100 next year is equivalent to £96.62 today, because $T = 1$ and $1/1.035 = 0.9662$.

As firms focus on short-run profitability, this eight-year gap between costs and benefits is part of the motivation for having an element of public funding. (An eight-year wait for profits to materialise exceeds the payback period of many firms.) However, as it is assumed that the economic value exceeds the costs of the programme, it is in the interests of society for this programme to go ahead. This is where the public sector steps in to provide the requisite funding for the programme.

1 IMPACT ANALYSIS: ESTIMATES FROM THE BELMANA STUDY

BEIS commissioned an econometric study from economists at Belmana, which in turn was published in 2019. This analysis found compelling evidence of attributable employment and wage effects among a group of 360 "**regularly supported**" firms that used NPL on a frequent basis. The "**regularly supported**" firms are those who received "support" from NPL during at least five years of the preceding a six-year period; where support corresponds to paying for measurement services or participating in collaborative R&D projects. The regularly supported firms saw the following net-additional employment and wage effects:

- On average, a regularly supported firm grows by **6.3 extra employees** each year.
- On average, people who take jobs at one of the supported firms (referred to as "job switchers") see their **annual wages increase by around £5,000**.
 - ~£4000 went to those who switched jobs¹ while ~£1000 went to those already at regularly supported firms

In general, **wages are known to track labour productivity**, although, employees don't capture the full value of the underlying increase in productivity. Hence, employment growth

¹ Her Majesty's Treasury (or HMT) believes that the UK as a whole is at full employment. Therefore, any net-additional jobs created are filled by those moving from one job to another, incentivised to move by an increase in pay.

and wage premiums are **indicative of an even greater underlying increase in labour productivity** and economic opportunity.

The benefit of economic growth (the value of the surplus) is shared between three parties:

- Employees – wage income increase by **~£6,000 per employee**. (~£5,000 wage premium plus £1000 from NI contributions.)
- Owners of capital – profits increase by **~£3,000 per employee**.
- Government (HMRC) – tax revenue increases by **~£3000 per employee**.
- The flow of benefits each year is the sum of the three components (~£12,000), multiplied by the increase in employees (~6 employees) and the number of regularly supported firms (360). These yields **~£27 million per year** as a headline estimate of one year's worth of **Gross Direct Economic Benefit**.

2 FLOW OF BENEFITS

2.1 DIRECT BENEFITS

Given information from the NMS customer survey, we assume that a firm sees a flow of **benefits that last for six years**, with a **delay of two years**. Because the people tend to slightly discount the future relative to the present, this flow of benefits must be discounted (by a rate of 3.5% from the Green Book). As we know the discount rate, the discounted lifetime of an innovation can be found, which is **5.12 years**, following this, the flow of benefits is:

$$\text{Gross Direct Economic Benefit} = \sim\text{£27 million} \times 5.12 = \sim\text{£142 million}.$$

2.2 INDIRECT BENEFITS

So far, the benefits accounted for in this analysis have gone solely to NPL's regularly supported firms. However, innovation creates benefits that go well beyond the original innovator because it is assumed that **knowledge spills over to other firms**. **The new knowledge aids the innovation activities of other firms** and sometimes enables outright replication of successful products or processes. The **spillovers will create indirect benefits** for a broad group of firms who don't get direct support from NPL. Following a meta-analysis by Frontier Economics, it was found that the **ratio of direct-to-indirect benefits is about 1:2**. The full benefit is three times the direct benefit going to regularly supported firms:

$$3 \times \text{£142 million} = \text{£426 million}$$

3 SOCIAL COSTS (PUBLIC & PRIVATE)

The direct costs are incurred by firms working with NPL, spending around **£7.5 million** purchasing support. However, as detailed in the customer survey², **for every £1 spent buying support from NPL, another £2 is spent inhouse** on associated innovation activities, at 1:2 ratio of NPL spend to internal spend (leveraged R&D spend), yielding a cost of $3 \times \text{£7.5 million} = \text{£22.5 million}$.

On top of these costs, the "opportunity costs" must also be accounted for. This is the value generated had the spend been on the "best alternative". In this instance, rather than spending the £22.5 million on R&D, the spend could have been instead in the stock market. This potential

2 <https://eprintspublications.npl.co.uk/8655/>

benefit can be estimated using a 5% compound interest rate for a **5-year payback period**. Based on this, the “**opportunity cost**” of the foregone investments is **£3.4 million**.

Direct Private Cost = £22.5 million + £3.4 million = **£26 million**.

As detailed above, seeing that the ratio of direct-to-indirect benefits is 1:2, the same can be assumed for the direct and indirect costs:

Total Private Cost = 3 × £26 million = **£78 million**

The public cost (taxpayer funding) corresponds to funding for the NMS programme, which is **£94 million** (after subtracting NPL’s rent from the gross funding):

Social Costs = £78 million + £94 million = **£172 million**.

4 NET ECONOMIC BENEFIT (NET PRESENT VALUE OR NPV)

Net Economic Benefit (Net Present Value) is found by subtracting the present value of Social Cost (£172 million) from the present value of the Gross Benefits (£426 million).

NPV = £426 million – £172 million = **£254 million**

When normalised by government expenditure, it’s found that £1 of government money yields around £2.70 of Economic Benefit over an 8-year period.

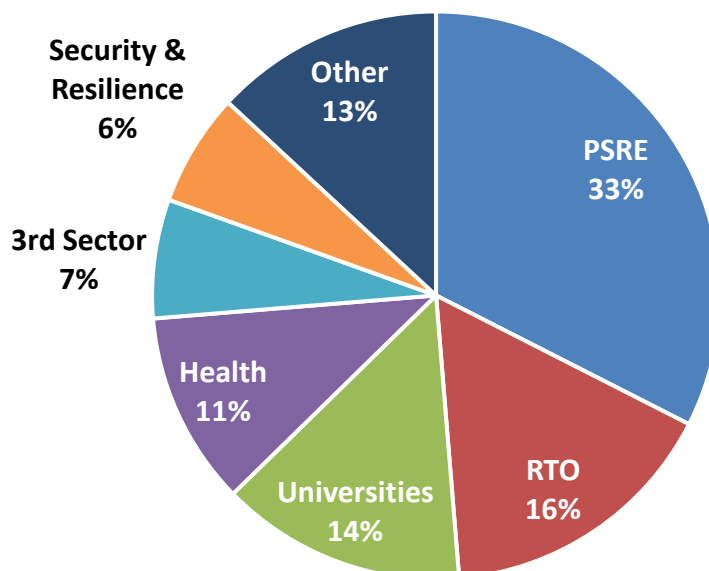
This is potentially important because there is a limited ‘pot of public funding’, and thus government tends to be allocated funds towards programmes with higher NPVs. The reason being that this maximises the net-benefit from the available public funding.

5 LIMITATIONS

The Business Case Model does have its limitations though. Given that 46% of NPL’s domestic, competitively won income comes from non-for-profit organisations. These range from PSREs to specific government departments responsible for certain “public goods”, such as environment, public health, and security & defence. This means that the “quality of life” benefits channelled through the public sector aren’t properly assessed. The breakdown of the private and “public” income is as follows:

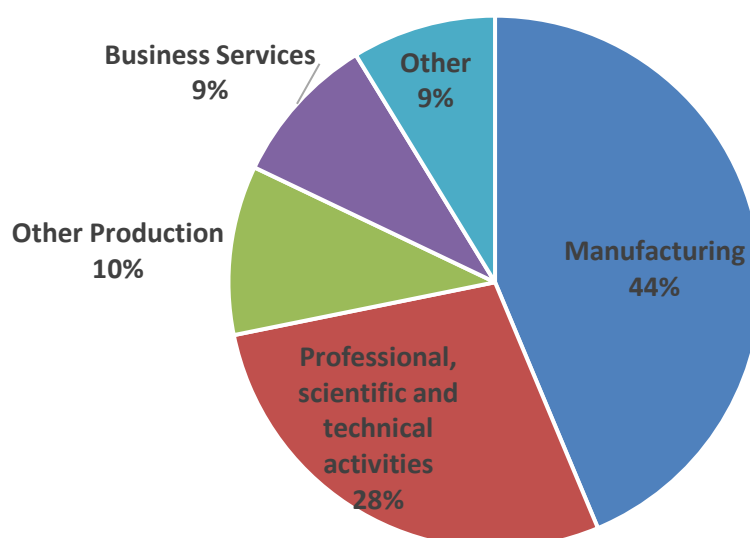
Non-Private Sector - 2015-2021

Annualised Income £6.2m



Private Sector - 2015-2021

Annualised Income £7.2m



Another limitation to the model is the ability to value the “fan-out”. Through the provision of measurement services, traceability extends far down the calibration chain, beyond our user’s customers. These benefits aren’t captured by the current model, implying that the model above gives a “lower bound” rather than the full economic benefit. Future customer surveys will attempt to better quantify and value this “fan-out”.

6 CONCLUSION

To conclude, NPL’s direct economic impact, as channelled through the private sector, can be quantified using the business case model that’s accepted by economists in BEIS. NPL’s economic impact is considerable (a 270% return on public funds) but it should be noted the calculations are highly dependent on the number of regularly supported firms - a metric that NPL has been collected from 2012 to 2021 and is observed to fluctuate year-by-year. Hence, greater impacts in the future are contingent on maintaining the existing group of regularly supported firms whilst encouraging occasional users to become regular users.

So far, the focus has been on quantifying the direct impacts channelled through the private sector; in part this is due to the relative ease of its estimation as compared to quantifying the indirect and quality-of-life impacts. However, future work will look to estimate the value of impacts channelled through the public sector, along with the indirect benefits transmitted along the calibration chain.

Mike King | Mike.King@npl.co.uk

National Physical Laboratory
Hampton Road, Teddington, Middlesex, United Kingdom, TW11 0LW

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