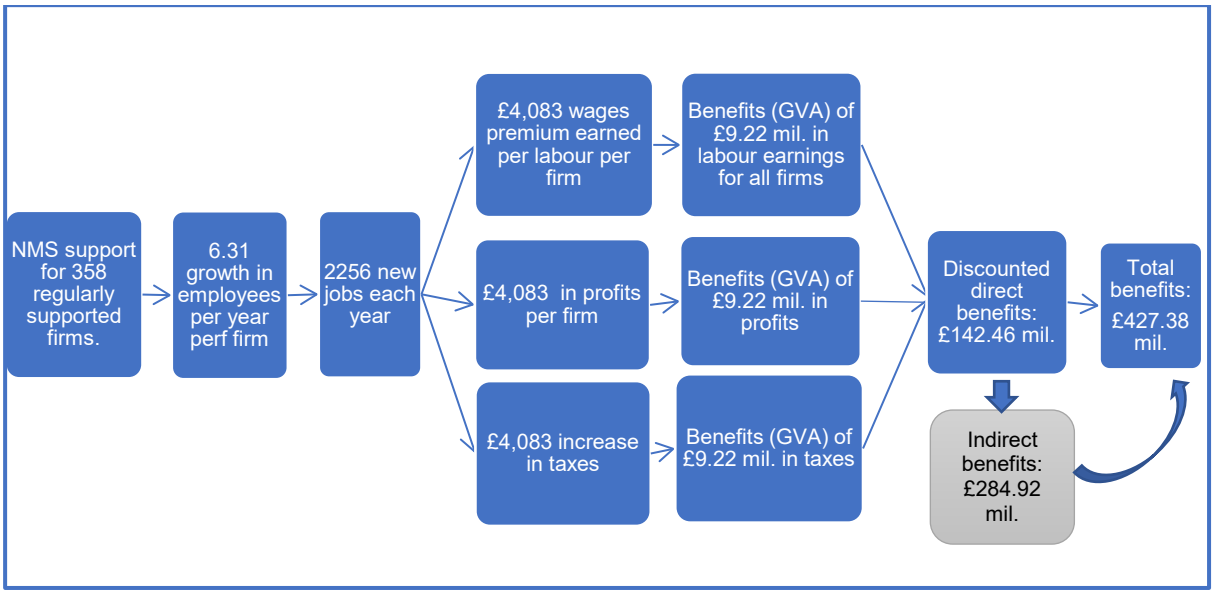
NMS Business Case Model: Addendum

1 INTRODUCTION

This document serves as an addendum to King & Olakojo (2023), which presents the NMS business case model for estimating the costs and benefits associated with funding the programme. The purpose of this note is to update the analysis in the business case model using new results that have emerged since the publication of the main report. The narrative behind the model remains unchanged from the main report, therefore, this note should be read in conjunction with the original report. The model essentially weighs business-as-usual benefits against the business-as-usual costs in a steady state. Therefore, this model can be used to assess the Value for Money (VfM) for the NMS programme because it has been operating in much the same way, with much the same level of funding for many decades now (hence representing a steady state).

2 CHANGES IN THE CALCULATION OF BENEFITS

Section 2 in King & Olakojo (2023) focuses on the economic benefits coming from the NMS programme. The calculation of direct benefits is based on the employment and wage impacts experienced by NMS regularly supported firms (Belmana 2019; Nayak et al., 2023). Additionally, Frontier Economics (2014) performed a meta-analysis of the evidence relating to the rate of return to investment in science and innovation and found that the ratio of direct to indirect benefits arising from innovation/R&D activities is 1:2. That is, for every £1 of direct (private) benefits generated by firms' innovation activities, there's a further £2 of indirect (public) benefits that arise due to spillovers. Using these result, King & Olakojo (2023) estimate the annual flow of total benefits from the innovation support provided by NMS laboratories as follows:



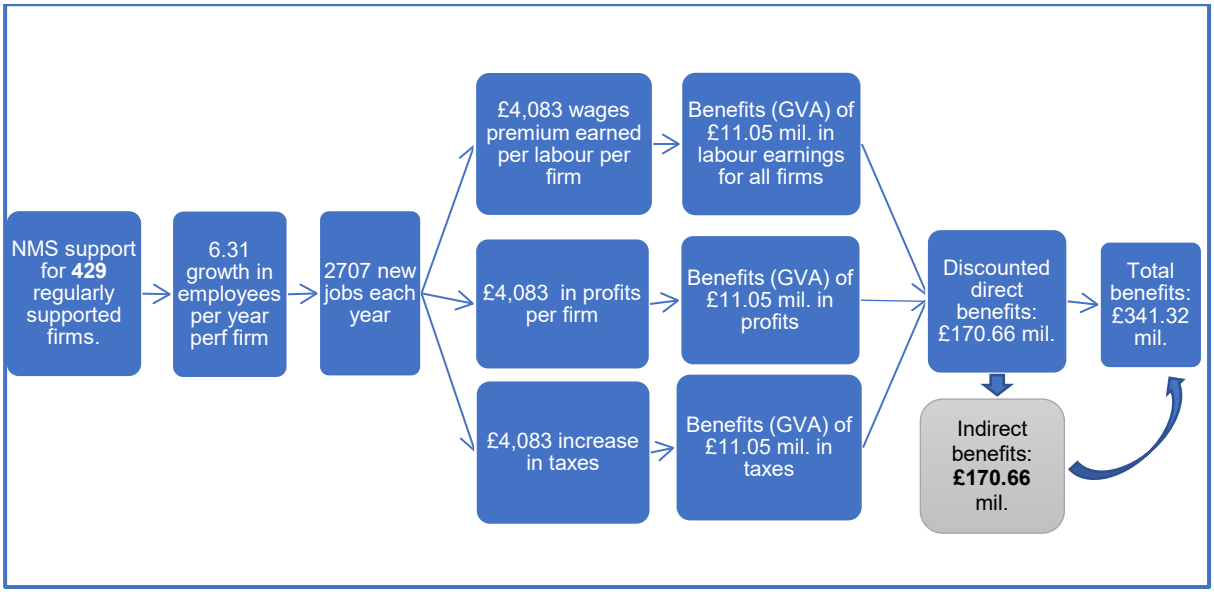
In this note, we make the following changes to the above analysis:

- Change in the number of regularly supported firms – The above count of 358 regularly supported UK-based firms comes from the analysis presented in Belmana (2019).

However, that analysis used data up until 2017. In 2023, the count of NPL's regularly supported UK-based firms was 429, which is what we use in revised analysis.[1]

- Change in the split between direct and indirect benefits – The results from an updated meta-analysis in Frontier Economics (2023) suggest that the benefits of business R&D/innovation activities are split in a 1:1 ratio between direct (private) benefits and indirect (public) benefits. That is, for every £1 of direct (private) benefits generated by firms' R&D activities, there's a further £1 of indirect (public) benefits that arise from spillovers. Therefore, the social (total) returns to private R&D are roughly twice that of the private returns.

Incorporating the above two changes, an updated estimation of the annual flow of total benefits can be carried out as follows[2]:



3 CHANGES IN THE CALCULATION OF COSTS

To estimate public costs, King & Olakojo (2023) uses a figure of approximately £94 million that the NPL received as public investment from DSIT's (then BEIS) R&D budget in 2020-21. A further breakdown of this funding is as follows:

- £76.1 million in NMS funding.
- £12.8 million in other public funding (e.g. SPF).
- £21.6 million in estates funding and subscriptions.

This funding amounts to £110.9 million, but because NPL paid BEIS £17.1 million in rent, the net funding is reduced to £94.1 million. Hence, King & Olakojo (2023) uses £94.1 million as our preferred measure of public costs (DEL). However, upon further thought, we believe that we should only be using the first element, i.e., NMS funding, minus the rent paid to DSIT, in our calculation for DEL in this model. That is because the first element represents the business-as-usual programme funding (NMS and NMS add-ons) that facilitates activities involving business users.

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[1] This does not include the regularly supported firms by other NMS laboratories as we do not have the 2023 data for NEL and NML. Therefore, 429 firms are an undercount if we consider other NMS laboratories too. In 2022, the counts of regularly supported UK-based firms by NPL, NEL, and NML were 404, 43, and 6, respectively. In total, these three NMS labs had 453 regularly supported UK-based firms in 2022.

[2] The flow of benefits coming from an innovation lasts for about 6 years (King and Tellett, 2020), but future flows are slightly discounted to account for the rate of time preference. We assume the discount factor to be 3.5%, which is the conventional discount rate as per the HMT's Green Book. Moreover, usually there is a lag before which the benefits of innovation activities start to materialise. Therefore, if an innovation takes place today (year 0), then the flow of benefits from that innovation are accrued from year 2 till year 7.

The second element usually captures funding that goes towards programmes that are at more nascent stages and are unlikely to generate benefits yet, but they have the potential to start generating benefits in the future. For instance, programmes like the National Timing Centre (NTC), UK Telecoms Lab (UKTL), etc., can be thought of as infrastructure/facility building programmes that do not yet have a user base. But they have the potential to bring in new users in the future after they become operational. However, we cannot treat them as being in steady state because they started only a few years ago. Hence, the model used here is not directly applicable to such infrastructure programmes and it should exclude funding that goes towards these programmes.

The third element – estates funding and subscriptions – also does not represent public funding in the conventional sense because of the ownership arrangements of the NPL Teddington site.[3] Moreover, NPL takes out a loan from DSIT for the capital element that it pays back in instalments (both principal and interest). That is, this element of funding does not contribute to the innovation activities of NMS laboratories in a conventional, straightforward way.

Using this revised logic, a better measure of public costs that support the innovation activities would be given by NMS funding of £76.1 million, minus the rent paid to DSIT, which was £17.1 million. That is, DEL would be £59 million. However, this was the figure from 2020-21.

In 2023-24, NPL's share of the NMS funding amounted to roughly £87.1 million. And NPL paid DSIT £16.9 million in rent. Therefore, our revised measure of public costs (DEL) becomes £70.2 million.[4] The other elements of cost (private, indirect private, opportunity costs, and interest) are roughly the same as in King & Olakojo (2023). Adding all the elements of cost together, we obtain an updated estimate of (total) social cost to be £148.2 million.

4 UPDATED NET PRESENT VALUE (NPV) CALCULATION

The net present value (NPV) of the programme is found by subtracting the present value of the benefits from the social cost. Thus, the NPV of the programme is given by £341.32 million − £148.2 million = **£193.12 million**; and the NPV-to-DEL ratio is given by (£193.12 million / £70.2 million) = **2.75**.

The headline results of this value-for-money analysis are that the NMS programme has an NPV of £193.12 million, and an NPV-to-DEL ratio of 2.75.

5 AREAS FOR FURTHER WORK

The model in this report uses the average annual increase in employment among NPL's regularly supported firms, and the wage premium received by job switchers to these firms to evaluate the benefits. However, focusing on wage premium alone means we may miss out on capturing impacts through other channels. For example, capital intensity (measure of the amount of capital in relation to labour) is a percentage of the total wages (and not wage premium). The job-switchers to NMS regularly supported firms tend to be more in high-skilled jobs, that is, as these firms employ new workers, they can also be expected to increase their capital to maintain (if not increase) their capital intensity.[5] This increase in capital is net additional to the UK economy, and the benefits coming from the increase in capital is currently not considered by this model.

[3] The estates funding can be treated money that DSIT provides for the maintenance and upkeep of the facilities that it owns and rents out to NPL. As an analogy, DSIT can be thought of as a landlord who owns an apartment and rents it out. But the landlord is still responsible for the basic upkeep the apartment.

[4] Since we use NPL's regularly supported firms in the calculation of benefits, to maintain consistency, we use only NPL's share of funding to calculate costs too. That is, we are using NPL's numbers to estimate the NPV and NPV-to-DEL ratio for the NMS programme, the implicit assumption here being that the NPL is a good "proxy" for NMS as a whole. While this assumption might not be true for all cases, as other NMS laboratories can generate impacts through different channels that may not be captured through this model, it is not an unreasonable assumption to make since NPL receives over 80% of the total NMS funding.

[5] There is evidence of positive correlation between wages and capital intensity. That is, more capital-intensive firms tend to pay higher wages.

Moreover, two new econometric studies (one in-house and one externally commissioned) are underway. The combined goal of these studies is to update the results from the Belmana (2019) analysis with more recent data, as well as to extend the analysis to investigate the impact of NMS support on more variables (for e.g., fixed assets) that we not included in the original study. Preliminary results from the analysis indicate an association between regular support from NPL / NMS laboratories and probability of growth in a firm's fixed assets. A more detailed causal analysis will be carried out in the econometric studies, the results from which are expected in 2025. However, preliminary findings suggest that there is a positive relationship between regular support from NMS laboratories and the firms' fixed assets, which is an impact that is not yet captured in the business case model.

Finally, it is important to note that this model focuses only on benefits channelled through UK's private businesses. However, over 40% of NPL's domestic, competitively-won income comes from supporting not-for-profit organisations, which range from Public Sector Research Establishments (PSREs) to specific government departments responsible for the delivery of certain "public goods" that fall within various sectors such as energy & environment, public health & life science, and security & defence. The support provided through these channels does not necessarily translate into conventional economic impacts but are probably better captured through other measures such as "quality of life" benefits. Future work can explore how to better capture the value of impacts that NMS support to the public sector generates.

6 REFERENCES

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