SOCIAL AND ECONOMIC RETURN ON INVESTMENT IN RESEARCH AND DEVELOPMENT

MOSTA
MONITORING AND ANALYSIS

POLICY BRIEF

Prepared in accordance to contract agreement No. ESF F9-17/14, signed with the Research and Higher Education Monitoring and Analysis Centre on 2014 -04-24.

Produced by Visionary Analytics (lead partner) and the ProBaltic Consulting consortium.

VISIONARY ANALYTICS

ProBaltic consulting

Vilnius, 2015-04-02

What is this brief about?

This policy brief presents the results of a pilot study that sought to assess the impact and return on investment of two R&D programmes: The High-tech development programme and Intelektas LT. The pilot study was carried out throughout 2014-2015 and sought to test the methodology, tools and instruments developed for an evaluation of the Smart Specialisation programme for 2014-2020[1]. The first section of the policy brief outlines the context of the pilot study: challenges in measuring the return on R&D investments, scope of methodology and a planned evaluation of the Smart Specialisation programme. The second section discusses the results of the pilot study.

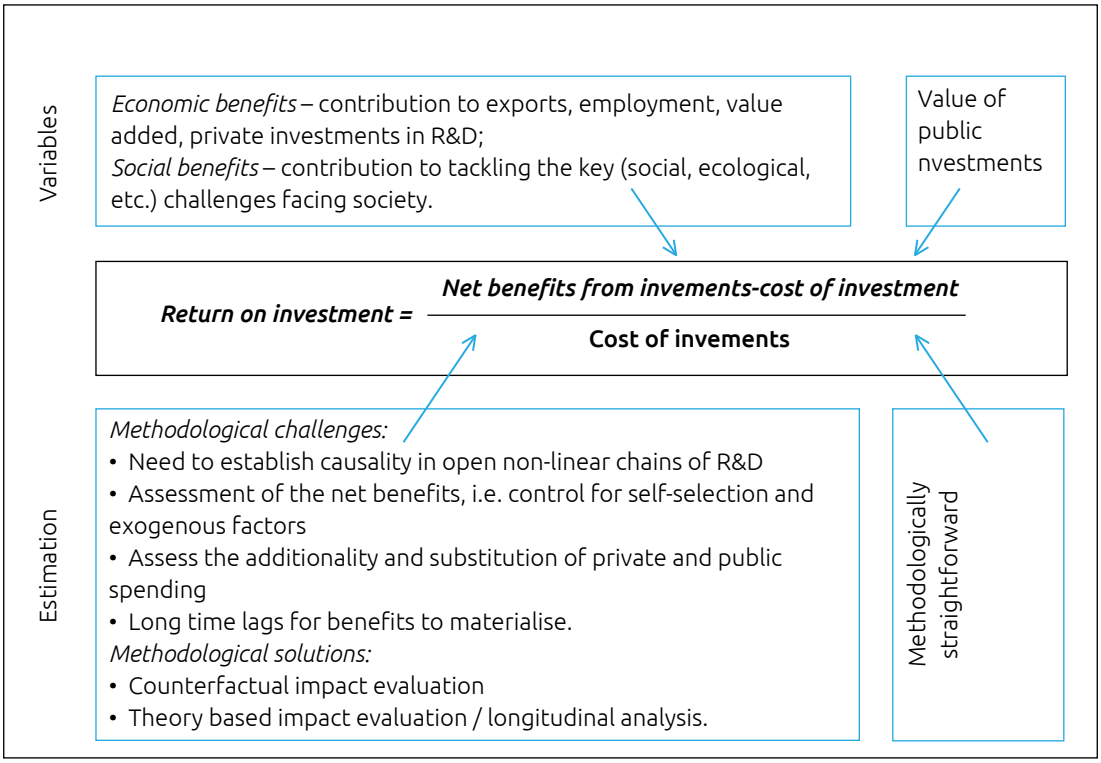
[1] Resolution On The Approval of The Programme on the Implementation of the Priority Areas of Research and Development (Socio-Cultural), Innovation (Smart Specialisation) and their Priorities by the Government of the Republic of Lithuania, Register of Legal Acts , 2014-05331, 2014 (Lithuanian)

CONTEXT

What: the return on R&D investments

What are the social and economic benefits of public investments in R&D? This is the main question in evaluating the return on R&D investments. Estimates serve two general purposes: a) accountability to society and donors; b) policy making – reallocation of investments to priorities / measures with higher returns. While calculating the cost of investment is relatively straightforward, an evaluation of the net benefits poses substantial challenges (see Figure 1). Hence, there is a need for complex methodological solutions and the constant collection of well-structured data.

Figure 1. Evaluation of the return on R&D investments.



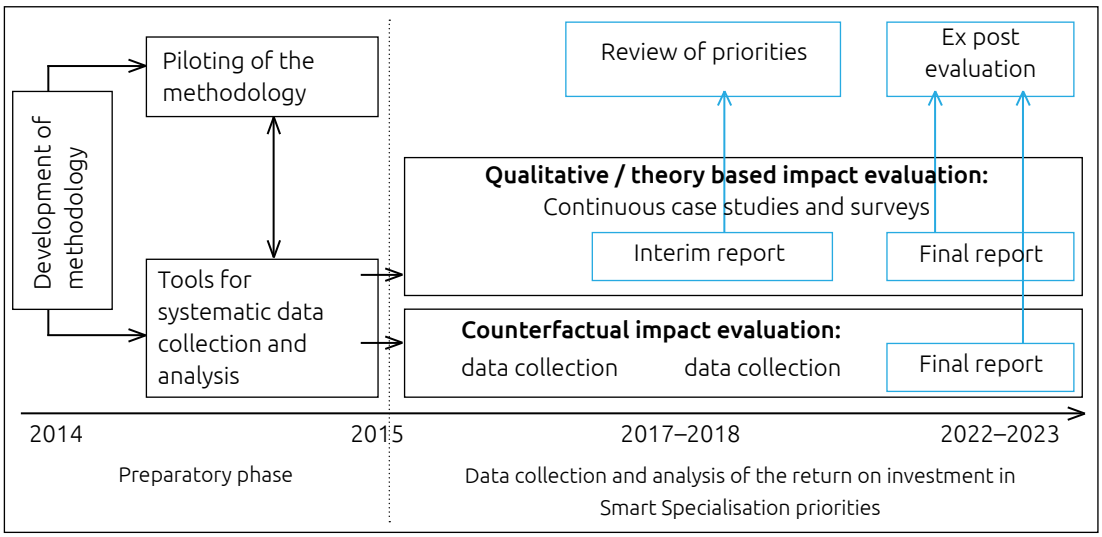
Source: Visionary Analytics, 2015.

Why: preparation for the evaluation of Smart Specialisation

In line with ex ante conditionality, the Lithuanian Programme on Smart specialisation[2] foresees the systematic monitoring, mid-term evaluation and review of priorities / measures, and the ex post impact evaluation of investments in R&D. Accordingly, during the preparatory phase (2014-2015):

- The methodology and tools for the evaluation of the return on R&D investment have been developed. They include:
    - Methods and tools for qualitative / theory based impact evaluation. The data collection design relies on continuous case studies and surveys of the beneficiaries and non-beneficiaries.
    - Methods and tools for quantitative counterfactual analysis.
- A pilot study has been performed.
- In line with the results of the pilot study, the methodology and tools were reviewed.

Figure 2. Development and piloting of the methodology and evaluation of Smart Specialisation.



Source: Visionary Analytics, 2015.

[2] *Ibid.*

During the implementation of Smart specialisation, methodology and tools will be used for:

- Continuous case studies and surveys carried out as part of qualitative / theory based impact assessments will provide inputs for: a) mid-term evaluation and review of Smart specialisation priorities as well as implementation measures (to be carried out in 2017-2018); b) ex post evaluation (to be carried out in 2022-2023).
- Counterfactual analysis will feed into ex post evaluation (to be carried out in 2022-2023). Since such analysis crucially depends on the high quality of data, it will be collected throughout the implementation of the Smart Specialisation Programme.

RESULTS OF THE PILOT STUDY

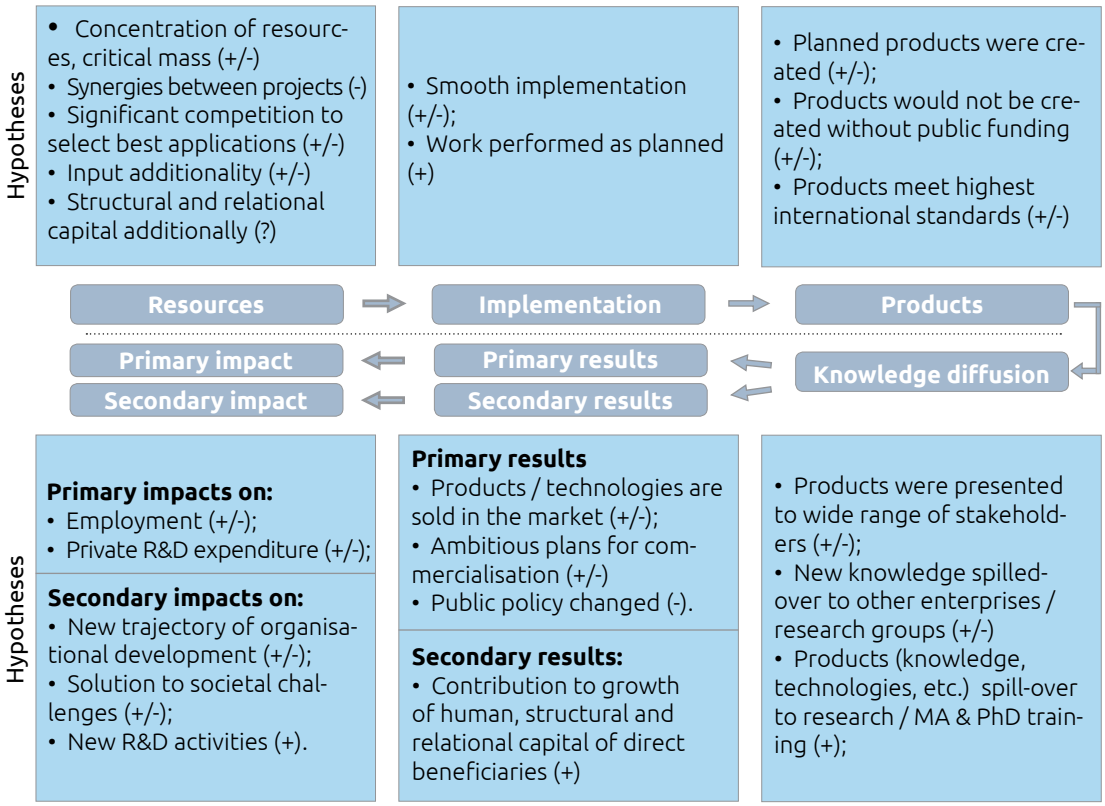
To assess the strengths and weaknesses of the specific tools and overall methodological approach, a pilot study has been carried out. It focused on R&D programmes – the Intelektas LT and High-tech development programmes – implemented in 2007-2013. Since such analysis was not built into the design of these programmes, the pilot study faced an acute lack of data. This severely limited its scope and potential for broadly-based conclusions.

Piloting of the methodology of qualitative / theory based impact evaluation regarding the High-tech development programme

Research design	Theory based impact evaluation
Object of evaluation	High-tech development programme
Short description of the programme	The programme funded 25 new joint public-private R&D projects between 2011 and 2013. Total budget for new projects: 9.3 mln. Lt (EUR 2.7 mln.). Programme continued 6 projects started by Research Studies Foundation of Lithuania. Priorities: biotech, IT, laser technologies, mechatronics, nanotechnologies and electronics.
Data collection methods	5 case studies that included desk research, analysis of monitoring data, interviews with 9 representatives of beneficiaries (5 from public research performing institutions and 4 from private enterprises). Survey of beneficiaries. Total sample – 21 private enterprises. Response rate – 38.1 %; Survey of non-beneficiaries. Total sample – 49 private enterprises. Response rate – 14.3 %; Administrative data was provided by MITA.

The theory of change behind the High-tech development programme is depicted in Figure 3.

Figure 3. Theory of change of High-tech development programme.



Source: MOSTA, Investicijų į mokslinius tyrimus ir eksperimentinę plėtrą socio-ekonominės grąžos tyrimas, Vilnius, 2015.
Notes: hypothesis rejected: - ; hypothesis partially confirmed: +/-; hypothesis confirmed: +; severe lack of data: ?. All results are only indicative, due to the lack of data.

The indicative findings of the evaluation are as follows:

- *Impacts.* The programme had a positive, but small, impact on employment. During the implementation of the projects, 17 new jobs were created. One year after the completion of the projects, approx. 25 new jobs in the private sector were created. An additional 50 new jobs are likely to be created three years after the completion of the projects. There is some evidence that the programme has contributed to higher private R&D spending. However, the effects are not substantial. The programme also had a positive impact on organizational capacities to carry out R&D activities in the future (secondary impacts).
- *Results.* Slightly less than half of the projects have introduced new products in the market at the time of evaluation (this is a very rough estimate, due to the lack of data). The products generated income of approx. EUR 10,000 – 40,000. Most of the income is generated from exports. Enterprises expect the income to grow in the coming years. The programme had significant secondary results: the intellectual capital of participating organisations has substantially increased. Several private enterprises have developed new R&D infrastructures, 70 PhD students were employed in project activities, and 13 PhD dissertations were defended in areas related to the projects.
- *Knowledge diffusion.* Knowledge spill-overs and diffusion through academia and between academic communities was strong. The implementation of projects led to 105 presentations in conferences / seminars and 102 publications. 9 patent applications were submitted. Evidence on intensive knowledge spill-overs between enterprises is weak.
- *Products.* 96 new products were developed and 38 new technologies were created during the implementation period. The stakeholders believe that their quality meets high standards. Although the evidence is very patchy, it seems that most of the products would have been created even without public funding, but the activities would be of smaller scale, lower quality and the development of products would take more time.
- *Implementation.* Overall, the implementation was very smooth; the MITA funding agency was very supportive. The main problems / issues encountered were caused by inadequate public procurement regulations.
- *Resources.* The overall budget for the new projects (EUR 2.7 mln.) of the programme was adequate to initiate research – business cooperation, but too small to achieve critical mass. Between 2 (biotech) and 8 (ICT) projects were funded per priority and a project on average received EUR 116,000. While some beneficiaries argued that the funding per project was adequate, others suggested that it was too small to develop new commercially viable products. Patchy evidence indicates the substitution of resources: most of the surveyed enterprises that received funding would have developed the products even without public subsidy, and the surveyed enterprises that did not receive funding have implemented the projects from other resources. Previous evaluations[3] found that approx. half of the projects would be carried out (albeit on a smaller scale, with significant delays) without funding.

[3] Public Policy and Management Institute and Association "Žinių ekonomikos forumas", Lietuvos mokslo ir verslo sričių bendradarbiavimo efektyvumo bei finansavimo galimybių koordinavimo vertinimo paslaugų galutinė vertinimo ataskaita, Vilnius, 2011.

Note on methods, tools and reliability of data

Overall, the pilot study suggests that the developed methodology is adequate and could yield high value-added knowledge. The main risks relate to the low response rates (specifically among non-beneficiaries).

Data collection during the current pilot study, however, was limited:

- Methodology envisages four rounds of data collection: immediately after funding decisions were taken, 1 year after the start of the projects, 1 and 2 years after the end of the projects. Since the piloting took place after the end of the programme, all the data collection rounds were collapsed into one. As a result, not all data could be collected.
- The programme under evaluation was of small scale (25 new projects and 6 continued projects). As a result, the survey could not yield significant results (even if the response rate was higher).
- Piloting was carried out under severe time and resource shortages.

All of the above imply that evidence supporting the findings is weak. Findings should be viewed as insights and indications rather than final conclusions supported by broad evidence.

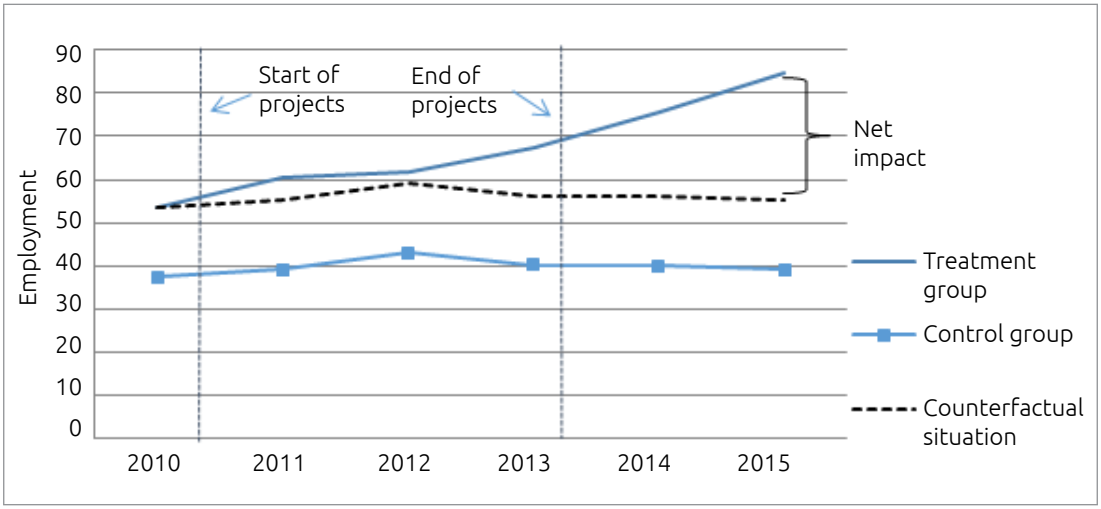
Piloting of methodology of quantitative / counterfactual impact evaluation regarding the Intelektas LT programme

Research design	Counterfactual impact evaluation
Object of evaluation	Intelektas LT. Dependent variable –employment.
Short description of the programme	The programme provided subsidies for R&D projects. 4 calls for proposals were launched between 2009 and 2013. EUR 60.6 mln. was allocated to 286 projects.
Data collection methods	Propensity score matching was used to select the treatment and control groups. Difference in difference was used to assess the net impact. Data on participation in the programme was obtained from public sources (esparama.lt). Data on the economic sectors of enterprises, employment and turnover was purchased from CreditReform. The historical data on employment and turnover (although with gaps) covered 2004-2015.

The main results of the analysis are as follows:

- *Propensity score matching.* Treatment and control groups were selected from all beneficiaries and non-beneficiaries according to the values of the employment variable. Other variables (economic sector, turnover) were not statistically significant.
- *Difference in difference.* There is a positive impact from the second call for proposals on employment (see Figure 4). The net number of new jobs in the treatment group is between 28.7 and 36.1 higher (depending on the matching method) in comparison to the counterfactual situation when the firms did not receive a subsidy. Since a large number of firms from the treatment and control groups also participated in other subsidy programmes, it is highly likely that these results are positively biased and include the effects of other subsidies[4] as well.
- *Other calls for proposals.* The model including data from all calls for proposals is statistically significant, but the difference between the treatment and control groups with respect to employment is not. The model with data from the third call for proposals is not statistically significant. The first and fourth calls for proposals are not appropriate for counterfactual analysis due to the small treatment and control groups (first call) and the fact that the projects are still under implementation (fourth call).

Figure 4. Intelektas LT second call for proposals: impact on employment.



Source: MOSTA, Investicijų į mokslinius tyrimus ir eksperimentinę plėtrą socio-ekonominės grąžos tyrimas, Vilnius, 2015.

[4] Small N did not allow control for the effects of other subsidies.

Note on methods, tools and reliability of data

Overall, the pilot study suggests that the developed methodology is adequate and could yield high value-added knowledge. The results of the analysis of the pilot study are limited to one call for proposals and one variable (impact on employment). This is due to the fact that the pilot study relied only on publicly available information. To facilitate a more sophisticated analysis and the higher value added of results, there is a need for systematic collection of data during and after the implementation of programmes, as outlined in the methodology. Ideally, applicants to similar programmes should be encouraged to work with an entrusted institution in order to access firm-level data from the Department of Statistics.

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