



Benchmarking:

Identifying good practices for innovation policy mix
evaluation

Final report

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1. Introduction

This report summarises specific cases for policy-mix evaluation that can be found in both literature and practice. The document is practically-oriented, so it can be used as a guide for understanding the existing methods for policy-mix evaluation and the steps that should be implemented for conducting such exercises. The cases described are not intended to be exhaustive in terms of the results achieved with the specific evaluations but aim to constitute a set of comprehensive examples that can guide practice.

This benchmarking aims to respond the Interreg Manumix partners demand for further information about how to implement a policy-mix evaluation in practice. Given the novelty of the topic, there are not many examples of such evaluations in the innovation arena, none referred to Advanced Manufacturing and several that comes from the environmental and energy field, in which the policy-mix concept has been widely applied. The methodology for this benchmarking exercise has combined a systematic analysis of the state of the art in both grey documents and academic literature with an in-depth analysis of the cases selected. The selection of the cases has been based on different criteria, trying to keep a balance between the different aims of the evaluations (evaluations aiming to assess the contribution of policy-mixes to policy strategy and evaluations aiming to assess the impact and interactions of policy-mixes) and different types of approaches (quantitative and qualitative approaches).

In order to give a sound structure to the cases presented we use the framework developed by Rogge and Reichardt (2016) for conceptualising the term policy-mix. Briefly, they define policy-mixes as a combination of three building blocks: elements, processes, and characteristics.

'Elements' comprises the **policy strategy** with its objectives and principal plans for achieving them and the **instrument mix** (composed of different instruments each of which has goals and different features) that interact among them.

The content of these elements is an outcome of the **policy process**, which covers all **stages of the policy cycle**, including *problem identification, agenda setting, policy formulation, legitimization and adoption, implementation, evaluation or assessment, policy adaptation, succession and termination*. It resembles a cycle of problem-solving attempts, embodying a **policy learning** continual process.

Both **elements** and **processes** can be described by their **characteristics**, including the **consistency** of elements, the **coherence of processes**, as well as the **credibility** and **comprehensiveness** of a policy mix.

The cases selected respond to evaluations of instrument mixes (from now on we will assume the term policy mixes for that concept) in two ways: first of all, evaluations directed to assess the consistency of the policy-mix with regards the policy strategy (including its contribution) (third level policy mix consistency) and secondly, evaluations directed to assess the impact and effect of the instruments combination, which can be defined as the consistency of the instruments mix (second level policy mix consistency).

2. Methodology and selection of the cases

The systematic search and review conducted to identify suitable evaluations of innovation policy-mix for advanced manufacturing started, as part of a process, from the definition of basic research questions for the benchmarking exercise: *Is there any example of evaluations of innovation policy-mix that has been examined in the advanced manufacturing? If not, do we have any example from a different industrial sector or field of research already studied? Has anyone else made a literature review on this issue or on similar ones previously?*

From this basis of queries, the systematic search started confirming that there was **no previous review** addressing innovation policy- mix evaluations in advanced manufacture or in any other kind of manufacturing segment *per se*. After that test, a **criteria for eligibility** of consistent information was set under the following characteristics and priority order:

- Consistent information was obtained according to certain keywords such as *advanced manufacturing, good policy practices, policy evaluation, policy mix, policy mix evaluation, and science and innovation policy evaluation.*
- Given the technical nature of the search, the sources of information in priority order were basically **grey literature** –reports, working papers, official works and evaluations conducted and written by research centers, governments, departments, agencies, civil society, NGOs, academic centers, consultants, etc. - and **scientific papers** from academic journals.
- The search included empirical or theoretical studies mostly published from 2000 to present time, not dismissing those prominent and well-known references written in the field prior to that date.
- The examined sources were mostly in English; however, some significant information was found in German and French.

On the other hand, different databases –relevant to the examined topic- were accessed to identify studies that could fit the specified search criteria.

In the case of the identified grey literature, the main sources were **SIPER** –*Science and Innovation Policy Evaluation Repository*-, **RISIS Datasets** –*Research Infrastructure for Research and Innovation Policy Studies*-, the **CSTI** –*The Centre for Science, Technology & Innovation Policy*-, the **Regional Innovation Monitor Plus**, the **European Commission Publications**, the **Department for Business, Innovation and Skills**; the **Austrian Institute for SME Research**, the **DINAMIX Project**, the **Manchester Institute of Innovation Research**, among many others.

When it comes to academic papers, the key digital sources were the **Web of Science**, **Scopus**, **ProQuest**, **EBSCOhost**, **Emeraldinsight**, among others. The journals that registered the most significant papers linked to the topic were *Research Policy, Policy Sciences, Technological Forecasting & Social Change, Energy Research & Social Science, Regional Studies, Climate Policy, Journal of Environmental Planning and Management*, and the *Journal of Comparative Policy Analysis*.

Furthermore, a screening procedure were performed based on the general criteria and the keywords utilized, trying to find arguments –experiences, exemplifications and even cases on how to evaluate innovation policy-mixes. One of the most relevant criteria for selecting the cases (apart from the scope) has been the methodological orientation of the cases, as the main

focus of the benchmarking exercise is to extract methodological insights for innovation policy-mixes. For that, it was used spreadsheets to extract all relevant data from each included study.

As a result, a table with the different sources was prepared in Word, which included 56 grey documents and 51 scientific publications linked to some extent to the subject. From this pool was finally selected the four cases of study.

3. Theoretical framework

There is a growing and recent literature on innovation policy-mixes (Flanagan et al., 2011; Magro and Wilson, 2013; 2018; Rogge & Reitchard, 2016, among others) that tackle with several dimensions of the concept and try to define it. One of the most useful approaches is the one developed by Rogge and Reitchard (2016) as it identifies the different elements that interplay under the policy-mix concept.

Thus, the analytical policy mix encompasses more than just a combination of policy instruments; it also includes the processes by which such instruments emerge and interact (Flanagan et al., 2011). Three general features emerge from this: objective(s) of the policy mix, interaction, and dynamic nature. Besides, in the context of this paper (innovation sustainability transitions), a broader policy mix concept is presented as introduces three elements: complexity, of real-world policy mixes, policy processes by which policies emerge/interact and have effects, and a strategic component.

Another bundle of terms, specifically used for characterizing the policy mix, is incorporated to this approach: consistency, coherence, credibility and comprehensiveness; given that, these characteristics bear the potential to impact the performance of a policy mix in terms of the standard assessment/evaluation criteria, particularly regarding effectiveness and efficiency. In this line, for the realization of this extended policy mix concept, there are addressed three basic requirements: the inclusion of a strategic component, the incorporation of associated policy processes, and the consideration of characteristics of policy mixes.

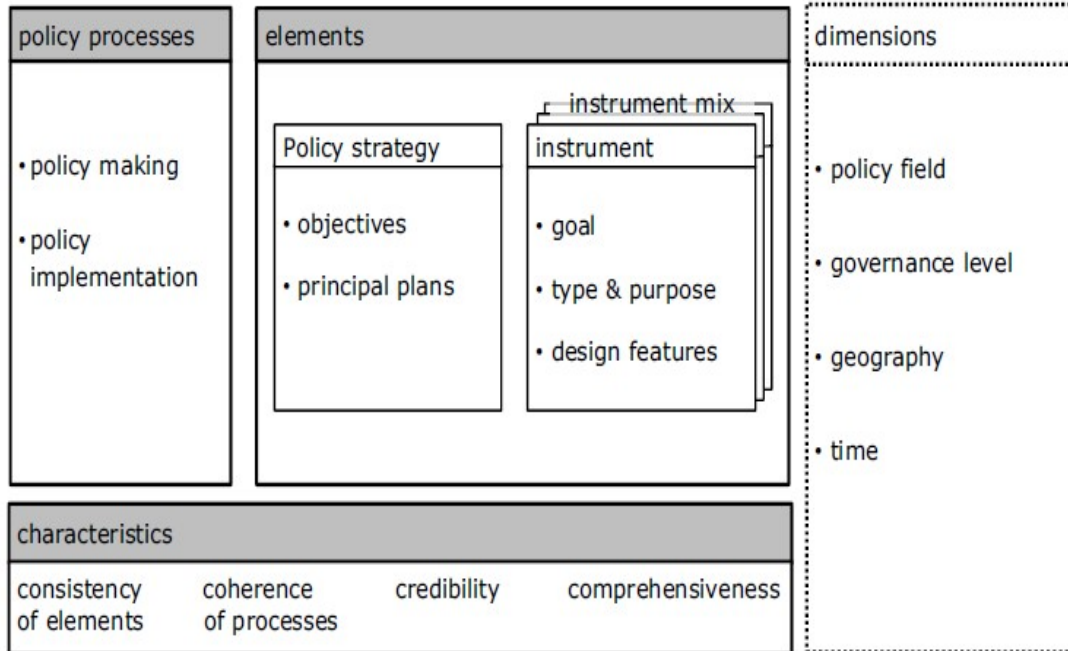
From the creation of these constructs, policy mix is defined as a combination of three building blocks: **ELEMENTS**, **PROCESSES**, and **CHARACTERISTICS**, which can be specified using different **DIMENSIONS**.

Elements comprises the **policy strategy** (*policy objectives, long term targets, principal plan – framework conventions, guidelines, strategic action plans and roadmaps-*), with its objectives and principal plans for achieving them and the **instrument mix** (goals, type, instrument design feature –these can be differentiated by **DESCRIPTIVE DESIGN FEATURES**, such as **legal form, target actors, and duration**; and **ABSTRACT DESIGN FEATURES**, such as **stringency, level of support, predictability, flexibility, differentiation, and depth-**, core and complementary instruments, interactions, goals nature, timing, and operation and implementation process) with its interacting **policy instruments**.

The content of these elements is an outcome of **policy process**, which covers all **stages of the policy cycle**, including *problem identification, agenda setting, policy formulation, legitimization and adoption, implementation, EVALUATION OR ASSESSMENT, policy adaptation, succession and termination*. It resembles a cycle of problem-solving attempts, embodying a **policy learning** continual process.

Both *elements* and *processes* can be described by their *characteristics*, including the *consistency* of elements, the *coherence of processes*, as well as the *credibility* and *comprehensiveness* of a policy mix. Finally, the policy mix can be delineated by several *dimensions*, including *policy field*, *governance level*, *geography*, and *time*.

Figure 1: Building blocks for policy-mixes



Source: Rogge and Reichardt (2016)

This benchmarking exercise is focused on two levels of consistency as defined by Rogge and Reichardt. Those authors highlight that ‘consistency captures how well the elements of the policy mix are aligned with each other’ (p. 1616) and distinguish three consistency levels. We will focus on two of those levels: second level consistency, which refers to the interaction of policy instruments and their effects and third level consistency, which focuses on the alignment between policy mixes and policy objectives (please note that in case 3 the authors refer to this with the word *coherence*).

4. Lessons learnt

In this section we summarise the main lessons we can extract from this benchmarking, according to the cases analysed. We can classify the lessons in two groups: general lessons that can be common to all the analysed cases; and then more specific lessons from the cases that illustrate a general step approach for evaluating policy-mixes.

Among the general lessons that can be extracted from the four cases included in the benchmarking exercise, we highlight the following:

First of all, in order to analyse the **consistency of the policy instruments** among them, it is very useful to define from the very beginning which are the type of interactions object of evaluation. That is, what do we exactly are going to evaluate? What do we mean by the different concepts?

As an example of this, the case 1 defines the concepts of complementary and competitive effects. These interactions can be assessed in different time frames (short, medium, long terms), as it is shown in Case 3. From a methodological point of view, there are different options for carrying out this type of evaluation, although as we observe in the cases, expert evaluation is the most common approach to evaluate policy-mixes. In addition to qualitative techniques, we find that counterfactual analysis (as it is explained in Case 4) allows to identify the causal effect of specific instruments and their combinations. It is the most suitable approach when beneficiaries are firms, but it is difficult to apply in the case of a limited number of beneficiaries (i.e. universities). This approach requires specific knowledge on the quantitative techniques thus, external evaluators could be required. In any case, triangulation of quantitative and qualitative techniques is very useful for policy-mixes evaluation, as seen in Case 2.

Secondly, for evaluating the **consistency of policy-mixes with strategic goals**, it is a good practice for Manumix Partners to take a level –approach (funnel-tunnel) like the one used in Case 2 as a framework and re-scaling it for a regional/national context. With regards methodologies, a meta-evaluation like the one carried out in Case 1 can be implemented at any administrative level or even following a multi-level approach (i.e. how regional instruments and policy-mixes contribute to national policy goals). Besides, an approach for analysing policy mixes can also contribute to assessing the evaluation and monitoring system of a government/department. The cases (Case 1 and Case 3) also show that it is difficult to apply exclusively quantitative approaches to measure the contribution of policy-mixes to policy objectives, since it is likely to find data gaps. In order to solve this, qualitative approaches are the most adequate ones. In fact, the cases (except Case 4) specially emphasize the role of qualitative techniques.

Finally, it is worth mentioning that while the emphasis is placed on ex-post evaluation (Case 1, 2 and 4) ex-ante evaluations are useful for analysing the different options and potential impacts when designing a policy-mix. For that purpose, we can use quantitative and qualitative techniques as well (see Case 3).

Besides these general lessons, some common basic steps can be identified for policy-mix evaluation. These are listed next, including insights derived from the four cases:

1. **Definition of logical frameworks.** It is a good practice to define a logical framework of the set of instruments and their joint expected impact regardless of the specific approach used to evaluate the policy mix. This exercise allows outlining and understanding the logic behind the interventions, their relationship with strategic goals and the specific outputs and impacts that instruments are expected to have. Cases 1, 2 and 3 provide examples of logic frameworks defined as first step of the evaluation. Moreover, Case 2 uses theory of change and theory-based evaluation, which help understanding the mechanisms of change in policy-mixes, identifying why policy-mixes lead to certain impacts. This approach can be employed for individual impact evaluations as well. As for Case 3, it constitutes an example of defining impacts following a holistic view, not only taking into account direct impacts but also indirect and considering many different areas such as environment, economy or society.

2. **Categorisation of policy instruments.** A categorisation of the interventions can be done as a previous step of the evaluation exercise since different instruments behave differently, as seen in Case 1 and Case 2.
3. **Literature review.** Theoretical and empirical evidence from previous studies can be used in policy-mix evaluation with different purposes. In Case 1 and Case 3 literature review was used as a substitute source of information when other type of primary data does not exist, and provided information on, for example, the likely contribution of a specific policy in a output or the possible impacts of a particular intervention.
4. **Collecting and analysing data.** There are different insights derived from the four cases with regards to methods for collecting and analysing data:
 - One of the most important issues for every type of evaluation is to systematically collect data, which usually comes from different sources. Therefore, designing the data collection carefully from the very beginning is a key issue for evaluating policy-mixes (either quantitative data bases or templates for qualitative evidence collection). (In Case 1 we can find an example for qualitative evidence collection).
 - Quantitative data is the main input for counterfactual analysis (see Case 4), either from primary or secondary sources. Therefore depending on the available data, the results of the evaluation will be more or less robust. Therefore, data might also be the main constraint of this method. Likewise, it is important to count with data from the same indicators for several years (before and after the interventions). This might be difficult in recent implemented instruments or for analysing policy-mixes when the instruments implementation differs in timeframe.
 - The definition of the control groups, which also depends on the data, is the most important step for doing counterfactual analysis (as Case 4 shows), as results will be conditioned by that definition.
 - By its part, meta-evaluations (evaluations based on existing ones) are a good approach to evaluate policy-mixes when counterfactual approaches (see Case 4) are difficult to apply (see Case 1). Therefore, for establishing a policy-mix evaluation system under this approach, a first step is to implement individual instrument evaluations. In this type of evaluations, it is very useful to establish quality criteria to assess the robustness of previous evaluations before using them as evidence.
 - In the cases in which data is missing, research evidence (quantitative results from other analyses) and secondary data from official statistical sources can be used as proxies(see Case 1).
 - Other techniques, such as seminars, surveys and interviews make possible to incorporate different voices in the evaluation process: policy-makers

responsible for the instruments and beneficiaries. They are useful for assessing behavioural additionality of policy-mixes (see Case 2).

- Desk research and experts views are some additional methods that could be implemented for policy-mixes evaluation. To this regard, experts should follow some guidelines, in order to have the same focus and a template is very adequate to this (see Cases 1 and 3).
- For analysing policy-mixes contributions (or at least potential contribution) to higher objectives the creation of a composed indicator is a useful approach (such as the performance score in Case 1).
- Finally, we can also highlight quantitative ex-ante techniques, which are based on macro-modelling and qualitative on experts' opinion (based on desk research). In the cases expert knowledge is a method for evaluation, defining a scoring system provides simplicity to the results (see Case 3).

5. Case description

CASE 1: Synthesis of evaluation evidence. Final report for the Department for Business, Enterprise and Regulatory Reform¹

Author: SQW Consulting

Year: 2009

Summary

The synthesis evaluation presented in this section was carried out in 2009 by SQW consulting, a consultancy firm commissioned by the Department for Business, Enterprise and Regulatory Reform (BERR) from UK.

The evaluation is based on a meta-analysis of existing evaluation reports of all interventions from BERR. Its objective was to determine the extent to which these interventions contribute to BERR objectives. By doing so, it also places a focus on the interactions among the interventions on their aim to contribute to BERR objectives. Likewise, the evaluation had the aim of identifying evidence gaps and best practices in current evaluation practices of BERR in evaluating the contribution of policy interventions to BERR objectives.

Due to evidence gaps in the existing evaluations (at that time) the study determines that it was not possible to quantitatively estimate the contribution of the intervention to higher objectives. Nevertheless, by using other evaluations' and research evidence the study did identify the interventions that are most likely to contribute to strategic objectives.

The study is relevant as it can be an example of (1) how to assess the contribution of policy instruments to strategic objectives; (2) how to infer potential contributions where data for quantitatively assessing contribution does not exist (3) how to determine evidence gaps in an evaluation system for achieving the evaluation goals, and thus, pointing out how to improve it (4) how other types of evidence (previous studies and research evidence) can be used in order to fill the gaps and extract conclusions that can inform policymaking.

1. Objective of the evaluation

The objective of this evaluation, which was based on historic evaluation evidence, was to determine the contribution of interventions from BERR both to the Department's strategic objectives (DSO) and to Public Service Agreement (PSA) objectives - the three-year objectives set up by UK government to each Department.. DSO and PSA objectives are detailed in Figure 2 in next section.

¹ Full reference of the report: SQW Consulting, 2009. Synthesis of Evaluation Evidence: Final report for the Department for Business, Enterprise and Regulatory Reform. BIS: London.
Note that all references to "the Report" relate to this document.

Concretely, the aim and subsidiary objectives of the study were set up as followed:

Primary objective:

To assess the extent to which it could be inferred from the evidence what the contribution of the evaluated interventions had been to current high level BERR objectives (i.e. the current PSAs and DSOs) - with a particular focus on improving UK productivity and its drivers.

Subsidiary objectives:

- *explore whether the syntheses of the evaluated interventions enabled them to be ranked in terms of their likely contribution to productivity, in order to assess whether particular types of interventions were more likely to have a positive impact than others;*
- *examine the degree to which the interventions were competing or complementary in terms of this contribution;*
- *identify gaps in the evidence base that need to be addressed to improve understanding of the contribution made by BERR interventions to higher level objectives;*
- *suggest lessons for the best practice evaluation methods that would need to be adopted to address the gaps identified in the evidence base.*

2. Context

In the period where the evaluation was carried out (2009) UK Government had established Public Services Agreements. PSA consisted of 30 aims (e.g. raise the productivity of UK) with more concrete objectives and responsibilities for delivering it for each Department of the Government. Besides, the BERR had also some strategic objectives (DSO).

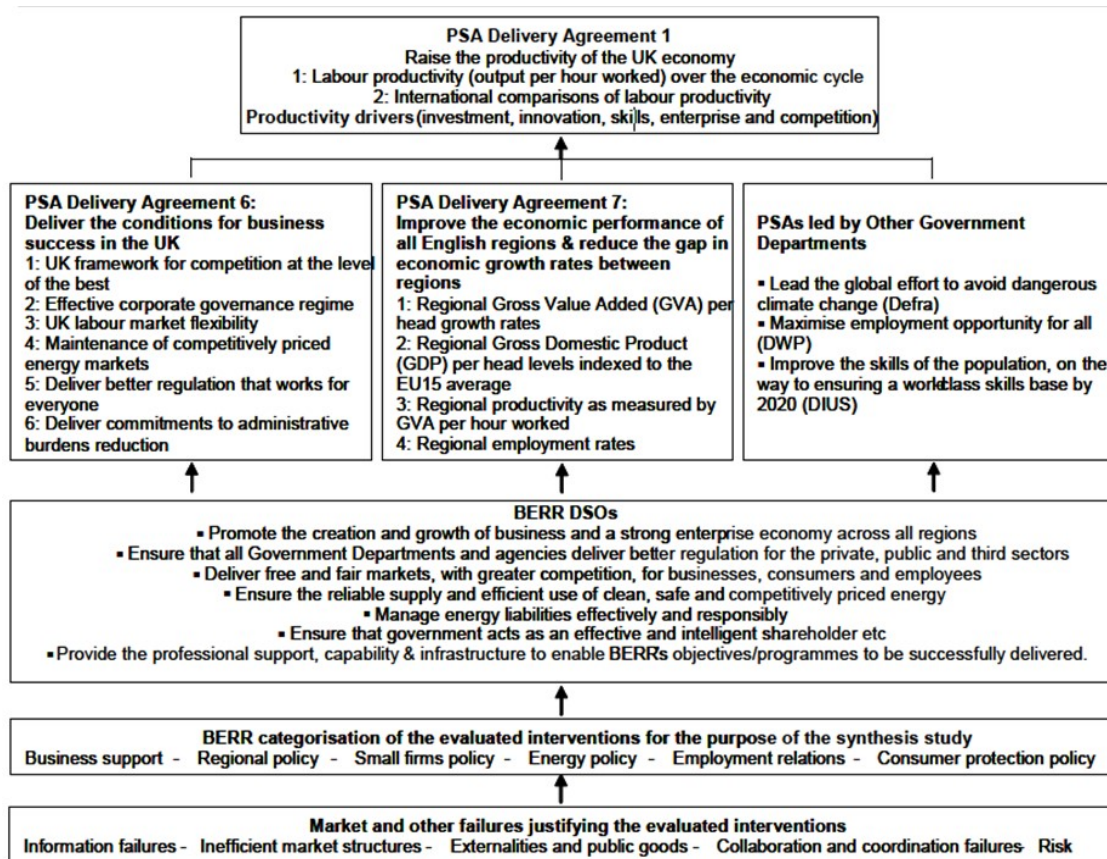
These higher level objectives, both PSA and DSO, were to be achieved by the interventions of the Department, which included more than 50 schemes. These schemes include a wide variety of programmes that aim to respond to different failures through different interventions. For the purpose of the study, the BERR categorized these into the following categories:

- a) Categorization of BERR intervention: business support, regional policy, small firms' policy, energy policy, employment relations, and consumer protection policy.
- b) Market and other failures: information failures, inefficient market structures, externalities and public goods, collaboration and coordination failures; risk.

Figure 2(next page) draws the general picture of these BERR intervention categories and high level objectives. As illustrated in Figure 2, what the evaluation aimed to do was to analyse how the interventions were working upwards in the figure; that is, to analyse the contribution of the interventions to higher level objectives.

A special emphasis was put in the objective of increasing UK productivity and its drivers (top box in Figure 2). The productivity drivers were defined by BERR as: investment, innovation, skills, enterprise and competition. That is, as it will be further discussed later, the evaluation tries to link the intervention to those drivers.

Figure 2. Higher level objectives and categories of BERR interventions



Source: SQW from the PSA Delivery Agreements (October 2007) and the BERR CSR/PSA web page

Source: SQW Consulting (2009, p.2)

The evaluation is based on a synthesis of historic evaluations of the interventions. Thus, it was developed in a context where previous evaluations did exist. Concretely, it draws from 135 evaluations of BERR's policy interventions and 6 evaluation reviews related to different policy interventions, on specific dimension and with different focus.

3. Scope of evaluation

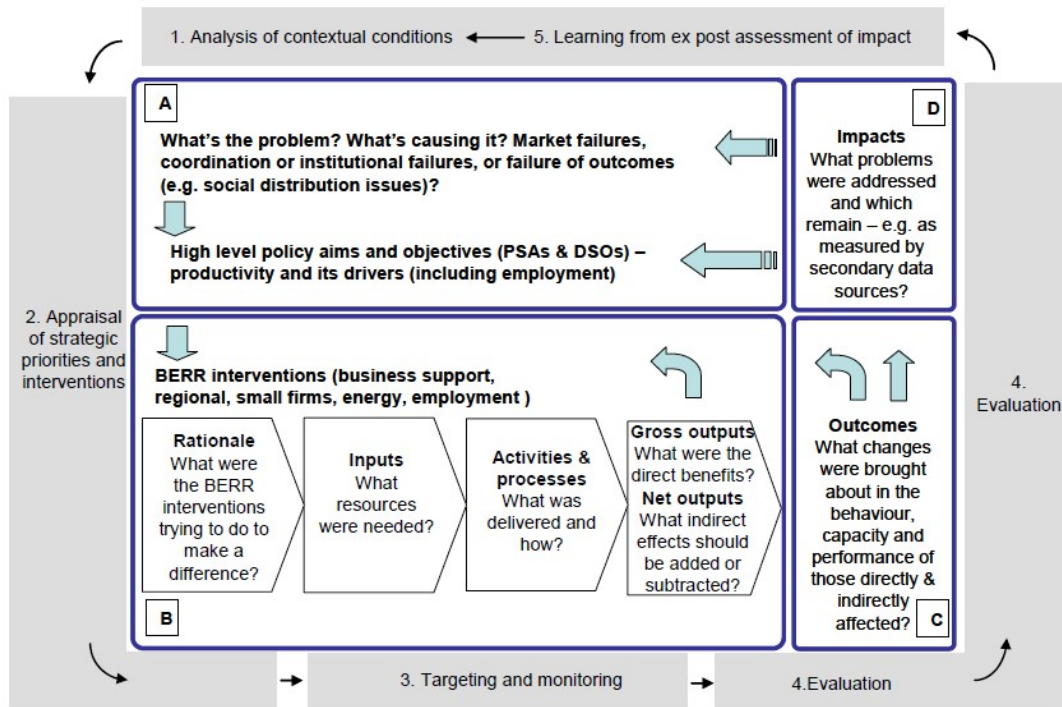
The evaluation is based on historic evaluations of all policy interventions by BERR, which cover different periods between 1977 and 2007. 135 evaluations were included initially, although as it will be described in the next section, this number was narrowed down through different stages of analysis based on the scope and robustness of the evidence base. The evaluation also takes into account and includes other previous reviews and substitute information, in a process that will be further explained in Section 4.

In terms of the policy mix framework by Rogge & Reichardt (2016), the study focuses on two dimensions: the consistency of the instrument mixes with policy strategic objectives, and - although in lesser extent- also on consistency among the instruments within the instrument mix.

The study reconstructed a general logic framework (Figure 3) for establishing the relationship of BERR interventions with higher level objectives, that is, the relationship of intervention rationale

(problem that aims at addressing) and the direct results of the intervention with their outcomes and impacts. The study focuses on the impacts, on quadrant D.

Figure 3. Logic framework for BERR interventions



Source: SQW Consulting (2009, p.4)

It must be clarified that the study defines results, outputs, and additionality as follows:

Output	<i>Direct and measurable results of an intervention</i>
Outcomes	<i>The effects of the behaviour, capacity and performance of the business and people directly and indirectly affected</i>
Impacts	<i>Changes induced in the contextual conditions that gave rise to the intervention in the first place</i>
Additionality	<i>The difference between net and gross outputs after allowance has been made for negative deadweight, displacement, substitution and leakage effects plus positive spill-overs and other wider effects.</i>

With regard to the interactions between the instruments, these are analysed in their relationship with strategic objectives. That is, what the study (briefly) analyses is the extent to which interventions are competitive or complementary in the light of increasing productivity and its drivers. Competitive and complementary interactions, which are defined in the study as stated below, include interactions at the strategic level (design of interventions) or at the operational level (delivery).

Complementary interventions	<i>Those that reinforce each other and, by doing so, increase the likelihood that policy objectives will be met.</i>
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Competitive interventions	<i>They pursue mixed objectives with the same group of stakeholders and/or in the same policy domain and at the same time (...) or (...) they provide apparently duplicate or competing services.</i>
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4. Methodology: the synthesis method

The evaluation mainly based on a synthesis method (later explained) involved diverse stages, which are now described.

4.1. Defining how to infer impacts

The first step after depicting the logic framework of intervention and the focus of the study on impacts was to determine how to quantitatively infer impacts, that is, how to infer the contribution of BERR interventions to higher objectives. Three different methods were assessed: evaluation evidence, research evidence and secondary data and substitute information.

Evaluation of intervention can be designed as to provide information on net outputs, outcomes and impacts, which requires sophisticated evaluation methods (e.g. counterfactual). When not possible, evidence from other evaluations can be used as substitute information.

Research evidence was reviewed to supplement evaluation results. As the study reports, research evidence can be useful to identify the relationship between productivity drivers and other elements and to infer relationships when there is a lack of evidence in the existent evaluations. For example, when there is a lack of estimates of outcomes and impacts of an intervention and research evidence suggest that there is a relationship between improved innovation and total factor productivity, coefficient suggested by that research can be applied to infer contribution.

Secondary data can be used, according to the report, to compare estimated outputs and outcomes of interventions with changes in relevant secondary data (e.g. official statistics). It can also be used as substitute information when evaluation does not provide information on outcomes. However, in order to use secondary data these need to be disaggregated at levels which are relevant for the specific evaluation purpose.

Thus, the Evaluation made a review on research evidence to identify causal relationships between drivers, productivity levels and growth. Equally, it reviewed existing secondary data from official statistics and indicators of PSA agreement with a disaggregation level (in size of firm, geography and sector) apt for the purposes of the evaluation. The study revealed that some of that information could be used but with care. Lastly, information on previous evaluation reviews was also assessed to determine its usefulness as substitute data. All this secondary data was later used to fill gaps when there was not available data on evaluations to infer the impact of evaluations to productivity and its drivers.

4.2. Developing the synthesis method

Once established that impact would be inferred by using evaluation results, and where insufficient, by using secondary data and research evidence, the evaluation consisted on developing a synthesis method. This method involved collecting information relevant to assess contribution; filtering the included evaluations according to the information they provided and their robustness; and afterwards, analysing contribution to higher level objectives through a variety of means. As it will be explained, the lack of data limited a quantitative assessment of contribution, which had to be substituted by an analysis of potential contribution of intervention to productivity and its drivers. Different steps of the analysis are detailed next.

Step 1: Design of a template to collect information on evaluation evidence

The evaluation team defined a template (See Annex D in the Report) in order to systematically collect the information derived from existing evaluations of BERR interventions and extract evidence about (1) costs, outputs and outcomes (2) characteristics of the interventions; and (3) their potential contribution to objectives.

Step 2: Assess which evaluations to include in the analysis

The Steering Group of the evaluation identified 135 potential evaluations to include in the evaluation exercise. These were later narrowed down to 86 due to clear lack of data or other reasons (e.g. transfer of interventions to other Department). Based on the recorded data from the templates, the evaluation team excluded some other evaluations after finding a lack of data for assessing impact.

Step 3: Analysis of robustness of evaluation of selected interventions

Finally, 63 interventions were analysed, specially assessing the robustness of the evaluations in terms of impact. This was done through grading certain criteria that the evaluation team had previously defined to assess robustness (Box 1).

Box 1. Components for analysing robustness of evaluations

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1. **Scope:** Does the evaluation cover all the issues?
 2. **Design:** Is the evaluation method well designed?
 3. **Data:** Does it generate and use reliable data?
 4. **Analysis:** Does it use reliable techniques to assess causality?
 5. **Robustness:** Are the judgements transparent and justifiable and the limitations clear?
 6. **Impartiality:** Are conclusions and recommendations based on the evidence and adequate benchmarks?
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Source: SQW Consulting (2009, p.19)

This way, an aggregate score was produced that enabled to rank the interventions in terms of their robustness. This was complemented by further analysis of the recorded information. However, posterior quantitative analysis of correlations (see next section and Annex F in the Report) made separately for the most robust 45 evaluations did not show any difference in results compared to results of 63 interventions. Thus, the posterior analysis and conclusion of the Report are based on 63 evaluations.

Step 4: Analysis of types of interventions and its relationship with higher level objectives

The evaluated interventions (63) were then categorized in terms of the BERR category stated in Section 2 (e.g. business support, small firms policy), the productivity driver which they were linked (e.g. innovation, investment), the market failure that they address (e.g. information), and the higher level objectives that they were most likely to address.

This exercise enabled to overview the distribution of the interventions on the different dimensions, which has implications for the results of the analysis. Concretely, the analysis revealed a concentration of evaluated interventions on specific BERR policy focus (business support, small firms and regional policy), productivity drivers (enterprise and innovation), market failures (information failure and inefficient markets), Department Objectives (promotion of business creation and growth) and PSA objectives (business success and regional balancing). This concentration limited the scope of the analysis. For example, a discriminatory analysis of performance of interventions based on different productivity drivers was no longer possible due to this concentration of interventions.

Equally, a further desk analysis of the information provided by the templates concluded that there was not systematic data to quantitatively infer the contribution of the interventions to higher level objectives (e.g. lack of quantitative estimates of outcomes of beneficiaries, because results of many interventions were not measured on those terms but on % of beneficiaries with improved performance).

Step 5: Assessment of the contribution to high level objectives: performance score

The analysis made in the previous step determined that it was not possible to assess quantitatively the contribution of each intervention to high level objectives (more detailed information on concrete quantitative analysis in Annex F of the Report).

In order to provide an alternative way of analysing contribution to objectives, a performance score was designed that would be applied to all interventions to define characteristics more likely to be conducive of higher contribution to objectives. The performance score was built by defining four factors that were judged to be relevant for determining the likelihood of an intervention to lead to higher contribution to productivity and its drivers:

- low public expenditure per beneficiary
- high number of assisted beneficiaries
- high net/gross output % (=high additionality)
- high contribution to productivity drivers.

An extra weight was given to the last two components. And where no information about one of those components existed in evaluations, this was filled with either information from previous reviews or with estimates through extrapolation from average made by the team (more information in the Report, pp. 23-24 and Annex F). This enabled to rank interventions in terms of their likely contribution to productivity and its drivers.

Step 6: Analysing association between performance score components and relationship between intervention characteristics and potential contribution to high level objectives

A correlation analysis was conducted between the components of the performance score stated above (e.g. between public expenditure and productivity driver) to draw some conclusions on the characteristics of the interventions more likely to lead to productivity growths. For example, this analysis allowed to draw that *productivity contribution of an intervention tends “to be higher where there is higher public expenditure per business and lower numbers of assisted businesses”* (p.27).

Further analyses were also carried out to find out the correlations between the performance score and other intervention characteristics (expenditure, additionality, etc.). More specific information about the concrete analyses and their results can be found in the Report (pp.27-32 and Annex F). But, as an illustration of the type of information and conclusions that can be drawn from this type of approach some of those are outlined briefly next:

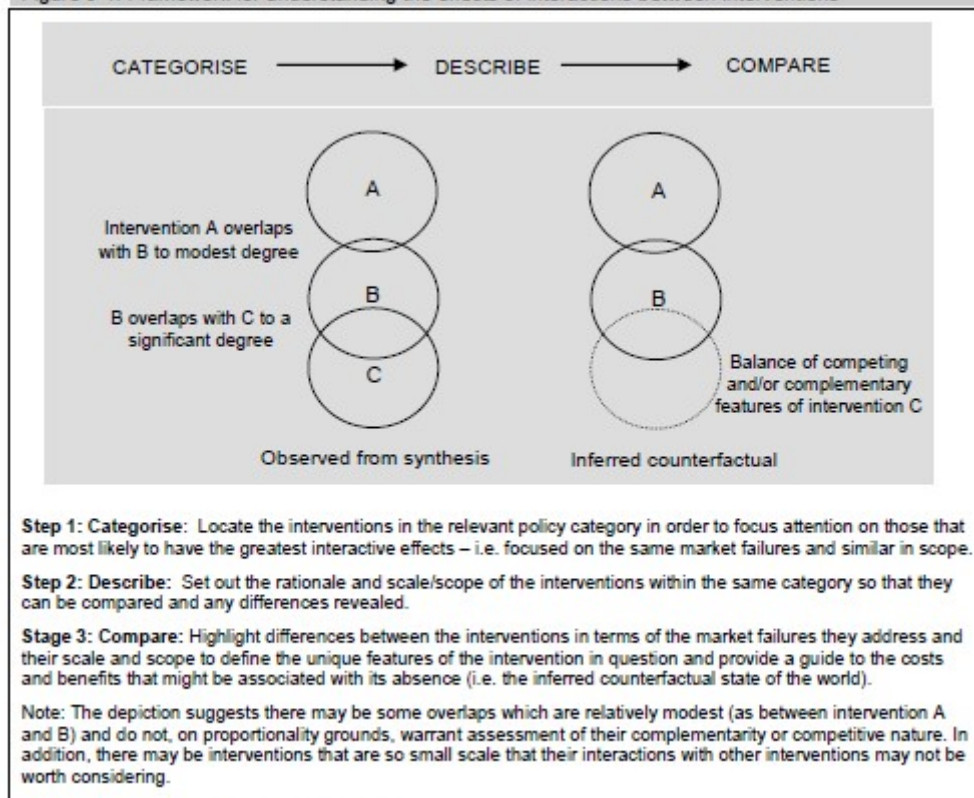
- Correlating contribution to higher objectives (performance score) with intervention characteristics. The analysed characteristics include, among others, BERR category, types of participants, or market failure rationale of interventions. The conclusions of these analyses are tentative, but revealed the characteristics of the interventions which are more likely to contribute to productivity and its drivers. For example, the report concludes that there was “a tendency for the overall performance of the interventions to be higher where they were generic in kind and focused on the enterprise productivity driver ” (p.28).
- Correlating contribution to higher objectives (performance score) with total expenditure. An analysis was developed to link the total expenditure of the interventions with their performance score, which determined, among others, the inexistence of a correlation between these two elements.
- Additionality (net/gross outputs). Based on previous reviews and also from the analysis with the performance score, the study determines that more intensive interventions tend to increase their contribution to objectives.

Lastly, a special analysis was made on the efficiency of interventions, by looking at specific evaluations that scored high in the performance score (more information in Annex G of the Report). However, the in-depth look at these interventions revealed –again- that it was not possible to do a quantitative assessment of efficiency, since most evaluations assessed business efficiency gains through % of businesses that have self-reported efficiency gains. However, the detailed analysis of the information provided by evaluations did enable to identify relevant intangible drivers such as management practices and improved networking on those interventions that reported high efficiency gains.

4.3. Analysis of complementarity/competition between interventions

The interactions between interventions were assessed following the framework depicted in Figure 4.

Figure 4. Framework for understanding the effects of interactions between interventions



Source: Adapted from Frontier Economics DIT (2006)

Source: SQW Consulting (2009, p.37)

Following this framework, the evaluation exercise:

- (1) categorized the interventions in terms of a) BERR categorization; b) market failure they address; c) productivity drivers they are to contribute
- (2) And included information/comments on the interactions of the interventions with other interventions.

The synthesis table can be found in Annex H, Table H-1 of the Report. An extract is depicted below (Table 1) as an illustration of the exercise carried out to analyse (subjectively) interactions or potential interactions between instruments.

Table 1. Categorisation of interventions and the interactions between them in BERR (extract)

Intervention (and period evaluated)	Market failure(s)	Productivity drivers (and targeted scope)	Commentary or inference on interactions
SMALL FIRMS POLICY			
Business Link (1995-2003)	Lack of awareness, underestimated benefits – information asymmetries plus institutional failures	Enterprise (individual SMEs & start ups national but delivered sub-regionally)	Support agencies integrating their services more and BL stimulated, rather than displaced private sector services
Small Firms Training Loans (1994-1998)	Externalities	Enterprise (individual businesses in the UK)	Small scale – unlikely to be significant interactions
Supply Chain Development and Management (1997-2001)	Lack of awareness, underestimated benefits – information asymmetries and imperfect information	Competition (groups of firms targeted at SMEs in the UK)	Indirect evidence from low deadweight and positive outcomes that likely to be a complementary initiative
Small Firms Loan Guarantee (1993-1997)	Lack of awareness/underestimated benefits – information asymmetries and imperfect information	Enterprise (UK SMEs)	Rational valid - remains a small firms financing problem – hence a complementary scheme
Company Rescue Scheme Pilots (2001-2002)	Collaboration/Co-ordination failure	Enterprise (firms in regions - focus on SMEs)	Small scale – unlikely to be significant interactions
BUSINESS SUPPORT			
Manufacturing Advisory Service (2002-2005)	Lack of awareness, underestimated benefits – information asymmetries and imperfect market for information	Investment (SMEs and other size businesses in manufacturing in England & Wales - delivered regionally)	MAS works in conjunction with BL which provides more general business advice – complementing manufacturing element of SBS Gateway
Biowise (1999-2004)	Lack of awareness, underestimated benefits – imperfect market for information	Innovation (firms in textiles, chemical and engineering in the UK)	Nearly half of 'high level users' thought alternative sources of support were available – private sector

Source: SQW Consulting (2009, p.H1)

This exercise revealed that very few evaluations had this mix perspective concentrated in the (competitive/complementary) interactions among the interventions. However, some possible interactions were also revealed, like for example, the interactions between the Business Link scheme and the Manufacturing Advisory Services (both in Table 2) with other private services. Or for example, small scale interventions may puzzle beneficiaries on the financial support available to them while not making any significant real difference (for their low amount).

4.4. Additional information provided by the synthesis study

Besides the analysis of (potential) contribution to higher level objectives of interventions, which also considers slightly the interactions among the interventions, the synthesis study also served to identify:

- evidence gaps for assessing contribution of policy interventions to strategic objectives (e.g. lack of evidence on net outputs, few assessments on substitution effects, on impacts or on cost-effectiveness)
- best practices in evaluation, in terms of a) comprehensiveness of coverage of evaluation issues included; or b) robustness in which specific issues were addressed (e.g. counterfactual)

Thus, an evaluation approach like the one developed in this report enables to identify evidence gaps that should be taken into account in an evaluation system when aiming at assessing an specific dimension (in this case, the contribution of intervention to strategic objectives) and also identify best practices that can be used to improve evaluation of other interventions.

5. Main results you can extract from this type of evaluation

Developing an evaluation based on historic evaluations like the one developed for BERR interventions allows having results and insights for informing policymaking and better evaluations in two different dimensions:

- (1) On the one hand, with regards to strictly evaluation results, it must be clarified that these will depend on the level and type of evaluation data available in the context where the evaluation will be carried out. In this particular case, several data gaps were identified, which led to evaluate the potential contribution of interventions to higher objectives rather than the real contribution. If data is available, the framework adopted in this evaluation exercise provides a framework for analysing the real contribution of policy instruments to strategic objectives. Likewise, when data is lacking to quantitatively assessing the contribution, the approach adopted (by filling in evidence gaps and defining a performance score) can help analysing interventions with regards their potential contribution to objectives. Thus, it can provide results that respond to the questions: what instruments are (or are likely to) contributing more to our strategic objectives? What are the characteristics of the interventions that are contributing (or are likely to contribute) more to higher level objectives?

Besides, the approach adopted for analysing interactions among instruments further helps identify existing or potential complementarities at the strategic level and operative level in their contribution to objectives.

- (2) On the other hand, this type of evaluation can contribute to assessing the evaluation and monitoring system of a government/department. By systematically collecting information on evaluations carried out and identifying the evidence gaps for evaluating specific aspects (in this case, contribution to higher level objectives and also the interactions between policy interventions) can be a means for learning and improving evaluation systems so that they respond to the needs for informing policymaking. Identifying best practices in evaluation can also be used for this purpose.

An experience from a Manumix partner analysing contribution of policy-mix to strategic objectives

The Basque Government has recently analysed its innovation policy mix's contribution to strategic objectives. The steps carried out are outlined briefly in this note to provide another example on how to approach this type of evaluation.

Context, objective and scope of the evaluation

This evaluation exercise is part of the evaluation system established for the Basque "Science, Technology and Innovation Plan Basque Country 2020" (PCTI 2020 in the Spanish acronym). The evaluation of PCTI2020 is comprised of: (1) annual monitoring of the RIS3 strategy implementation (2) biannual analysis of the Basque Science, Technology and Innovation System (3) evaluation of agents of the Basque Network of Science, Technology and Innovation; and (4) biannual assessment of the contribution of innovation instruments to PCTI220 objectives. All of them are carried out by Innobasque – the Basque Agency of Innovation, commissioned by the Basque Government. This note summarizes the methodological steps of the analysis of the contribution of the innovation policy mix to the PCTI2020 objectives (the fourth component), which has been carried out for the first time in 2018, and thus, it is considered a pilot analysis.

The analysis' goals were: (1) to assess the contribution of a selection of instruments of the Basque innovation policy mix to PCTI2020 objectives; (2) to assess the extent to which the objectives of the PCTI2020 are covered by the innovation policy mix; (3) to assess the alignment of instruments' monitoring system with the PCTI2020 indicators.

The analysis, due to its pilot nature, includes a selection of programmes of the whole policy mix that is representative of each of the 5 main categories of instruments (e.g. support to the business innovation ecosystem, generation of scientific and technological capacities). In terms of the policy mix framework by Rogge & Reichardt (2016), the study mainly focuses on the consistency of the instrument mixes with policy strategic objectives.

Methodology

The analysis involved: (1) To identify the PCTI2020 objectives and their sub-objectives; (2) To qualitatively determine the impact of each analysed programme to sub-objectives; and (3) To analyse existing indicators that assess the impact of each programme, in order to determine quantitatively –when data existed- the real impact of programmes in sub-objectives.

Qualitative analysis of the contribution of programmes to PCTI objectives was carried out as follows:

1. Definition of types of contribution: primary (the PCTI sub-objective constitutes a main purpose of the programme), secondary (the sub-objective is not one of the main purposes but the programme does affect it indirectly), or no contribution.
2. Determine the type of contribution of each programme by analysing the decrees of the programmes. The external evaluation team interpreted the match between the objectives of the programmes and the sub-objectives of the RIS3, and classified the programmes accordingly.
3. Contrast with programme owners and managers to readjust the analysis of primary/secondary contribution.

Quantitative analysis involved:

1. Analysis of the monitoring system of each programme to determine the extent to which data exist to assess the impact of the programme to RIS3 objectives, and identify data gaps. The information was collected by asking programme managers.
2. In programmes where indicators exist further analysis was developed to establish the contribution of the programmes to the PCTI objectives. These were collected through programme managers. Indicators most of the times cannot establish the exact contribution, but rather confirm whether they have contributed or not. E.g., % of SME beneficiaries of a programme that self-report that have developed R&D activities enables to determine that that programme has contributed to the objective through a programme, it is assumed that it has contributed to "to increase the number of companies that develop R&D".

Type of conclusions derived from the analysis

Due to lack of relevant data that is aligned with RIS3 objectives indicators (e.g. the example just mentioned about % increase in R&D) it was difficult to assess quantitatively the real exact contribution of the programmes to the strategy. However, this pilot exercise by Basque Government is interesting in that: a) it provides an example of how to start analysing the alignment of a policy-mix to a regional strategy; b) assess the degree to which strategic objectives are covered by innovation instruments and identify gaps; b) identify data gaps in the monitoring system.

CASE 2: Support to SMEs – Increasing Research and Innovation in SMEs and SME Development. Ex post evaluation of Cohesion Policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF). European Union Commission (2016).

Author: Florio et al.²

Year: 2016

1. Summary and objective of the evaluation

This case discloses an ex post evaluation of the Cohesion Policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF). It aims to assess the effects of ERDF support to micro, small and medium enterprises (SMEs) and to outline the mechanisms and context features that explain why and how these effects were achieved.

Throughout the case, the authors suggest that policy-mixes should be understood, and thus designed, as the result of a profound analysis of the multiple interactions between contextual mechanisms, specific features, distinct challenges, and particular stakeholders (e.g. wide variety of SMEs throughout the EU, barriers preventing SMEs from developing and innovating, context-related variables that explain capacities and performance, etc.).

According to the researchers, this approach rooted in the *Theory-based Impact Evaluation* shapes a specific time-based situation of the target group/sector in which it is intended to intervene, and explains the present and potential future effects of feasible policy-mix implementations. This scope rationalises the utilization of the *Bayesian Network Analysis* by the authors, as argued in the methodology section below.

2. Context of the evaluation

Background, geography and context of ERDF support

During 2007-2013 Europe experienced a period of significant support to SMEs provided by the *European Regional Development Fund (ERDF)*. The financial resources invested in aid programmes to SMEs amounted to almost € 47.5 billion³ –76.5% of the total volume for business support and 16% for allocation.

This initiative reported a small number of beneficiaries to support; approximately, it identified 246,000 SMEs beneficiaries -nearly 60% of all ERDF policy instruments-, which was an obvious small share of EU SMEs, overlooking the indirect beneficiaries commonly not recorded in the monitoring systems and implying 2% of 15.7 million small and medium firms totalled by countries and regions. It varied extensively from less than 1% of its *Operational Programmes* OPs (Spanish, French, and Poland –Mazowieckie-) to almost 10% or more (Lithuania, Finland – north region-, and Swedish –Norra Mellansverige and Övre Norrland).

² Florio, M., Graeme, B., Astbury, P., Armstrong, H. W., Audretsch, D. B., Dermastia, M., & Vignetti, S. (2016). *Support to SMEs- Increasing research and innovation in SMEs and SME development. Final report. Work package 2.* ZEW-Gutachten und Forschungsberichte.

In contrast, a large number of policy instruments were offered, addressing *six hundreds and seventy* (670) policy instruments to SMEs –mobilized by the 50 OPs reviewed- and assisting approximately 550 SMEs with a high degree of variability. It encompassed either beneficiaries of eco-innovation instruments (Hainault, Belgium or Burgenland, Austria) or 8,000 beneficiaries of a concrete Spanish OP Technology Fund’s policy instrument, as well as 9,000 beneficiaries of the Italian OP Piedmont’ Guarantee Fund.

Additionally, there was a large difference in the size of investment projects. For instance, the volume directly allocated by the ERDF funds to each SME was approximately € 115,000³, while the investment projects size ranged from few thousands euros to some millions. This indicates the different potential roles played by the European Regional Development Fund.

It is worth noting that the geographic policy intervention of ERDF’s support converged in major urban areas. However, the ERDF addressed and executed their strategies in contexts that vary in many aspects. For example, there were well performing regions and innovation leaders who suffered only marginally the effects of the crisis. There was a limited but focused ERDF allocation in some performing regions and mostly centered on research and innovation concerns, such as the competitiveness regions in Denmark, Sweden and Finland.

On the other hand, large volumes of ERDF were implemented in regions lagging behind, with venerable structural difficulties increased due to the acute economic crisis, moderating innovators disposition to flourish. These received substantial volumes of economic stimuli from ERDF, often the only source of funding for industrial policies in what we know as convergence regions⁴.

The contextual logic of the policy intervention

On the other hand, and in contrast to this complex and compound context, the examination of the Operational Programmes (fifty one) and the exhaustive case studies showed that these implemented relatively homogeneous theories of change mostly rooted in the Lisbon strategy’s broad goals. The approach implied that *growth* and innovation were to be assumed as the key objectives for the application of policy instruments. Nonetheless, this approximation was set with little precise recognition of the different supporting ***Theories of Change***⁵. In other words, instead of making precise alternatives, OPs frequently embraced dual strategies encompassing both objectives.

Indeed, there was an adoption of demand-driven approach to deal with SMEs’ needs. The deployment of multiple policy mechanisms, an average of 13 instruments per OP, reflect the determination of *Managing Authorities* to deliver full complement of support measures to possible recipients from which to opt for. For instance, 50% of the policy tools were utilized to invest in fixed assets or R&D initiatives, while others varied from common access to finance to more explicit purposes such as favouring eco-innovation. According to the authors, this fact contributed to veiling the primary strategic objective of certain programmes.

³ The estimate is based on available data of beneficiary SMEs.

⁴ where incomes lag behind Europe's average

⁵ The *Theory of Change* is a specific type of methodology for planning, participation, and evaluation that is used in the philanthropy, not-for-profit and government sectors to promote social change. Theory of Change defines long-term goals and then maps backward to identify necessary preconditions [Brest, P. (2010). The power of theories of change. *Stanford Social Innovation Review*, 8(2), 47-51]].

Managing Authorities actually engaged in two rather different logics of intervention: to complement or even substitute the national/regional aid policies supporting SMEs in tackling the crisis consequences (*anticyclical role*) and to focus more on aspiring strategies to thrive innovation in SMEs. Hence, further specific tools were implemented in both more dynamic and less advanced regions.

Results achieved with regards policy implementation

The most relevant focal points regarding policy implementation can be summarized as follows:

The foremost *priority of policy instruments was to escalate the main production factors* of SMEs (e.g. capital, labour and R&D expenditure), while reduced interest was posed to the final objective or result in terms of tangible goals such as growing exports, productivity or total sales.

The core of the beneficiaries was *centred on low-tech micro enterprises*, that meant 54%, whereas 30% were small enterprises and 16% medium enterprises: 44% in the manufacturing sector, 16% in retail and wholesale trade, and 56% firms classified as low-tech companies.

The conducted aggregate analysis of operational programmes exposed *noteworthy sophisticated forms of intervention*. For instance, even though a change from non-repayable to repayable aid was perceived, grants still was the most usual method of provision of funds: regular grants embodied half of the policy tools labelled, being considered as traditional and less innovative among financial instruments. However, the examination of many case studies brought to light that these were employed to disburse funds with no additional complications and to facilitate liquidity to enterprises without supplementary specifications.

The *managing authorities played a fundamental role in tailoring support to SMEs according to their needs*: 22% of all the mechanisms considered included an arrangement of diverse modes of assistance, usually grants with technical support and consulting services, or just loans.

The case studies revealed an outstanding process of self-selection for capable SMEs in a general approach that only addressed 7% of the policy instruments to firms in specific sectors. The self-selection process was a “soft targeting” one in which a particular group of recipients, distinguished by a higher absorptive capacity, was to all intents and purposes pointed out given the very design of a certain policy instrument. For instance, in grants for strategic productive investments within a specific financial threshold, the most competent firms, generally small or medium-sized ones, were automatically concerned.

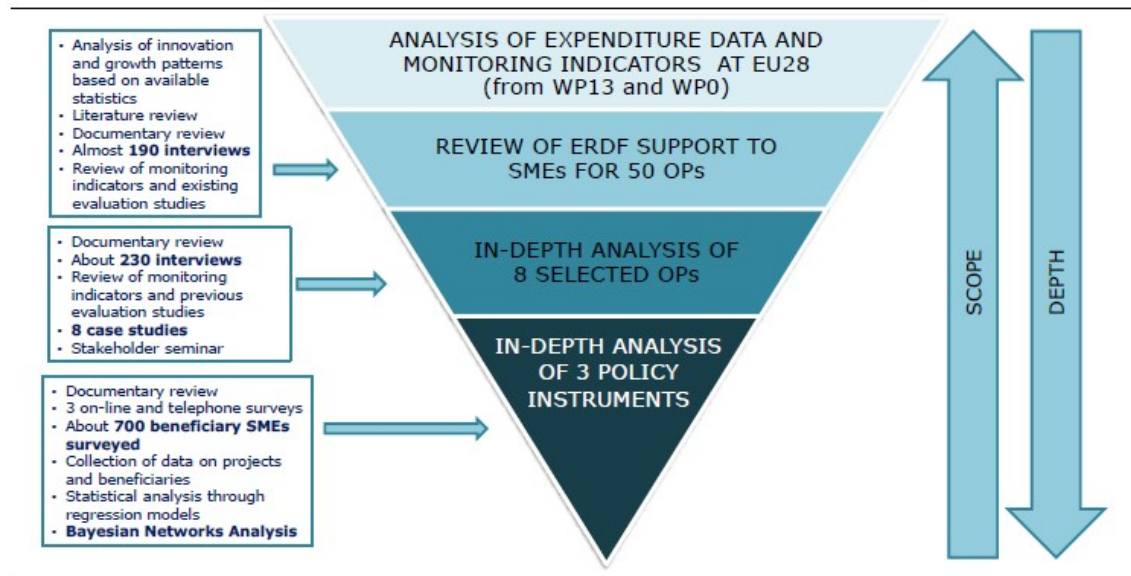
3. Scope of the evaluation

The present work utilizes an elaborated evaluation methodology, embracing quite a few actions at different levels of analysis, from the EU level to examples of specific Operational Programmes (OPs)⁶ and policy instruments⁷.

⁶ The eight programmes analyzed in case studies are Denmark – Innovation and Knowledge, Germany – Saxony, France – Île-de-France, Spain – Castile and Leon, Lithuania – Economic growth, Poland – Innovative economy, Czech Republic – Business and Innovation, Italy – Apulia.

⁷ The three policy instruments subject to in-depth evaluations are *Support for technological innovation in Poland* (“Technological Credit”), *Aid to investment projects by micro and small enterprises in Apulia, Italy* (“Title II”), *Support for industrial R&D and innovation in Castile and León, Spain*.

Figure 5. Concise features of the methodological framework for ERDF evaluation



Source: CSIL.

Source: European Commission (2016, p.9)

4. Methodology used

This study pertains to an analysis performed by a group of researchers chosen by the *Evaluation Unit from the DG Regional and Urban Policy of the European Commission*, via a call for tenders by open procedure No 2014CE16BAT002⁸.

Several experts joined in the primary team of this work, guaranteeing geographical coverage for the field analysis⁹

The methodological tools included the following steps:

- **A literature review** on the rationale and evidence of effectiveness of public support to SMEs.
- **An analysis of the policy instruments** addressed to SMEs implemented in a sample of 50 OPs representing 65% of the expenditure addressed to SMEs.
- **A statistical analysis of the regional socio-economic context** in which the 50 OPs were implemented.
- **Eight case studies** of selected OPs.
- **A seminar** with representatives of Managing Authorities and external experts.
- **Three theory-based impact evaluations** of three policy instruments implemented in different contexts.

⁸ The nominated consortium included the Centre for Industrial Studies (CSIL), the Centre for Strategy & Evaluation Services (CSES)-, and the Centre for European Economic Research (ZEW). Additionally, it counted on the following subcontracting firms: the Center for Social and Economic Research (CASE), the Información y Desarrollo S.L. (INFYDE), the Visionary Analytics, and the Österreichisches Institut für Wirtschaftsforschung (WIFO).

⁹ Massimo Florio, CSIL and University of Milan (Scientific Director); Julie Pellegrin, CSIL (Project Manager); Brad Graeme Philip Astbury, University of Melbourne/Harvey Armstrong, University of Sheffield/David Audretsch, Indiana University/Mateja Dermastia, Anteja ECG/Robert Picciotto, Kings College (Advisory Committee). Laura Delponte, CSIL/Georg Licht, ZEW/James Rampton, CSES/Davide Sartori, CSIL (Senior experts); Silvia Vignetti, CSIL/Mike Coye, CSES/Emanuela Sirtori, CSIL/Mark Whittle, CSES/ Julie Pellegrin, CSIL (Task managers); Donatella Cheri, CSIL/Stefania Pelizzari, CSIL/Silvia Salini, CSIL and University of Milan (Statistical Experts); Chiara Pancotti, CSIL (Junior Experts); Paola Govoni, CSIL (Quality manager).

- *Direct surveys* to beneficiaries.
- A *Bayesian Network Analysis*.
- *400 direct interviews* to stakeholders were carried out
- *The collection of 700 questionnaires* from SMEs beneficiaries.

Theory-based impact evaluation

As stated in the introductory part, this ex-post assessment is grounded on the *Theory Impact Evaluation* approach. It was conducted to measure the outcomes of ERDF assistance on SMEs and underscore the processes and contextual circumstances that shed light on how these results happened.

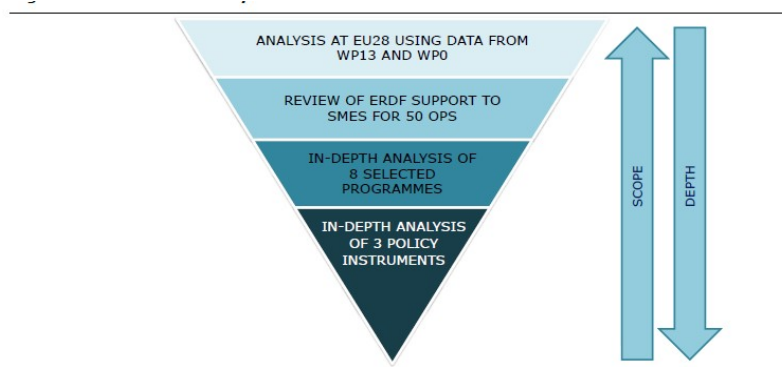
Among the many theory-based approaches, the *Realist Evaluation Paradigm* (Pawson and Tilley, 1997; 2004) was used as main reference, as it proposes the benefit of taking into consideration contextual circumstances – socio-economic, institutional and cultural frameworks- when investigating whether particular upshots of concrete interventions may or may not engendered the achievement of pursued goals. This is predominantly critical when managing EU policies favouring SMEs.

The assumptions of the TBIE were utilized throughout the whole evaluation study, which incorporated various levels of analysis. In this sense, each level was linked to different *evidence bases, methods of data collection and processing, evaluation outputs, and constraints*.

Levels of analysis

The evaluation relied on a funnel approach to explain its multilevel scope from general to specific level of analysis. It initiated with an exploration of expenditure and monitoring indicators associated with SMEs and business promotion in the whole EU. This step implied a broad revision of ERDF assistance to SMEs, analyzing the 50 Operational Programmes (OPs) currently applicable. The exploration continued by digging into the logics and effectiveness of the policy mix embedded in eight chosen OPs, for which the same number of case studies were elaborated. Lastly, three specifically major policy instruments applied in three dissimilar contexts were assessed using direct surveys to aid recipients, plus its statistical treatment of data collected.

Figure 6. Levels of analysis in ERDF evaluation



Source: CSIL.

Source: European Commission (p.26)

Furthermore, two cross-cutting actions were performed: the literature review -setting out the analytical framework and identifying the patterns of intervention logic lying beneath ERDF SME support- and the contextual analysis -focused on the regional/national socio-economic characteristics, research and innovation potentials, and industrial environment. The information obtained from these methodological tools was employed as point of departure for the description of the three levels of analysis.

Table 2. Concise features of the three levels of analysis in ERDF evaluation

Level of analysis	EU level: 50 OPs	Programme level: 8 OPs	Policy instrument level: 3 instruments
Evidence base	<ul style="list-style-type: none"> - Statistics at national and regional level - Literature - Programming and implementation documents - Interviews with almost 190 policymakers, implementing bodies and experts - Monitoring indicators - Previous evaluations and studies 	<ul style="list-style-type: none"> - Programming and implementation documents - About 230 interviews with policymakers, implementing bodies, experts, SMEs and other stakeholders - Monitoring indicators - Previous evaluations and studies 	<ul style="list-style-type: none"> - Programming and implementation documents - Interviews with policymakers, implementing bodies and experts - Surveys of about 700 beneficiary SMEs - Data on projects and beneficiaries
Methods of data collection and elaboration	<ul style="list-style-type: none"> - Almost 40 country experts were in charge of collecting the relevant information - The huge amount of information collected was summarised in a concise and structured way - Quality and consistency checks were carried out by the Core Team on a continuous basis 	<ul style="list-style-type: none"> - Eight case studies were produced in a narrative and mostly qualitative form - A stakeholder seminar was organised to discuss the findings emerging from the case studies 	<ul style="list-style-type: none"> - Three online and telephone surveys - Statistical analysis through regression models - Bayesian Networks Analysis
Outputs of the analysis	<ul style="list-style-type: none"> - Stylised facts explaining SMEs' growth and innovation - Taxonomy of ERDF policy instruments - Identification of patterns in the use of policy instruments - Preliminary propositions on intervention logics - Collection of available evidence on performance - Identification and clustering of beneficiary SMEs 	<ul style="list-style-type: none"> - Analysis of the rationale and relevance of the policy mix impacting SMEs in relation to the context - Assessment of the appropriateness, effectiveness and efficiency of the instruments funded by the OPs - Identification of examples of good practice in the use of policy instruments 	<ul style="list-style-type: none"> - Detailed reconstruction of the intervention logic, structured according to combinations of Context variables-Mechanisms-Outcomes - Test of the causal chain of the theory of intervention - Test of an innovative methodological tool
Deliverables	<ul style="list-style-type: none"> - First Intermediate Report Vol. I: summary report - First Intermediate Report Vol. II: 50 OP summary fiches 	Second Intermediate Report	Third Intermediate Report

Source: CSIL.

Source: European Commission (2016, p.27)

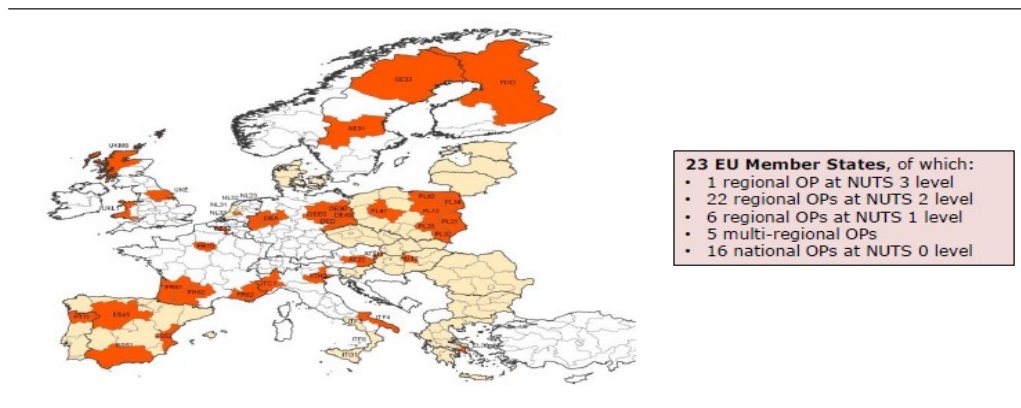
Review of ERDF support to SMEs at EU level

The initial stage of the evaluation was carried out at EU level and comprised the study of the construct utilized by ERDF to foster SMEs and the compilation of primary evidence on the instruments employed and the degree and effectiveness of the policy instruments arranged in this context.

This step included:

- An overview of the environment.
- A theoretical and empirical literature review.
- The information extraction from the sample of 50 ERDF OPs.
- The degree of effectiveness of policy instruments and OPs resulting from the monitoring indicators.

Figure 7. Overview of the 50 Operational Programmes analyzed



Note: The regions covered by regional OPs are indicated in the darker colour; areas covered by national or multi-regional OPs are indicated in the lighter colour.
Source: CSIL.

Source: European Commission (2016, p.29)

Box 2. Main categories of policy instruments for SME development and innovation

The following main categories of policy instruments were found.

Business creation and development: instruments for the promotion of business creation, early development, modernisation, structural change, financing e.g. building construction or modernisation, purchase of tangible and intangible assets, employment.

Support for R&D projects: instruments supporting research and applied development activities (which may, in some cases, include the commercialisation of innovation) of enterprises individually or in collaboration with the research centres of other firms.

Development of technological or non-technological innovation: support to innovation only, without any activity regarding research and experimental development. It includes, for example, instruments supporting a technology upgrade in already existing enterprises, as a way of increasing innovation, managerial and organisational innovation, and the commercialisation of innovative products.

Access and diffusion of ICT: instruments supporting the access to and diffusion of ICT services and solutions for SMEs or enterprises in general. ICT solutions can be used, for example, for e-commerce, business-to-business communication, or for increasing the efficiency of the productive system.

Infrastructures and related services: instruments that only indirectly benefit both SMEs and all enterprises, via the provision of infrastructures aimed at improving the conditions for doing business and the introduction of new services targeting the business sector, such as technology parks, logistic centres, and the creation or strengthening of networks of business support organisations.

Generic access to finance: different tools to provide SMEs (or enterprises in general) with capital for their activities, without any indication of the conditions for the use of this capital.

Creation of innovative companies: specific support for the creation or development of new enterprises with a strong innovative base, oriented towards the commercialisation of innovative products (e.g. innovative spin-offs).

Internationalisation and visibility: instruments supporting SMEs (or all enterprises) in going international, mainly by means of support for participation in fairs, partner search, incoming missions; support for promotional and visibility actions.

Knowledge and technology transfer: instruments supporting knowledge and technology transfer from research centres/universities to enterprises, for the adoption of innovative products and processes.

Support for improving capacities: instruments aimed at promoting the development of skills and capabilities of SMEs or enterprises in general, so as to promote an entrepreneurship culture and capacities in general, or to provide knowledge on specific issues, such as the development of a business plan, ICT and green energy opportunities.

Networking: instruments specifically designed to support the establishment of partnerships, networking and clustering among enterprises and the formation of cooperation platforms.

Eco-innovation: instruments meant to introduce environmentally-friendly products, processes and technologies into enterprises.

Source: CSIL.

Source: European Commission (2016, p. 29)

Table 3. Variables used to characterize the policy instruments

Variable	Options	
Mode of delivery	- Grant - Repayable financial support - Equity finance	- Information campaign, events, seminars - Consulting, advice, technical assistance - Provision of infrastructure - Combination of the above
Targeted beneficiaries	- Individual SMEs - Individual enterprises - Groups of SMEs - Groups of enterprises - SMEs in partnership with universities/research institutions - SMEs in partnership with large enterprises - Single generic entrepreneurs - Combination of the above	- Individual SMEs in a specific sector - Individual enterprises in a specific sector - Groups of SMEs in a specific sector - Groups of enterprises in a specific sector - SMEs in a specific sector in partnership with universities/research institutions - SMEs in a specific sector in partnership with large enterprises - Single entrepreneurs belonging to specific groups (young, female, etc.) - Single entrepreneurs belonging to specific economic sectors
Main barriers to be tackled	- Competition failures - Transaction costs - Asymmetric information - Lack of human capital - Under-provision of infrastructures and institutions	- Risks related to the uncertainty of R&D - Lack or inefficiency of intellectual property protection - Imperfect information on innovation opportunities - Coordination and network failures - Non-availability of positive externalities arising from agglomeration effects - Limited capacity to absorb spill-over effects
Intermediary	- No intermediate body - Business support organisations - Universities or research centres - Cluster managers or Incubators/ technology parks	- Municipalities, other local public authorities or associations of local public authorities - Chambers of commerce - Financial institutions/Fund managers - Combination of the above
Changes in SME production inputs	- Create jobs	- Increase fixed capital
	- Safeguard jobs	- Increase the R&D and innovation level
	- Improve the quality of work	- Increase ICT
	- Improve human capital	- Increase entrepreneurship
Changes in SME performance	- Increased turnover	- Strengthened equity structure
	- Increased share of exports	- Increased profitability
		- Increased probability of survival

Source: CSIL.

Source: European Commission (2016, p.30)

Lessons learned

Despite the great variety in the evidence base that this evaluation is built upon, some methodological challenges were noted. As far as possible, measures were taken to mitigate any possible bias or weaknesses in the evaluation:

- Ensuring a coherent categorization of the policy instruments.
- Retrieving statistics on SMEs.
- Integrating data from the monitoring systems.
- Dealing with the early timing of the evaluation.

In-depth analysis of eight Operational Programmes

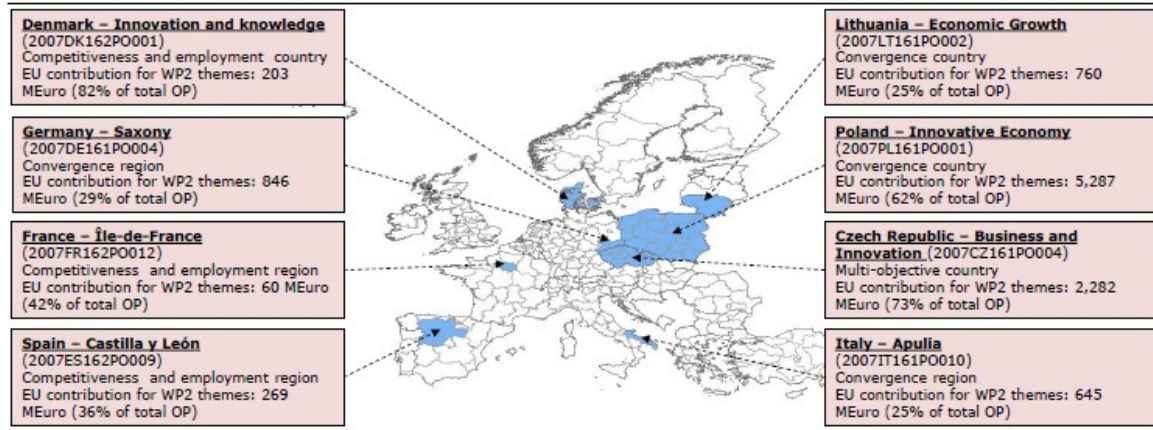
This part of the general analysis was broken in the following steps:

- Eight OPs from the list of 50 were selected with the aim of ensuring the greatest degree of representativeness.
- An assessment of the effectiveness of SME support at the programme level was made. It is here where the policy-mix concept has been applied as for the assessment other programmes implemented in the same contexts were taken into account. In terms of the results of this assessment coherent policy-mixes were identified. The analysis was conducted following a desk analysis of programming and implementation documents,

existing studies and evaluation, and a wide field work, which included conducting around 230 interviews.

- A “stakeholder seminar” was held on 29th April 2015 to discuss the preliminary findings and the main issues emerging from the eight case studies. Among other issues, the role of ERDF in regional policy-mix was one of the points discussed in this seminar.

Figure 8. Overview of eight Operational Programmes analyzed in-depth



Note: EU Community contributions shown in the map are the 2007-2013 ERDF amounts programmed at end 2012.
Source: CSIL.

Source: European Commission (2016, p.32)

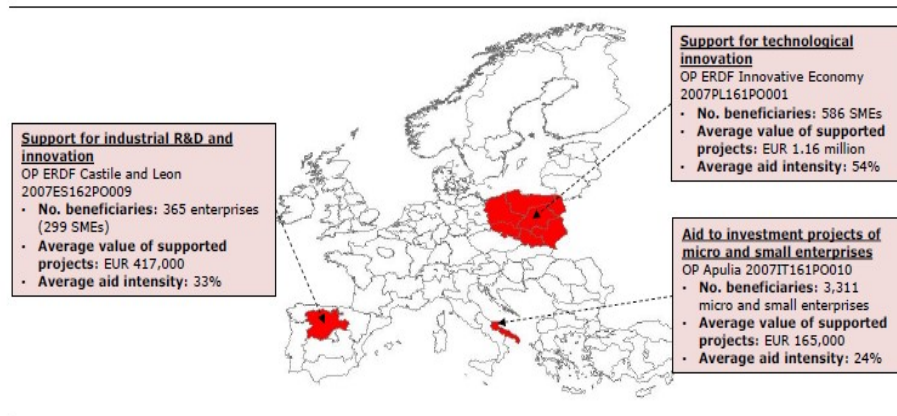
Overall, the analysis of the policy interactions was conducted by using qualitative approaches, mainly dealing with beneficiaries and relevant stakeholders of the programmes.

In-depth analysis of three policy instruments

This comprised the following components of analysis:

- Three policy instruments were selected.
- The intervention logic of each instrument was reconstructed.
- Descriptive information and data on beneficiaries (e.g. sector, size, location) and projects.
- Three surveys of beneficiary SMEs were conducted.
- The evidence collected to test the theory. The one was statistically analyzed through a combination of traditional statistical techniques to explore the responses (*Principal Component Analysis*) and to test the correlations between variables, estimating the statistical significance of coefficients (*regression models*). Additionally, the *Bayesian Network Analysis* was utilized to depict the network of random variables that shape to establish the embodiment and strengths of given outcomes.

Figure 9. Overview of three policy instruments analyzed in-depth



Source: CSIL.

Source: European Commission (2016, p.34)

Lessons learned

The methodology implemented in this third level of analysis entailed the following challenges:

- The Realist Evaluation is a relatively new and emerging approach.
- Online/telephone surveys of SMEs were used to collect a wide range of fresh data.
- The BNA is an experimental method that provides “added value” to traditional econometric impact analysis techniques.

Robustness of the findings

Finally, the robustness of the findings is grounded on:

- The representativeness of the objects of analysis.
- The triangulation of data sources.
- The triangulation of methodologies and results.

5. Main results you can extract from this type of evaluation

This case constitute a sound example of a holistic evaluation as it takes into account different levels of policy implementation and designs an individual evaluation for each of the levels. It thus facilitates a comprehensive understanding of a certain policy. The results achieved by this type of evaluation can be summarised in the following:

- First, the application of theory of change to evaluation gives a better understanding of the mechanisms that lead to policy results, and therefore it needs to deepen into the policy, programmes... logic models. This knowledge is really valuable for policy learning and future policy interventions as it also contributes to the understanding of how different instruments work in different contexts, which is useful not only at regional or country level but also at European level.
- Second, the triangulation of methods (quantitative and qualitative) in most of the evaluations conducted in this study is the best approach for dealing with complex

policy interventions, as it is one that includes a significant number of programmes and instruments.

- However, the effectiveness of policy-mixes is assessed only by using qualitative techniques, such as interviews and discussion groups, which shows the difficulty of measuring the impact of combination of instruments. The implementation of such techniques gives more room for analysing behavioural impacts of the interventions, as in this case.
- Finally, it is worth noting that the scale of this evaluation conditions the scope of the analysis and the extensive field works carried out as well as the variety of techniques employed. Taking a level –approach as a framework and re-scaling it for a regional/national context is a good practice for Manumix partners.

CASE 3: “DYNAMIX. Decoupling growth from resource use and its environmental impacts”. Case studies and ex-ante looking forward assessment

Author: DYNAMIX project team (several authors)

Year: 2015-2016

Summary and objective of evaluation

This case presents part of the evaluation framework and methodological approach adopted in Dynamix, a FP7 funded project that aimed at identifying promising policy mixes for absolute decoupling. The objective of the evaluation was to gain insights to inform the design of policy mixes that would constitute pathways to absolute decoupling.

The case includes both ex-post evaluation of current policies (at a very aggregate level) and ex-ante assessment of policy mixes that include different assessment criteria and dimensions. Despite the differences due to the policy field (environment), the scope (national policies across UE) and policy targets (society as well as industry), which implies significant differences to innovation policy mixes for Advance Manufacturing, there are some methodological aspects that can provide insights, especially for ex-ante assessment and defining roadmaps with a mix perspective. Due to the difference on the issues, the case does not enter in detailing substantive issues of the evaluation (e.g. results, specific substantive policy focus, etc.) other than just the necessary to provide a context. Rather, it highlights and outlines diverse tools used to analyse the policy mix and its (potential) impacts from a variety of dimensions. References to the reports where the analysis are developed are specified in the case.

1. Context

The evaluation that this case summarizes was carried out in the framework of Dynamix, a large research project within the 7th EU Framework Program (FP7) developed with the objective to *identify policy mixes to absolute decoupling of economic growth from resource use and its associated environmental impacts* (Umpfenbach, 2015, p.1).

The project aimed to identifying ideal policy mixes (combination of policy instruments) targeting absolute decoupling. In order to do so, the project developed several steps that were divided in different work packages. In brief, these consisted on:

1. Setting a common framework for the assessment of the efficiency, effectiveness, sustainability and cost-efficiency of policy mixes aimed at achieving decoupling. The common framework identified five key targets for 2050 for decoupling (e.g. in terms of the quantity of maximum greenhouse gas emission or consumption of virgin metals). These targets were the benchmark against which the effectiveness of policy mixes was going to be assessed.
2. Identifying sources of resource inefficiency from literature and empirical studies (as input for identifying potential policy mixes in Step 4).

3. Assessment of existing policies and policy mixes. 15 resource-efficiency policy mixes across Europe were selected to analyse their effectiveness, efficiency and sustainability. The aim of this assessment was also to gain insights about which policy mixes may effectively contribute to decoupling by looking at results of real policies at their contexts.
4. Based on drivers and barriers for resource efficiency (step 3) and results from the case studies of policy mixes (step 3) 3 promising policy mixes for absolute decoupling were identified.
5. Ex-ante assessment of the identified 3 promising policy mixes. Quantitative and qualitative ex-ante assessments were developed to evaluate potential impacts of the selected policy mixes. This analysis led to readjustment of the 3 promising policy mixes proposed for absolute decoupling.

In all stages relevant stakeholders and experts were involved to provide inputs. Lastly, all the research developed has been disseminated through diverse reports for policymakers and researchers.

This report places the focus on the approach and methodologies adopted in steps 3 and 4 in order to get insights on (1) how existing policy mixes were evaluated and (2) how evaluation was used with a future orientation to assess potential impacts (at various dimensions) of policy mixes not yet implemented.

2. Scope of evaluation

The evaluation is wide in scope, both in the types of policy mixes assessed and their geographical scope (case studies), as well as in the methodologies applied. It focuses on EU national policy mixes of different nature and field (waste, transport, land use, etc.) which are linked to resource-efficiency.

For the evaluation of existing policy mixes, 15 cases were included:

- a) Policy mixes targeted at renewable resources: Sustainable use of forests and wood in Finland; Sustainable levels of fish catch in Iceland; More efficient use of aggregates in the UK; A sound material cycle society in Japan
- b) Policy mixes targeted at land: Conserving rural land in England; Reducing land sealing in Germany
- c) Policy mixes targeted at environmental media: Reducing transport CO₂ emissions in Spain; A fossil fuel-free energy system by 2050 in Denmark; Reducing fossil fuels in Sweden; Reducing fertiliser use in Denmark; Reducing phthalate and PVC use in Denmark; Increasing industrial energy efficiency in Portugal
- d) Policy mixes for waste prevention: Reducing municipal waste at local level in Slovakia; Preventing food waste in the UK; Reducing plastic bag use in Ireland and the UK.

The evaluation carried out afterwards (in Sept 4 stated above) is not based on existing policy mixes but on promising policy mixes to potentially being developed at the European context (not country-specific). The three policy mixes are:

1. Policy mix for land-use, composed of 8 instruments aimed at reducing the impacts of agricultural production and consumption
2. Policy mix for metals and competing materials, which includes 5 instruments that aim at reducing metals and material use
3. The overarching policy mix, comprising 8 instruments aimed at fostering sustainable consumption and production.

In terms of the policy mix framework by Rogge & Reichardt (2016), the study focuses on two dimensions: the consistency of the instrument mixes with policy strategic objectives, and - although in lesser extent- also on consistency among the instruments.

The various studies carried out analyse (a) effects, effectiveness, efficiency and social sustainability of existing policy mixes (case studies) (a) consistency of promising policy mixes with key targets/objectives established for 2050 (b) consistency between among the instruments and promising policy mixes (c) effectiveness, efficiency, equity and feasibility of the instruments of the promising policy mixes. What those concepts mean in the study is clarified in the next section.

3. Methodology

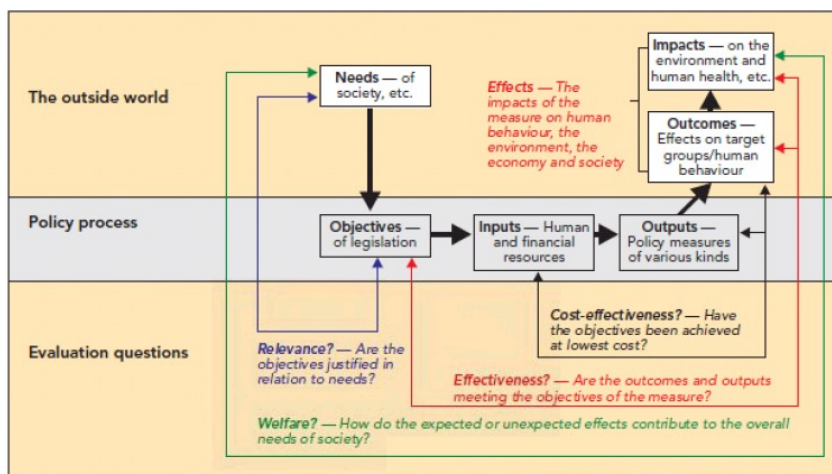
As stated above, the general objective of the project Dynamix is to identify potential policy mixes or policy pathways for absolute decoupling in the UE. The evaluation was carried out by a team of experts, who developed different parts of the analysis. It is an external assessment, where stakeholders were also included.

The analysis is based on desk research, analysis of policy documents and statistics as well as an extensive review on previous studies and academic literature.

3.1. Case studies to learn what policy mixes could contribute to absolute decoupling

Existing policy mixes towards decoupling are analysed through 15 case studies. The case studies analyse the policy mixes following the evaluation framework depicted in Figure 10.

Figure 10. Policy evaluation framework used in DYNAMIX



Source: Mazza et al. (2013, p.8)

Following this framework a template was designed (see complete template in Annex 1). With regards to the evaluation, the analysis focuses on three dimensions: (1) effectiveness in terms of environmental sustainability, which is measured against the benchmark established for absolute decoupling; (2) efficiency or economic sustainability, which is assessed by comparing “the achieved level of resource and impact with monetary (and other) resources applied to achieve the outcome; and (3) welfare (social sustainability), assessed by social effects.

The analysis is developed through desk research, based on expert knowledge and secondary data, that is, analysis of policy documents, research evidence and national statistics and other secondary data related to the results of some of the measures analysed (e.g. waste reduction).

The guiding questions for analysing each of the evaluated dimensions, included in the template, are detailed below:

Table 4. Extract of policy-mix assessment template for case study analysis in Dynamix

Evaluation of policy mix: effectiveness (environmental sustainability)
<ul style="list-style-type: none"> • Does/did the policy mix result in a positive environmental outcome? • Were its stated objective(s) met? Were the instruments used sufficient to meet the objectives? • Did other, unforeseen/unintended positive outcomes or impacts (environmental, social, economic) result? Did other such negative outcomes or impacts result? • Were these objectives set at a level to meet environmental needs (e.g. avoid crossing environmental thresholds/tipping points or achieve more sustainable levels of resource use/extraction (e.g. maximum sustainable yield (MSY) in fisheries)? • Which sectors/actors were identified as having key impacts/influences on the problem/issue? (e.g. specific industrial/ business sectors, consumers, economy as a whole?) Did any of the instruments specifically target these key sectors/actors? Was there significant take-up/implementation of (voluntary) instruments by these sectors? • Was the policy mix applied to a sector previously not targeted by policies on the issue under question, or in a new area/issue – thereby aiming to stimulate change? • What were the anticipated and actual outcomes, impacts and effects of the policy mix on the behaviour of sectors and actors targeted? (e.g. reductions in emissions from industry, increased recycling rates, increase/decrease in certain product purchases, etc.). • Relationships between the instruments, identifying positive/negative influences on the overall policy mix or on key instruments in the mix, as well as any positive or negative impacts from changes to the mix (introduction or termination of instrument(s), increase or decrease in tax/levy/charge, etc.). Level of ‘connectivity’ (strong, weak) between each instrument and the primary one(s). • Are there any indicators, monitoring systems, review processes or other monitoring mechanisms in place to track progress?
Evaluation of policy mix: efficiency (economic sustainability)
<ul style="list-style-type: none"> • Is/was the policy mix considered cost-effective? • What has been the level of impact on resource use of the policy mix (the effect)? • What have been the costs of implementing the policy mix for target audience (e.g. business, households, etc.)? • What are the costs (financial, human) of implementing the policy mix for the implementing authority – i.e. the administrative/transaction costs? • Were sufficient resources made available to ensure an effective implementation of the policy-mix? • Was anything foreseen in the policy-mix to address competitiveness concerns (e.g. use of exemptions) or minimise transaction costs (e.g. thresholds below which monitoring wasn’t required)? • Did the policy mix involve providing financial support (e.g. subsidies, low interest loans, tax breaks etc.) to key actors (e.g. sector, households, etc.)? • Did the measures generate revenues (e.g. in the case of taxes) and if so, was revenue recycled/re-

injected into the economy, and to what levels and activities? Did revenue recycling have positive amplifying effects?

- In synthesis - was the policy mix cost-effective?
- What elements of the mix were (un)helpful in improving cost-effectiveness?
- How was relative/absolute decoupling achieved?
- Were resource limits or other thresholds taken into account and how were they addressed?

Evaluation of policy mix: welfare (social sustainability)

- What social impacts have you found associated with the policy mix? E.g. jobs created, reduced health impacts, distributional impacts etc.
- Were social aspects included in an ex-ante impact assessment of the policy mix if one was undertaken? What were these?
- Has monitoring of social impacts been included in implementation, to identify actual effects compared to anticipated ones?
- Was the policy mix designed to not be socially regressive? What measures were undertaken to ensure this?
- Were equity concerns addressed and, in case of re-structuring of the economy/sector, measures in the area of reskilling of the workforce foreseen?
- What other public acceptability elements were addressed or considered?

Source: Adapted from Faria-Lopes and Bego (2013)

Through answering these questions, the analysis identifies instruments and/or mixes that are relatively effective in achieving the goals and the targets established within Dynamix, and where data was available, some of the impacts or potential impacts of the analysed mixes.

3.2. Forward-looking evaluation: assessment of potential impacts and interactions of policy mixes

The analysis of the cases, together with a literature review carried out previously to identify barriers and drivers of resource efficiency contribute to define a promising policy mix for absolute decoupling (see Ekvall et al, 2016, in case of interest on how they were defined).

A forward looking evaluation or ex-ante assessment was carried out with the three hypothetical policy mixes. This assessment aimed at looking at potential impacts of the mixes in order to readjust them. The analysis includes quantitative and qualitative assessments, which are outlined briefly next.

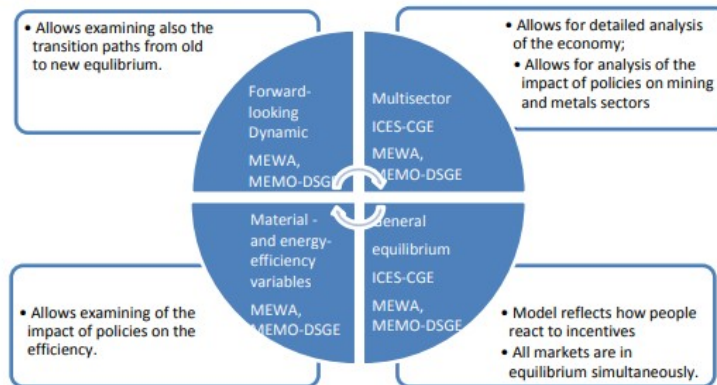
3.2.1. Quantitative analysis: Modelling potential impacts of instruments and policy mixes

Potential impacts of the policy mixes were analysed using three macro-economic models (of Computable General Equilibrium modelling) that allow partly foreseeing the direct and indirect effects on the economic system, capturing also trade effects, technological change, behaviour of agents and labour related effects.

This report does not enter into the detail of these models, whose characteristics are outlined in Figure 11. An extensive report on the particularities of the models and how they were used can be found in Bosello et al. (2016). Despite these models overlook complexity of policy implementations processes, their feasibility and other relevant factors in order to be operationalized, they enabled to have a first overall assessment of potential impacts of the policy mixes. See the next extract from the report's summary as example:

Another interesting result is the potential occurring of undesired rebounds effects due to intra and international trade dynamics. This is for instance the case of the pesticide tax that might simply redirect EU pesticide production abroad or of an increased public investment for material efficiency R&D that can trigger a “production scale” larger than the “material use decline” effect. This raises some caveats: all the policies examined should be accompanied by further and more capillary regulation or incentives limiting material use or promoting dematerialized services. (retrieved from: <https://dynamix-project.eu/quantitative-economic-ex-ante-assessment-dynamix-policy-mixes.html>)

Figure 11. Characteristics of the economic models used in DYNAMIX



Source: Bosello et al. (2016, p.21)

3.2.2. Qualitative analysis: assessing potential environmental, social, economic and governance-related impacts

Ex-ante quantitative analysis was complemented with qualitative assessment at different dimensions: environmental impact, social impact, economic impact, and public acceptability and feasibility of policy mixes. All these analyses were based on desk research based on extensive literature review on empirical studies linked to the instruments analysed. Ad-hoc score systems were built to guide the expert knowledge and the research based assessment.

Environmental impact assessment

All policy mixes are assessed using a Scoring system (see Box 3) to identify the likely change fostered by the policy mixes towards the five targets established as the baseline of the project, which is the target against the evaluation is carried out. Scores are given to the instruments and the policy mixes by the expert team of the project, who based their scores on a literature review that identifies the environmental impacts of different instruments. (See Nesbit et al. 2016 for details).

Box 3. Scoring system used to assess potential environmental impact of Dynamix policy mix

Scoring system

Upwards arrows indicate a beneficial change with respect to the trend under a baseline scenario up to 2050, as described in the policy-mix descriptions, for each of the stated environmental objectives. Downward arrows indicate a detrimental change.

Estimated magnitude of change:

- ↗↗↗↗ or ↘↘↘↘ = High (above 100% deviation from the baseline)
- ↗↗↗ or ↘↘↘ = Medium high (ie between 50-100% deviation)
- ↗↗ or ↘↘ = Medium low (ie between 10-50% deviation)
- ↗ or ↘ = Low (ie less than 10% deviation)

Source: Nesbit et al. (2016, p.7)

Social impact assessment

The potential social impact of the policy mixes is also assessed through a qualitative scoring system and on insights from previous studies. The analysis follows different steps:

1. Definition of a long list of possible social impacts (drawn from previous research – a specific guideline).
2. Building a social impact matrix combining all instruments of the policy mix and the long list of possible social impacts. Two researchers scored all instruments with regards to regards their possible social impacts (subjective qualitative), with a score system that ranged from no impact (0) to great impact (3).
3. Shortlist of key social impacts. The possible types of social impacts that scored the highest were selected and grouped. Three categories of relevant social impacts were defined: impact in public health, impact in labour market and impact in social inclusion.
4. Assessment of potential impacts of policy mixes in social inclusion, labour market and public health. All policy mixes and the overarching policy mix were assessed through the three dimensions. The assessment was again developed through a scoring system (Box 4). Researchers scored and analysed potential impacts based on literature review on previous empirical research and historic data on the impact of certain types of measures in elements of those categories (e.g. the effects of decarbonisation on labour market change, and thus on job creation and destruction).

Box 4. Scoring system used to assess potential social impact of Dynamix policy mix

	Social impact assessment
+++	Likely very positive
++	Likely positive
+	Likely rather positive
0	Likely neutral
-	Likely rather negative
--	Likely negative
---	Likely very negative
(++)	Assessment uncertain
((--))	Assessment very uncertain

Source: Bukowski et al. (2015, p.12)

The analysis enabled to identify potential impacts and possible interactions between the instruments in relation to the impact. This can serve to inform policy design, since it can point to potential unwanted interactions, or to effects that may need to be counteracted through other instruments and measures. See for example this extract from Bukowski et al. (2015), to illustrate the types of insights gained through the analysis:

When analyzing the consequences of individual policy mixes for social inclusion and labour market it can be noticed that many of them overlap one with another. Number of tax and command and control instruments in the mix may result in redundant amplification of some economic incentives or lead to conflicting price signals and/or regulations. These overlaps should be avoided as overtaxing or overregulating will increase the economic costs of transition and encourage suboptimal allocation of resources. On the other hand, it may result in negative social effects in areas of the labor market particularly. At the same time,

proper aligning of policy instruments with the area of intervention that will take into account redistributive impacts may be helpful. In fact, the same instrument may have different redistributive impacts depending on the type of product that will be taxed or regulated. Therefore, it is essential to take into account price and income elasticities of demand when designing the ultimate policy mix. (p.74)

Economic assessment

An economic qualitative assessment is developed to complement the quantitative economic analysis previously made. Those models need simplifying assumptions to be operationalized, but they leave aside factors that are relevant (like costs, feasibility, etc.). Thus, this assessment aims at qualifying the results of the quantitative analysis. Two types of analysis are carried out:

- a) Coherence and consistency, that is, the relationship of the whole policy mix with the key targets (the baseline), which is carried out from an economic perspective. This analysis includes also an analysis of the interactions of the instruments within the policy mix.

Coherence and consistency are defined as follows (Bigano et al.2015, p.26)

Coherence	“Policy instruments are coherent if one contributes to the achievement of one (or more) key target(s) or one (or more) objective(s) of another policy instrument”.
Consistency	“Consistency refers to the lack of conflict among policy instruments or between a given policy instrument and one (or more) key target(s)”.

First, a coherence and consistency analysis of the three policy mixes with the five key targets is developed. The analysis is based on expert knowledge and literature review, to qualitatively assess the effects of the instruments, in the long and short term, in each of the targets. This analysis enables to have a general picture of the relationship of the targets with the instruments. For example, the analysis reveals that whereas some of the targets were addressed by many of the instruments, one of them was not directly addressed by any of them (although it can be benefited from instruments primarily oriented to other targets).

Secondly, an analysis of consistency and coherence between the policy mixes is carried out, studying the relationship among the instruments within each policy mix and among the policy mixes. This analysis is also qualitative, based on expert knowledge and research base.

- b) Effectiveness, efficiency, equity and feasibility of each instrument and the overall policy mix. The four assessment parameters for analysing instruments and the policy mix are defined as follows (Bigano et al., 2015):

Effectiveness	“The capability of a policy to achieve a given target” (p.17)
Efficiency	“Efficiency refers to the relationship between the objective that the policy foreseeably allows to reach and the costs that the economy bears due to its introduction” (p.20)
Equity	“Equity has to do with how the impact of a given policy affects different categories in the economy.” (p.22)
Feasibility	“Feasibility is the level of difficulty related to the introduction and the implementation of a policy.” (p.23)

Note that the effectiveness analysis is aimed at deepening and highlighting the elements that promote or hinder effectiveness, since these issues are not included in the quantitative analysis. When analysing efficiency, several costs are taken into account, such as: welfare loss, government costs (administrative costs), and compliance costs of private actors. In order to assess equity, the impact is looked at different scales, such as sector, whole economic sector or private households. As for feasibility, which means trying to foresee possible difficulties that may be linked to the implementation of a policy, several issues need to be taken into account, like public acceptability or trust level in government.

Each of the instruments and the policy mixes are analysed following those assessment criteria, through a qualitative analysis based on expert knowledge of researchers and previous studies regarding the types of instruments analysed (e.g. that tax instruments are effective in achieving certain goals).

These two types of assessment enabled to identify strengths of the policy mixes and issues to consider to define the ideal policy mix, taking into account their potential effectiveness and efficiency and also potential interactions that may occur with other instruments of the mix or other instruments already in place in the contexts to be implemented. See for example two extracts from the report as illustration of the types of conclusions and insights gained through the analysis:

Another couple of policies need substantial restructuring. As regards the environmental tax and the material tax, our analysis indicates a high potential to be effective and efficient, but finds potential pitfalls in the way they are designed. For instance, there could be possible negative interactions of a new tax with the tax system already in place, monitoring and enforcement costs could be significant, and the intrinsic regressivity of environmental taxes also in these cases has the potential to fuel resistance and cause distributional conflicts. (Bigano et al., 2105, p.113)

(...)

An important example of synergy among policies is the one that links environmental R&D support policies with (correctly formulated) market-based instruments. The latter indeed make the adoption of new, cleaner technologies economically more attractive in the short run, thus accelerating the diffusion of environmental friendly innovation, and justifying the funds invested in costly research programs. (Bigano et al., 2015, p. 114)

Governance related assessment: legal and public acceptance

Due to the nature of the policies analysed in Dynamix, the analyses encompasses a legal basement in order to determine potential legal barriers (national as well as UE) for establishing specific policy instruments. It also makes an assessment of potential public acceptance of the policies. This is done through a discourse analysis methodology to determine key concerns for the public and further analysis to assess how well the public may accept instruments of the policy mixes analysed.

This type of assessment may be particularly relevant in Dynamix many of the instruments of the policy mix are targeted at population, unlike the policies for Advanced Manufacturing. However, -having in mind all the differences due to the different nature of the policy fields and the targeted populations- this type of analysis and approach could also be applicable to Advanced

Manufacturing instruments and policy mixes, to assess with target groups (e.g. companies or research organisations), probably with other methodologies (e.g. focus groups) the potential acceptance of instruments and policy mixes to be introduced by the government.

4. Main results you can extract from this type of evaluation

- This type of evaluation provides a holistic picture of possible impacts of policy mixes from a wide perspectives (social, economic and environmental) combining quantitative and qualitative methods
- Ex-ante assessment allows analyzing different policy-mix options and their potential impact. This can be relevant for policy-mix design purposes
- Expert knowledge and literature review can be used as substitute knowledge when other type of empirical evidence to evaluate policy-mixes does not exist

CASE 4: “Quantitative analyses based on control group approaches”

Author: Several authors, mainly Guezorni and Raitoldi (2015)¹⁰

1. Summary and objective of evaluation

This case is focus on a specific quantitative approach that has been used by different authors for analysing the interactions among different innovation instruments. For the sake of simplicity the case includes the methodological approach and results of an specific case, which is the one developed by Guezorni and Raitoldi (2015) and then a brief description of the application of the same method to a practical approach of evaluating policy-mixes from different administrative levels completes the information and gives another example of how this method could be applied.

The main objective of these types of evaluation is to focus on the impact assessment of the interactions among different policy instruments, trying to conclude whether these interactions lead to complementary or overlapping/ contradictory effects (in evaluation terms crowding – out effects). More specifically, the case presented by Guezorni and Raiteri (2015) assess the interactions between R&D subsidies, tax credits (supply side instruments) and public procurement for innovation (demand side instrument) on European firms’ behaviour.

2. Context

The evaluation that this case summarises is published in one of the top journals that deals with innovation policy, which is Research Policy. The main objective of the paper is to test *the impact of R&D subsidies, R&D tax credits and innovative procurement upon a firm’s private investment* (Guerzoni & Raiteri, 2015, p.727).

Therefore, the paper focuses on the role of R&D subsidies as a basis for other policies to be applied (such as tax credits); the effectiveness of innovative public procurement and the interactions of the three instruments together. The case is significant as it studies not only the interaction of supply side policies, but also the interactions between them and demand-side policies.

The methodological approach is based on a quasi-experimental approach, which is possible to be applied as the dataset for analysis contains information about firms that have received R&D subsidies, tax credits and/or are beneficiaries of innovation public procurement but also firms that are not beneficiaries of any of those instruments. More detailed information about how the quasi-experiment was carried out and the data needed for this is included in the following sections.

¹⁰ The Manumix Advisory Partner (Orchestra) has conducted several policy-mix evaluations following this approach. One of them is published as Magro (2012).

3. Scope of evaluation

The evaluation is wide in scope, as it includes the evaluation of three different instruments from both supply and demand side on firm's innovative behaviour and the data sample includes firms from the 27 EU member states, Norway and Switzerland.

Concretely, the main objects of evaluation are the following:

1. Firms that only received R&D subsidies (specifically firms that reported changes in public financial support;
2. Firms that are only beneficiaries of tax credits (firms that report changes in tax environment)
3. Firms that have only been awarded with an innovation public procurement contract.
4. The different combinations of the three previous situations (firms receiving subsidies and using tax credits; firms receiving subsidies and winning innovative public procurement contracts; firms winning innovation public procurement contracts and using tax credits; and firms beneficiaries of the three instruments).

In terms of the policy mix framework by Rogge & Reichardt (2016), the study focuses on the **consistency among the different instruments**, so directly tackling the issue of instruments interactions.

The study focuses on analysing the impact of the different instruments and each of the different combinations in the firms' innovation spending (whether it has increased or not) between the years 2006 and 2008. Summarising, the impact of the instruments and mixes is measured in terms of inputs of the innovation process and not the outputs.

In the next section we provide with a more detailed approach of the methodology and data.

4. Methodology

The analysis carried out has employed data of the survey "Innobarometer on Strategy Trends in Innovation 2006-2008" which is a survey conducted by an external consultancy to firms in EU27 for the European Commission. The survey was directed to senior managers of those companies. One of the most important issues for conducted and impact assessment through quasi-experiments is to define control groups of firms with the same characteristics than the ones that have received the impact of the intervention but that they have not been beneficiaries.

In this case, the different beneficiaries (treated groups) and control groups are described in the next table:

Description	N. treated firms	N. of firms in control group
Firms receiving subsidies	1108	3723
Firms receiving innovative public procurement contracts	551	4277
Firms receiving tax credits	1082	3655
Firms receiving only subsidies	462	2708
Firms receiving only innovative public procurement contracts	273	2708
Firms receiving only tax credits	483	2708
Firms receiving subsidies and tax credits	403	2708
Firms receiving subsidies and innovative public procurement	85	2708
Firms receiving innovative public procurement and tax credits	75	2708
Firms receiving all policies	84	2708

Source: Adapted from Guerozi and Raitoni (2015)

Once we have the treated groups and the control groups defined and the pool of firms allocated to each of the groups, before estimating the impact of the instruments the technique matches every firm from the control group with one of the treated group with similar characteristics. Propensity Score Matching (PSM) is used for calculating the probability of being treated within the units in the control group, according to a set of characteristics. It is useful therefore, for identifying non-participants with the same probability of being beneficiaries of the instruments than the treated group. This allows defining a counterfactual situation for the beneficiaries. The Propensity Score Matching can be defined as the probability of being subsidized according to a set of individual characteristics (X):

$$p(X) \equiv P \{D = 1 | X\} = E \{ D | X \}$$

where(X) is the vector of individual characteristics and D= {0, 1} is the participating situation of the firm, being 0 when the firm has not being subsidized and 1 when the firm has received a subsidy.

As it is difficult to find two firms with the same characteristics in the literature we can find different estimators. The most used one is the NNM (*Nearest Neighbour Matching*), which matches each treated unit with the most similar unit in the control group according to their propensity score:

$$\tau^{NNM} = \frac{1}{N^T} \sum_{i \in T} Y_i^T - \frac{1}{N^T} \sum_{j \in T} w_j Y_j^C$$

where T is the treated group, C is the control group, Y_i^T and Y_j^C , the dependent variables in both groups, N_i^T shows the number of control units matched with treated units $i \in T$, and the

weightings are defined by $w_{ij} = \frac{1}{N_i^C}$ if $j \in C_{(i)}$ and $w_{ij} = 0$ on the contrary.

In this case, the variables employed to match the firms in both groups were: size of the firm, industrial sector, country of origin of the firm, geographical location of firms' sales, R&D activities in firms. After the matching procedure, which is normally carried out before receiving any policy impact, the second step is to calculate the Average Effect of Treatment on the Treated (ATT) through the difference between the average of the dependent variable in the treated group and the average of this variable in the control group. Summarizing, the average effect of an intervention or programme is calculated by the average of the differences in both groups. In this case, as mentioned before, the dependent variable is the increase on firms' innovation spending in 2008 as compared to 2006. In consequence, if the calculated ATT is positive and statistically significant means that the treated firms (the ones that have been beneficiaries of any or more than one instrument) has increased their innovation activities as compared to similar firms from the control group.

In this specific case the treatment effect of the groups that have been beneficiaries of more than one instrument indicates the complementary (if the result is positive) or substitutive effect (if the result is negative) of the interactions. In this specific case, the results show a positive effect of all the instruments combination, but higher in the cases in which firms have been beneficiaries from the three instruments.

5. Main results you can extract from this type of evaluation

- It allows to identify the causal effect of specific instruments and their combinations
- It is the most suitable case when beneficiaries are firms, difficult to apply in the case of a limited number of beneficiaries (i.e. universities)
- Data is the main input for this approach, either from primary or secondary sources. Therefore depending on the data the results of the evaluation will be more or less robust. Therefore, data might also be the main constraint of this method.
- It requires specific knowledge on the quantitative techniques thus, external evaluators could be required.

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- Umpfenbach, K. (2015): How will we know if absolute decoupling has been achieved and will it be enough? - Common Approach for DYNAMIX, Deliverable D.1.3., Berlin: Ecologic Institute.

Annex 1. Sources of information

SOURCE OF INFORMATION	ANALYSIS OF EXPERT LITERATURE					
	Advanced Manufacturi	Good Policy Practices	Policy Evaluation	Policy Mix	Policy Mix Evaluation	Science and Innovation Policy
Grey literature						
<i>(2018) Climatrans. Indian Institute of Technology Bombay. A report on evaluation of mitigation policy packages. Mumbai Metropolitan Region.</i>	↗	→	↗	↑	↑	↗
<i>(2017) Tillväxtanalys.Stödinstrumentmixens samstämmighet? Strategin Smart industri och delen Industri 4.0</i>	↗	→	↑	↗	→	↗
<i>(2017) International Energy Agency. Insights Series 2017. Real-world policy packages for sustainable energy transitions. Shaping energy transition policies to fit national objectives and constraints.</i>	↗	→	↗	↑	↑	↗
<i>(2017) Gillingham K.et al. Advances in evaluating energy efficiency policies and programs.</i>	↗	→	↗	↑	↑	↗
<i>(2017). European Commission. Synergies between Framework Programmes for Research and Innovation and European Structural Funds.</i>	→	→	↑	↑	↗	↑
<i>(2016) SIPER (Policy Evaluation). European Commission. WP1: synthesis report. Ex post evaluation of cohesion policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF).</i>	↗	↗	↗	↑	↑	↗
<i>(2016) SIPER (Policy Evaluation). European Commission. Support to SMEs –Increasing research and innovation in SMEs and SME development. Ex post evaluation of cohesion policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF).</i>	↗	↗	↑	↑	↑	↗
<i>(2016) European Commission. JRC Technical reports. RIS3 implementation and policy mixes.</i>	→	→	↗	↑	→	↑

SOURCE OF INFORMATION	ANALYSIS OF EXPERT LITERATURE					
	Advanced Manufacturi	Good Policy Practices	Policy Evaluation	Policy Mix	Policy Mix Evaluation	Science and Innovation Policy
<i>(2016) European Commission. Analysis of drivers, barriers and readiness factors of EU companies for adopting advanced manufacturing products and technologies.</i>	↑	→	→	↓	↓	↑
<i>(2016) Duscha, V. et al. Analysis of interactions between renewable support and climate policies.</i>	↗	→	→	↑	↗	↗
<i>(2016) Copenhagen Business School. The effect of multiple participations in the Danish innovation and research support system.</i>	↗	→	→	↑	↗	↑
<i>(2013-2016). Several reports on Dynamix project. https://dynamix-project.eu/index.html</i>	↓	↑	↑	↑	↑	→
<i>(2015) Watson, D. et al. EPR-systems and new business models. Part II: policy packages to increase reuse and recycling of textiles in the Nordic region.</i>	↗	→	↗	↑	↑	↗
<i>(2015) Technopolis Group. Regional Innovation Monitor Plus 2015. Thematic Paper 2 – Advanced Manufacturing Case Studies.</i>	↑	→	→	↓	↓	↑
<i>(2015) SIPER (Policy Evaluation). European Commission. Final report. Ex post evaluation of Cohesion Policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and Cohesion Fund (CF) – Work Package Zero: Data collection and quality assessment</i>	↗	↗	↗	↑	↑	↗
<i>(2015) SIPER (Policy Evaluation). Commissariat Général à Légalité des Territoires. Évaluation de la politique des grappes d'entreprises.</i>	→	↗	↗	→	→	→
<i>(2015) OECD. Monitoring policy coherence for sustainable development.</i>	↗	→	↗	↑	↑	↗
<i>(2015) European Commission. Smart specialization strategies and ERDF tourism investments.</i>	→	↓	↑	↓	↓	↗
<i>(2015) Department of Jobs, Enterprise and innovation of Ireland. Evaluations of state supports for enterprise. Synthesis</i>	↗	→	↑	→	→	↗

SOURCE OF INFORMATION	ANALYSIS OF EXPERT LITERATURE					
	Advanced Manufacturi	Good Policy Practices	Policy Evaluation	Policy Mix	Policy Mix Evaluation	Science and Innovation Policy
<i>Report and conclusions.</i>						
<i>(2014) Technopolis Group. Regional Innovation Monitor Plus. Supporting advanced manufacturing activities at the regional level.</i>	↑	→	→	↓	↓	↑
<i>(2014) Technopolis Group. Regional Innovation Monitor Plus. Policies and Perspectives of Advanced Manufacturing across EU Regions.</i>	↑	→	→	↓	↓	↑
<i>(2014) Policymix. Assessing the role of economic instruments in policy mixes for biodiversity conservation and ecosystem services provision. Guidelines for multi-scale policy mix assessments.</i>	↗	→	↗	↑	↑	↗
<i>(2014) Polfree. Policy Options for a Resource-Efficient Economy. Policy mixes for resource efficiency.</i>	→	↗	→	↑	→	→
<i>(2014) European Commission. JRC Technical Reports. RIS3 implementation and policy mixes.</i>	↗	↓	↑	↑	→	↑
<i>(2014) European Commission. ESIC. Summary assessment of the province of Limburg.</i>	→	→	↑	→	→	→
<i>(2014) European Commission. ESIC. Summary assessment of the Canary Islands.</i>	→	→	↑	→	→	→
<i>(2014) European Commission. ESIC. Summary assessment of Northern Ireland.</i>	→	→	↑	→	→	→
<i>(2014) European Commission. ESIC. Summary assessment of Luxemburg.</i>	→	→	↑	→	→	→
<i>(2014) European Commission. ESIC. Summary assessment of Emilia-Romagna.</i>	→	→	↑	→	→	→

SOURCE OF INFORMATION	ANALYSIS OF EXPERT LITERATURE					
	Advanced Manufacturi	Good Policy Practices	Policy Evaluation	Policy Mix	Policy Mix Evaluation	Science and Innovation Policy
<i>(2014) European Commission. ESIC Newsletter Issue #4. The transformative power of service innovation is there on the horizon but the journey towards it has only just begun.</i>	↗	↓	↑	→	→	↗
<i>(2014) European Commission. Assessment grid for evaluating strategic policy frameworks for digital growth & next generation network plans.</i>	↗	→	↑	→	→	↗
<i>(2014) European Commission. Lessons from the model demonstrator regions: service innovation policy in practice.</i>	↗	↗	↑	→	→	↑
<i>(2014) European Commission ESIC. Summary assessment of Upper Austria.</i>	→	→	↑	→	→	→
<i>(2013) University of Cambridge. Policy Links. Emerging trends in global advanced manufacturing: policy challenges, opportunities and policy responses.</i>	↑	→	→	↓	↓	↑
<i>(2013) SPREE Servicizing policy for resource efficient economy. A procedure to develop synergetic policy packages and assessing their political acceptability.</i>	↗	→	↗	↑	↑	↗
<i>(2013) SIPER (Policy Evaluation). Enterprise Research Centre. An experimental approach to industrial policy evaluation: the case of Creative Credits.</i>	↗	↗	↗	→	→	↑
<i>(2013) European Commission. Regional policy for smart growth of SMEs. Guide for managing authorities and bodies in charge of the development and implementation of research and innovation strategies for smart specialization.</i>	↗	↗	↑	↗	→	↑
<i>(2013) European Commission. Lessons from a decade of innovation policy. What can be learnt from the INNO Policy Trend Chart and The Innovation Union Scoreboard.</i>	→	↗	↑	↗	→	↑
<i>(2013) Cunningham, P. et al. Innovation policy mix and instrument interaction. Compendium of evidence on the effectiveness of innovation policy intervention.</i>	↗	↗	↗	↑	↗	↑
<i>(2013) Apraise. University of Piraeus, National Technical University of Athens. Assessment of policy impacts on sustainability in Europe. The interplay of policy instruments in the energy and climate package with a focus on RES-E and RES H&C</i>	↗	→	↗	↑	→	↗

ANALYSIS OF EXPERT LITERATURE

SOURCE OF INFORMATION	Advanced Manufacturi	Good Policy Practices	Policy Evaluation	Policy Mix	Policy Mix Evaluation	Science and Innovation Policy
<i>promotion targets (Greece).</i>						
<i>(2013) Apraise. University of Piraeus, National Technical University of Athens. Assessment of policy impacts on sustainability in Europe. Policy interrelationships in the field of sustainable buildings (Greece).</i>	↗	→	↗	↑	→	↗
<i>(2013) Apraise. Stockholm Environment Institute. Assessment of policy impacts on sustainability in Europe. The policy interactions of offshore wind energy generation and conserving marine ecosystems (Estonia).</i>	↗	→	↗	↑	→	↗
<i>(2013) Apraise. Fraunhofer ISI. Assessment of policy impacts on sustainability in Europe. Assessment of the impact of the policy mix relevant for offshore wind in Germany.</i>	↗	→	↗	↑	↑	↗
<i>(2012) SIPER (Policy Evaluation). Technopolis Group. Evaluation de la politique régionale : les Pôles de Recherche Scientifique et Technologique (PRST) en Lorraine dans le cadre du CPER 2007-2013.</i>	↗	↗	↗	→	→	↑
<i>(2012) European Union. Entracte. Report on assessment and interaction of policy instruments and policy mixes.</i>	↗	→	↗	↑	↑	↗
<i>(2012) European Commission. Exchange of good policy practices promoting the industrial uptake and deployment of Key Enabling Technologies.</i>	↗	↑	→	→	→	↗
<i>(2011) SIPER (Policy). Inter-American Development Bank. Innovation Policy and Employment. Evidence from an impact evaluation in Argentina.</i>	↗	→	↗	→	→	↗
<i>(2011) SIPER (Policy Evaluation). European Commission. Mid-term evaluation of the sustainable consumption and production and sustainable industrial policy action plan.</i>	↗	→	↗	→	→	↗
<i>(2010) SIPER (Policy Mix). Policy mix peer review. Latvia peer review outcome report (Final).</i>	→	→	↗	↑	↗	→
<i>(2009) WIFO. Systemevaluierung der österreich-chischen Forschungsförderung.</i>	↗	→	↑	↗	↗	↗

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SOURCE OF INFORMATION	Advanced Manufacturi	Good Policy Practices	Policy Evaluation	Policy Mix	Policy Mix Evaluation	Science and Innovation Policy
<i>(2009) UK Department for Business, Innovation and Skills. Synthesis of Evaluation Evidence. Final Report.</i>	→	↗	↑	↑	↑	↑
<i>(2009) SQW Consulting. Evaluation of the Northern Way 2004-08.</i>	↗	↗	↑	↑	↑	↗
<i>(2009) OECD. Eco-innovation in industry enabling green growth. Measuring eco-innovation: existing methods for macro-level analysis.</i>	↗	→	↗	↑	↑	↗
<i>(2009) Aiginger, K.et al. Reaching out to the future needs radical change. Towards a new policy for innovation, science and technology in Austria.</i>	↗	↓	↑	↗	→	↑
<i>(2007) SIPER (Policy Mix). United Nations. United Nations University. Monitoring and analysis of policies and public financing instruments conducive to higher levels of R&D investments. The policy mix Project. Country review Latvia.</i>	↗	↗	↗	↗	→	↑
<i>(2005) SIPER (Policy). Technopolis Consulting Group Belgium SPRL. Evaluation of the design and implementation of Estonian RTDI policy: implications for policy planning.</i>	↗	→	↗	↗	↗	↑
<i>(2004) Larosse, J. Conceptual and empirical challenges of evaluating the effectiveness of innovation policies with “Behavioural Additionality” (The case of IWT R&D subsidies).</i>	↗	→	↑	↗	↗	↑

ANALYSIS OF EXPERT LITERATURE

SOURCE OF INFORMATION	Advanced Manufacturi	Good Policy Practices	Policy Evaluation	Policy Mix	Policy Mix Evaluation	Science and Innovation Policy
Scientific papers						
<i>(2018) Wilts, H. & O'Brien, M. A policy mix for resource efficiency in the EU: key instruments, challenges and research needs.</i>	↗	→	→	↑	→	↗
<i>(2018) Schmidt, T.S. & Sewerin, S. Measuring the temporal dynamics of policy mixes- An empirical analysis of renewable energy policy mixes' balance and design features in nine countries.</i>	↗	↗	→	↑	→	↗
<i>(2018) Ossenbrink, J. et al. Delineating policy mixes: contrasting top-down and bottom-up approaches to the case of energy-storage policy in California.</i>	↗	→	→	↑	→	↗
<i>(2018) May, A.D. et al. Option generation for policy measures and packages: an assessment of the KonSULT knowledgebase.</i>	↗	→	↗	↑	↗	↗
<i>(2018) Mavrot, C. et al. Mapping the mix: linking instruments, settings and target groups in the study of policy mixes.</i>	→	→	→	↑	→	→
<i>(2018) Magro, E. & Wilson, J.R. Policy-mix evaluation: governance challenges from new place-based innovation policies.</i>	↗	→	↗	↑	↗	↗
<i>(2018) Geels, F.W. et al. Reducing energy demand through low carbon innovation: a sociotechnical transitions perspective and thirteen research debates.</i>	↗	→	→	↑	→	↗
<i>(2018) Edmondson, D. L. et al. The co-evolution of policy mixes and socio-technical systems: towards a conceptual framework of policy mix feedback in sustainability transitions.</i>	↗	→	→	↑	→	↗

ANALYSIS OF EXPERT LITERATURE

SOURCE OF INFORMATION	Advanced Manufacturi	Good Policy Practices	Policy Evaluation	Policy Mix	Policy Mix Evaluation	Science and Innovation Policy
<i>(2018) Edmondson, D. L. et al. The co-evolution of policy mixes and socio-technical systems: towards a conceptual framework of policy mix feedback in sustainability transitions.</i>	↗	→	→	↑	→	↗
<i>(2018) Crescenzi, R. et al. Cohesion policy incentives for collaborative industrial research: evaluation of a smart specialisation forerunner programme.</i>	↗	→	↗	↑	↗	↗
<i>(2018) Bouma, J.A. et al. Policy mix: mess or merit?</i>	→	→	→	↑	→	→
<i>(2018) Borrás, S. & Laatsit, M. Towards system oriented innovation policy evaluation? Evidence from EU28 member states.</i>	↗	→	↗	↑	↑	↗
<i>(2018). Monmartin, B., Herrera, M., & Massard, N. The impact of the French policy mix on business R&D: how geography matters.</i>	↗	↗	↗	↗	↗	↗
<i>(2017) Rosenow, J. et al. The need for comprehensive and well targeted instrument mixes to stimulate energy transitions: the case of energy efficiency policy.</i>	↗	→	→	↑	→	↗
<i>(2017) Rogge, K. et al. Conceptual and empirical advances in analysing policy mixes for energy transitions.</i>	↗	→	↗	↑	↗	↗
<i>(2017) Mulligan, K.M. Innovation policy instrument mix. Unravelling the knowns and unknowns.</i>	↗	→	→	↑	→	↗
<i>(2017) Kern, F. et al. Policy packaging or policy patching? The development of complex energy efficiency policy mixes.</i>	↗	→	↗	↑	↗	↗
<i>(2017) Grubb, M. et al. On order and complexity in innovations systems: conceptual frameworks for policy mixes in sustainability transitions.</i>	↗	→	↗	↑	↗	↗
<i>(2017) Dumont. M. Assessing the policy mix of public support to business R&D.</i>	↗	→	↗	↑	↗	↗

ANALYSIS OF EXPERT LITERATURE

SOURCE OF INFORMATION	Advanced Manufacturi	Good Policy Practices	Policy Evaluation	Policy Mix	Policy Mix Evaluation	Science and Innovation Policy
<i>(2016) Rosenow, J. et al. Energy efficiency and the policy mix.</i>	↗	→	→	↑	↗	↗
<i>(2016) Rogge, K. & Reichardt, K. Policy mixes for sustainability transitions: an extended concept and framework for analysis.</i>	↗	→	→	↑	↗	↗
<i>(2016) Reichardt, K. et al. Analyzing interdependencies between policy mixes and technological innovation systems: the case of offshore wind in Germany.</i>	↗	→	→	↑	↗	↗
<i>(2016) Naidoo, S. Rebalancing innovation policy mix to improve support for South Africa's manufacturing sector.</i>	↗	→	→	↑	→	↗
<i>(2016) Kameyama, Y. & Kawamoto, K. Four intermediate goals: a methodology for evaluation of climate mitigation policy packages.</i>	↗	→	↗	↑	↑	↗
<i>(2016) Cunningham, P. et al. Handbook of innovation policy impact. The innovation policy mix.</i>	↗	→	→	↑	→	↗
<i>(2015) Veugelers, R. Mixing and matching research and innovation policies in EU countries.</i>	↗	→	↗	↑	→	↗
<i>(2015) Lis, A.M. & Romanowska, E. Evaluation of selected innovation policy instruments on the example of Poland.</i>	↗	→	↑	→	→	↗
<i>(2015) Lanahan, L. & Feldman, M.P. Multilevel innovation policy mix: a closer look at state policies that augment the federal SBIR program.</i>	↗	→	→	↑	→	↗
<i>(2015) Guerzoni, M. & Raiteri, E. Demand-side vs. supply-side technology policies: hidden treatment and new empirical evidence on policy mix.</i>	↗	→	↑	↑	↑	↑
<i>(2014) Weber, M. et al. Evaluating environmental policy instruments mixes; a methodology illustrated by noise policy in the Netherlands.</i>	↗	→	↗	↑	↗	↗

SOURCE OF INFORMATION	ANALYSIS OF EXPERT LITERATURE					
	Advanced Manufacturi	Good Policy Practices	Policy Evaluation	Policy Mix	Policy Mix Evaluation	Science and Innovation Policy
(2014) Rio, P. <i>On evaluating success in complex policy mixes: the case of renewable energy support schemes.</i>	↗	→	↗	↑	↗	↗
(2014) Loud, M. L. & Mayne, J. <i>Enhancing Evaluation Use. Insights from internal evaluation units.</i>	↓	↓	↗	↓	↓	→
(2014) Justen, A. et al. <i>Assessment of policies and detection of unintended effects: guiding principles for the consideration of methods and tools in policy-packaging.</i>	↗	→	↗	↑	↗	↗
(2014) Guzman, L. et al. <i>Evaluating of synergies from transportation policy packages using a social welfare maximization approach: a case study for Madrid, Spain.</i>	↗	→	↗	↑	↗	↗
(2013) Tæihagh, A. et al. <i>A virtual environment for the formulation of policy packages.</i>	↗	→	↗	↑	→	↗
(2013) SIPER (Policy Evaluation). Aranguren, M.J. et al. <i>Nested methodological approaches for cluster policy evaluation: an application to the Basque Country.</i>	→	→	↑	→	→	↗
(2013) Jacobsson, S. & Karltorp, K. <i>Mechanism blocking the dynamics of the European offshore wind energy innovation systems –Challenges for policy innovation.</i>	↗	→	↗	↑	→	↗
(2013) Guzman, L. et al. <i>Evaluation of synergies from transport policy packages using a social welfare maximization approach.</i>	↗	→	↗	↑	↗	↗
(2013) Guerzoni, M. & Raiteri, E. <i>Innovative public procurement and R&D subsidies: hidden treatment and new empirical evidence on the technology policy mix.</i>	↗	→	↑	↑	↑	↑
(2013) Givoni, M. et al. <i>From policy measures to policy packages.</i>	↗	→	↗	↑	→	↗

ANALYSIS OF EXPERT LITERATURE

SOURCE OF INFORMATION	Advanced Manufacturi	Good Policy Practices	Policy Evaluation	Policy Mix	Policy Mix Evaluation	Science and Innovation Policy
<i>(2013) Borrás, S. & Edquist, C. The choice of innovation policy instruments.</i>	↗	→	→	↑	→	↗
<i>(2012) Veugelers, R. Which policy instruments to induce clean innovating?</i>	↗	→	↗	↑	↗	↗
<i>(2011) Hofele, V. & Thomas S. Combining theoretical and empirical evidence: policy packages to make energy savings in buildings happen.</i>	↗	→	↗	↑	↗	↗
<i>(2011) Flanagan, K. et al. Reconceptualising the “policy mix” for innovation.</i>	↗	→	→	↑	→	↑
<i>(2011) Carboni, O.A. R&D subsidies and private R&D expenditures: evidence from Italian manufacturing data.</i>	↑	→	→	↓	↓	↗
<i>(2010) Lehmann, P. Using a policy mix to combat climate change –An economic evaluation of policies in the German electricity sector.</i>	↗	→	↗	↑	↗	↗
<i>(2009) Kern, F. & Howlett, M. Implementing transition management as policy reforms: a case study of the Dutch energy sector.</i>	↗	↑	→	→	→	↗
<i>(2009) Howlett, M. & Cashore, B. The dependent variable problem in the study of policy change: understanding policy change as a methodological problem.</i>	→	→	↗	↑	→	→
<i>(2008) SIPER (Policy). Falck, O. et al. The extension of clusters: differences-in-difference evidence from the Bavarian state-wide cluster policy.</i>	→	→	↑	→	→	→
<i>(2004) Geurs, K & van Wee, B. Backcasting as a tool for sustainable transport policy making: the environmentally sustainable transport study in the Netherlands.</i>	↗	↗	↗	→	↓	↗
<i>(2000) Anderson, I. Evaluation in complex policy systems.</i>	→	→	↗	↑	→	→

Annex 2. Policy-mix assessment template for case study analysis in Dynamix

Policy context	<p>Needs assessment: The environmental problem /resource challenge</p> <ul style="list-style-type: none"> • What is the environmental problem/concern (consider both quantity and quality), e.g. soil erosion, excessive use of non-renewable or renewable resources and the crossing of environmental thresholds/tipping points for impact, resource scarcity concerns? • Are there any economic or social problems related to the issue and environmental problems – e.g. is there important price volatility, (risk of) unavailability of resources for the economy or society? • Who is the target group affected that have been, are or will be beneficiaries of the policy response?
	<p>Policy context and policy needs</p> <ul style="list-style-type: none"> • What policy challenge(s) did the problem pose and what policy challenges does it still pose? • What is the policy context related to the policy mix being evaluated? What policies have been put in place to address the issues, what policies are currently in place and which ones are already foreseen for future introduction (e.g. to address past, existing and future objectives)? • What sort of policy response did (and does) the problem call for?
	<p>Historical performance and projections into the future: Insights on decoupling</p> <ul style="list-style-type: none"> • What has been the trend vs. GDP (or other economic performance metrics, such as sectoral growth) and what type of decoupling has been achieved?
	<p>Drivers affecting change: resource use/ environmental issues</p> <ul style="list-style-type: none"> • What are the drivers affecting resource use (driving demand for the resource and leading to resource overuse) or other environmental impacts?
Situation/trend prior to introduction of policy mix	<ul style="list-style-type: none"> • Information on the baseline situation before the policy mix was introduced.
Description of policy mix(es)	<p>Supplementary context questions including elements pertinent to paradigm discussions in DYNAMIX</p> <ul style="list-style-type: none"> • Timeline for the different phases of the policy cycle (i.e. rationale and objective-setting; appraisal; implementation and monitoring). • Description of the government in power during each of the three following policy phases: rationale and objective-setting; appraisal; and implementation and monitoring. • Does the mix contain policies that are unusual or not typical of the country/ies or regional/local administration that implemented it? • Names of resource efficiency concepts, terms, models, ranking/classification systems, accounting methods etc. used or relied upon in each of the three phases of the policy cycle: rationale and objective-setting; appraisal; and implementation and monitoring, and how they were used (e.g.: ‘waste hierarchy’ – used in objective-setting to link policy objectives to more desirable uses for waste)
	<p>Instruments and orientation of policy mix</p> <ul style="list-style-type: none"> • Instruments in the mix and whether one type of tool (i.e. regulatory, economic, information) is dominant. • For each instrument, what is its aim? What requirements does it place on relevant players (for example, phasing out a certain substance, meeting minimum recycling targets, etc.)? What reporting requirements exist?
	<p>Evolution of policy mix</p> <ul style="list-style-type: none"> • Evolution of the policy mix throughout its existence –details of the introduction of the first policy tool(s), then all subsequent relevant tools, and related revisions/reforms (e.g. progressive increases in rates applied through economic tools, broader extension of regulation requirements,

	etc.).
Evaluation of policy mix: effectiveness (environmental sustainability)	<ul style="list-style-type: none"> • Does/did the policy mix result in a positive environmental outcome? • Were its stated objective(s) met? Were the instruments used sufficient to meet the objectives? • Did other, unforeseen/unintended positive outcomes or impacts (environmental, social, economic) result? Did other such negative outcomes or impacts result? • Were these objectives set at a level to meet environmental needs (e.g. avoid crossing environmental thresholds/tipping points or achieve more sustainable levels of resource use/extraction (e.g. maximum sustainable yield (MSY) in fisheries)? • Which sectors/actors were identified as having key impacts/influences on the problem/issue? (e.g. specific industrial/ business sectors, consumers, economy as a whole?) Did any of the instruments specifically target these key sectors/actors? Was there significant take-up/implementation of (voluntary) instruments by these sectors? • Was the policy mix applied to a sector previously not targeted by policies on the issue under question, or in a new area/issue – thereby aiming to stimulate change? • What were the anticipated and actual outcomes, impacts and effects of the policy mix on the behaviour of sectors and actors targeted? (e.g. reductions in emissions from industry, increased recycling rates, increase/decrease in certain product purchases, etc.). • Relationships between the instruments, identifying positive/negative influences on the overall policy mix or on key instruments in the mix, as well as any positive or negative impacts from changes to the mix (introduction or termination of instrument(s), increase or decrease in tax/levy/charge, etc.). Level of 'connectivity' (strong, weak) between each instrument and the primary one(s). • Are there any indicators, monitoring systems, review processes or other monitoring mechanisms in place to track progress?
Evaluation of policy mix: efficiency (economic sustainability)	<ul style="list-style-type: none"> • Is/was the policy mix considered cost-effective? • What has been the level of impact on resource use of the policy mix (the effect)? • What have been the costs of implementing the policy mix for target audience (e.g. business, households, etc.)? • What are the costs (financial, human) of implementing the policy mix for the implementing authority – i.e. the administrative/transaction costs? • Were sufficient resources made available to ensure an effective implementation of the policy-mix? • Was anything foreseen in the policy-mix to address competitiveness concerns (e.g. use of exemptions) or minimise transaction costs (e.g. thresholds below which monitoring wasn't required)? • Did the policy mix involve providing financial support (e.g. subsidies, low interest loans, tax breaks etc.) to key actors (e.g. sector, households, etc.)? • Did the measures generate revenues (e.g. in the case of taxes) and if so, was revenue recycled/re-injected into the economy, and to what levels and activities? Did revenue recycling have positive amplifying effects? • In synthesis - was the policy mix cost-effective? • What elements of the mix were (un)helpful in improving cost-effectiveness? • How was relative/absolute decoupling achieved? • Were resource limits or other thresholds taken into account and how were they addressed?
Evaluation of policy mix: welfare (social sustainability)	<ul style="list-style-type: none"> • What social impacts have you found associated with the policy mix? E.g. jobs created, reduced health impacts, distributional impacts etc. • Were social aspects included in an ex-ante impact assessment of the policy mix if one was undertaken? What were these? • Has monitoring of social impacts been included in implementation, to identify actual effects compared to anticipated ones?

	<ul style="list-style-type: none">• Was the policy mix designed to not be socially regressive? What measures were undertaken to ensure this?• Were equity concerns addressed and, in case of re-structuring of the economy/sector, measures in the area of reskilling of the workforce foreseen?• What other public acceptability elements were addressed or considered?
Overall assessment	<ul style="list-style-type: none">• What is your overall view on the success(es) or failure(s) of this policy mix?• How did the policy mix enable decoupling?• How could it have been improved to achieve its original objective(s) and to achieve absolute decoupling?

Source: Adapted from Faria-Lopes and Bego (2013)