



Maximising the multiplier effect of research results in regions¹

Brief reminder

The BERRY+ S3 industrial modernisation partnership is a result of the Interreg Europe project BRIDGES (2016-2021). It is aiming at industrial modernisation by systematising value-chain based interregional, circular economy complementarities and their integration into RIS3 priorities and measures.

BERRY+ was approved on 17.11.2020. It has eleven (11) members and their associated stakeholders, Table 1.

Table 1 The BERRY+ S3 industrial modernisation partnership

Organisation	NUTS
P1.- Regional Council of Kainuu	NUTS3: FI 1D4
P2.- Helsinki-Uusimaa Regional Council	NUTS2: FI 1B; NUTS3: FI 1B1
P3.- Region of Western Greece	NUTS2: EL 63
P4.- Region of Western Macedonia	NUTS2: EL 53
P5.- Region of Friuli Venezia Giulia	NUTS2: IT H4
P6.- Lombardy Region	NUTS2: IT C4
P7.- Centro region	NUTS2:PT 16
P8.- ACCIO on behalf of the Region of Catalonia	NUTS2: ES 51
P9.- Athens University of Agriculture	NUTS1: EL 3
P10.- Malopolska Voivodeship, Marshall's Office	NUTS2: PL 21
P11.- Regional Council of Lapland	NUTS3: FI 1D7

The BERRY+ objectives include:

Objective 1: Strengthen circular economy through value chains innovations and SDG improvement related to partner regions' RIS3. Value-chains are science & innovation based, i.e. towards development or scaling up of existing markets. Value chains in focus: anti-aging and regenerative cosmetics (VC1), dairy industry side-streams (VC2), forest industry side-streams (VC3), functional ingredients of natural resources (VC4), recyclable and renewable textiles (VC5).

Objective 2: Interregional cluster management unit; by building on interregional complementarities identified through value chains to form an interregional cluster management unit; interregional cluster organised and registered; (2.1) Strategic collaboration linkages and opportunities between and among regions. (2.2) Project opportunities ad hoc and / or as a result of 2.1.

¹ BERRY+ partners contributed to this paper: BP1 (University of Oulu, Ninetta Chaniotou), BP2 (Helsinki-Uusimaa Regional Council, Ari Lainevo, BP4 (ANKO S.A. [ANKO Western Macedonia S.A. /Organization for Local Development – Greece], Tasos Sidiropoulos).

Objective 3: Linking governance levels Identify funding paths and options ensuring funding continuities and tailored funding approaches depending on the nature of initiatives (public & eventually private funds); aim for multiplier effect.

Objective 4: Interregional governance; value chains as a regional policy instruments linked to RIS3; new concepts, capitalisation, diffusion.

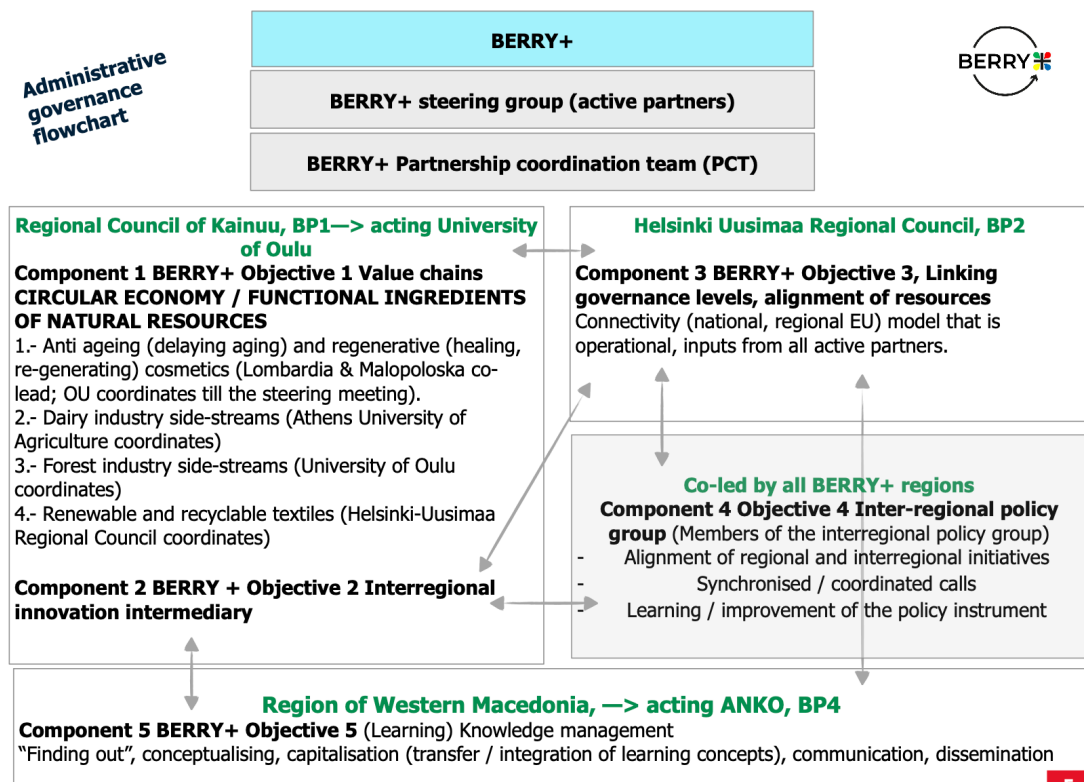
Objective 5: Knowledge management, reinforce the iterative approach; knowledge integration, dissemination.

Motivation, aim of this paper

To address the issue of interregional governance from the perspective of maximising benefits of regional public sector funded and co-funded R&D projects, in the context of RIS3 & value-chain based strategies. To propose a methodology of an evidence-based approach, building on the place-based development through interregional complementarities. The proposed concept is that regions can aim for, either maximising location-based multiplier effect through value-chain complementarities or/and catching up through technology and knowledge transfer. complementarities. The former has not been, to our knowledge sufficiently explored and understood yet, the latter is being intensely explored already. Our efforts here focus more on the former, the less explored case.

This document contributes to the implementation of Objectives 3 (Linking governance levels) and 4 (Interregional policy group), respectively Components 3 and 4 of the BERRY+ governance structure, Figure 1 below.

Figure 1 The BERRY+ governance structure



Background

Multiplier effect is “the marginal effect of a change of one economic variable upon another economic variable, of which the first variable is a component”². The investment multiplier was introduced by Kahn in 1931³, and further elaborated into a fiscal policy instrument by Keynes in 1935⁴. The investment multiplier establishes a precise relationship between aggregate income and the rate of investment, given the marginal propensity to consume. It refers to the increase in the aggregate income of the economy as a result of an increase in the investments done by the government in the form of new projects.

According to the way usually applied, the size of the investment multiplier is determined by the decisions of households in an economy in the areas of spending (which is known as marginal propensity to consume) or saving (known as marginal propensity to save). In order to find the value of the investment multiplier (k), either the value of the marginal propensity to consume (MPC) or the marginal propensity to save (MPS) should be determined or the value of the multiplier can be determined if MPC or MPS values are provided.

The multiplier can be represented by the following formula:

$$\text{Multiplier} = \frac{\text{Change in Income}}{\text{Change in Spending}}$$

$$\text{or, in codified way: } k = \Delta Y / \Delta I$$

Where,

ΔY = Increase in GDP or National Income or regional income, or some kind of aggregate of growth criterion.
 ΔI = Increase in Investment, or in spending within a specific economy.

At equilibrium income conditions:

a) $\Delta I = \Delta S$, where ΔS = Increase in Savings $\rightarrow k = \Delta Y / \Delta S$ and $MPS = \Delta S / \Delta Y \rightarrow MPS = 1/k$ or $k = 1/MPS$

b) $MPS + MPC = 1 \rightarrow 1/k + MPC = 1$ and **$k = 1 / (1 - MPC)$** and equivalently that **$k = 1 / MPS$**

i.e. the bigger the (individual) savings the smaller the investment multiplier effect. (At regional-national level it means decrease in GDP - paradox of thrift!).

Multiplier effects can be measured according to several different theoretical approaches to urban and regional development, including⁵:

- *economic base theory*: Economic base theory and export base theory. They can be used to explain the development of a city or region in terms of economic activities satisfying external demand, which assumes a dependence on broader markets. *The relationship between total economic activity and the economic base – often thought of in terms of employment – is expressed by a local/ regional multiplier that allows an*

² R. F. Kahn R.F. (1931). The Relation of Home Investment to Unemployment. *The Economic Journal*, Vol. 41, No. 162 (Jun., 1931), pp. 173-198 (26 pages), Published By: Oxford University Press.

³ Ibid. above.

⁴ Keynes J. M., (1935). *The General Theory of Employment, Interest, and Money*. Palgrave Macmillan 2007. ISBN 978-0-230-00476-4. There exists an inverse relationship between unemployment and inflation and that governments should manipulate fiscal policy to ensure a balance between the two.

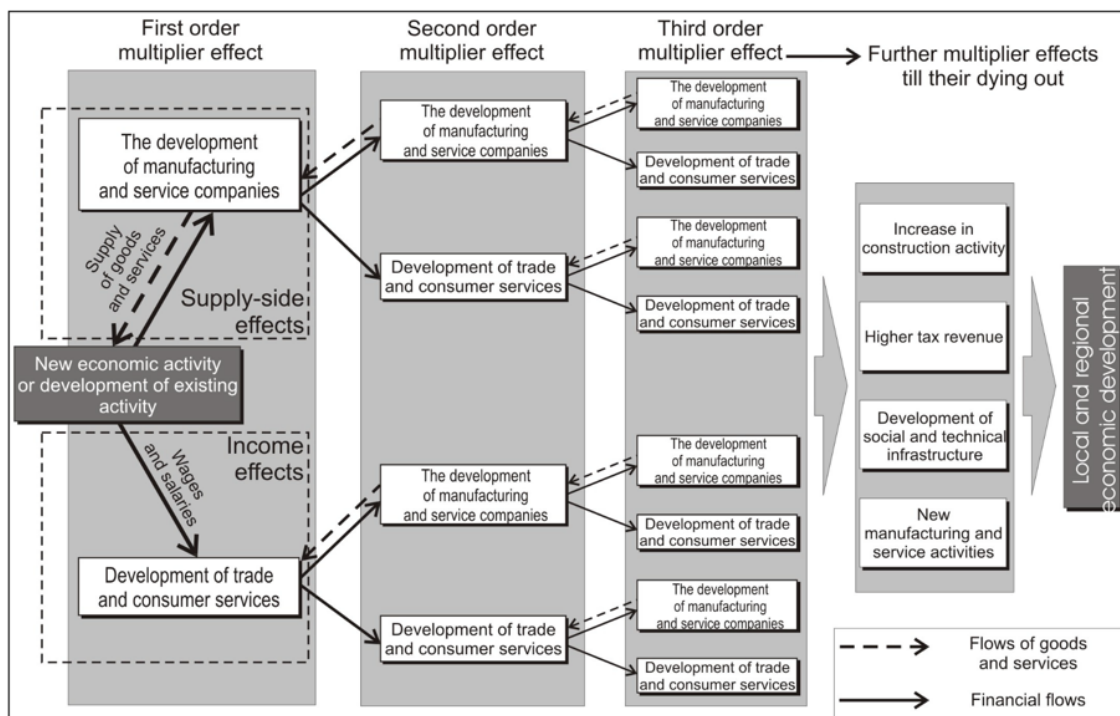
⁵ Domański B. & Gwosdz K., (2010). Multiplier effects in local and regional development. *Quaestiones Geographicae* 29(2) • 2010. Institute of geography and spatial management, Jagiellonian University, Cracow, Poland

*assessment of the impact of changes in the economic base on the entire economy of the city or region*⁶.

- *growth pole theory*: The theory rests on the idea that dynamic economic activity impacts local and regional economies and multiplier effects are the basic mechanism whereby a growth pole affects its surroundings. It should also be noted that strong locally confined multiplier effects are a basic force exerted by metropolitan areas.
- *input-output model*: The input-output model takes a more differentiated approach: it is not based on a division of the local and regional economy into just two sectors (basic=export and non-basic economy). The input-output model attempts to show the linkages between many different types of economic activity within & beyond a given city or region. *An input-output matrix is used to calculate input coefficients, which measure inputs necessary to generate the output of each economic activity. Input coefficients, together with the degree to which demand is met locally or regionally, allow an analysis of the impact of changes in one sector of the economy on other sectors in the city or region (multiplier effects)*⁷. The input – output model is mapped in Figure 2 below.

Figure 2 Mechanism of supply-side and income-type multiplier effects

(source: Domański et al. (2005)⁸)



⁶HOYT H., 1949. The economic base of the Brockton. Massachusetts Area, Brockton, Mass.

⁷This type of analysis is normally part of what has been termed regional science. (Isard 1960: ISARD W., 1960. Methods of regional analysis. MIT, Cambridge, Mass. Miller & Blair 1985: MILLER R. & BLAIR P., 1985. Input-output analysis: foundations and extensions. Prentice Hall, Englewood Cliffs, NJ.).

⁸Domański B. & Gwosdz K., (2010). Multiplier effects in local and regional development. Quaestiones Geographicae 29(2) • 2010. Institute of geography and spatial management, Jagiellonian University, Cracow, Poland.

Cwik t., and Wieland V. (2010). Keynesian government spending multipliers and spillovers in the euro area. European Central Bank Working Paper series no 1267 / November 2010.

Input-output analysis is a macroeconomic analysis based on the interdependencies between different economic sectors or industries. Input-output analysis is used to estimate the impacts of positive or negative economic shocks and analyzes the ripple effects throughout the economy⁹. By using I-O models, the change in output across industries due to a change in inputs in one or more specific industries can be calculated, for example¹⁰:

- The direct impact of an economic shock is an initial change in expenditures. For example, building a bridge would require spending on cement, steel, construction equipment, labor, and other inputs.
- The indirect, or secondary, impact would be due to the suppliers of the inputs hiring workers to meet demand.
- The induced, or tertiary, impact would result from the workers of suppliers purchasing more goods and services for personal consumption. This analysis can also be run in reverse, seeing what effects on inputs were likely the cause of observed changes in outputs.

The input-output approach implies complementary relationships at local, national and beyond levels. Thus it relates to clusters and value chains. It maps an operational approach to regional development and not only a metric. This is further confirmed by Enrico Moretti (Moretti 2012¹¹) in his research regarding the reasons why regions' growth patterns diverge: "Some places have always been more prosperous than others, but these differences have increased more rapidly over the last 30 years as the gross domestic product and patents for new technologies have concentrated in two to three dozen communities that co identifies as "brain hubs" or "innovation clusters." His conclusion is that clusters, developed around research & innovation activities, matter: "The importance of multiplier effects lies in their very nature: they are an expression of the linkages inherent in local and regional economies. A study of the strength, industry structure, spatial distribution, and key drivers of these effects can serve the following purposes: (i) it can help understand the growth mechanisms underlying local and regional economies, (ii) it can help evaluate the advantages and disadvantages associated with foreign investment as well as the effectiveness of regional economic policy that may include special economic zones (ex ante or ex post), and (iii) it can help evaluate economic threats associated with the liquidation or contraction of a given economic activity in towns and regions, e.g. bankruptcy or relocation".

But what causes clusters to emerge, what makes a regional input-output approach become a significant growth factor? Moretti indicates three factors: labour market thickness related to highly specialised skills, then "you want to be in a labour market where there are a lot of employers looking for workers, and a lot of workers looking for

⁹ <https://www.investopedia.com/terms/i/input-output-analysis.asp#:~:text=Input%20output%20analysis%20is%20a,ripple%20effects%20throughout%20the%20economy.>

Leontieff, Nobel Prize in Economics 1973, (Leontief, Wassily W. Input-Output Economics. 2nd ed., New York: Oxford University Press, 1986), proposed the input-output analysis method. Input-output analysis breaks down the sectors of the economy and discusses how changes in one sector can affect other sectors. Leontief's Paradox does not account for human capital and the resulting difference between skilled and unskilled labour. Later researchers showed that U.S. exports were skilled-labour-intensive—or, in other words, human capital intensive relative to imports—resolving the Leontief Paradox in favor of the comparative advantage view. [Comparative advantage is an economy's ability to produce a particular good or service at a lower opportunity cost than its trading partners. Comparative advantage is used to explain why companies, countries, or individuals can benefit from trade.]

¹⁰ Ibid., above.

¹¹ Moretti (2012). The New Geography of Jobs. Enrico Moretti: The Geography of Jobs | Stanford Graduate School of Business 12.10.2023, 1.13. <https://www.qsb.stanford.edu/insights/enrico-moretti-geography-jobs>.
<https://sloanreview.mit.edu/article/the-multiplier-effect-of-innovation-jobs/>.

employers. The match between employer and employee tends to be more productive, more creative and innovative in thicker labour markets”; a second factor are the vendors, the intermediate services, that focus on that niche in the market and “because they are so specialised, they’re particularly good at what they’re doing”; a third factor, finally, are spill over effects, i.e. the fact that people learn from their colleagues, random encounters. The takeaway is critical: One of the best ways for a city or state to generate jobs for less-skilled workers is to develop and attract high-tech companies that hire highly skilled ones¹². Research showed that comparative advantage was not the sole reason behind USA exports, it was also that the products were made better due to better skills¹³. This meant that the distinction between comparative¹⁴ vs absolute advantages, was resolved in favour of absolute advantages (better and cheaper), what in the EC is often called competitive advantage¹⁵.

Research

Objectives

The multiplier effect is to identify and measure the impact (income generation) of research and innovation projects funded by regional and / or national funds (spending) invested in actors in specific locations¹⁶ and understand how the income generation results, based on the structuring of different spaces, as in Figure 1. This process this would lead, as well, to an understanding of the direct or indirect regional contexts that generate “income” for research projects, and, therefore, of the types of collaborations that might be indicated.

Policy makers and their stakeholders would have a perspective on

- The direct domain and geographical range of the the project’s outputs value proposition.
- New value propositions that could be identified at the intersection of emerging technologies.
- Cross-sector opportunities that emerging technologies might create, with implications for competitive dynamics and market structures¹⁷.

¹² Multiplier Effects: Connecting the Innovation and Opportunity Agendas | Brookings.
<https://www.brookings.edu/articles/multiplier-effects-connecting-the-innovation-and-opportunity-agendas/>.

¹³ Ibid 8.

¹⁴ Comparative advantage is contrasted with absolute advantage.
[<https://www.investopedia.com/terms/a/absoluteadvantage.asp>]. Absolute advantage refers to the ability to produce more or better goods and services than somebody else. Comparative advantage refers to the ability to produce goods and services at a lower opportunity cost, not necessarily at a greater volume or quality.

¹⁵ Competitive advantage refers to factors that allow a company to produce goods or services better or more cheaply than its rivals. These factors allow the productive entity to generate more sales or superior margins compared to its market rivals.
https://www.investopedia.com/terms/c/competitive_advantage.asp#:~:text=Competitive%20advantage%20refers%20to%20factors,compared%20to%20its%20market%20rivals.

¹⁶ Mitze and Makkonen 2023, have discussed this issue at national level, regarding Business Finland (BF) funding for different technology intensity levels. They have found that there is “tentative evidence for decreasing returns to RDI funding in low and medium-tech sectors” (page 10, Timo Mitze, Teemu Makkonen, (2023). Can large-scale RDI funding stimulate post-crisis recovery growth? Evidence for Finland during COVID-19, Technological Forecasting and Social Change, Volume 186, Part B, 2023, 122073, ISSN 0040-1625, <https://doi.org/10.1016/j.techfore.2022.122073> ; <https://www.sciencedirect.com/science/article/pii/S0040162522005947>), and they have introduced a discount factor r .

¹⁷ Deloitte (2020). The multiplier effect. The imperative for coordinated technology deployment in financial services.

- The capabilities that emerging technologies could unlock, individually and in combination.
- To conceptually understand the first, second and eventually third order multiplier effects of the project.
- To propose immediate action for achieving first order multiplier effect.
- To investigate, plan and propose actions for ensuring second order multiplier effect.

Argument

The investment multiplier concept can be utilised in more ways than one.

- 1) It can be applied to calculate the impact of public spending on the generation of different types of national or regional aggregates “types” of income (growth, employment, capital formation, ...) as a total or even in relation to specific industries. For example, it can answer the question: **what is the multiplier effect of Structural Funds projects (i.e. investments largely funded by regional authorities) in terms of turnover, or exports, or employment, or gross capital formation, or employment, etc.** In this way, it can also be used as a policy implementation monitoring tool and a policy guidance tool. The aim would be to describe (qualify and quantify) the multiplier effect to be expected and reach follow up activity recommendations.
- 2) It can be applied as a tool for guiding R&D public investment decisions¹⁸. To identify this potential within the scope **of the present project XXX Task 2.1**, the first requirement is to ensure the relevance of Task 2.1, the context of its application, the measurement parameters (or criteria) and the method for addressing the issue.
- 3) The relevance of the research argument, its context and criteria for implementation are confirmed by recent. It is not sufficient to allocate R&D funding, it is important in what activities the funding goes (Liu et al 2023¹⁹) once the initial positive research funding shock is made. Liu et al propose a model for “the optimal allocation of R&D resources”, in which they stress investments in mainstream sectors: “We show a planner valuing long-term growth should allocate more R&D toward central sectors in the innovation network, but the incentive is muted in open economies that benefit more from foreign knowledge spillovers”. Liu et al, consider, as well, the cross-disciplinary impact of R&D projects, i.e. going beyond the production of a certain technology to also considering its applications in various relevant sectors. The IMF (IMF 2023²⁰) argues that public investment shocks “can increase the fiscal multiplier if public investment shocks improve private agents’ expectations about future economic outlook, and lead to larger private spending”. The impact of public R&D spending has been investigated by De Lipsis et al 2023²¹ and what was found is that “it is very effective in fostering the total national innovation effort, crowding in private investment, and in raising aggregate output in the long run”.

¹⁸ <https://insights.som.yale.edu/insights/rd-investment-can-have-multiplier-effects-if-its-made-in-the-right-industries>

¹⁹ Liu E., Ma S., (2023). Innovation networks and R&D allocation. National Bureau of Economic Research (NBER), Working Paper 29607, https://www.nber.org/system/files/working_papers/w29607/w29607.pdf.

²⁰ Ghobui W. (2023). Uncertainty and Public Investment Multipliers: The Role of Economic Confidence. IMF Working Paper, WP/21/272. <https://www.imf.org/en/Publications/WP/Issues/2021/11/12/Uncertainty-and-Public-Investment-Multipliers-The-Role-of-Economic-Confidence-506825> .

²¹ De Lipsis, V., Deleidi, M., Mazzucato, M. and Agnolucci, P. (2023) Macroeconomic Effects of Public

From the brief reference above it can be concluded that (i) measuring and anticipating public R&D spending for strategic and initiative decisions is a relevant issue, leading in the long run to increased aggregate output, (ii) the immediate measurement criteria can be measured in R&D investments of the private sector, (iii) the private sector investments relate to two domains: investments for technology production (the output of the research) and investments for technology applications (i.e. cross disciplinary). The proposed activities for Task 2.1 take into account these conclusions.

The proposed approach is differentiated slightly from usual input-output and investment multiplier analyses in the sense that it 1) includes a geographic spread dimension, considering impact within regional borders, within national borders and within the EU; 2) considers the private sector R&D spending as an interpretation of the marginal propensity to consume. This leads to drawing conclusions as to the marginal propensity to invest in different regions and the potential of any scaling up policy-based efforts; 3) we are utilising results to anticipate the impact of emerging industries or new research and to reduce public sector investment risks.

Hypotheses

Hypothesis 1: The added value of a regional economy increases as a result of publicly funded (or co-funded) research and innovation projects.

Hypothesis 2: Private investments in new/improved products increase as a result of publicly funded (or co-funded) research and innovation projects.

Hypothesis 3: The added value concentrations and the equilibrium (or not) of upstream and downstream linkages reveal strengths and weaknesses/improvement needs of a regional economy.

Hypothesis 4: Spatial analysis of added value upstream and downstream concentrations of linkages, reveal potential longer term interregional collaborations.

To measure actualised and anticipated results of the input-output analyses and calculate the investment multiplier, we use the methodology proposed by [Kowalewski 2009](#)²².

R&D. UCL Institute for Innovation and Public Purpose, Working Paper Series (IIPP WP 2023-02).
<https://www.ucl.ac.uk/bartlett/public-purpose/wp2023-02> .

²² Kowalewski, J. (2009). Methodology of the input-output analysis, No 1-25, HWWI Research Papers, Hamburg Institute of International Economics (HWWI), <https://EconPapers.repec.org/RePEc:zbw:hwwirp:1-25>.

More in input-output analysis:

Holub, H.-W. and Schabl, H. (1994). Input-Output-Rechnung: Input- Output-Analyse - Einführung, Oldenbourg's Lehr- und Handbücher der Wirtschafts- und Sozialwissenschaften.

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Methodology

1.- Interpretation of the investment multiplier

$$\text{Multiplier} = \frac{\text{Change in Income}}{\text{Change in Spending}}$$

The multiplier formula:

$$; \text{multiplier} = \Delta Y / \Delta I = k$$

Where,

1) THE EXPENDITURE CONCEPT²³

In economics, gross regional / national product **GDP = C+G+I+NX**, where

- C= private consumption
- G= government consumption of goods and services equals = spending on goods & services (G_{sgs}) + spending on infrastructure (G_{infra}) + spending on R&D projects (RIS3 projects, G_{sfp}).
- I= private investment. Private investments in goods and services for product improvement/product development/organisational adjustments. Among these investments, a few come from those industries that have benefitted from G_{sfp} . Therefore, there is a multiplier effect implied by G_{sfp} spending.
- NX= net exports (exports-imports).

Therefore the GDP formula equals = $C + G_{sgs} + G_{infra} + G_{sfp} + I + NX$.

2) THE INCOME CONCEPT²⁴

In economics, gross regional / national product **GDP = GVA** (gross added value). **GVA= (Value of output – value of output production - subsidies on products) + taxes = GDP.**

GVA is aggregate of the value added VA by industrial sectors equalling value of sold output – intermediate goods and services acquisition for the production of the said output. $VA = \text{value of output (} VA_o \text{)} - \text{value of production costs [private investments PI + subsidised investments } G_{sfp}] \rightarrow VA = VA_o - PI - G_{sfp}$.

2.- Spatial dimension

From a geographical point of view, the question is: where do multiplier effects begin and what is their spatial range? In the case of this project, Order 1 space is the NUTS 3 area, Order 2 space is the NUTS 2 area, Order 3 space is NUTS 1 (all Finland), and order 4 space is EU and beyond. In Figure 2 (page 2 above), the project (-s) itself/themselves has/have the position of "NEW ECONOMIC ACTIVITY". Investment multipliers are planned to be calculated at all four levels separately and as a total.

The findings of the two analytical paths, reveal the potential for a more effective place-based development and accordingly planned innovation strategies. The analysis combines the quantification process described above with

Gabriel, C. (2001). Constructing regionalised input-output tables: A new simple-to-use method, in W. Pfähler (ed.), Regional Input-Output Analysis - Conceptual Issues, Airport Case Studies and Extensions, Vol. 66 of HWWA Studies, Nomos.

Beynon, M. J. and Munday, M. (2007). An aggregated regional economic input-output analysis within a fuzzy environment, Spatial Economic Analysis 2(3): 281–296.

²³ <https://www.investopedia.com/terms/g/gdp.asp>

²⁴ The link between GVA and GDP can be defined as: GVA (at current basic prices; available by industry only) plus taxes on products (available at whole economy level only) less subsidies on products (available at whole economy level only) equals GDP (at current market prices; available at whole economy level only).
<https://webarchive.nationalarchives.gov.uk/ukqwa/20121003015625/http://www.ons.gov.uk/ons/guide-method/method-quality/specific/economy/national-accounts/gva/gross-value-added-and-gross-domestic-product.html> .

understanding and gaining insights as to how much regions benefit from publicly funded research, how and why. For this purpose, reference will be made to the methodology proposed by Lau & Lo (Lau & Lo 2014, Figure 1 page 101) where absorptive capacity (AC) is introduced and distinguished into several stages.

Figure 3 Regional innovation system, absorptive capacity and innovation performance [source: Lau & Lo 2014].

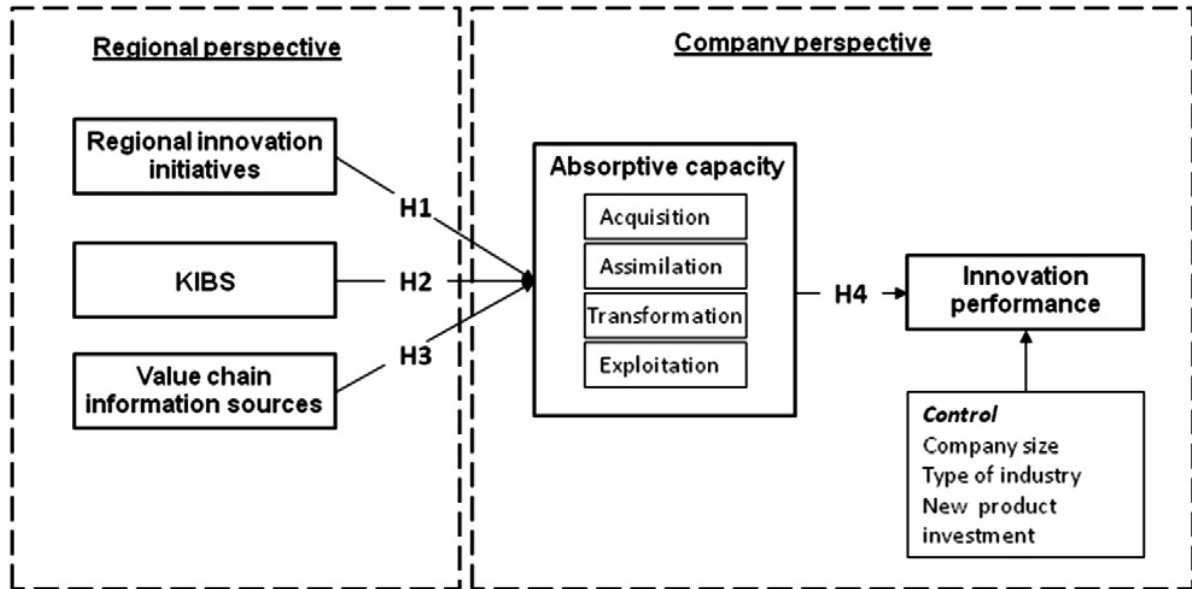


Table 2 Research process

IDENTIFIER	
Region	
RIS3 domain, sector (NACE traceable)	
INVESTIGATION FIELDS	
3.1 CORRELATING SPENDING AND INCOME	3.2 GROWTH AND INVESTMENT MULTIPLIER
3.1.1) how R&D projects impact the region's added value for specific industry or industries, i.e. to investigate how VA_o & G_{sfp} correlate.	3.2.1) How much and in what direction increase in G_{sfp} impacts / changes VA_o .
3.1.2) how G_{sfp} impacts GVA	3.2.2) How much and in what direction increase in G_{sfp} impacts / changes GVA .
3.1.3) how G_{sfp} correlates with PI for industries that have benefitted from G_{sfp} .	3.2.3) How much and in what direction increase G_{sfp} correlates with PI changes for industries that have benefitted from G_{sfp} .
Spatial dimension: input-output multipliers	
Policy recommendations	

The relevance of this model is that a) it refers to value chains (even if only as information inputs operated by businesses rather than as regional development and policy tools), b) links business to regional perspectives, c) introduces the concept of absorptive capacity and structures it into different fields, allowing to interview people accordingly, d) links absorptive capacity to innovation performance, which, in our approach is the added value

resulting from public research funding, and e) it includes 'new product investment', which in our model is the 'new/improved product investments' criterion.

Contribution to research issues

The research contributes to the challenge to explicitly link the regional with the business perspective. We argue that the proposed approach offers such a possibility. In this respect our research is aligned with one recommendation Mitze & Makkonen ([Mitze and Makkonen 2023](#), page 14), "Future studies on the effectiveness of public RDI funding under COVID-19 should thus consider alternative ways to identify causal relations, preferably on the basis of micro data for firms and institutions receiving public RDI funding".

1. IMPACT ON ADDED VALUE AND INVESTMENTS

1.1) WHAT IT MEASURES

It describes how to describe the impact of structural funds R&D -funded or co-funded projects on regional value added and on private investments. This allows to measure regional resource concentration especially in terms of added value.

1.2) WHAT IT IMPLIES

This allows to measure regional resource concentration especially in terms of added value. We feel this is important option to employment concentrations, because inevitably, in the future, due to AI, employment will be a different story. This allows considering how to improve own innovation strategies, especially their operationalisation.

2. INPUT-OUTPUT ANALYSIS AND SPATIAL POSITIONING

2.1) WHAT IT MEASURES

It describes, thanks to input-output analysis, the "essential and operative proximities" between and among regions, i.e. where they buy from and where they sell to. This might imply different types of connectivities within countries and also cross-border where spatial continuities facilitate joint activities and selective but crucial collaborations when spatial continuities are not there.

2.2) WHAT IT IMPLIES

2.2.1) It allows us understand which industries are localised and generate localised /national i.e. controllable income and employment, and it allows adjusting competitiveness and employment policies.

2.2.2) It encourages stable value-chain based collaborations. Regions enable, re-introduce, verticalization of industries; long term collaboration within value chains serves this purpose. This saves outsourcing and quality assurance costs²⁵ since, beyond initial complementarities, long term joint development is anticipated. This is one part of reasons why interregional governance schemes are needed.

²⁵ S-ryhmän suurmuutos voi laskea ruuan hintaa: S-ryhmä aikoo tuoda valikoimiinsa lähes kaikista poistuvista Rainbow-tuotteista vastaavat Coop-tuotteet. <https://www.hs.fi/talous/art-2000009996014.html>.

2.2.3) Encourages anticipation future collaboration needs, including research and development collaborations. This will always be needed, because we need to renew industries anyhow. It leads to anticipatory interregional complementarities and policy adjustments.

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