Economic impact modeling in the prioritization process of smart specialization

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Introduction

- Smart specialization policy aims at supporting growth by enabling each region to identify and develop their own competitive advantages

- S3 is a bottom-up development concept: pockets of potential future innovations (discoveries) developed by entrepreneurs may result in a change of the region's future industrial structure

Introduction

- Prioritization is key in S3
- In the prioritization process the government selects from alternative domains (activities) for policy support
- Dimensions of prioritization (Foray 2015):
  - the activity's individual features (degree of novelty, the extent to which it targets new regional opportunities, availability of regional supply factors)
  - its regional spillover capacity to generate firm concentration
  - economic significance of the new activity
- This presentation argues for the necessity to involve economic impact models in the prioritization process
- A concrete economic impact assessment exercise is carried out for a selected new activity in the city of Pécs

Economic impact assessment in prioritization

- The suggested approach for economic impact assessment in the smart specialization literature:

  'estimation of direct and indirect resource inputs from both the private and public sector suppliers' (Foray et al. 2011, p. 13)

- However the suggested approach covers impacts only partially since a new activity
  - requires investments in the region followed by investments in other sectors
  - results in changes in regional employment in the new sector and other sectors
  - investment and production requires intermediate production inputs from the region and other regions
  - increased capital and labor income involves income multiplier effects in the region and in other regions
  - goods and factor prices might change that might result in substitutions of regional products with imports from other regions or countries, migration impacts, etc.

- Therefore the introduction of a new activity will result in various, mutually interconnected changes in the economy of the region as well as the economies of other regions

Economic impact assessment in prioritization

- Economic impact models could potentially be useful in the estimation of the various economic impacts of a new activity

- Suitable economic impact models should incorporate
  - the regional dimension (S3 interventions address regional development)
  - interregional interactions (trade, migration, technology spillovers)
  - the industrial dimension of the regional economy (S3 interventions address selected industrial sectors)

- With the application of multi-regional, multi-sectoral models the economic impacts of different new activities may become comparable

Challenges in modeling the likely economic impacts of a new activity

- How to involve a new activity in an economic model?
  - The solution we followed: we added a new sector which produces this output to an existing model (since the new activity results in new output)
- How to get the data to model the new sector?
  - In the case of existing sectors data from statistical offices (SAM) provide the basis to model the sectors' production, its interrelations with other sectors, labor, capital income, etc.
  - The solution we followed: the necessary information is collected via interviews

Challenges in modeling the likely economic impacts of a new activity

- The structure of the existing economic model should be changed in several respects:
  - All the equations that represent the new sector in the economy should be added and calibrated (e.g., production functions, different demand and supply functions)
  - Some of the aggregate functions (e.g., consumption, investment demand) should be re-calibrated
  - Some of the functions should be updated (e.g., household income, savings, balance of payment)

A regional case study: ex-ante impact modeling of a selected new activity in the city of Pécs

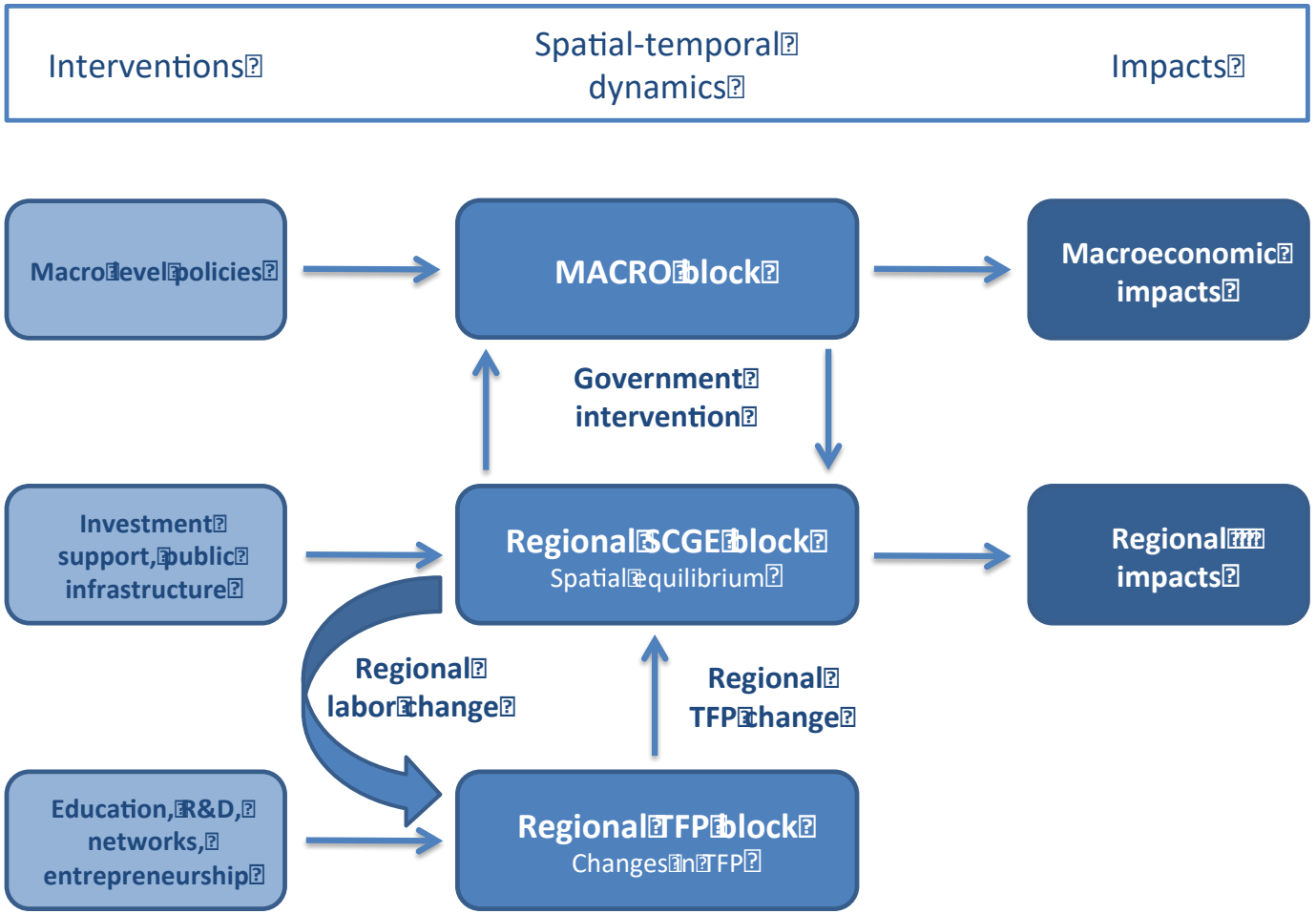
The model applied in assessment: The GMR-Hungary model

- **GMR**: Geographic Macro and Regional model

- GMR-models: EcoRET model (Varga, Schalk 2004), GMR-Hungary (Varga 2007, Varga, Járosi, Sebestyén 2013), GMR-Europe (Varga 2017, Varga, Sebestyén, Szabó, Szeb 2018), GMR-Turkey (Varga, Baypinar 2016)

- Selected applications:
  - Cohesion Policy impact assessment for the Hungarian government (since 2004 continuously)
  - Cohesion Policy impact assessment for the European Commission (DG Regio, 2011)
  - FP6 impact assessment (2010)
  - policy impact assessments for Turkish regions (2014)

The model applied in assessment: The GMR-Hungary model



Screening for potential domanins 1: Some of the innovative firms in the region

- **Soft Flow – biotechnology, R&D**
  - Flow cytometry, antibodies, toxi-watch mycotoxin
  - Nish market, highly specialized, global buyers, global suppliers, University's necessity is limited
- **Games for Business – software, B2B**
  - Recruitment, HR development software using gamification methods
  - Regional (Budapest), global buyers, human resource (most important) is available via freelancer channels
- **Rati – car interior product development**
  - Supplier of car interior for global players (Renault, Audi, VW)
  - Supply of semi finished products from China, local human resource for assembly, industrial design capacity from Budapest (despite of the fact that the University has such potential)

Screening for potential domains 2: Some of the research areas inspected at the University of Pécs

- **New grape cultivars with durable disease resistance** – *Institute of Viticulture and Oenology*
  - New grape cultivars with durable disease resistance that allows significant reduction of insecticides, suitable for organic wine growing
  - Obstacles: long process (still 3-4 years to get all licenses); regional spillover and transformation effects are not evident
- **3D printing, rehabilitation robotics development, medical equipments** – *3D Print Project Center Medical working group*
  - Design and development of experimental medical equipment, prototypes, e.g. rehabilitation robotics development, design and manufacturing of medical simulation equipment
  - Obstacles: the projects are in initial phase, lack of focus
- **Biotechnology and biopharmacology** – *School of Pharmacy, School of Medicine, SZRC, 3D PPC*
  - Many promising research avenues ranging from anti-inflamatory drugs to cancer treatment
  - Obstacles: regional spillover and transformation effects are not evident owing to high level of internationalization

The activity selected for assessment:
3D Bioprinting of cartilage for sport injuries

- Special area of 3D printing
- Fat cells of the patients are used to grow the personally customized cartilage
- High value added compared to traditional treatments by full costumization and relatively short period of recovery to loadability that is of utmost importance in sport
- Expertise in research and surgery are present at the University of Pécs
- Potential spillover into other sectors (tourism, insurance, transportation services etc.)

Business Model Canvas – Sport medical, 3D cartilage printing and implant

Key Partners

University,
Medical equipment producers,
Medical accessories producers,
Patient management service providers – transfer shuttle, taxi, hotel,
Entertainment activity providers – restaurants, touristic attraction sites, etc.

Key Activities

Business administration,
Patient management,
Medical activities,
Cartilage production.

Key Resources

Human capacity – doctors, biologist, assistants, business support staff.
Physical facility – for treatment and for the 3D printing.
Equipment – assessment, diagnostic, operation, 3D printing.
Financial resource – investment, working capital funding.

Value Propositions

Durable, resistant, natural cartilage customized using 3D printing technology.

Cost of the cartilage, treatment and other support services are at a low price.

Scientific credibility due to University supported R&D activity.

Customer Relationships

Newsletters, publications, tutorial videos, thematic events and scientific conferences, trainings and educational programs.

Key account relationship with professional organizations and associations.

Community building activities.

Channels

Direct communication to professional sport clubs and associations, via thematic events.
Word of mouth in the professional segment.
Through actors of the health care system with diagnostic capacity.
In cooperation with medical aids producers and distributors.

Customer Segments

Professional athletes with knee injuries resulting in cartridge trauma.

35-40 years old, mid-upper, upper class non-professional individuals with intensive, daily sport activity.

Hungarian and EU professional soccer, handball, basketball, athletic, swimming and water polo clubs and associations.

Cost Structure

Patient management, diagnostics, treatment, 3D printing, aftercare, insurance, cost of accessories, amortization, hazardous waste.

Revenue Streams

Treatment – medical assessment, diagnosis, cartilage printing, implantation.
Support services – logistics, medical hotel, food, rehabilitation.
Aftercare services – monitoring, consulting

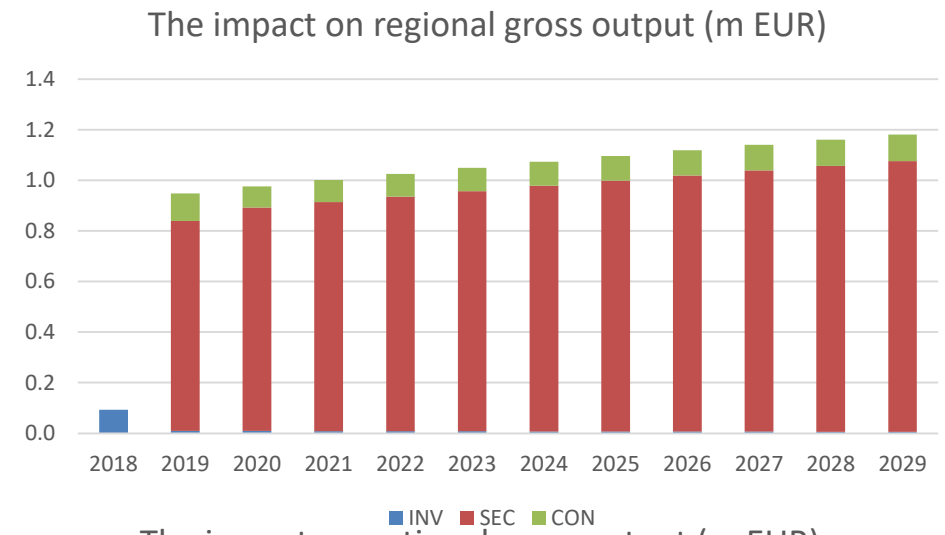
Shocks associated with the new sector

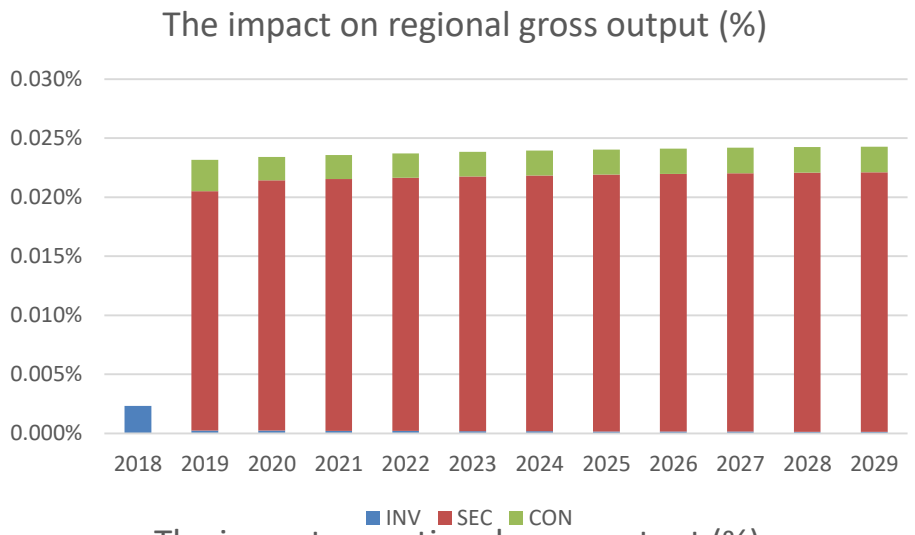
- Investment in the new sector (only) in 2018: 2.280 million EUR
  - Source: foreign grant (e.g. EU funds)
- Consumption shock (of the new sector) between 2019-2029: 630 thousand EUR (annually)
  - Source: foreign patients (125 people)
- Tourism shock between 2019-2029: 196 thousand EUR (annually)
  - Source: foreign patients (125 people – staying for 4-13 days per visit)
- Labour shock
  - 15 new employees (252 thousand EUR annually)

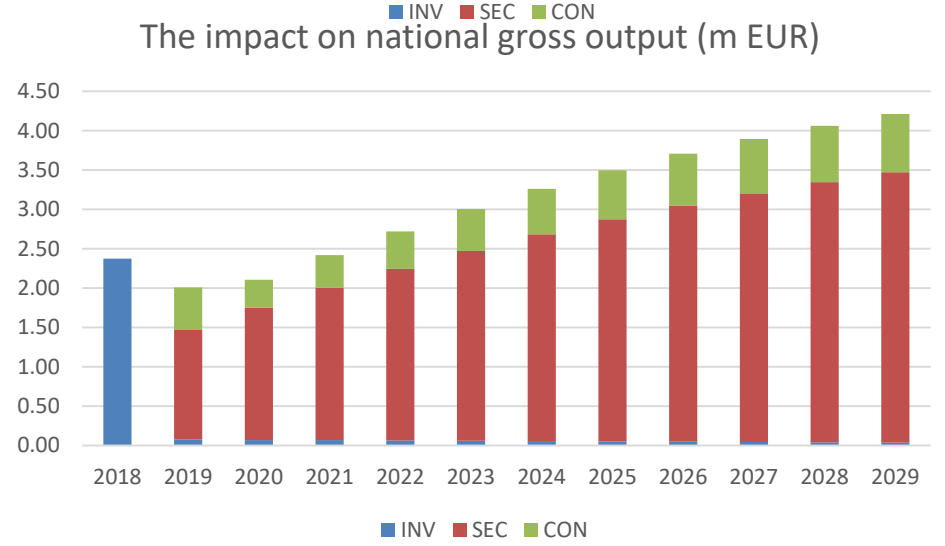
Sectoral details of the shocks

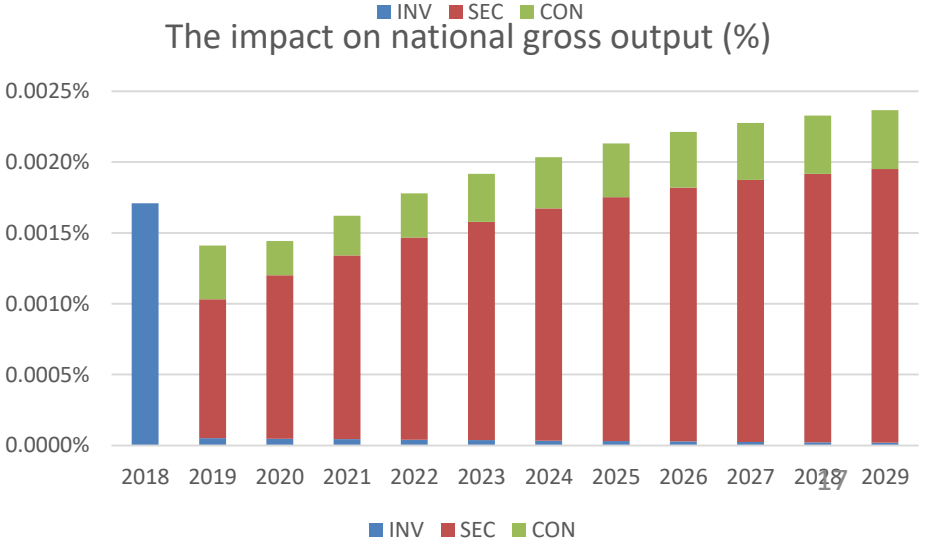
	Investment	3D bioprinting sector	Tourism
AGRI			18 647
FOOD			12 990
TEXT		1 617	2 658
WOOD		404	1 896
COKE			5 579
PHAR		11 319	489
PLAS		404	1 930
COMP	1 685 262		1 633
ELEC			395
MECH	8 085		
OTHE	120 630	6 609	3 033
ENER		4 191	
WATE		466	
WAST		1 213	
CONS	470 554		
TRAN		3 881	29 645
REST			78 886
INFO	323	3 234	
FINA		2 264	
OTSC		12 936	
ADMI		7 762	
HEAL			9 081
ARTS			21 172
OTSE			8 597
Total purchases	**2 284 855**	***56 300***	**196 630**
LAB		*252 877*	
CAP		*321 462*	
TOTAL	**2 284 855**	**630 639**	**196 630**

Impacts on output

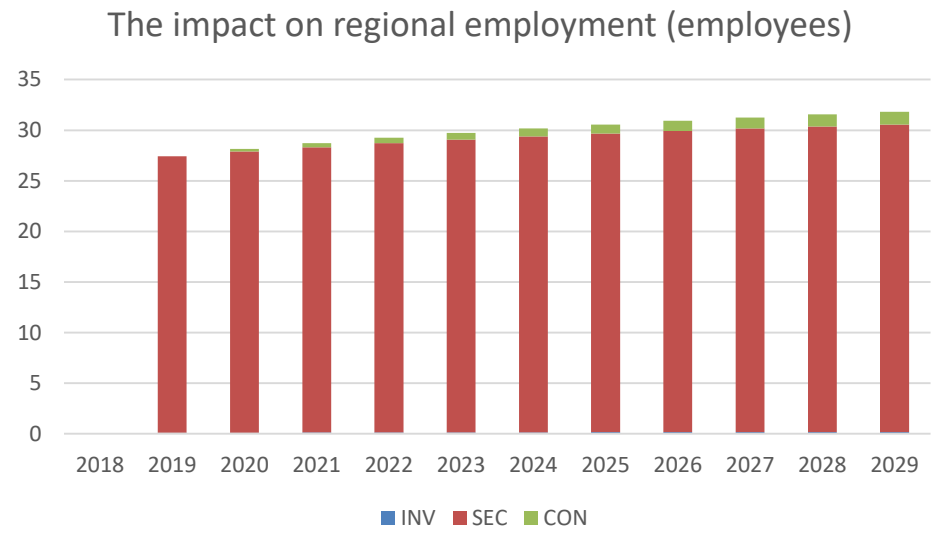


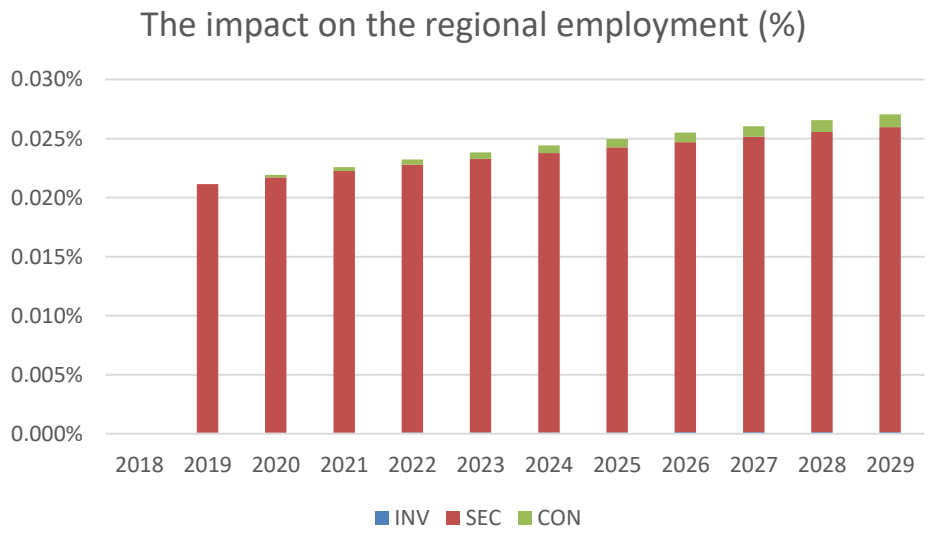






Impacts on employment





Plans for further developments in the methodology

- Additional investigations with different demands for 3D bioprinting:
  - The impacts of increasing demand
  - The impacts when capacities (production, local services, etc.) implied by increasing demand are adjusted

- Impact assessment of policy interventions to increase the new activity's spillover capacity (generating new firm formation)
  - Entrepreneurship development
  - Human capital development
  - Improving physical accessibility

- Impact analyses for additional new activities and comparisons of the costs of interventions with regional and national economic impacts