

Gazdasági hatáselemzés az intelligens  
szakosodás szelekciós folyamatában  
(Economic impact modeling in the  
prioritization process of smart specialization)

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# Outline

- Introduction
- Economic impact assessment in prioritization
- The challenges in modeling the likely economic impacts of a new activity
- A regional case study: ex-ante impact modeling of a selected new activity in the city of Pécs
- Summary

# Introduction

- Prioritization is key in S3
- In the prioritization process the government selects from alternative domains (activities) for policy support
  - Which activity to support?
  - What are the policy instruments to be applied to support the activity?
  - How much public money to spend for the support of each the activity's introduction?
- 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
- **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
  - might require investments in the region inducing further investments in other sectors in the region and in other regions
  - results in changes in regional employment in the new sector and other sectors in the region and in other regions
  - 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

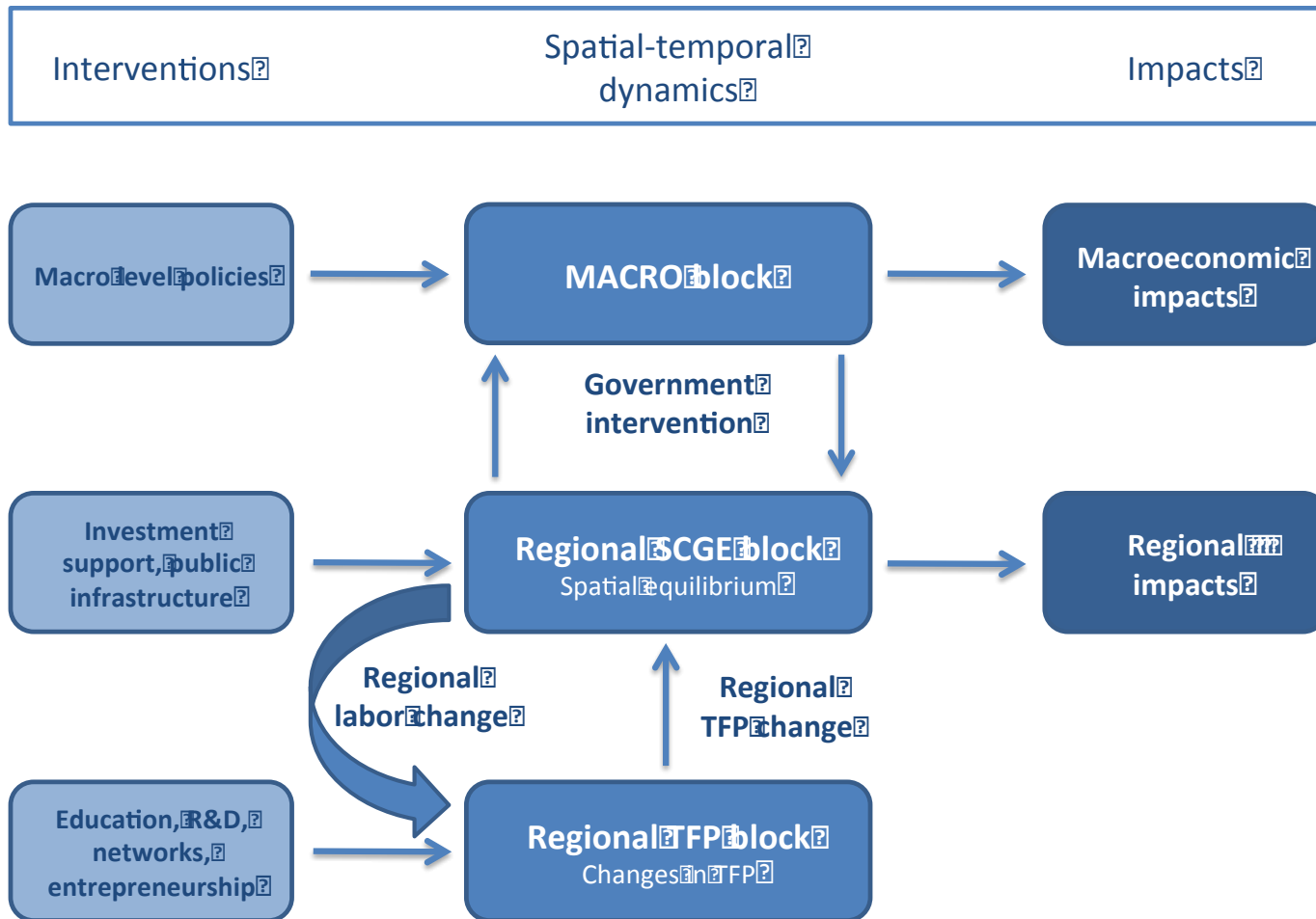
# Economic impact assessment in prioritization

- 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

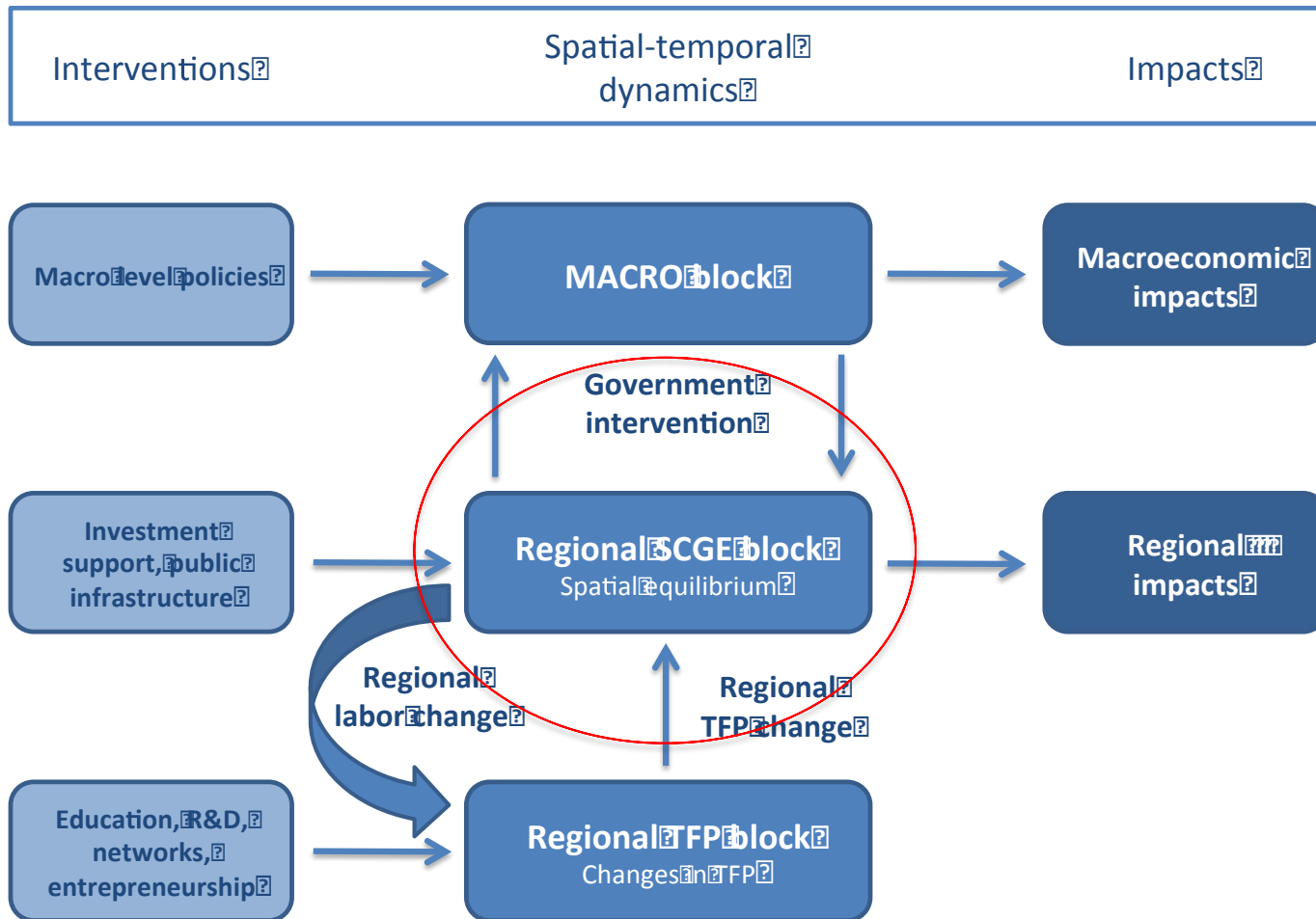
# The model applied in assessment: The GMR-Hungary model

- **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, Szabó 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



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# The regional SCGE block

- A recursive dynamic **multisectoral** spatial computable general equilibrium model
- **Spatial:**
  - Transportation costs
  - Interregional trade
  - Labor migration
  - Agglomeration effects
- **General equilibrium:**
  - Utility maximizing households
  - Profit maximising firms
  - Production side (perfect competition)
  - Foreign markets (partially exogenous)
- **Model features:** it runs in GAMS, calibrated for 2010 with an estimated Hungarian multiregional input-output table for 20 Hungarian NUTS 3 regions and 39 NACE rev 2 digit industries

# 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 in 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.
  - **In the case of the new sector** 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 the introduction of a selected new activity in the city of Pécs

# Screening for potential domains 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-inflammatory 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 customization 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 spillovers into other sectors (tourism, insurance, transportation services etc.)

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

<b>Key Partners</b> University, Medical equipment producers, Medical accessories producers, Patient management service providers – transfer shuttle, taxi, hotel, Entertainment activity providers – restaurants, touristic attraction sites, etc.	<b>Key Activities</b> Business administration, Patient management, Medical activities, Cartilage production.	<b>Value Propositions</b> 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.	<b>Customer Relationships</b> Newsletters, publications, tutorial videos, thematic events and scientific conferences, trainings and educational programs.  Key account relationship with professional organizations and associations.  Community building activities.	<b>Customer Segments</b> 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.
	<b>Key Resources</b> 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.		<b>Channels</b> 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.	
<b>Cost Structure</b> Patient management, diagnostics, treatment, 3D printing, aftercare, insurance, cost of accessories, amortization, hazardous waste.			<b>Revenue Streams</b> Treatment – medical assessment, diagnosis, cartilage printing, implantation. Support services – logistics, medical hotel, food, rehabilitation. Aftercare services – monitoring, consulting	



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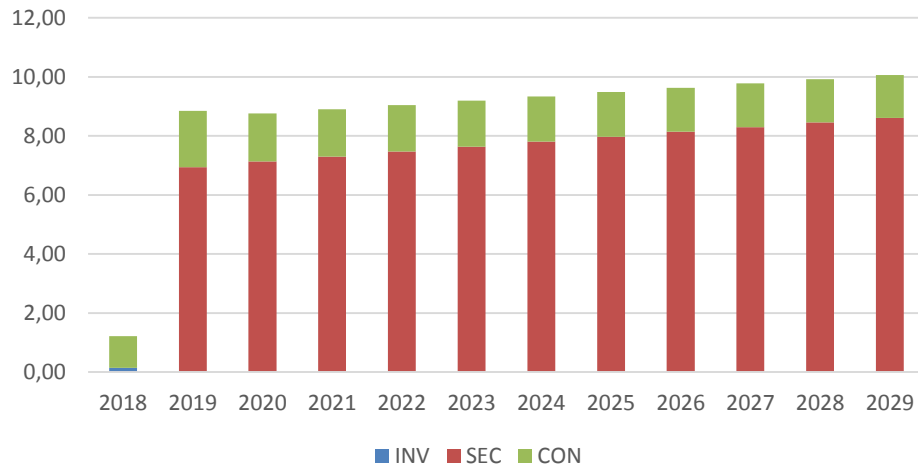
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# Shocks associated with the new sector

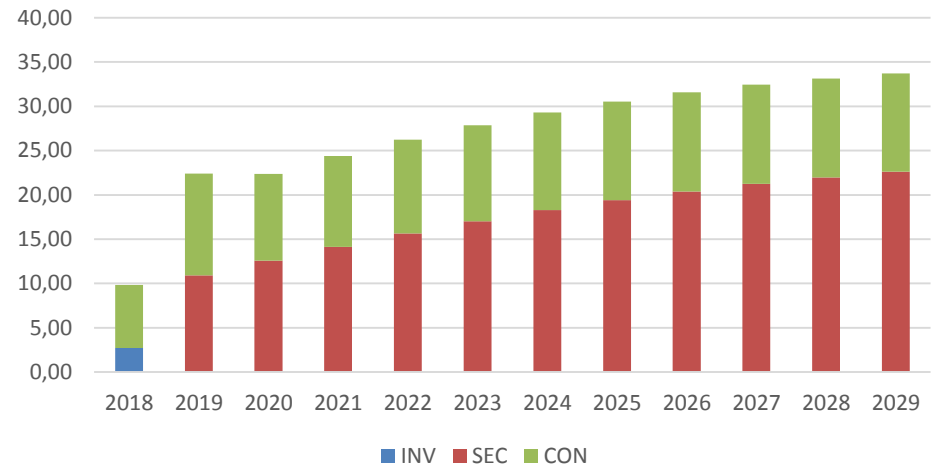
- Scenario: 1000 patients per year (full capacity utilization)
- Labor shock
  - 15 new employees (252 thousand EUR annually)
- Investment in the new sector in 2018 (equipment, construction): 2.6 million EUR
  - Source: foreign grant (e.g. EU funds)
- Investment in a new hotel and a restaurant in 2018: 4.4 million EUR
  - Source: foreign grant (e.g. EU funds)
- Consumption shock (of the new sector) between 2019-2029: 4.9 million EUR (annually)
  - Source: foreign patients (1000 patients per a year)
- Tourism shock between 2019-2029: 1.7 million EUR (annually)
  - Source: foreign patients (1000 people – staying for 4-13 days per visit)

# Impacts on output

The impact on regional gross output (m EUR)

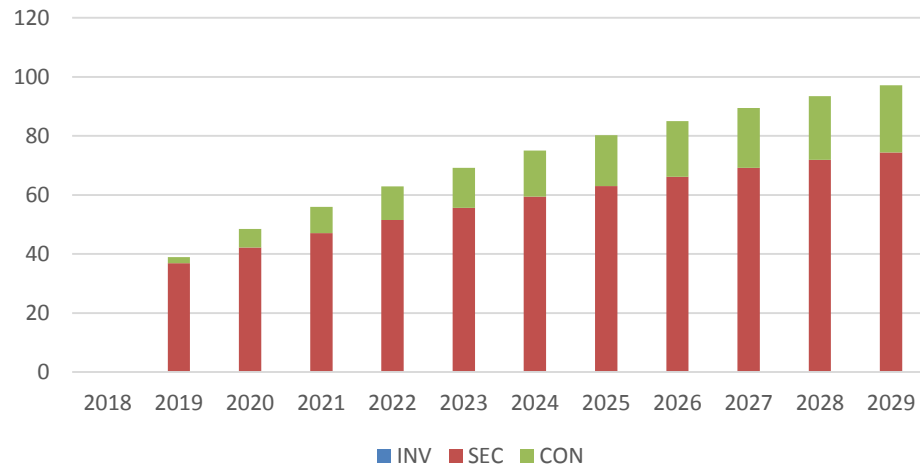


The impact on national gross output (M EUR)

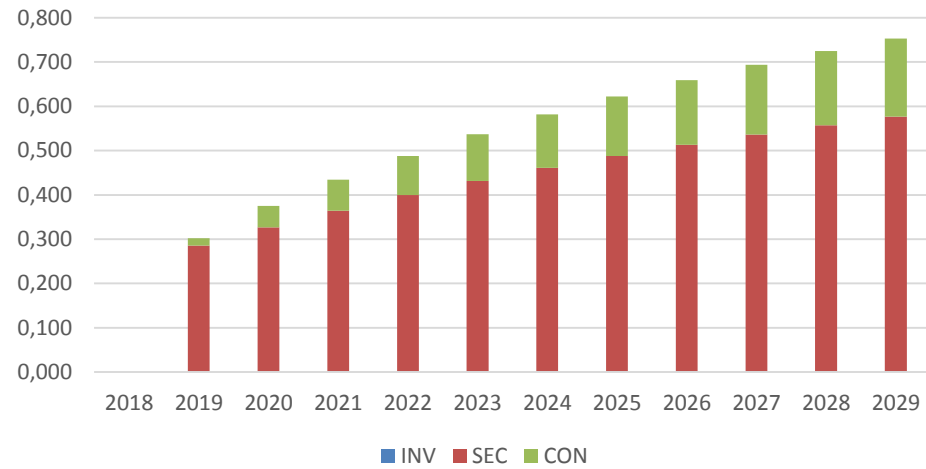


# Impacts on employment and wages

The impact on regional employment (employees)



The impact on regional labour income (M EUR)



# Plans for further developments in the methodology

In the example simulation the shock is relatively moderate (compared to the new activity's potential): 2-3 patients per day

Additional investigations:

- The impacts of increasing demand for 3D bioprinting
  - Including the impacts when capacities (production, local services, etc.) implied by increasing demand are adjusted
- Economic impact assessment of the policy interventions to improve regional conditions for increasing the new activity's spillover capacity (generating new firm formation)
  - Entrepreneurship development
  - Human capital development
  - Improving physical accessibility
  - Increasing R&D activity
  - Improving the access to interregional knowledge networks
- Impact analyses for additional new activities and cross-activity comparisons of the costs of interventions with regional and national economic impacts