

# The university as a venture capitalist?

## Determinants and Consequences of University Seed funds and Proof-of-Concept Programs in Europe

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## Starting point

- *Limited* availability of *private funding* sources to support *technology transfer* (Munari and Toschi, 2011; Audretsch et al., 2012 ).
  - » Information asymmetries
  - » Technological and commercial uncertainty
  - » Long-term horizons
  
- Universities started to be active in creating *internal programs* to support their TT process.
  - » Proof of concept programs (POCs) - Gulbranson and Audretsch, 2008
  - » University seed funds (USFs) - Croce et al., 2013; Munari and Toschi, 2014
  
- *Europe* presents high heterogeneity in the development of such initiatives.



## Research questions

- What are the *key factors* that determine the activation of gap funding instruments by universities?
  - » Technology transfer office (TTO)
  - » University
  - » Environment
  
- How *effective* are these instruments in respect to similar *external* instruments?
  - » Perceived effectiveness, according to university TTO managers
  
- Does *effectiveness* vary according to the *design* of the different instruments?

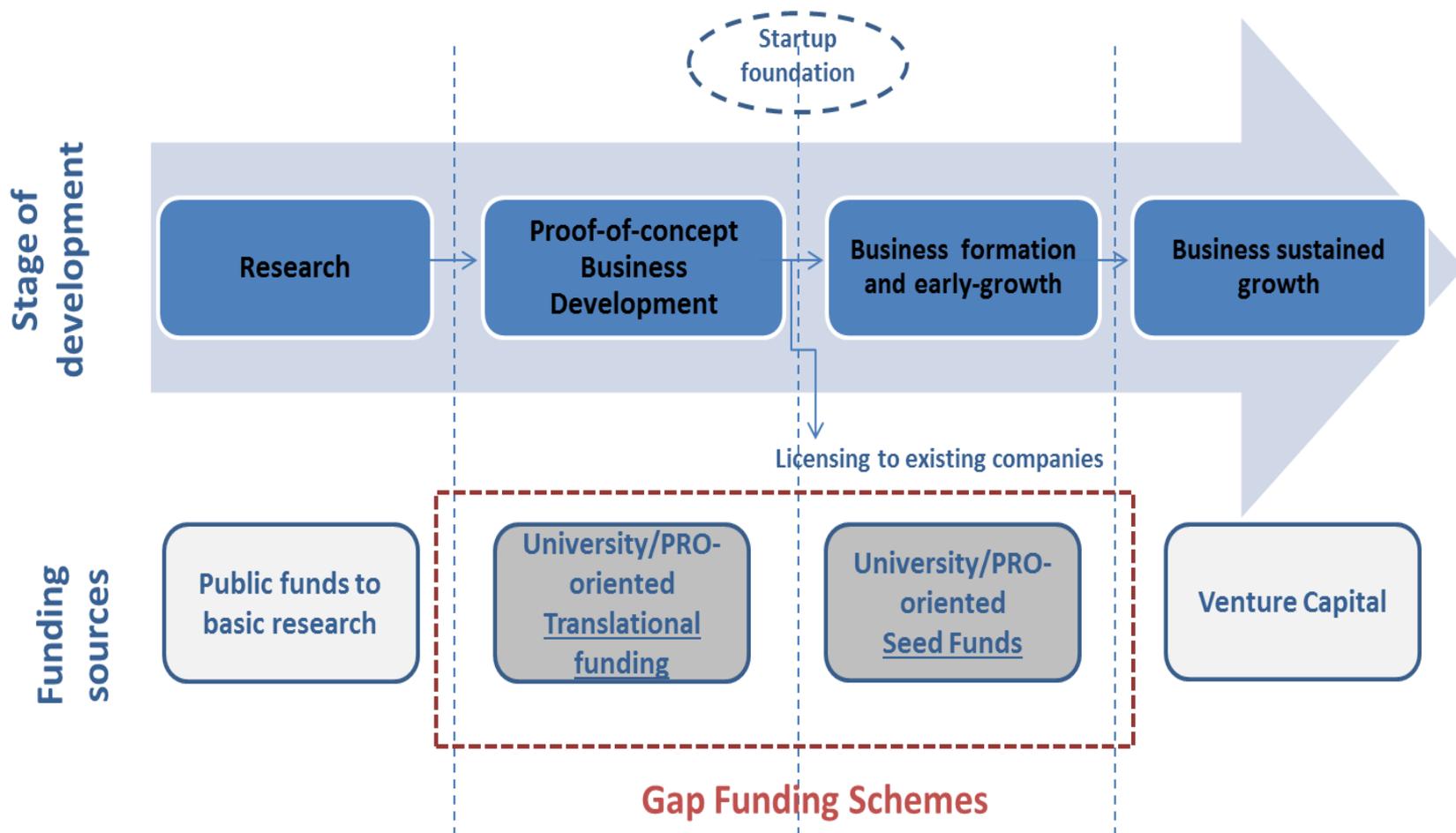


## *Theoretical background*

- **Strong attention** from the EU research policy framework (i.e., Horizon 2020 Agenda) towards such activities.
  
- **Strong barriers and inefficiencies**
  - » Funding gap (lack of private funding sources to support TT activities)
  - » Knowledge gap (strong technical skills, but lack of managerial/commercial skills)
  - » Communication gap (different goals, priorities and culture among actors involved)
  
- **Different types of supporting mechanisms** have been implemented (university accelerators and incubators, start-up competitions, university-managed seed funds (Munari et al., 2014b; Rasmussen and Soreheim, 2012))
  
- **Very limited research** addresses these emerging financial instruments for TT
  - » Only evidence based on single cases (Rasmussen et al., 2011; Munari et al., 2014).
  - » Multi-country comparisons are virtually absent.



## Gap funding schemes



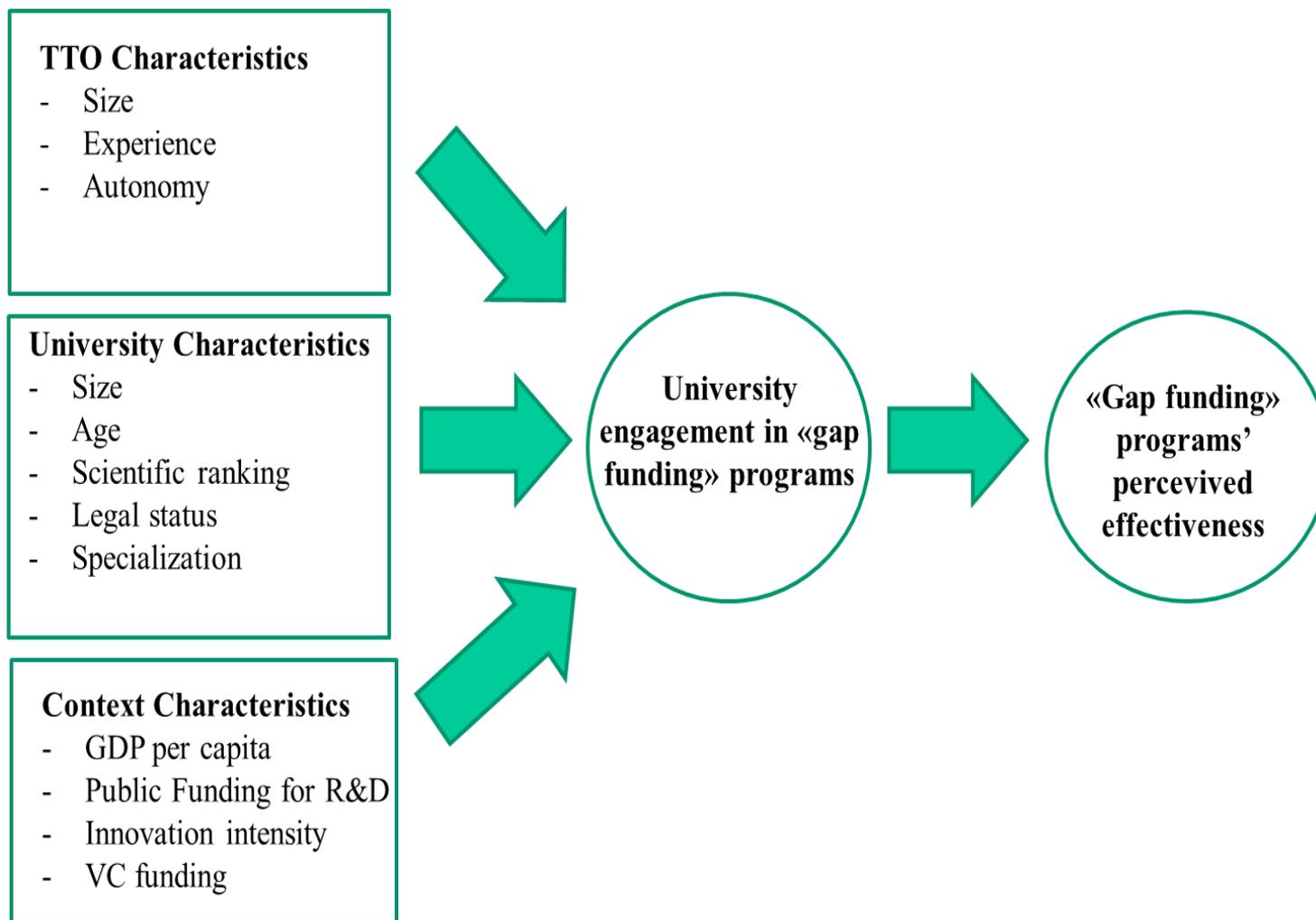
## POC programs and USFs



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	POC	USF
Objectives	Evaluate and support the <i>technical feasibility and commercial potential</i> of early stage technologies generated by universities and PROs	Provide capital to university and PRO start-ups to assist the <i>early formation</i> of new company creation and early growth
Focus of investment	Primarily <i>projects</i> by individual researchers or research teams	Primarily university and PRO <i>start-ups</i>
Investment typology	Typically <i>grants</i> , but other forms are possible (i.e., loan, repayment schemes)	Typically <i>equity</i> based, but other forms are possible (i.e., convertible loan)
Investment stage	<i>Pre-seed</i> stage (typically before company formation)	<i>Seed and early stage</i> (business formation and early growth)

## Theoretical framework





## Effectiveness of gap funding instruments

- **Ex post evaluation** of economic and social results obtained through POC programs and USFs represents a key priority for university TTO managers
- **A challenging task**
  - » General problems associated related to the limited availability of data due to confidentiality issues (Cumming, 2007; Munari and Toschi, 2015).
  - » Difficult to access a large pool of comparable observations.
- **Different approaches** (Kochenkova et al., 2014 )
  - » *perceived* assessment based on *questionnaires* submitted to recipient companies/projects (e.g., Giuri et al., 2013; Luukkonen et al., 2013)
  - » *perceived* assessment based on *direct interviews* with key stakeholders (e.g., Wright et al., 2006)
  - » *quantitative analyses* of the performance of recipients, possibly in comparison with a matched-paired group of non-treated companies/projects (e.g., Cumming, 2007; Croce et al., 2013; Munari and Toschi, 2011).
    - Few studies: Bradley et al. 2013; Croce et al. 2014; Munari et al. 2014



## Method

### ■ Sample

- » *FinkT survey* to 663 TTO managers from 28 European countries
  - 128 observations (RR of 20.4%), of which 55 with an internal POC **and/or** USF
  - 51 observations with an internal POC
  - 30 observations with an internal USF (of which 26 with also a POC)
- » *Secondary sources*
  - Eumida from university-level data
  - Eurostat from environment-level data

### ■ Econometric models

- » Probit for the antecedents of the university's likelihood to activate (128 observations)
  - an Internal Gap Funding Program
  - an Internal POC
  - an Internal USF
- » Ordered Probit for the perceived effectiveness of internal gap funding programs (48 observations)



## *Dependent and independent variables (1/2)*

Variable	Definition
<b>Dependent variables</b>	
Internal Gap Funding Program	Dummy: 1 if the university has activated a gap funding program as of May 2013
Internal USF	Dummy: 1 if the university has activated a USF as of May 2013
Internal POC	Dummy: 1 if the university has activated a POC program as of May 2013
Perceived Effectiveness	Perceived effectiveness of the gap funding measures in promoting technology transfer, measured on a 1–5 Likert scale
<b>TTO level variables</b>	
TTO age	Age of the TTO (years) on May 2013
Internal TTO	Dummy: 1 if the TTO is an internal department of the university
TTO size	Size of the TTO (units working at the TTO) in 2012



## *Dependent and independent variables (2/2)*

Variable	Definition
<b>University level variables</b>	
University size	Size of the university (units working at the university) in 2008
University Research Quality	Dummy: 1 if the university is in the top 200 THE Ranking
Technical/Medical University	Dummy: 1 if the university is a technical or medical university
Public University	Dummy: 1 if the university is public
University Age	Age of the university (years) on May 2013
<b>Environmental level variables</b>	
Professor Privilege	Dummy: 1 if the nation is based on a professor privilege model
Regional GDP	GDP (€ per inhabitant) by NUTS 2 regions on 2013
Regional Public Funding	Total intramural R&D expenditure (€ per inhabitant) by NUTS 2 regions on Dec 2013
Regional Innovation Activities	Employment in technology and knowledge-intensive sectors ('000) by NUTS 2 regions on 2013
National VC Funding	VC investments, expressed as % of GDP, by country in 2013



## Main descriptive statistics

### ■ Distribution of POC programs and USFs in Europe

- » *Important* presence of such instruments in *Northern* (73%) and *Western* Europe (52%). *Limited* presence in *Eastern* (25%) and *Southern* Europe (5.7%).
- » *Positive perceived effectiveness* (average value of 3.5 on 5-point scale), with *lower* assessments for *Eastern* and *Southern* European universities (3 and 2.3 respectively).

### ■ Characteristics of POCs and USFs

- » *Source of capital*: university (48%), national (36%) and regional (24%) public sources, VCs and banks (14% and 5%) and corporations (11%). National public entities and corporations more active for POCs.
- » *Program size*: USFs bigger than POCs (median(avg amount per project): € 180k vs. 50k)

### ■ Characteristics of TTOs and universities

- » *Eastern* European TTOs *smaller* (around 9 people) and *younger* (around 5 years) than TTOs in *Northern* (14 and 13 people) and *Western* Europe (13 and 13 years).
- » Average university *total staff* around 2,900 people, with *Eastern* European universities significantly *smaller* (around 1,900 people).
- » *High quality universities* concentrate in *Northern* and *Western* European countries.



## Comparison tests among groups (main variables)

Variable	Without Internal Program vs. With Internal Program	Without Internal POC vs. With Internal POC	Without Internal USF vs. With Internal USF
TTO Age	-2.158*	-2.119*	-2.510*
TTO Size	-7.747***	-7.679***	-8.676***
University Size	ns	ns	-639.607*
University Research Quality	-0.309***	-0.347***	-0.380***
Professor Privilege	0.210**	0.188**	ns
Regional GDP	-9.579***	-10.465***	-9.652***
Regional Public Funding	ns	ns	-47.982**
National VC Funding	-0.018***	-0.019***	-0.011**

Variable	Internal POC vs. Internal USF	Public Program vs. Private Program
Perceived effectiveness	ns	ns

# Regression analyses of the 128 observations



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VARIABLES	(1) Internal Gap Funding Program	(2) Internal POC	(3) Internal USF	(4) Per ceived Effectiveness
<i>Internal USF</i>				-0.0291 (0.380)
<i>Public Gap Funding Program</i>				-0.277 (0.398)
<b>TTO-level Characteristics</b>				
<i>TTO Age</i>	-0.00263 (0.00642)	-0.00267 (0.00634)	-0.00128 (0.00511)	0.0378 (0.0345)
<i>Internal TTO</i>	-0.00134 (0.144)	0.0290 (0.143)	-0.0250 (0.111)	0.519 (0.491)
<i>TTO Size</i>	0.00821* (0.00483)	0.00756* (0.00481)	0.00517* (0.00330)	-0.00880 (0.0143)
<b>University-level Characteristics</b>				
<i>University Size</i>	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	0.001 (0.001)
<i>University Research Quality</i>	0.219 (0.140)	0.279** (0.139)	0.284** (0.126)	0.762* (0.459)
<i>Technical/Medical University</i>	0.0975 (0.124)	-0.0102 (0.123)	0.0292 (0.0925)	0.00787 (0.459)
<i>Public University</i>	-0.0149 (0.214)	-0.0468 (0.216)	0.0626 (0.143)	-0.231 (1.768)
<i>University Age</i>	0.000217 (0.000306)	0.001 (0.000312)	-0.001 (0.000233)	0.000768 (0.00117)
<b>Environment-level Characteristics</b>				
<i>Professor Privilege</i>	-0.271** (0.127)	-0.231* (0.126)	0.0101 (0.118)	-1.156* (0.738)
<i>Regional GDP</i>	0.00587 (0.00551)	0.00694 (0.00574)	-0.00166 (0.00337)	0.0117 (0.0181)
<i>Regional Public Funding</i>	-0.000937 (0.000676)	-0.00120* (0.000695)	0.000559 (0.000422)	0.000385 (0.00249)
<i>Regional Innovation Intensity</i>	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.000215)
<i>National VC Funding</i>	9.229*** (3.512)	9.591*** (3.487)	4.024* (2.396)	29.81** (15.14)



## Conclusions

### ■ Contributions

- » *Cross-country analysis.*
- » Definition of *POC* and *USF* and of the *critical factors* that should guide universities in deciding whether (or not) to activate internal gap funding instruments.
- » First exercise to assess the *perceived effectiveness* of these instruments

### ■ Summary of the results

- » *Significant (but uneven) diffusion* of gap funding instruments among universities.
- » Important investors include *public sources* (local, national, international institutions).
- » Relevant factors:
  - *TTO size* and expertise to select, support, and monitor the projects
  - *University research quality* to guarantee a stream of high-potential and diversified projects

### ■ Implications

- » Understanding the *conditions* supporting the implementation of internal programs.
- » Help to university managers and policy makers interested in enhancing the effectiveness of TT activities through dedicated funding instruments.



## Next steps

- Theory

- » *Formal formulation of hypotheses and improvement of theoretical framework*

- Method

- » *Control for propensity score matching, by comparing outcomes among units that received 'the treatment' (our sample) versus those that did not (a control group extracted by EUMIDA).*

# *Thank you!*

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