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**University-based antecedents
of early-stage external equity financing
of university spin-offs**

A joint work with

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- USOs are **new entrepreneurial firms** that transform technological inventions developed from university research (Meoli and Vismara, 2016; Rogers et al., 2001; Wright et al., 2006)
- **Some distinctive characteristics of USOs analysed by the literature:**
 - The founding team (Visintin and Pittino, 2014 ; Rasmussen et al., 2011)
 - Relationship with the university (Zerbinati et al., 2012; Fernandez-Alles et al., 2015)
 - Skills and network that they possess (Knockaert et al., 2011; Wright et al., 2012)
- **The literature has also analysed USOs performance:**
 - Less likely to fail (Rothaermel and Thursby 2005; Zhang 2009)
 - Higher probability of survival (Criaco et al., 2014)
 - Higher propensity to patent (Toole and Czarnitzki, 2009; Toole and Czarnitzki, 2014)
 - Local employment (Smith and Ho, 2006)
- However, obtaining external financing seems challenging for USOs, which as a result, undermines the commercialization of many valuable inventions (Roche et al., 2020).

The importance of first external equity financing

- Early-stage external equity financing involves the greatest uncertainty for investors and it's a critical milestone that USOs often must achieve in order to grow (Huang and Pearce, 2015).
- USOs, especially if innovative, are **financially demanding** and are **debt constrained**.
- Prior studies have showed that obtaining early-stage external equity financing can certify venture quality, which in turn reduces the information gap for subsequent investors (Moedl, 2019).
- Obtaining early-stage external equity financing may also signal the positive effort and ability of USOs in identifying, approaching, negotiation and dealing with investors (Elitzur and Gaviious, 2003).
- This can lead to follow-on investment (Ko and McKelvie, 2018), lower cost of capital and higher share turnover (Zhao et al., 2009).



- It has been suggested that USOs need to exploit resources embedded within their networks to support their growth (Shane, 2004; Vohora, et al., 2004; Walter, et al., 2006)
- Studies in this domain have explored university **reputation** and **research strength** and have focused on either a **particular sector** (e.g., nanotechnology), a **single region** (e.g., West midlands – UK) or **a handful of universities** (Jelfs and Smith, 2021; Munari and Toschi, Soetanto and Van Geenhuizen, 2015).
- Little is known on how relevant characteristics such as the **research orientation** of the parent university might influence USOs' ability to attract early-stage external financing (Munari and Toschi, 2011).
- It is legitimate to consider the parent university research orientation as a mechanism that affects USOs' **behavior and performance** (Hahn et al., 2019), given that it impacts several USOs' dimensions such as its **learning processes**, **socialization** and **networking**, and **norms** from its founding moments.

- University research knowledge is increasingly considered as providing a significant number of opportunities to develop new or improved products (Muscio et al., 2013; Leydesdorff and Wagner, 2009)
- The interest in this domain reflects the increasing importance of research knowledge as a strategic resource that creates competitive advantages (Landry et al., 2006).
- **Some of the importance of research knowledge analyzed by the literature:**
 - May partially reduce technological uncertainty (Sun et al., 2020).
 - Provides technological know-how and expertise to USOs engaged in innovation development (Cohen et al., 2002).
 - Provides specific knowledge related to its competence base (Bathelt et al., 2010; Hindle and Yencken, 2004)
- We thus focus on USOs from different industrial sectors to explore the parent university **research orientation** (in terms of **explorations** and **exploitation**) as an imprinting mechanism.

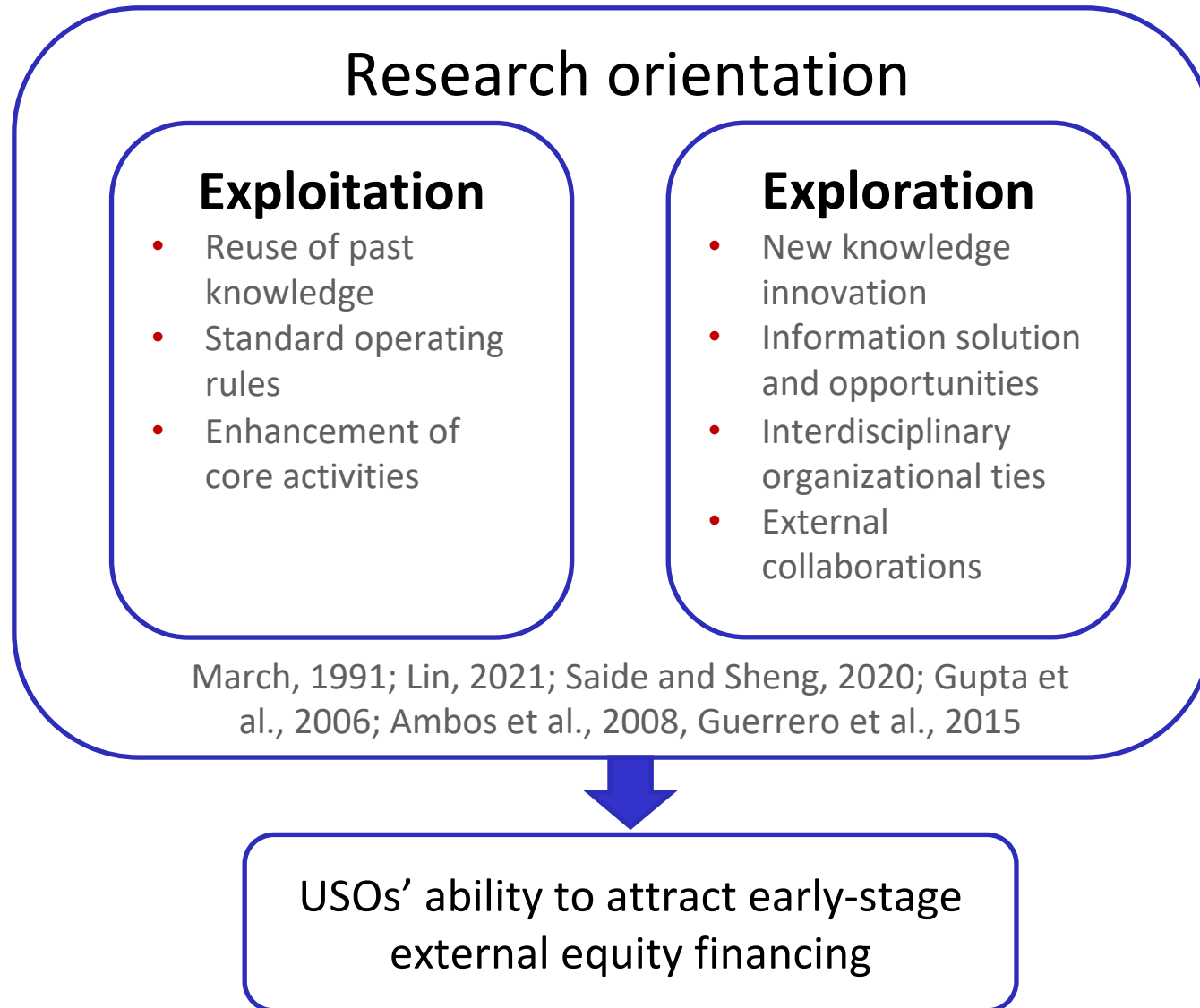


Fig.2 The link between university research orientation and USOs' ability to attract external funding

Source: Own elaboration

- We built a novel dataset that relies on data from multiple sources(e.g., Spinoff Italia database, MIUR database, Aida BvD database; WOS database, Scopus database, CWTS Leiden Ranking database, Eurostat database).
- Final sample comprises of **743 Italian USOs** from **39 public universities**, established over the period **2011-2019**.
- We control for **University-level variables** (prestige and size), **firm-level variables** (time and industry fixed-effects and revenue at founding) and **regional variable** (GDP).
- We examined the presence of multicollinearity among predictors (Walter et al., 2006; Ramaciotti and Rizzo, 2015).
- Probit regression models were then used (Stephan, 2014; Zhang, 2009).



Early-stage external equity financing

- Construct: Early-stage external equity financing is often referred to as equity capital for the expansion of a venture that is generally less than 5 years and may not be showing profit yet (Sohl, 1999).
- Measurement: Following Jelfs and Smith (2021), we use a dummy variable that takes a value of 1 if the USO obtained external equity within the first five years from its founding, zero otherwise.

University research exploitation

- Construct: Learning gained via local search, experimental refinement and selection, production, efficiency and execution (March, 1991; Centobelli et al., 2019).
- Measure: **Input** → Percentage on full professors , percentage of associate professors, percentage of assistant professors (Ambos et al., 2008).
Output → Total publications, citations per publications (Ambos et al., 2008, Guerrero et al., 2015).

University research exploration

- Construct: Learning gained through processes of distant search, risk taking, experimentation, play, flexibility, discovery, innovation (March, 1991; Centobelli et al., 2019)
- Measure: **Input** → Percentage of postdoctoral researchers, percentage of PhD students (Ambos et al., 2008). **Output** → Collaborative publication with industry (Fini et al., 2021; Bozeman et al., 2012)

Results: research input

Variable	Dependent variable: USO early-stage external equity financing (yes = 1, no = 0)			
	(1)	(2)	(3)	(4)
Full professors (Exploitation)	-0.473***			-0.100
	(0.123)			(0.162)
Assistant professors (Exploitation)		-0.960***		-0.555**
		(0.205)		(0.275)
Post-doctorate researchers (Exploration)			0.389***	0.208*
			(0.082)	(0.109)
University control	Yes	Yes	Yes	Yes
Firm control	Yes	Yes	Yes	Yes
Regional control	Yes	Yes	Yes	Yes
Constant	-2.629***	-0.907*	-2.047***	-1.471**
	(0.497)	(0.551)	(0.494)	(0.654)
Observations	743	743	743	743



Results: research output

Variable	Dependent variable: USO early-stage external equity financing (yes = 1, no = 0)			
	(1)	(2)	(3)	(4)
Publications (Exploitation)	0.296***			0.337***
	(0.101)			(0.107)
Citations per publication (Exploitation)		-0.154*		-0.153*
		(0.079)		(0.082)
Collaborative publication with Industry (Exploration)			0.209***	0.192**
			(0.073)	(0.081)
University control	Yes	Yes	Yes	Yes
Firm control	Yes	Yes	Yes	Yes
Regional control	Yes	Yes	Yes	Yes
Constant	-2.052***	-2.239***	-2.206***	-2.103***
	(0.473)	(0.470)	(0.467)	(0.475)
Observations	743	743	743	743



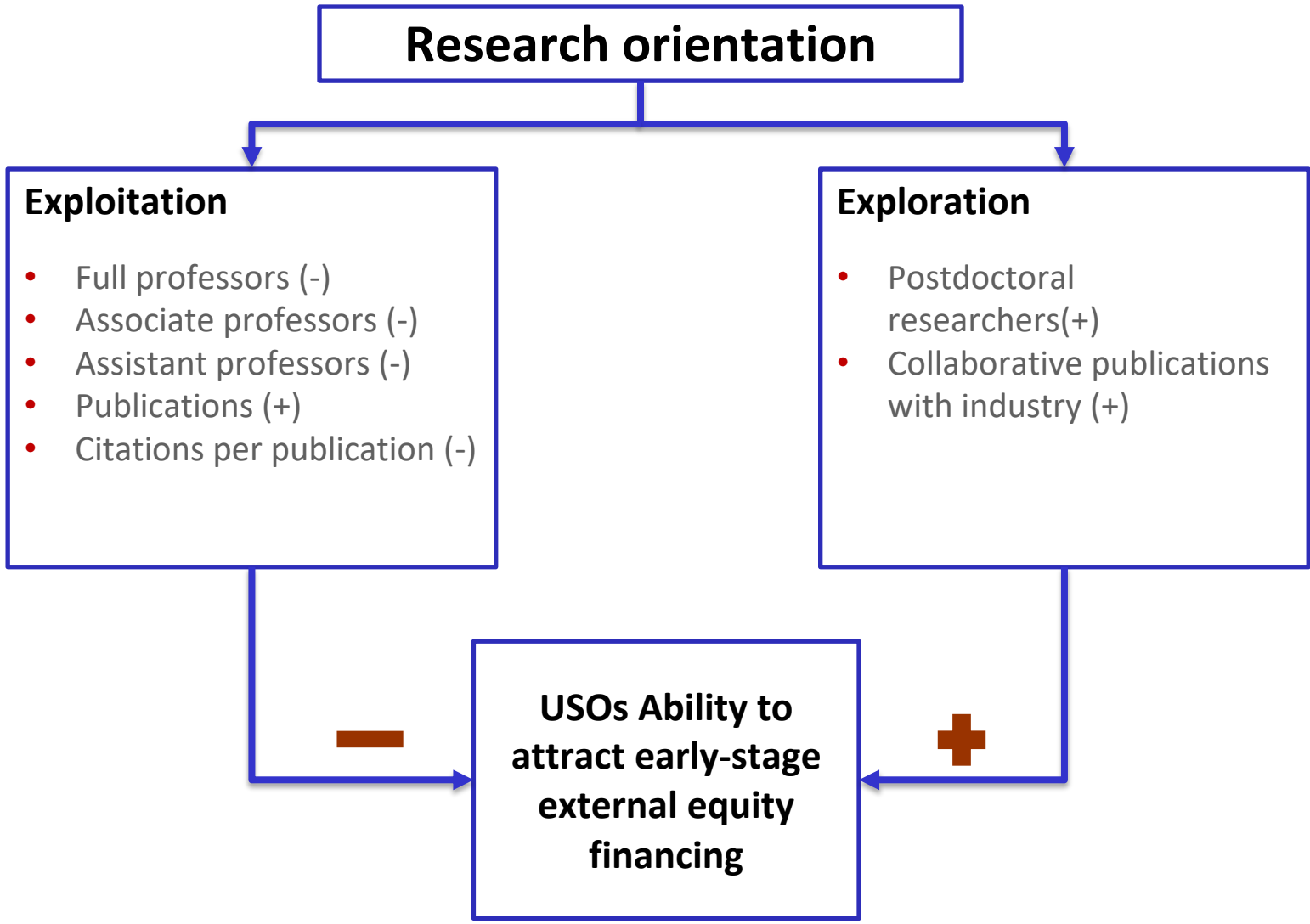


Fig.3 The effect of university research orientation on USOs' ability to attract external financing

Source: Own elaboration



- First, our analysis relied on data from 39 Italian public universities out of the total of 69 over the period 2011-2019.
- Therefore, our findings can probably be expanded to all Italian public universities over a wider time span.

- Second, we focused on the likelihood of USOs to obtain external financing via the imprinting effect of the parent university research, but we did not consider other significant dimensions, such as the timing of investment, the financing amount, or the number of subsequent financing rounds obtained.
- Future research could also explore the influence of other relevant characteristics of the parent university under these dimensions.

**Thank you for
your attention !**

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