It Takes Time but It Pays
International Postdoctoral Mobility and Career Effect in Italian Academia

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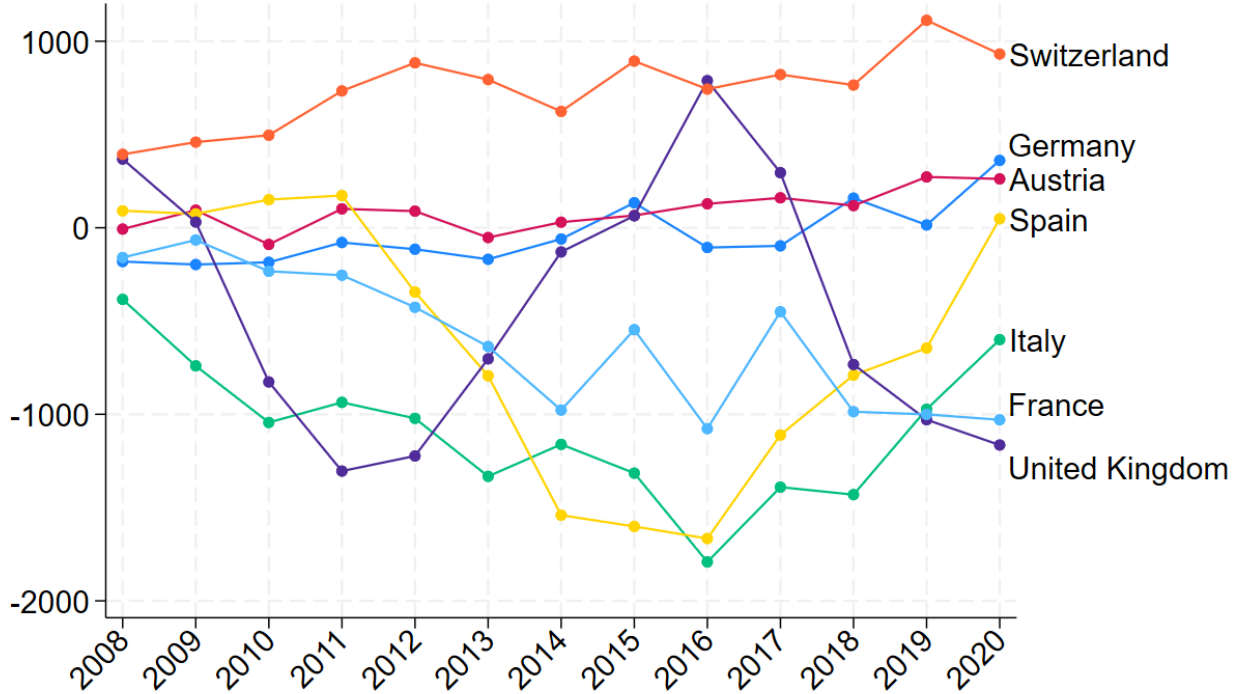
[1]University of Turin

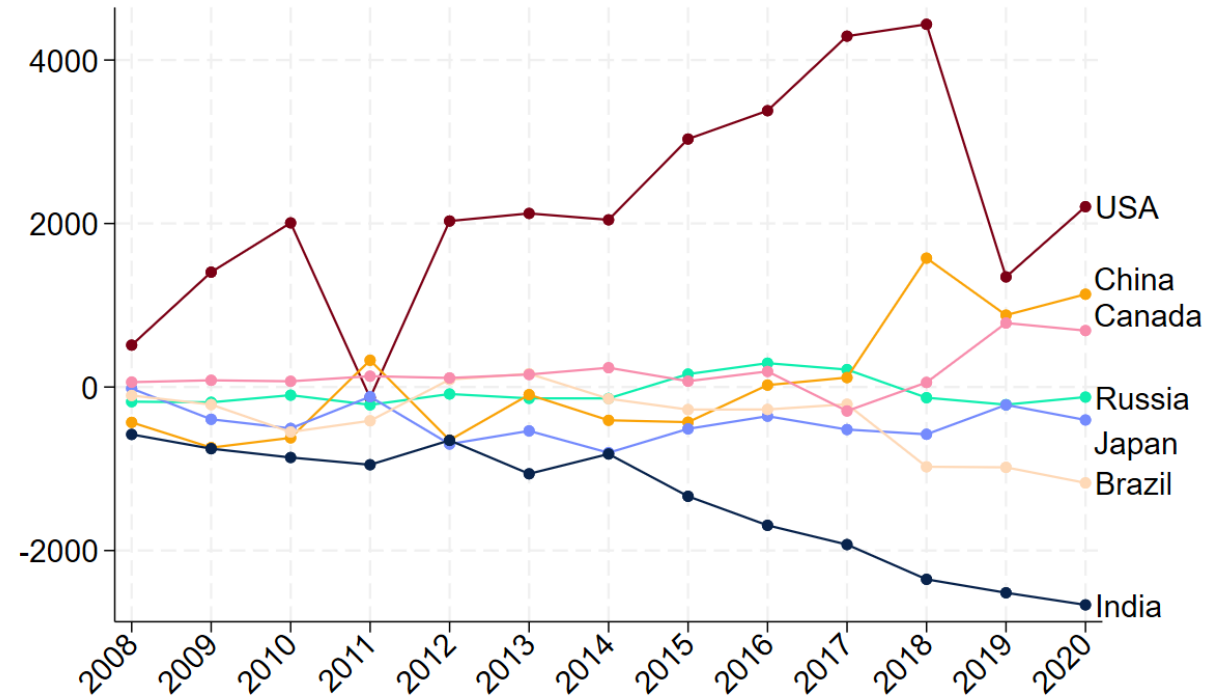[2]Collegio Carlo Alberto

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Investments in Early Career Scientists – April 26, 2024

Context

Figure: Net flows of researchers by year (Source: OECD STI Scoreboard)

a) Europe

b) World

Motivation and Research Questions

- **Mobile scientists** drive science and technology development, fostering international connections and improving research quality (Meyer et al., 2001; Franzoni et al., 2012; 2015)

- International mobility of scientists, especially in the **early phase of their career**, it is increasingly regarded as a strategy to boost success of scientific systems (WIPO, 2013; EFI, 2014; 2024)

- Whether international mobility influences **scientists' careers**, is a question which has received increasing attention (Kahn & Ginther, 2017; Cañibano et al., 2020; Kotsemir et al., 2022; Liu & Hu, 2022)

- However, the empirical evidence is still fragmented and results are not univocal (Gureyev et al., 2020; Netz et al., 2020)

Motivation and Research Questions

<u>Positive</u> effect of mobility:

- Mobility impacts career and scientific productivity through changes in **scientific and technical human capital** (Bozeman et al., 2001)

- Returning scientists leverage abroad experience, demonstrating **autonomy** in publications and **faster career advancement** (Jonkers 2011; Lawson and Shibayama 2015; Schulze et al., 2008)

<u>Negative</u> effect of mobility

- Mobility reduces **social capital** initially ⇒ broken connections with former colleagues (weak ties, cfr. Granovetter, 1973) and takes time to establish new scientific ties ⇒ negative impact on productivity and career (Cruz-Castro and Sanz-Menéndez, 2010; Jonkers and Cruz-Castro, 2013; Ryazanova and McNamara 2019)

Motivation and Research Questions

Are internationally mobile postdocs faster/slower than national postdocs in entering (and being promoted in) the academic system?

Does social capital/network matter to returnees' career timing and path?

- This paper:
  - Post-doctoral return mobility
  - Impact on 2 career stages (entry and promotion)
  - Administrative data on academic career
  - Population of PhD students

Outline

- Literature

- Data Sources

- Empirical Strategy

- Results

- Conclusions

Literature

Literature

- International mobility is often studied for its impact on skill investment and **scientific productivity**, particularly in enhancing **scientific and technical human capital** (Bozeman et al., 2001)

- Studies typically focus on its effects on **international networks** (e.g., Baruffaldi et al., 2020; Scellato et al., 2015) and **scientific productivity** (e.g., Cruz-Castro & Sanz-Menéndez, 2010; Jonkers & Cruz-Castro, 2013)

- Less attention has been given to its influence on **academic career trajectories**, with mixed results (Netz et al., 2020)

- This study draws upon the main **social capital** and network factors from existing research on international mobility of scientists to **academic careers**

Literature
Localism

- "<u>Institutional inbreeding</u>": hiring PhD graduates from their *alma mater*

- Strong **local scientific connections** formed during their PhD (Horta, 2013) ⇒ can **<u>ease the return</u>** of international mobile scientists to their home countries

- However, inbred scientists may have **lower productivity** (Horta et al., 2010), **smaller international networks** (Scellato et al., 2015), and **slower career development** (Inanc & Tuncer, 2011)

- Thus, we expect inbred scientists may experience <u>longer time-to-promotion</u>

Literature
Home Country Linkages

- International mobility has a positive impact on research productivity when mobile scientists maintain <u>**linkages to their home country**</u> (Baruffaldi & Landoni, 2012)

- International mobility may coincide with **career instability.**
  - **Detachment** from the **domestic scientific network** may expose international mobile scientists to career risks ⇒ more challenging for them to reintegrate into their home country (Gill, 2005)

- Maintaining connections to their home country will assist international mobile scientists in returning more quickly ⇒ <u>**reduce their time-to-entry**</u> compared to other international mobile peers

Literature
Collaboration Network Persistence

- International mobility connects researchers with prolific scientists, **expanding their network** and granting access to international peers otherwise inaccessible (Jonkers & Cruz-Castro, 2013)
  - These new "weak ties" (Granovetter, 1973) provide non-redundant information, enhancing **creativity and productivity**

- Scientists typically **maintain ties** with co-authors and collaborators abroad, positively impacting productivity (Kato & Ando, 2017)

- However, the positive effects of international mobility tend to **diminish over time** unless scientists continue engaging in it (Wang et al., 2019)

- International mobile scientists **maintaining collaboration ties with former co-authors** upon returning home ⇒ **positive effect** on their **time-to-promotion**

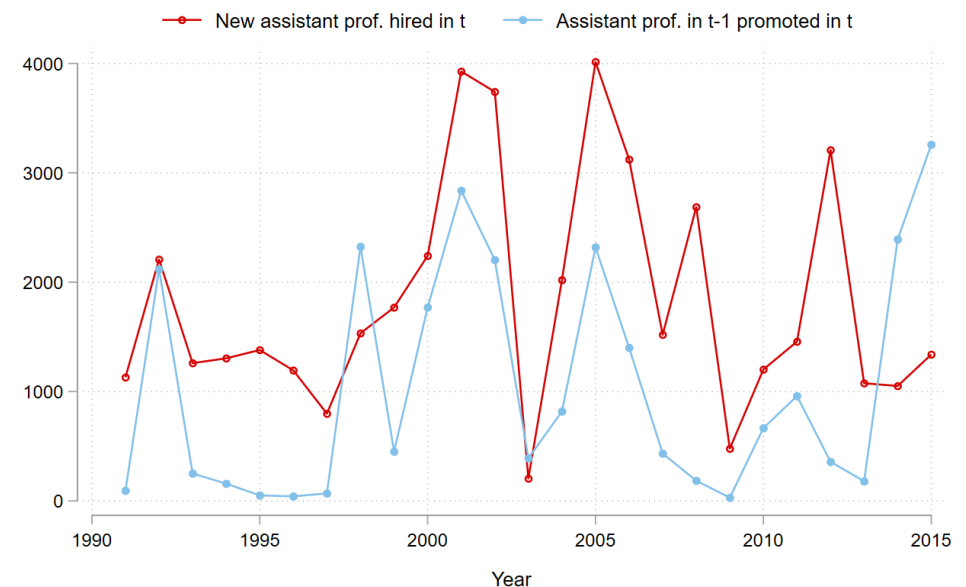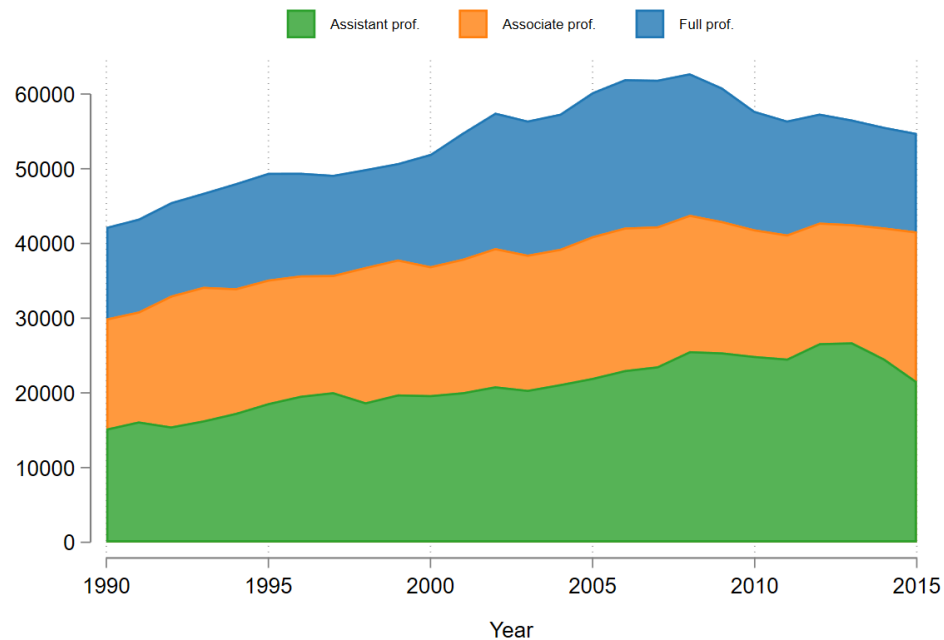# Data Sources

Data Sources
BNCF

- Italy does not have an official database with information on all PhD holders

- BUT: universities deposit their thesis in the **online public access catalogue** (OPAC) of the **National Library of Florence** (BNCF)

- We scraped BNCF's OPAC ⇒ ~76k doctoral theses (1986-2006):
  - **Population** of PhD theses discussed in IT academia (3 years program, founded by state grants)
  - Author, title, supervisor, granting institution, scientific field and PhD defense year
  - After 2006 BNCF data are incomplete   Graph

Data Sources
MUR

- Italian **Ministry of University and Research** (MUR)

- **Administrative records** on all **academics** (~88k) working in Italian universities (1990-2015)
  - Name, rank, scientific field, university affiliation, birth year and gender

Data Sources
Record Linkage

- BNCF + MUR: **Record Linkage** ⇒ Population of researchers w/ PhD from IT universities, active in IT academia ≥ 1 year (Coda Zabetta & Geuna, 2020)
  - Key variables:
    - BNCF: name, gender (*from name analysis*), scientific field and PhD year
    - MUR: name, gender, scientific field and PhD year (*from birth year*)
  - Results: 25,969 records
    - 34% theses (in line with survey from ISTAT)
    - 66% eligible academics

- This paper: 18,039 researchers
  - Entered as assistant professor <10 years from PhD
  - Active in 2015

Table

Data Sources
Scopus

- Scopus API: Name + Affiliation ⇒ Scopus **AU-ID**
  - For each AU-ID we download all publications, from first one up to 2015
  - **285k scientific articles** published in international journals

- Filter out incorrect information ⇒ 15,385 individuals (~85%) w/ ≥1 article in Scopus' referenced journals

- Restrict to scientists **actively engaged in research during their PD** period (≥ 1 article between PhD and first appointment)

- **Final sample:** 9,912 individuals

Table

Identification of Early Career Mobility

- We identify mobility using the **affiliation** reported in Scopus publications
    - Unique author identifier (AU-ID)
    - Unique affiliation identifier (AF-ID)
    - 1-to-1 AU-ID/AF-ID correspondence for co-authored articles
    - AF-ID order maintained for multiple-affiliated authors

- We are able to **identify mobility** when:
    - Researchers publish ($\Rightarrow$ We discard short stays that do not involve publication)
    - Affiliation is reported
        - Multiple affiliations (9.4% of author-publication pairs) $\Rightarrow$ Select the **first one** (proxy for the main institution or the one where the research took place)

Identification of Early Career Mobility

Table: Number of PhD, international mobiles and share by gender and cohort

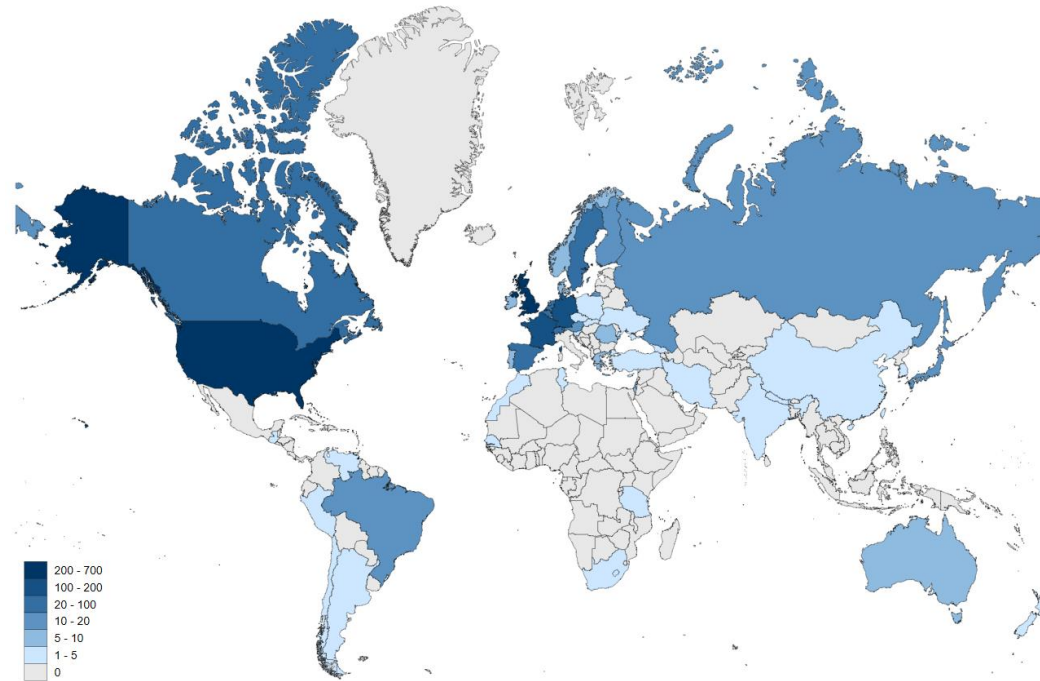|	All	Men	Women	Cohort 86-96	Cohort 97-06
Nb. PhDs	9,912	5,852	4,060	2,578	7,334
Nb. PD abroad	1944	1268	676	615	1329
Share PD abroad	19.6%	21.7%	16.6%	23.9%	18.1%

Figure: Destination countries of Italian international PD

Empirical Strategy

Empirical Strategy

- Cox proportional hazard model

- Dependent variables:
  - Years from PhD to first appointment as assistant professor (time-to-entry)
  - Yeas from first appointment to promotion (time-to-promotion)

- Main independent variable: *PD_Abroad*

- Social capital moderating variables
  - Localism
  - Home linkages
  - Persistence in collaboration

- Controls + Fixed effects

Empirical Strategy
Social Capital Moderating Variables

- **Localism**: 1 = first appointment in PhD granting institution

- **Home linkages:**
  - Identify "PD coauthors' affiliations", compute share of IT affiliations
  - Set 3 threshold (TH) by scientific area: Q1, Q2 and Q3
  - We split PD_Abroad in 2 complementary dummies:
    - PD_Abroad (Home Linkages > TH)
    - PD_Abroad (Home Linkages ≤ TH)

- **Network Persistence:**
  - Identify "PD co-authors", compute share over "Post-entry coauthors"
  - Set 3 TH by scientific area: Q1, Q2 and Q3
  - We split PD_Abroad in 2 complementary dummies:
    - PD_Abroad (Netw. Persistence > TH)
    - PD_Abroad (Netw. Persistence ≤ TH)

Empirical Strategy
Other Variables

- **Control variables**
  - Precocity
  - Publications until entry/promotion
  - Citations until entry/promotion
  - Gender
  - Age at PhD

- **Fixed effects**
  - Scientific field
  - Year of PhD
  - University of PhD
  - University of first appointment (time-to-promotion)

Empirical Strategy
CEM

- To address endogeneity and unobserved heterogeneity concerns
  $\Rightarrow$ **Coarsened Exact Matching** (Iacus et al., 2012)

- Match each internationally mobile academic with peers **actively engaged in research** during their PD, but did not undertake a PD appointment **abroad**

- Matching variables: **pre-mobility** observable characteristics existing prior to mobility
  - Gender, birth year, PhD year, PhD university, number of publications, yearly citations, and scientific field

- PD appointment abroad: a form of "treatment" with long-lasting effects on academics' career trajectories

Empirical Strategy
CEM

Table: Treated and control units

	Treated	Controls
All	1944	7968
Matched	577	577
Un-matched	1367	7391

Table: Descriptives and t-test of matched units by treated and controls

	Control Scientists		Treated Scientists		Difference in Means	
	Mean	SD	Mean	SD	b	t
Time-to-Entry	3.55	2.36	4.05	2.46	-0.51***	(-3.51)
Promoted	0.53	0.50	0.60	0.49	-0.07*	(-2.48)
Time-to-Promotion	8.89	4.21	7.87	4.00	1.02***	(4.16)
Nb. Pubs during PhD	2.08	2.70	2.37	2.60	-0.29	(-1.81)
Nb. of yearly Cits during PhD	3.17	6.98	3.90	7.46	-0.72	(-1.67)
Woman	0.32	0.47	0.32	0.47	0.00	(0.00)
Year of birth	1969.69	4.84	1969.75	4.93	-0.06	(-0.20)
Year of PhD	1999.70	4.35	1999.66	4.34	0.04	(0.16)
Field: Natural Sci.	0.46	0.50	0.46	0.50	0.00	(0.00)
Field: Med. & Vet.	0.10	0.30	0.10	0.30	0.00	(0.00)
Field: Arch. & Engi.	0.36	0.48	0.36	0.48	0.00	(0.00)
Field: Hum. & Law	0.03	0.18	0.03	0.18	0.00	(0.00)
Field: Social Sci.	0.04	0.20	0.04	0.20	0.00	(0.00)
Observations	557		557		1114	

Descriptives

Table: Summary statistics of main variables

	Full Sample				CEM Sample			
	Mean	SD	Min	Max	Mean	SD	Min	Max
Time-to-Entry	3.84	2.57	1	10	3.80	2.42	1	10
Promoted	0.50	0.50	0	1	0.56	0.50	0	1
Time-to-Prom	7.97	3.66	1	24	7.79	3.64	1	20
PD_Abroad	0.20	0.40	0	1	0.50	0.50	0	1
PD_Abroad_USA	0.09	0.28	0	1	0.23	0.42	0	1
PD_Abroad_EUR	0.09	0.29	0	1	0.23	0.42	0	1
PD_Abroad_OTH	0.02	0.13	0	1	0.04	0.20	0	1
Localism	0.61	0.49	0	1	0.65	0.48	0	1
Ln_Pubs_Entry	0.48	0.33	0	2.62	0.53	0.33	0	1.87
Ln_Pubs_Prom	0.41	0.27	0	2.14	0.46	0.28	0	2.02
Ln_Cits_Entry	1.42	1.01	0	6.00	1.61	0.95	0	4.91
Ln_Cits_Prom	1.60	0.95	0	6.53	1.75	0.89	0	4.87
Precocity	0.65	0.48	0	1	0.69	0.46	0	1
Female	0.41	0.49	0	1	0.32	0.47	0	1
Age_PhD	30.78	2.53	25	39	29.96	1.76	25	37
Observations	9912				1114			

Results

Results
Time-to-entry

Table: Risk of entry in *t*, baseline results

	Full sample			CEM sample		
	(1)	(2)	(3)	(4)	(5)	(6)
PD_Abroad	0.771***		0.774***	0.745***		0.816*
	(0.021)		(0.033)	(0.049)		(0.088)
PD_Abroad_USA		0.809***			0.723***	
		(0.030)			(0.062)	
PD_Abroad_EUR		0.767***			0.797***	
		(0.028)			(0.064)	
PD_Abroad_OTH		0.636***			0.586***	
		(0.050)			(0.098)	
Localism	1.047**	1.047**	1.049*	1.012	1.009	1.086
	(0.023)	(0.023)	(0.026)	(0.070)	(0.070)	(0.105)
PD_Abroad × Localism			0.769***			0.710***
			(0.026)			(0.057)
PhD year, Area & Univ. FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9912	9912	9912	1114	1114	1114
Log likelihood	-82222.9	-82218.7	-82222.9	-6771.8	-6770.0	-6771.2
Chi-squared	1615.2	1623.7	1615.2	250.0	253.6	251.1

- Controls consistent with previous literaure
- *Precocity*: "+"; *Woman*: no significant ("–") effect

Results
Time-to-entry

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Chi-squared	1615.2	1623.7	1615.2	250.0	253.6	251.1

- ATE estimated for PD abroad: +0.64 years on average

- 17% increase in time-to-entry compared to non-internationally mobile

Results
Time-to-entry

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Chi-squared	1615.2	1623.7	1615.2	250.0	253.6	251.1

- Regardless of destination, doing a PD abroad delays entry as an assistant professor compared to those who did it in Italy

Results
Time-to-entry

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Observations	9912	9912	9912	1114	1114	1114
Log likelihood	-82222.9	-82218.7	-82222.9	-6771.8	-6770.0	-6771.2
Chi-squared	1615.2	1623.7	1615.2	250.0	253.6	251.1

- *Localism*: PD in IT who get their first appointment in their PhD institution, get the position faster compared to internationally mobile peers
- Only marginally significant, not significant in the CEM sample

Results
Time-to-entry

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	(0.021)		(0.033)	(0.049)		(0.088)
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Chi-squared	1615.2	1623.7	1615.2	250.0	253.6	251.1

- Inbreeding delays entry into Italian academia for internationally mobile PD researchers

Results
Time-to-entry

Table: Risk of entry in *t*, additional results (CEM sample)

	(1) TH: Q1	(2) TH: Q2	(3) TH: Q3
PD_Abroad (Home Linkages>TH)	0.721***	0.814**	1.419**
	(0.050)	(0.079)	(0.247)
PD_Abroad_Ita (Home Linkages≤TH)	0.917	0.721***	0.672***
	(0.119)	(0.052)	(0.046)
PhD Year, Area & Uni FEs	Yes	Yes	Yes
Observations	1114	1114	1114
Log likelihood	-6770.2	-6771.1	-6523.2
Chi-squared	253.3	251.4	365.5
Prob.	0.066	0.227	0.000

Results
Time-to-entry

Table: Risk of entry in *t,* additional results (CEM sample)

	(1) TH: Q1	(2) TH: Q2	(3) TH: Q3
PD_Abroad (Home Linkages>TH)	0.721***	0.814**	1.419**
	(0.050)	(0.079)	(0.247)
PD_Abroad_Ita (Home Linkages≤TH)	0.917	0.721***	0.672***
	(0.119)	(0.052)	(0.046)
PhD Year, Area & Uni FEs	Yes	Yes	Yes
Observations	1114	1114	1114
Log likelihood	-6770.2	-6771.1	-6523.2
Chi-squared	253.3	251.4	365.5
Prob.	0.066	0.227	0.000

- *Home Linkages* reduce time-to-entry for internationally mobile researchers, when the share of IT co-authors' affiliations is above the third quartile

- Two modes of scientific workforce management in Italy:
  - PD appointments abroad may delay access to assistant professor positions
  - BUT: if researchers collaborate mainly with IT during their PD, they have a higher chance of obtaining an assistant professor position sooner

Results
Time-to-promotion

Table: Risk of promotion in t, baseline results

	Full sample				CEM sample			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PD_Abroad	1.211***		1.236***		1.279***		1.348*	
	(0.045)		(0.071)		(0.117)		(0.212)	
PD_Abroad_USA		1.276***		1.371***		1.486***		1.461*
		(0.063)		(0.109)		(0.172)		(0.309)
PD_Abroad_EUR		1.151***		1.114		1.111		1.216
		(0.059)		(0.086)		(0.132)		(0.238)
PD_Abroad_OTH		1.186		1.407*		1.210		1.750
		(0.133)		(0.262)		(0.296)		(0.714)
Localism	0.926**	0.925**	0.933*	0.936*	0.896	0.891	0.933	0.941
	(0.033)	(0.033)	(0.037)	(0.037)	(0.130)	(0.129)	(0.163)	(0.165)
PD_Abroad × Localism			1.195***				1.247**	
			(0.056)				(0.138)	
PD_Abroad_USA × Localism				1.227***				1.482***
				(0.075)				(0.200)
PD_Abroad_EUR × Localism				1.183**				1.055
				(0.079)				(0.155)
PD_Abroad_OTH × Localism				1.088				1.013
				(0.153)				(0.311)
PhD/Entry Year, Area & Uni FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9912	9912	9912	9912	1114	1114	1114	1114
Log likelihood	-40369.7	-40368.4	-40369.6	-40367.0	-3685.1	-3682.8	-3685.0	-3682.1
Chi-squared	2528.5	2531.0	2528.7	2534.0	495.7	500.1	495.8	501.6

Graphs

Full table

- *Woman*: "–"; *Precocity*: no significant ("+") effect

Results
Time-to-promotion

Table: Risk of promotion in t, baseline results

	Full sample				CEM sample			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PD_Abroad	1.211*** (0.045)		1.236*** (0.071)		1.279*** (0.117)		1.348* (0.212)	
PD_Abroad_USA		1.276*** (0.063)		1.371*** (0.109)		1.486*** (0.172)		1.461* (0.309)
PD_Abroad_EUR		1.151*** (0.059)		1.114 (0.086)		1.111 (0.132)		1.216 (0.238)
PD_Abroad_OTH		1.186 (0.133)		1.407* (0.262)		1.210 (0.296)		1.750 (0.714)
Localism	0.926** (0.033)	0.925** (0.033)	0.933* (0.037)	0.936* (0.037)	0.896 (0.130)	0.891 (0.129)	0.933 (0.163)	0.941 (0.165)
PD_Abroad × Localism			1.195*** (0.056)				1.247** (0.138)	
PD_Abroad_USA × Localism				1.227*** (0.075)				1.482*** (0.200)
PD_Abroad_EUR × Localism				1.183** (0.079)				1.055 (0.155)
PD_Abroad_OTH × Localism				1.088 (0.153)				1.013 (0.311)
PhD/Entry Year, Area & Uni FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9912	9912	9912	9912	1114	1114	1114	1114
Log likelihood	-40369.7	-40368.4	-40369.6	-40367.0	-3685.1	-3682.8	-3685.0	-3682.1
Chi-squared	2528.5	2531.0	2528.7	2534.0	495.7	500.1	495.8	501.6

- ATE estimated for PD abroad: –1.2 years on average (–10% and –15%)

Results
Time-to-promotion

Table: Risk of promotion in *t*, baseline results

	Full sample				CEM sample			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PD_Abroad	1.211***		1.236***		1.279***		1.348*	
	(0.045)		(0.071)		(0.117)		(0.212)	
PD_Abroad_USA		1.276***		1.371***		1.486***		1.461*
		(0.063)		(0.109)		(0.172)		(0.309)
PD_Abroad_EUR		1.151***		1.114		1.111		1.216
		(0.059)		(0.086)		(0.132)		(0.238)
PD_Abroad_OTH		1.186		1.407*		1.210		1.750
		(0.133)		(0.262)		(0.296)		(0.714)
Localism	0.926**	0.925**	0.933*	0.936*	0.896	0.891	0.933	0.941
	(0.033)	(0.033)	(0.037)	(0.037)	(0.130)	(0.129)	(0.163)	(0.165)
PD_Abroad × Localism			1.195***				1.247**	
			(0.056)				(0.138)	
PD_Abroad_USA × Localism				1.227***				1.482***
				(0.075)				(0.200)
PD_Abroad_EUR × Localism				1.183**				1.055
				(0.079)				(0.155)
PD_Abroad_OTH × Localism				1.088				1.013
				(0.153)				(0.311)
PhD/Entry Year, Area & Uni FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9912	9912	9912	9912	1114	1114	1114	1114
Log likelihood	-40369.7	-40368.4	-40369.6	-40367.0	-3685.1	-3682.8	-3685.0	-3682.1
Chi-squared	2528.5	2531.0	2528.7	2534.0	495.7	500.1	495.8	501.6

- PD to the USA accelerates promotion more than elsewhere

Results
Time-to-promotion

Table: Risk of promotion in t, baseline results

	Full sample				CEM sample			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PD_Abroad	1.211***		1.236***		1.279***		1.348*	
	(0.045)		(0.071)		(0.117)		(0.212)	
PD_Abroad_USA		1.276***		1.371***		1.486***		1.461*
		(0.063)		(0.109)		(0.172)		(0.309)
PD_Abroad_EUR		1.151***		1.114		1.111		1.216
		(0.059)		(0.086)		(0.132)		(0.238)
PD_Abroad_OTH		1.186		1.407*		1.210		1.750
		(0.133)		(0.262)		(0.296)		(0.714)
Localism	0.926**	0.925**	0.933*	0.936*	0.896	0.891	0.933	0.941
	(0.033)	(0.033)	(0.037)	(0.037)	(0.130)	(0.129)	(0.163)	(0.165)
PD_Abroad × Localism			1.195***				1.247**	
			(0.056)				(0.138)	
PD_Abroad_USA × Localism				1.227***				1.482***
				(0.075)				(0.200)
PD_Abroad_EUR × Localism				1.183**				1.055
				(0.079)				(0.155)
PD_Abroad_OTH × Localism				1.088				1.013
				(0.153)				(0.311)
PhD/Entry Year, Area & Uni FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9912	9912	9912	9912	1114	1114	1114	1114
Log likelihood	-40369.7	-40368.4	-40369.6	-40367.0	-3685.1	-3682.8	-3685.0	-3682.1
Chi-squared	2528.5	2531.0	2528.7	2534.0	495.7	500.1	495.8	501.6

- *Localism*: " – " / no effect for non-internationally PD mobile

Results
Time-to-promotion

Table: Risk of promotion in t, baseline results

| | Full sample | | | | CEM sample | | | |
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PD_Abroad	1.211***		1.236***		1.279***		1.348*	
	(0.045)		(0.071)		(0.117)		(0.212)	
PD_Abroad_USA		1.276***		1.371***		1.486***		1.461*
		(0.063)		(0.109)		(0.172)		(0.309)
PD_Abroad_EUR		1.151***		1.114		1.111		1.216
		(0.059)		(0.086)		(0.132)		(0.238)
PD_Abroad_OTH		1.186		1.407*		1.210		1.750
		(0.133)		(0.262)		(0.296)		(0.714)
Localism	0.926**	0.925**	0.933*	0.936*	0.896	0.891	0.933	0.941
	(0.033)	(0.033)	(0.037)	(0.037)	(0.130)	(0.129)	(0.163)	(0.165)
PD_Abroad × Localism			1.195***				1.247**	
			(0.056)				(0.138)	
PD_Abroad_USA × Localism				1.227***				1.482***
				(0.075)				(0.200)
PD_Abroad_EUR × Localism				1.183**				1.055
				(0.079)				(0.155)
PD_Abroad_OTH × Localism				1.088				1.013
				(0.153)				(0.311)
PhD/Entry Year, Area & Uni FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9912	9912	9912	9912	1114	1114	1114	1114
Log likelihood	-40369.7	-40368.4	-40369.6	-40367.0	-3685.1	-3682.8	-3685.0	-3682.1
Chi-squared	2528.5	2531.0	2528.7	2534.0	495.7	500.1	495.8	501.6

- *Localism × PD_Abroad*: "+" but not significantly different from baseline effect

Results
Time-to-promotion

Table: Risk of promotion in *t*, baseline results

	Full sample				CEM sample			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PD_Abroad	1.211***		1.236***		1.279***		1.348*	
	(0.045)		(0.071)		(0.117)		(0.212)	
PD_Abroad_USA		1.276***		1.371***		1.486***		1.461*
		(0.063)		(0.109)		(0.172)		(0.309)
PD_Abroad_EUR		1.151***		1.114		1.111		1.216
		(0.059)		(0.086)		(0.132)		(0.238)
PD_Abroad_OTH		1.186		1.407*		1.210		1.750
		(0.133)		(0.262)		(0.296)		(0.714)
Localism	0.926**	0.925**	0.933*	0.936*	0.896	0.891	0.933	0.941
	(0.033)	(0.033)	(0.037)	(0.037)	(0.130)	(0.129)	(0.163)	(0.165)
PD_Abroad × Localism			1.195***				1.247**	
			(0.056)				(0.138)	
PD_Abroad_USA × Localism				1.227***				1.482***
				(0.075)				(0.200)
PD_Abroad_EUR × Localism				1.183**				1.055
				(0.079)				(0.155)
PD_Abroad_OTH × Localism				1.088				1.013
				(0.153)				(0.311)
PhD/Entry Year, Area & Uni FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9912	9912	9912	9912	1114	1114	1114	1114
Log likelihood	-40369.7	-40368.4	-40369.6	-40367.0	-3685.1	-3682.8	-3685.0	-3682.1
Chi-squared	2528.5	2531.0	2528.7	2534.0	495.7	500.1	495.8	501.6

- Destination of PD mobility, rather than *Localism*, influences time to promotion

Results
Time-to-promotion

Table: Risk of promotion in *t*, additional results (CEM sample)

	(1) TH: Q1	(2) TH: Q2	(3) TH: Q3
PD_Abroad (Netw. persistence>TH)	1.266**	1.355***	2.174***
	(0.132)	(0.149)	(0.304)
PD_Abroad (Netw. Persistence≤TH)	1.305*	1.193	1.081
	(0.179)	(0.141)	(0.108)
PhD/Entry Year, Area & Uni FEs	Yes	Yes	Yes
Observations	1114	1114	1114
Log likelihood	-3685.0	-3684.6	-3674.1
Chi-squared	495.7	496.5	517.5
Prob.	0.840	0.349	0.000

Results
Time-to-promotion

Table: Risk of promotion in *t*, additional results (CEM sample)

	(1) TH: Q1	(2) TH: Q2	(3) TH: Q3
PD_Abroad (Netw. persistence>TH)	1.266**	1.355***	2.174***
	(0.132)	(0.149)	(0.304)
PD_Abroad (Netw. Persistence≤TH)	1.305*	1.193	1.081
	(0.179)	(0.141)	(0.108)
PhD/Entry Year, Area & Uni FEs	Yes	Yes	Yes
Observations	1114	1114	1114
Log likelihood	-3685.0	-3684.6	-3674.1
Chi-squared	495.7	496.5	517.5
Prob.	0.840	0.349	0.000

- Maintaining an active scientific collaboration with acquaintances from the PD increases the speed of promotion

- The difference between the two coefficients is significant in the most "extreme" case

Summary

Table: Summary table of main findings

		Career stage	
		Entry	Promotion
Main effect	International Mobility	Negative	Positive
	Localism	Negative	No effect
Social Capital moderating effect	Home country linkages	Positive for high levels of home connections	/
	Persistence in the composition of the co-author network	/	Positive for high levels of persistence

- **Robustness:**
  - Alternative parametric survival models (Weibul, Gompertz, Exponential)
  - STEM sub-sample

Conclusions

Conclusions

- Returnees' international postdoctoral mobility and career effect:
  - They secure **initial appointment slower**, unless they maintain intense **connection with home country**
  - They experience **shorter time-to-promotion**, especially if:
    - Nurture **scientific collaborations from PD period**
    - Move to **prestigious institutions** (US)

- **Limitations:**
  - No short stays and visiting periods (no publication);
  - Only return mobility to academia
  - Low Scopus coverage of journals in some scientific areas (-->OpenAlex?)

Thank you!

Back-up slides

Results
Time-to-entry

|	Full sample			CEM sample		
	(1)	(2)	(3)	(4)	(5)	(6)
PD_Abroad	0.771***		0.774***	0.745***		0.816*
	(0.021)		(0.033)	(0.049)		(0.088)
PD_Abroad_USA		0.809***			0.723***	
		(0.030)			(0.062)	
PD_Abroad_EUR		0.767***			0.797***	
		(0.028)			(0.064)	
PD_Abroad_OTH		0.636***			0.586***	
		(0.050)			(0.098)	
Localism	1.047**	1.047**	1.049*	1.012	1.009	1.086
	(0.023)	(0.023)	(0.026)	(0.070)	(0.070)	(0.105)
PD_Abroad × Localism			0.769***			0.710***
			(0.026)			(0.057)
Log_Pubs_Entry	3.417***	3.433***	3.417***	3.254***	3.289***	3.245***
	(0.162)	(0.162)	(0.162)	(0.420)	(0.425)	(0.419)
Log_Cits_Entry	0.785***	0.783***	0.785***	0.914*	0.919*	0.915*
	(0.024)	(0.024)	(0.024)	(0.047)	(0.047)	(0.047)
Precocity	1.162***	1.161***	1.162***	1.210**	1.210**	1.209**
	(0.030)	(0.030)	(0.030)	(0.094)	(0.095)	(0.094)
Female	0.972	0.973	0.972	0.969	0.958	0.967
	(0.021)	(0.021)	(0.021)	(0.080)	(0.079)	(0.080)
Age_PhD	1.198**	1.192**	1.198**	1.518	1.388	1.477
	(0.092)	(0.091)	(0.092)	(0.656)	(0.607)	(0.638)
Age_PhD^2	0.998**	0.998*	0.998**	0.993	0.995	0.994
	(0.001)	(0.001)	(0.001)	(0.007)	(0.007)	(0.007)
PhD Year, Area & Uni FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9912	9912	9912	1114	1114	1114
Log likelihood	-82222.9	-82218.7	-82222.9	-6771.8	-6770.0	-6771.2
Chi-squared	1615.2	1623.7	1615.2	250.0	253.6	251.1

Results
Time-to-promotion

	Full sample				CEM sample			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PD_Abroad	1.211***		1.236***		1.279***		1.348*	
	(0.045)		(0.071)		(0.117)		(0.212)	
PD_Abroad_USA		1.276***		1.371***		1.486***		1.461*
		(0.063)		(0.109)		(0.172)		(0.309)
PD_Abroad_EUR		1.151***		1.114		1.111		1.216
		(0.059)		(0.086)		(0.132)		(0.238)
PD_Abroad_OTH		1.186		1.407*		1.210		1.750
		(0.133)		(0.262)		(0.296)		(0.714)
Localism	0.926**	0.925**	0.933*	0.936*	0.896	0.891	0.933	0.941
	(0.033)	(0.033)	(0.037)	(0.037)	(0.130)	(0.129)	(0.163)	(0.165)
PD_Abroad × Localism			1.195***				1.247**	
			(0.056)				(0.138)	
PD_Abroad_USA × Localism				1.227***				1.482***
				(0.075)				(0.200)
PD_Abroad_EUR × Localism				1.183**				1.055
				(0.079)				(0.155)
PD_Abroad_OTH × Localism				1.088				1.013
				(0.153)				(0.311)
Log_Pubs_Prom	4.069***	4.083***	4.069***	4.112***	4.954***	5.070***	4.958***	5.118***
	(0.335)	(0.337)	(0.335)	(0.340)	(1.292)	(1.320)	(1.294)	(1.334)
Log_Cits_Prom	1.201***	1.195***	1.201***	1.192***	1.109	1.086	1.108	1.081
	(0.054)	(0.054)	(0.054)	(0.054)	(0.150)	(0.147)	(0.150)	(0.146)
Precocity	1.093**	1.091**	1.093**	1.090**	1.035	1.005	1.037	1.020
	(0.040)	(0.040)	(0.040)	(0.040)	(0.113)	(0.111)	(0.113)	(0.113)
Female	0.825***	0.826***	0.825***	0.826***	0.666***	0.675***	0.665***	0.676***
	(0.027)	(0.027)	(0.027)	(0.027)	(0.089)	(0.091)	(0.089)	(0.091)
Age_PhD	0.941	0.939	0.942	0.942	0.389	0.404	0.387	0.394
	(0.111)	(0.111)	(0.111)	(0.111)	(0.258)	(0.268)	(0.256)	(0.261)
Age_PhD^2	1.001	1.001	1.001	1.001	1.015	1.014	1.015	1.015
	(0.002)	(0.002)	(0.002)	(0.002)	(0.011)	(0.011)	(0.011)	(0.011)
PhD/Entry Year, Area & Uni FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9912	9912	9912	9912	1114	1114	1114	1114
Log likelihood	-40369.7	-40368.4	-40369.6	-40367.0	-3685.1	-3682.8	-3685.0	-3682.1
Chi-squared	2528.5	2531.0	2528.7	2534.0	495.7	500.1	495.8	501.6

Data Sources
BNCF

Figure: Number of PhD holders and BNCF theses (Source: own calculations)
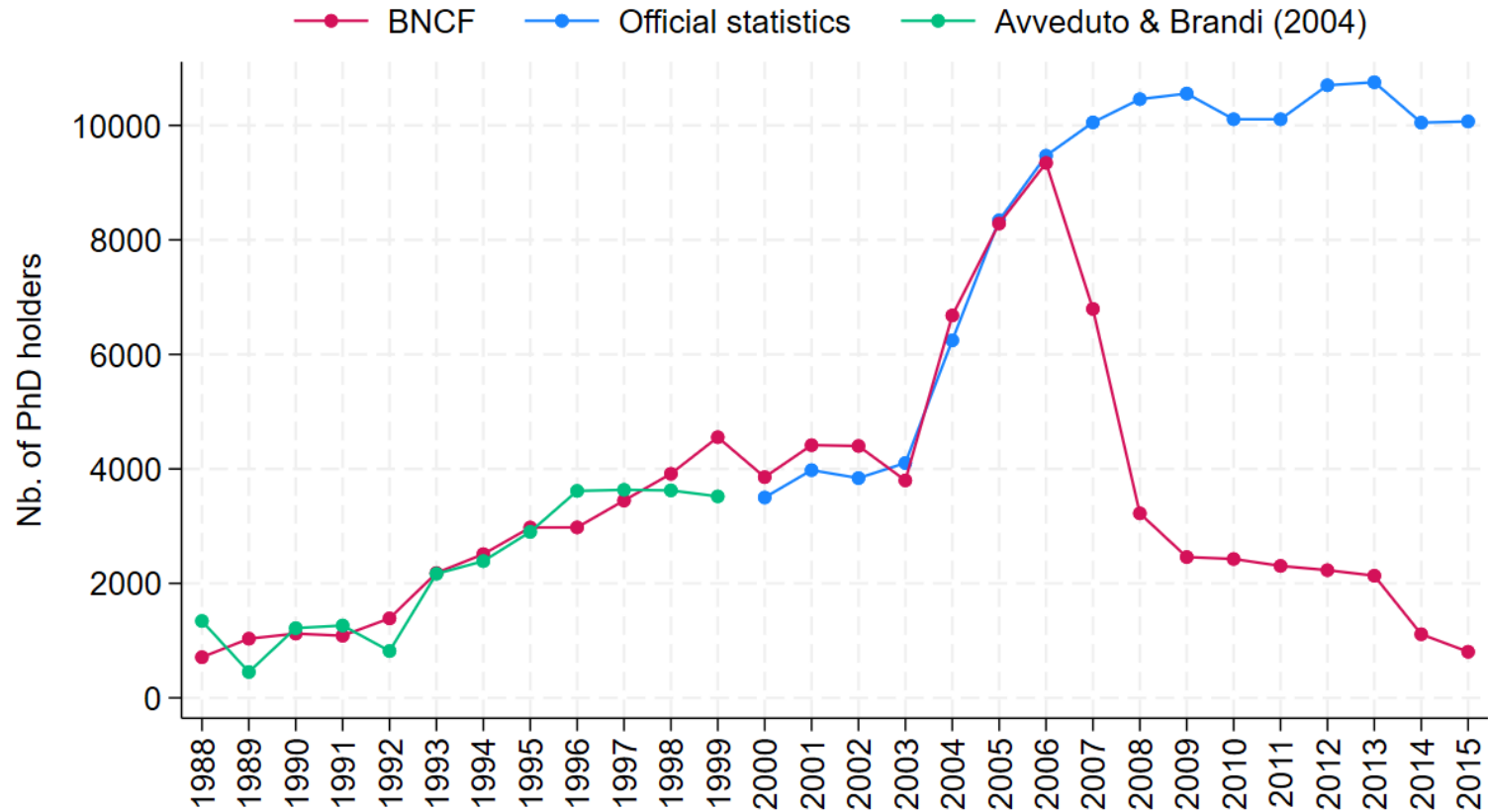
Data Sources
Record Linkage

Table: Summary statistics for all academics (MUR), matched (BNCF∩MUR) and sample (Source: own calculations)

	MUR		BNCF∩MUR		Sample	
	Mean	SD	Mean	SD	Mean	SD
Natural Sci.	0.29	0.45	0.31	0.46	0.28	0.45
Med. & Vet.	0.20	0.40	0.10	0.30	0.12	0.33
Arch. & Eng.	0.15	0.35	0.20	0.40	0.20	0.40
Hum. & Law	0.26	0.44	0.26	0.44	0.26	0.44
Social Sci.	0.10	0.30	0.13	0.33	0.13	0.34
Woman	0.33	0.47	0.42	0.49	0.43	0.49
Year of birth	1955.33	14.18	1967.03	6.18	1968.46	5.62
Year of PhD			1998.31	5.35	1999.54	4.84
Observations	88073		25969		18039	

Data Sources
Record Linkage

Table: Summary statistics for academics unmatched with BNCF, not in the sample, and in the sample (Source: own calculations)

	MUR – BNCF		BNCF – Sample		Sample	
	Mean	SD	Mean	SD	Mean	SD
Natural Sci.	0.28	0.45	0.29	0.46	0.28	0.45
Med. & Vet.	0.24	0.43	0.15	0.35	0.12	0.33
Arch. & Eng.	0.13	0.33	0.18	0.38	0.20	0.40
Hum. & Law	0.27	0.44	0.27	0.45	0.26	0.44
Social Sci.	0.09	0.29	0.11	0.31	0.13	0.34
Woman	0.29	0.45	0.39	0.49	0.43	0.49
Year of birth	1950.37	13.69	1963.90	6.31	1968.46	5.62
Year of PhD			1996.50	5.90	1999.54	4.84
Observations	62104		7930		18039	

Data Sources
Scopus

Table: Summary statistics for sample, research active, and research active during PD (Source: own calculations)

	Sample		Sample Pub		Sample Pub PD	
	Mean	SD	Mean	SD	Mean	SD
Natural Sci.	0.28	0.45	0.33	0.47	0.46	0.50
Med. & Vet.	0.12	0.33	0.14	0.35	0.17	0.38
Arch. & Eng.	0.20	0.40	0.22	0.41	0.24	0.42
Hum. & Law	0.26	0.44	0.17	0.38	0.06	0.25
Social Sci.	0.13	0.34	0.14	0.35	0.07	0.25
Female	0.43	0.49	0.41	0.49	0.41	0.49
Year of birth	1968.46	5.62	1968.50	5.59	1968.95	5.50
Year of PhD	1999.54	4.84	1999.47	4.85	1999.73	4.79
Time-to-Entry	3.68	2.54	3.65	2.53	3.84	2.57
Time-to-Prom	8.49	4.26	8.53	4.27	8.53	4.34
Promoted	0.52	0.50	0.53	0.50	0.50	0.50
Nb. Pubs during PhD	2.00	4.89	2.35	5.21	3.52	6.07
N_Pubs_Prom	11.69	17.27	13.71	17.94	19.86	19.39
N_Pubs_Entry	5.07	9.53	5.94	10.07	9.22	11.27
Observations	18039		15384		9912	

Data Sources
Scopus

Table: Summary statistics for academics without Scopus publications, without PD publications, and sample (Source: own calculations)

	No Pub		No Pub PD		Pub PD	
	Mean	SD	Mean	SD	Mean	SD
Natural Sci.	0.04	0.18	0.09	0.28	0.46	0.50
Med. & Vet.	0.02	0.14	0.08	0.28	0.17	0.38
Arch. & Eng.	0.11	0.31	0.19	0.39	0.24	0.42
Hum. & Law	0.73	0.44	0.37	0.48	0.06	0.25
Social Sci.	0.10	0.30	0.27	0.44	0.07	0.25
Female	0.50	0.50	0.42	0.49	0.41	0.49
Year of birth	1968.19	5.78	1967.70	5.65	1968.95	5.50
Year of PhD	1999.93	4.78	1999.01	4.92	1999.73	4.79
Time-to-Entry	3.86	2.56	3.31	2.44	3.84	2.57
Time-to-Prom	8.27	4.17	8.52	4.16	8.53	4.34
Promoted	0.45	0.50	0.59	0.49	0.50	0.50
Nb. Pubs during PhD	0.00	0.00	0.23	1.65	3.52	6.07
N_Pubs_Prom	0.00	0.00	2.58	5.62	19.86	19.39
N_Pubs_Entry	0.00	0.00	0.00	0.00	9.22	11.27
Observations	2655		5472		9912	

Results
Time-to-promotion

Figure: Kaplan-Meier survival estimate (left) and hazard curve (right)