How did Bologna Reforms Affect Returns to Higher Education?
–
New Comparative Evidence using LIS Data

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Income and Wealth Inequality: Drivers and Consequences

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Motivation

- HE expansion worldwide,
- in Europe accompanied by the Bologna process
  - a political reform aimed at establishing the European Higher Education Area (EHEA)
  - Facilitating mobility between different HE systems
  - 48 EHEA member countries
  - 18 countries gradually transfomed one-cycle to two-cycle structures (BA / MA)

- BA degrees constituting a novelty

- How did changing the degree structure affect the HE wage premium?

Previous research

- Scattered evidence for single-countries:
  - Italy (e.g. Bosio & Leonardi 2011): positive effect for graduates‘ employability, but smaller college wage premium
  - Germany (e.g. Neugebauer & Weiss 2018): return to BA degree higher than return to vocational degree, return to BA degree from University of Applied Science even higher

- But, no comparative study yet available (Kroher et al. 2021):
  - Differences across countries can be expected to exist
  - Contributing to knowledge about underlying mechanisms

Theoretical background

- The effect of the introduction of the Bologna reforms is composed of two effects

- Human capital theory - market forces of supply and demand driving the **expansion effect**
  - larger share of graduates puts downward pressure on wages as long as demand does not keep pace
  - mediated by the quality of higher education
- **Differentiation effect** - Holding average tertiary attainment constant, what is the impact of a more heterogeneous structure of higher education?
  - Role of employers in defining the value of `new' vs `old' degrees
  - How do employers assess their signaling value?
  - Where do they place the credentials of e.g. BA graduates in the labour queue ?

Differences across countries

- How employers value a particular degree vs another depends on social norms, business conventions and labour market institutions, and will thus differ across sectors within countries, and across countries.
- Systems without a strong vocational sector might have higher returns to BA degrees than countries where the shorter BA degree competes with high-quality vocational training at the secondary level.
- Collective bargaining tends to establish a hierarchy among degrees
- The quality of `new' degrees depends on whether public spending keeps pace with rising student numbers.
- Different implementation strategies w.r.t. speed and scope (exempt fields)

Data

- LIS data for 10 European countries that changed their degree structure (1990-2020):
  - Today: Germany, Austria, Italy

- Dataset restrictions
  - completed education
  - excluding short-cycle and PhD degrees, control group: upper secondary
  - aged 25-35 (early labour market careers)
  - dependent employees

- Dependent variable: log gross hourly wage, top coded at the 99th percentile

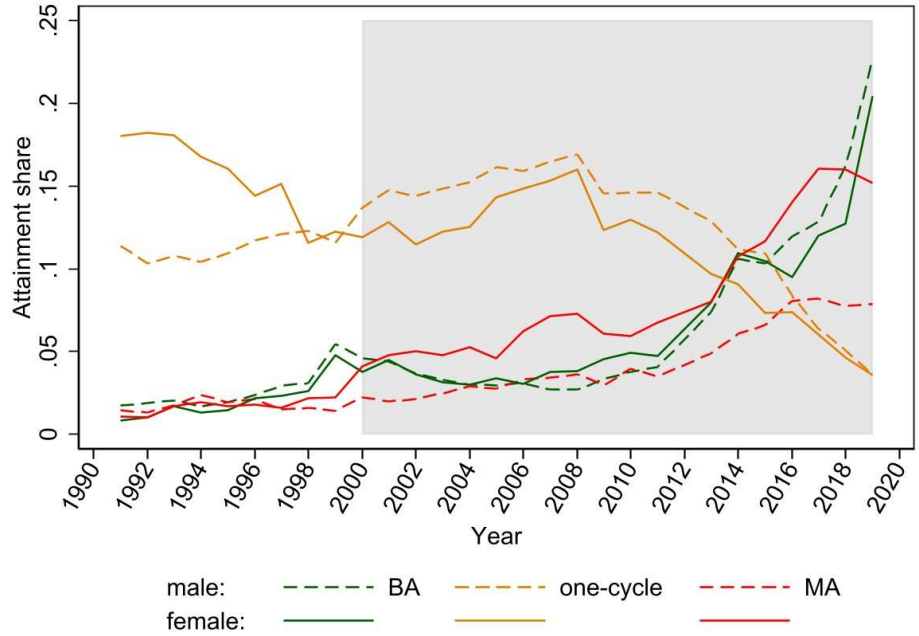
- Main explanatory variables
  - dummy variable indicating whether a person has attained tertiary education (BA, `old‘ one-cycle or MA degree)
  - data on the implementation of two-cycle structures constructed based on Kroher et al. (2021) and Diogo & Sabic (2015)

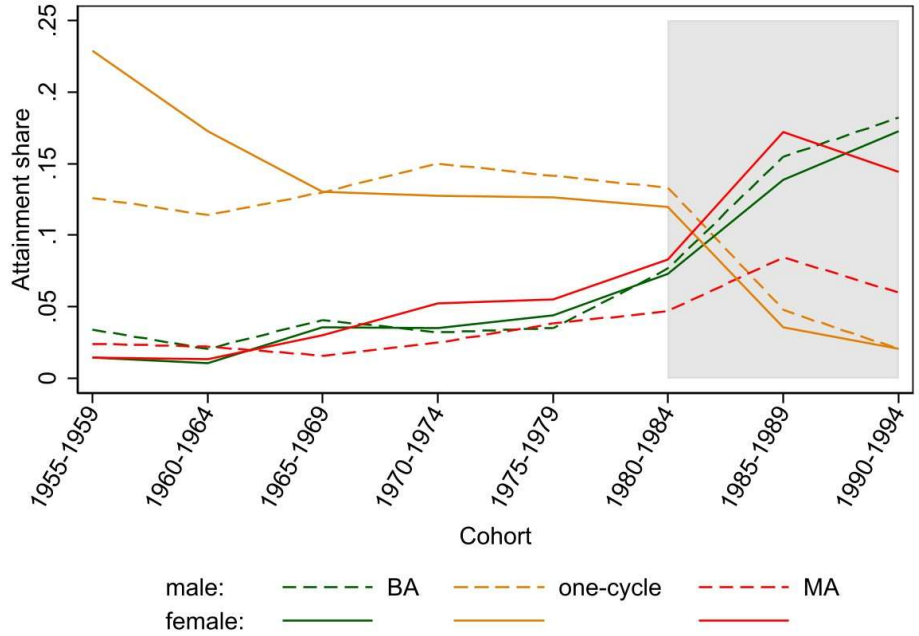
Identification through variation across cohorts

- Bologna effect
  - Implementation period in e.g. Germany: 2000-04
  - 18 as HE entry age
  - First birth cohort affected:

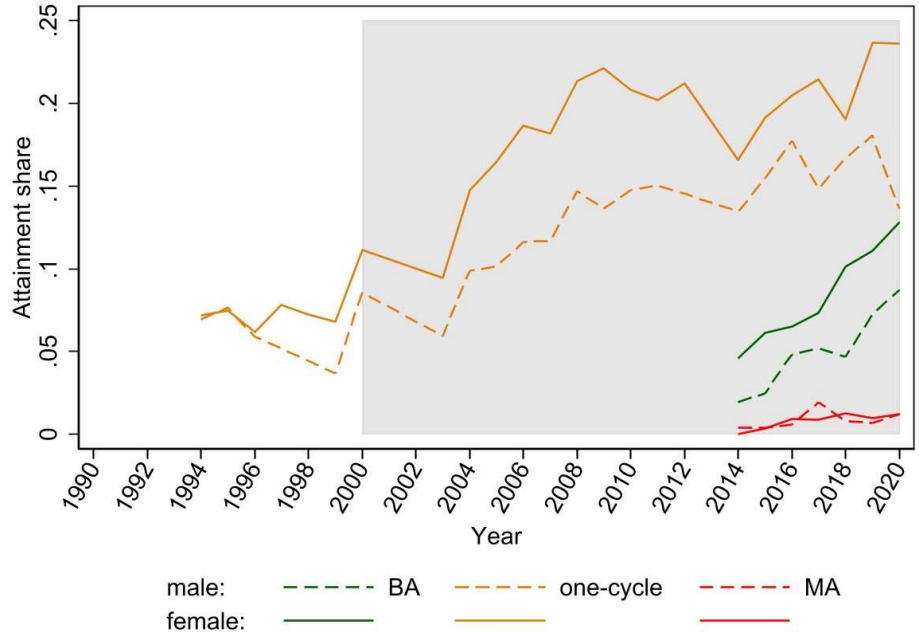
    1982-1986 → 1980-1984

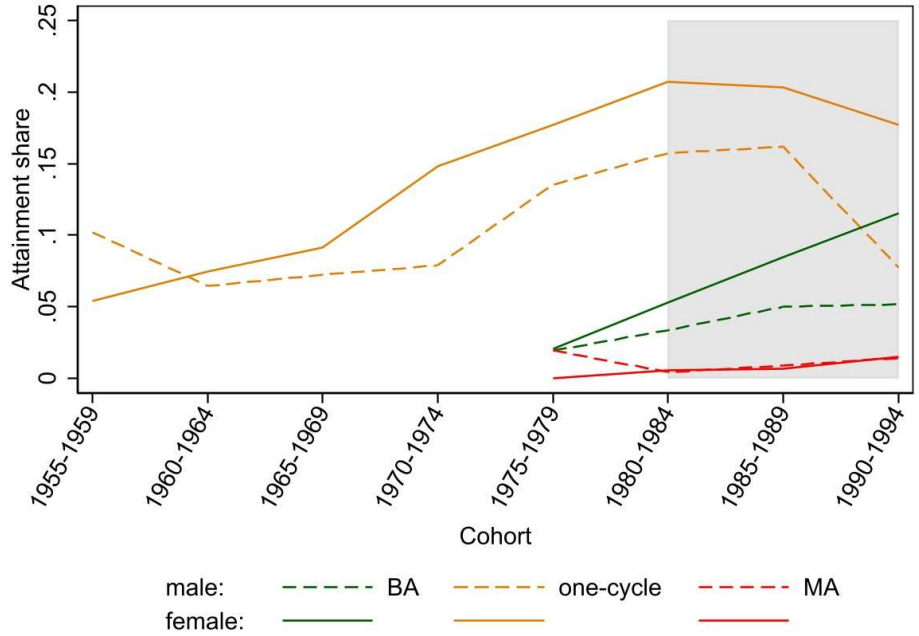
Educational expansion in Germany



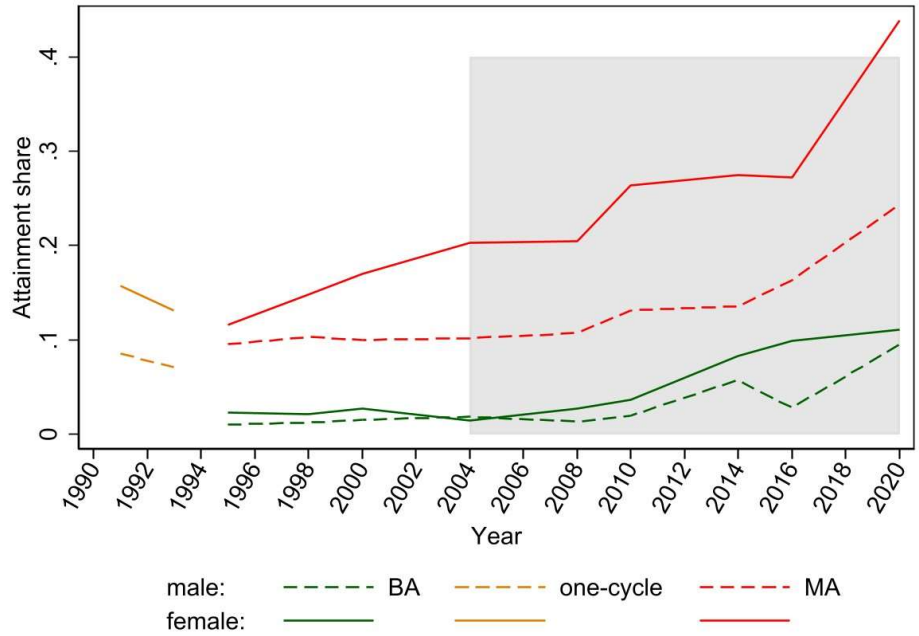


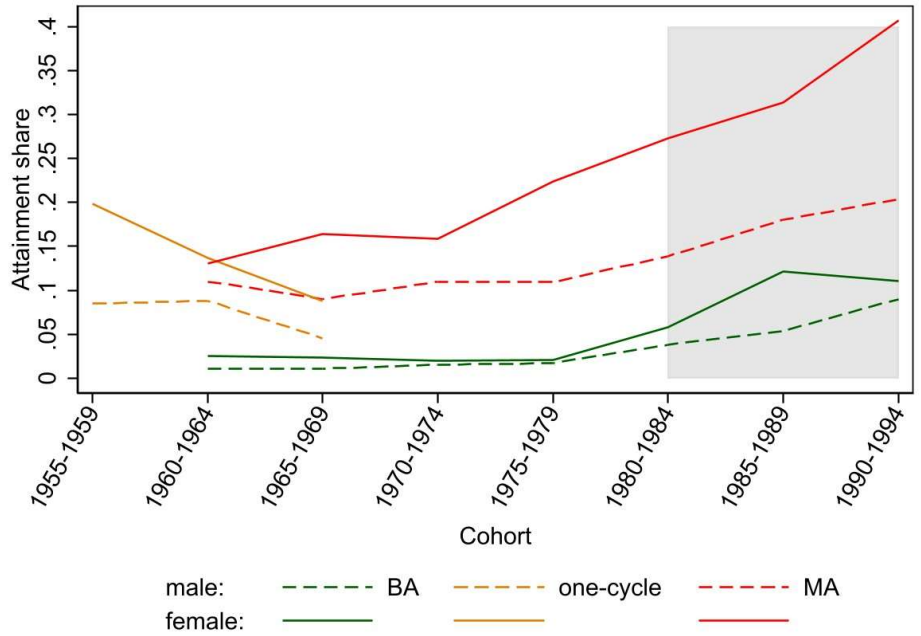
Educational expansion in Austria





Educational expansion in Italy





Estimation Strategy

- Single regressions for each country based on cohort-datasets (men and women separately)

- Sequential control approach:
  - Base model (1)

    ln(wage) = $\beta_0 + \beta_1\, tertiary + \beta_2\, bologna + \beta_3\, tertiary\ x\ bologna + \delta\ (age, survey) + \varepsilon,$

  - Expansion model (2)

    ln(wage) = $\beta_0 + \beta_1\, tertiary + \beta_2\, bologna + \beta_3\, tertiary\ x\ bologna + \beta_4\, expansion + \delta\ (age, survey) + \varepsilon,$

    with *expansion* being the cohort- and gender-specific average share of tertiary attainment when entering HE

  - Differentiation models(3/4)

    ln(wage) = $\beta_0 + \beta_1\, tertiary + \beta_2\, bologna + \beta_3\, tertiary\ x\ bologna + \beta_4\, expansion + \beta_{51}\, BA + \delta\ (age, survey) + \varepsilon,$

    model 4 exchanges BA dummy with one indicating one-cycle degrees

  - Controlled models (5/6)

    ln(wage) = $\beta_0 + \beta_1\, tertiary + \beta_2\, bologna + \beta_3\, tertiary\ x\ bologna + \beta_4\, expansion + \beta_{51}\, BA + \beta_{52}\, MA + \delta\ (age, survey) + \gamma\, \boldsymbol{A} + \varepsilon,$

    with ***A*** = matrix including dummies for part time, industry, occupation

Results Germany: men

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	base	ptime	expansion	BA	one-cycle	industry	occupation
tertiary	0.297***	0.305***	0.305***	0.320***	0.250***	0.273***	0.0829***
	(0.00703)	(0.00692)	(0.00692)	(0.00717)	(0.00998)	(0.00756)	(0.00960)
tertiary*bologna	0.00537	0.00355	0.00388	0.0266**	0.0316***	0.00713	-0.000512
	(0.0118)	(0.0116)	(0.0116)	(0.0119)	(0.0122)	(0.0122)	(0.0130)
bologna	-0.0278**	-0.0336***	-0.0188	-0.0250*	-0.0283**	-0.00894	0.00858
	(0.0123)	(0.0121)	(0.0144)	(0.0144)	(0.0144)	(0.0141)	(0.0135)
age	0.0214***	0.0212***	0.0201***	0.0200***	0.0200***	0.0186***	0.0183***
	(0.000952)	(0.000936)	(0.00112)	(0.00112)	(0.00112)	(0.00111)	(0.00106)
part-time		-0.390***	-0.390***	-0.389***	-0.389***	-0.285***	-0.225***
		(0.0129)	(0.0129)	(0.0128)	(0.0128)	(0.0130)	(0.0128)
expansion			-0.00447*	-0.00429*	-0.00402*	-0.00730***	-0.00935***
			(0.00235)	(0.00235)	(0.00235)	(0.00234)	(0.00225)
BA				-0.0891***		-0.0712***	-0.00419
				(0.0110)		(0.0109)	(0.0109)
one-cycle					0.0779***		
					(0.0103)		
Constant	2.136***	2.143***	2.255***	2.253***	2.247***	1.974***	2.325***
	(0.0319)	(0.0314)	(0.0666)	(0.0666)	(0.0666)	(0.0699)	(0.0748)
Observations	26,277	26,277	26,277	26,277	26,277	23,983	23,872
R-squared	0.133	0.162	0.162	0.164	0.164	0.261	0.368
Standard errors in parentheses							
*** p<0.01, ** p<0.05, * p<0.1							

Results Germany: women

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	base	ptime	expansion	BA	one-cycle	industry	occupation
tertiary	0.265***	0.235***	0.235***	0.252***	0.234***	0.200***	0.0261***
	(0.00796)	(0.00791)	(0.00791)	(0.00816)	(0.0109)	(0.00857)	(0.00983)
tertiary*bologna	0.0760***	0.0718***	0.0720***	0.0906***	0.0726***	0.0780***	0.0598***
	(0.0128)	(0.0126)	(0.0126)	(0.0128)	(0.0133)	(0.0130)	(0.0137)
bologna	-0.0305**	-0.0279**	-0.00148	-0.00875	-0.00172	-0.00854	0.00522
	(0.0126)	(0.0124)	(0.0141)	(0.0141)	(0.0142)	(0.0137)	(0.0130)
age	0.00743***	0.0135***	0.0116***	0.0113***	0.0116***	0.0118***	0.0118***
	(0.00108)	(0.00108)	(0.00118)	(0.00117)	(0.00118)	(0.00116)	(0.00109)
part-time		-0.163***	-0.164***	-0.162***	-0.164***	-0.119***	-0.0658***
		(0.00581)	(0.00582)	(0.00582)	(0.00582)	(0.00585)	(0.00568)
expansion			-0.00608***	-0.00592***	-0.00607***	-0.00419***	-0.00436***
			(0.00153)	(0.00153)	(0.00153)	(0.00150)	(0.00142)
BA				-0.104***		-0.0968***	-0.0149
				(0.0125)		(0.0124)	(0.0124)
one-cycle					0.00154		
					(0.0114)		
Constant	2.333***	2.202***	2.392***	2.394***	2.391***	2.023***	2.529***
	(0.0369)	(0.0366)	(0.0601)	(0.0601)	(0.0601)	(0.0660)	(0.138)
Observations	24,499	24,499	24,499	24,499	24,499	22,308	22,194
R-squared	0.108	0.136	0.136	0.139	0.136	0.249	0.372
Standard errors in parentheses							
*** p<0.01, ** p<0.05, * p<0.1							

Results Austria: men

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	base	ptime	expansion	BA	one-cycle	industry	occupation
tertiary	0.257***	0.266***	0.274***	0.413***	0.164***	0.387***	0.271**
	(0.0142)	(0.0142)	(0.0204)	(0.132)	(0.0355)	(0.125)	(0.120)
tertiary*bologna	-0.0327*	-0.0353*	-0.0398*	-0.151	-0.0201	-0.156	-0.145
	(0.0193)	(0.0193)	(0.0241)	(0.133)	(0.0246)	(0.126)	(0.120)
bologna	-0.0485***	-0.0500***	-0.0249	0.00776	-0.0299*	0.0140	0.0261
	(0.0151)	(0.0151)	(0.0180)	(0.0571)	(0.0180)	(0.0548)	(0.0524)
age	0.0144***	0.0141***	0.0146***	0.0139***	0.0142***	0.0139***	0.0153***
	(0.00134)	(0.00133)	(0.00200)	(0.00230)	(0.00200)	(0.00223)	(0.00215)
part-time		-0.138***	-0.163***	-0.167***	-0.160***	-0.112***	-0.0757***
		(0.0175)	(0.0196)	(0.0274)	(0.0196)	(0.0272)	(0.0266)
expansion			-0.00578**	-0.00586**	-0.00584**	-0.00529**	-0.00587**
			(0.00247)	(0.00255)	(0.00246)	(0.00246)	(0.00237)
BA				-0.143***		-0.121***	-0.0950***
				(0.0321)		(0.0314)	(0.0304)
short-cycle					0.111***		
					(0.0292)		
Constant	2.379***	2.388***	2.503***	2.533***	2.515***	1.985***	2.083***
	(0.0436)	(0.0435)	(0.0687)	(0.0975)	(0.0687)	(0.117)	(0.241)
Observations	9,331	9,330	5,572	2,703	5,572	2,684	2,671
R-squared	0.102	0.109	0.120	0.124	0.123	0.249	0.333

Results Austria: women

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	base	ptime	expansion	BA	one-cycle	industry	occupation
tertiary	0.302***	0.298***	0.277***	0.342***	0.171***	0.428***	0.285**
	(0.0165)	(0.0166)	(0.0210)	(0.127)	(0.0328)	(0.124)	(0.117)
tertiary*bologna	-0.0687***	-0.0705***	-0.0532**	-0.0972	-0.0313	-0.213*	-0.164
	(0.0220)	(0.0220)	(0.0244)	(0.128)	(0.0249)	(0.125)	(0.117)
bologna	0.0158	0.0151	0.00742	-0.0665	-0.00270	0.00623	0.0424
	(0.0194)	(0.0194)	(0.0403)	(0.0802)	(0.0403)	(0.0776)	(0.0732)
age	0.0106***	0.0119***	0.0139***	0.0138***	0.0135***	0.0138***	0.0124***
	(0.00176)	(0.00179)	(0.00348)	(0.00462)	(0.00348)	(0.00451)	(0.00424)
part-time		-0.0363***	-0.0559***	-0.0211	-0.0550***	0.00627	0.0413***
		(0.00956)	(0.00994)	(0.0138)	(0.00993)	(0.0137)	(0.0130)
expansion			0.000864	0.00672	0.00128	0.00681	0.00200
			(0.00688)	(0.00865)	(0.00687)	(0.00845)	(0.00794)
BA				-0.108***		-0.0827***	-0.0459*
				(0.0260)		(0.0255)	(0.0245)
one-cycle					0.107***		
					(0.0253)		
Constant	2.248***	2.216***	2.281***	2.174***	2.282***	1.779***	1.957***
	(0.0586)	(0.0592)	(0.221)	(0.325)	(0.221)	(0.328)	(0.421)
Observations	7,652	7,647	4,954	2,453	4,954	2,430	2,420
R-squared	0.115	0.117	0.126	0.118	0.129	0.237	0.352
Standard errors in parentheses							
*** p<0.01, ** p<0.05, * p<0.1							

Results Italy: men

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	base	ptime	expansion	BA	industry	occupation
tertiary	0.136***	0.138***	0.173***	0.173***	0.135***	0.0298
	(0.0170)	(0.0170)	(0.0245)	(0.0245)	(0.0235)	(0.0245)
tertiary*bologna	0.00650	0.00175				
	(0.0294)	(0.0292)				
bologna	0.0152	0.0172				
	(0.0251)	(0.0249)				
age	0.0259***	0.0257***	0.0360***	0.0360***	0.0326***	0.0305***
	(0.00209)	(0.00208)	(0.00680)	(0.00680)	(0.00647)	(0.00616)
part-time		-0.170***	-0.0355	-0.0355	-0.00406	0.0584
		(0.0260)	(0.0614)	(0.0614)	(0.0587)	(0.0563)
expansion			-0.0106*	-0.0106*	-0.0113**	-0.0118**
			(0.00595)	(0.00595)	(0.00567)	(0.00539)
highereduc==BA = 0, omitted				-	-	-
Constant	1.482***	1.491***	1.354***	1.354***	1.455***	1.424***
	(0.0655)	(0.0651)	(0.140)	(0.140)	(0.151)	(0.145)
Observations	3,536	3,536	1,168	1,168	1,168	1,168
R-squared	0.083	0.094	0.099	0.099	0.195	0.274
Standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

Results Italy: women

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	base	ptime	expansion	BA	industry	occupation
tertiary	0.179***	0.174***	0.183***	0.183***	0.131***	0.0606**
	(0.0177)	(0.0177)	(0.0284)	(0.0284)	(0.0278)	(0.0289)
tertiary*bologna	0.0156	0.0132				
	(0.0310)	(0.0309)				
bologna	-0.0120	-0.0143				
	(0.0309)	(0.0308)				
age	0.0283***	0.0285***	0.0364***	0.0364***	0.0228***	0.0207***
	(0.00246)	(0.00245)	(0.00846)	(0.00846)	(0.00819)	(0.00798)
part-time		-0.0767***	-0.0951***	-0.0951***	-0.0195	-0.0187
		(0.0168)	(0.0329)	(0.0329)	(0.0325)	(0.0317)
expansion			-0.0287	-0.0287	-0.00912	-0.0114
			(0.0258)	(0.0258)	(0.0247)	(0.0241)
highereduc==BA = 0, omitted				-	-	-
Constant	1.370***	1.373***	1.944***	1.944***	1.800***	1.874***
	(0.0769)	(0.0767)	(0.547)	(0.547)	(0.534)	(0.520)
Observations	3,255	3,255	1,115	1,115	1,115	1,115
R-squared	0.101	0.107	0.090	0.090	0.178	0.224
Standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

Summary and next steps

- Positive return to HE in all countries, for men and for women
- Differences across countries exist w.r.t. the impact of the Bologna reform
  - Bologna introduced simulataneously with other reforms (e.g. Italy)
  - Differences between countries with strong vocational sectors (Austria – Germany)
- Estimation for 7 further countries
- Further controls at the cohort-level
  - Quality: e.g. public spending by student and level
  - Macro-economic conditions: unemployment rate
- Robustness
  - Field-of-study
  - Selection effects

Thank you for your attention!

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country	year joining EHEA	year implementing two-cycle structure	pre bologna system (1 = one-cycle / 2 = two-cycle)
Austria	1999	2000/2001	1
Belgium – Flemish Community	1999	2004/2005-2007/2008	1
Belgium – French Community	1999	2004/2005-2007/2008	1
Czech Republic	1999	2000–2004/2005	2
Denmark	1999	1993-2003	2
Estonia	1999	2002/2003	1
Finland	1999	2005/2008	1
France	1999	2006/2010	2
Georgia	2005	no/minor changes	2
Germany	1999	2000–2004/2005	1
Greece	1999	no/minor changes	2
Hungary	1999	2005-2006	1
Iceland	1999	no/minor changes	2
Ireland	1999	no/minor changes	2
Italy	1999	2001/2002	1
Luxembourg	1999	2004	1
Netherlands	1999	2002/2003	1
Norway	1999	2002/2003-2003/2004	2
Poland	1999	2006/2007-2007	2
Romania	1999	2005/2006-2008	1
Russian Federation	2003	2009/2010-2010/2011	2
Serbia	2003	2006/2007	2
Slovak Republic	1999	no/minor changes	2
Slovenia	1999	2004/2005-2009/2010	2
Spain	1999	2005/2006-2008-2009	2
Sweden	1999	2007	1
Switzerland	1999	2004/2005-2010	1
United Kingdom	1999	no/minor changes	2
United Kingdom (Scotland)	1999	no/minor changes	2

Country-specific implementation (Diogo & Sabic 2015)

- Speed: share of HE institutions
  - 2003: Austria and Germany 0-50%, Italy 70-85%
  - 2007: Austria and Germany 50-70%, Italy 85-100%
  - 2010: Austria, Germany and Italy 85-100%
- Disciplinary fields excluded
  - Germany (6): medicine, dentistry, veterinary studies, pharmacy, law, theology, teacher education (still in transition in some `Länder')
  - Austria (3): medicine, dentistry, veterinary studies
  - Italy (6): medicine, dentistry, veterinary studies, pharmacy, law, architecture