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

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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 on average, and to what extent does the premium vary across the different degrees that existed after the implementation?

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

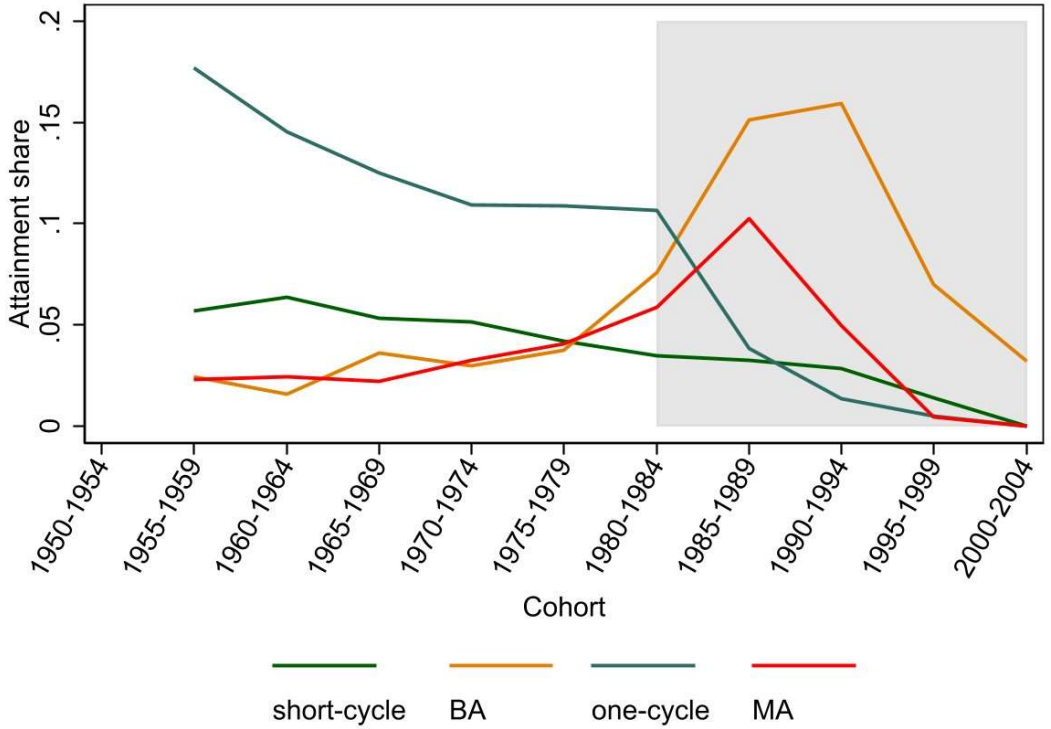
- Dependent variable: log gross hourly wage, top coded at the 99th percentile

- 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)

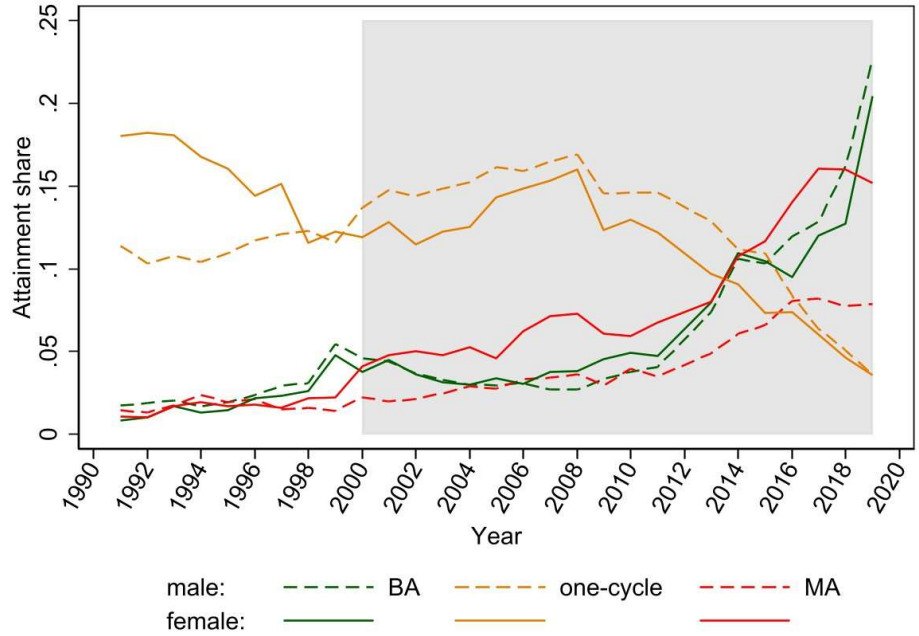
Identification through variation across cohorts

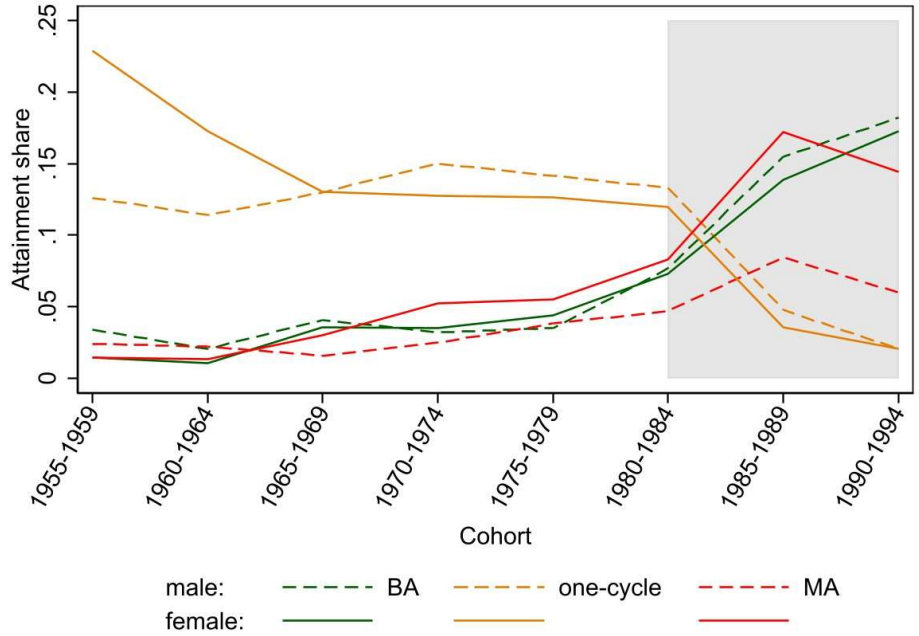
- Bologna effect
  - Implementation period in e.g. Germany: 2000-04
  - 18 as HE entry age
  - First birth cohort affected:

    1982-1986 → 1980-1984

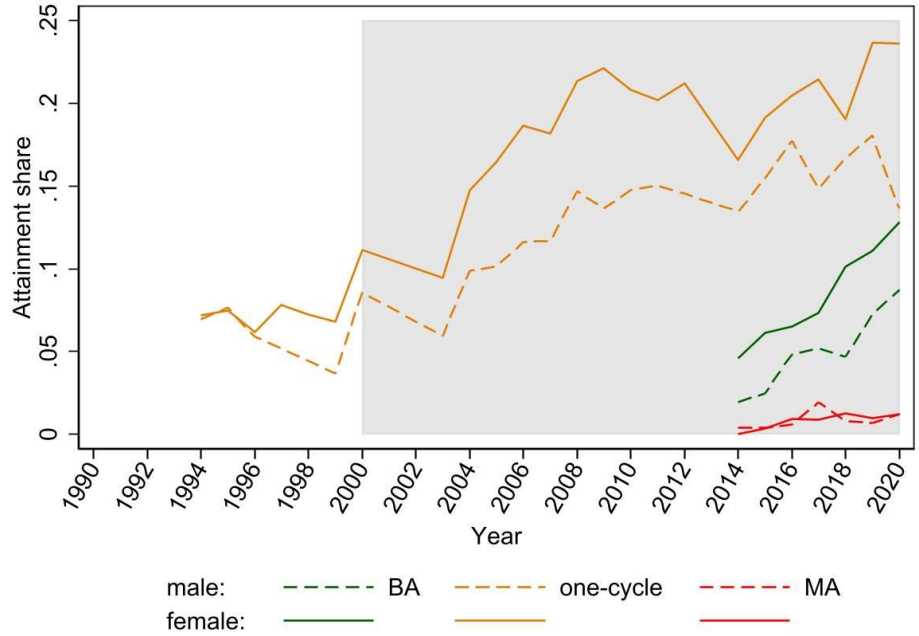


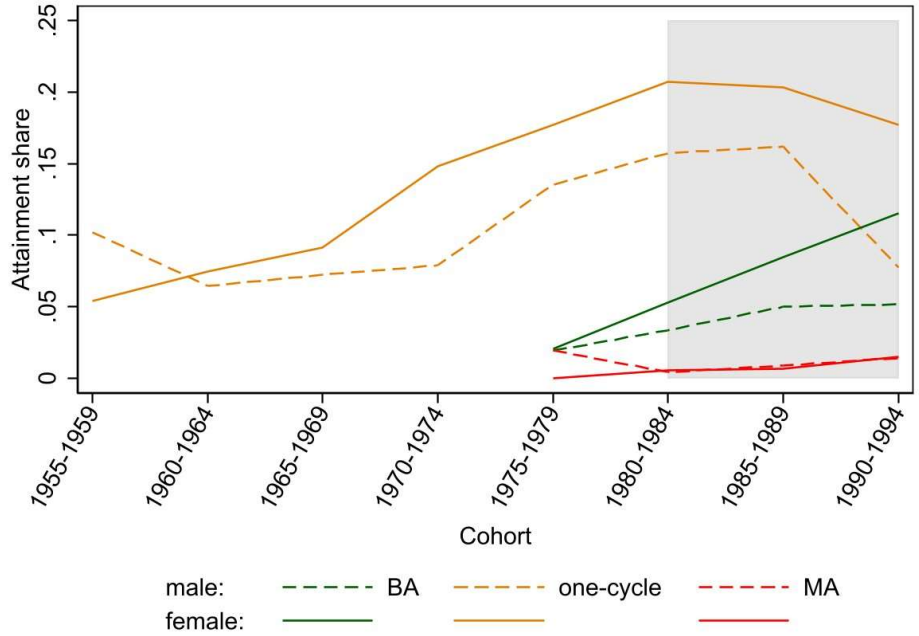
Educational expansion in Germany



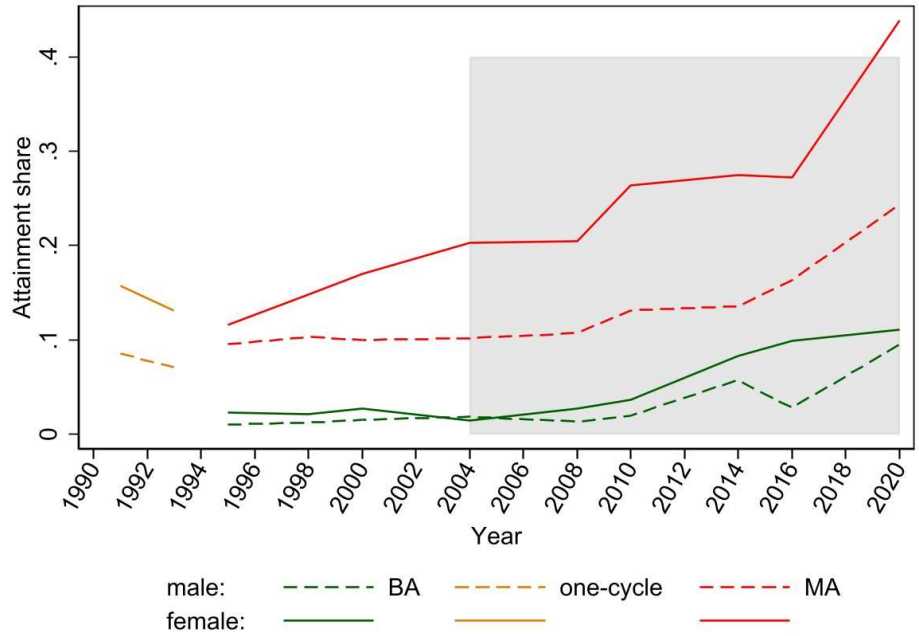


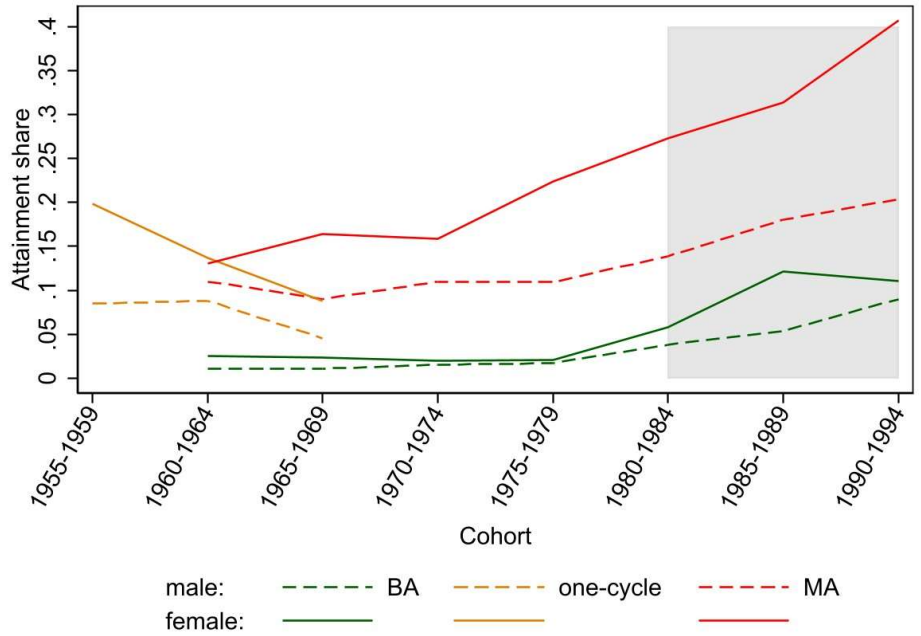
Educational expansion in Austria





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/MA dummies 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
- How do `old' vs. `new' degrees pay off after the implementation?
  - Estimation of return to BA/MA/one-cycle degree only for (two) cohorts after implementation
- 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