



Seeds of knowledge: scholars, universities, and academies in premodern Europe

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Handwritten lecture notes of
George Licon who studied in
Louvain in 1467

sketched a master delivering a
lecture on Aristotle's *Physica*

Content of lecture likely strange
(by today standard). But fostered
habits of reason and intellectual
discipline

Europe, 1000–1800 CE: A Hub of Academic Innovation

- Over **>100,000 academic scholars** across Europe during this period.
among whom 39% have a footprint in today's libraries
- Scholars did not work in isolation: they were part of a **vast academic community**
- 1000-1200: cathedral and monastic schools. Outcompeted as learning centers c. 1200.
- Over 1000-1800:
 - **200 universities** established (1000–1800, e.g. Bologna, Paris, Oxford, Louvain, Kraków, Salamanca).
 - **150 notable academies** (1500–1800, e.g. Royal Society, Leopoldina, Ricovrati, Académie des Sciences).

Key features of universities

Many are bottom-up. Recognized *ex post* by a charter (e.g. Papal Bull)

Very unique feature: they are *persona ficta* ($\approx$ legal persons/corporations)

Origin: Roman law (*universitas, societas*) + Theology (church as *corpus mysticum* of Christ) + Canon law

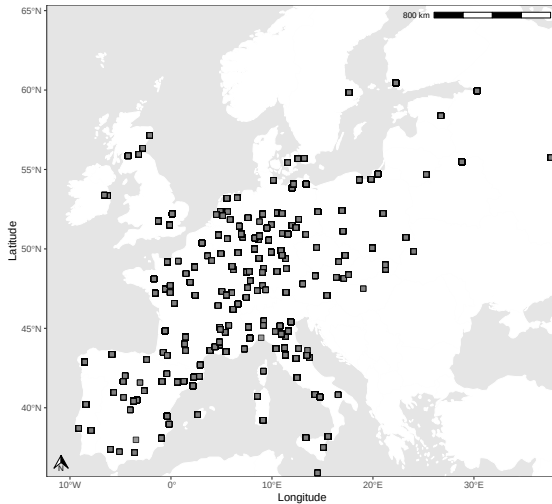
In corporations, professors act collectively. + one can leave a corporation.

The institution persists beyond the existence of its members (universities more persistent than States)

Diplomas follow exams. Given by institutions (hence by community of masters)

Some dose of meritocracy (*disputatio*, exams)

Universities



Universities across Europe shared remarkable similarities

- Latin (until late in the 18th century)
- *licentia ubique docendi*
- similar curricula
- Charters and Bulls (giving autonomy)
- ritual: sceptres, gowns, etc..



University of Paris, 1253.
Virgin and Child + with
masters and scholars.



University of Oxford,
c. 1300. Chancellor seated
among scholars.



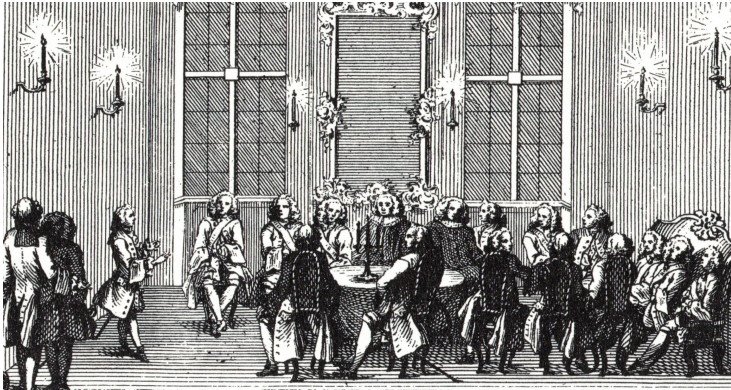
University of Coimbra. A
1897 redrawing based on
the medieval design.

University seals, witnessing the recognition of the university as a collective legal entity

Academies

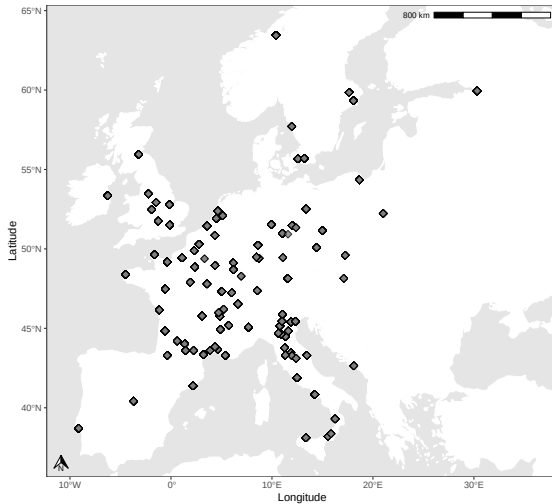
Academies: informal clubs becoming formal institutions after 1650.

Mostly arts & sciences (+ applied) – Meetings, publications, letters, prizes



meeting of the academy
in Copenhagen (1751)

Academies



Type of institution	Period	Bottom-up	<i>Persona ficta</i>	Gave diplomas
Monastic Schools	c. 600–1200	yes	early form	no
Cathedral Schools	c. 900–1200	no	no	no
European Universities	c. 1100–	yes	legally autonomous corporate entity	granted by the collective authority of the faculty
European Academies	c. 1500–	yes	legally autonomous corporate entity	gave prizes
Nalanda monastery–university	427–1197	?	?	no
Madrasas	c. 800–	yes	no, charitable endowment	issuance of ijazahs based on attendance
Imperial academies (Guozijian)	c. 700–1905	no	no	central examination system

A conceptual framework: the knowledge network

Scholars, universities and academies can be seen as participants to a multilayer knowledge network

next slide: example centred on Isaac Newton (1642–1727), Robert Hooke (1635–1703), and Edmund Halley (1656–1742)

This perspective provides the big picture. It also clarifies the scope of the present project centered on the affiliation network linking scholars to institutions.

Applications

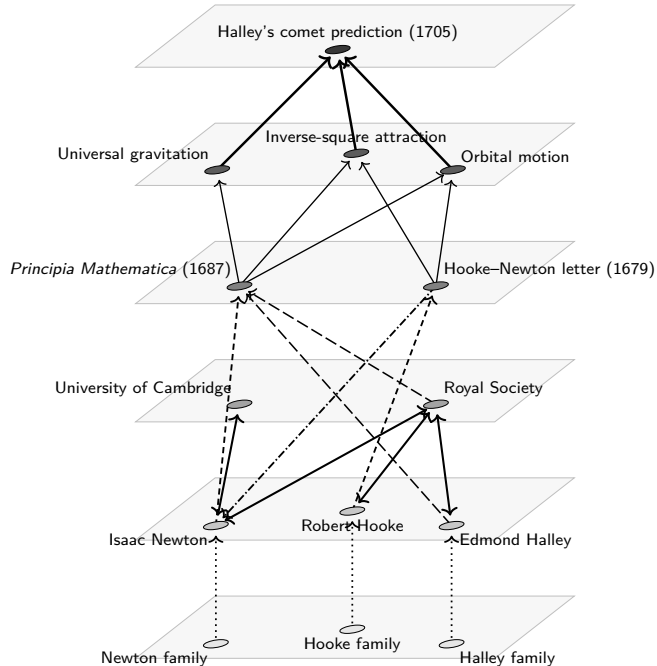
Concepts

Texts

Institutions

Scholars

Families



Human Capital and Economic Takeoff

- Debate over whether the knowledge network is a cause or a consequence of economic takeoff
- Literacy increased steadily in Europe from around 1600 onward (measured by signatures in marriage registers; Cipolla, 1969)
- Was rising literacy a necessary condition for takeoff? Was it sufficient?
- Even if average human capital was not decisive, the upper tail of the distribution may have mattered
- Who were the scholars and learned elites that constituted this upper tail of human capital?
- What were the features of the institutions to which they were harnessed? Were they complementary with knowledge growth?

Data collection: where we stand (Sep 2026)

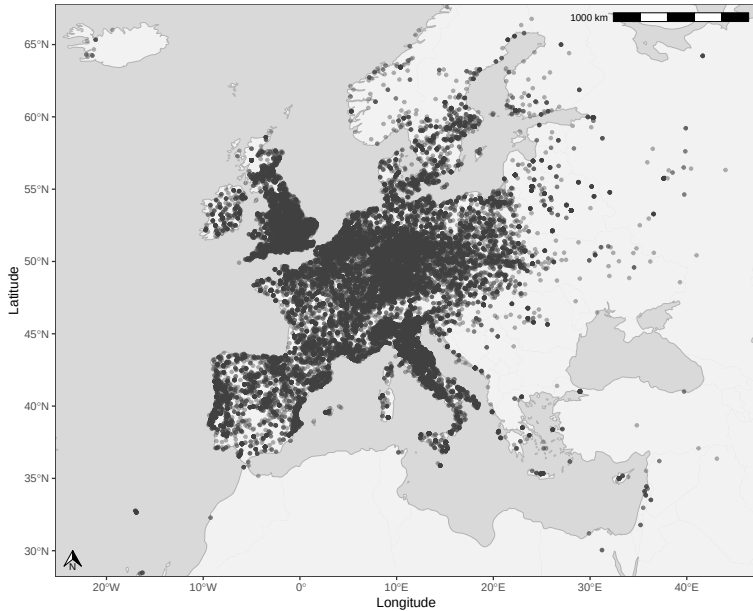
Data collected from 728 secondary sources (example next slide)

<https://shiny-lidam.sipr.ucl.ac.be/scholars/>

- list of relevant institutions: universities (from Frijhoff 1996), scientific academies (McClellan 1985), Italian Renaissance academies (British Library) + some other important institutions (Jardin Royal) + cathedral schools and abbeys before 1200 with at least 5 named scholars.
→ **381** institutions
- c. 94000 Scholars and Literati (21k in academies, 77k in universities, 4k both)
- c. 112000 Activities, each activity representing the presence of a scholar in one institution

Geographical coverage

Places of birth:



Originality of the database

- bottom-up construction $\neq$ top-bottom (Laouenan et al. 2022), Serafinelli-Tabellini (2022)
- Teachers, not students
- Intersection Universities – Academies
- European scope
- Linking scholars with productivity measures (publications in VIAF, occupations listed in Wikidata)

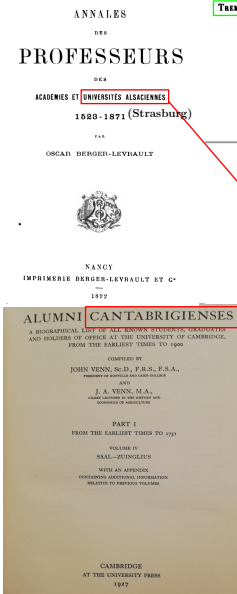
Matching three different types of sources

Secondary source on members of a university/academy → field, dates, type of membership, place of birth

Biographical dictionaries (Treccani, Allgemeine Deutsche Biographie, etc.) → vital dates, places of death/birth

VIAF (Virtual International Authority File) page → publications

Example next slides: sources for Emmanuel Tremellius



TREMELLIUS, Emmanuel, Ferrariensis.
Natus 1510
Denatus (Sedan.) 9 Octobr. 1580.

244 Académies et Universités alsaciennes.

Hebraeae linguae Professor, Luccae, 1541.
Hebraeae linguae Professor, 1542-1547.
Hebraeae linguae Professor, Cambridge, 1549-1553.
Hebraeae linguae Professor in Universitate Heidelbergensi.
Hebraeae linguae Professor in Academia Sedanensi.

TREMILL or TREMYLL, — (senior). Pens. at PETERHOUSE, in 1581. Probably Richard, s. and h. of Richard, of Bedfordshire. Of Wrawby, Lincs. Married Helen, dau. of William Thorley, of Northamptonshire. Probably brother of Henry (1580) and of James (above). (Essex Pedigrees, 608.)

TREMELLIUS, JOHN EMMANUEL, Hebrew lecturer, 1550-3. A Jew. B. at Ferrara, 1550. Studied at Padua between 1530 and 1540. Converted to Christianity by Cardinal Pole, his godfather, 1540. Teacher of Hebrew at Lucca, where he imbibed the opinions of the reformers chiefly through the influence of Peter Martyr. Came to England; resided with Archbishop Cramer at Lambeth Palace, 1547. Preb. of Carlisle, 1552. Left England on the accession of Queen Mary, 1553. Head of the gymnasium at Hornbach, 1559. Imprisoned for his Calvinistic views; released, 1560. Professor of Old Testament studies at Heidelberg, 1561. D.D. (Heidelberg), 1561. Sent to England as Envoy of the Elector; resided with Archbishop Parker, c. 1565. Expelled from Heidelberg, 1576. Appointed teacher of Hebrew at Sedan. Translated the Bible from Hebrew and Syriac into Latin. Author, miscellaneous. Died at Sedan, Oct. 9, 1580. (Cooper, i. 425; D.N.B.)

TREMELT, GEORGE. Adm. sizar (age 17) at SIDNEY, Dec. 21,

Dagmar Drüll
HEIDELBERGER
GELEHRTENLEXIKON
1386-1651



Tremellius (Tremmel), Immanuel

1561 - 1577 Theol. Fak.

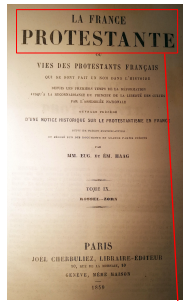
1561 - 1577 Altes Testament; 1561 - 1575 Hebräische Sprache

* 1510 Ferrara (im Ghetto)

† 9. Okt. 1580 Sedan
mosaisch, seit 1540 kath., seit 1541 ref.

☾ Okt. 1544 Elisabeth N.N., Witwe

K 1 T. 1 Stief-T. 1 S: Immanuel T., s. Toepke 2 (1886) S.26, Hundsnerscher (1996) S.45



18 — TRÉ
de Jean Tremblay et d'Anne Seyvon.
TREMELLIUS (EMMANUEL), né à Ferrara, vers 1510, et mort à Sedan, le 9 oct. 1580.
Tremellius quitta la religion juive dans laquelle il était né, pour embrasser la religion catholique, et celle-ci pour se faire protestant. Après sa conversion, il se retira à Lucques, où il enseigna quelque temps la langue hébraïque, mais la crainte de l'inquisition finit par le chasser d'Italie, ainsi que Pierre Martyr et d'autres italiens, partisans secrets de la Réforme. Il s'établit d'abord à Strasbourg, où il donna des leçons d'hébreu. Plus tard, il passa en Angleterre et y resta jusqu'à la mort d'Edouard. Chassé de nouveau par Marie la sanguinaire, il retourna en Allemagne en 1553, et fut placé comme professeur d'hébreu dans l'école de Hornbach. Quelque temps après, l'archevêque palatin Frédéric III l'appela à Heidelberg. En 1560, nous le trouvons à Metz, où il s'était marié pendant un premier séjour qu'il avait fait dans cette ville avant de se rendre à Strasbourg. S'il est vrai qu'il y fut arrêté par ordre du maréchal de Vieilleville sous le règne de François II, sa détention fut de courte durée, puisqu'il fut un des députés (1) que les Protestants de Metz envoyèrent en Cour aussitôt après la mort de ce prince, pour demander à la reine régente la liberté du culte, le rappel des bannis et la délivrance de Guillaume Palisau, prisonnier à Auxerre. Les deux dernières demandes furent accordées; quant à la première, il fut répondu que les prétendus réformés n'auraient ni temple ni lieu d'exercice quelconque à Metz, qu'ils n'y tiendraient aucune assemblée sous peine de mort, mais que Senneterre leur assignerait un lieu hors de la ville pour y faire leurs prêches. Il est probable que Tremellius ne tarda pas à retourner à Heidelberg, d'où, quelques années plus tard, il fut appelé à Sedan par le duc de Bouillon pour y remplir une chaire d'hébreu qu'il occupa jusqu'à sa mort.
L'auteur se nomme Daniel Huet.

Measuring Publications from VIAF

VIAF
 Virtual International Authority File

Search

Select Field:
 All Headings

Select Index:
 All VIAF

Search Terms:
 Trémellius, Emmanuel, 1510-1580

Search

Tremellius, Immanuel, 1510-1580.

Tremellius, Immanuel

Immanuel Tremellius italienischer Exulant und reformierter Theologe

טרמליוס, עמנואל

Tremellius, Immanuel (1510-1581).

Tremellio, Emanuele, 1510-1580

Emmanuel Tremellius

VIAF ID: 56619788 (Personal)
 Permalink: http://viaf.org/viaf/56619788

Preferred Forms

4xx's: Alternate Name Forms (63)

5xx's: Related Names (29)

Works

Biblia sacra des Oudē ende Nieuwē Testamēts ofte De gantsche Heylige Schrift vervattende het beschrevene woort Godes:

Biblia sacra, sive Testamentum Vetus, ab Im. Tremellio et Fr. Junio ex Hebræo Latinè redditum, et Testamentum Novum, à Theod. Beza è Græco in Latinum versum

Bibliorum pars secunda, id est libri historici

Bijbel.

Catéchisme de l'Eglise de Genève.

Christiana Katechesis Hebraicis literis mandata / Emanuel Tremelius. - Londini, [1820].

Jesu Christi domini nostri Novum Testamentum

Libri Apocryphi

Nieuwe Testament. Ofte, het Nieuwe verbondt onses Heeren Jesu Christi

Praelectiones doctiss. in Epistolam D. P. ad Ephesios... D. Martini Bucerī, habitae Cantabrigiae... anno MDL et LI, ex ore praelegentis collectae et nunc primum in lucem editae diligentia Immanuelis Tremellii,....

Proverbiorvm Solomonis regis Israel, liber carmine elegiaco redditus:

Psalmi Davidis

Rudimenta Hebraicae linguae : accurata methodo et brevitate conscripta : eorundem rudimentorum praxis quae vivae vocis loco esse possit

Seṗer ḥinnuḳ beḥirē yāh

Testamenti Veteris Biblia Sacra, sive Libri canonici priscae Judaeorum ecclesiae a Deo traditi

Testamentvm Novvm



Biblia sacra, sive Testamentum Vetus, ab Im. Tremellio et Fr. Junio ex Hebræo Latinè redditum, et Testamentum Novum, à Theod. Beza è Græco in Latinum versum

Bibliorum pars secunda, id est libri historici

Bijbel.

Catéchisme de l'Eglise de Genève.



Showing 1 to 10 of 25 entries

Previous 1 2 3 Next

Selected Co-authors

Countries and Regions of Publication (8)

Publication Statistics

Selected Publishers (13)

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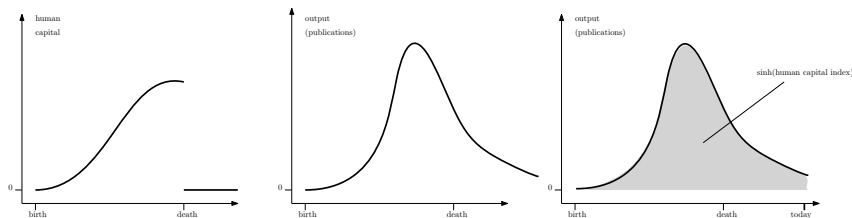
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Measuring individual human capital with library footprints today

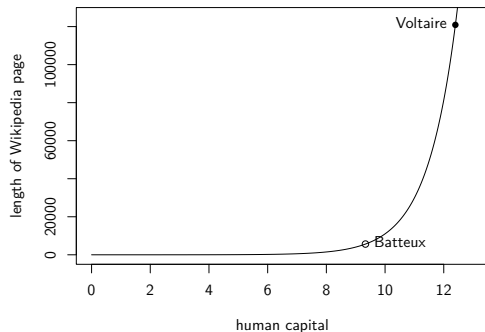
Two conceptual issues: ex-post data only, and superstar phenomenon



From human capital to publications, and to the human capital index

▷ Curtis, de la Croix, Manfredini, Vitale, Academic Human Capital in European Countries and Regions, 1200-1793, *Explorations in Economic History*, **101**, 101756, 2026

The superstar phenomenon



The convex relationship between rewards (length of Wikipedia page) and talent (human capital)

Voltaire: 396 titles. Longest Wikipedia page has 120896 normalized characters.

Compare with Charles Batteux (1713–1780), a respected Enlightenment thinker. (Académie française + Royal College).

Batteux: 54 titles, Longest Wikipedia page has 5645 normalized characters.

Was the human capital of Voltaire greater by one order of magnitude than the one of Batteux?

**Coverage in
Wikipedia, VIAF,
and Wikidata**

Region	No. scholars	% with Wikipedia	% with VIAF	% with Wikidata
Scotland	1095	54.79	54.70	58.63
English Realms	19615	26.34	27.62	31.29
Netherlands	2148	52.89	82.12	71.55
Scandinavia	2562	73.73	80.64	78.92
Evangelical Germania	8949	65.73	82.47	80.43
Tridentine Germania	7841	22.66	49.99	40.89
Poland-Lithuania	3758	18.87	36.19	28.82
Austrian Habsburg Lands	4268	23.73	38.26	37.25
Lotharingian corridor	3963	20.59	37.22	30.76
Switzerland	921	40.72	72.96	65.58
Francia	12331	33.14	40.76	37.59
Occitania	5027	21.23	31.75	27.09
Southern Italy	2331	18.92	26.81	25.35
Central Italy	11695	16.50	25.85	22.49
Northern Italy	14079	20.88	31.69	29.23
Castilla	3793	9.25	13.26	12.15
Levante	4224	14.49	18.73	18.92
Portugal	2219	15.46	25.28	19.65
All activities	110819	28.09	38.69	36.34

Combine 11 measures of production & notoriety through PCA

Variable (in asinh)	PC1	PC2
Wikipedia: No. characters of longest page (<i>LengthWikiN</i>)	0.29	-0.01
Wikipedia: No. pages in different languages (<i>NWikiLanguage</i>)	0.26	-0.46
VIAF: No. publication countries (<i>countries</i>)	0.33	0.04
VIAF: No. different publishers (<i>publishers</i>)	0.32	0.23
VIAF: No. titles (<i>titles</i>)	0.33	0.20
VIAF: No. coauthors (<i>coauthors</i>)	0.32	0.27
VIAF: No. isbn (<i>isbn</i>)	0.24	-0.66
VIAF: No. publications before 1900 (<i>pubbef1900</i>)	0.32	0.17
VIAF: No. publications after 1900 (<i>pubaft1900</i>)	0.29	-0.34
Wikidata: No. of identities / external ids (<i>nidentities</i>)	0.31	0.18
Wikidata: No. of occupations (<i>noccupations</i>)	0.30	0.11
Eigenvalue	8.46	0.91
Proportion of Variance explained	0.77	0.08

Human capital index

$$\begin{aligned}
 q_i = & -1.53 + 0.29 \text{ LengthWikiN} + 0.26 \text{ NWikiLanguage} + 0.33 \text{ countries} \\
 & + 0.32 \text{ publishers} + 0.33 \text{ titles} + 0.32 \text{ coauthors} \\
 & + 0.24 \text{ isbn} + 0.32 \text{ pubbef1900} + 0.29 \text{ pubaft1900} \\
 & + 0.31 \text{ nidentities} + 0.30 \text{ noccupations}
 \end{aligned} \tag{1}$$

- constant term chosen to give $q_i = 0$ for someone with neither a Wikipedia page, nor a VIAF page, nor a Wikidata page
- Seen from the point of view of today
- Includes both output and citations
- Measurement errors, mitigated by combining 11 variables
- Based on digitally-native sources, hence subject to updates
- Bias: printing press, non academic works (von Schiller, Rabelais, Swift)

For obscure scholars $q_i = 0$ (no VIAF, no Wiki)

Tomb of Bonandrea de Bonandreis,
 lectured on canon law at Bologna in
 1321-22 – no publication from him
 survived →



← Gothic house built by Antoine de Dorne,
 lectured on law at Valence 1520-1551 – no
 publication from him survived



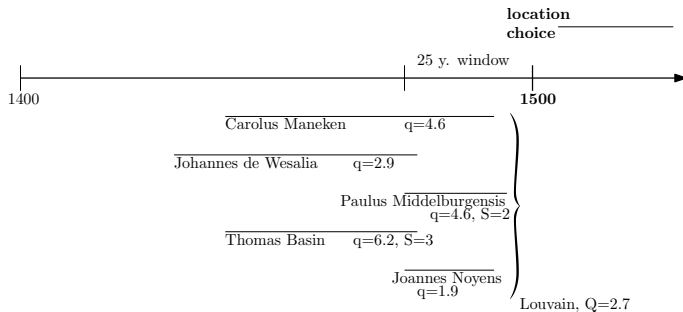
Ranking of top scholars

Ranking	Scholar	Institution	Index (q_i)
1	Luther	U. Wittenberg	19.96
2	Voltaire	15 academies	19.53
3	Aquinas	U. Paris	19.15
4	von Schiller	U. Jena	19.12
5	Kant	U. Königsberg	18.99
6	Swift	A. Dublin	18.92
7	Diderot	A. Prussia	18.72
8	Erasmus	U. Louvain	18.7
9	Machiavelli	A. Plato	18.62
10	Descartes	A. Mersenne	18.57

Notability index Q_k

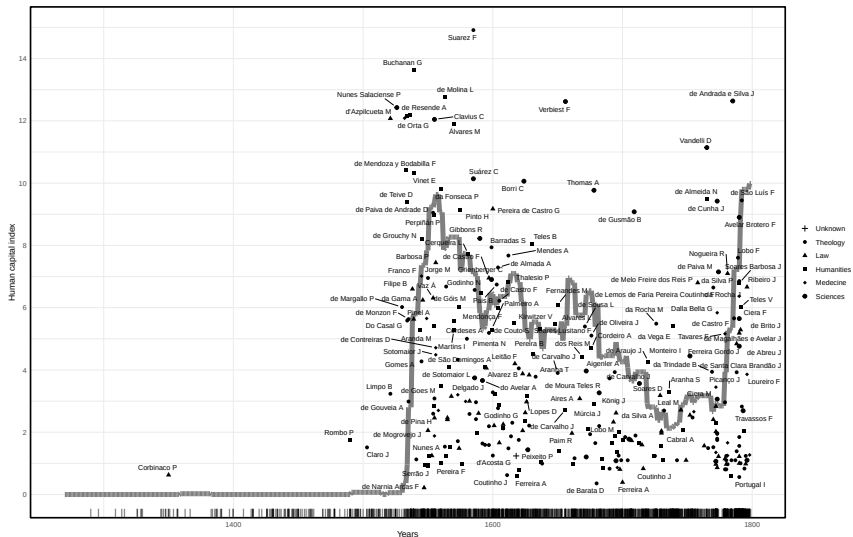
At time t , the notability Q_{kt} of a university k aggregates the q_i of the top 5 persons who were active at any point $\in [t - 25, t[$

$$Q_{kt} = \sqrt{\sum_{i=1}^5 \frac{1}{5} \left(\frac{q_i}{S_i} \right)^2}$$

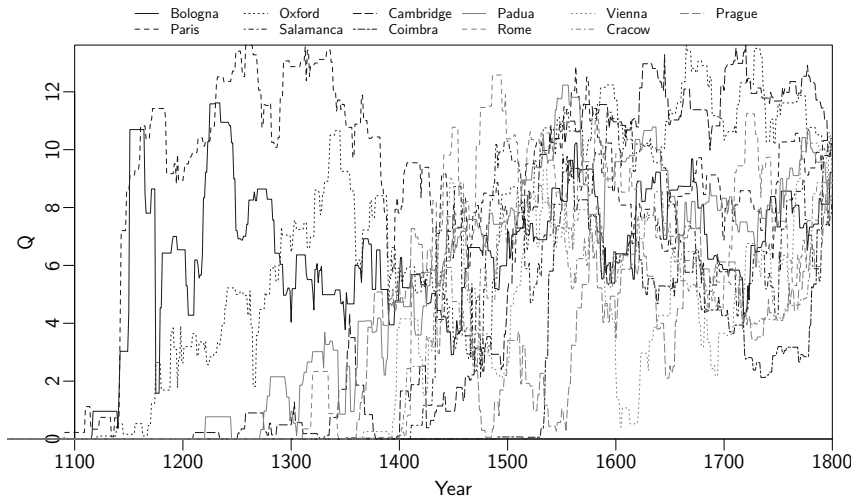


This measure is not sensitive to how many obscure scholars work at k

Notability index Q_k for Coimbra



Notability index Q_k of the main European Universities over time



RETE

When data collection completed for one institution we produce a data sheet

Database available at:

<https://shiny-lidam.sipr.ucl.ac.be/rete/>

Soon linked with Wikidata pages




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Articles

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	Scholars and Literati at the "Mersenne" Academy (1635-1648) David de la Croix, Julie Duchêne PDF	7-12
	Scholars and Literati at the University of Valence (1452-1793) David de la Croix, Alice Fabre PDF	13-20
	Scholars and Literati at the University of Copenhagen (1475-1800) David de la Croix PDF	21-29

Demographics of Scholars

Half of the scholars come from the middle class.

Before 1700, we observe a standard Malthusian pattern.

After 1700, Beckerian quality-quantity tradeoff.

Transition well captured by a growth model driven by human capital accumulation.

Matching scholars' data with genealogies for Northern Europe

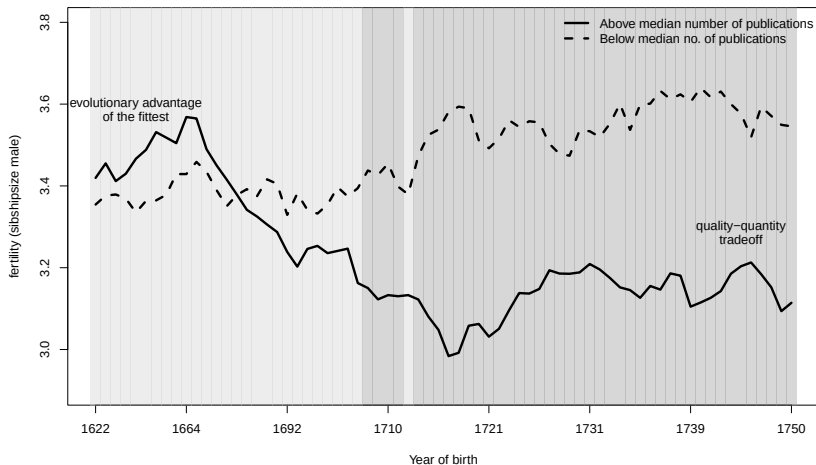
Analysis of quality-quantity tradeoff using our q_i as measure of quality

▷ Baudin, de la Croix, The Emergence of the Child Quantity-Quality Tradeoff - insights from early modern academics, *The Economic Journal*, ueag080, 2026

Main occupations of scholars' fathers – occurrence in parenthesis

Upper class (Elite)	professor (193), councillor (84), minister (74), physician (62), mayor (56), theologian (50), bishop (47), rector (42), doctor (42), general (42), lawyer (36), noble (34), lord (29), governor (27), colonel (25)
Middle class	merchant (203), preacher (164), priest (140), pastor (134), farmer (74), clergyman (59), officer (42), vicar (34), lieutenant (30), trader (28), master (27), superintendent (25), secretary (23)
Lower class (Workers)	craftsman (19), blacksmith (8), brewer (7), goldsmith (5), fisherman (4), miner (4), builder (4), tailor (3), innkeeper (3), gardener (3), baker (3), grocer (2), tanner (2), saddler (2), carpenter (2), engraver (2)

Emergence of the QQ tradeoff among scholars' parents



Note: moving 30-percentile window of birth cohorts. Gap is 10% significant in darker areas

Emergence of the QQ tradeoff among scholars' parents

This pattern is consistent with a world with Malthusian constraints before 1700
(better scholars also have more brothers)

Switching to a standard Q-Q trade-off afterwards.

The academic world seems to be a forerunner of what will happen in the rest of the society later

Accumulation of human capital might have triggered the regime change

Nepotism vs Intergenerational transmission of human capital

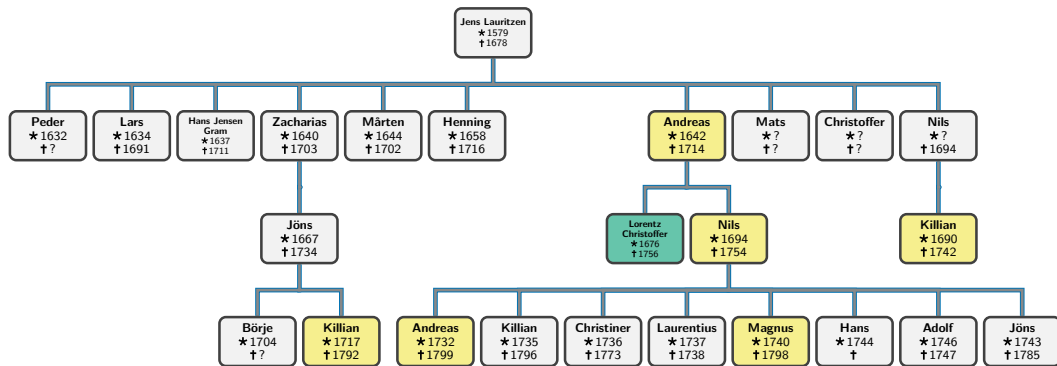
Meritocracy is essential for universities to flourish.
 Anecdotal evidence suggests it was present from the beginning.
 We show a decreasing importance of nepotism among father-sons in academia.
 → Rise of meritocracy

Many father-son pairs in academia: Bernoullis, Eulers, Cassinis, Bartholin
 We find c. 2000 father-son(s) in same institution (university or academy)

Question: Did fathers secure jobs for their son ahead of better candidates (nepotism)?
 or talent was scarce and scholars' sons inherited endowments of human capital ?

▷ de la Croix and Goñi, Nepotism vs. Intergenerational Transmission of Human Capital in Academia (1088-1800), *Journal of Economic Growth*, **29**, 469–514, 2024

The Stobaeus family. Professors at Lund (yellow squares) & members of Academy in Stockholm (green)



A structural model

Need for a structural model to disentangle inherited skills from nepotism

Children's human capital: $h_t = \beta h_{t-1} + u_t$,

where β : intergenerational elasticity of human capital.

Consider the universe of families $i \in \mathbb{I}$.

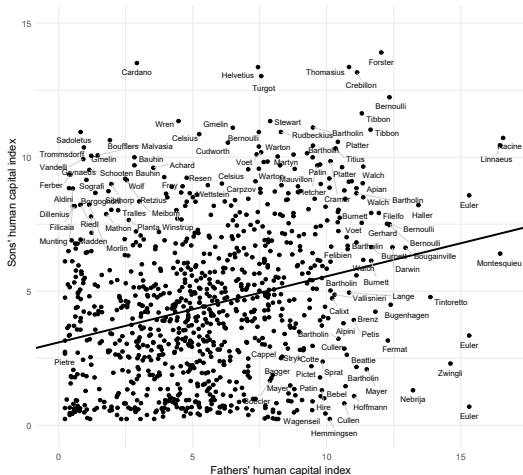
Selection into being a scholar depends of human capital: $h_{t-1} > \tau$

Nepotism: selection criterion is weaker for the sons of scholars: $h_t > \tau - \nu$

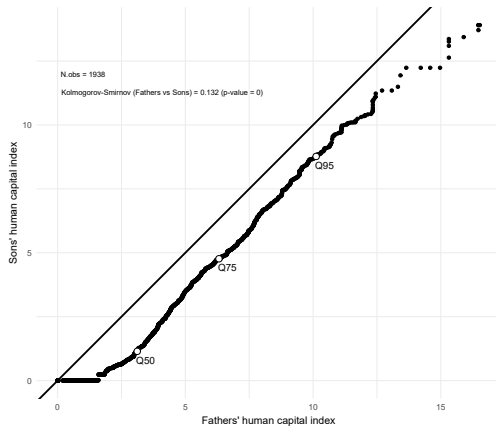
→ need to identify β and ν

Identifying assumptions

Father-son correlation



Parent-child distributional differences

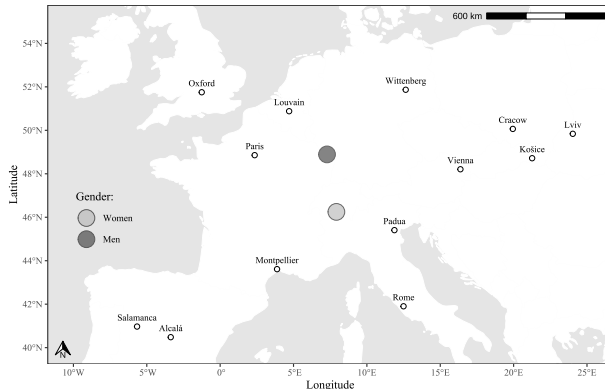


Main results

- High rate of transmission of human capital (≈ 0.63)
- 18.8% scholars' sons are nepotic scholars.
- Nepotism decreased during Scientific Revolution and Enlightenment.
- Nepotism more prevalent in stagnant fields/context.
- → meritocracy developed further in the 16-18th centuries.

151 women appear in our database

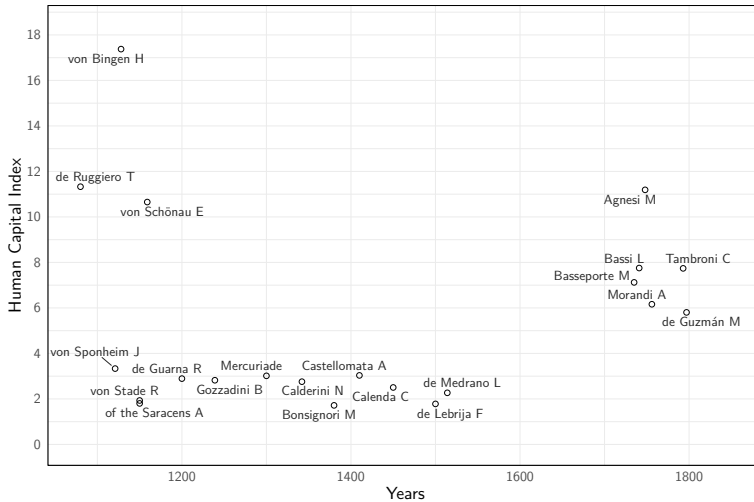
Not many women in premodern academia, but some.
A surprise: we find them mostly in Catholic institutions



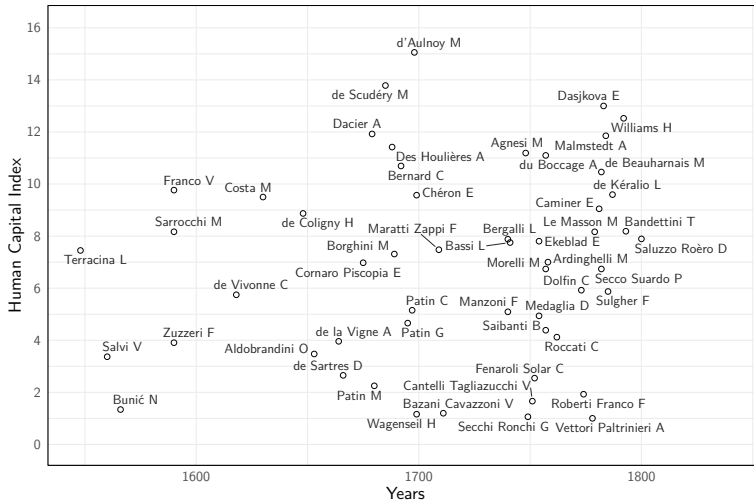
Barycenter of the places of birth

▷ de la Croix and Vitale,
Women in European Academia
before 1800 - Religion,
Marriage, and Human Capital,
*European Review of Economic
History*, **27**, 506–532 , 2023

Women in universities (& monasteries)



Women in academies



Why are Protestant places more conservative w.r.t women?

Protestant social norms for women were not too different from Catholic norms.

The substantial difference was in the formal centralization of decision making.

Women in Protestant communities were subject to the will of their husbands and fathers, under peer pressure – difficult for women to achieve visibility in public space.

The Catholic Church could control women's participation in public space → could also make exceptions, which allowed these notable women to emerge.

Integrated market

There was an **integrated** academic market since the Middle Ages
Key argument: market forces led the best scholars to agglomerate
Assuming complementarities, this was highly beneficial for knowledge growth

Should help to sustain the needed mobility:

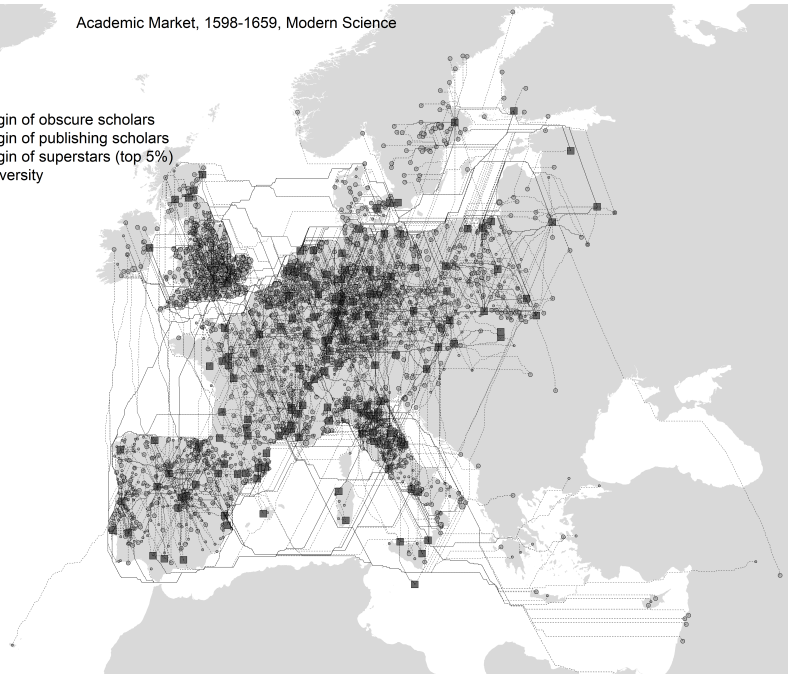
- Political fragmentation of Europe preventing strong control from the top.
- Intellectual unity (use of latin).
- *licentia ubique docendi*, right to teach anywhere with a doctoral degree

Allows to harness together universities and UTHC (upper tail human capital)

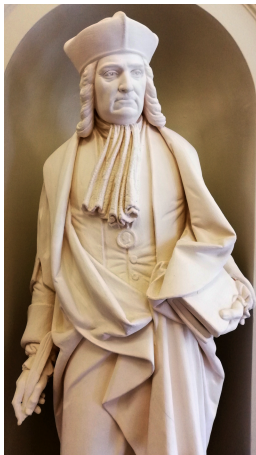
▷ de la Croix, Docquier, Fabre, Stelter, The Academic Market and the Rise of Universities in Medieval and Early Modern Europe (1000-1800), *Journal of the Euro. Eco. Association*, **22**, 1541–1589, 2024

Academic Market, 1598-1659, Modern Science

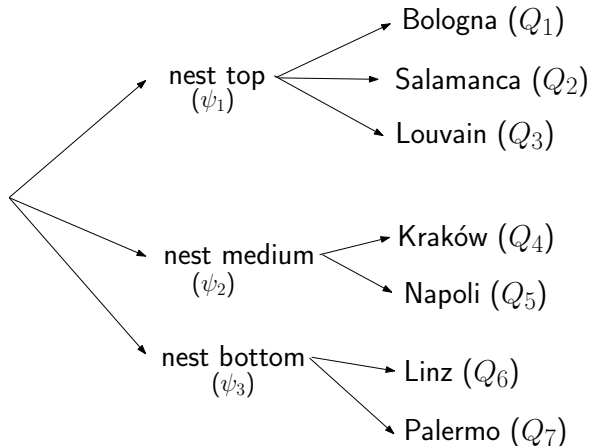
- Origin of obscure scholars
- Origin of publishing scholars
- Origin of superstars (top 5%)
- University



Methodology: nested multinomial logit



scholar with q_i



Determinants of the location choice

The probability for a scholar to go to university k decreases with

- distance from birth

increases with

- notability of k (Q_k)

- gap between individual and institution $(q_i - Q_k)^2 \rightarrow$ positive sorting

$\rightarrow$ high quality scholars are attracted by notable places and agglomerate there

–Simulating agglomeration gains from the market shows large effect during the Middle Ages and the Scientific Revolution

Network of universities

Reformation and Counter-Reformation (ideologies) led to a fragmentation of the academic network

Hence slowing down the mobility of persons and ideas, lowering overall quality

Look at mobility in the data through the lens of graph theory

Let $N = \{1, 2, \dots, n\}$ be the set of universities in the network g (nodes, exogenous)

For two universities $(i, j) \in N$, we define $g_{ij} \in \{0, 1\}$ as the *link* (edge) between them.

$g_{ij} = 1$ if at least one same scholar has taught in both universities, $g_{ij} = 0$ otherwise.

▷ de la Croix and Morault, Winners and Losers from the Protestant Reformation: An Analysis of the Network of European Universities, *Journal of Economic History*, **86**, 460-500, 2026

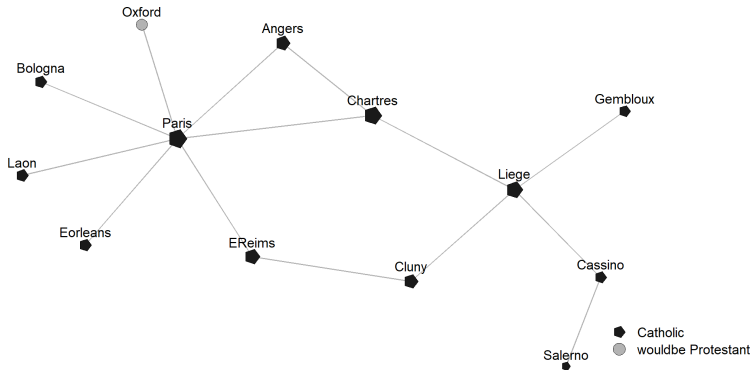
Network 1000-1149

Positioning of universities determined by Fruchterman-Reingold force-directed algorithm.

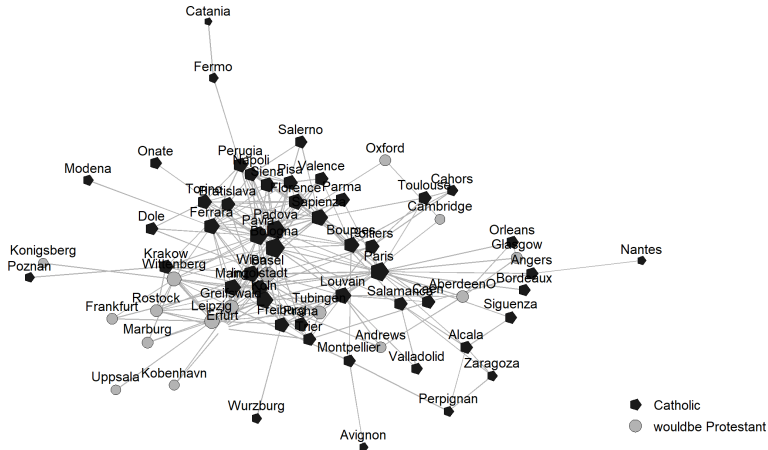
Groups universities more closely together when linked to each other.

Only show big component.

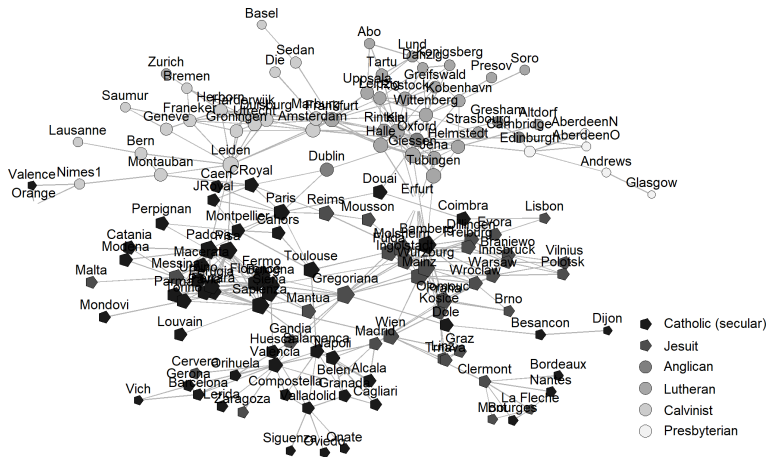
Size of circle proportional to eigenvector centrality.



Network 1453-1517



Network 1660-1715



Main Results

Confessionalization: process by which institutions get a religious identity

- ▷ Religion became a strong determinant of network structure, even when controlling for geography & culture
- ▷ Sharp clear-cut divide between Protestant and Catholic univ
- ▷ Loss of centrality for everyone

Message: universities should cherish diversity and avoid identifying with an ideology

Academies

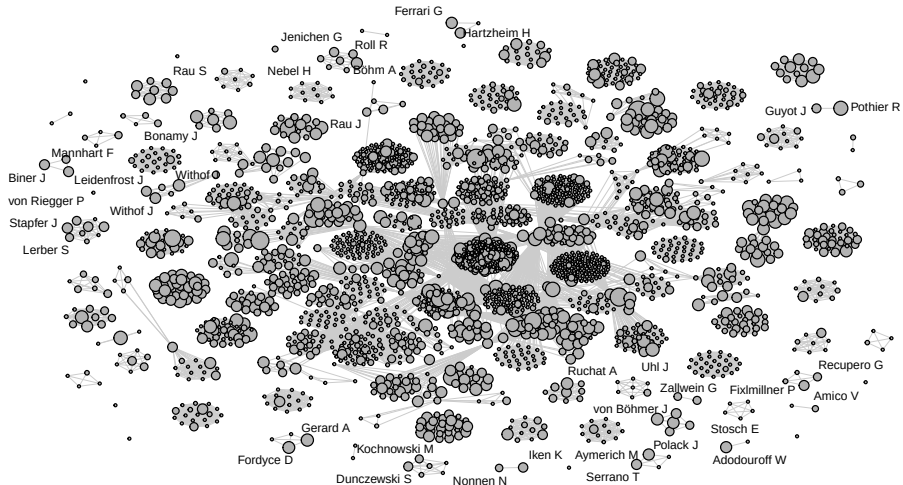
Academies become an important component of the landscape after 1600.

Zanardello (2024) shows that their nature, science vs humanities, mattered for city growth

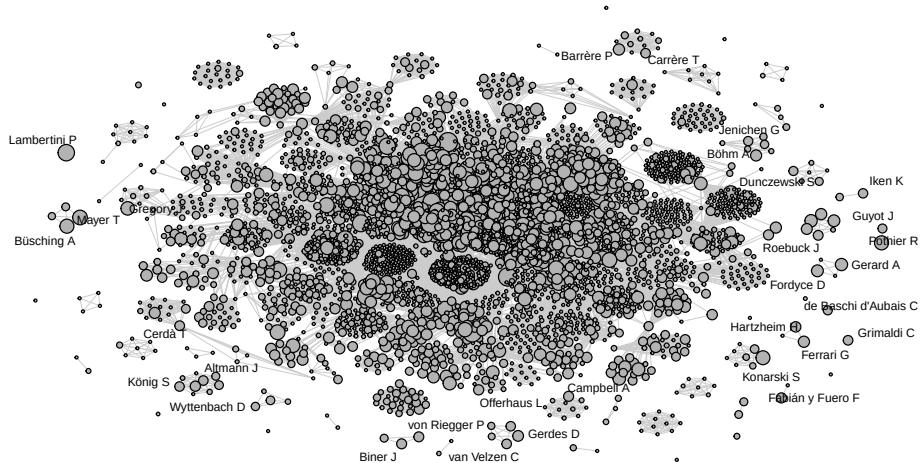
We also show that academies were crucial to connect people and bring universities closer
using a network of persons linked together by common affiliation

▷ de la Croix, Scebba, Zanardello, Flora, Cosmos, Salvatio: Pre-modern Academic Institutions and the Spread of Ideas, CEPR Discussion Paper 20569, 2025

Network 1750 - only universities



Network 1750 - universities & academies



Academia and growth: role of censorship

Was the Counter-Reformation responsible for Southern Europe's decline?
Combining publication and censorship data with a structural growth model of idea production, our answer is yes.

15-16th centuries: undisputed Italy's primacy in knowledge creation (Galileo)
North and Western Europe overtook Italy in the following two centuries

Reasons for the relative decline of Italy ? Counter-Reformation & censorship (Landes 1999) or war & pandemics (Alfani 2019)

Matching RETE with *Index Librorum Prohibitorum* - censorship of books

▷ Blasutto and de la Croix, Catholic Censorship and the Demise of Knowledge Production in Early Modern Italy, *The Economic Journal*, **133**, 2899-2924, 2023

New fact: quality vs. censorship status by period

Moment description	Period				
	1400– 1469	1470– 1539	1540– 1609	1610– 1679	1680– 1749
No. of published scholars (all)	257	468	899	823	884
% censored scholars (%)	4.67	9.83	7.56	7.65	4.64
median:					
human capital index (all) (1)	4.74	4.9	4.39	3.82	3.36
human capital index (censored) (2)	11.23	10.51	9.69	7.39	7.81
Gap (2)-(1)	-6.49	-5.61	-5.3	-3.57	-4.45
75 th pctl:					
human capital index (all)	7.24	7.42	7.22	6.56	6.46
human capital index (censored)	13.42	12.25	11.3	9.8	9.08

Model

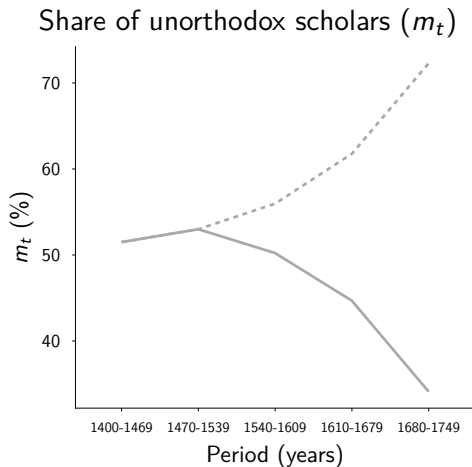
An endogenous growth model encompassing two mechanisms:

- censorship makes “unorthodox knowledge” less available to new generations
- censorship changes the occupational choices of agents from unorthodox to compliant

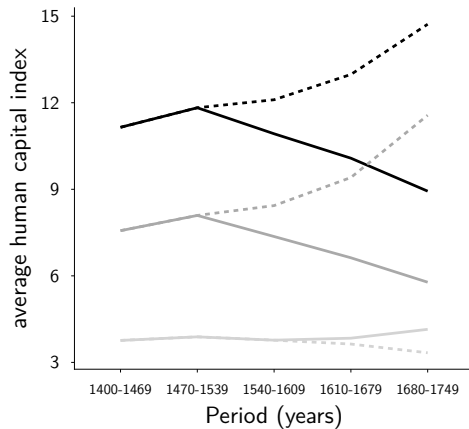
Because the new generation learns from the previous one, these effects are cumulative

The parameters of the model are estimated for the model to reproduce the table (prev. slide)

Baseline simulations (solid), simulations without censorship (dashed)



Overall (darkgray), unorthodox (black) compliant (lightgray) scholars quality



Results

imposing a censorship rate of c. 20% on the non-conformist books was sufficient to decrease the share of non-conformist authors by half from 1470-1550 to 1680-1750,

censorship reduced by 43% the average human capital index per scholar in Italy,

half of this drop stems from the induced reallocation of talents towards compliant activities,

The effect of adverse macroeconomic conditions on knowledge production is one fourth of the effect of censorship.

Academia and growth: role of academic fields

Did regions with more academic human capital grew faster? yes
 Were some fields more important than others? science and botany
 Which mechanism seems more important? role-model effect (at birth place)

We measure the historical relationship between scholarly output (1000-1800) and economic growth (1900)

We inferred fields of scholars from publications titles using machine learning

Each field is a set of topics with different loadings.

▷ Curtis and de la Croix, *Seeds of Knowledge: Premodern Scholarship, Academic Fields, and European Growth*, *European Economic Review*, **185**, 105299, 2026

Byzantine refugees

Associated Subjects

Aristotle Astrology Astronomers Astronomical geography Astronomy Atomic theory Atomic theory--Historiography Atomism Brahe, Tycho, Contingency
 (Philosophy) Copernicus, Nicolaus, **Descartes, René,** Empiricism **Epicurus** Ethics **France** Free will and determinism French literature
Gassendi, Pierre, God--Will--History of doctrines Historians Humanists Influence (Literary, artistic, etc.) Locke, John, **Logic**
Meditationes de prima philosophia (Descartes, René) Mind and body Necessity (Philosophy)
 Optics Peiresc, Nicolas Claude Fabri de, Pensées (Pascal, Blaise) Peurbach, Georg von, Philosophers Philosophy Philosophy, Ancient Philosophy, Ancient, in literature
Philosophy, French Philosophy, Modern Philosophy in literature **Philosophy of mind Philosophy of nature** Physics
 Physics--Philosophy Providence and government of God--History of doctrines Regiomontanus, Joannes, **Science Science--Philosophy** Soul Statesmen White, Thomas,

Tag cloud from the (now retired) worldcat identities page of Pierre Gassendi. Font size indicates adequacy of subject with the author.

Findings:

Optimal number of distinct fields = 10

The fields Theology 2 (Protestantism), Science, and Botany have a positive association with growth. The field Law has a negative association.

Effects are stronger when we look at places of birth rather than places of activity

Instrumenting with 3 episodes of forced migration (huguenots, byzantines, british catholics)

Role model example

BEAUMONT-DE-LOMAGNE (82)



Places of birth of scholars matters

Possible mechanism: scholars foster human capital accumulation among their fellow natives (role model).

The mathematics festival held in Beaumont-de-Lomagne to commemorate Pierre de Fermat and promote mathematics and the emotion of discovery.

Conclusion

A database allowing to study key aspects of pre-modern European academia as a whole, and their relation to growth:

- market for talent, mobility, agglomeration
- room for meritocracy when needed
- ambivalent role of religions (*persona ficta*, unified market, division, censorship)
- adaptability: when some universities became breathless, academies kicked in

Interaction between institutions is key. That interaction is difficult to perceive when universities, academies, or scholars are studied separately.