

Flora, Cosmos, Salvatio: Pre-modern Academic Institutions and the Spread of Ideas Online Appendix

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A Descriptive Statistics

A.1 Completeness of the data

Figure 1 provides an overview of missingness in the scholars dataset across three indicators: the presence of a Wikipedia page, the availability of birth and death years (and thus longevity), and the availability of a place of birth. The largest segment consists of scholars for whom none of these pieces of information is observed—no place of birth, no vital dates, and no Wikipedia link. In the plot, this group is labelled “no.info” and comprises 26,549 individuals. A second large segment (25,381), labelled “Origin.known”, includes scholars for whom only the place of birth is known. The third-largest group, with 17,200 scholars, has complete information on all three indicators. Two additional groups are also sizeable. One includes scholars with complete information except for a missing Wikipedia page (13,528). Finally, the set-size bars indicate that scholars with a Wikipedia page — roughly corresponding to the samples used in studies such as Laouenan et al. (2022) — number about 20,000, i.e. approximately one quarter of the full dataset.

Figure 2 offers a similar overview for affiliations. The number of affiliations exceeds the number of scholars because many individuals held multiple affiliations over their lifetimes. The figure focuses on academic fields. Roughly 80% of scholars are associated with a single field, most commonly the humanities, followed by the sciences (including medicine), theology, and law. 6,939 scholars have an unknown field, and 3,744 are classified as “honorary” because

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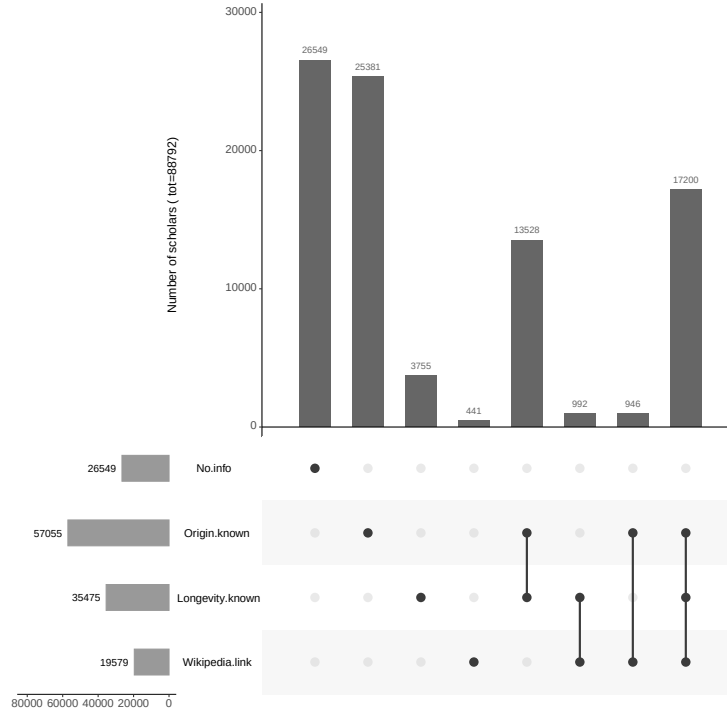


Figure 1: UpSet diagram for persons (matrix-based visualization of intersections across variables).

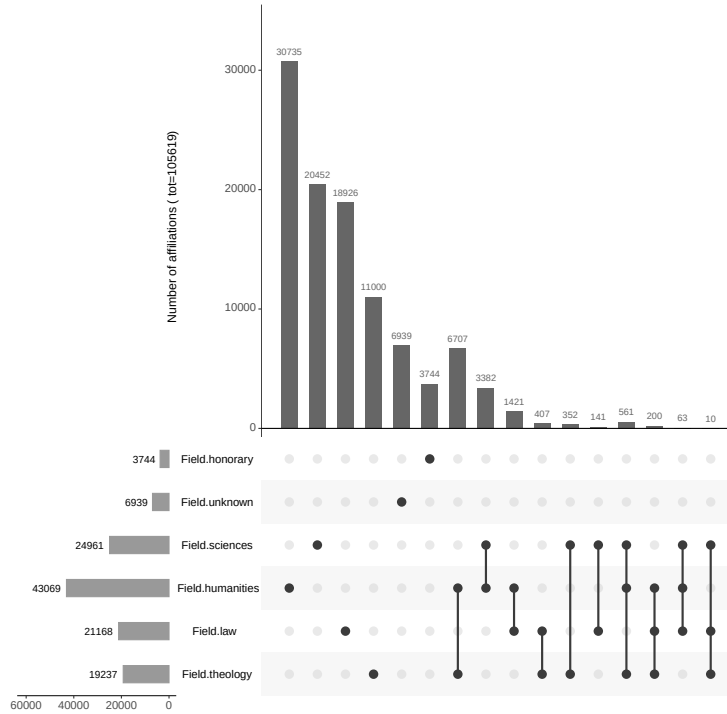


Figure 2: UpSet diagram for affiliations and academic fields (matrix-based visualization of intersections across variables).

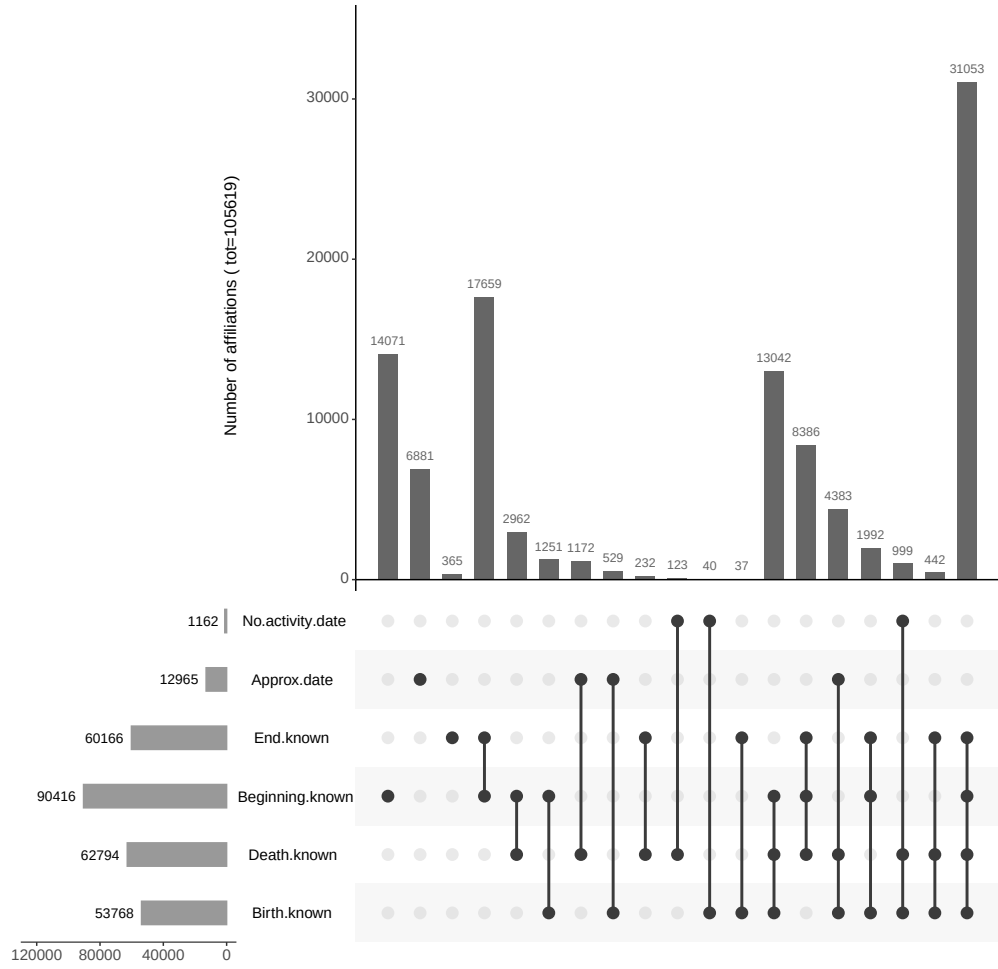


Figure 3: UpSet diagram for affiliations and activity periods (matrix-based visualization of intersections across variables).

they are not scholars in the strict sense but instead hold honorary or administrative roles (e.g., academy protectors, or students serving as rectors in Italian universities). The plot also highlights frequent combinations of fields among multi-field scholars, notably theology with humanities (6,707) and humanities with sciences (3,382).

Figure 3 shows how complete our information is for identifying scholars’ periods of activity. In the vast majority of cases, the start year is known, typically the year of appointment at a university or the year of election to an academy. End dates, however, are recorded less systematically, as many sources report the year a professorship begins but not when it ends. For academies, it is generally reasonable to assume that membership lasts until death, whereas no comparable assumption can be made for university posts. For 12,965 scholars we can only assign an approximate activity date, and for a small minority (around 1,000) no dating information is available at all.

A.2 The affiliation network over time

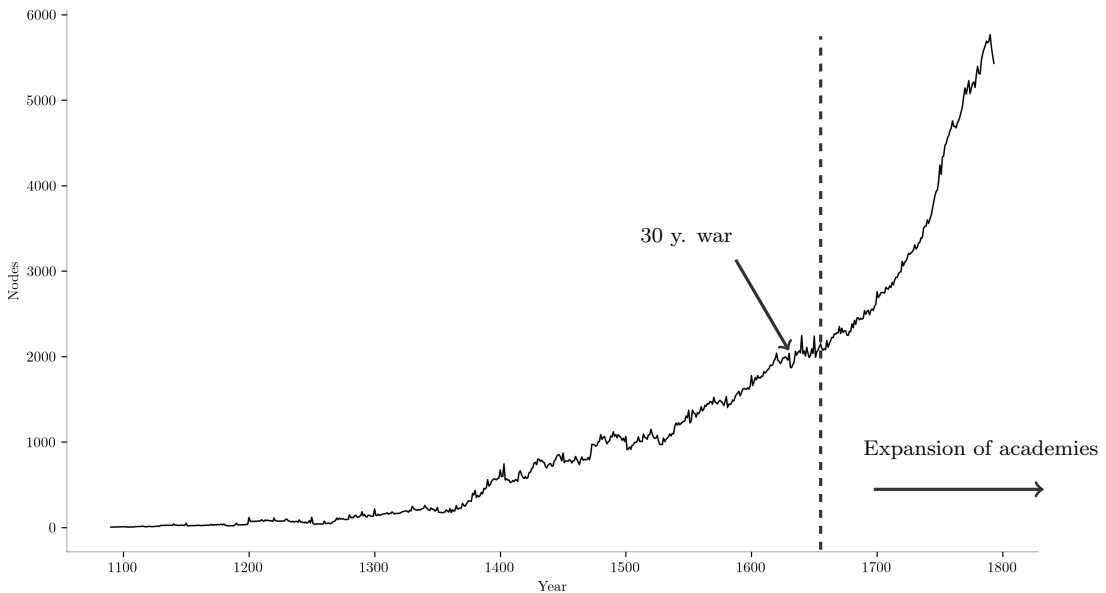


Figure 4: Number of active scholars in the network, 1084-1793.

B Definition of active periods

The active period of each scholar commences at the start of their academic career and concludes at their retirement or death. Activity begins in the earliest known year of affiliation with a formal educational institution, when available. For university professors, this is the year they began teaching, while for academy members, it is the year they were elected as members of the academy. If the exact affiliation date is unavailable, we infer the first year

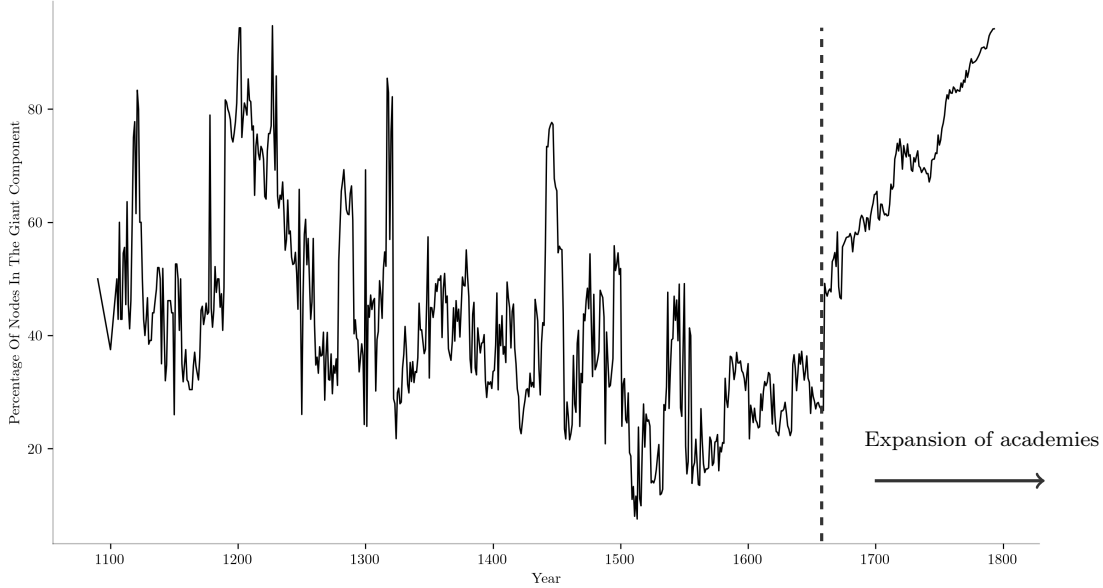


Figure 5: Percentage of active scholars in the giant or connected component over time, 1084-1793.

of affiliation from approximate dates. In more extreme cases, we use the earliest available date among: 30 years after the birth year, the year of death, the institution’s closing date, or 1793, which marks the end of our study period. This approach aims to provide a conservative estimate of each scholar’s active period.

Scholars cease to be active when they leave the institution, if this date is available. For university professors it is the year their teaching ends. For members of academies it is usually the death year, or in some rare case, the year the member was expelled. When there is no precise information about the end of their activity, we infer it in one of two ways for university professors and academicians. For university professors without a precise end affiliation date, we assume it is equal to the approximate affiliation date when available.

Table 1: Network statistics for the affiliation network, 1200-1700

Year	1200	1300	1400	1500	1600	1700
Number of active scholars	116	218	672	1065	1776	2757
Avg. degree	30.03	17.08	42.14	26.54	42.24	55.68
Size of giant component	104	151	226	552	622	1792
% of giant component	89.66	69.27	33.63	51.83	35.02	65
Size of second-largest component	6	29	139	75	244	51
Avg. clustering coefficient	0.88	0.92	0.93	0.91	0.89	0.90
Avg. distance (giant)	2.16	3.36	1.95	4.14	5.51	4.31

Note: The degree of a node is the number of distinct scholars with which the node is connected. The Avg. degree is the mean of the degrees of all connected scholars in the network. The clustering coefficient of a node is the fraction of all possible links among a node’s neighbors that are actually present. The Avg. clustering coefficient is the mean of the clustering coefficients of all connected scholars in the network. The distance between two scholars is the length of the shortest path between them. The Avg. distance is the mean distance among all connected pairs of scholars in the giant component.

Otherwise, if these pieces of information are unknown, we assume that a university professor will teach in that university for eight years.¹ Hence, we take the earliest date between the beginning date (after adding eight years) and the year of death. For academicians without a precise end date of their affiliations, we also assume it from more approximate dates if available. When not possible, for these scholars, we assume a lifelong affiliation,² so we take the year of death when there is no more precise information. Otherwise, when we do not know the year of death either, we assume they stay in the academy only one year, imposing the end affiliation date equal to the beginning date.

C Empirical Assessments

C.1 Descriptive Statistics

Table 2 presents some descriptive statistics, which supports the results in the main text, Table 1 and Table 2. Here we consider $\hat{\alpha} = 0.2$.

Table 2: Summary statistics.

Variable	Obs	Mean	Median	SD	Min	Max
Prevalence of Botanical Realism	67620	0.009	0	0.038	0	0.998
(ihs) Eligible Mass of Botanical Realism	67620	0.928	0	1.302	0	6.471
Prevalence $\times$ Eligible Mass of Botanical Realism	67620	0.025	0	0.086	0	2.299
Prevalence of Mathematical Astronomy	67620	0.064	0	0.157	0	0.487
(ihs) Eligible Mass of Mathematical Astronomy	67620	0.619	0	1.063	0	6.054
Prevalence $\times$ Eligible Mass of Mathematical Astronomy	67620	0.162	0	0.457	0	2.945
(ihs) City population in 1500	67620	2.531	2.492	1.243	0	5.521
(ihs) Distance to Tübingen	67620	7.026	7.101	0.823	0	8.338
(ihs) Distance to Vienna	67620	7.388	7.466	0.748	0	8.434

(ihs) refers to the transformation in inverse hyperbolic sine of the relative variable.

C.2 Botanical Realism

Figure 6 shows yearly exposure to Botanical Realism at three points in time. It visualizes how exposure evolves over time and space, from a concentration around Tübingen in 1600 to a spread across Europe by 1700, and a further expansion to smaller and more distant urban

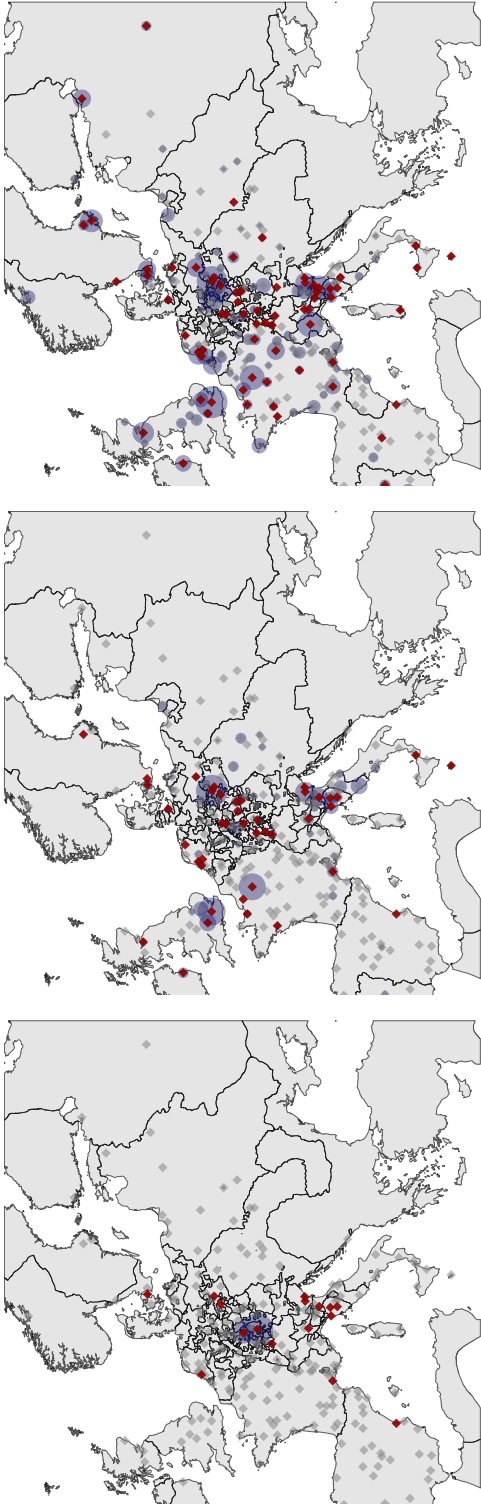
1. Eight years being the median of the affiliation years in the sample of university professors for whom we know the precise beginning and end affiliation dates. This data is consistent with the literature: Koschnick (2025) finds that the median length of academic careers at Oxford and Cambridge is 9 years.

2. Academies usually grant a lifelong affiliation.

centers by 1793. Blue bubbles represent exposure to Botanical Realism, while red diamonds indicate cities that had at least one botanic garden by the respective year.

C.3 Mathematical Astronomy

Figure 7 visualizes the sample of universities cities with their yearly exposure to Mathematical Astronomy in 1600, 1700, and 1793. This figure shows how the exposure evolves over time and its interaction with the creation of observatories. As in the first experiment, blue bubbles represent exposure to Mathematical Astronomy, while red diamonds indicate cities that had at least one observatory in the relative year.

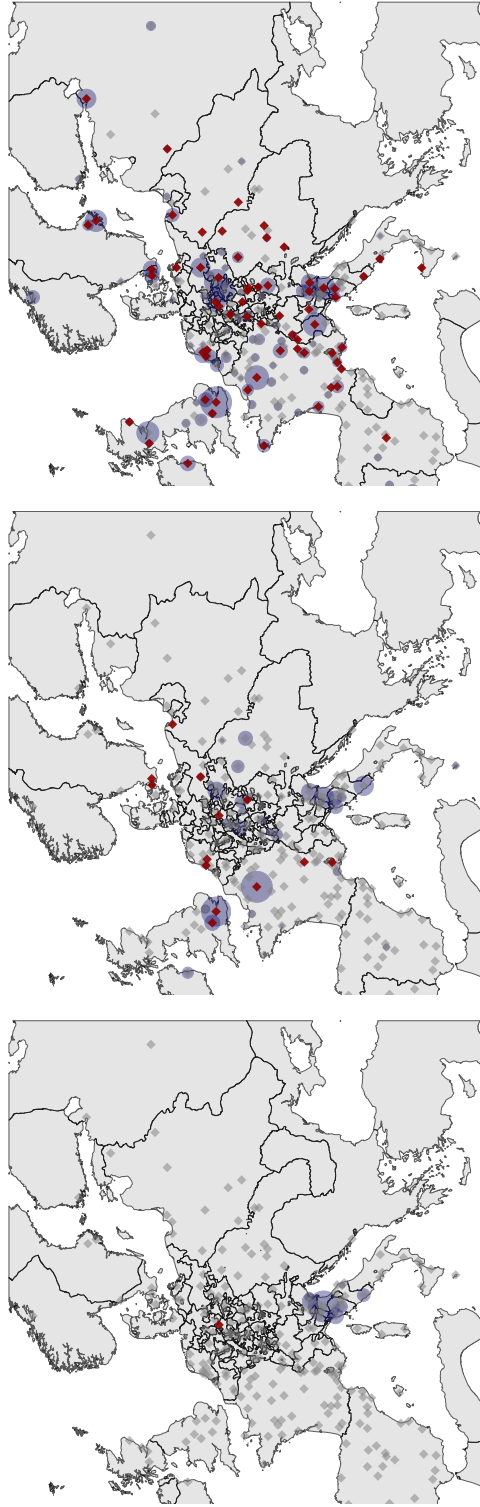


(a) Year 1600

(b) Year 1700

(c) Year 1800

Figure 6: Blue bubbles represent the yearly exposure of Botanical Realism in years 1600, 1700, and 1800, respectively. $\alpha = 0.2$ and $D = 5,000$. Cities with a botanic garden are the red diamonds, and without botanic gardens are the grey diamonds.



(a) Year 1600

(b) Year 1700

(c) Year 1800

Figure 7: Blue bubbles represent the yearly exposure of Mathematical Astronomy in years 1600, 1700, and 1800, respectively. $\alpha = 0.2$ and $D = 5,000$. Universities cities with an astronomical observatory are the red diamonds, and without astronomical observatories are the grey diamonds.

D Structural estimation

Table 3 reports the log-likelihoods for each level of α for Botanical Realism (Flora, column 1) and Mathematical Astronomy (Cosmos, column 2). Column 3 reports the joint likelihood $\ell_1(\alpha) + \ell_2(\alpha)$. The joint likelihood reaches its maximum at $\hat{\alpha} = 0.45$, where $\ell_1(\alpha) + \ell_2(\alpha) = -652.568$. Because the likelihood function is relatively flat around its maximum, we also construct a 95% likelihood-ratio confidence set. The corresponding lower likelihood threshold is $\ell(\hat{\alpha}) - 3.84/2 = -654.488$. The interpolated lower bound is approximately $\alpha = 0.198$. On the grid of simulated values, $\alpha = 0.20$ is the first simulated value inside it. We therefore use $\alpha = 0.20$ as a conservative lower-bound value in our main analysis, rather than relying on the likelihood-maximizing value alone. Finally, Table 4 reports the Cox estimates at both $\alpha = 0.20$ and $\hat{\alpha} = 0.45$ for Flora and Cosmos.

Table 3: Log-likelihood values for different values of α .

α	Flora ℓ_1	Cosmos ℓ_2	Sum $\ell_1(\alpha) + \ell_2(\alpha)$
0	-343.178	-324.834	-668.012
0.01	-342.610	-313.493	-656.103
0.02	-342.625	-313.633	-656.258
0.03	-342.623	-314.785	-657.408
0.04	-342.648	-315.396	-658.044
0.05	-342.671	-315.552	-658.223
0.10	-342.511	-316.084	-658.595
0.15	-339.284	-316.661	-655.945
0.20	-337.442	-316.995	-654.437
0.25	-336.348	-317.147	-653.495
0.30	-335.757	-317.216	-652.973
0.35	-335.453	-317.242	-652.695
0.40	-335.330	-317.262	-652.592
0.45	-335.286	-317.282	-652.568
0.50	-335.280	-317.308	-652.588
0.55	-335.289	-317.342	-652.631
0.60	-335.300	-317.385	-652.685
0.65	-335.310	-317.432	-652.742
0.70	-335.315	-317.488	-652.803
0.75	-335.315	-317.562	-652.877
0.80	-335.312	-317.645	-652.957
0.85	-335.307	-317.735	-653.042
0.90	-335.299	-317.832	-653.131
0.95	-335.288	-317.939	-653.227
1.00	-335.276	-318.044	-653.320

Table 4: Cox Proportional Hazards Models at $\alpha = 0.20$ and $\alpha = 0.45$

α	Botanical Realism		Mathematical Astronomy	
	Hazard of botanic garden founding		Hazard of observatory founding	
	0.20	0.45	0.20	0.45
Prevalence $P_t^{k,\varphi}$	14.044*** (3.540)	3.608*** (1.225)	3.391*** (1.003)	1.928*** (0.562)
(ihs) Eligible Mass $M_t^{k,\varphi}$	0.823*** (0.106)	0.895*** (0.098)	1.108*** (0.188)	1.116*** (0.194)
Prevalence $P_t^{k,\varphi}$ × (ihs) Eligible Mass $M_t^{k,\varphi}$	-10.323*** (2.989)	-1.697*** (0.348)	-1.965*** (0.430)	-1.129*** (0.252)
(ihs) Distance to Tübingen	-0.160** (0.080)	-0.108 (0.077)		
(ihs) Distance to Wien			-0.091** (0.044)	-0.095** (0.044)
Log Likelihood $\ell(\alpha)$	-337.442	-335.286	-316.995	-317.282
(ihs) Pop in 1500 Observations	✓ 67,620	✓ 67,620	✓ 67,620	✓ 67,620

Note: *p<0.1; **p<0.05; ***p<0.01. City-clustered robust standard errors are reported in parentheses. The columns for $\alpha = 0.20$ report the conservative value used in the main analysis, corresponding to the first simulated value inside the 95% likelihood-ratio confidence set. The columns for $\alpha = 0.45$ report the likelihood-maximizing value. All models include (ihs) population in 1500 and distance to the origin of the relevant idea. Distance is measured from Tübingen for Botanical Realism and from Vienna for Mathematical Astronomy. Variables indicated by (ihs) are transformed using the inverse hyperbolic sine.

E Tests for the proportionality of Hazard Functions

In this section we test the proportionality of the hazard functions using scaled Schoenfeld residuals for the covariates included in Table 1 and Table 2, respectively, with $\alpha = 0.20$.

For Botanical Realism, the individual tests show no evidence non-proportionality for Prevalence $P_t^{k,\varphi}$ ($p = 0.884$), its interaction with Eligible Mass $M_t^{k,\varphi}$ ($p = 0.234$), or population in 1500 ($p = 0.791$). The test for Eligible Mass is borderline ($p = 0.053$). The global proportionality test is rejected ($p = 0.016$), but this result is driven by the distance to Tübingen control ($p = 0.002$). Figure 8a reports the corresponding scaled Schoenfeld residuals. In particular, the residuals for our main variables of interest do not display a pronounced systematic drift over time.

For Mathematical Astronomy, the global test does not reject the proportional hazards assumption ($p = 0.215$). Prevalence, population in 1500, and distance to Vienna show no evidence of non-proportionality ($p = 0.268$, $p = 0.545$, and $p = 0.953$, respectively). The individual test for Eligible Mass yields $p = 0.026$, while the interaction term is marginal ($p = 0.093$). Figure 8b reports the corresponding scaled Schoenfeld residuals and does not reveal a pronounced systematic pattern in the residuals over time.

In Figures 8a and 8b, the blue line and grey confidence interval correspond to the scaled Schoenfeld residuals of Prevalence $P_t^{k,\varphi}$ for Botanical Realism and Mathematical Astronomy, respectively. The yellow line and confidence interval correspond to Eligible Mass $M_t^{k,\varphi}$, while the purple line and confidence interval correspond to the interaction between Prevalence $P_t^{k,\varphi}$ and Eligible Mass $M_t^{k,\varphi}$. The red line and confidence interval correspond to “(ihs) City population in 1500”, while the green line and confidence interval correspond to “(ihs) Distance to Tübingen” in Figure 8a and “(ihs) Distance to Vienna” in Figure 8b.

Allowing distance to Tübingen to vary over time. Since the rejection of the global proportionality test for Botanical Realism is driven by distance to Tübingen, we perform an additional robustness exercise in which we allow the coefficient on distance to vary linearly over time. Specifically, we interact (ihs) distance to Tübingen with a linear calendar-time trend,

$$\text{Time}_t = \frac{t - 1650}{100}.$$

Calendar time is centered at 1650 and expressed in centuries, so that the coefficient on the interaction captures the change in the effect of distance over one century. The choice of 1650 as the reference year only changes the interpretation of the main distance coefficient and does not affect the fitted model.

Table 5 reports the results. Allowing distance to vary over time does not materially affect the coefficients of interest. At our preferred value $\alpha = 0.20$, the coefficient on Prevalence

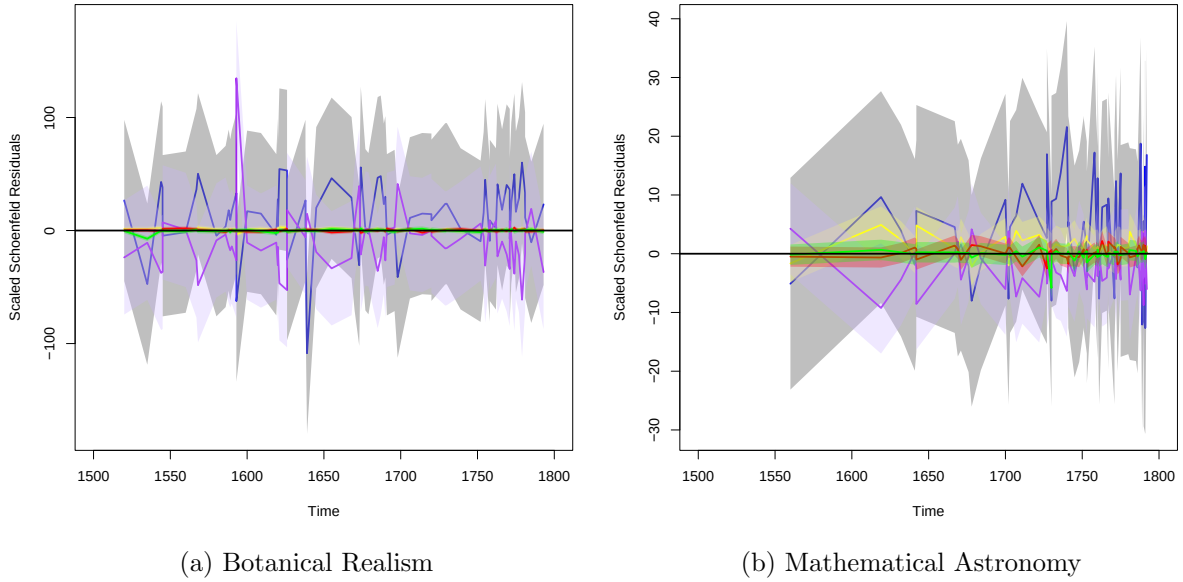


Figure 8: Joint correlations between the scaled Schoenfeld residuals (e.g. hazard ratios) of all the covariates in column (3) of (a) Table 1 and time, and (b) Table 2 and time. Alpha = 0.20.

changes from 14.04 in the baseline specification to 13.23, the coefficient on Eligible Mass from 0.82 to 0.81, and the interaction from -10.32 to -9.93. Their signs and statistical significance are unchanged. By contrast, the interaction between distance and time is positive and statistically significant, confirming that the effect of distance to Tübingen becomes less negative over time.

Finally, we repeat the likelihood exercise over the full grid of α values using the specification with time-varying distance for Botanical Realism. The likelihood-maximizing value moves from $\alpha = 0.45$ in the baseline specification to $\alpha = 0.35$. The lower part of the likelihood confidence region is considerably more stable: the interpolated 95% likelihood-ratio lower bound moves from approximately 0.20 to 0.16. Although $\alpha = 0.15$ is the simulated value closest to this interpolated threshold, it remains outside the 95% likelihood-ratio confidence set, whereas $\alpha = 0.20$ remains the first simulated value inside the confidence set. This robustness exercise therefore reinforces our choice to rely on the conservative lower-bound value rather than on the more specification-sensitive likelihood maximum.

F Robustness of the Cox estimates at $\alpha = 0.20$

In this section we assess the robustness of the Cox estimates to alternative sets of controls, holding the diffusion parameter fixed at our preferred value $\alpha = 0.20$. The benchmark specification includes city population in 1500 and distance from the origin of the relevant

Table 5: Cox Proportional Hazards Model with Time-Varying Distance – Botanical Realism and botanic gardens

α	Dependent variable: Hazard of botanic garden founding					
	0	0.1	0.2	0.5	0.7	1
Prevalence $P_t^{k,\varphi}$		24.32 (109.85)	13.23*** (3.33)	2.91*** (0.99)	1.97*** (0.62)	1.72*** (0.51)
(ihs) Eligible Mass $M_t^{k,\varphi}$	0.54*** (0.07)	0.56*** (0.14)	0.81*** (0.10)	0.90*** (0.10)	0.89*** (0.10)	0.89*** (0.10)
Prevalence $P_t^{k,\varphi}$ × (ihs) Eligible Mass $M_t^{k,\varphi}$		-23.78 (123.98)	-9.93*** (2.72)	-1.39*** (0.28)	-0.90*** (0.18)	-0.76*** (0.15)
(ihs) Distance to Tübingen	-0.07 (0.11)	-0.19* (0.11)	-0.17 (0.11)	-0.06 (0.11)	-0.05 (0.11)	-0.05 (0.11)
(ihs) Distance to Tübingen × Time	0.33*** (0.11)	0.41*** (0.12)	0.39*** (0.11)	0.33*** (0.10)	0.33*** (0.10)	0.33*** (0.10)
Log Likelihood $\ell_1^{TV}(\alpha)$	-340.52	-338.34	-333.68	-332.55	-332.57	-332.51
(ihs) Pop in 1500	✓	✓	✓	✓	✓	✓
Observations	67620	67620	67620	67620	67620	67620

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Robust standard errors are reported in parentheses. Calendar time is defined as $(t - 1650)/100$, so that one unit corresponds to one century. The coefficient on “(ihs) Distance to Tübingen” therefore gives the distance effect at the reference year 1650, while its interaction with Time captures the linear change in this effect over one century. Models are estimated for every simulated α between 0 and 1; selected values are reported here, including our preferred value $\alpha = 0.20$. Distance to Tübingen is computed using the Haversine formula. All models include (ihs) population in 1500. All variables indicated by (ihs) are transformed using the inverse hyperbolic sine.

idea. We then sequentially add latitude, remove population, replace population in 1500 with population in 1400, and control for pre-invention intellectual capacity.

The population variables are measured prior to the main period of institutional adoption and transformed using the inverse hyperbolic sine. The pre-invention intellectual-capacity measure captures predetermined city-level scholarly capacity before the relevant idea could generate the institutional outcome; for Botanical Realism it is measured over 1500–1530, and for Mathematical Astronomy in 1423–1453. All specifications retain the same measures of Prevalence, Eligible Mass, and their interaction and use the same city-year sample.

Tables 6 and 7 show that the main results are highly stable across these alternative specifications. For both ideas, both the coefficients on Prevalence and Eligible Mass remain positive and statistically significant, and their interaction remains negative and statistically significant. The magnitudes of the three coefficients of interest also change only modestly relative to the benchmark specification.

Table 6: Robustness of Cox estimates – Botanical Realism, $\alpha = 0.20$

	Benchmark	+ Lat	No pop	Pop 1400	+ Pre-idea capacity
Prevalence $P_t^{k,\varphi}$	14.044*** (3.540)	14.508*** (3.466)	14.163*** (3.571)	14.099*** (3.568)	15.009*** (3.635)
(ihs) Eligible Mass $M_t^{k,\varphi}$	0.823*** (0.106)	0.815*** (0.105)	0.852*** (0.102)	0.830*** (0.108)	0.894*** (0.140)
Prevalence $P_t^{k,\varphi}$ × (ihs) Eligible Mass $M_t^{k,\varphi}$	-10.323*** (2.989)	-10.747*** (2.966)	-10.344*** (3.000)	-10.302*** (3.001)	-11.214*** (3.323)
(ihs) Population in 1500	0.095 (0.093)	0.156 (0.105)			0.128 (0.095)
(ihs) Population in 1400				0.061 (0.088)	
(ihs) Distance to Tübingen	-0.160** (0.080)	-0.152* (0.084)	-0.142* (0.082)	-0.155* (0.084)	-0.188** (0.089)
(ihs) Latitude		1.952 (1.381)			
(ihs) Pre-invention intellectual capacity					-0.089 (0.076)
Log Likelihood	-337.442	-336.417	-337.851	-337.681	-336.922
Observations	67,620	67,620	67,620	67,620	67,620

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. City-clustered robust standard errors are reported in parentheses. The benchmark includes (ihs) population in 1500 and (ihs) distance to Tübingen. Subsequent columns add latitude, omit population, replace population in 1500 with population in 1400, or add pre-invention intellectual capacity. All specifications use $\alpha = 0.20$ and the Efron method for ties. Variables indicated by (ihs) are transformed using the inverse hyperbolic sine.

G Example of scholastic reasoning

To fix ideas, a good example of reasoning using the tools of scholastic theology is the second proof of the existence of God by Aquinas as reported by Copleston (1993). Remark that it does not rely much on the scriptures, but rather on a kind of mathematical/logical argumentation:

1. In the world, we can see that things are caused.
2. But it is not possible for something to be the cause of itself because this would entail that it exists prior to itself, which is a contradiction.
3. If that by which it is caused is itself caused, then it too must have a cause.
4. But this cannot be an infinitely long chain, so, there must be a cause which is not itself caused by anything further.
5. This everyone understands to be God.

H Augmenting Rubin’s data

Rubin (2014) compiled data on whether European cities were Protestant in 1530, 1560, and 1600, focusing primarily on cities within the Holy Roman Empire. His approach assumed

Table 7: Robustness of Cox estimates – Mathematical Astronomy, $\alpha = 0.20$

	Benchmark	+ Lat	No pop	Pop 1400	+ Pre-idea capacity
Prevalence $P_t^{k,\varphi}$	3.391*** (1.003)	3.370*** (1.001)	3.228*** (1.017)	3.368*** (1.013)	3.386*** (1.009)
(ihs) Eligible Mass $M_t^{k,\varphi}$	1.108*** (0.188)	1.068*** (0.190)	1.157*** (0.180)	1.119*** (0.186)	1.114*** (0.189)
Prevalence $P_t^{k,\varphi}$ × (ihs) Eligible Mass $M_t^{k,\varphi}$	-1.965*** (0.430)	-1.949*** (0.427)	-1.918*** (0.429)	-1.976*** (0.433)	-1.952*** (0.434)
(ihs) Population in 1500	0.209** (0.089)	0.276*** (0.100)			0.227** (0.092)
(ihs) Population in 1400				0.185** (0.078)	
(ihs) Distance to Vienna	-0.091** (0.044)	-0.082* (0.045)	-0.100** (0.045)	-0.083* (0.044)	-0.103** (0.048)
(ihs) Latitude		1.783* (1.017)			
(ihs) Pre-invention intellectual capacity					-0.041 (0.058)
Log Likelihood	-316.995	-316.194	-318.883	-317.342	-316.888
Observations	67,620	67,620	67,620	67,620	67,620

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. City-clustered robust standard errors are reported in parentheses. The benchmark includes (ihs) population in 1500 and (ihs) distance to Vienna. Subsequent columns add latitude, omit population, replace population in 1500 with population in 1400, or add pre-invention intellectual capacity. All specifications use $\alpha = 0.20$ and the Efron method for ties. Variables indicated by (ihs) are transformed using the inverse hyperbolic sine.

that cities located in officially Catholic countries remained Catholic throughout the period. However, this assumption does not hold for regions such as France and the Low Countries (approximately corresponding to the modern-day Benelux area), where several cities adopted Protestantism temporarily before being reconquered by Catholic forces.

To address this limitation, we have updated the religious status of the following cities to reflect periods of Protestant control, based on information from the Catholic Encyclopedia (Herbermann 1913).

- Die. Protestant control: 1562-1628/1629. Became a Protestant stronghold in Dauphiné during the Wars of Religion. Occupied by royal troops during Richelieu's repression of Huguenot fortresses.
- La Rochelle. Protestant period: 1550s-1628. Key Huguenot stronghold. Besieged and subdued by royal forces under Richelieu in 1628.
- Montauban. De facto Protestant Rule: 1561-1629. Montauban became one of the most fortified and independent Huguenot cities in France. Finally capitulated (1629) to royal troops under Richelieu after the fall of La Rochelle and a renewed campaign to suppress Huguenot political autonomy.

- Montpellier. Protestant control: 1562-1622. Served briefly as a de facto capital of Huguenot political assemblies. Lost military and political autonomy after Siege of Montpellier (1622) by royal troops under Louis XIII.
- Nîmes. Protestant control: 1561-1629. After violent iconoclasm in 1561, the city came under Huguenot control. Held by Protestants throughout the Wars of Religion; formally lost autonomy in 1629 after Richelieu’s campaigns.
- Ostend. In 1572, Ostend joined the Dutch Revolt and came under the control of the rebel States-General of the Netherlands, aligning with Protestant (Reformed) forces. After the Siege of Ostend (1601-1604), the city was almost entirely destroyed, and Catholicism was restored under Spanish Habsburg rule.
- Uzès. Protestant control: ca. 1562-1629. Important center in the Languedoc region. Remained predominantly Protestant until submission to royal forces in 1629, when Richelieu dismantled Protestant strongholds.

For the sake of completeness, we list here the cities with Protestant control outside Rubin’s years 1530, 1560, and 1600.

- Antwerp. Protestant period: ca. 1566-1585. During the Reformation, Antwerp became a Calvinist stronghold. After the Fall of Antwerp in 1585, Protestant worship was banned, and many Protestants fled north.
- Caen. Protestant control: 1562-1572. Important Protestant stronghold in Normandy. The St. Bartholomew’s Day Massacre (1572) led to widespread killings and ended Protestant rule.
- Ghent. Protestant period: ca. 1577-1584. Calvinist Republic of Ghent established during the Dutch Revolt. Ended with Spanish reconquest.
- Tournai. Protestant control: 1577-1581. Strong Calvinist presence; fell to Spanish forces in 1581.

I Mapping Exposure to Scholasticism and the spread of Protestantism

J Additional results with alternative ideas: Practical Surgery and Civil Law

In addition to the benchmark results in Table 3, we present results controlling for two specific, orthogonal ideas: *Exposure to Practical Surgery* PS_{1508}^c and *Exposure to Civil Law* CL_{1508}^c . This is interesting because it captures a distinct effect, separate from scholasticism. We compute exposure to Practical Surgery and Civil Law similarly to scholasticism, with

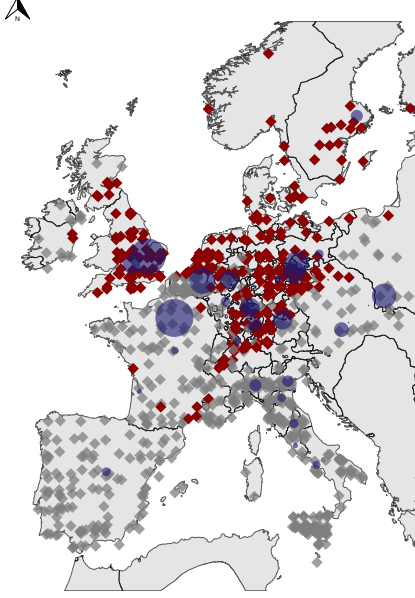


Figure 9: Blue bubbles represent the exposure to scholasticism in 1508. $\alpha = 0.2$ and $D = 5,000$. Protestant cities are the red diamonds, and Catholic cities are the grey diamonds. Data on cities' religion are taken from Rubin (2014) and updated as in Appendix H, they reflect the religious status in 1600.

the only difference being the starting point. The “inventor” of the former, Guy de Chauliac (c. 1300–1368), was the most prominent physician and surgeon of the Middle Ages. His most famous work *Chirurgia Magna*, published in 1363, was the first to detail surgical procedures, previously handled mostly by charlatans. It remained the main reference well into the 17th century (The Editors of Encyclopaedia Britannica 2024). The inventor of the latter idea, Irnerius, already mentioned in the paper's Introduction, established the school of jurisprudence which eventually grew into the University of Bologna. He was a jurist credited with reviving the scholarly study of Roman civil law, knowledge of which had endured in the Byzantine East but largely faded in Western Europe following the fall of the Western Roman Empire (Berman 1983).

The orthogonal relationship between scholasticism and Practical Surgery is evident in Figure 10: Practical Surgery was more prominent in Southern Europe, spreading independently of scholasticism. Similarly, Figure 11 shows that exposure to Civil Law followed its own geographic pattern, radiating outward from Bologna and concentrated in regions where the revival of Roman jurisprudence had the deepest institutional roots. In the linear probability model shown in the first placebo panel of Table 3, *Exposure to Practical Surgery* PS_{1508}^c always has a negative sign, but it is never significant. The results for Civil Law are equally unambiguous: as shown in the second placebo panel of Table 3, *Exposure to Civil Law* CL_{1508}^c is never statistically significant in any specification and at any date.

We interpret this as further evidence that the relationship documented above is specific to scholasticism: exposure to other intellectual traditions rooted in medieval universities—one medical, one juridical—bears no association with a city’s likelihood of becoming Protestant. This reinforces our hypothesis of a “disgust” effect triggered by scholasticism, rather than by university culture or intellectual activity in general.

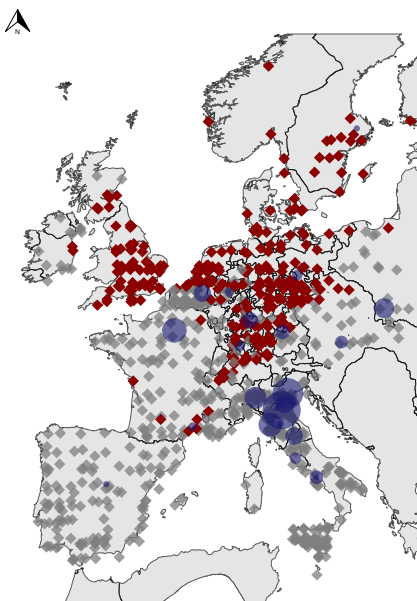


Figure 10: Blue bubbles represent the yearly exposure to Practical Surgery in 1508. $\alpha = 0.2$ and $D = 5,000$. Protestant cities are the red diamonds, and Catholic cities are the grey diamonds. Data on cities’ religion are taken from Rubin (2014) and updated as in Appendix H, they reflect the religious status in 1600.

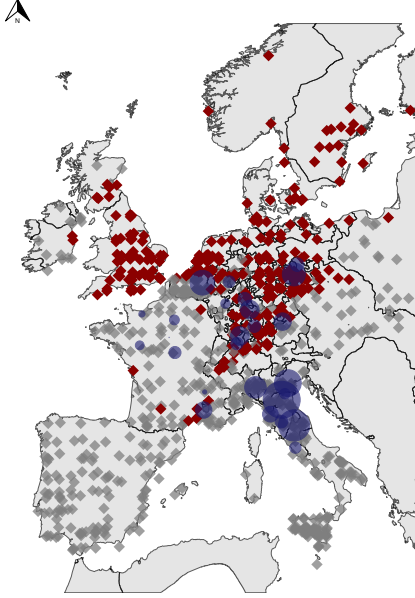


Figure 11: Blue bubbles represent the yearly exposure to Civil Law in 1508. $\alpha = 0.2$ and $D = 5,000$. Protestant cities are the red diamonds, and Catholic cities are the grey diamonds. Data on cities’ religion are taken from Rubin (2014) and updated as in Appendix H, they reflect the religious status in 1600.

K Placebo Inventors of Botanical Realism

Here, we list the twelve scholars we use as “placebo” inventors in the counterfactual analysis in Section 5.1. While it is speculative to say whether each of these twelve individuals could have invented Botanical Realism, many of them were indeed prominent scholars in fields that could have contributed to the development of a more empirical approach to botany. However, the emergence of a paradigm like Botanical Realism depended on a combination of factors—intellectual, cultural, and scientific—beyond the work of individual scholars. Below, a closer look at the potential of each of the individuals:

- Juan Aguilera was professor of medicine and sciences at the University of Salamanca from 1538 to 1560 (Vidal y Díaz et al. 1869; Esperabé de Arteaga et al. 1917): as he had a background in natural philosophy or medicine, he could have contributed to a more empirical study of plants, as Salamanca was a leading university with a strong focus on scientific inquiry during the Renaissance.
- John Warner taught medicine at the University of Oxford from 1520 to 1554 (Gunther 1937) and was a member of the Royal College of Physicians (1561): he might have had access to Renaissance humanist ideas, but Oxford was more conservative at the time, and Warner would need a strong inclination toward natural science to spearhead Botanical Realism.

- Jeremius Dryvere taught medicine at the University of Louvain from 1522 to 1554 (Lamberts and Roegiers 1990): Louvain was a center of scientific learning, and someone like Dryvere could have contributed to botanical studies.
- Andreas Goldschmidt taught medicine at the University of Königsberg from 1550 to 1559 (Schwinges and Hesse 2019): As a scholar trained in Wittenberg, where humanism and scientific inquiry were encouraged, Goldschmidt could have been part of the intellectual currents that led to developments like Botanical Realism.
- Mikołaj Mleczko Wieliczki was professor of medicine at the University of Cracow from 1512 to 1552 (Uniwersytet Jagielloński 2019): Cracow had a strong tradition in astronomy and natural sciences, and a scholar like Wieliczki could have contributed to the empirical study of nature.
- Jacob Bording was professor of medicine at the University of Rostock from 1549 to 1556 and at the University of Copenhagen from 1556 to 1560 (Slottved 1978): as a prominent physician, Bording would likely have been interested in botany as it related to medicine, which was a key motivator for many early botanists.
- Antoine Saporta was professor of medicine at the University of Montpellier from 1531 to 1573 (Dulieu 1979): Montpellier was a leading medical school, and Saporta, as a physician, would have had a strong interest in medicinal plants. He could have been well-positioned to develop a more scientific approach to botany.
- Girolamo Donzellini taught medicine at the University of Padua from 1541 to 1543 (Facciolati 1757): The University of Padua was a hub of medical and scientific learning, so Donzellini, with his interest in medicine, might have had the right environment to develop Botanical Realism.
- Oronce Fine taught sciences at the Royal College in Paris from 1530 to 1555 (Collège de France 2018) : Although primarily a mathematician and cartographer, Fine was part of a broader Renaissance movement that emphasized empirical study, and he could have contributed to a more systematic approach to botany.
- Realdo Colombo taught medicine at the universities of Padua (1538–1544), Pisa (1544–1548) and Roma (1548–1559), see Del Negro (2015): he was a noted anatomist, and his empirical methods in anatomy could have translated well into botany, particularly in the detailed study of plant structures.
- Georg Joachim Porris taught sciences at the universities of Wittenberg (1537–1542), Leipzig (1542–1551) and Vienna (1554–1555), see Schwinges and Hesse (2019) and Aschbach (1865). Also known as Rheticus, Porris was an astronomer and mathematician. While not a botanist, his scientific mindset might have inclined him toward an empirical approach in natural studies if he had turned his attention to plants.

K.1 Centrality of the Placebo inventors

The likelihood of an idea spreading depends on how well-connected its inventor is, typically measured by degree centrality—the number of edges a node has. However, degree centrality (and other centrality measures) does not fully capture the dynamics of idea diffusion, which unfolds over time rather than at a single moment. A high degree centrality does not necessarily equate to greater reach. To illustrate this, we report the degree centrality of each placebo inventor in 1542 (i.e., the number of colleagues in the same field) or in the first available year of activity.

If Fine (2) or Colombo (19) had been the originators, the idea would have already spread to around 50% of the academic population by the second half of 1600. The next fastest spread would have occurred with Dryvere (8) and Porris (22), followed by Saporta (6) and Bording (2 in 1550). For Warner (10), the spread would occur significantly later, only accelerating after the establishment of the first major academies, with a sharp increase around 1640. If Goldschmidt (0 in 1542, but 1 in 1549) had been the inventor, the idea would have struggled to survive initially, only gaining rapid traction around 1680. Interestingly, had Aguilera (8) been the inventor, the idea would have remained confined to Salamanca, persisting without spreading elsewhere until the end of the 18th century, when we observe a sudden spike. This shift coincides with scientists from the Spanish university beginning to affiliate with more international academies. In one case (Wieliczki (3) in Cracow), the idea fails to spread altogether. These simulations demonstrate how academic institutions can play a crucial role in preserving ideas that might otherwise remain obscure due to their development in less influential locations.

L Placebo networks and the role of the Jesuits

To test whether Jesuits operated within a relatively isolated network, we examine whether Jesuit nodes are densely connected internally while remaining weakly connected to the rest of the network. We define two groups of nodes: Jesuits and non-Jesuits. To quantify Jesuit insularity, we compute the Coleman (1958) inbreeding homophily index, which ranges from -1 (no internal Jesuit connections) to 0 (connections similar to a random network) to 1 (complete inbreeding). Following Currarini, Jackson, and Pin (2009), we define IH as follows:

$$IH_{Jesuits,t} = \frac{H_{Jesuits,t} - \omega_{Jesuits,t}}{1 - \omega_{Jesuits,t}}$$

where $H_{Jesuits,t}$ is the fraction of edges entailing only Jesuits at time t , and $\omega_{Jesuits,t}$ is the relative fraction of Jesuits in the scholar population any given point in time t .



Figure 12: Jesuit inbreeding homophily over time

Figure 12 plots $IH_{Jesuits,t}$ from 1556 to 1767, the period over which Jesuits were most active. For most of the timeframe, the index remains between 0.6 and 0.8, indicating a high degree of inbreeding. Jesuit universities were typically closed to non-Jesuit professors, and Jesuit scholars rarely taught outside them. However, the index is slightly lower at the beginning, when the Jesuits were establishing their university network, and at the end, preceding their gradual dissolution.³

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3. Supplementary materials 7 provides additional statistics on the Jesuits' position and connectivity in the network, including their number, density, conductance, and decompositions by field.

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