

“New Media and Competition: Printing and Europe’s Transformation After Gutenberg”

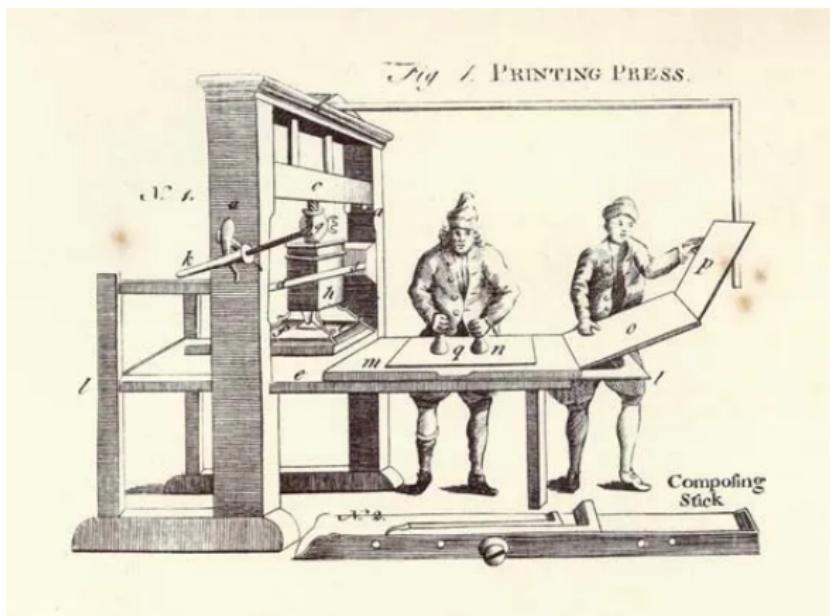
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The Creation of Mass Media



Purpose

What is the role of book *content* in economic, religious, and institutional development, and how did competition shape this role?

- Focus on:
 - Business education content
 - Religious content
- Key Text as Data component
 - Classification of religious books as Catholic or Protestant based on their titles
- I'll highlight the paper's general findings, but will focus more on the textual analysis element

Approach and Findings

They use a dataset of early printed books to measure the impact of business education and religious content on economic growth and institutional change

- Find positive relationship between business education content and city growth, Protestant content and institutional change
- Find that competition predicts content
 - Use printer deaths as a source of exogenous variation in printing competition

Early Printing

- Printing largely unregulated prior to the Reformation in 1517
 - Only study variation in competition *prior* to the Reformation
- Characterized by high fixed costs and entry barriers
 - “the cost of a complete set of equipment... was equivalent to 4 to 10 years of skilled wages”
 - Led to oligopolistic and collusive behavior between firms
 - Printer deaths were a significant shock to competition and collusive agreements
- High inter-city trade costs gave local firms a substantial advantage
 - Supports the assumption that both printing and consumption typically occurred in the same city

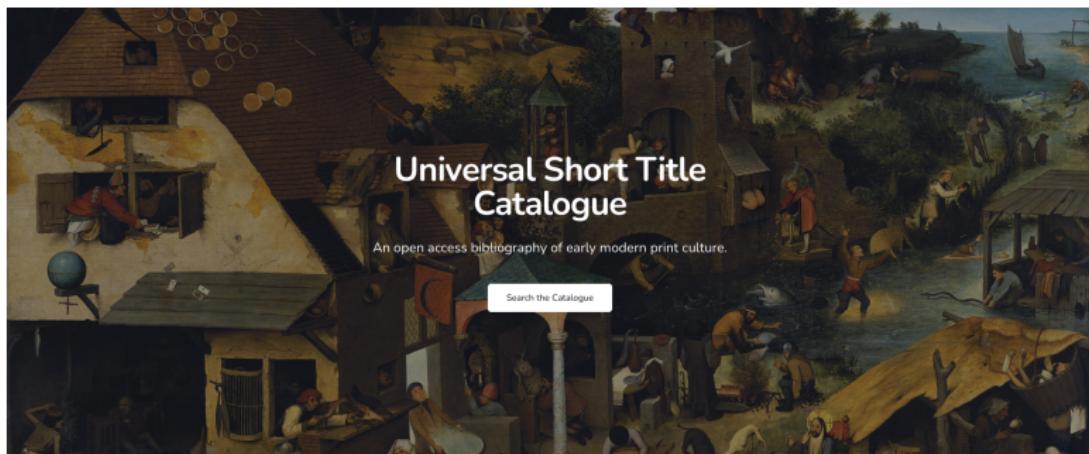
Effects on Economic Growth and Religion

- Dittmar (2011) finds that early adoption (pre-1500) of the press is associated with large gains in economic growth
 - Argues this largely occurred due to the diffusion of business education content, but cannot go further with data available at the time
- Rubin (2014) finds that early adoption of the press makes a city 29% more likely to become Protestant
 - Also can't dig any further, but argues the diffusion of Protestant materials through the press played a substantial role

Prior research has documented associations between the press and growth/religious change, but couldn't empirically explore the inner workings of the relationships. Dittmar and Seabold seek to do this with new data on book content.

The Universal Short Title Catalogue (USTC)

Dataset of early printed book editions (1454–1600)



- Variables include: Author, Title, Print Year, Print City, Printer

Other Data

- Business Education Publications: Hoock et al. (1991), Hoock and Jeannin (1993), Hoock et al. (2001)
- Book Prices: Book purchasing records of Christopher Columbus' son
- Printing Firms & Deaths: Book imprints from USTC
- Economic and Institutional Outcomes: Bairoch (1988) and records of Reformation laws

Classification of Religious Publications

- Classify religious publications in German-speaking cities as Protestant or Catholic based on author language using multinomial inverse regression
 - ① Record religious affiliations of 459 known authors
 - 225 Catholic and 234 Protestant
 - ② Estimate how language changes with religious affiliation of known authors
 - ③ Classify religion of all authors in dataset based on “distance” from known authors
- Classify author as Protestant if the probability they’re Protestant is > 0.5 , Catholic otherwise

Classification of Religious Publications

Our classification procedure studies variation in language in long historical book titles that provide extensive information on content.²⁹ To understand the information in titles, we provide two examples of English-language books printed in 16th century Germany.³⁰ An example Protestant title is a book written by Martin Luther and printed in Wesel:

The last wil and last Confeßion of martyn Luthers faith concerning the prin-
cipal articles of religion which are in controversy, which he wil defend &
maiteine until his death, agaynst the pope and the gates of hell.

An example Catholic title is a book written by John Old and printed in Emden:

A Confeßion of the most auncient and true christen catholike olde belefe
accordyng to the ordre of the .XII. Articles of our comon crede, set furthe in
Englishe to the glory of almightye God, and to the confirmation of Christes
people in Christes catholike olde faith.

Classification of Religious Publications

- Corpus: Titles of religious book editions from the USTC
 - Latin and German religious texts from German-speaking cities
- Estimation Framework: Multinomial Inverse Regression
 - Uses subset of titles where author's religion is known to construct an estimation framework, then applies the framework to titles where author's religion is unknown to estimate whether they are Protestant or Catholic
- Vocabulary Selection
 - Remove generic titles
 - Make titles lower-case and remove punctuation
 - Remove numbers, roman numerals, words that occur < 3 times
 - Experiment with stop word removal
 - Do NOT stem words

Classifying Strategies

Dittmar and Seabold test two different strategies of selecting the most relevant features to classify titles as Protestant or Catholic:

- The Gentzkow and Shapiro (2010) χ^2 measure
 - All based on phrase counts between pre-classified titles
 - No way to distinguish inherently Catholic phrases from inherently Protestant ones
 - Results: Catholic terms more distinguished and unique than Protestant ones
- The Monroe et al. (2008) Log-Odds Ratio measure with an informative prior
 - Naive log-odds ratio sorts based on the odds of a word being used by Protestants or Catholics
 - Determined largely by sample variation, focuses on obscure words
 - Adding an “informative prior” to assist in calculation helps alleviate these problems

Gentzkow-Shapiro Performance



Log-Odds Performance

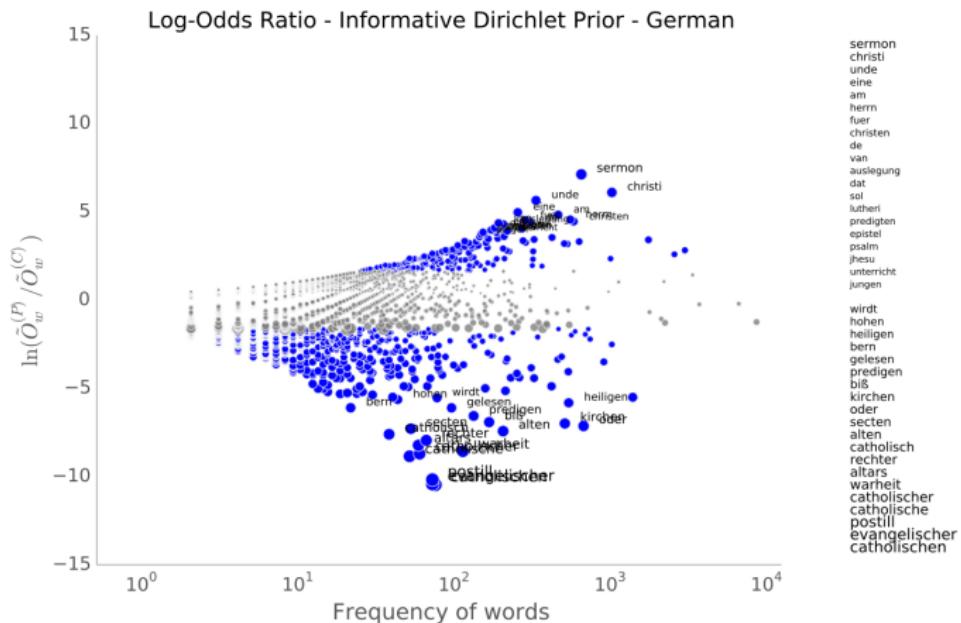


Figure B10: Log-odds ratio with informative Dirichlet prior vs. Frequency of words in log scale. The top 20 words for Protestants and Catholics are listed. German unigrams only.

Classification Results

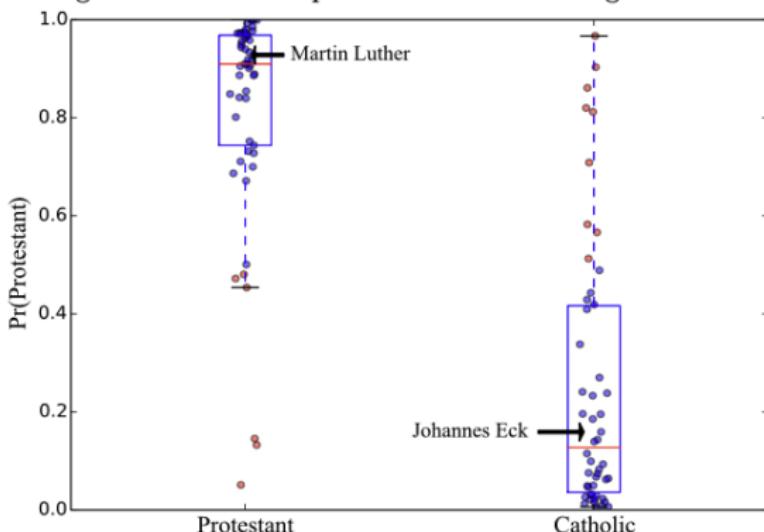
Table 1: Phrases Differentiating Protestant and Catholic Publications in German

Protestant		Catholic	
sermon von dem	sermon on the	sacrament des altars	sacrament of the altar
sermon von der	sermon for the	die sontags evangelia	the evangelical sunday
in der kirchen	in the church	biß auff ostern	from easter
ain sermon von	a sermon on	auf die fest	from the feast
die jungen christen	the young christians	an biß auff	and so from
des liebs und	of love and	unser lieben frawen	our dear women

This table reports presents top three-word phrases (trigrams) that differentiate Protestant and Catholic authors. In the original, some words are capitalized which are rendered in lower case here. See text and footnotes for discussion of titles in which this language is observed.

Classification Results

Figure 1: Out-of-Sample Classification of Religious Authors



This graph presents the out-of-sample classification performance for a single draw from the data. The model is trained on 80% of the data and predicted on the held-out 20%. We present predictions for held-out Protestants (at left) and for held-out Catholics (at right).

Business Education and Growth

- Estimate impact of business education content on economic growth
 - Use city growth as a measure of economic dynamism in accordance with literature on pre-industrial Europe

Estimate regressions of the form:

$$\ln(\text{pop}_{1600}/\text{pop}_{1500})_i = \alpha_0 + \alpha_1 \text{publications}_i + \gamma X_i + \epsilon_i \quad (1)$$

Where the outcome variable is log population growth from 1500–1600 in city i and publications_i is the number of publications in city i between 1500–1600

Business Education and Growth

Table 2: Merchant Manual Printing and City Growth

	(1)	(2)	(3)	(4)	(5)	(6)
Outcome: $\ln(\text{Population}_{1600}/\text{Population}_{1500})$						
Merchant Manuals	0.454** (0.193)		0.429* (0.243)			
Publications		0.002** (0.001)	0.000 (0.001)			
Ln Merchant Manuals				0.173*** (0.051)		0.127** (0.047)
Ln Publications					0.065*** (0.019)	0.023* (0.013)
Observations	269	269	269	269	269	269
R ²	0.26	0.25	0.26	0.32	0.28	0.33

This table reports estimates from regressions studying city population growth. The outcome is the natural logarithm of population growth at the city level: $\ln(\text{pop}_{1600}/\text{pop}_{1500})$. “Publications” is the count of publications (varieties) observed 1500–1600 in units of 100. “Merchant Manuals” is the count of merchant manuals observed 1500–1600 in units of 100. All regressions control for the natural logarithm of population in 1500, country fixed effects, city latitude and longitude, and indicators for: navigable rivers, ocean or sea ports, printing pre-1500, and the presence of universities established pre-1500. Standard errors in parentheses are clustered by country. Significance denoted: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Religious Content and Institutional Change

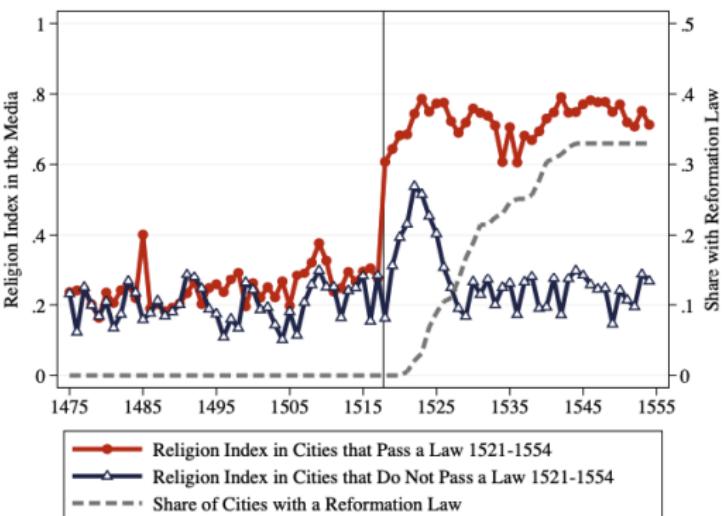
They now test the impact of religious content on institutional change using authors classified as Protestant and Catholic using the methods described above.

- Institutional change in response to the Reformation began at the city level
 - Pro-Protestant cities would pass “Reformation Laws”
- The Catholic Church was still incredibly powerful, and local rulers who embraced the Reformation took risks by doing so

Did Protestant media play a role, and was it sustained?

Religious Content and Institutional Change

Figure 2: Religious Ideas in the Media and City-Level Institutional Change



This graph presents the annual mean of the religion index for religious publications in cities that did and did not pass Reformation laws (Protestant = 1, Catholic = 0 on left axis). The graph also presents the share of cities having adopted institutional change measured by the passage of a city Reformation law (on right axis). The vertical line at October 1517 marks the first circulation of Martin Luther's theses.

Religious Content and Institutional Change

Estimate impact of Protestant content on Reformation laws

Estimate regressions of the form:

$$\text{law}_{i,1521-1554} = \alpha + \beta \ln(\text{protestant publications})_{i,1518-1521} + \theta X_i + \epsilon_i \quad (2)$$

Where the outcome variable is a dummy variable for whether a Reformation law was passed in city i between 1521–1554, and *protestant publications* is the number of Protestant publications in city i between 1518–1521

Religious Content and Institutional Change

Table 3: Protestant Media and Institutional Change at the City-Level

	(1)	(2)	(3)	(4)
	Outcome: Reformation Law Passed 1521-1554			
Ln Protestant Publications 1518-1521	0.09*** (0.03)	0.06*** (0.02)	0.06 (0.04)	0.08** (0.04)
Cluster Definition	State	State	210km	70km
Cluster Fixed Effect		Yes	Yes	Yes
Observations	191	191	191	191
Controls	Yes	Yes	Yes	Yes

This table presents linear probability model estimates of the relationship between institutional change and Protestant publications. The outcome is a binary indicator for the passage of a law between 1521 and 1554. “Ln Protestant Publications 1518-1521” is the natural logarithm of the count of Protestant publications plus one. All specifications control for: Latin Media pre-1517 and Vernacular Media pre-1517 measured in hundreds of titles; Religious Media pre-1517 measured as the share of titles on religious topics; distance to Wittenberg measured in hundreds of kilometers; indicators for university towns, feudal cities (not free-imperial), Hansa cities, ecclesiastical rule cities, prince bishropries, cities on navigable rivers, and cities ever printing pre-1517. Population in 1500 is controlled for with fixed effects for bins: unknown (omitted), 1000-5000, 6000-1000, 11000-25000, 26000+. Standard errors are clustered on state or on geographic grid cells as indicated. The states are the historic principalities of the Holy Roman Empire. Following the Euratlas classification, free cities are assigned to the “Small States of the Holy Roman Empire” state category. The “210km” cluster designates grid cells of 3 degrees latitude (2 degrees \times 3 degrees, reflecting the earth’s curvature). The “70km” grid cell designates 70km grid cells of 1 degree latitude. Significance at the 99%, 95%, and 90% levels denoted “****”, “***”, and “**”, respectively.

Printer Deaths as an Instrument

- Master printers required extensive knowledge of a large number of topics
 - Functioning of the press
 - Multiple languages
 - Business practices
- Personal relationships were important in collusive business practices
 - A printer death could open up competition in a market that was previously subject to extensive collusive behavior

Thus, printer deaths were disruptive shocks to the printing market

Printer Deaths and Book Prices

Table 5: Printer Competition and Book Prices

	(1)	(2)	(3)	(4)	(5)
	Outcome: Ln Price				
	Complete Data				New Books
Printers: Number of Firms	-0.25*** (0.07)				
Indicator: 2+ Printers		-0.37** (0.16)			
Printer Death			-0.43* (0.24)		
Ln Transport Distance	0.36*** (0.08)	0.37*** (0.08)	0.37*** (0.08)	0.36*** (0.08)	0.60** (0.23)
City-Decade Fixed Effects	Yes	No	No	No	No
City & Decade Fixed Effects	No	Yes	Yes	No	No
City-Year Fixed Effects	No	No	No	Yes	Yes
Book Characteristics	Yes	Yes	Yes	Yes	Yes
Observations	2035	2035	2035	2035	363
With Variation	1168	78	514	2017	360

Business Content: IV Results

Table 10: IV Estimates of the Growth Impact of Merchant Manuals

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Panel A: Baseline All Cities - IV from Book Inscriptions</i>								
					Outcome: Ln Growth 1500-1600			
Merchant Manuals	0.004** (0.001)	0.003*** (0.001)	0.002*** (0.001)	0.002** (0.001)				
Ln Merchant Manuals					0.117*** (0.031)	0.095*** (0.031)	0.079** (0.037)	0.070* (0.040)
Observations	269	269	269	269	269	269	269	269
F Statistic on IV	258.60	223.30	206.75	166.42	7.04	6.50	10.76	10.32
<i>Panel B: German-Speaking Cities - IV from Book Inscriptions</i>								
					Outcome: Ln Growth 1500-1600			
Merchant Manuals	0.007*** (0.001)	0.004** (0.001)	0.003 (0.001)	0.004 (0.004)				
Ln Merchant Manuals					0.101*** (0.020)	0.064** (0.021)	0.052* (0.024)	0.077 (0.071)
Observations	70	70	70	70	70	70	70	70
F Statistic on IV	139.78	367.89	455.85	180.89	15953.70	993.18	1376.75	32.54
<i>Panel C: German-Speaking Cities - IV from Biographical Data</i>								
					Outcome: Ln Growth 1500-1600			
Merchant Manuals	0.008*** (0.003)	0.006** (0.003)	0.005 (0.003)	0.005 (0.003)				
Ln Merchant Manuals					0.124*** (0.033)	0.096** (0.040)	0.090* (0.050)	0.103* (0.057)
Observations	70	70	70	70	70	70	70	70
F Statistic on IV	97.00	95.66	86.77	79.28	189.77	135.82	145.59	110.84
Death Other Printers		Yes	Yes	Yes		Yes	Yes	Yes
Ever Manuals			Yes	Yes			Yes	Yes
Match Group Fixed Effects				Yes				Yes

Religious Content: IV Results

Table 11: Protestant Publications and Institutional Change IV Estimates

<i>Panel A: First Stage</i>	(1)	(2)	(3)	(4)
Outcome: Ln Protestant Publications 1518-1521				
Printer Deaths 1508-1517	0.80*** (0.19)	0.81*** (0.21)	0.55** (0.26)	0.57 (0.35)
Firms 1498-1507	0.41*** (0.06)	0.42*** (0.07)	0.13 (0.09)	0.14* (0.08)
Observations	191	191	191	191
R ²	0.58	0.58	0.66	0.68
<i>Panel B: IV Estimates</i>				
Outcome: Reformation Law Passed 1521-1554				
Ln Protestant 1518-1521	0.28*** (0.10)	0.22*** (0.08)	0.34** (0.17)	0.17 (0.11)
Firms 1498-1507	-0.05 (0.04)	-0.04 (0.05)	-0.01 (0.04)	0.00 (0.04)
Observations	191	191	191	191
F Statistic on IV	17.07	14.13	4.46	2.59
Population in 1500		Yes	Yes	Yes
Controls			Yes	Yes
Geographic Grid Cell FE				Yes

Conclusion

This paper examines many aspects of the influence of book *content* rather than mere printing

- Merchant manuals and business content are associated with increased economic growth
- Religious writings, particularly Protestant content, are associated with acceptance of Protestant ideas and institutional change in the form of Reformation laws
 - More Protestant content is associated with more competition
- Printer deaths were an exogenous shock to printed book markets
 - Deaths arguably increased competition