Appendix

The Appendix presents the variable codings, summary statistics, and two robustness tests: placebo tests for reverse causation and an alternative specification that uses a state-level clustering of the raster data. These specifications show that fragmentation is consistently and positively associated with the adoption of the Protestant Reformation.

Data Sources

protestant: # of cities with status as a protestant city or territory, data from Rubin 2014. Rubin's data is available for 1500, 1530, 1560, and 1600. All years before 1530 are 0 (provided Rubin's data is available for a state at least in one of the three years 1530 / 1560 / 1600). Years between 1530 and 1555 take the value Rubin assigns in 1530 (they remain missing if Rubin's data is unavailable for 1530 for the respective state). Years between 1560 and 1595 take the value assigned in 1560. All years after 1600 take the 1600 value.

fragmentation: # of states within the grid cell at given point in time. Data from Abramson 2017, augmented with data on territorial boundaries from the Max Planck Institute for Demographic Research and Historical GIS and files from the Mosaic Census Collection (University of California, Berkeley).

neighbor: sum of the neighbors' adopting the Reformation at a point in time, weighted by the distance between capitals of the neighbors and normalized by the inverse distances to all the other capitals, from Cantoni 2012.

printing press: "press" dummy variable for the existence of a printing press in 1500 from Rubin 2014.

distance to Wittenberg: distance from Wittenberg to center of grid cell. Own calculation.

universities:# of universities within grid cell at a given point in time. Data on university formation was taken from the chronologies offered in de Ridder-Symoens 2003, Wieruszowski 1966, and checked against Becker and Woessman 2009.

monasteries: # of monasteries within grid cell. Data on the presence of monasteries in a given territory was taken from Mapping Past Societies (Harvard University); Boranbay and Guerriero 2019; Martínez 1978 (España Mística); Monasticon Italiae; Monasteri Italiani; Monasticon Praemonstratense; Census of Dutch Monasteries (https://www2.fgw.vu.nl/oz/monasteries/kres.php); Wyczawski 1985; and other online sources.

urbanization: log population of cities with population above 5,000 within grid cell data from Bosker, Buringh, and Van Zanden 2013.

agricultural potential: "soilquality" variable from Dincecco and Onorato 2018.

imperial city: "reichsstadt" dummy variable for imperial city status from Cantoni 2012.

bishops: # of bishoprics within the grid cell. Data from Mapping Past Societies (Harvard University).

communes: # of cities coded as communes within grid cell, data from Van Zanden, Buringh, and Bosker 2012.

parliaments : "parliament" dummy variable for presence of parliament in grid cell from Van Zanden, Buringh, and Bosker 2012.

primogeniture: "primogeniture" variable from Kokkonen and Sundell 2014, recoded as dummy variable for adoption of primogeniture by given ruler and given point in time.

HRE: dummy variable for whether cell was in Holy Roman Empire at given point in time, using data from Nuessli 2011 and Cantoni 2012. If either one of these sources indicates the area was in the Holy Roman Empire, I code the grid as belonging.

Summary Statistics

Table A.1: Variable Summary

	count	mean	sd	min	max
protestant (Rubin)	37113	.3212082	1.17791	0	17
fragmentation	105111	1.825213	2.439251	1	33
neighbor	7923	.224932	.2959431	0	.7503785
press	37113	.7265918	1.146646	0	8
distance to Wittenberg	105111	1640.852	1012.83	30.05229	4353.827
university	105111	.1161249	.4401652	0	6
monastery	105111	12.97221	25.33593	0	237
bishops	105111	2.218664	4.552118	0	40
urbanization	105111	.3199094	.8723096	0	13
ag potential	2008	.7053577	.2396785	.011	.999
communes	6123	.3078556	.8031191	0	9
parliaments	105111	.4888166	1.355119	0	14
imperial city	7923	.2982456	.4575168	0	1
primogeniture	105111	.7861689	.4100109	0	1
HRE	105111	.9292748	.2563665	0	1
Observations	105111				

Placebo Tests

I rerun the model in Table 1, but using a placebo test: I generate a "fragmentation + 50 years" lead variable that is equivalent to the value of the fragmentation variable at fifty years later (t+50) with all the other measures at (t=1). In all but one specification, future fragmentation has no association with the adoption of Protestantism.

Table A.2. Placebo Tests: Future Fragmentation and the Protestant Reformation

	(1) Baseline	(2) Diffusion	(3) Resources	(4) Institutions	(5) All
fragmentation + 50 years	-0.011	0.006	-0.029**	-0.023	-0.003
	(0.018)	(0.020)	(0.010)	(0.016)	(0.023)
neighbor		5.740			5.385
		(3.753)			(4.897)
university		0.419	0.273*		0.420
		(0.317)	(0.125)		(0.425)
monastery			-0.065***		-0.071***
			(0.006)		(0.015)
urbanization			-0.075		-0.016
			(0.038)		(0.230)
communes				0.835**	0.353
				(0.286)	(0.257)
parliaments				0.338	0.296
				(0.362)	(0.471)
primogeniture				-0.672	-0.146
				(0.342)	(0.260)
HRE				-1.257**	-0.584
				(0.442)	(0.656)
Constant	0.688***	-1.152	3.394***	2.456*	1.610
	(0.052)	(1.859)	(0.262)	(1.032)	(2.005)
N	18,156	3,604	868	212	172

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Since several universities were founded after the Reformation, there is the danger that they are endogenous to the spread of the Reformation. To alleviate this concern, I run another placebo test that uses the same 50 year lead for university presence, and rerun the models in Table 1 that contained universities. The results show that there is no relationship between future universities and the Reformation.

State-level data

This table shows the same mixed effects regressions as in Table 2, but clustering around countries, rather than grid cells. Here, fragmentation is measured by taking a 100km radius of a state centroid, and then counting the number of state borders that cross the radius. States that fall entirely in one radius have a value of 0 (there are no borders within the cell). The results are consistent with those obtained using the grid cells: fragmentation is positively and consistently associated with the adoption of Protestantism.

Table 1: Table A.2.a Placebo Tests: Future Universities and the Protestant Reformation

	(1) Diffusion	(2) Resources	(3) All
university lead	-0.069	0.066	-0.295
	(0.131)	(0.050)	(0.148)
fragmentation	0.180**	0.157**	0.176**
	(0.055)	(0.059)	(0.063)
neighbor	6.189		5.735
	(3.460)		(4.437)
monastery		-0.065***	-0.070***
		(0.006)	(0.014)
urbanization		-0.092*	-0.054
		(0.040)	(0.204)
university			0.382
			(0.385)
communes			0.295
			(0.301)
parliaments			0.351
			(0.395)
primogeniture			-0.070
			(0.253)
HRE			-0.757
			(0.497)
Constant	-2.571	2.992***	0.080
	(1.746)	(0.312)	(2.012)
N	3,604	868	172

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A.3. Fragmentation Facilitates the Protestant Reformation: ME Models

	(1) Baseline	(2) Diffusion	(3) Resources	(4) Institutions	(5) All
fragmentation	0.008***	0.009***	0.005**	0.006***	0.025***
	(0.000)	(0.001)	(0.002)	(0.000)	(0.005)
Protestant neighbors		2.185***			2.632***
		(0.125)			(0.471)
universities		-0.228***	-0.046**		-0.069
		(0.027)	(0.016)		(0.115)
monasteries			0.000		-0.017**
			(0.000)		(0.006)
urbanization			0.011*		0.190
			(0.004)		(0.130)
ag potential			-0.138		0.091
			(0.128)		(0.226)
bishops				-0.001***	-0.093*
				(0.000)	(0.038)
communes				0.162***	-3.788**
				(0.020)	(1.222)
parliaments				0.002***	-0.508**
				(0.000)	(0.186)
KSP				-0.181***	0.021
				(0.039)	(0.363)
HRE				0.094	-0.192
				(0.056)	(0.261)
Constant	0.261***	-0.734***	0.358*	0.244***	2.522**
	(0.031)	(0.080)	(0.169)	(0.073)	(0.928)
var(cell)	-1.410***	-2.024***	-1.400***	-1.615***	-13.973
	(0.088)	(0.168)	(0.421)	(0.092)	(2901.820)
var(resid)	-1.079***	-1.213***	-1.189***	-1.077***	-1.946***
	(0.011)	(0.028)	(0.059)	(0.014)	(0.147)
N	4,274	736	149	2,734	23

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$