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The Dominican Order and the Printing Press

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ABSTRACT

The printing press was arguably one of the most important pre modern innovations. Why did some European cities adopt it and not others? I argue that the Dominican monastic order played a key role in explaining the diffusion of the printing press, as the technology was helpful in pursuing the order's spiritual and missionary goals. The article documents that cities with a Dominican monastery prior to the invention of the printing press, were more than twice as likely to adopt the press following its invention.

Keywords: Religion, Catholic Church, technology, diffusion

Introduction

The invention and spread of the movable type printing press in early modern Europe was a momentous development. It transformed the way that information was disseminated, and as a result, it promoted human capital formation and economic development (e.g., Dittmar, 2011; Eisenstein, 1979; Mokyr, 2005) and spurred great religious and institutional change (e.g., Boerner *et al.*, 2021; Rubin, 2014). In this article, I document that the spread of the printing press to some cities and not others was influenced by the prior presence of the Dominican monastic order.

The Dominican order was established in 1216 and quickly spread to cities located across most of the European continent. It placed a high value on education and saw intellectual engagement and religious exercises as equally

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important in the quest for spiritual development. As a result, the order exerted significant efforts in preaching and spreading these values to the secular world (Hinnebusch, 1965, p. 282–7; Lawrence, 1994, p. 69, 72–75; Prudlo, 2010, p. 1278; Showalter, 1973, p. 561, 566–67). Therefore, the order created a market for printed books by educating its monks and laymen, and it early on saw the value of the printing press for pursuing its spiritual goals and for attracting new potential recruits. Figure 1 presents the share of Dominican and non-Dominican cities with a printing press using a dataset covering 1901 European cities. Dominican cities are more likely to adopt the press.

When accounting for differences in the propensity of rulers to support new technology (e.g., Febvre and Henri-Jean, 1958), I find that the likelihood of adopting the printing press increase from around 8.6% to 19.6% when a Dominican order was present in a city. This association also cannot be explained by economic development (e.g., Gilmont, 1998), distance to the place the press was invented (Mainz) (e.g., Dittmar, 2011), university presence (e.g., Febvre and Henri-Jean, 1958), biographical conditions (e.g., Ahmed and Stasavage, 2020), the Black Death, and warfare (e.g., Dincecco and Onorato, 2016; Tilly, 1990).

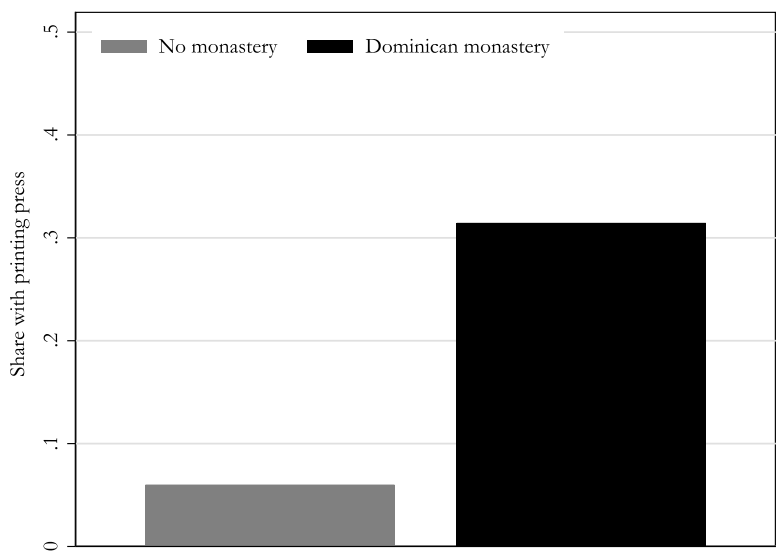

Figure 1: Share of Dominican and non-Dominican cities with a printing press by 1500 AD.

Note: The figure shows the difference in the share of cities with a printing press in 1500 AD among cities with and without a Dominican monastery in 1400 AD. Towns with a monastery are substantially more likely to adopt a printing press by 1500 AD. The data is presented in the "Data and empirical strategy" section.

In addition, I test an observable implication. The Franciscan monastic order was the Dominican order's main competitor (Doucette, 2021), and as a result they often established monasteries in the same cities. However, in comparison the Franciscans placed much less emphasis on education (Roest, 2000). Supporting this, I show that there is no correlation between Franciscan monasteries and the adoption of the printing press when a Dominican monastery is not also present and that cities with a Dominican monasteries and a Franciscan monastery are no more likely to have a press than cities with only a Dominican monastery. Furthermore, I provide evidence for the mechanism concerning the creation of a market for books. I show that Dominican cities were more likely to establish an university between 1216 and 1400, and subsequently, that cities with a university were more inclined to adopt the printing press. I provide suggestive evidence that Dominican cities have additional non university schools by 1400, and that areas with more Dominican monasteries have higher levels of education today.

I thereby make several contributions to our understanding of the diffusion of technology and Europa's development more generally. First, prior studies stress the importance of material conditions, such as financing, rulers (dis)interest, or simply chance in determining where the printing press was adopted (Clair, 1976; Dittmar, 2011; Febvre and Henri-Jean, 1958; Gilmont, 1998). However, I show that religion, and specifically religious ideas concerning the spiritual value of education, also played an important part in the diffusion of the printing press. This is in line with recent findings documenting an impact of religious movements and ideas on economic development, regime change, and state formation (Andersen *et al.*, 2016; Doucette, 2021; Doucette and Møller, 2021; Grzymala-Busse, 2022; Møller and Doucette, 2022; Rubin, 2017).

In addition, the positive implications of religious values for the spread of technology stands in contrast to much earlier literature that emphasize the negative influence of religion on innovation and the adoption of new ideas (e.g., Benabou *et al.*, 2022; Iyigun *et al.*, 2021; Mokyr, 2011; Squicciarini, 2020). This indicates, in line with the argument of Benabou *et al.* (2022), that religious beliefs sometimes co-exist with technological progress when doctrine is adapted to allow for the pursuit of new knowledge and technological progress does not challenge religion outright. This is, of course, exactly what happened later as the spread of the printing press spurred the Reformation (Rubin, 2014).

The Dominican Order and the Printing Press

The consensus among economic historians is that the diffusion of the printing press had a substantial and positive impact on economic development in European cities. In the following, I review this literature and discuss why a

printing press was established in some cities and not in others. Next, I present a short overview of the foundation of the Dominican order and the factors that influenced its spread. Finally, I propose that the presence or absence of the Dominican order explains why some cities adopted the printing press.

The Printing Press

Around 1440 in the German city of Mainz, Johannes Gutenberg invented the movable-type printing press. It made it possible to rapidly reproduce manuscripts, and as the invention spread the prices for books plummeted. It was primarily an urban technology because individuals that could read were located in cities. The technology had positive implications for economic development. Knowledge and know-hard could much more easily be transmitted. The better availability of books also made it possible for more people to become literate, as it was feasible for cities to run schools that used printed books. In addition, when books could be printed it was easier to employ other new technologies, as the need for human supervision decreased. The printing press also attracted new migrants such as students, illuminators, translator, and so forth. Overall, economic activity and increases in city population seemed to follow the press (Dittmar, 2011, p. 1136–41; Febvre and Henri-Jean, 1958; Grendler, 1990).

At first the printing press spread via the migration of workers that apprenticed under Gutenberg, and in a second step, workers that learned from Gutenberg's former apprentices spread the technology. This meant that cities located closer to Mainz were more likely to adopt the press (Dittmar, 2011, p. 1153). However, the initial investment in capital was prohibitive — it is estimated that it cost a craftsman roughly 7 years wages to establish a press. This meant that potential printers often required access to finance by urban merchants, implying that it was only possible to adopt the press in larger cities. The product, books, also required a sufficiently sizeable audience, which further underlined the importance of city size (Dittmar, 2011, p. 1155; Febvre and Henri-Jean, 1958; Wright, 1996). Cities with a university naturally had a larger audience for books, and thus they were also likely locations for the printing press.

Following earlier literature (e.g., Boerner *et al.*, 2021; Dittmar, 2011), this article examines the diffusion of the printing press across Europe from 1450 to 1500. During this period the press was adopted, to varying extent, within states located in all corners of the continent. As a result, book prices dropped more than two-thirds. In comparison, the technology was not fundamentally altered between 1500 and 1800, and therefore further decreases in book prices were relatively small (Febvre and Henri-Jean, 1958; Füssel, 2005). I propose that the Dominican order was an underappreciated driver of this diffusion.

The Dominican Order

The order was founded in 1216 by Dominic, and its first convent was established in Toulouse. Within a century it had spread to cities across most of Europe. It was aided in this by its decentralized system of representatives, which kept a degree of central control over the individual monasteries while retaining local autonomy (Finer, 1997, p. 1031; Hinnebusch, 1965, p. 217–32; Lawrence, 1994, p. 82–3; Prudlo, 2010, p. 1277). This system of representation also spread to cities wherein the order was located, as its friars, due to their education and continent-spanning network, were highly valued as administrators (Casagrande, 2013, p. 182–90; Doucette, 2021). However, the Dominican order also played a large role in the Inquisition and in promoting anti-Jewish preaching (Vose, 2013, p. 971–2).

Compared to earlier Benedictine monks that preferred seclusion, the Dominican order sought cities wherein they could pursue their studies and interact with wealthy merchants or craftsmen. The first factor was needed as the order valued intellectual pursuit as an important part of spiritual development — in fact they boasted that is was equally important to religious exercises. Regarding the second factor, commerce and economic activity provided several benefits for the order. Merchants supported the order economically in exchange for religious services or by legitimizing trade. A marketplace was also a good venue for preaching (Doucette, 2021; Garcia-Serrano, 1997, p. 23–5; Hinnebusch, 1965, p. 120–22, 279–87; Lawrence, 1994, p. 72–5, 80, 102–103; Showalter, 1973, p. 561–7). Due to their commitment to intellectual pursuits, the order produced many of the leading intellectual figures of the middle ages and the early modern period, such as Thomas Aquinas and Vincent of Beauvais (Vose, 2013).

As I argue in the next subsection, the order's focus on urban life and scholarly excellence had positive implications for the spread of the printing press.

Spreading the Printing Press

The printing press was likely to be established in cities that hosted a Dominican monastery for several reasons. First, the intellectual requirements for joining the order implied that its friars were potential buyers of books. In addition, the order's establishment of educational institutions helped spur a market for books among the general citizenry. Second, the printing press made the collection and dissemination of information much cheaper, thus aiding the friars in their own intellectual pursuit. Third, the press furthered the reach of the order's preaching.

The Dominican order required its members to be highly educated. No monastery were to be founded without a *doctor* or *lector* that could help

further the education of its associates. The order also created centers of higher learning, so-called *studia*, with the purpose of furthering the education of its members beyond what could be accomplished at the local monasteries (Giraud and Linde, 2021, p. 248–51; Hinnebusch, 1965). As the fifth Master General, Humbert of Romans (d. 1277), remarked (quoted in Giraud and Linde, 2021, p. 248–9):

> Study it not the end of the order, but is exceedingly necessary to secure its twofold end, namely preaching and the salvation of souls, for without study neither can be achieved

Thus, members of the order were capable of reading and were therefore potential buyers of books. In fact, monasteries were expected to keep local libraries to provide a supply of books to new recruits, and some members even curated their own personal libraries (Giraud and Linde, 2021, p. 252; Röhrkasten, 2017, p. 265). Consequently, many of the first printers targeted the monastic market (Beach and Cochelin, 2020, p. 994–95). Moreover, members of the order was also expected to teach the local clergy. In some cases, the presence of learned Dominican friars even provided the impetus for the creation of a university. This appears to have been the case in, for instance, Glasgow and Rostock. As a result, these cities saw an increase in the number of potential non-Dominican book buyers. The Dominicans also sometimes supplied teachers for local schools run by cities. The presence of Dominican monasteries therefore not only implied that the friars themselves were potential book buyers, but also that the share of readers among the general citizenry increased. Moreover, non-religious citizens often attended classes at the local Dominican monastery, which were generally open to the public. For example, Dante himself appears to have been a frequent visitor at the monastery in Florence (Foggie, 2003, p. 9; Giraud and Linde, 2021, p. 269–70; Hinnebusch, 1965, p. 317; Jakobsen, 2008, p. 142–44; Ulpts, 1995, p. 252–59). Overall, the market for printed book was thus expected to be larger in cities with a Dominican monastery.

The printing press gave Dominican intellectuals additional opportunities to gather information and disseminate their work. As stated, the press made the production of books significantly cheaper, which led book prices to decrease by more than two-thirds (Febvre and Henri-Jean, 1958; Füssel, 2005). As a result, Dominican monasteries were likely to see benefit from the press as it allowed them to expand their libraries cheaply. Thus, many monasteries offered both their premises and support to entrepreneurs willing to establish a printing press. An example was the convent of San Pedro Mártir in Spain that housed a printing press by 1483, which made it one of the first presses in the country (Vidal, 2015, p. 228–229). Other examples include Augsburg in Germany, Subiaco in Italy, and the convent of S. Jacopi di Ripoli that had one of the earliest presses in Florence (Kristeller, 1992, p. 99).

Often the monks did not execute the printing process themselves but instead relied on local entrepreneurs or invited printers. However, they organized and financed the printing workshops and designed the printing programs. Yet, as a result of the mismatch between the requirements of printing and monastic routine along with the non commercial aims of the printing programs, most monastic printing forays shuttered their doors within a relatively short time period. Thus, their main impact was to spread printing to new locations and to help local entrepreneurs acquire the expertise and capital needed to start their own printing enterprises (Eisermann, 2013, p. 47–67; Schmidt, 1997, p. 147).

The printing press was an effective tool for creating preaching material (Richardson, 1999, p. 27). It was, for instance, later used by Protestants to print pamphlets that agitated for religious change (Dittmar, 2011, p. 1164). As a result, the printing press made it easier for the Dominican order to reach a larger audience. Instead of only spreading their message to bystanders at the marketplace or to people that already attended their services, the order could now reach other citizens. As the potential new audience were literate, they were also more likely to match the ideal Dominican recruit. The Dominicans were interested in reaching a non clergy audience. They were some of the first to translate scripture into, for example, Italian, French, and German — even prior to the Lutheran German translation (Callus, 1941, p. 165).

Data and Empirical Strategy

Sample

As the printing press was an urban phenomenon, my sample consist of all European cities with at least 1,000 inhabitants by 1,400 (based on city population data from Buringh, 2021). In total the sample contains 1,901 cities located in 41 different countries.

Outcome

Data on the adoption of the printing press comes from the *Incunabula Short Title Catalogue* (2022), which has information on nearly all books printed using movable type in Europe (including their printers location) during the 1450 to 1500 period. This was the infancy of printing where the technology spread across European cities, resulting in a sharp decline in book prices (Jara-Gigueroa *et al.*, 2019, p. 4). This source is also used in other studies of the impact of the printing press (see Dittmar, 2011; Jara-Gigueroa *et al.*, 2019). My main outcome is an indicator equal to 1 in cities that had at least one printing press by 1500, and 0 otherwise. Two-hundred and five out of 1,901

cities adopt the press in the first 50 years after its invention. I also consider two alternative specifications of the outcome: first, the logged total number of printing presses adopted in each city by 1500; and second, the number of printing presses in 1500 per (1,000) capita in 1400.

Explanatory Variable

Data on the location of Dominican monasteries comes from the *Digital Atlas of of Roman and Medieval Civilization* (2018) and the *Atlas of Church History* (Jedin *et al.*, 1987). The main explanatory variable is an indicator equal to 1 in cities where a Dominican monastery had been established between 1216 and 1400, and 0 otherwise. Three-hundred and fifty-six out of 1,901 cities had a monastery.

Empirical Strategy

I assess the impact of having a Dominican monastery on the probability of adopting the printing press before 1500. A key worry is that the selection of locations for Dominican monasteries is affected by the religious affiliation and religious interests of rulers, and that rulers may also seek to bar or attract new technologies (Febvre and Henri-Jean, 1958). To mitigate this, I estimate regressions that include state fixed effects. Thus, the estimated coefficient for Dominican presence uses the difference in the presence of monasteries and printing presses within states in 1400. Figure 2 presents the distribution of cities, monasteries, and states in 1400. The closer examination of Burgundy illustrates the within-state approach, as the variation in where the order is located vary even within small areas. There are 23 cities in each state on average. I also consider an alternative specification using 2 degree by 2 degree grid fixed effects (nine cities in each grid on average). Specifically, I estimate variants of the following specification using Ordinary Least Squares (OLS):

$$Press_{i,t=1500} = \gamma_s State_{i,t=1400} + \beta Dominican_{i,t=1400} + \epsilon_i \qquad (1)$$

where $Press_{i,t=1500}$ is a dummy indicating whether a printing press was adopted in city i by 1500 ($t = 1500$). γ_s are state fixed effects. β is the quantity of interest as it gives the difference in probability of adopting the printing press between non-Dominican and Dominican cities. Some specifications include a vector of coefficients ($\mathbf{X_i}$) for additional variables that also determine technology adoption and monastic locations.

Alternative Explanations

The Dominican order preferred larger cities, as it gave them better opportunities to attract wealthy patrons and educated members (Doucette, 2021, p. 726;

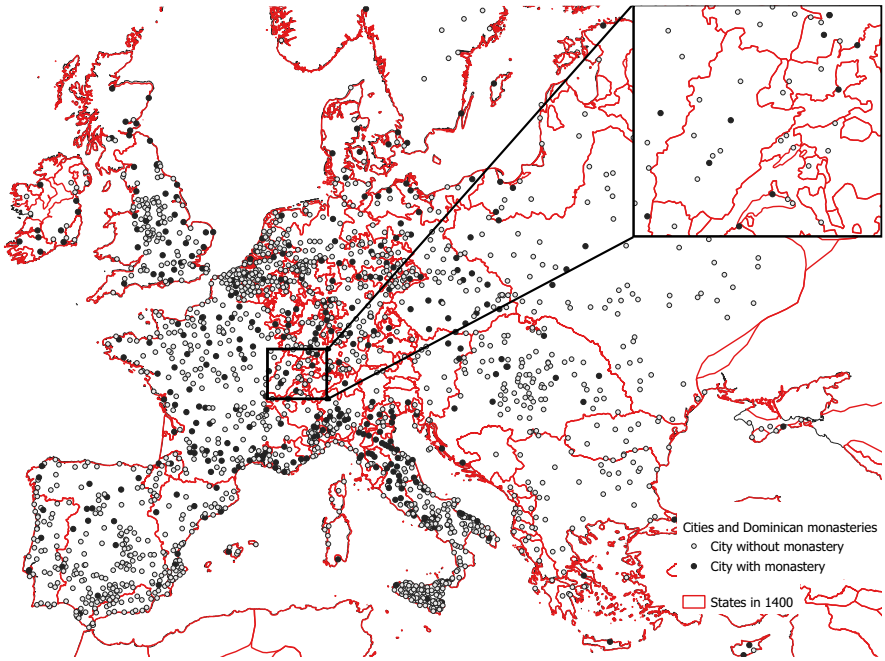

Figure 2: Dominican monasteries and European states in 1400.

Note: Data on state borders in 1400 is from *Euratlas* (Nüssli and Nüssli, 2008).

Garcia-Serrano, 1997, p. 23–5; Lawrence, 1994, p. 72, 80, 102–3). Bigger cities were more likely to adopt printing presses, as there was a larger market for books and better access to finance (Dittmar, 2011; Gilmont, 1998). Thus, I control for the logged population of each city in 1400, pct. city growth between 1000 and 1400, and the market potential of each city in 1400 (data on city size from Buringh, 2021).[1] Universities create a market for books and they attract the Dominican order (Hinnebusch, 1965, p. 279; Lawrence, 1994, p. 72, 80, 102–3). As a result, I account for whether there is a university prior to the beginning of the Dominican order (in 1215), and the distance to the nearest university. I also include an indicator measuring if a city was located on a Roman road (data from McCormick *et al.*, 2013), as connection to the road network made it easier for both the Dominican order and technology to spread. Conflict spurred the migration of peoples and their technologies (Dincecco and Onorato, 2016), and thus a measure of the numbers of battles that occurred within 2 degrees of each city between 1000 and 1400 is included

[1]Market potential is measured using the urban potential index as described in (Bosker *et al.*, 2013).

(data from Kitamura, 2021). The black death killed a large share of European city dwellers and altered the institutional trajectory of cities as a result (e.g., Gingerich and Vogler, 2021). Hence, I control for the interpolated share of citizens that died due to the plague (based on mortality data for 59 European cities from Gomez and Verdu (2017)). The next variable is the distance to the birthplace of the printing press, Mainz, as it is a strong predictor of adoption (Dittmar, 2011). Other monasteries may also increase the demand for books, thus I account for the number of non-Dominican monasteries within 20 km of a city in 1400 (based on data on Franciscan monasteries (Doucette, 2021), Cluniac monasteries (Doucette and Møller, 2021, Cistercian monasteries (Andersen *et al.*, 2016), and early medieval monasteries (Åhlfeldt, 2011)). Bio-geographical conditions foster both urban development and the likelihood of technological diffusion (e.g., Ahmed and Stasavage, 2020; Hibbs and Olsson, 2004). Therefore, I include controls for latitude, longitude, elevation, suitability for agriculture and variation in suitability, river and sea access, and rainfall and temperature during the growing season (data from EEA, 2019; Fick and Hijmans, 2017; Galor and Özak, 2016; Nüssli and Nüssli, 2008). Table 1 presents descriptive statistics for all variables presented thus far.

Table 1: Descriptive statistics.

Variable	Mean	SD	Min	Max
Main variables				
Any printing press	0.11	0.31	0	1
Dominican monastery	0.19	0.39	0	1
Controls				
Ln(city size, 1400)	0.68	0.84	0	4.50
Pct. growth, 1000 to 1400	2.35	4.7	−0.9	59
Market potential	90.1	35.7	0	145.9
University in 1215	0.002	0.045	0	1
Distance to uni. (km)	498	344	0	2173
Battles, 1000–1400	2.88	4.75	0	36
Black Death mortality	50.9	10.0	0	75
Distance to Mainz (km)	891	496	0	2652
Other monasteries	2.1	2.4	0	25
Elevation	202	227	−4	1333
Agri. suit.	2108	406	0	3042
Var. in suit.	48.9	88.3	0	1083
Temperature	13.9	2.2	3.55	20.5
Rainfall	60.7	20.9	14.9	151.7
River access	0.14	0.35	0	1
Sea access	0.10	0.30	0	1

Note: Based on sample of 1901 cities.

Results

Descriptive Evidence

This section compares the share of cities that adopted the printing press in cities with and without a Dominican monastery. It does this across different city sizes. In cities with a Dominican monastery there is a higher share with a printing press no matter the population of the city.

Table 2 contrasts, by city size, the share of cities that adopted the printing press across monastic presence. In small agglomerations (around 1,000 inhabitants), cities with a Dominican monastery were more than three times as likely to have a printing press. When looking at medium-sized cities (1,001–5,000 inhabitants), the likelihood roughly doubles in Dominican cities. Finally in large cities (>5,000 inhabitants), the share changes from 32.4% in non monastic cities to 63.1% in cities with a Dominican monastery. Thus, having a Dominican monastery is positively associated with having a printing press no matter the size of the city.

Regression Analysis

This section shows that Dominican monasteries are correlated with a higher likelihood of adopting the printing press even when accounting for differences in lordly control and other city characteristics.

Table 3 regresses the adoption of the printing press on the presence of a Dominican monastery by 1400. According to model (1), Dominican cities enjoyed a 25 percentage point higher likelihood of adopting a printing press. This estimate is unchanged when state fixed effects are included in model (2). When a full set of controls are included in model (3), the coefficient drops slightly. However, cities with a Dominican monastery remain about 11 percentage points more likely to adopt the printing press. This corresponds to a 0.35σ change. This suggests that the impact of the Dominican order on

Table 2: Share with printing press by monastery presence and city size.

	Share with printing press	Share with printing press	Share with printing press
No monastery	1.4%	8.0%	32.4%
Dominican monastery	5.4%	19.4%	63.1%
City size in sample	1,000	1,001–5,000	>5,000
Cities in sample	919	758	224
Dominican monasteries in sample	74	160	122

Note: Based on sample of 1901 cities.

Table 3: Regression analysis of Dominican presence and the printing press.

	(1) Printing press	(2) Printing press	(3) Printing press	(4) Printing press
Dominican	0.254***	0.247***	0.107***	0.097***
	(0.025)	(0.025)	(0.024)	(0.024)
State FE	No	Yes	Yes	No
Controls	No	No	Yes	Yes
Grid FE	No	No	No	Yes
Observations	1901.000	1876.000	1875.000	1862.000

Note: Estimated using OLS. Robust standard errors in parentheses $^{+}0.1$, $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

adoption of the printing press was substantial. Using grid rather than state fixed effects in model (4) does not alter this conclusion.

Tables A1 and A3 in the Online Appendix, shows that these findings remain when using alternative outcomes (logged number of presses and the number of presses per 1,000 capita), and when using Logit rather than OLS. A worry might be that the results does not adequately control for the impact of universities. However, controlling for university presence in 1400 might induce post-treatment bias as the order spurred interest in education. Reassuringly, adding a control for the presence of a university in 1400 (and distance to the nearest university in 1400) does not substantially change the findings.[2]

Observable Implication

The Dominican order had a preference for wealthier cities with an active cultural life (e.g., Doucette, 2021), and thus their selection was unlikely to be as-if random with respect to cities' propensity to adopt new technology. To mitigate this concern somewhat, I compare the Dominicans with their main competitor — the Franciscan order — which had similar selection criteria. This section finds that only the Dominicans and not the Franciscans are correlated with the adoption of the printing press.

The Franciscan order was founded in 1209 by Francis of Assisi. Its members sought to forsake material possessions and live in poverty — preferably in cities where its monks could support themselves via begging. Founded almost at the same time as the Dominicans, the two orders were competitors for the attention and gifts of townspeople. Thus, the two orders spread to many of the same cities. Crucially, however, the Franciscans placed no special value on

[2]The coefficient in the most restrictive model, column (4) in Table 3, changes from 0.097*** to 0.090***. There is furthermore no evidence of an interaction between university presence in 1400 and the impact of the Dominicans.

education, and thus there is less reason so suspect that they were related to the adoption of the printing press (except in the sense that they might have attracted a Dominican monastery) (Roest, 2000; Southern, 1970).

I track the location of Franciscan monasteries established before 1400 using the *Digital Atlas of Roman and Medieval Civilization* (2018) and the *Atlas of Church History* (Jedin *et al.*, 1987). Figure 3 shows the predicted probability that a city has a printing press based on the composition of monasteries in the city. Cities with no monastery or a Franciscan monastery have a similar likelihood of adopting the printing press (around 9%). This increases by approximately 8 percentage points when a Dominican monastery is present. A similar increase is visible for cities with a Dominican and Franciscan monastery. Note, however, that there is no significant difference in the predicted probability of adopting the printing press when comparing cities that have a Dominican monastery to cities that have both a Dominican and Franciscan monastery. Thus, the Dominican order but not the Franciscan order seems to be related to the adoption of the printing press. Similarly, the coefficient on other monasteries is small and non-significant (0.007, SE=0.006). Consequently, the relationship does not just reflect a general impact of the Catholic Church.

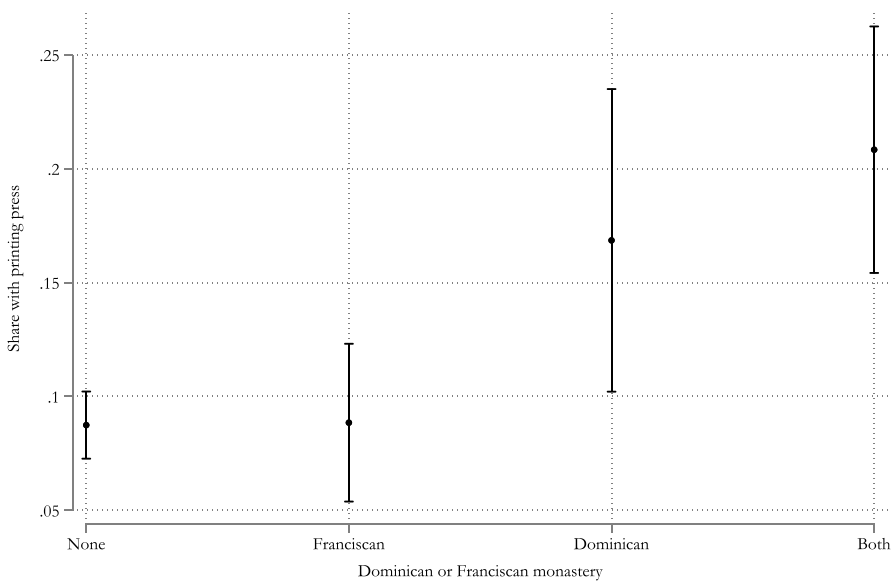

Figure 3: The printing press and Franciscan and Dominican monasteries.

Note: Estimated using OLS. Based on the specification from model (3) in Table 3. Franciscan monasteries are discounted from the *Other monasteries* control variable.

Dominicans and Education

As noted, one explanation for the results is that the Dominican order spurred interest in education, thus increasing the market for books. This section documents (i) that cities with a Dominican monastery were more likely to establish a university between 1216 and 1400, (ii) that cities with a university were more inclined to adopt the printing press, (iii) that cities with a Dominican monastery were more likely to have non-university school by 1400, and (iv) that areas with a Dominican presence have higher levels of education today.

First, I correlate Dominican presence with university creation between 1215 and 1400 (based on data from Bosker *et al.*, 2013, checked against de Ridder-Symoens, 1996). Table 4 shows the results. Cities with a Dominican monastery are more likely to establish a university. According to model (3), the probability of establish a monastery increases from 1.1% to 3.8% when a Dominican monastery is present. Once a city has a university, it is much more likely to adopt the printing press. In fact, regression results suggest that a university increases the likelihood of adoption by 38 percentage points (see Table A2 in the Online Appendix).

The Dominican order may also have spurred interest in education more generally. If this is the case, I might expect that areas with a Dominican presence have additional non university schools by 1400. I use data on construction activity in German cities from (Cantoni, 2020). It covers 232 German cities that are also part of my sample. I find that 0.6% (1 out of 182) non-Dominican cities have a non university school by 1400, while 6.4% (3 out of 50) Dominican cities have a school.

Finally, I investigate the relationship between the historical share of cities with a Dominican monastery (weighted by population size in 1400) and the share of the population (ages 25–64) with a tertiary education at the NUTS2

Table 4: Association between Dominican order and universities.

	(1) University, 1216–1400	(2) University, 1216–1400	(3) University, 1216–1400	(4) University, 1216–1400
Dominican	0.059***	0.056***	0.027*	0.023^{+}
	(0.013)	(0.013)	(0.010)	(0.012)
State FE	No	Yes	Yes	No
Controls	No	No	Yes	Yes
Grid FE	No	No	No	Yes
Observations	1,901.000	1,876.000	1,875.000	1,862.000

Note: Estimated using OLS. Robust standard errors in parentheses $^{+}0.1$, $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

Table 5: Association between Dominican order and education levels in 2011.

	(1) Share ter. edu., age 25–64	(2) Share ter. edu., age 25–64	(3) Share ter. edu., age 25–64
Share with Dominican (population weighted)	4.512*	3.607*	2.448^{+}
	(1.960)	(1.499)	(1.437)
Country FE	No	Yes	Yes
Controls	No	No	Yes
Observations	235.000	225.000	225.000

Note: Estimated using OLS. Robust standard errors in parentheses $^{+}0.1$, $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.
Unit of analysis is NUTS2 region in 2011. All controls are averages across all cities in each NUTS2 region.

level in 2011.[3] Table 5 reports the findings. Based on model (3), if the Dominican order is present in all cities in a region, the share of the population (aged 25–64) with a tertiary education increases by 2.4 percentage points (equal to a 0.25σ change in the share). Adding a control for university presence in 1400 does not alter this finding.[4] Thus, there is further evidence that the impact of the Dominican order may go through an increase in the education level of city populations. Finally, I investigate the relationship between the historical share of cities with a Dominican monastery (weighted by population size in 1400) and the share of the population (ages 25–64) with a tertiary education at the NUTS2 level in 2011.[5] Table 5 reports the findings. Based on model (3), if the Dominican order is present in all cities in a region, the share of the population (aged 25–64) with a tertiary education increases by 2.4 percentage points (equal to a 0.25σ change in the share). Adding a control for university presence in 1400 does not alter this finding.[6] Thus, there is further evidence that the impact of the Dominican order may go through an increase in the education level of city populations.

Conclusion

The spread of the printing press had monumental consequences for the economic transformation of Europe. This article shows that the Dominican order played

[3]NUTS2 is an sub national administrative unit used by the European Union. There is, on average, 11 NUTS2 regions per country in my sample. Data from Eurostat (2011).

[4]The coefficient is still 2.4

[5]NUTS2 is an sub national administrative unit used by the European Union. There is, on average, 11 NUTS2 regions per country in my sample. Data from Eurostat (2011).

[6]The coefficient is then 2.1. There is also no evidence of an interaction.

an important part in diffusing the technology across European cities. The order placed high value on education and intellectual engagement. In its efforts to promote these values it expanded the market for books and it early on saw the value of printing. The presence of a Dominican monastery greatly increased the likelihood of adopting the printing press from 8.6% in non-Dominican cities to 19.6% in Dominican cities. Furthermore, the article documents that areas with Dominicans saw additional educational institutions and have higher levels of education today.

Since Weber's (1905) seminal work, it has been discussed whether the ideological content of religion have mattered for European development (see also, e.g., Andersen *et al.*, 2016; Cantoni, 2015; Gorski, 2003). However, recent work on the influence of the Catholic Church and the Reformation have generally emphasized not their ideology but rather their influence on political machinations and institutional innovations (e.g., Cantoni *et al.*, 2018; Doucette, 2021; Figueroa, 2023; Grzymala-Busse, 2022; Møller and Doucette, 2022). Yet, this article shows that the spread of the printing press and human capital formation in Europe more generally was a consequence of religious ideas concerning the value of education (see also Becker and Woessmann, 2009). Thus, the main impact of religious ideas on European development may not be via any direct effects on economic development or state formation but rather via their effects on human capital accumulation.

The Dominican order had a profound but varied influence. The order's early representative institutions inspired secular imitation and institutional development in cities were it was present (Doucette, 2021). Moreover, its strong ideas concerning education accelerated the adoption of the printing press and the accumulation of human capital. On the other hand, the order's later important role in the inquisition and its dedication to eradicating sin and heresy mar its legacy (see, e.g., Vose, 2013). The heterogeneous and time-varying effects of just the Dominican order does question the analytical usefulness of treating, for example, various Catholic Church institutions as similar units with common effects (e.g., Schulz *et al.*, 2019). Future studies of religion would do well to carefully specify the exact institutions and periods that matter for an outcome.

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