

Medieval Universities, Legal Institutions, and the Commercial Revolution

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Abstract

Europe experienced a “Commercial Revolution” in the late Middle Ages, with urbanization and trade expanding across the continent. We present newly-collected evidence on the Commercial Revolution: a comprehensive dataset encompassing 2,256 incorporated cities in Germany, indicating their dates of incorporation and the granting of market rights. We then use this information to test whether formal legal institutions supported market establishment. We argue that the universities of medieval Europe, which developed the continent’s legal systems and trained the individuals who served in them, contributed to the development of formal legal institutions. We then exploit the arguably exogenous creation of universities in Germany following the Papal Schism to test for a causal relationship between legal institutions and market establishment. Our findings suggest that university establishment and legal development significantly increased economic activity.

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1 Introduction

The late Middle Ages saw the first stirrings of the “Rise of the West.”¹ Between the year 900 and the year 1500, Europe experienced a Commercial Revolution and awoke from centuries of economic slumber, with cities growing and trade expanding. This flowering of the European economy set the stage for modern Europe’s exploration and colonization of the world, and its institutional and political development on the path toward modern growth.²

Economic historians have documented this story of remarkable change using a variety of sources: from the rise of fairs (Epstein, 2000), to the expansion of cities (Verhulst, 1999), the increased output of books (Buringh and van Zanden, 2009), or the growth of population and urbanization (McEvedy and Jones, 1978, and Bairoch et al., 1988). However, a great deal of mystery still surrounds Europe’s late medieval development. When did European cities and trade begin to increase? How did this vary across the continent? Most importantly, what else changed that allowed Europe to transform itself from a poor, rural, backward society (relative to the Chinese and Islamic civilizations), into an international power?

A central question is: what protected medieval Europeans’ property, and how were contracts enforced, in an age with extremely fragmented political units and high transportation (and information) costs?³ Trade between parties requires one individual to trust that the other will fulfill his or her end of the exchange. If individuals can easily avoid fulfilling their obligations in a transaction, by escaping to another jurisdiction, by hiding

¹See, for example, Lopez (1976), North and Thomas (1973), and Buringh and Van Zanden (2009).

²Studies linking medieval and early modern institutional and economic development to modern growth include Acemoglu, Johnson, and Robinson (2005) and Allen (2009).

³Acemoglu and Johnson (2005) draw a distinction between “property rights institutions” (which protect against confiscation by the state and by elites) and “contracting institutions” (which protect property rights *vis a vis* one’s peers). Both were lacking in early medieval Europe. See Greif (1993) and Greif, Milgrom, and Weingast (1994).

their behavior, or by using force, fewer transactions will occur. In modern societies, courts enforce contracts and the police protect individuals from the use of force by others; but how did individuals in medieval Europe solve the “fundamental problem of exchange”?⁴

Prior work in this area has concentrated on informal, private institutions (such as coalitions of trader-merchants and guilds).⁵ This work has argued that, facing the threat of appropriation from agents or from authorities, merchants devised institutional mechanisms that promoted trade.⁶ On the other hand, Harold Berman (1983) has argued that a common formal legal system spread throughout (Western) Christendom in the Middle Ages, facilitating Europe’s economic and institutional development.⁷ Avner Greif (2006) argues that as the scale of trade increased in the late medieval and early modern periods, formal legal institutions became necessary to support further economic expansion.

Testing whether formal legal institutions played an important, causal role in the Commercial Revolution is a difficult task. Most fundamentally, the data required for a quantitative test have simply been lacking; in addition, because legal institutions might develop in response to commercial activity (and both might respond to some other factor), identifying a causal effect would require plausibly exogenous variation in the quality of formal legal institutions.

The first purpose of this paper is to address the current paucity of direct, systematic and quantitative evidence on the timing and spread of the Commercial Revolution. We present data on the establishment dates of 2,256 German⁸ cities, as well as the dates when

⁴Greif (2000).

⁵Greif (1993) and Greif, Milgrom, and Weingast (1994).

⁶In the case of the Maghribi traders’ coalition, merchants’ agents’ behavior was kept in line by the threat of punishment by the entire coalition; in the case of merchant guilds, punishment of confiscatory authorities could be sustained by an entire guild, thus reducing the incentive to confiscate.

⁷The contrast between the view that informal, bottom-up institutions were paramount, and the view that formal legal institutions were the critical innovation is drawn in Van Zanden (n.d.).

⁸The modern state of Germany did not exist in the period under consideration; our data cover the regions of Germany within its 1937 borders (excluding East Prussia, which was not considered part of the Holy Roman Empire). For brevity, we use the anachronism “Germany” throughout the paper.

these cities received grants to hold markets, collected from the *Deutsches Städtebuch*, several volumes edited by Erich Keyser (1939-1964).⁹ The grants to hold markets are direct indicators of increased economic activity; the markets established under the grants took a variety of forms, and they were granted to cities large and small. This dataset thus captures economic changes in medieval Europe that occurred inside and outside large, urban areas.

Our data on market establishments from the Middle Ages up to the year 1500 provide quantitative evidence of the Commercial Revolution in Germany. They also allow us to test the role of formal legal institutions in encouraging economic activity due to a unique natural experiment. Formal legal institutions in medieval Europe were intimately tied to the newly-created universities of the time: universities trained lawyers, who became administrators, and staffed the legal system that they helped to develop and spread across Europe.¹⁰ Church politics—the Papal Schism of 1378—resulted in the establishment of Germany’s first universities, and thus in arguably exogenous variation in the quality of formal legal institutions. Our second purpose in this paper is to exploit this natural experiment to test whether economic activity (market establishment) responded to the development of formal legal institutions (university establishment due to the Papal Schism). Indeed, we find evidence that the rate of German market establishment sharply increased in the decades following the establishment of Germany’s first universities.

We proceed as follows. In Section 2, we provide an overview of the Commercial Revolution, presenting data collected by other scholars that point to a dramatic change in Europe’s economy, and presenting our newly-collected data on economic changes in late medieval Germany. In Section 3, we present historical evidence of a strong association

⁹To be included, a “city” must have been incorporated prior to the compilation of the *Städtebuch*; the sizes of these cities today vary greatly from several hundred inhabitants to millions.

¹⁰Murphy, Shleifer and Vishny (1991) argue that more lawyers are not always beneficial for growth.

among the Commercial Revolution, the establishment of the first universities, and the development of formal legal systems in Europe. In Section 4, we discuss the challenge of identifying a causal effect of legal institutions on economic activity, and describe how the Papal Schism can be seen a source of exogenous variation in universities and legal institutions. In Section 5, we use our dataset to test for a causal effect of formal legal institutions on market establishment. In Section 6, we offer some concluding thoughts.

2 Documenting the Commercial Revolution

2.1 Existing Evidence

Beginning around the tenth century, there was a revival of trade within the continent and growth of trade with nations outside Europe.¹¹ Increased trade and improved farming technology (which produced agricultural surpluses) allowed for larger urban populations. Robert Lopez describes the Commercial Revolution as follows: “When food surpluses increased, it became possible to release more people for governmental, religious, and cultural pursuits. Towns re-emerged from their protracted depression. Merchants and craftsmen were able to do more than providing a fistful of luxuries for the rich.”¹²

Douglass North and Robert Paul Thomas tell a similar story: “The revival of trade and commerce in the eleventh and twelfth centuries led not only to the proliferation of towns but to a host of institutional arrangements designed to reduce market imperfections. As new towns developed their own governments for administration and protection, they necessarily evolved bodies of law to adjudicate disputes arising from these new condi-

¹¹After the decline of the (Western) Roman Empire (in 476), there was little trade throughout Western Europe. There seems to have been a revival of economic activity in the Carolingian Empire, but it was not sustained. See van Zanden (n.d.).

¹²Lopez (1976), p. 56.

tions.”¹³

Unfortunately, only very limited data for the period are available to support this grand narrative. Thus, to compare economic development across European regions during the Middle Ages, Buringh and Van Zanden (2009) rely on the fraction of a region’s population living in cities with populations greater than 10,000, and on manuscript production. Each should be correlated with the volume of economic activity: higher urbanization rates depend on trade, as goods must move from the country to the city; manuscript production would have been greater when incomes were higher and the demand for books (a luxury) was greater.¹⁴ In Figure 1, we present Buringh and van Zanden’s data on these indicators of economic activity.¹⁵ They clearly indicate the dramatic changes experienced in Europe between the years 900 and 1500: in 900, Western Europe had only about 1% of its population living in cities with more than 10,000 people; by 1500, the urbanization rate for Western Europe stood at over 8%, with peaks of over 10% and 20% in the Netherlands and in Belgium, respectively. Similarly, manuscript production soared in the late Middle Ages, rising from less than 100,000 manuscripts per century to over 4 million.

In fact, aggregate urbanization figures for Western Europe conceal regional variations. Figure 2 plots urbanization rates for four European regions, Italy, France, the Netherlands (including Belgium), and Germany. While Italy took off early in the 11th and 12th centuries, and remained at a stable level of 13% urban population afterwards, France had a smoother path of moderate increases in urbanization rates. Germany’s urbanization rate remained constant at 5% during the period 900–1500, whereas Belgium and the Nether-

¹³North and Thomas (1973), p. 12. North and Thomas’ narrative takes increased trade as a given, which then led to new institutions and further trade. Clearly, the causation between improved institutions and increased trade can, and likely did, go in both directions. While we believe that improved institutions played a causal role in expanding trade in the Middle Ages, we do not make the argument that improved institutions caused all of the increased trade, nor that they were not at least in part a response to increased trade.

¹⁴Urbanization rates have often been used as indicators of economic development. See, for example, Acemoglu, Johnson, and Robinson (2002) and Cantoni (2009).

¹⁵The data can be found in Buringh and van Zanden (2009).

lands increased their share of urban population strongly and consistently over time.

[Figure 1 about here]

[Figure 2 about here]

Buringh and Van Zanden (2009) present two additional panel datasets that shed light on the institutional development of medieval Europe. In the second graph of Figure 1, we present their data on the number of monasteries and the number of universities in European regions. To the extent that the development of these institutions required additional resources, they may indicate greater productivity. As was the case for urbanization and manuscripts, one can see that the late Middle Ages saw striking changes in European society, with more monasteries and more universities across Europe.

The data presented in Figures 1 and 2 match the narrative presented above: Europe changed dramatically between 900 and 1300. Yet, the data presented are only partially reflective of economic activity; moreover, they are extremely coarse measures of economic change, available only at long time intervals, and completely ignoring the institutional developments that likely affected most Europeans at the time: the establishment of local markets and incorporation of smaller towns and cities that we examine next.¹⁶

2.2 New Evidence on the Commercial Revolution in Germany

The *Deutsches Städtebuch* compiles, for all of Germany, information on each incorporated unit, including the date a city was first mentioned, the date it was formally incorporated, and the dates when it received a “market privilege” from the Emperor to hold markets and

¹⁶Epstein (2000, p. 74) notes that “[t]he daily and weekly markets where most small-scale retailing took place” are often ignored by scholars.

fairs.¹⁷ The market privilege was a formal document that gave a local lord the right to tax trade in a formal market, to coin money and to require its use in the market; in exchange for these rights, it required the lord to guarantee the protection of merchants en route to, and present at, the market—this included the provision of courts and the establishment of standard measures.¹⁸ Because it was in a local lord’s interest to receive a market privilege recognizing markets in his region as quickly as possible (to receive tax revenues), we can treat the granting of a market privilege as an event marking market establishment.¹⁹ Many cities had multiple market privileges granted; for all cities, we collected data on all of the years in which they were granted a market privilege, throughout the Middle Ages, up to the year 1700.

This information provides direct evidence of the establishment of hundreds of cities and markets during the Middle Ages. In Figure 3 we show the number of city incorporations and market establishments. The top graph displays absolute numbers of incorporations and market grants in 10-year moving averages; the bottom graph displays the cumulative number of cities incorporated or markets established at each point in time.²⁰ The figure reveals a dramatic rise in city incorporations in the German lands in the 13th century; the average number of cities incorporated per year increased from less than one to approximately four. In fact, our comprehensive dataset casts doubts on the view, commonly held in the literature, that the years 1150–1250 are to be considered the “phase of city foundations;”²¹ by the evidence in Figure 3, this term would be more appropriate for

¹⁷Missing information, and uncertainty regarding some dates is an undeniable problem. However, it is typically clear when there is such uncertainty, and we do not include in our analysis market or city establishments whose dates are uncertain.

¹⁸Schmieder (2005), p. 49.

¹⁹We recognize that the measure is imperfect; it might, for example, capture changes in the capacity of the state.

²⁰Since some city incorporations, and many market grants, do not have an exact date reported (or none at all), we prefer to use the term “cumulative city incorporations/market establishments” instead of “total number of cities/markets established.”

²¹Schmieder (2005), p. 86.

the period 1220–1370.

The granting of market rights also accelerated during the 13th century, albeit considerably more slowly. In many cases, the incorporation of a city was explicitly linked to the creation of a market; if evidence of both could be found in the *Städtebuch*, this will be reflected both in our city incorporations and market grants time series. But in many cases, no explicit mention of markets is made in the *Städtebuch* when a city incorporation is reported; to the extent that the city charters explicitly or implicitly included the rights to hold a certain number of markets or fairs, therefore, our time series of market grants will underestimate the actual number of markets.²²

During the 14th century, the comovement of city incorporations and market grants becomes evident, indicating a clear tendency toward greater urbanization and expanded economic activity; a tendency which is not even affected by the Black Death of 1348. Toward the end of the 14th century, however, the two series begin to diverge. City incorporations subside, while the number of markets granted per year remains high, varying between approximately 2–6 markets per year.

[Figure 3 about here]

Importantly, the trends displayed in Figure 3 are not limited to large urban areas, but are experienced much more broadly, reflecting economic activity and urbanization over the whole of Germany. A comparison of our city establishment time series with Buringh and Van Zanden's (2009) urbanization data for Germany is quite striking: from a comparison of Figures 2 and 3, one can see that while Germans were not moving to large cities (over 10,000 inhabitants) much more often throughout the 13th and 14th centuries, they were establishing hundreds of smaller cities at that time. Markets were being regularly

²²To take into account this degree of ambiguity, in our empirical analyses below we consider two dependent variables: the market establishment rate on its own, and the rate of market establishments and city incorporations combined.

established as well, indicating a much more dynamic German economy at the time than would be inferred from the urbanization data.

Other interesting patterns emerge when we disaggregate the data collected by region. Figure 4 displays the performance of cities west and east of the Elbe. The Elbe river has traditionally been seen as demarcating the the boundary between two clearly distinct parts of Europe, with diverging institutional, cultural and economic evolutions.²³ East of the Elbe, the mobility of labor was severely restricted as a result of the Black Death pandemics, and after 1500 in particular, resulting in the process known as “second serfdom.”²⁴ In fact, the graphs in Figure 4 show that these two regions started to follow different paths much earlier. City incorporations move in similar directions both west and east of the Elbe until around 1250, when the number of incorporations sharply drops in the east. This trend is continued until the mid-14th century, when incorporations east of the Elbe rise briefly, only to fall to near-zero levels again after the Plague outbreaks of 1348. At the same time, after 1250 regions west of the Elbe expanded their number of cities at an increasing rate. The number of city incorporations dropped considerably only during the second half of the 14th century.²⁵

Even more striking is the different evolution of market establishments west and east of the Elbe. While in the west a trend toward more market grants per year is visible over the whole period 1200–1400 (albeit with high variability), in the east market establishments languished at a level only slightly above zero. The cumulative numbers of incorporations and markets (graphs in the lower half of Figure 4) reflect these patterns of yearly rates,

²³Hajnal (1965).

²⁴Dittmar (2009).

²⁵It should be noted that the region labeled “east of the Elbe” represents 23.5% of the land surface covered by our dataset. If the dependent variable of interest was “city incorporations per square kilometer” instead, the area east of the Elbe would have experienced a relatively higher rate (compared to the west) before 1250. Such a correction, however, would leave the observations about the changes in relative trends, and about their timing, unaffected.

with an evident backwardness of the region on the east of the Elbe, in particular with regard to markets.

[Figure 4 about here]

Another way to examine different regional evolutions in the German lands of the Empire is to single out regions that were under control of the Roman Empire, as opposed to those occupied by Germanic tribes. The border between these regions was marked by the *Limes Germanicus*, a fortified frontier stretching from the Danube in Bavaria to the Lower Rhine in the Netherlands, from about AD 9 to the late third century. In Figure 5 we classify the cities in our dataset as lying within the *Limes* or outside (in the Germanic area). In fact, the two areas show very similar evolutions, with the bulk of city incorporations concentrated around the year 1300. Similarly, the concessions of market rights increase steadily from the year 1200 onward and reach their highest levels around the year 1400, both within and outside of the *Limes*.

[Figure 5 about here]

Our efforts represent the first attempt known to us to compile a comprehensive dataset on the establishment of markets over a large region in late medieval Europe. We now use these data to examine the impact of legal institutions on market establishment.

3 Universities, Legal Training, and the Commercial Revolution

How might legal institutions and the establishment of medieval universities have promoted the expansion of economic activity observed during the Commercial Revolution? We discuss the mechanism in stages: first, we present evidence that codified law—a legal system—arose in Europe at the time of the Commercial Revolution and had the potential

to play an important role in promoting commerce; second, we show that the university was an institution created at the time of the Commercial Revolution that provided training in the law and promulgated a system of laws across Europe; finally, we present historical evidence that those individuals who were trained in the law at universities went on to fill important posts in public administration.

3.1 The Establishment and Importance of a System of Laws

The time of the commercial revolution was also the time of the rediscovery of Roman law in Europe.²⁶ The Justinian Code, rediscovered around 1070, provided the foundation for a legal system that could enforce contracts and define the relationship between the rulers and the ruled. The Code became the “core curriculum” at Europe’s first university, in Bologna.

Although the Justinian Code was first the subject of lectures in Bologna, over the centuries it formed the basis of the civil law curriculum in universities throughout Europe. Doctors of law at the universities wrote glosses on (interpretations of) the Code and lectured on these to their students; as their students spread throughout Europe (students came to Bologna from across Europe), the legal system in which they were trained spread, too.²⁷

In the German lands of the Holy Roman Empire, which are the focus of our analysis, Roman law was slowly introduced in the late Middle Ages as well.²⁸ While formal adop-

²⁶We join legal scholars in attaching preeminent importance to the rediscovery of the Justinian code, as opposed to other codifications of that epoch, such as the *Sachsenspiegel*.

²⁷It is also important to note that students trained in a university shared a common experience, a mastery of Latin, and a similar course of study. Thus, universities may have had a positive social network effect on their students, which itself could have promoted trade.

²⁸Legal rules other than Roman law *per se* were developed and applied to commercial activity in Germany during the Middle Ages. For example, a set of legal rules governed the behavior of brokers, who brought together buyers and sellers in some medieval markets. Boerner and Quint (2007) argue that the legal rules regulating broker behavior were generally efficient.

tion did not occur until the late 15th century, typical institutions of Roman law entered the political and commercial sphere earlier than that, thanks to the Church and some territorial lords.²⁹ As argued by Wieacker (1967, pp. 101–112), the rise of territorial states within the Empire was a fundamental factor favoring the reception of Roman law. The Church’s competence in cases which would today be regarded as purely belonging to secular law was another factor.³⁰ Public notaries, who helped to secure property rights and were often linked to the Church, were yet another vehicle through which Roman legal concepts entered the public sphere in Germany.³¹

The adoption of Roman law culminated in the creation of arbitration courts, such as the one in Leipzig (founded 1432), which was composed of faculty members of the local university, and supreme courts within the states of the Empire (Saxony 1483, Württemberg 1495, Palatinate 1472), which were organized in a fashion similar to the Empire’s highest court, the Reichskammergericht, and adjudicated according to Roman law.³²

Thus, the establishment of a legal system improved the public bureaucracy as well as the enforcement of private contracts; these may have resulted in commercial expansion, greater division of labor, and the rise of markets and fairs.³³ In addition, it should be noted that the influence of jurists on market establishment may have been more direct. For the

²⁹This process is known as *Frührezeption* (early reception) and has been widely studied by Trusen (1962), Coing (1964) and Wieacker (1967).

³⁰The cases in which the Church’s tribunals dealt with *causae saeculares* were the following: *ratione peccati*, i.e., contents that were considered sins and hence had to be confessed to a priest; *privilegium fori*, i.e., the participation of a cleric as a plaintiff or defendant, or other special categories, such as Jews and sometimes even university students; *denuntiatio evangelica*, i.e., the evident necessity to apply moral or theological reasonings. See Wieacker (1967) p. 76. Because contracts relied on promises and sworn oaths, the church played a role in contract enforcement, even when the parties to the contract were not clerics.

³¹Wieacker (1967), p. 117.

³²Ibid., pp. 177–180.

³³Acemoglu and Johnson (2005) draw a distinction between “property rights institutions” and “contracting institutions.” It is worth noting that the legal institutions we describe supported both property rights (protection of one’s property from the state and elites) and contract enforcement (*vis a vis* one’s peers). The former were promoted by having administrators trained to uphold a system of laws; the latter were promoted when administrators trained in the law ensured that individuals fulfilled their contractual obligations.

duration of a market, merchants normally assembled a court composed of their peers, but occasionally a professional jurist was also part of this committee.³⁴ Improved legal institutions thus may have encouraged economic activities through several channels; we do not distinguish among these in our current work.

3.2 The Rise of Universities

For a legal system to function, there must be individuals trained to serve in it. At precisely the time at which the Justinian Code was rediscovered, the first universities arose to meet that need.³⁵ The first university, the University of Bologna, was founded in the eleventh century by foreign students who were receiving training in the law, and wanted official recognition and protection of their rights. They formed a corporation of scholars; the Latin term for this turned into our modern term, university.

The spread of universities throughout Europe during the period of the Commercial Revolution is striking. There were no universities in all of Europe before the Commercial Revolution began in the tenth century. By the year 1500, there were more than 50.³⁶ In Table 1, we provide a list of some of the universities founded in the Middle Ages, along with their foundation dates.³⁷

[Table 1 about here]

Although not all university students studied the law (universities also provided training in the arts, in theology, and in medicine), a large minority did.³⁸ Garcia y Garcia

³⁴Berman (1983), p. 346.

³⁵Good references on the medieval universities include Rashdall (1895) and DeRidder-Symoens (1992).

³⁶Vergier (1992), pp. 62–65.

³⁷The foundation dates come from Vergier (1992). Note that there is some ambiguity in the foundation dates of many of the early universities, so the numbers in Table 1 may differ slightly from those reported elsewhere.

³⁸In most universities, study of the law implied the study of both canon and civil law. Although we focus on the study of civil law (and the pursuit of public administration careers), the study of canon law (and a career in the church) could also have had important consequences for economic activity. For example,

(1992) writes that around fifteen percent of German university students in the second half of the fifteenth century studied law, or about 1,000 students annually.³⁹ As early as the thirteenth century, Bologna had hundreds of law students enrolled each year.⁴⁰

3.3 The Careers of University Graduates

We now turn to the question of the careers of university graduates in law. Historians of universities suggest that law graduates served in important administrative positions in which they may have affected economic activity. For example, Peter Moraw (1992) writes, “In general, . . . as far as most modern careers are concerned, leadership passed to the secular authorities. . . . [T]here was something like a legal, secular, administrative and judicial ‘career path’ which it was possible to choose on the basis of appropriate study.”⁴¹ Garcia y Garcia (1992) provides a similar description of law graduates’ careers: “[L]aw graduates, both clerics and laymen, held official posts with various authorities, from the imperial and royal chanceries downwards. Both in the church and in civilian employment men of law held economic as well as administrative posts.” Even those who were not able to complete their university degree were able to find employment in positions of relative economic importance, such as chroniclers or procurators.⁴²

To provide quantitative support for these qualitative descriptions, we collected data on the careers of 1,212 graduates in law from the University of Bologna, from 1070 through 1619. We find that 21 percent of the graduates pursued careers in public administration; another 31 percent pursued non-clergy administrative careers in the church (see Table 2).⁴³

some territories were ruled by Bishops just as others were ruled by secular lords; serving these Bishops in an administrative capacity would therefore affect trade in a region just as would serving any other lord.

³⁹Garcia y Garcia (1992), p. 400.

⁴⁰Ibid.

⁴¹Moraw (1992), p. 273.

⁴²Wieacker (1967), p. 159.

⁴³The data used to create Table 2 come from Alidosi (1623).

Thus, our data for Bologna support historians' view that a large number of graduates in law in the Middle Ages pursued careers in which they could have an impact on economic activity.

[Table 2 about here]

We also examine another source of data on legal graduates' careers. Kuhn (1971) collected information on 1,627 graduates in law from Tübingen University from the years 1477 to 1534. Although this time period is a bit later than that on which we focus, we think it is important to present information on German university graduates' careers. Kuhn's data paint a similar picture to that from Bologna: around 20 percent of graduates in Kuhn's sample served in public administration jobs (see Table 2).⁴⁴

Finally, we find evidence that the central administration of the Holy Roman Empire was a substantial employer of university graduates trained in the law: between 1273 and 1493, at least 230 jurists served in the Imperial Court. Most of these served in the century following the establishment of the first universities in Germany, both in an administrative capacity and in a judicial court, the *Reichskammergericht*.⁴⁵ University training in the law was thus closely linked to occupations that were likely to affect commercial activity in medieval Europe.

⁴⁴In a sub-sample of these graduates, namely, those students who attended both Tübingen and Bologna Universities (69 students), around 30 percent pursued public administration careers (see Table 2). A similar analysis has been performed by Stelling-Michaud (1960), who found that nine out of ten Swiss law graduates of the University of Bologna ended up in administrative positions.

⁴⁵Moraw (1986), page 143. Other sources that can document the rise of trained jurists within the public administration of late medieval Germany are so-called *Dienerbücher*, compilations of all people employed by a court. We have found such collections for the states of Hesse, Württemberg, and the Palatinate (Gundlach (1930-32), Pfeilsticker (1957-74), *Zeitschrift für die Geschichte des Oberrheins* (1942)), and in future work we plan to undertake a quantitative analysis of the information these sources contain.

4 A Causal Relationship Between Universities and Market

Establishment

The discussion in Section 3 suggested a link between the rise of universities, the training of graduates in law who served as public administrators, and the Commercial Revolution. However, determining whether one of these caused the others is not possible using the data discussed in the previous section.

4.1 Identifying a Causal Effect

The challenge of interpreting the association between legal training in universities and the Commercial Revolution is one of identifying a causal link between one event and the other. It is possible that the Commercial Revolution was driven (at least in part) by the improved legal system made possible by the establishment of universities. On the other hand, it is possible that the Commercial Revolution increased the demand for legal services produced by university training—perhaps universities were established in response to economic expansion. Yet another possibility is that a different explanation exists for both the Commercial Revolution and the rise of universities.

To state the problem more formally, suppose that one expected the presence of a university to *cause* greater economic activity in a city, i , at time t , due to the higher concentration of graduates in law nearby, who implement policies that promote trade. Also suppose that one could collect information on an outcome variable indicating economic activity in city i , at time t , y_{it} .⁴⁶ To estimate the impact of university presence (and thus good legal institutions) on economic activity, it would be natural to estimate a model of the following form (this specification assumes information on a cross-section of cities at

⁴⁶Anticipating our empirical work, below, one can think of y_{it} as the establishment of a market in city i at time t .

multiple time periods):

$$y_{it} = \alpha_0 + \alpha_1 Univ_{it} + \epsilon_{it} \quad (1)$$

y_{it} is the outcome variable measuring economic activity, $Univ_{it}$ is a dummy variable equal to 1 if city i contains (or is sufficiently proximate to) a university in time period t , α_0 is an intercept term capturing the average level of economic activity in a city that contains no university, and ϵ_{it} is a stochastic error term.

If one were to estimate equation (1) using OLS (or a probit model), the estimate of α_1 would be unbiased only if $Univ_{it}$ were exogenous. For instance, if universities were randomly assigned across a large number of cities and across time periods, one could estimate equation (1) using OLS and have an unbiased estimate of the impact of university presence on economic activity; to the extent that university presence is a good proxy for legal institutions, one would also have a good estimate of the impact of legal institutions on the outcome variable, y_{it} . On the other hand, because universities are not randomly assigned to cities and because they do not appear at random times, the university dummy variable will tend to be correlated with unobservable variables captured in ϵ_{it} .⁴⁷ The university dummy variable could also vary in response to y_{it} .⁴⁸ In short, without exogenous variation in the establishment of a university, estimating equation (1) using OLS will not produce a credible estimate of the impact of universities or legal institutions on economic activity. Rather, a source of exogenous variation in university establishment is needed; we claim that the Papal Schism of 1378 represents such a source.

⁴⁷The direction of the bias due to omitted variables is likely to be away from zero. For example, areas with more productive farmland are better able to support towns and traders, and are also better able to support faculty and students at university. Thus, $Univ_{it}$ may be positively correlated with y_{it} only because universities and markets are both likely to be located in areas with high agricultural productivity.

⁴⁸As was the case with the omitted variables problem, the reverse causality problem will likely bias the estimate of α_1 away from zero. An area with more wealth produced by trade will be better able to support, and more likely to demand graduates from, a university.

4.2 The Papal Schism as a Natural Experiment in University Establishment

Prior to the establishment of the first German university in 1386, German students had to travel abroad, to the Universities of Paris, Bologna, or Prague, to receive a university education.⁴⁹ However, by 1409, there were four universities in Germany: one in Heidelberg (founded in 1386), one in Cologne (1388), one in Erfurt (1392), and one in Leipzig (1409).⁵⁰ In a brief period of time, the distance to a university shrank significantly for cities throughout Germany. The reason for the sudden rise of several German universities was the Papal Schism, an event which was arguably exogenous with respect to the German economy, and thus provides a natural experiment to evaluate the causal impact of university establishment (and the resultant legal institutions) on economic activity.

From 1309 to 1378, a period known as the “Avignon Papacy,” Popes resided in Avignon, France rather than in Rome. In 1378, Pope Gregory XI moved the Papal Court back to Rome, and died shortly thereafter. The election to replace Gregory XI resulted first in the selection of Pope Urban VI, who remained in Rome, and then in the selection of (anti-Pope) Clement VII, who maintained his court in Avignon. Thus, beginning in 1378, there were two rival “Popes;” secular lords chose to pledge allegiance to one or the other. France and Spain were loyal to the French Pope, while the Holy Roman Empire and the Italian states were loyal to Rome.

The split in the Church had important consequences for university students and faculty from Germany. Because there were no German universities, many of them had studied and taught at the University of Paris. However, following the Schism, the University

⁴⁹Prague was part of the Holy Roman Empire at that time. However, in following the convention of this paper, we use the anachronism “German” to refer only to the territory covered by our dataset, which does not encompass Prague and the Kingdom of Bohemia.

⁵⁰Another university of the Holy Roman Empire, the University of Vienna, was officially established in 1365, but actual teaching there did not begin until after the Schism (in 1383). At that time, the famous theologian Henry of Langenstein arrived from the University of Paris and attracted the students necessary for the university to function. The only functioning university in the Holy Roman Empire prior to the Schism was the University of Prague, founded in 1347.

of Paris did not tolerate individuals loyal to the Roman Pope, as were German students and faculty. Forced to leave Paris, students and faculty returned to Germany, where universities were established to take them in.⁵¹

Notable faculty who were forced to return to the Holy Roman Empire by the Schism, such as Marsilius of Inghen, who taught at the University of Heidelberg, attracted students to the new universities. The decreased cost of university attendance did so as well. Hastings Rashdall wrote, "The bulk of Germans at foreign universities [before the Schism] were probably young nobles and well-born or well-beneficed ecclesiastics. . . . The career open to merit was [after the Schism] brought within reach of sons of the tradesmen and the artisan. Martin Luther could have hardly enjoyed a university education if he had had to go to Paris for it."⁵²

Thus, as a result of the Papal Schism, Germany was rapidly transformed from a land with no universities, and relatively few graduates, to a land with several universities and many graduates.⁵³ Importantly, the cause of this transformation was not economic: the Papal Schism was a political event that did not coincide with any dramatic economic shifts of which we are aware (see Table 3 for a list of important economic events that took place in Germany in the centuries surrounding the Papal Schism).⁵⁴ Thus, we believe that the Schism was a truly exogenous shock leading to university establishment in Germany.

⁵¹Rashdall (1895, p. 247) writes: "The tendency to multiply Universities in Germany gained further strength from the Schism, since the Roman Popes were always ready to necessary bulls as a means of weakening Paris, the great champion of the Avignon Pontiffs."

⁵²Rashdall (1895), p. 214.

⁵³An important question regarding the rise in the number of German graduates is why was there no university establishment before the Schism, given the apparent demand? One possible reason is that the Church wanted to limit the number of centers of theological and canon law training to prevent heterodox teachings. This constraint was loosened by the Schism, because the Roman Church lost the University of Paris, which had been the preeminent university for the study of theology until then.

⁵⁴The Papal Schism did not coincide with an economic shock that was either causal or unrelated. It is also worth adding that there was no dramatic change in Germany's political structure at the time of the Papal Schism. DeLong and Shleifer (1993) discuss the importance of the structure of government to urbanization in medieval Europe, but they do not note any change in Germany's government in the time period we study.

[Table 3 about here]

5 Empirics: Universities and Market Establishment

We begin our empirical analysis by examining changes in market establishment rates at the time when Germany received its first university (Heidelberg, in 1386). In fact, we document sharp changes in the trend rate of market establishment in 1386. Next, we consider whether the observed changes in the trend preceded university establishment, or were anticipating long-term changes in the German economy. We then try to identify a closer link between universities and the change in market establishment rates; to do so, we test for heterogeneity of the effect of university establishment on market establishment rates across different regions of Germany. We then address questions about the channel through which university establishment might have affected economic activity. Finally, we conduct several falsification exercises that test whether papal politics can account for the economic changes we observe.

5.1 University Foundation and Market Establishment in Germany

The variable we use to measure changes in economic activity is the granting of a market privilege to a city in a given year, using information from the *Deutsches Städtebuch*. In some specifications, we consider both city incorporations and market establishments as the dependent variable, as city establishments may have included the right to hold a market.⁵⁵

Because most of the variation in market establishment in which we are interested occurs across time—before and after universities were established—we reduce our city-year panel dataset to a time series of market establishments in each year. We always standard-

⁵⁵See fn. 22.

ize the number of market establishments in a given year by the size of the sample of cities under consideration; thus, our outcome variable will be the rate of market establishment (markets per 1,000 cities) in each year. Our empirical strategy will be to examine whether there is a change in the level and trend of market establishment rate at the time when Germany's first universities were established.

This runs into an important concern regarding university establishment: even if university establishment was exogenously driven by the Papal Schism, why were universities established precisely when and where they were? We cannot prove that the timing and location of university establishment within the Papal Schism was exogenous, but we conduct a series of tests below to address concerns about endogeneity.

To begin, we present the basic patterns of market establishment before and after universities were founded in Germany. We estimate two specifications: the first simply compares mean market establishment rates before and after university foundation; the second compares mean levels and trends of market establishment rates before and after university foundation.

Thus, we estimate:

$$markets_t = \alpha_0 + \alpha_1 \cdot Post_t + \epsilon_t \quad (2)$$

and

$$markets_t = \beta_0 + \beta_1 \cdot Post_t + \beta_2 \cdot Year_t + \beta_3 \cdot Year_t \cdot Post_t + \epsilon_t \quad (3)$$

The dependent variable in both models is the number of markets established per 1,000 cities in the sample in year t . In our baseline specification, the sample is all 2,256 German cities in our dataset. $Year_t$ is simply the year of the observation.⁵⁶ $Post_t$ is a dummy variable, equal to 1 when t is larger than a pivot year. The pivot year can vary across

⁵⁶In practice, we normalize $Year_t$ so that it is equal to 0 in the pivot year, to ensure comparability of coefficient magnitudes across regressions.

specifications: in the baseline specification it corresponds to the year 1386, as this is the year when Germany's first university was founded.

Equation (2) simply examines whether the market establishment rate after the pivot date is, on average, different from before. The coefficient of interest, on $Post_t$, captures the difference in mean market establishment before and after the pivot date. Equation (3) examines whether there is a discrete jump in the market establishment rate at the pivot year (the coefficient on $Post_t$) and whether there is a change in the trend rate of market establishment (the coefficient on $year_t \cdot Post_t$). We expect the coefficient β_3 to be positive if the Schism increases rates of market establishment, relative to the pre-existing trend β_2 . Moreover, if the effect of the Schism works through the creation of universities and the formation of human capital trained in the laws, we do not expect the coefficient β_1 to be significantly different from zero, as this would imply an implausible sudden change in economic conditions. Rather, we expect the effect to occur gradually over time and be reflected in the change of trend β_3 .

We begin our analysis considering all of Germany from 20 years before through 20 years after the first university, Heidelberg, was founded in 1386. In Table 4, Panel A, column 1, we present the coefficient on the $Post_t$ variable from equation (2). It is positive, but not statistically significant. This indicates that average market establishment rates in Germany were similar in the decades just before and just after the foundation of the University of Heidelberg. In Panel B, column 1, we present results from equation (3), which allows the rate of market establishment to vary linearly over time, at different rates before and after 1386. We find that the trend rate of market establishment sharply changed in 1386; while the rate of market establishment was decreasing prior to 1386 (indicated by the negative coefficient on $Year_t$), there is a significant, positive change in the trend in 1386 (indicated by the positive, significant coefficient on $Year_t \cdot Post_t$). The point estimate of β_3

is equal to 0.151, enough to reverse the negative trend (of -0.061) present before 1386. This relationship is displayed graphically in Figure 6.

[Table 4 about here]

[Figure 6 about here]

For robustness, we next vary the window of years around 1386 that we examine. We present estimates of equations (2) and (3) using windows of ± 10 and ± 30 years around 1386 in columns 2–3 (as before, Panel A presents the results from equation (2), and Panel B presents the results from equation (3)). As in the case of the ± 20 year window, there is no difference in rates of market establishment on average before 1386 (the estimated coefficient on $Post_t$ is small and changes sign), but there is a positive change in the trend using both alternative windows (the coefficient on $Year_t \cdot Post_t$ is always positive).⁵⁷

Next, we repeat the estimates from columns 1–3, but now using both market establishments and city incorporations as the dependent variable. We present results from estimates of equations (2) and (3), using this outcome variable, and windows of ± 20 , ± 10 and ± 30 years, in columns 4–6, respectively. The results using this alternative outcome variable are consistent with those in columns 1–3: market and city establishment rates are not very different on average before and after 1386 (though perhaps greater after 1386); however, falling market establishment rates prior to 1386 are reversed after universities are first established.⁵⁸

An important concern with the above regressions is that the timing of university establishment in Germany was endogenous: we might simply be capturing changes in trends

⁵⁷Using the ± 10 year window, one finds a positive change in trend significant at the 5% level, while using the ± 30 year window, the estimated change in trend is not statistically significant.

⁵⁸The positive change in trend is again statistically significant using the ± 20 years and ± 10 years windows, and is not significant using the ± 30 years window.

that began before university establishment; or, we may be capturing the effects of some broad change in market establishment rates of which the change in 1386 was only a small part.

To examine whether either of these possibilities is likely to have been true, we estimate equation (3) 21 times: in each regression, we change the pivot year, testing for a break in the trend rate of market establishment for every year between 1376 and 1396, using a window of ± 20 years around each pivot year. We plot the coefficients on $Year_t \cdot Post_t$ from these regressions, along with their 95% confidence intervals, in Figure 7.⁵⁹ One can see that the largest, most significant trend breaks occur very close to 1386. Ten years before Germany's first university was established, market establishment rates were, if anything, *falling* sharply. After 1386, there is progressively less evidence of a change in trend: the sharp change in the trend rate of market establishment is quite specific to the time of university establishment in Germany.

[Figure 7 about here]

5.2 Heterogeneous Treatment Effects

Our results above indicate that the trend of market establishment rates in Germany increased in 1386, when the first German university was founded. It is natural to ask whether this result could be due to some other, unobserved, factor. It is therefore important to establish a strong link between markets and university establishment *per se*. If the change in market establishment rates were observed even in parts of Germany that should not have been much affected by university establishment, one would suspect that some change other than university foundation drove the change in the trend rate of market establishment in 1386.

⁵⁹The coefficients and standard errors are available from the authors upon request.

To link the effect of universities themselves to economic change, we divide our sample of German cities into several categories. We first examine separately those cities that experienced a reduction in the distance to the nearest university following the establishment of the first German universities, and those cities that did not (because their closest university, even after the Schism, remained Prague's). If German universities affected legal institutions by making legal training more accessible, thus increasing the number of trained lawyers, one would expect this effect to be concentrated in areas where legal training was, in fact, made more accessible. On the other hand, if one observed a large change in the trend of market establishment in areas that were no closer to a university following the creation of German universities, one would be concerned that the break in trend we observed in 1386 for all of Germany was driven by factors other than university creation. We thus estimate equations (2) and (3) separately on these two groups.

We present results from these estimates in Table 5, columns 1 and 2. They suggest that increased access to a university played a crucial role in the changing rate of market establishments in 1386: in areas with decreased distance to the nearest university after 1386, there is a significant and large break in the trend rate of market establishment (the coefficient β_3 on $Year_t \cdot Post_t$ is positive and significant); in those areas where German university establishment brought universities no closer, there is no break in the trend. Figures 8 and 9 give a visual impression of the starkly different patterns.

[Table 5 about here]

[Figure 8 about here]

[Figure 9 about here]

One might wonder if the effect in Table 5, columns 1 and 2, was simply due to regional differences in market establishment patterns across Germany: the group of cities

without a decrease in distance to a university were all located in Germany's southeast. We therefore split our sample into finer categories. Among those cities that experienced a reduction in the distance to a university during the Papal Schism, we split the cities into mutually-exclusive groups based on the magnitude of the reduction: those for which the reduction was less than 100 km (but greater than zero); those for which the reduction was between 100 and 200 km; those for which it was 200–300 km; and those for which it was between 300 km and the maximum reduction of 415 km. We then test for a break in the trend of market establishment in 1386 for each of the groups.

In Table 5, columns 3–6, we present the results from estimating equations (2) and (3) for each group. One can again see strong evidence that the break in the trend of market establishment was a result of greater access to universities: the areas that experienced greater reductions in distance to a university consistently show greater positive trend changes in 1386.

We next examine the robustness of the findings in Table 5, columns 1–6, by estimating equations (2) and (3) for each of these samples of cities, but including city incorporations and market establishments in our outcome variable. The results from these estimates are presented in Table 5, columns 7–12; they, too, provide strong evidence that areas that experienced a greater reduction in distance to a university during the Papal Schism experienced larger changes in the trend rate of market and city establishment.

5.3 Endogeneity of University Location

The results above reveal a positive break in the trend in market establishment in 1386—when Germany's first university was established—and that this break in trend was most evident in areas that experienced the greatest reduction in the distance to a university during the Papal Schism. This suggests that universities themselves, and the legal institutions

that they supported, played a causal role in market establishment.

However, one might wonder whether the results above were merely due to a correlation between good leadership, or good local economic conditions, and university foundation. That is, a territorial lord may have founded a university, then founded many markets nearby; a prescient lord may have founded a university in anticipation of good economic times ahead. Both of these alternative stories would explain a sharp change in market establishment rates precisely when universities were founded, and *near* those universities. In addition, even if one believed that universities were the causal factor, one might doubt that their effect was through improved legal institutions; perhaps university establishment increased demand for goods in an area, or generated agglomeration economies due to the concentration of human capital.⁶⁰

We thus estimate equations (2) and (3) excluding from our analysis cities that are within 10, 25, or 50 km of the four German cities where universities were established during the Papal Schism. If (anticipated) good local economic conditions drove university establishment, or if increased demand around the university or agglomeration economies drove increased market establishment, dropping these cities should eliminate the break in trend found above.

In Table 6, columns 1–3, we present the results of estimating equations (2) and (3) without cities within 10 km, 25 km, or 50 km of the four German universities established during the Schism. Even excluding these cities one can see a large, positive coefficient β_3 on $Year_t \cdot Post_t$ —a positive break in the trend of market establishment. In Table 6, columns 5–7, we repeat these estimates, but use as our outcome variable the measure of market establishments that includes city incorporations. Again, we find a positive change in the trend rate of market establishment.

⁶⁰On human capital and city growth see Glaeser and Saiz (2003) and Florida (2002).

[Table 6 about here]

Next, using information on local territorial lords collected for each of our cities from the *Deutsches Städtebuch*, we exclude from our analysis the four lords' territories containing a university city: these are the Rhenish Palatinate (Heidelberg), the Archbishopric of Cologne (Cologne), the Archbishopric of Mainz (Erfurt) and the Electorate of Saxony (Leipzig).⁶¹ If the break in the trend of market establishment was due entirely to differences in economic activity within the territories of lords whose territories received universities, one would be concerned that these territories were different from others in ways unobservable to us, and that these differences drove university foundation and market establishment.

In Table 6, column 4, we present the results from estimating equations (2) and (3) using only cities whose territory did not include a university established during the Schism. The results are somewhat weaker in both magnitude and statistical significance (the point estimate falls from 0.151 in the baseline estimate to 0.111), suggesting that in fact there are some unobserved characteristics in the territories with a university which bias the coefficient upward. However, we still continue to observe a positive break in the trend of market establishment in this sample. In columns 5–8, we use the joint city and market establishment rates as the dependent variable and yet again find evidence of a positive change in trend after 1386.

5.4 Placebo Regressions: The Economic Impact of Papal Politics

We next ask whether some other effect of the Papal Schism was likely to have changed economic activity and caused some part of the trend break we found above. Changes in

⁶¹The Holy Roman Empire in the late Middle Ages was a convoluted array of partly overlapping layers of sovereignty. Nevertheless, for each city in our dataset we tried to code the highest liege lord it was subject to (except for the Emperor), unless it was a Free (Imperial) City.

the residence of the Pope may have affected trade patterns; shifts in papal politics may have had broader impacts on Western Christendom. We search for evidence of economic consequences of shifts in Church politics by testing for breaks in market establishment trends at the beginning of the Avignon Papacy—the period from 1309–1378 when the Pope resided in Avignon—and at the end of the Papal Schism in 1417. Finding significant changes in market establishment rates at these dates would indicate that papal politics affect economic activity in general, making one worry about their effects around the time of the foundation of Germany’s first universities.

In Table 7, columns 1–2, we present estimates of equations (2) and (3), but with the pivotal dates at 1309 (column 1) and 1417 (column 2), respectively. In Table 7, columns 3–4, we repeat these estimates using our outcome measure that counts city incorporations and market establishments. We do not find strong evidence that market establishment patterns changed when the Pope moved to Avignon or when the Schism was resolved.⁶²

[Table 7 about here]

As a final test of the Schism’s impact through channels other than university establishment, we examine market establishment in Italy around the time of the Schism.⁶³ Unlike Germany, Italy had many universities prior to the Schism, and only one university foundation during the Schism. Finding a break in the trend of market establishment in Italy would indicate that the Schism affected economic activity through channels other than university establishment. We thus estimate equations (2) and (3) using data from Italy.⁶⁴ The results, presented in Table 7, column 5, indicate that there was no change in the level

⁶²Only one estimate of the coefficient on $Year_t \cdot Post_t$ in these regressions is statistically significant (at 10%), and it is not robust.

⁶³The market establishment data we were able to collect for Italy are for Naples, Sicily, and Lombardy, and come from Mira (1955), Grohmann (1969), and Epstein (1992).

⁶⁴We present estimates using 1386 as the pivot year, but the results are very similar if we use 1378, the year of the Schism itself.

or trend of the rate of market establishment in Italy.

5.5 Summary

Our analysis indicates that market establishment rates in Germany experienced a break in trend in 1386. This trend break did not occur in regions that were no closer to a university at the end of the Schism than at the beginning; indeed, the trend break is most pronounced for the group of cities whose distance to a university shrank most as a result of the establishment of German universities during the Papal Schism.

These results do not appear to be driven by university establishment in areas that were bound to grow more quickly or in territories whose lords established universities and markets more often: excluding from our analysis cities close to universities or territories containing universities does not eliminate the break in trend. These results suggest that universities affected market establishment through a channel that was not entirely local, making legal training a more likely channel than increased local demand or agglomeration economies.

Finally, the change in the trend of market establishment does not seem to be a result of the Schism through a channel other than university establishment. Along with the finding that a reduction in distance to a university is strongly associated with the change in trend, we find that shocks in papal policy other than the Schism (which did not result in university establishment) were not associated with changes in market establishment rates. That the Papal Schism worked through university establishment receives further support from the finding that market establishment trends did not change in Italy, where universities were already prevalent, and did not increase due to the Schism.

These results, along with the historical evidence of the strong links among universities, legal training, administration, and commercial activity, point to a causal effect of the

development of formal legal institutions, through university establishment, on economic activity.

6 Conclusion

Understanding the “Rise of the West” is a monumental task, made more difficult by the fragmentary data available for the late medieval period when it began. Understanding the economic aspects of the transformation of Europe requires systematic evidence on economic activity. Our evidence on German city incorporation and market establishment from the late medieval period indicates a striking change in urbanization and economic activity: hundreds of cities were incorporated and hundreds more markets established during the Commercial Revolution in Germany.

These data also provide some answers to a fundamental question about the Commercial Revolution: did formal legal institutions play a causal role in the economic changes observed during this time? Germany experienced an exogenous shock to its legal institutions—through the universities established during the Papal Schism. Following this shock, market establishment rates, indeed, changed course. The break in trend is largest in areas that saw the greatest decrease in distance to a university during the Papal Schism, and is not observed at all in cities that were no closer to a university at the end of the Schism than the beginning. These results are consistent with an important role for universities, and legal institutions, in the development of markets in medieval and early modern Europe.

Other research questions regarding the Commercial Revolution remain open: the development of legal institutions is just one of many factors that may have driven economic change. Deeper analysis of the patterns of city incorporation and market establishment may yield new insights about these factors. In addition, understanding the links, if any,

between medieval economic change and the economic changes of the modern era would be valuable.

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Figures and Tables

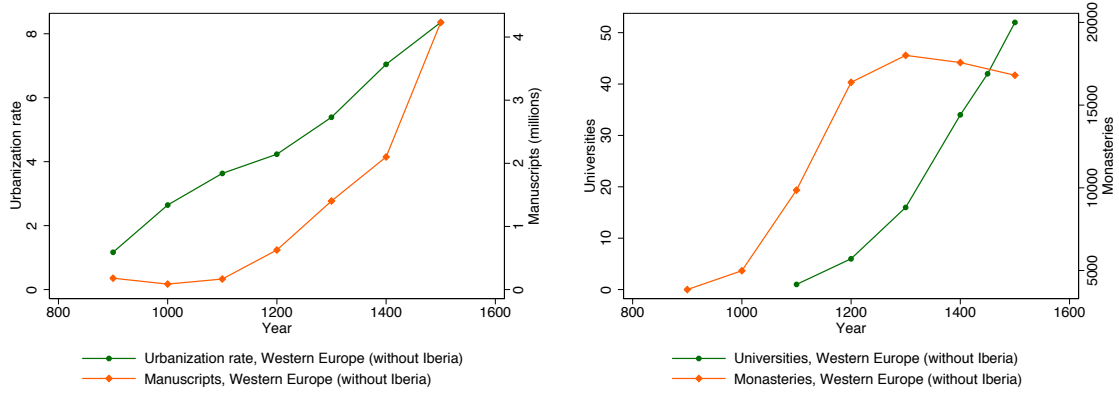


Figure 1: Indicators of economic development in the Middle Ages (source: Buringh and van Zanden, 2009)

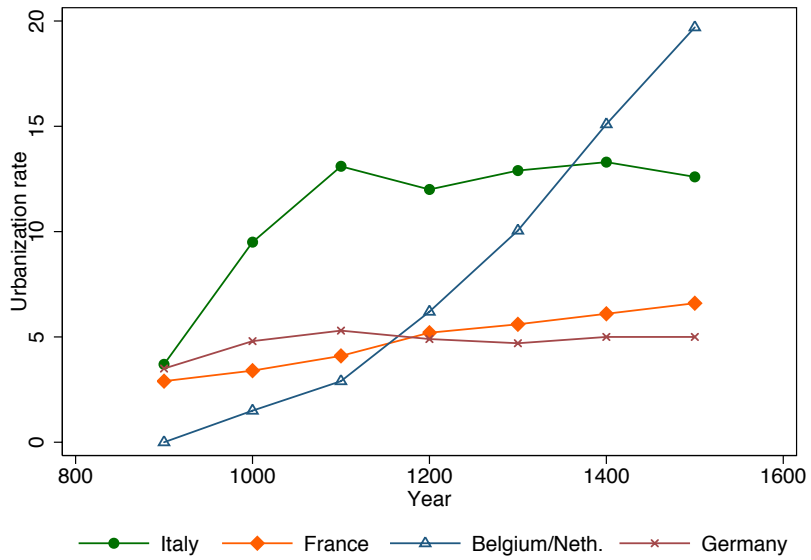


Figure 2: Urbanization rates (% of the population living in cities with more than 10,000 inhabitants) in European regions (source: Buringh and van Zanden, 2009)

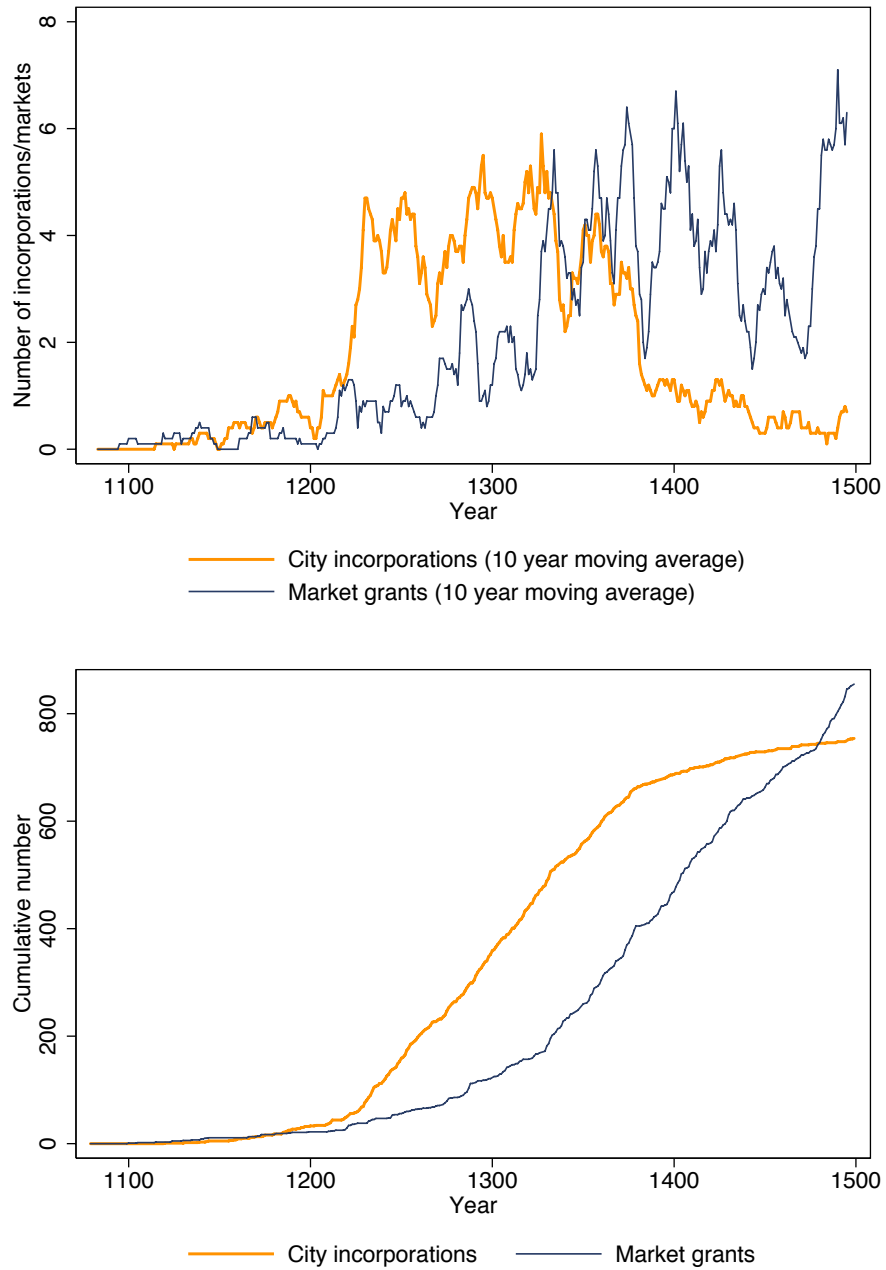


Figure 3: Absolute (10 year moving average) and cumulative number of city incorporations and market grants, Germany

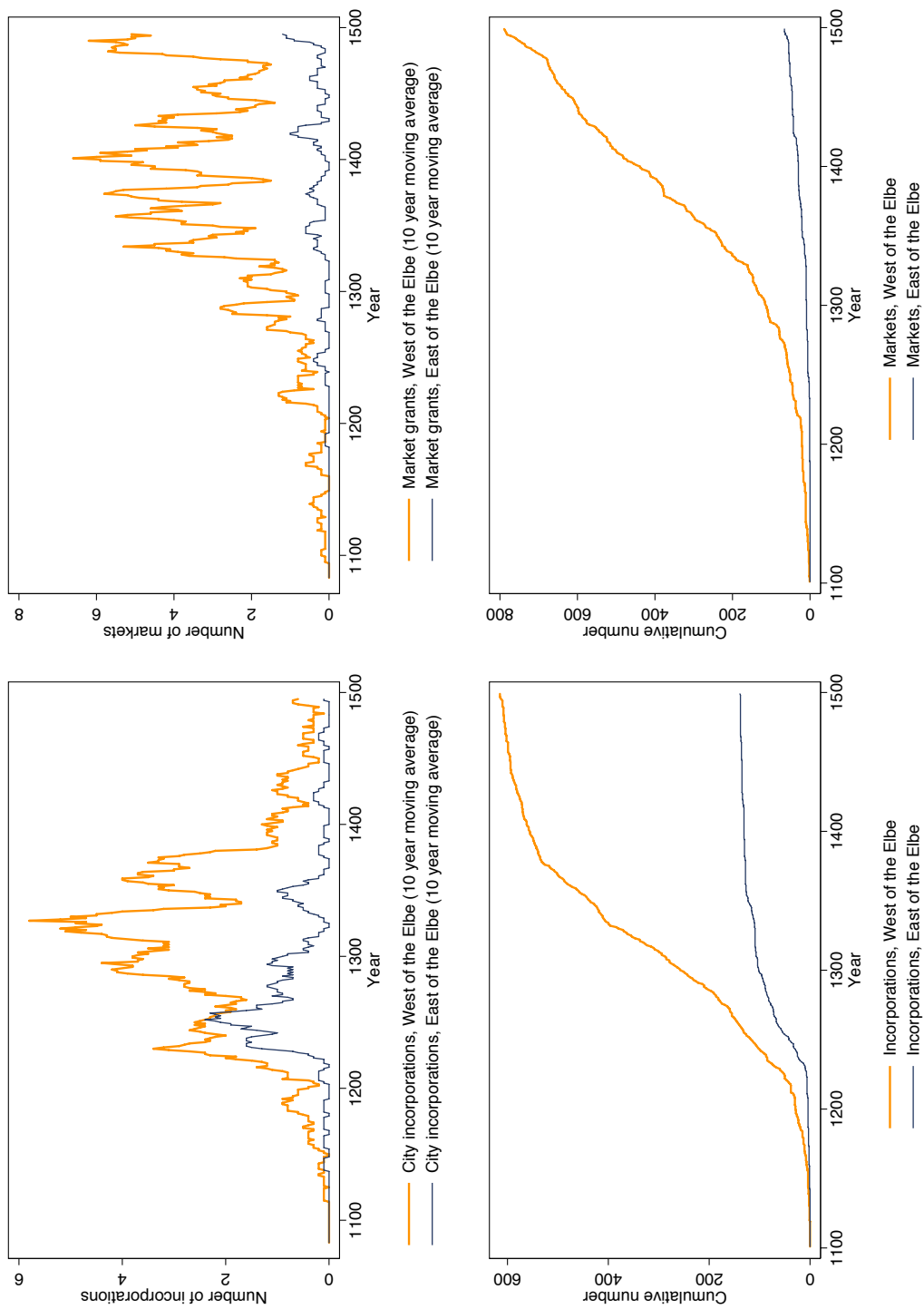


Figure 4: Absolute (10 year moving average) and cumulative number of city incorporations and market grants, by region (west/east of the Elbe)

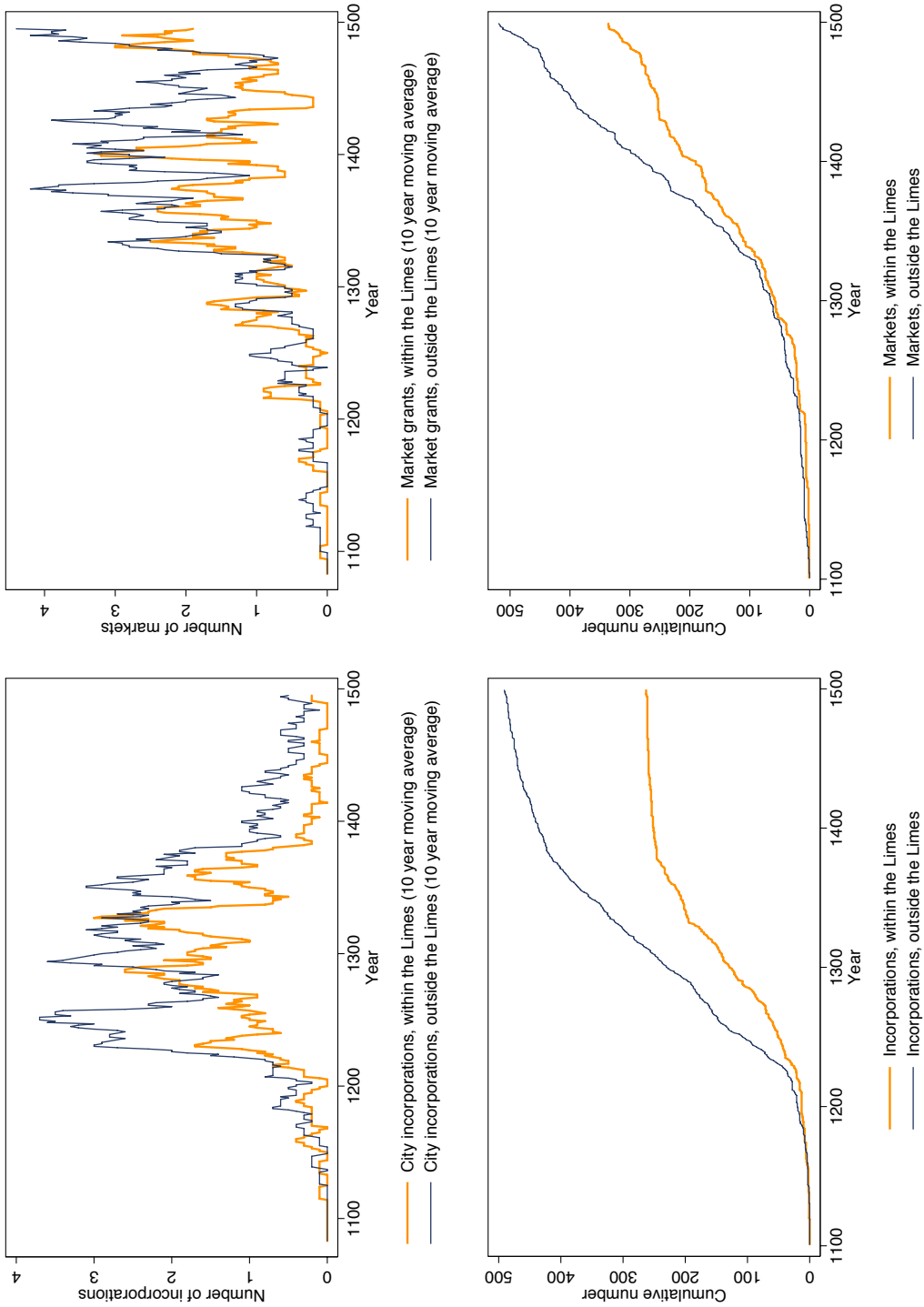


Figure 5: Absolute (10 year moving average) and cumulative number of city incorporations and market grants, by region (within/outside the *Limes*)

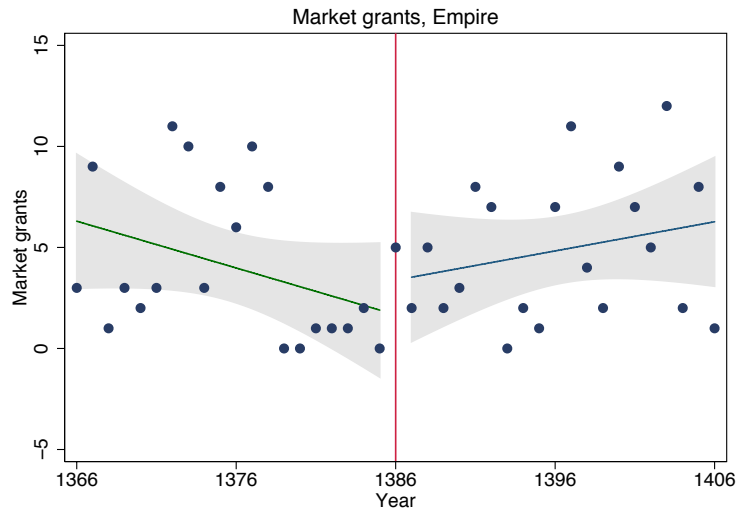


Figure 6: Changes in the trend rate of market establishment, whole sample (corresponding to the regression in Table 4, column 1, Panel B.)

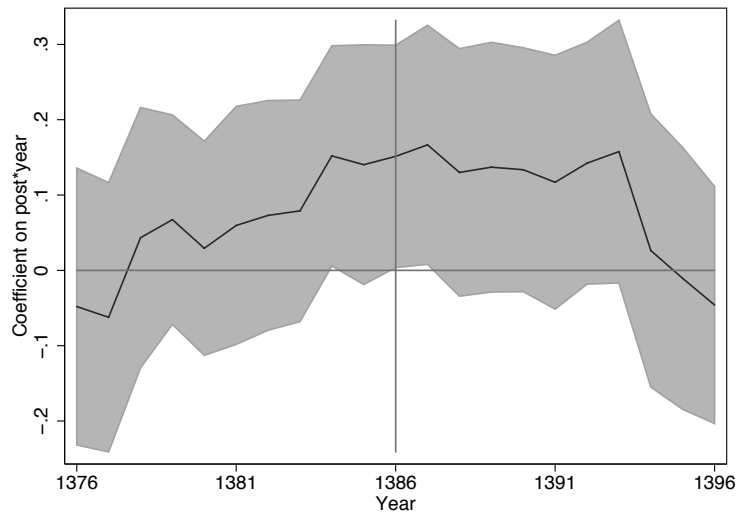


Figure 7: Changes in the trend rate of market establishment (coefficient on year · post-dummy) under varying pivot years (1376–1396)

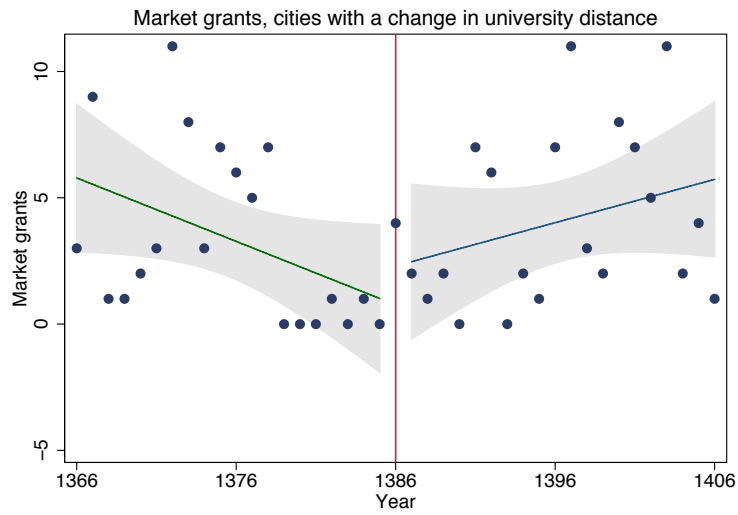


Figure 8: Changes in the trend rate of market establishment, cities with a change in distance to the closest university (corresponding to the regression in Table 5, column 1, Panel B.)

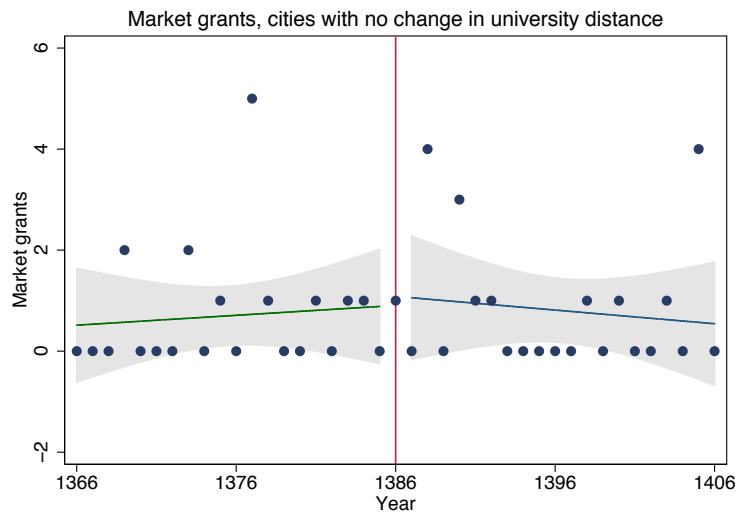


Figure 9: Changes in the trend rate of market establishment, cities with no change in distance to the closest university (corresponding to the regression in Table 5, column 2, Panel B.)

Table 1: University establishments

University Location	Foundation Date
Bologna	end of 12th Century
Vicenza	1204
Paris	beginning of 13th century
Oxford	beginning of 13th century
Montpellier	beginning of 13th century
Cambridge	1209–1225
Arezzo	1215
Salamanca	before 1218–1219
Padua	1222
Naples	1224
Vercelli	1228
Toulouse	1229
Orléans	around 1235
Siena	1246
Angers	1250
Lisbon	1290
Lerida	1300
Avignon	1303
Rome	1303
Perugia	1308
Pisa	1343
<i>Prague</i>	<i>1347</i>
Florence	1349
Pavia	1361
Cracow	1364
Orange	1365
<i>Vienna</i>	<i>1365 (opens in 1383)</i>
<i>Erfurt</i>	<i>1379 (opens in 1392)</i>
<i>Heidelberg</i>	<i>1385</i>
<i>Cologne</i>	<i>1388</i>
Turin	1404
<i>Leipzig</i>	<i>1409</i>
St. Andrews	1411
<i>Rostock</i>	<i>1419</i>
Louvain	1425
Basle	1459
<i>Tübingen</i>	<i>1476</i>

Source: Verger (1992), pages 62–65. German universities in italics.

Table 2: Careers of Graduates in Law

Career	Abs. number	% of sample
<i>Bologna graduates 1070–1619</i>		
Church (clergy)	478	39.44
Church Administration	381	31.44
Academia	91	7.51
Public Administration	262	21.62
<i>Tübingen graduates 1477–1534</i>		
Church (clergy)	1095	67.3
Academia	133	8.17
Public Administration	327	20.1
Other career	72	4.43
<i>Tübingen and Bologna graduates 1477–1534</i>		
Church (clergy)	21	30.43
Academia	8	11.59
Public Administration	21	30.43
Other career	19	27.54

Source: Alidosi (1623) and Kuhn (1971).

Table 3: Economic Shocks in Germany, 1200–1500

Date	Event
13th Century	Creation of “commercial” schools that teach reading, arithmetic, bookkeeping
Around 1250	Creation of the legal form of a corporation in Germany
1320	Discovery of gold in Hungary, decline of the Champagne fairs
by 1345	Financial instruments such as IOU widely used
1348	First wave of the Black Death hits Europe
1470-1490	Discovery of silver in Schwaz (Tyrol) and Schneeberg (Saxony)

Source: Cipolla (1976) and North (2000).

Table 4: Baseline estimates

Dependent Variable:	Rate of market establishment			Rate of market establishment and city incorporation		
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Panel A: Differences in average rate</i>						
Post	0.399 [0.502]	-0.089 [0.655]	0.133 [0.388]	-0.266 [0.617]	-0.621 [0.855]	-0.739 [0.484]
Constant	1.862*** [0.370]	1.640*** [0.541]	1.936*** [0.281]	3.036*** [0.496]	2.704*** [0.786]	3.265*** [0.384]
<i>Panel B: Changes in trends of rate</i>						
Post	0.084 [0.807]	2.807*** [0.791]	0.636 [0.735]	0.084 [0.904]	3.694*** [0.912]	0.551 [0.876]
Year	-0.061 [0.053]	-0.416*** [0.099]	-0.033 [0.030]	-0.117* [0.062]	-0.685*** [0.153]	-0.072* [0.039]
Year · Post	0.151** [0.073]	0.306** [0.133]	0.033 [0.040]	0.201** [0.084]	0.586*** [0.170]	0.061 [0.047]
Constant	1.225* [0.615]	-0.650 [0.604]	1.427** [0.572]	1.808** [0.750]	-1.064 [0.845]	2.145*** [0.745]
Size of the window (years)	±20	±10	±30	±20	±10	±30
Observations	40	20	60	40	20	60
Number of cities	2256	2256	2256	2256	2256	2256

*: Significant at 10%; **: 5%; ***: 1%. Robust standard errors in brackets. The dependent variable is computed as market establishments per year per 1,000 cities (columns 1–3) or market establishments *and* city incorporations per year per 1,000 cities (columns 4–6).

Table 5: Spatial variation

Dependent Variable:	Rate of market establishment						Rate of market establishment and city incorporation									
	> 0 km		= 0 km		> 100 km		> 200 km		> 300 km		> 100 km		> 200 km		> 300 km	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)				
Sample:																
change in distance	> 0 km	> 100 km	> 200 km	> 300 km	> 415 km	> 300 km	> 0 km	= 0 km	≤ 100 km	> 100 km	> 200 km	> 300 km	> 415 km			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)				
<i>Panel A: Differences in average rate</i>																
Post	0.373	0.610	0.575	0.450	0.633	-0.090	-0.323	0.203	-0.144	-0.000	0.181	-1.264				
	[0.532]	[1.625]	[1.328]	[0.763]	[0.626]	[1.061]	[0.656]	[1.699]	[1.466]	[0.952]	[0.817]	[1.319]				
Constant	1.741***	2.846**	2.299***	0.991*	1.356***	2.527***	2.985***	3.455***	3.592***	1.802**	2.441***	4.332***				
	[0.378]	[1.107]	[0.769]	[0.514]	[0.433]	[0.779]	[0.509]	[1.190]	[0.906]	[0.739]	[0.513]	[1.067]				
<i>Panel B: Changes in trends of rate</i>																
Post	0.141	-0.385	5.067*	-1.185	0.305	-1.786	0.199	-0.856	5.006*	-1.508	-0.105	-0.808				
	[0.801]	[3.671]	[2.659]	[1.018]	[0.774]	[1.676]	[0.935]	[3.725]	[2.856]	[1.325]	[1.239]	[1.961]				
Year	-0.088	0.165	-0.190	-0.004	-0.077	-0.119	-0.149**	0.144	-0.184	-0.016	-0.107	-0.301**				
	[0.055]	[0.117]	[0.153]	[0.044]	[0.050]	[0.097]	[0.065]	[0.127]	[0.160]	[0.071]	[0.073]	[0.133]				
Year · Post	0.199**	-0.235	-0.048	0.164	0.186**	0.400***	0.248**	-0.186	-0.123	0.176	0.242*	0.559***				
	[0.078]	[0.300]	[0.212]	[0.104]	[0.082]	[0.143]	[0.093]	[0.303]	[0.225]	[0.116]	[0.133]	[0.178]				
Constant	0.814	4.579**	0.302	0.948	0.542	1.273	1.422**	4.964**	1.664	1.631	1.313*	1.169				
	[0.561]	[1.962]	[1.093]	[0.771]	[0.485]	[1.450]	[0.686]	[2.086]	[1.337]	[1.073]	[0.751]	[1.697]				
Size of the window (years)	40	40	40	40	40	40	40	40	40	40	40	40				
Observations	±20	±20	±20	±20	±20	±20	±20	±20	±20	±20	±20	±20				
Number of cities	2010	246	348	555	553	554	2010	246	348	555	553	554				

*: Significant at 10%; **: 5%; ***: 1%. Robust standard errors in brackets. The dependent variable is computed as market establishments per year per 1,000 cities (columns 1–6) or market establishments and city incorporations per year per 1,000 cities (columns 7–12).

Table 6: Spatial endogeneity

Dependent Variable:	Rate of market establishment				Rate of market establishment and city incorporation			
	≥ 10 km	≥ 25 km	≥ 50 km	not in the same territory	≥ 10 km	≥ 25 km	≥ 50 km	not in the same territory
Sample:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Panel A: Differences in average rate</i>								
Post	0.401 [0.505]	0.482 [0.493]	0.712 [0.495]	0.260 [0.521]	-0.245 [0.619]	-0.184 [0.598]	0.127 [0.612]	-0.520 [0.655]
Constant	1.873*** [0.373]	1.813*** [0.356]	1.653*** [0.332]	1.899*** [0.389]	3.033*** [0.498]	2.960*** [0.470]	2.747*** [0.453]	3.200*** [0.521]
<i>Panel B: Changes in trends of rate</i>								
Post	0.085 [0.812]	0.080 [0.811]	0.479 [0.793]	-0.011 [0.897]	0.117 [0.901]	0.041 [0.885]	0.565 [0.843]	-0.118 [0.999]
Year	-0.061 [0.053]	-0.056 [0.051]	-0.049 [0.052]	-0.043 [0.059]	-0.119* [0.062]	-0.115* [0.058]	-0.113** [0.054]	-0.108* [0.064]
Year · Post	0.152** [0.074]	0.149** [0.071]	0.121 [0.073]	0.111 [0.079]	0.203** [0.084]	0.208** [0.080]	0.185** [0.080]	0.178* [0.090]
Constant	1.232* [0.619]	1.229* [0.623]	1.135* [0.566]	1.451* [0.716]	1.786** [0.745]	1.754** [0.727]	1.558** [0.644]	2.062** [0.836]
Size of the window (years)	40	40	40	40	40	40	40	40
Observations	±20	±20	±20	±20	±20	±20	±20	±20
Number of cities	2242	2179	1966	1922	2242	2179	1966	1922

*: Significant at 10%; **: 5%; ***: 1%. Robust standard errors in brackets. The dependent variable is computed as market establishments per year per 1,000 cities (columns 1–4) or market establishments *and* city incorporations per year per 1,000 cities (columns 5–9).

Table 7: Placebo analyses

Dependent Variable:	Rate of market establishment		Rate of market establishment and city incorporation		Rate of mkt. establishment
	Germany				Italy
Sample:	(1)	(2)	(3)	(4)	(5)
<i>Panel A: Differences in average rate</i>					
Post	-0.022 [0.208]	-0.488 [0.464]	-0.022 [0.453]	-0.443 [0.518]	2.632 [1.563]
Constant	0.665*** [0.156]	2.327*** [0.348]	2.660*** [0.296]	2.748*** [0.404]	1.316** [0.523]
<i>Panel B: Changes in trends of rate</i>					
Post	-0.684 [0.441]	0.618 [0.863]	-0.327 [0.978]	0.943 [0.923]	0.305 [2.581]
Year	0.065** [0.028]	-0.102** [0.050]	0.039 [0.065]	-0.125** [0.055]	0.115 [0.097]
Year · Post	-0.068* [0.034]	0.098 [0.069]	-0.050 [0.085]	0.117 [0.077]	-0.008 [0.236]
Constant	1.351*** [0.366]	1.260** [0.578]	3.073*** [0.726]	1.439** [0.584]	2.521* [1.257]
Observations	40	40	40	40	40
Size of the window (years)	±20	±20	±20	±20	±20
Number of cities	2256	2256	2256	2256	190

*: Significant at 10%; **: 5%; ***: 1%. Robust standard errors in brackets. The dependent variable is computed as market establishments per year per 1,000 cities (columns 1, 2, and 5) or market establishments *and* city incorporations per year per 1,000 cities (columns 3 and 4).