Religion and Economic Organization: The Rise and Decline of the Medieval English Craft Guilds

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Abstract

Scholars have debated the manner in which religious beliefs influence economic organization. This paper examines a particular case—the craft guilds of medieval England—to show how religious doctrines influence the ability of a group to enforce cooperation. When mortality rates are high, repeated interaction alone cannot sustain cooperation, but spiritual sanctions in the afterlife can sustain cooperation in organizations that used spiritual sanctions to enforce both religious and secular cooperation. This insight explains why during the fourteenth and fifteenth centuries, when the Catholic Church promoted the doctrine of Purgatory and repeated plagues decimated urban populations, guilds evolved and industry expanded. In the sixteenth century, the Reformation, which dispelled the doctrine of Purgatory, weakened guilds, disrupted the economy, and necessitated the development of new methods of organizing industry.

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1 Introduction

Religious beliefs influence economic activity. A large literature establishes this fact (CITE: Kuran, Mokyr, Stark, Barrow and McLeary). Yet, exactly why and how it does so remains the subject of debate, and various channels linking spiritual and secular society have been investigated. Traditional scholarship emphasizes how religious beliefs shape individuals’ tastes, desires, proclivities, and habits. This research grew from Max Weber’s *The Protestant Ethic and the Spirit of Capitalism* (Weber 1930), which focused on preferences for labor relative to leisure, for savings relative to consumption, and for physical goods relative to acceptance by religious peers and fear of damnation. Weber argued that the Reformation changed these preferences in Protestant nations, thereby encouraging the accumulation of capital and expansion of industry. Weber’s famous thesis emerged from his research on *The History of Commercial Partnerships in the Middle Ages*, which examined the structure of commercial law and mercantile enterprises in medieval Europe, and which established a baseline from which to assess how the Reformation influenced commerce and industry (Weber 2003). Recent research carries the tradition in a new direction. It elucidates how incentives shape the organization of congregations, why religious sects specialize in particular economic niches, and where economic opportunities induce trade-offs between spiritual and secular activities (CITE: Iannaccone, Berman, Abramitzky).

Despite differences emphases, the recent and traditional research share a common thread analogous to Weber’s basic idea. They both explore the symbiotic evolution of religious and economic institutions during the centuries crucial for the formation of the modern market economy. They also both illuminate a particular channel through which religion may influence the economy: religious beliefs may influence the structure and effectiveness of economic organizations.

Our analysis builds on the tradition exemplified by Weber. We examine the organization of industry in late medieval England, a society where almost all industrial activity occurred in organizations that medieval men and women called *mysteries* but that modern scholars call *craft guilds*. These associations of artisans dominated economic activity for centuries, during which time the foundations of modern economic progress—including mod-
ern industries such as clothmaking, metallurgy, and manufacturing, which took off during
the Industrial Revolution, and modern concepts such as contract and incorporation, which
comprise the legal foundation for capitalist economies—evolved. A fact that has received
much less attention is that these associations were as religious as they were occupational, if
not more. They expended tremendous resources to promote pious living and fund spiritual
activities.

We argue that combining religious and occupational activities was not only crucial for
the success of these economic organizations, but that it also explains their rise and decline.
Scholars have long pondered craft guilds’ rise and decline. In 1776, Adam Smith attributed
guilds’ origins to the universal "interest of the freemen of a corporation to hinder the rest
of the inhabitants from employing any workmen but themselves (Smith 1776, Wealth of
Nations, Book 4, Chapter 3, Part 2)." In 1848, Karl Marx argued that guilds were the
late-medieval manifestation of the material dialectic, in which "guild-master and journey-
man, in a word, oppressor and oppressed, stood in constant opposition to one another . . .
until] guild-masters were pushed aside by the manufacturing middle class (Marx and Engels
1848, Communist Manifesto, Section 1)." Later scholars attributed the origins of guilds
to continuity from Roman collegia, descent from fraternal associations frequently found in
ancient Germanic societies, a universal taste for association, the need for collective defense,
urban political imperatives, government regulatory and taxation policies, and changes in
technology, prices, and transaction costs (CITES). No consensus concerning these theories
exists, probably because few of the theories generate testable implications, and none of the
theories corresponds well with the facts.

This essay offers a new theory of the rise and decline of craft guilds that is consistent
with the evidence. The key is to understand how guilds fostered cooperation, and how
exogenous changes in the environment influenced the effectiveness of the guilds’ enforcement
mechanisms. We argue that the principal driving forces were the disease environment and
religious doctrines.

Diseases influenced craftsmen’s ability to cooperate by determining the mortality rate.
Standard Folk Theorem logic holds that cooperation occurs more readily when individuals
care more about the future, which in turn, depends on how long one expects to live. If you
will die tomorrow, the future has little value. If you will live forever, the future may bring you more happiness. In the lexicon of economists, the mortality rate was a key component of the discount rate. Low mortality meant extensive cooperation. High mortality meant little cooperation. The mortality rate for craftsmen fluctuated dramatically during the Middle Ages, as the introduction of virulent, infectious diseases, such as the Black Death, scourged generations of defenseless urban residents.

Religious doctrines influenced cooperation in medieval England by emphasizing the concept of an afterlife. The late medieval Church promoted the Doctrine of Purgatory, which stated that after your death, you would experience excruciating pain, which purged your sins in preparation for entrance into Heaven, where one would experience incomparable joy and ecstasy. The pain that you experienced could be lessened by the prayers of the living, particularly pious people who knew you well, such as family, friends, and colleagues. Guilds were organized to, among other things, provide prayers for salvation of the souls of deceased members. Guilds threatened to punish members caught breaking the rules by excluding non-cooperators from this intercessory service. This threat became more salient when belief in the doctrine spread and mortality rates rose, enabling guilds that bundled together religious and occupational activities to sustain occupational cooperation in environments where purely occupational associations, according to Folk theorem thinking, could not.

This logic provides a new understanding of the rise and decline of guilds. Let us here distinguish guilds, which we define as institutions that bundled religious and occupational, from cartels, which were purely occupational, and also from chantries, which were purely religious organizations. Figure 1 (INSERT) illustrates a number of well documented and undisputed facts. Prior to the thirteenth century, there were many occupational organizations (cartels) but no purely religious (chantries) or bundled organizations (guilds). As the doctrine of Purgatory spread in the thirteenth century, we observe the rise of organizations that serve purely religious functions (chantries) and the rise of bundled organizations (guilds). We see a dramatic rise of the number of guilds after that spread of Purgatory doctrine and the increase in mortality rates following the Black Death of 1347-1348. Guilds then persisted as the dominant institutional form until the demise of the Purgatory doctrine during the Reformation in the 16th century, a time in which mortality rates also had regained their
earlier low levels. We argue that this timing is not merely coincidence but instead reflects our claim that only bundled guilds could successfully foster cooperation under high mortality rates. As the Reformation reached England its peak, the impact of the religious threats disappeared, and all guilds either lost their religious components (essentially turning into cartels), or disbanded altogether. The rise and decline of guilds is thus directly related to exogenous shocks on two fronts, mortality rates and the pervasiveness of the doctrine of Purgatory.

The remainder of the paper develops our argument. Section 2 summarizes the essential facts concerning guilds’ occupational and religious activities; how guilds’ structure, numbers, and effectiveness changed over time; the movement of mortality rates; the spread of the doctrine of Purgatory; and the doctrine’s demise during the Reformation. Section 3 provides a verbal synopsis of our argument. It describes how guilds used religious trigger strategies to sustain occupational cooperation in a setting where purely economic threats could not do so. Section 4 presents a game theoretic model of guild to illustrate how such religious threats functioned. Section 5 expands the scope of our analysis to describe how the changes in religious doctrines influenced the trajectory of economic activity. Section 6 concludes and relates the findings to the broader literature. In particular, we discuss the implications of this study for our broader understanding of how religion can influence economic organization.

2 Historical Background

2.1 Broad Trends: Guilds, Purgatory, and Mortality in medieval England

Evidence from a variety of sources yields the broad trends depicted in Figure 1. Written records indicate that occupational cooperatives existed in twelfth century England, although numbers appear to have been low. Most were merchant organizations that defended the rights of urban residents, enforced contracts, and encouraged long distance trade. Though these cooperatives have been called guilds, we prefer to classify them here as cartels because they served primarily occupational functions. The number of these craft cooperatives grew slowly during the thirteenth century, and the majority operated in the cloth industry. Many strug-
gled to make ends meet. For example, in Leicester, Northampton, Oxford, and Winchester, the weavers pleaded poverty because of low guild membership, and the royal government eventually cancelled their debts. (CITE)

The doctrine of Purgatory crystallized on the European continent during the late twelfth century (Le Goff) and spread throughout the English realm largely by the mendicant friars during the 14th century. According to the doctrine, Purgatory was a place where souls served penitence after death. Ordeals such as fire and ice inflicted great pain which purged deceased individuals of their sins. This purgation lasted for a length of time determined by the extent of a person’s sinfulness, faith, and repentance, but it could also be shortened by the prayers of the living. Particularly effective were prayers by priests and paupers, who were viewed as particularly pious, and relatives, friends, colleagues, and neighbors, who knew the individual well. (Harper-Bill 1989, 67)

When disseminating the doctrine via sermons and pamphlets, the Church emphasized the financial and communal aspects related to prayers. Financially, the church encouraged individuals to pay priests to pray for the salvation of their souls as well as the souls of those whom they loved. Communally, the most effective prayers came from those who knew one well. The number of cooperatives grew as the doctrine gained increasing prominence. Groups of friends, relatives, neighbors, and colleagues organized themselves into religious associations we call chantries that were dedicated to praying for the salvation of members’ souls. Many of these religious groups coalesced along occupational lines and later began pursuing common commercial objectives. These organizations which linked spiritual-occupational incentive systems are what we call craft guilds. These guilds became more common and influential, yet they did not yet dominate economic, social, or religious life in urban areas, and at times struggled to recruit and retain members.

By the middle of the fourteenth century, the Purgatory doctrine was widely recognized but not universally accepted. The terror and trauma of the Black Death changed that fact. Repeated plagues ravaged England after 1348, altering public perceptions about religion, fate, life, and death. Urban areas were particularly hard hit because infectious disease spread rampantly among individuals living in close proximity. Figure 2 (INSERT) illustrates the sharp increase in mortality rates at the Black Death using country-level data, and the rates
will likely be twice as large in urban areas where cooperatives were prominent. Demand for masses for the dead soared as a result of the everpresent reality of death. Although the Purgatory doctrine was increasingly influential, it now rapidly became a universal and transcendent belief. It dominated Christianity for the next 150 years during which time mortality rates slowly regained their pre-Black Death levels.

Numerous sources confirm that the rate of guild formation increased after the Black Death. McCisak (CITE), Hibbert (CITE), and Lambert (CITE) report that few craft guilds existed before 1350, that they were numerous by the end of the 14th century, and that they maintained their highest power up to the early 16th century. Figure 3 plots the dates of foundation for 333 chantries and 24 guilds, as recorded in Parliaments 1388 census of corporations. The sample contains no returns from cartels, though they would have been included in the survey. During the period of guild activity, almost all merchandise exported from towns came from the workshops of guild members. Cloth making guilds, whose fortunes had waxed and waned in earlier centuries, thrived. They manufactured cloth of higher quality and exported their wares throughout Europe. Manufacturing guilds introduced an array of new products and techniques in many industries. One example is lead-free pewter.

By the beginning of the 16th century, evidence of avariciousness within the Church exasperated some clerics and laymen. A long-simmering opposition burst forth when Martin Luther and others publicly attacked the Purgatory doctrine, which they argued was corrupt and lacking Biblical foundations. This “Reformation” hit England in the 1530s when Henry VIII disagreed with the Papacy over his desired marital status. In 1536, Henry asserted his supremacy over English religious institutions, and he then seized the assets of the Church in England, suppressed the monasteries, and attacked the doctrine of Purgatory. The dogma was deemed heretical, the liturgy was reformed, and priests were forbidden to accept payment in exchange for prayers for the souls of the deceased. Private sector reforms related to Purgatory doctrine began in 1547, after the accession of Edward VI. Organizations that collected funds for religious purposes were required to forfeit those funds to royal servants. Auditors seized cooperative organizations’ assets accumulated for religious reasons. New laws forbade guilds from various religious activities, including praying for deceased members.

The number, size, and influence of guilds declined rapidly as a result of these attacks.
For example, Lambert refers to the legislation in that year as the “death blow” of the guilds in Kingston-Upon-Hull and describes how the Reformation turned “public opinion against the Gilds” (CHECK THIS CITE), and Pooley observes a similar phenomenon in London (CITE). The edicts of the Reformation rapidly reduced the religious functions of guilds. “Up to the time of the Tudors the religious associations were fully mentioned in the charters or licenses issued to the guilds, and the ‘trade or mistery’ was kept in the background, but after the Reformation the industries took first place.” (CITE) The onslaught of the royal government destroyed almost all religious fraternities across England. With their religious funds and functions stripped away, craft guilds continued operating as occupational associations, but their influence rapidly waned. During the reigns of the remaining Tudor Kings and Queens, industrial organizations within England underwent dramatic change. Government protected monopolies arose, the locus of industry and innovation moved to new towns and the countryside, entrepreneurs experimented with new methods of organizing manufacturing in rural areas, family firms evolved, and merchants and manufacturers experimented with inchoate forms of joint-stock enterprises.

2.2 The Inner Workings of Guilds

Craft guilds dominated economic activity between the coronation of Edward I and the demise of Edward VI—a period running roughly from 1275 to 1550. Guilds of victuallers (e.g., bakers, brewers, and butchers) bought agricultural commodities, converted them to consumables, and sold finished foodstuffs. Guilds of manufacturers made durable goods (e.g., textiles, military equipment, and metal ware), and when profitable, exported them to consumers in distant markets. Guilds of a third type sold skills and services (e.g., clerks, teamsters, and entertainers).

Most basically, craft guilds were groups of individuals with common goals. Members sought prosperity in this life and providence in the next. Members wanted high and stable incomes, quick passage through Purgatory, and eternity in Heaven. Cooperation was the key to achieving both objectives because craftsmen could raise their incomes if they acted in concert, and Christians could speed passage through Purgatory if they prayed for the salvation of each others’ souls. The benefits of cooperation induced individuals to form
stable, self-enforcing associations that advanced their common interests.\footnote{For citations to sources and additional details, see a series of articles that substantiate the factual foundations of this argument, Richardson 2001, 2004a, 2004b, and 2005.}

These organizations engaged in a wide array of occupational activities to increase guild members’ profits. Some manipulated input and output markets to their own advantage, while others established reputations for quality to foster the expansion of anonymous exchange. Because of the underlying economic realities, victualling guilds tended towards the former, manufacturing guilds tended towards the latter, and guilds of service providers fell somewhere in between. Yet, all types of guilds managed (or manipulated) labor markets, lowered wages, and advanced their own interests at their subordinates’ expense. Moreover, success required cooperation among guild members. To lower labor costs, all masters had to reduce wages. To raise the price of products, all members had to restrict output. To maintain a reputation for product quality, all members had to produce and sell superior merchandise.

Guilds also served as institutions for organizing, managing, and financing the collective quest for eternal salvation. Efforts centered on three types of tasks. The first were routine and participatory religious services to mark ceremonial occasions, such as the day of their patron saint or Good Friday, with prayers, processions, banquets, masses, the singing of psalms, the illumination of holy symbols, and the distribution of alms to the poor. The second category consisted of actions performed on members’ behalf after their deaths for the benefit of their souls. Postmortem services began with elaborate and expensive funerals and burials, which included processions, masses, and the hiring of priests to pray for the souls of the deceased. The third category involved indoctrination and monitoring to maintain the piety of members. Guild ordinances proscribed standards from the Christian catechism of the era: members should neither gamble nor lie nor steal nor drink to excess; they should restrain their gluttony, lust, avarice, and corporal impulses; they should pray to the Lord and live like His son; and they should give alms to the poor.

Notice that the religious benefits of membership are best described as club goods because they required inputs from multiple members, could be excluded from non-members, and were susceptible to free-rider problems due to positive externalities in production (Cornes and Sandler 1997). Overcoming the free-rider problem was key to the successful cooperation
necessary for the provision of religious benefits. Members contributed money to pay priests and purchase pious paraphernalia, and they also contributed time, emotion, exertion, and energy in their attendance at events. Righteous living linked members’ fates together. The more pious one’s brethren, the more beneficial their prayers, and the quicker one escaped from purgatory. So, in hopes of minimizing purgatorial pain and maximizing eternal happiness, guilds beseeched members to restrain physical desires and forgo worldly pleasures.

To enforce cooperation in both the occupational and religious dimensions, guilds administered their associations and the nexus of agreements among members. Details of these agreements varied greatly from guild to guild, but the issues addressed were similar across guilds. Members agreed to contribute certain resources or take certain actions that furthered the guild’s occupational and spiritual endeavors. Officers of the guild monitored members’ various contributions. Manufacturing guilds, for example, employed officers known as searchers who scrutinized members’ merchandise to make sure it met guild standards and inspected members’ shops and homes seeking evidence of attempts to circumvent the rules.

Members who failed to fulfill their obligations faced punishments. Although punishments varied across transgressions, guilds, time, and space, a common pattern existed. First time offenders were punished lightly, perhaps suffering public scolding and paying small monetary fines, and repeat offenders punished harshly. The ultimate threat was expulsion. Guilds could do nothing harsher because laws protected persons and property from arbitrary expropriations and physical abuse. The legal system set the rights of individuals above the interests of organizations. Since guilds were voluntary associations, members facing harsh punishments could quit the guild and walk away. Thus, the most the guild could extract was the value of membership.

3 Why Guilds Bundled Occupational and Religious

To understand the rise and decline of guilds, we must understand why craft guilds bundled occupational and religious. Richardson (2005), in the first attempt to address this issue, suggested that this bundling facilitated both occupational and religious cooperation. Basic game theoretic logic holds that the larger the benefits of cooperation, the larger the range
of environmental conditions under which those removal of those benefits poses an effective threat to deter defection. For example, in a simple repeated prisoners’ dilemma game, this means that the larger the benefits of cooperation, all else constant, the larger the range of discount factors under which cooperation can be sustained. In the context of medieval England, an occupational cooperative that does not bundle is limited because it can only use threats related to occupational benefits. By bundling occupational with religious and making access to both types of benefits conditional on cooperative behavior, the guild can increase the size of its threat, thereby increasing the range of conditions under which it can deter defection. In Richardson’s words, “Bundling increased the pain of expulsion” (2005, 163).

Other game-theoretic options existed, of course. Guilds could have punished uncooperative members by taking actions with wider consequences. Members of a manufacturing guild who caught one of their own passing off shoddy merchandise under the guilds’ good name could have punished the offender by collectively lowering the quality of their products for a prolonged period. That would lower the offender’s income, albeit at the cost of lowering the income of all other members as well. Similarly, members of a guild that caught one of their brethren shirking on prayers and sinning incessantly could have punished the offender by collectively forsaking the Lord and descending into debauchery. Then, no one would or could pray for the soul of the offender, and his period in Purgatory would be extended. In broader terms, cheaters could have been punished by any action that reduced the average incomes of all guild members or increased the pain that all members expected to endure in Purgatory.

In theory, such threats could have convinced even the most recalcitrant members to contribute to the common good. But, no evidence exists that craft guilds ever operated in such a manner. None of the hundreds of surviving guild ordinances contains threats of such a kind. No surviving guild documents describe punishing the innocent along with the guilty. Guilds appear to have eschewed indiscriminate retaliation for several salient reasons. First, monitoring members’ behavior was costly and imperfect. Since time and risk preferences varied across individuals and uncertainty of many kinds influenced craftsmen’s decisions, some members would have attempted to cheat regardless of the threatened punishment.
Thus, punishments would have occurred in equilibrium, and the cost of carrying out an equilibrium-sustaining threat of expulsion would have been lower than the cost of carrying out an equilibrium-sustaining threat that reduced average income. Hence, expelling members caught violating the rules was an efficient method of enforcing the rules. Second, punishing free riders by indiscriminately harming all guild members may not have been a convincing threat. Individuals may not have believed that threats of mutual assured destruction would be carried out. The incentive to renegotiate would have been strong. Third, skepticism probably existed about threats to do onto others as they had done onto the guild. That concept contradicted a fundamental teaching of the church, to treat others as you wished them to treat you. It also contradicted the New Testament admonition to turn the other cheek and not to fight others, but to let them punish themselves, by excluding themselves from God’s covenant. Thus, indiscriminant retaliation based upon hair-trigger strategies was not an organizing principle likely to be adopted by guilds whose members hoped to speed passage through Purgatory.

The exact nature of punishment possibilities depended, of course, on the institutional setting which varied across time, place, and profession. In some industries, once craftsmen mastered their guilds’ manufacturing methods, the guild could not keep them from manufacturing merchandise identical to that of other members. In other industries, the production of merchandise required the use of resources that the guild controlled and which the guild could deny to uncooperative individuals. In some cases, guilds imported inputs in bulk or exported outputs in large lots, and uncooperative individuals could be excluded from those deals. In other instances, particularly victualling occupations such as brewing and banking and service occupations such as teamsters and minstrels, where markets were reasonably dense and competitive and home production was a close substitute, guilds had few economic means to retaliate against free riders. In all English towns, residents possessed the right to practice any profession they preferred. So, expulsion from a guild would not deprive them of their livelihood. But, the enforcement of laws against engrossing, forestalling, and regrating varied from town to town. At times, special interests corrupted municipal governments, or municipal governments aided in the enforcement of guild bye-laws, so that coercive exclusion, while illegal in law became possible in fact.
4 Model

We now provide a model of a medieval English craft guild to illustrate in a simple manner how bundling religious and occupational fosters cooperation. The presentation of the model progresses in stages. It begins with a model of a cartel, continues with a chantry, and then combines the cartel and chantry together into a guild. We also build into the model two key exogenous variables, the mortality rate and the value that craftsmen place on prayers for the salvation of their soul. While all of the stages provide specific interpretations for the actions of craftsmen, such as choosing to produce durable goods of either high or low quality and choosing to whether to pray for the salvation of the souls of those on the organizations roster, the underlying logic (and the mathematics that encapsulates it) is general enough to represent the various issues described in the preceding sections.

4.1 Cartel Equilibrium

We use the term cartel to denote a cooperative of craftsmen engaged in occupational but not religious activities. The term cartel has many common connotations, but we consider an association in which craftsmen must overcome a free-rider problem to benefit from cooperation. The craftsmen interact repeatedly, observe each others actions, and may punish free riders by free riding themselves in the future.

For concreteness, our specific model is perhaps best thought of as craftsmen manufacturing cloth for export to the wider market, although the main logic extends to other craft trades. Master craftsmen own their own workshops employing identical technologies and manufacturing indistinguishable textile products. Our clothmakers develop a collective reputation for product quality. They differentiate their merchandise from cloth made in other towns by giving it a conspicuous characteristic, such as a unique weave or color, which outsiders cannot copy. The conspicuous characteristic and collective reputation provide our clothmakers with pricing power. When they manufacture high quality cloth, they sell their wares at premium prices, and earn large profits. When they manufacture shoddy merchandise, consumers refrain from purchasing their products. They sell limited quantities at low
prices, and earn small sums.\textsuperscript{2}

Our cartel consists of group of \( n \) craftsmen, labeled \( i = 1, 2, 3, \ldots, n \), who interact during regular periods, labeled \( t = 1, 2, 3, \ldots, \infty \). Each period \( t \) consists of a sequence of moves in the following order:

1. All craftsmen simultaneously decide the quality, \( q_{it} \in \{q_H, q_L\} \), of the cloth that they manufacture. \( H \) stands for high quality. \( L \) stands for low quality, and \( q_H > q_L \).

2. Nature chooses which craftsmen die. The mortality rate \( m, 0 < m < 1 \), is the probability that craftsman \( i \) dies. This probability is independently and identically distributed across craftsmen.

3. Period \( t \) ends and payoffs are received.

Craftsman \( i \)'s chooses \( \{q_{it}\}_{t=1}^{\infty} \) to maximize his expected present discounted payoff

\[
\sum_{t=1}^{\infty} (1 - m)^t \pi_{it}(q_{it}, q_{-it}).
\]  

where \( \pi_{it}(q_{it}, q_{-it}) \) is \( i \)'s profit in period \( t \) given the qualities chosen by all craftsmen in that period. Each craftsman acts to maximize \( U_{it} \). For simplicity, assume that all quality levels are publicly observed at the end of step 1, and that each craftsman who dies in stage 3 of period \( t \) is replaced by a new, identical craftsman at the start of period \( t + 1 \). Also suppose that there is a regular supply craftsmen to replace deceased craftsmen. This is a reasonable assumption given that guilds wished to limit the sizes of their membership and that journeymen were waiting to fill any openings in the cooperative.

A craftsman's profits, \( \pi_{it}(q_{it}, q_{-it}) \), decrease as the quality of his own cloth, \( q_{it} \), increases, because high quality cloth costs more to manufacture than low quality cloth. A craftsman's profits increase, however, as the average quality of the cloth made by other members of the cartel, \( \sum_{j=1}^{n} q_{jt} \), increases, because the craftsmen share a collective reputation for product quality. To members of the cartel, in other words, quality is a public good.

\textsuperscript{2}Note that the logic which we employ in this section applies to any of the industries that describe in the previous section. With simple adjustments to the profit functions, our cartel model could represent a group of victualers attempting to act as a Cornout oligopoly, lower quantities, and raise prices or a group of master craftsmen attempting to limit competition for journeymen and lower wages.
The profit function does not need to be characterized explicitly in order to solve our model. The only requirement is to denote three single-period profit levels. If all of our master craftsmen chooses \( q_H \) in period \( t \) to maintain the cartel, denote \( i \)'s single-period profit level as \( \pi_C \), which is the cooperative level of profits. If all of the craftsmen other than craftsman \( i \) choose \( q_H \) in period \( t \) but craftsman \( i \) deviates by choosing \( q_L \), denote \( i \)'s single-period profit level as \( \pi_D \), the defector’s profit level. If all of the craftsmen including craftsman \( i \) choose \( q_L \) in period \( t \), denote \( i \)'s single-period profit level as \( \pi_{NE} \), which is the single period Nash Equilibrium profit level. Our assumptions about \( \pi_{it} \) imply \( \pi_D > \pi_C > \pi_{NE} \).

In this situation, the craftsmen can sustain cooperation if all play the traditional trigger strategy: “produce high quality in period 1; in period \( t > 1 \), produce high quality if all others have produced high quality in all prior periods; otherwise produce low quality.” These strategies can be sustained in equilibrium if for each \( i \)

\[
\sum_{t=1}^{\infty} (1-m)^t \pi_C \geq (1-m) \pi_D + \sum_{t=2}^{\infty} (1-m)^t \pi_{NE} \Rightarrow \\
\frac{1-m}{m} \pi_C \geq (1-m) \pi_D + \frac{(1-m)^2}{m} \pi_{NE} \Rightarrow \\
m \leq \frac{\pi_C - \pi_{NE}}{\pi_D - \pi_{NE}} = m^*.
\] (2)

Inequality (2) indicates that craftsmen can sustain the cartel in equilibrium through trigger strategies if the mortality rate is sufficiently low. This condition coincides with the logic of the standard folk theorem. In our model, a key exogenous variable, the mortality rate, determines individuals’ intertemporal preferences. We have no evidence that other influences on individuals’ intertemporal preferences vary or have explanatory power, and for that reason, exclude them from our model. Thus, our discount factor is \( 1-m \), and as long as the discount factor is sufficiently high (i.e. mortality is sufficiently low), craftsmen care enough about consumption in future periods that they can sustain economic cooperation through the threat of economic sanctions.

4.2 Chantry Equilibrium

A chantry is a religious club that specializes in the production of postmortem prayers. The prayers reduce the pain (i.e. increase the utility) that individuals experience in Purgatory
and speed their entry into Heaven. We model the production of prayers as a club good, which is the standard model used by social scientists studying religious organizations. The club model captures the key circumstances surrounding medieval chantries, which were voluntary organizations whose output (prayers) was jointly produced, easily excludable, and non (or minimally) rival.

For simplicity, we abstract from the free-rider problem inherent in the production of religious services. We instead suppose club contributions are perfectly monitored so that benefits can be perfectly excluded from non-contributors. This allows us to focus solely on how exclusion from religious benefits fosters economic cooperation.

Again, there is a group of \( n \) craftsmen, labeled \( i = 1, 2, \ldots, n \), who interact during regular periods, labeled \( t = 1, 2, \ldots, \infty \). Each period \( t \) consists of a sequence of moves in the following order:

1. All craftsmen simultaneously decide whether to join a chantry, \( j_{it} = 1 \), or not join \( j_{it} = 0 \). Joining/re-joining in \( t \) involves paying a membership fee \( f \).

2. Nature chooses which craftsmen die. The mortality rate \( m, 0 < m < 1 \), is i.i.d. across craftsmen.

3. Surviving chantry members vote on how to spend their club resources \( \hat{n}_t f \), where \( \hat{n}_t \) is the number of craftsmen who joined in step 1 in period \( t \). The surviving members can divide resources among the surviving members or spend the resources on prayers for the salvation of the souls of deceased chantry members or some combination of each.

4. Period \( t \) ends and payoffs are received.

Craftsmen \( i \)'s Bellman equation is

\[
U_{it} = \max \{ m I \text{ (pray) } v_{it} (\text{prayer expenditures}) - I (j_{it} = 1) f + (1 - m) (r_{it} + U_{t+1}) \}.
\]

\( I \text{ (pray) } \) takes the value 1 if \( i \) dies and is prayed for in \( t \) by the surviving chantry members and takes value 0 otherwise, while \( v_{it} (\cdot) \) is \( i \)'s valuation of those prayers before step 3 in
time \( t \). The prayer value function, \( v_{it} \) represents \( i \)'s valuation today of prayers said on his behalf after he dies. A higher \( v_{it} \) indicates an individual places greater value on the belief that prayers will be said on his behalf. As the previous section indicates, \( v_{it} \) is increasing in amount (of money and/or effort) expended on prayers and is non-rivalrous. \( I(j_{it} = 1) \) is an indicator function that has value 1 if \( i \) joins in \( t \) but takes value 0 otherwise. \( r_{it} \) is the amount of club resources redistributed back to \( i \) in step 3.

Additional assumptions complete the model. First, all choices are publicly observable, i.e., each \( i \) in \( t \) knows all membership choices in all prior periods. This assumption seems reasonable, since the chantries under investigation were small (10 to 50 members), close-knit associations of individuals interacting on a frequent (daily or weekly) basis with periodic (quarterly or annual) administrative meetings attended by all members where the organization reviewed the conduct of its officers and members. Second, each craftsman who dies in stage 2 of period \( t \) is replaced by a new, identical craftsman at the start of period \( t + 1 \). This assumption simplifies the analysis and is consistent with the structure of these organizations. Chantries recruited new members continuously but screened them intensively, often collecting large entry fees and imposing waiting periods of several years before candidates became eligible for benefits. Guilds possessed ranks of journeymen and apprentices seeking promotion to the rank of master. These provisional members participated in the social and ritual life of the organization. So, they had the ample opportunity to observe events that transpired and learn the history of the organization. Third, craftsmen believe that the promise to pray for the salvation of their souls will be fulfilled, even after their deaths, when they lack the ability to monitor the behavior of their former colleagues or to retaliate against those who do not live up their part of the bargain. In another essay, we examine the credibility of this promise, and demonstrate that provisions of the doctrine of Purgatory ensured that the promise would be fulfilled, by making the fulfillment of the promise a good work that reduced time spent in Purgatory, and by convincing individuals that praying for the salvation of souls was a salutary part of the grieving process, which would reduce the pain that a person felt for their deceased family, friends, colleagues, and brethren. Fulfilling the promise could also serve as a screening and signaling device, enabling a chantry to recruit the type of members who valued prayers and fulfilled promises, which would enable
the institution to be self-sustaining. Fourth, the spending option with most votes in step 3
is chosen, and if there is a tie among options, then the option outlined in the club by-laws
is chosen.

The chantry’s by-laws consist of two edicts. First, in step 3 of period \( t \), the chantry
includes a member on the prayer roll if he joined the chantry in all prior periods of his life
and died in period \( t \). Note that this by-law encapsulates an assumption that simplifies the
mathematics of the model, since a craftsman that does not join the chantry in one period
never receives prayers in future periods, and therefore, have no incentive to cycle in and out
of the organization. Second, in step 3 of period \( t \), the chantry spends all resources from
fees collected in step 1 on prayers for members who are on the prayer list from by-law 1.
The by-laws in our model reflect the by-laws of the typical medieval chantry, which stated
that the association would pray only for the souls of members who died in good standing.
Those names would be enshrined on a roll of parchment which was read during intercessory
services.

In our model craftsmen, join the club in step 1 of period \( t \) if the expected benefit of
membership exceeds the cost of membership. The expected benefit depends upon aspects of
craftsmen’s strategies related to the distribution of chantry benefits. To simplify our analysis
of these strategies, we assume the by-laws that determine the allocation of resources are
contractually binding. In the next section, we explain why these by-laws are self-enforcing.

Craftsman \( i \) pursues the following chantry strategy. “In each period \( t \), join the club in
step 1 and vote according to the by-laws in step 3.” If choosing this strategy is optimal
given all others choose this strategy, then

\[
U_{it} = mv_{it} (nf) - f + (1 - m) U_{i+1}.
\]

Since if all craftsmen pursue the chantry strategy in all periods, \( U_{it} = U_{it+1} \), we find that

\[
U_{it} = v_{it} (nf) - \frac{f}{m}.
\]

A craftsman will follow this strategy when all others craftsmen follow this strategy if doing
so yields a higher expected payoff than all possible deviations from the chantry strategy. The
only deviation for \( i \) in \( t \) is to not join the club, which yields payoff of 0 in round \( t \) and all
future periods. Thus, the present value of this deviation is 0.
Therefore, adopting the chantry strategy is optimal for $i$ when

$$U_{it} \geq 0 \Rightarrow v_{it}(nf) - \frac{f}{m} \geq 0 \Rightarrow v_{it}(nf) \geq \frac{f}{m} \equiv v^*.$$  \hfill (4)

Inequality (4) states that craftsmen will pursue the chantry strategy when the spiritual benefits, $v_{it}(nf)$, are sufficiently valuable. The value depended largely on the intensity of craftsmen’s belief in the doctrine of purgatory. The more that they believed, the more that they valued prayers for the salvation of their soul, and the higher the value of the function $v_{it}(nf)$, for all levels of spending on prayers.

Inequality (4) contains sufficient information for us to plot the minimum spiritual benefit necessary for a chantry to exist. The minimum increases in $f$ but decreases in $m$. The minimum approaches $\infty$ as $m \to 0$ from above and approaches $f$ as $m \to 1$ from below. Thus, the chantry is more likely to exist in equilibrium when the mortality rate, $m$, is high. Intuitively, when the mortality rate rises, the chance of entering Purgatory soon increases, and craftsmen place a higher value on membership in a chantry. When the mortality rate falls, the chances of dying soon decreases, and craftsmen place less weight on the anticipated benefits of postmortem prayers.

Figure 4(a) depicts this chantry curve by plotting combinations of $m$ and $v(nf)$ in $(m, v(nf))$-space for which (4) holds as an equality. For convenience, the entry fee, $f$, is set equal to 1. The area along and above the curve, $v^*$, indicates combinations of $m$ and $v(nf)$ for which chantries will exist in equilibrium. Figure 4(b) adds the condition for a cartel to exist. The plotted line is vertical, since the cartel engages in no religious activities, and its existence is unaffected by individuals’ beliefs about Purgatory. At any point to the left of the line, mortality rates are low enough for the cartel to be sustained as an equilibrium. To the right of the line, mortality rates are so high and life expectancies are so low, that threats of punishments in the future cannot deter defection today, and the cartel cannot be sustained as an equilibrium.
4.3 Guild Equilibrium

A guild was a cooperative of craftsmen with both pious and profitable functions. We model a guild by merging our models of a chantry and a cartel. Our guild consists of $n$ craftsmen and $t$ periods, where each period consists of a sequence of moves in the order that follows.

1. All craftsmen simultaneously decide whether to join the chantry.

2. Irrespective of the choice made in step 1, all craftsmen simultaneously decide whether to produce high or low quality merchandise.

3. Nature decides which craftsmen die.

4. Club members decide how to use club resources.

5. Payoffs for the period are received.

Using equations (1) and (3), we represent craftsman $i$’s Bellman’s equation as

$$U_{it} = \max \{ Pr[i \text{ dies and is prayed for in } t] v_{it} \text{ (prayer expenses)}$$

$$-I \text{ (join) } f + (1 - m) (\pi_{it} (q_{it}, q_{-it}) + r_{it} + U_{it+1})\}.$$  \hspace{1cm} (5)

The guild’s by-laws consist of two ordinances. First, in step 3 of period $t$, include a $t$-period guild member on the prayer list if he joined the guild and chose $q_{it} = q_H$ in all prior periods of his life and died in $t$. Second, in step 3 of period $t$, spend all guild resources from fees collected in step 1 on prayers for the salvation of the souls of the members on the prayer list. These by-laws link the guild’s pious and profitable endeavors by promising spiritual benefits only to those who also cooperated economically and religiously in the cartel. Economic cooperation is sustained by threats of religious, rather than economic, retaliation.\footnote{In this section of the essay, we assume that the guild operates according to by-laws that allow only religious retaliation because ordinances of this type are the only ones observed historically. In the next section of the essay, we explain how such by-laws can be sustained as an equilibrium.}

The cooperative guild strategy of interest has each craftsman do the following: “In each period $t$, join in step 1, set $q_{it} = q_H$ in step 2, and vote according to the by-laws in step 3.”
If everyone abides these guild by-laws, then from (5) we calculate craftsman $i$’s expected payoff to be

$$\begin{align*}
U_{it} &= mv_{it} (nf) - f + (1 - m) (\pi_C + U_{it+1}) \\
U_{it} &= \frac{(1 - m)}{m} \pi_C + v_{it} (nf) - \frac{f}{m}.
\end{align*}$$

(6)

To see when this guild can be sustained as an equilibrium, we need to consider craftsman $i$’s payoffs under both of his possible deviations. One, craftsman $i$ can deviate in step 1 by not joining the chantry. Under this deviation, he will forever be excluded from the religious benefits. Moreover, since all others continue to choose $q_H$, he can set $q_{it} = q_L$ and receive $\pi_D$ in every period. The present value of this deviation is $\sum_{t=1}^{\infty} (1 - m)^t \pi_D$, which equals $\frac{1 - m}{m} \pi_D$. Two, after joining the chantry in step 1, craftsman $i$ can deviate in step 2 by choosing $q_{it} = q_L$. This deviation yields a lower expected payoff than the first deviation since the deviating craftsman pays the membership fee $f$ in step 1 but never receives religious benefits. Since it is a dominated strategy, to determine when the guild can be sustained as an equilibrium, we only need to compare the present value of the payoff in (6) with the step 1 deviation.

The comparison indicates that pursuing the guild strategy when all other craftsmen also pursue the guild strategy is optimal for $i$ when

$$\begin{align*}
\frac{(1 - m)}{m} \pi_C + v_{it} (nf) - \frac{f}{m} &\geq \frac{1 - m}{m} \pi_D \\
v_{it} (nf) &\geq \frac{1 - m}{m} (\pi_D - \pi_C) + \frac{f}{m} \\
v_{it} (nf) &\geq \frac{1 - m}{m} (\pi_D - \pi_C) + v^* \equiv v^{**}.
\end{align*}$$

(7)

Inequality (7) states that the guild can be sustained in an equilibrium if the value of the religious benefits is sufficiently high.

Figure 4(c) plots combinations of $m$ and $v(nf)$ in $(m, v(nf))$-space for which (7) holds as an equality, using assumptions identical to those in Figures 1(a) and (b). The area along and above the curve, $v^{**}$, indicates combinations of $m$ and $v(nf)$ for which the guild exists as an equilibrium. The $v^{**}$-curve has a similar shape to the $v^*$-curve, but lies above it, because the benefits to deviating from the guild are greater, so that at any mortality
rate, the guild needs a greater threat to sustain cooperation. In addition, for all mortality rates, the benefits provided by guild membership, according to $v^{**}$, is strictly larger than the benefits of chantry membership, according to $v^*$. Intuitively, the guild must provide greater benefits to members in order to sustain pious and profitable cooperation as compared to the benefits necessary to sustain only religious cooperation in the chantry. However, $v^{**}$ approaches $v^*$ as the mortality rate, $m$, increases. As the chance of dying in period $t$ increases, the economic incentives to deviate diminishes, and the punishment needed to sustain a the guild approaches that needed to sustain the chantry.

Figure 4(c) also indicates the equilibria for different parameter ranges. At low mortality rates, separate religious and economic organization exist. At high mortality rates, only religious organizations exist, with or without an economic component. If $m > m^*$, cartels cannot exist in equilibrium, because the incentives to free ride are too powerful and cooperation breaks down. Craftsmen can prevent this breakdown of cooperation by bundling economic and religious activities together in a guild. As long as the postmortem promise of prayers for the salvation of one’s soul are sufficiently enticing, the guild can use the threat of exclusion from prayers to sustain economic cooperation.

5 Theoretical Synthesis

Our analysis implies that religious belief in Purgatory and the mortality rate, as well as economic, legal, and social factors (e.g., $\pi_C$, $\pi_D$, $\pi_{NE}$, and the punishments permitted by law and custom) determine the organizational structure of society. In our model, economic, legal, and social factors determine the shape and location of the curves in Figure 1. Changes in these parameters will shift the curves. The following hypotheses extend the conclusions derived in the previous section, where we discussed a particular industry in a particularly institutional setting, to a world composed of numerous groups of craftsmen in a variety of industries operating under a spectrum of institutional conditions.

Hypothesis 1 (Institutional Structure and Mortality Rates):

(a) At low mortality rates, there can exist separate religious and economic organizations and also bundled religious-economic organizations.
(b) At high mortality rates, all organizations must have a religious component.

Why? At mortality rates below the \( m^* \) for all industries, individuals have long time horizons and place great weight on future consumption. Individuals prefer the long run benefits of economic cooperation to the short run benefits of economic defection. So, economic organizations can sustain themselves as equilibria without recourse to religious sanctions. At mortality rates above the \( m^* \) for all industries, however, time horizons are too short to sustain economic cooperation, and economic cooperation only occurs when bundled with religious rituals. At intermediate mortality rates, craftsmen in some industries might need to form guilds to sustain economic cooperation, while craftsmen in other industries may be able to sustain cooperation as cartels.

**Hypothesis 2 (Religious Institutions and Beliefs about Purgatory):** As belief in purgatory and the value placed on post-mortem prayers increases, religious clubs (chantries or guilds) will be more likely to exist.

Why? As the value of post-mortem prayers rise so that \( v(n,f) \) exceeds \( v^* \) (for a given set of parameters, a fixed mortality rate, and a given group of craftsmen), the craftsmen will organize a chantry. As more groups rise above the threshold, more chantries will operate. If \( m \) exceeds \( m^* \) for a particular group, the craftsmen will convert their chantry into a guild, once prayers’ value rises so that \( v(n,f) \) exceeds \( v^{**} \), because the guild equilibrium always dominates the chantry without cartel equilibrium. If \( m \) falls below \( m^* \), however, the craftsmen may form a guild, or they may continue to operate separate chantries and cartels, depending on the circumstances for that particular occupational and institutional setting (i.e. the guild equilibrium dominates the chantry plus cartel equilibrium in some instances but not others).

Hypothesis 2 yields an interesting corollary. Religious vitality (as measured by the percentage of organization engaged in religious activities) does not depend on religious beliefs alone. It depends on other factors, such as the mortality rate, which plays a key role in our model where the afterlife serves as a disciplinary device. When mortality rates rise, occupational organizations cease operations, and intercessory societies flourish. At high levels
of mortality, cartels cannot operate, leaving chantries and guilds as the only organizations in existence. In such circumstances, the percentage of organization engaged in religious activities rises, even though religious beliefs, as measured by amount that individuals value prayers for the salvation of their soul, remains constant. When the mortality rate rises to extreme levels, it is possible for the apparent religiosity of society to increase, even if the amount that individuals value religion falls.

**Hypothesis 3 (Religious Participation and Mortality Rates):** *Holding religious beliefs constant, as the mortality rate increases, participation in religious institutions increases.*

Why? This hypothesis follows from the fact that $v^*$ and $v^{**}$ are downward sloping in $m$. The slope of these curves indicates that the opportunity cost to religious participation depends upon the mortality rate. As the mortality rate increases, life expectancies fall. The expected value of future consumption diminishes. And, the opportunity cost of expected participation in religious activities falls. In effect, individuals care more about post-mortem prayers, even though their religious beliefs remain unchanged.

Hypothesis 3 also yields an illuminating corollary. The nature of the industry, craftsmen’s cost and revenue functions, craftsmen’s market opportunities, and any legal, social, or cultural institution that influences individuals’ per period income or rate of time preference can generate variation in observed structure of and participation within religious organizations.

**Hypothesis 4 (Guilds and Deviation Payoffs):** *As the payoff to economic defection increases, only guilds that use religious sanctions can sustain economic cooperation.*

To see this, define $\Delta = \pi_D - \pi_C$ as the single-period difference between the defection and cooperation payoffs. This definition implies that $m^* = \frac{\frac{\pi_C - \pi_{NE}}{\Delta} - \pi_{NE}}{\Delta + \pi_C - \pi_{NE}}$. As $\Delta$ increases, $m^*$ decreases, thus shrinking the range of parameter values in which economic institutions can exist without religious sanctions. In effect, economic sanctions alone might no longer be sufficient to sustain cooperation, and guilds that bundle religious and economic might now be necessary, because the benefits to free riding on the cartel have increased.
**Self-enforcing by-laws.** The preceding analysis assumes that the by-laws of chantries and guilds are contractually binding, yet chantries and guilds were ultimately voluntary, and their rules had to be self-enforcing. In this context, self-enforcement means that rules encoded in the by-laws had to arise as an endogenous equilibrium from a game in which craftsmen freely chose how to distribute resources. We have analyzed an extended version of our model that endogenizes such choices. This model shows that by-laws similar to the ones in our model could be sustained as self-enforcing. We say “similar” because in the extended model, craftsmen’s strategies must account for a variety of rare, extreme states of the world (e.g., all craftsmen die, or only craftsman \( i \) survives, or nobody ever dies) and all possible deviations in those states.

The primary substantive results presented above and depicted in Figure 1 remain unchanged. The primary reason is that when the value of intercessory prayers is sufficiently large, their denial becomes an excruciating punishment, and when the mortality rate rises high enough, defection from economic organizations becomes irresistibly enticing.

That said, several subtle differences are worth mentioning. First, if the mortality rate is extremely high (\( m \) close to 1), then there is a high probability that no club member will be alive to spend club resources on prayers. Specifically, the probability of receiving \( v_{it} (nf) \) is no longer \( m \) but is instead \( (m - m^n) \), which approaches 0 as \( m \) approaches 1. For the expected benefits of membership to be sufficiently high when \( m \) is close to 1, \( v_{it} (nf) \) must then be very large. This results in U-shaped \( v^* \) and \( v^{**} \)-curves. The upward turn of the \( v^* \) and \( v^{**} \)-curves occurs at an extremely high value of \( m \). Above that value, as \( m \) approaches 1, neither chantries, nor guilds, nor any other cooperative can be sustained. This intriguing subtlety may help to explain the breakdown of both religious and economic institutions during the first few years of the Black Death’s initial onslaught into Europe.

Second, if the mortality rate is very low (\( m \) close to 0), then there is a high probability that no member of the organization will die, and no money needs to be expended on prayers. Allowing the club to reward living members, either in the form of a refund of club fees or by producing a club good to be consumed by living members, will lower the expected cost of joining the club. This shifts the \( v^* \) and \( v^{**} \)-curves downward at low mortality levels. However, as long as amount received by the living member is less than the cost of the fee,
both \( v^* \) and \( v^{**} \) will still be downward sloping at low \( m \) as in Figure 1, and there are many reasons to believe why the full fee cost cannot be recuperated. First, the club has fixed operational costs, and second, part of the fee is the non-monetary cost of living a pious life, which is a sunk cost that cannot be refunded. Thus, although both \( v^* \) and \( v^{**} \) change locations, they retain the shape described in our earlier analysis.

With these subtle differences in mind, the model in Section 4 and the corresponding diagrams are best thought of as applying for an interior range of mortality rates bounded away from 0 and 1. Since this interior range would correspond the range of actual mortality rates observed (with the possible exception of a few years around 1350), the model presented in Section 3 elucidates the essential issues.

**A Continuum of Cooperation.** If \( m > m^* \), then the cartel cannot sustain production of the highest quality merchandise. If craftsmen can produce goods of intermediate quality, however, then the cartel might be able to sustain production at the intermediate quality. To demonstrate this fact, expand the set of quality choices, so that \( q_{it} \in \{q_H, q_M, q_L\} \), \( q_H > q_M > q_L \). Calculate \( m^{**} (M) \equiv \frac{\pi_C(M) - \pi_N}{\pi_D(M) - \pi_N} \), which is the maximum mortality rate at which the cartel can sustain the production of intermediate-quality goods. Since profits increase in average quality,

\[
\pi_C > \pi_C (M),
\]

(8)

where \( \pi_C \) and \( \pi_C (M) \) are the single-period profits from cartels that produce high and medium quality cloth, respectively. In addition,

\[
\pi_D - \pi_C > \pi_D (M) - \pi_C (M).
\]

(9)

which indicates that the single-period net benefit to deviating is higher when the cartel manufacturers higher quality cloth. Combining the preceding equations and the definitions of \( m^* \) and \( m^{**} (M) \) indicates that \( m^{**} (M) > m^* \). Thus, at mortality rates severe enough to prevent the production of high-quality merchandise, the cartel may be able to sustain the production of merchandise of intermediate quality. This mathematics may be extended to a continuum including qualities, \( q_{it} \in [q_L, q_H] \), of all grades between the highest and lowest. In that case, the logic of the argument implies that as the mortality rate rises, the quality of the
merchandise manufactured by the guild falls, until it reaches the lower bound, at which the
cartel can no longer sustain cooperation and all members manufacture cloth of the lowest
quality. The mortality rate at that threshold is the \( m^* \) that we calculated previously.

Similar logic applies to guilds. While \( v_{it} (nf) \geq v^{**} \) is needed to sustain production of
the highest quality, there is a \( v^{**} (M) \), such that \( v^* < v^{**} (M) < v^{**} \), in which the guild can
sustain medium quality if \( v_{it} (nf) \geq v^{**} (M) \). With a continuum of qualities, variation in the
mortality rate and the value of intercessory prayers will influence the level of cooperation.
As the mortality rate decreases and as the value of intercessory prayers rises, guilds are able
to manufacture merchandise of increasingly higher quality. This result, that changes in the
exogenous variables influence the behavior of craftsmen within organizations, complements
the result that we emphasized in the previous section, that the mortality rate and doctrine
of Purgatory determined the optimal organizational form.

**Exclusion vs. Nash Reversion.** By using both religious exclusion and Nash reversion,
the guild could sustain cooperation for a wider set of parameter values. In our simple
model, we can define joint punishment strategies and by-laws that can sustain cooperation
for all \( v_{it} (nf) \geq v^{***} \), where \( v^{***} \) is the dual-threat version of \( v^{**} \) defined in inequality (7).
Specifically, we calculate

\[
v^{***} = v_{it} (nf) \geq -\frac{1}{m} \left( \pi_C - \pi_{NE} \right) + v^* \equiv v^{***}.
\]

Because \( \pi_C > \pi_{NE} \), it follows that \( v^{***} < v^* \) for all \( m \). Thus, we could depict \( v^{***} \) in the
figure and find that the parameter space in which dual-threat guilds exist is a strict superset
of the parameter space in which exclusion-only guilds exist in equilibrium.

Why, then, did guilds use exclusion alone as the punishment instead of a combination of
exclusion and Nash reversion? One possible answer, not original to this paper, is that keeping
quality high among the non-defectors provides a higher off-equilibrium path payoff than
does Nash reversion. The non-deviators will prefer to maintain their economic cooperation
because it yields them a higher punishment-phase payoff. Another possible answer is that
variation in craftsmen types and adverse selection can yield an equilibrium in which trigger
punishments happen on the equilibrium path. The same result may arise if uncertainty exists
in monitoring and enforcement.
While these "off-path" explanations are relevant for guilds, our model suggests another "on-path" reason. Notice that \( v^{***} \) approaches \( v^* \) as \( m \) increases. As stated earlier, \( v^{**} \) also approaches \( v^* \) as \( m \) increases. This means that at low mortality rates, dual-threat guilds may exist for some parameter values where exclusion-only guilds cannot function. But, at low mortality rates, bundling is not necessary to sustain economic cooperation at low mortality rates; cartels can exist on their own. At high mortality rates, the threat of religious sanctions becomes substantial, and the threat of Nash reversion diminishes, since individuals do not expect to suffer temporal punishments for prolonged periods (they expect to be dead instead). In other words, the range where the bundling of economic and religious activities is important for sustaining cooperation is exactly the range where the threat of Nash reversion has least marginal value. Thus, guilds will not employ Nash threats, since executing Nash reversion entails substantial costs, and even threatening Nash reversion entails spiritual costs, since Christian doctrines encouraged individuals to "turn the other cheek" and discouraged indiscriminate retaliation.\(^5\)

**Outside Options and Renegotiation.** Our model assumes that craftsmen must choose whether or not to join a single cartel, chantry, or guild. Other organizations do not exist. The assumption obviously colors our result. The guild’s spiritual threat would be weaker, and the guild may not form, if a craftsmen could cheat his colleagues by manufacturing low-quality merchandise, and after suffering expulsion, quickly use a portion of his ill-gotten gains to join an independent chantry which would pray for the salvation of his soul. We rule out this possibility, because both historical and strategic factors limited craftsmen’s outside options. Strategically, the formation of a new chantry (or guild) requires a multi-player deviation, since a craftsman cannot form a single-person chantry. Postmortem prayers cannot, after all, be self administered. A multi-player deviation entails overcoming all of the impediments to collective action that impede the operation of the original organization. Historically, most medieval chantries had long probationary periods through which new members had to pass before receiving religious benefits. These probationary periods

\(^5\)Taking a first derivative, we obtain \( \frac{\partial v^{***}}{\partial m} = \frac{1}{m} (\pi_C - \pi_{NE} - f) \). With \( \pi_C - \pi_{NE} < f \), then \( v^{***} \) will have the same general shape as \( v^* \) and \( v^{**} \), but if \( \pi_C - \pi_{NE} < f \), then \( v^{***} \) will be positively sloped. In this case, the dual-threat guild can sustain cooperation in many more places than the exclusion-only guild. However, \( v^{***} \to v^* \) as \( m \to 1 \) in both cases.
enabled guilds to size up new members, helping them to screen out bad apples and limit adverse selection. Chantries also charged sizeable entrance fees. Guilds also charged large entry fees and required prospective members to serve long apprenticeships. These organizational attributes would have made it difficult and may have precluded the possibility of joining a new chantry. Moreover, since the value of postmortem prayers depended upon the piety of those doing the praying, a known deviator would be perceived as a bad candidate for membership in a new organization. This would reduce the number of organizations willing to accept a defector and the value of the postmortem prayers from any organization willing to accept such an impious person.

The last reason helps us understand the limited possibilities for renegotiation between defectors and chantries or guilds. Once a craftsman defected, the other member’s valuation of that defector’s membership decreased because of the defector’s demonstrated lack of piety. Hence, chantries and guilds had little (and perhaps no) incentive to renegotiate religious punishments. In contrast, the incentive to renegotiate Nash reversion was always strong, since Nash reversion hurt honest craftsmen who remained faithful to their colleagues as much as it hurt those who had been caught defecting. This contrast is an additional reason that guilds emphasized religious punishments during the later Middle Ages.

6 Comparative Statics and Historical Evidence

The last thing that we need to discuss is the power of the evidence. We are not advocating a bicausal theory of history. We know that many forces propelled the changes discussed in this paper. We believe, however, that our model and the intuition which it encapsulates captures an important link between (a) exogenous forces – principally the rate of mortality and beliefs about the afterlife, (b) the evolution of cooperation, and (c) the expansion of commerce and industry in late-medieval Europe. While alternative explanations exist for all of these phenomena, our theory provides a unifying theme for a large body of disparate data and apparently unrelated phenomena.

TO BE COMPLETED...
7 Discussion

Our mathematical model and historical analysis generate several insights of general interest. The first is that in circumstances where high mortality rates (and thus low discount rates) limit the amount of economic cooperation supported by repeated interaction and Folk Theorem effect, religious beliefs can provide an alternative method of sustaining economic cooperation. Evidence indicates that religion played a key role in sustaining cooperation during the later Middle Ages, when the introduction of the Yersina Pesta and other infectious diseases raised mortality rates in urban areas to such an extent that the populations of towns and cities could not sustain themselves.

The second insight is the interaction between mortality and religiosity. In late medieval England, religion became a transcendent force underlying social and economic organization only after the Black Death, when mortality rates rose to such an extent that repeated interaction and Folk Theorem effects could not sustain cooperation in purely economic organizations. In that environment, only organizations with a religious foundation could survive, and therefore, all organizations were religious. When mortality rates were lower, such as during the decades preceding the Black Death, purely economic organizations existed (and at times operated quite effectively), even though the doctrine of Purgatory had gained widespread acceptance.

The analysis above yields various insights into the incidence of economic cooperation and institutional development. When mortality rates are high so that cooperation in a repeated interaction environment cannot be sustained by economic sanctions as implied by the Folk Theorem, then economic cooperation can be sustained by using religious instead of economic threats. This finding both contrasts and complements earlier research. For example, Greif [CITE] shows how the Maghribi traders used a reputation mechanism to make economic threats credible, thereby fostering economic cooperation in the medieval Mediterranean. In our analysis, a similar mechanism works to sustain economic cooperation in a cartel, but only if mortality rates are sufficiently low. With low mortality rates, individuals sufficiently value the future consumption that is only obtained by cooperation. However, if mortality rates are high so that future consumption is not weighed heavily in the expected utility
calculations, then other punishments must be used to sustain cooperation. Craft guilds in late-medieval England did just that taking advantage of the purgatory doctrine.

That craft guilds in medieval England rose and declined with the doctrine of purgatory implies that institutional change will also depend on changes in mortality rates and religious beliefs. North [CITE], in his general theory of institutions and institutional change, posits that institutional change is driven by changes in relative prices. In medieval England, an increase in mortality rates weakened the viability of economic sanctions on defecting cartel members, thereby damaging the cartel’s ability to maintain cooperation. The increased belief in the doctrine of purgatory partially countered this trend by allowing for religious sanctions to substitute for economic sanctions on defectors, thereby leading to the formation of guilds.

In their environment, craft guilds can understood as a form of organization more efficient than other forms. Economic cooperation yielded high quality crafts, thereby generating demanded products for consumers and profits for craftsmen, and only guilds could sustain this cooperation when mortality rates were high. Note as well that the economic notion of efficiency applies also to religious institutions. Given exogenous beliefs in the doctrine of purgatory, religious cooperation that provides a desirable religious club good is also efficient. This point contrasts as well as complements the view of Ekelund et al (1996) that purgatory was a doctrinal innovation that eventually generated large rents for the medieval Church. We do not deny that the Church benefited from this doctrine. Instead, we claim that the Church was not the only benefactor.

Since religious beliefs impact both the success of and change in economic institutions, it follows that they also affect economic outcomes. Weber [CITE] made a similar claim that religious beliefs have economic consequences, but our analysis differs from Weber’s in a crucial way. Whereas Weber emphasized that religion influences economic outcomes by changing preferences (i.e., the Puritan ethic influenced the development of Capitalism in the west), we show that religious beliefs have economic effects through their effect on institutions. In so doing, we argue that the influence of religion on economic outcomes, as seen in the expansion of manufacturing and commerce in medieval England, predates the rise of the Protestant Reformation and the Protestant ethic.
Our model sweeps many richer details of medieval industry “under the rug,” yet it is also flexible and general enough to accommodate various extensions. In Section 4, we described how to modify the model to more closely examine the credibility of promises to pay for post-mortem prayers, the possibility of multiple quality choices, other forms of punishment, and renegotiation. Instead of fundamentally changing the analysis, variations in these factors shift the parameter ranges in which chantries, cartels, and guilds can exist in equilibrium. Graphically speaking, varying these other factors shift the $m^*$ line and the $v^*$ and $v^{**}$ curves in Figure 1. With accurate data of all factors and forces, the model implies variation in the types of institutions we would observe. Extending the model in still other ways will also shift these curves. For example, particular industries may differ in the benefits of economic defection or in the abilities of craftsmen to monitor their fellow craftsmen’s product quality. In each of these cases, each industry will have a unique $m^*$ line, and with a common mortality rate for all craftsmen, the model will predict variation in the types of institutions observed.

Future work can build on this paper’s analysis in a variety of ways. Exactly what conditions are necessary for the guild’s promise to pray for a deceased craftsman’s soul a credible promise? Why factors led to the spread of the doctrine of purgatory? Have other institutions used threats based on a belief in the afterlife to limit free-riding? Examining these and other questions may provide new insights into the variety of economic institutions we observe both in the past and today.

References


Figure 1: The Timing of Changes in Belief in Purgatory, Mortality Rates and Guild Formation

Before 1250
No guilds

1250-1350

1525-1575

1350-1400
Guilds abundant

1400-1525

Mortality Rates

Figure 2: Mortality and Population, England, 1200 to

Annual Mortality Rate

Population
Figure 3: Dates of Guild Foundation in the Corporate Census of 1388

Figure 2: Dates of Occupational Guild Foundation in the Corporate Census of 1388
Figure 4: Parameter Ranges for Various Equilibria

(a) Parameter Ranges for Chantry Equilibria

(b) Parameter Ranges for Separation Equilibria

(c) Parameter Ranges for Guild Equilibria