THE ECONOMIC JOURNAL

The Economic Journal, **128** (*August*), 2066–2105. Doi: 10.1111/ecoj.12498 © 2017 Royal Economic Society. Published by John Wiley & Sons, 9600 Garsington Road, Oxford OX4 2DQ, UK and 350 Main Street, Malden, MA 02148, USA.

WITCH TRIALS*

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We argue that the great age of European witch trials reflected non-price competition between the Catholic and Protestant churches for religious market share in confessionally contested parts of Christendom. Analyses of new data covering more than 43,000 people tried for witchcraft across 21 European countries over a period of five-and-a-half centuries and more than 400 early modern European Catholic–Protestant conflicts support our theory. More intense religious-market contestation led to more intense witch-trial activity. And compared to religious-market contestation, the factors that existing hypotheses claim were important for witch-trial activity – weather, income and state capacity – were not.

> For, where God built a church there the Devil would also build a chapel.
> –Martin Luther (Kepler, 2005, p. 23)

Witch trials have a peculiar history in Christendom. Between 900 and 1400, Christian authorities were unwilling to so much as admit that witches existed, let alone try someone for the crime of being one. This was not for lack of demand. Belief in witches was common in medieval Europe and in 1258 Pope Alexander IV had to issue a canon to prevent prosecutions for witchcraft (Kors and Peters, 2001, p. 117).

By 1550, Christian authorities had reversed their position entirely. Witches now existed in droves and, to protect citizens against the perilous threat witchcraft posed to their safety and well-being, had to be prosecuted and punished wherever they were found.[1] In the wake of this reversal, a literal witch-hunt ensued across Christendom. The great age of European witch trials would not end for another 150 years. By the time it did, no fewer than 80,000 people had been tried for witchcraft, half of them executed (Scarre and Callow, 2001; Ankarloo and Clark, 2002; Stark, 2003; Behringer, 2004; Levack, 2016).[2]

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We thank the Editor, Hans-Joachim Voth, and two anonymous reviewers for their suggestions. Earlier versions of this article benefited from the comments of seminar participants at Harvard, Yale and the University of Pennsylvania.

[1] Of course, the evolution of the Church's stance on witches was not discontinuous. While traditional acts of witchcraft, such as black sorcery and 'night flights', were rejected as mere hallucinations in the *Canon Episcopi c.* 1100, these hallucinations were nevertheless attributed to evil spirits (Lea and Howland, 1939). Between *c.* 1300 and *c.* 1400, the Church began to reconsider the reality of witchcraft, definitively declaring its existence in 1398 when Church scholars at the University of Paris proclaimed witchcraft the result of contracts made with Satan (Lea, 1888, p. 464; Stoyanov, 2000, pp. 237–8; Levack, 2004). In 1484 Pope Innocent VIII issued *Summis desiderantes affectibus*, a papal bull authorising violence against witches. In 1487 Heinrich Kramer and Jacob Sprenger published *Malleus Maleficarum* – 'Hammer of Witches' – a manual describing how to investigate accusations of witchcraft and execute witches (Summers, 1971).

[2] The precise number of Europeans tried and executed for witchcraft is unknown. The consensus among historians is that 100,000–110,000 Europeans were tried for witchcraft between *c.* 1400 and *c.* 1750, about half of them executed (see in-text citations above). The data our article furnishes suggest that approximately 88% of Europeans tried for witchcraft between 1400 and 1750 were tried between 1520 and 1700. Eighty thousand Europeans tried for witchcraft during the great age (*c.* 1520–1700) is thus a conservative estimate.

The distribution of their trials was highly uneven, temporally and geographically. Sixty per cent were prosecuted between 1560 and 1630, a period known as the 'Great Hunt'; more than half within a 300-mile radius of Strasbourg, France. Countries such as Spain, Italy and Portugal, on other hand, largely avoided witch trials (Lea and Howland, 1939; Scarre and Callow, 2001; Behringer, 2004; Decker, 2004; Thurston, 2007; Levack, 2016).

This article develops an economic theory of the great age of European witch trials. We explain its rise in the early sixteenth century; surge in the mid-sixteenth; decline in the mid-seventeenth; why it ravaged certain countries, spared certain others; and why Christian officials prosecuted virtually no one for witchcraft in the Middle Ages despite popular belief in witches and demand for their persecution.

Our argument is simple: Europe's witch trials reflected non-price competition between the Catholic and Protestant churches for religious market share in confessionally contested parts of Christendom.[3] By leveraging popular belief in witchcraft, witch-prosecutors advertised their confessional brands' commitment and power to protect citizens from worldly manifestations of Satan's evil. Similar to how contemporary Republican and Democrat candidates focus campaign activity in political battlegrounds during elections to attract the loyalty of undecided voters, historical Catholic and Protestant officials focused witch-trial activity in confessional battlegrounds during the Reformation and Counter-Reformation to attract the loyalty of undecided Christians.[4] Throughout Europe before Reformation and where Protestantism never gained ground after it, there was little need for witch trials, since religious-market contestation was minimal. Moreover, precisely because of this, what few challengers the Church confronted here could be and were dealt with through the application of a more decisive competitive strategy: compelled conversion or annihilation, carried out through crusades and inquisitions.

To evaluate our theory, we create two new data sets. To measure witch-trial activity, we collect data on more than 43,000 people prosecuted for witchcraft across 21 European countries between 1300 and 1850; to measure religious-market contestation, on more than 400 confessional battles – Catholic–Protestant conflicts comprising early modern Europe's wars of religion.

Analyses of the data support our theory: more intense religious-market contestation led to more intense witch-trial activity. This result is robust to accounting for the factors that existing hypotheses for witch trials claim were important – weather, income and state capacity – which, compared to religious-market contestation, were not.

[3] Our discussion focuses on the most significant religious competition in early modern Christendom: that between Catholics and Protestants. However, the Reformation gave birth to not one but several different Protestant churches, which also competed with one another. In Britain, for example, much confessional competition was between rival Protestant churches rather than between Catholics and Protestants (Heinze, 2005). As discussed below, the economic theory of European witch trials we develop applies also to competition between rival Protestant churches.

[4] The possibility that confessional strife may have played a role in early modern European witch-trial activity is mentioned in some form in nearly every major witchcraft study in the historical literature (Midelfort, 1972; Monter, 1976, 2008; Schormann, 1977, 1981; Larner and Macfarlane, 1984; Behringer, 1997; Levack, 2016). With few exceptions (Trevor-Roper, 1967; Waite, 2003), however, these mentions are followed by dismissals of confessional competition's importance. Our analysis suggests that this dismissal has been too hasty.

Far from limited to the practice of prosecuting witches in early modern Europe, the phenomenon we document – using public trials to advertise superior power along some dimension as a competitive strategy – is general and widespread, appearing across diverse parts of the world, historical and modern. This phenomenon is closely related to that made famous by Foucault (1977), who argued that public criminal prosecutions in absolutist regimes had a logic: through them, officials widely advertised to citizens their willingness and power to detect and suppress challengers to their authority.

Consider, for example, Stalin's 'show trials' in late-1930s Soviet Russia. Here, the Supreme Court of the USSR investigated the alleged crimes of Stalin's political rivals, Old Bolsheviks and Trotskyists (Conquest, 1968). The outcome was certain to everyone before these trials began – the defendants' conviction and execution. Still, they played an important role not only in Stalin's purges of his political enemies but, more critically, in the message they advertised to Soviet citizens contemplating whose political faction to get behind: that Stalin had the willingness and power to ruthlessly suppress political challengers; his challengers did not. Or consider Mao's show trials of wealthy landlords in 1950s China, which advertised the same basic message but to Chinese citizens contemplating their loyalties in a slightly different context: whether to support or resist the reforms of the Great Leap Forward.

The phenomenon underlying European witch trials also features in much earlier history. Take, for instance, the infamous 'cadaver trial' of Pope Formosus, who was prosecuted posthumously in 897 for allegedly violating canon law by his successor, Pope Stephen VI. A scramble for the papacy in the late ninth and early tenth centuries led to the rapid turnover of numerous pontiffs, several of whom were murdered in the rivalry to accede to the See of Rome. Among the scramblers was Formosus. A year after his death, Stephen ordered the trial of Formosus's corpse: it was adorned with papal vestments, propped up in a throne in the Basilica of St. John Lateran before an ecclesiastic audience and questioned with the pointed query, 'Why did you usurp the universal Roman see in a spirit of ambition?' (Liudprand of Cremona, 2007, p. 64). The carcass was then convicted, defrocked and dismembered in a powerful advertisement to designing clerics of Stephen's readiness and ability to punish would-be challengers in an environment of intense papal competition.

Still closer to Christian officials' use of witch trials as a competitive strategy are 'vermin trials' – the criminal prosecution of rodents and insects by Church authorities in Renaissance-era Europe. Here, ecclesiastics tried vermin for crop infestations at citizens' behest, punishing convicted species with excommunication and anathema. As Leeson (2013*a*) shows, clerics used these peculiar prosecutions to convince the public of their power to sanction tithe evasion supernaturally where belief in that power was under attack by pre-Reformation challengers to the Church.

Or consider the Salem witch trials, prosecuted in late seventeenth-century Massachusetts amid intense competition between Puritan ministers for congregants (Mixon, 2015). Similar to their European forerunners, these trials advertised rival religious leaders' power to suppress perceived satanic threats to citizens deciding which of them to follow.

There are of course important differences between early modern European witch trials and many of these others, used elsewhere and at other times. Perhaps most

significantly, the former did not in general serve competitive ends by executing witch-prosecutors' confessional rivals.[5] Stalin's show trials, in contrast, had the annihilation of his political opponents as one of their primary purposes and in this sense were closer to inquisitions. Still, European witch trials and these others share a core characteristic: all of them, whether they also executed rivals or not, performed the broader competitive function of advertisement, publicly conveying the prosecutor's superior power in a contested marketplace – religious, political, or other.

Our article is closely connected to three strands of literature. The first uses rational choice theory to understand the practices of the historical Catholic Church. Ekelund *et al.* (1989, 1996, 2002, 2004, 2006) and Ekelund and Tollison (2011) study the historical Church as a firm and analyse changes in its behaviour after the Reformation as profit-maximising responses to religious competition from Protestantism. Our article uses a similar approach to analyse one such response to Protestant competition in particular: witch trials.

Our article is also connected to the literature on the law and economics of superstition, which uses rational choice theory to analyse the role that scientifically false beliefs play in a variety of political-economic institutions. Posner (1980), for example, considers how witch beliefs can support social insurance in primitive societies. Leeson (2012, 2013*b*, 2014*a*,*b*) studies how religious beliefs facilitated criminal justice in medieval Europe; witchcraft and divination beliefs resolved conflict between neighbours in early twentieth-century Africa; ritual-purity beliefs promoted law and order in American Gypsy communities; and Biblical-cursing beliefs protected ecclesiastical property rights in medieval Francia. Most recently, Gershman (2015) analyses 'evil-eye' beliefs as means of avoiding destructive envy driven behaviour in preindustrial societies. Our analysis contributes to this literature by explaining how Christian officials leveraged popular beliefs in witchcraft to compete for religious consumers in early modern Europe.

Finally, our article is connected to the immense historical literature that seeks to understand the great age of European witch trials (Trevor-Roper, 1967; Macfarlane, 1970; Midelfort, 1972; Monter, 1976; Ben-Yehuda, 1980; Larner, 1981; Behringer, 1987, 1995, 1999; Soman, 1989; Ankarloo and Henningsen, 1990; Barstow, 1994; Barry *et al.*, 1996; Briggs, 1996, 2007; Stark, 2003; Jensen, 2007; Thurston, 2007; see also the lengthy bibliographies in, for example, Behringer, 2004; Golden, 2006; Levack, 2016). In addition to furnishing new data that present the most comprehensive picture of European witch-trial activity to date, our analysis reveals the primary importance to that activity of religious-market contestation.

1. A Brief History of Religious Competition in Christendom

For most of the Middle Ages, the Catholic Church enjoyed a virtual monopoly on the supply of Christian religion in Europe (Lynch, 1992, p. 222). When confronted with challengers, it relied on a simple competitive strategy: coercive exclusion – compelling religious rivals' conversion into Catholicism, annihilating those who refused (Ekelund

[5] Though, in a few cases, witch trials did that too. Many witches immolated under the supervision of the Catholic Habsburgs in the Spanish Netherlands, for instance, were Protestants.

et al., 1996, p. 29; 2002, p. 649).[6] In the late twelfth and early thirteenth centuries, for instance, the Church responded to the Cathar and Waldensian movements by declaring their members heretics and then launching the Albigensian Crusade and Medieval Inquisition to extinguish holdouts violently (Oldenbourg, 1962, p. 5; Stoyanov, 2000, p. 208).

This strategy proved highly effective. Between the fourteenth and sixteenth centuries, the Church's share of Christendom's religious market was nearly total. Like most monopolies, however, the Church's was not to last. Between 1517 and 1521, the influential work of a German priest that criticised the Church for corruption and religious abuses spread from Germany throughout Europe.[7] That priest was Martin Luther, whose *Ninety-five Theses* catalysed the Protestant Reformation.[8]

The Church responded to this new religious threat with its old competitive strategy. In 1520 at the Diet of Worms, Pope Leo X issued a bull that declared Luther's views heretical, demanding their renunciation. When Luther refused, Charles V, the Holy Roman Emperor and secular vicariate of the Church in Europe, condemned him as a heretic, banned the publication, possession and dissemination of his or similar writings under pain of 'confiscation and loss of body and belongings and all goods', and offered a bounty for the fugitive religious competitor's capture.

In long-standing Catholic strongholds, such as Spain, Italy and Portugal, this approach worked. Here, laws criminalising Protestantism and non-Catholicism more generally, were enforced by rulers and supported by citizens, virtually all of whom were loyal Catholics. The result was the Spanish, Roman, Venetian and Portuguese Inquisitions, which effectively hunted non-Catholics – Protestants but also relapsed Jewish and Muslim *conversos* – compelling their conversion to Catholicism, executing the contumacious.

In other parts of Europe, however, where existing loyalty to the Church was not so strong, its coercive-exclusion strategy encountered a problem. Here, within just a few short years of Luther's *Ninety-five Theses*, many rulers, citizens too, converted to the reformed faith and thus were unwilling to prosecute, let alone execute, people for the crime of Protestantism. Following Worms, for instance, 'Many ... territories simply ignored the edict' against Lutheranism 'or failed to publish it at all' (Whaley, 2012, p. 174). In fact, in the Holy Roman Empire, 'most rulers did nothing to comply with

[6] As we discuss further below, even in the Middle Ages, coercive exclusion, though primary, was not the only competitive strategy the Church used to deal with religious rivals. For example, much of the Waldensians' attraction to some religious consumers was its adherence to apostolic poverty. To enhance Catholicism's appeal to such consumers, medieval Catholic authorities established two new Church franchises whose members took vows of poverty: the Dominican and Franciscan Orders (Lea, 1887; Lynch, 1992). It was these new franchises that would carry out the Medieval Inquisition.

[7] On the determinants of Protestantism's spread throughout sixteenth-century Germany, see Cantoni (2011). On the causes of the Reformation, see Rubin (2014).

[8] See Luther (1957). Although initiated by Luther, whose particular brand of Protestantism, Lutheranism, was the most influential in the Reformation, the Reformation was not monolithic. It included numerous Protestant brands, such as Calvinism, named for the French pastor and theologian who ultimately fled to Switzerland, John Calvin; Zwinglianism, named for the Swiss preacher whose Protestant ideas had the most influence in his home country, Huldrych Zwingli; the Anabaptist movement, which was formed by some of the more radical followers of Zwingli; and a Henrician branch of Protestantism, initiated with Henry VIII's break from the Catholic Church and establishment of the Anglican Church in England.

the judgement of Rome' (Whaley, 2012, p. 171).[9] Compliance was better in the Low Countries but 'Charles could not order Inquisitors into the German lands without the agreement of the German princes, many of whom had become Lutherans' and so refused (Waite, 2003, p. 82).

In 1555, the problematic became the impossible: the Peace of Augsburg decriminalised Lutheranism in the Holy Roman Empire, precluding coercive exclusion. This treaty between Charles V and the Schmalkaldic League – an alliance of Lutheran princes – sought to bring peace to the Empire, whose territories had become embroiled in confessional wars in the wake of the Reformation.[10] Subject to an array of ambiguous and disputed reservations, it granted princes in each of the Empire's territories authority over the confessional denomination of their lands – *cuius regio, eius religio*, 'whose realm, his religion'. Princes were to choose for their territories' inhabitants either Catholicism or Lutheranism, the latter now legally recognised as a legitimate and permissible Christian religion.

A similar situation prevailed in France. In the first half of the sixteenth century, the crown criminalised the reformed faith, initiating inquisitions against Protestants. Given the kingdom's large number of Huguenots and sympathetic judges, however, many proved reluctant to prosecute the crime. In the second half of the century, the French inquisitions were disbanded, Protestantism at least partly decriminalised – first in 1562 with the Edict of Saint-Germain, later in 1598 with the Edict of Nantes.

Mid-sixteenth century legalisation in most of Europe permanently established Protestantism as a competitor to Catholicism, which had a further effect: the intensification of confessional contestation in Europe's religious marketplace. 'Although ostensibly signaling the end of religious conflict, the Peace of Augsburg' in particular 'actually became a source of further conflict, as princes' sought 'to convert neighboring properties to their own faith' (Waite, 2003, p. 83). Confessional competition flourished, leading to Protestant 'reformations, further reformations, and Catholic … Counter-Reformations … spread across the whole period between the Peace of Augsburg and the Thirty Years War' (Whaley, 2012, p. 507).

The outbreak of that war in the early seventeenth century and, outside the Holy Roman Empire, the Eighty Years' War in the second half of the sixteenth, reflected another manifestation of intensified religious-market contestation after 1555. These wars pitted Catholics against Protestants in violent confessional confrontations.

'The vicious religious conflict ended only with the signing of the Treaty of Westphalia in 1648' (Waite, 2003, p. 83). That treaty ended the confessional battles of the Eighty Years' War between Spain and the Dutch Republic, those of the Thirty Years' War in the Holy Roman Empire and covered two important countries that participated in the latter war but were not part of the Empire: France and Sweden (Croxton, 2013).

It accomplished this 'by permanently fixing the Holy Roman Empire's confessional geography' (Corpis, 2014, ch. 1). The Peace of Westphalia turned the Empire's confessional-geography clock back to 1 January 1624, the so-called 'normal year'. The

[9] Indeed, Charles V was forced to suspend his 1521 ban on Luther's writings temporarily in 1526 at the First Diet of Speyer. In 1529, at the Second Diet of Speyer, Charles V reaffirmed his ban on Lutheranism together with Zwinglianism and Anabaptism.

[10] The Peace of Augsburg was anticipated by the Peace of Passau in 1552.

confessional denomination of every territory reverted to that prevailing in it as of this year, to remain henceforth even if its prince changed his religion.[11] By 'freezing the confessional map' of much of early modern Europe, this treaty 'creat[ed] clearly demarcated boundaries between rival confessions', carving up Christendom into permanent territorial confessional monopolies for Catholics and Protestants (Corpis, 2014, introduction). After 1648, it was no longer possible for Catholic or Protestant religious suppliers to change the denomination of any of the Empire's territories, greatly reducing their motivation to compete.[12]

2. An Economic Theory of European Witch Trials

Two kinds of competitive strategies may be available to religious producers who confront competition for their services in the religious marketplace. The first, mentioned above: coercive exclusion. If a religious supplier can get a rival supplier's faith criminalised and that law can be enforced, he can use the threat of violence to compel his rival and his rival's followers to patronise him, literally eliminating from the marketplace those who refuse through inquisitions and crusades.

This was the strategy the Church pursued in early modern Spain, Italy and Portugal, previously in the Middle Ages, with great success. It was also the strategy the Church attempted elsewhere in early modern Europe with abysmal failure. The reason for this difference is simple.

In the former countries, the Church enjoyed overwhelming loyalty. Nearly everyone – citizen and ruler alike – was devoted to its cause. Thus, the Reformation never made headway; post-Reformation religious competition was weak. This allowed the Church to have its religious rivals criminalised and ensured enforcement, enabling inquisitions against them.

Elsewhere, loyalty to the Church was not so great. Thus, when the Reformation came along, large numbers of citizens, still more important, rulers, quickly abandoned Catholicism for Protestantism; post-Reformation religious competition was stronger. This prevented the enforcement of early attempts to criminalise Protestantism and led ultimately to its decriminalisation, precluding inquisitions against Lutherans, as illustrated by the Peace of Augsburg.

Where religious competition was strong, an alternative competitive strategy was therefore needed – one that did not require overwhelming confessional-brand loyalty. Leading to the second strategy religious producers may resort to: engage in activities that make their brands more attractive to religious consumers; precisely the tact taken

[11] Additionally, whatever rights of religion a confessional minority in a particular territory may have enjoyed as of the normal year were restored to it in perpetuity. A minority that possessed no such rights whatsoever was henceforth permitted the right of 'domestic worship' – religious practice inside the home. Although a few territories were rendered officially biconfessional under these terms, 'most states . . . declare[d] an exclusive, public confessional monopoly' (Corpis, 2014, ch. 1).

[12] The Treaty of Westphalia therefore corresponds not only to a dramatic reduction in European witch-trial activity, as our theory suggests and we document below but also to reduced reliance on other activities the Church engaged in to compete with Protestantism. Barro and McCleary (2016), for example, document a significant slowdown in the pace of canonisations and beatifications after the Westphalian Peace was adopted.

by Catholic and Protestant officials in early modern Europe's confessionally contested marketplaces.

'Europe's rival confessions competed constantly with each other in demonstrating religious zeal' (Monter, 2002, p. 11). And in other ways. Protestant suppliers, for instance, wooed religious consumers with lower prices, replacing the Church's onerous array of tithes, taxes and indulgences with a simple 10% 'biblical tithe' (Ekelund *et al.*, 2002). They regularly preached the superiority of their clergy against the corruption of the Church's. They provided public services, establishing new schools to educate youth.

Catholic suppliers offered consumers a new-and-improved Church in the form of the Tridentine reforms (Ekelund *et al.*, 2004); a more saintly Church in the form of increased canonisations and beatifications, catering to the popularity of saints (Barro and McCleary, 2016). They established their own new schools, spearheaded by the Jesuits: 'Our adversaries are well aware', one Jesuit noted, 'that the more the Catholics and their schools flourish ... the more do their own go down in the scale' (Janssen, 1905, p. 340).

And both Catholic and Protestant religious suppliers vigorously prosecuted witches. Given religious consumers' belief that certain people might be witches and thus threaten to harm them if left undiscovered, religious suppliers could evidence their commitment and power to protect consumers from worldly manifestations of Satan's evil through their commitment and power to prosecute such people for witchcraft. 'Whichever confession could prove its power over ... the Devil's realm, was surely the one approved by God' (Waite, 2003, p. 119) – the better protector against diabolism, hence more attractive to Christian consumers.[13]

Popular belief in witchcraft made it easy for early modern religious suppliers to use witch trials in this way. They needed simply to respond to citizens' existing demand for witchcraft prosecutions.[14] And 'As the common people had long wished to get rid of their troublesome witches, they were only too eager to comply' (Waite, 2003, p. 147).

In prosecuting suspected witches, a religious producer provided protection from worldly manifestations of Satan's evil not only to his confessional brand's consumers but also to his competitor's, who likewise benefited from his witch-hunting activities. This made witch-hunting a kind of confessional advertisement. Similar to contemporary soft-drink suppliers' promotional giveaways, which advertise the giving supplier's brand, the benefits of which accrue to both its customers and those of its competitors, early modern religious suppliers' witch-trial activities advertised the witch-prosecutor's confession, the benefits of which accrued to both its members and those of its rivals.

[13] This is not the only way that religious producers who prosecuted suspected witches might, in doing so, increase the attractiveness of their confessional brands to religious consumers. Given consumers' existing belief in witches and demand for their persecution, a religious producer who catered to that demand appeared to embrace consumers' values, perhaps ingratiating himself to them. On such a phenomenon in contemporary sub-Saharan Africa, see Leistner (2014).

[14] While witches were not prosecuted equally everywhere, they seem to have existed equally everywhere: 'every village must be assumed to have contained several individuals with a more or less established reputation as witches' (Briggs, 2013, p. 214; see also, Gaskill, 2013, p. 284). What varied was not so much the supply of witches as the supply of witch prosecutions, which, as we discuss below, depended on religious producers' benefit of conducting witch trials, in turn dependent on the intensity of religious-market contestation they faced.

The publicity such advertisement afforded religious suppliers was substantial. Accusations of witchcraft took time to investigate, during which word of the investigation and the possibility of an impending trial circulated. If a trial was conducted and, as was often the case, the accused convicted and sentenced to death, her execution took place in public, amplifying the audience for the witch-prosecutor's confessional advertisement by rendering the witch's death a public spectacle.[15]

Witch executions attracted hundreds, sometimes thousands, of observers and news of them spread to neighbouring communities. A sixteenth-century priest described the execution scene he observed in Switzerland this way: 'The crowd was great, and all assembled in the vast space and cried aloud the Holy Name; and the unfortunate women echoed their cries, calling "Jesus! Jesus!" from the midst of the flames' (Stacpoole-Kenny, 1911, p. 216). In case the burning did not make the point clearly, the charges against convicted witches were read publicly at their executions. Similarly, 'Throughout Europe witchcraft sermons were preached during witch-hunts and especially before executions' (Levack, 2016, p. 55).

Citizens who missed an execution and were not satisfied with mere verbal descriptions of its horrors might still manage to get a visual sense of the witch-prosecutor's commitment to protecting them from diabolism. In 1540, for instance, 'at Wittenberg four persons were burnt on one day as witches and sorcerers, and the execution was made publicly known to all the inhabitants by a special woodcut in which the unhappy wretches were depicted with torn and lacerated limbs' (Janssen, 1910, p. 299). Similarly, in Schongau, following the late sixteenth-century prosecution of some 60 witches, 'In order that future generations should retain the memory of these "righteous" proceedings "the administrator of divine justice" requested that … a lasting monument of the trials should be erected in some public place' (Janssen, 1910, p. 416).[16]

Of course, prosecuting witches was not free; it could be very expensive (Thurston, 2007; Briggs, 2013; Dillinger, 2013). The intensity of a religious supplier's witch-trial activity thus depended on its benefit, which depended on the intensity of the religious-market contestation he faced. The more intense the contestation, the higher the benefit of conducting witch trials, hence the more he would conduct. And *vice versa* – for not only was the advertising benefit of witch trials lower in less intensely contested religious markets but, where competition was sufficiently weak, coercive exclusion could be used instead.

'The prosecution of witches in a religiously divided area served, therefore, as an *alternative* to the prosecution of heretics', the Church's religious competitors (Levack, 2016, p. 116). While the inquisitions prosecuted *maleficium* – though mostly the ritual rather than diabolical variety, the latter a distinguishing feature of witchcraft – they were neither established to try witches nor in general showed much interest in doing so. 'Portugal executed a grand total of exactly seven witches … the Spanish Inquisition … permitted barely two dozen executions for maleficent witchcraft' and 'The situation in Italy was broadly comparable' (Monter, 2002, p. 14). The inquisitions were established to hunt non-Catholics – Lutherans in the case of Roman and Venetian

[15] On the 'broadcast efficiency' of public executions, immolation in particular, see Leeson (2014*c*).
[16] Alas, the administrator's thoughtful request was declined.

Inquisitions, false *conversos* in the case of the Spanish and Portuguese, though the latter prosecuted Protestants too. Their targets were the Church's religious rivals and this is where most of the inquisitors' energies were spent.

Witch trials, in contrast, were conducted to hunt, well, witches – the practitioners of diabolical *maleficium*. And 'the adherents to the dominant faith in a religiously divided area generally did not use witchcraft prosecutions to dispose of their religious antagonists ... For the most part, individuals who were prosecuted for witchcraft belonged at least formally to the same faith as their prosecutors' (Levack, 2016, p. 114; see also, Scarre and Callow, 2001, p. 43; Thurston, 2007, p. 170). This distinctly non-inquisitorial aspect of witch trials is hardly surprising. In the Holy Roman Empire, for instance, to proceed otherwise would have run afoul of the law permitting Protestantism and prohibiting its adherents' persecution per the Peace of Augsburg.

Examples of post-Reformation religious producers using witch trials to compete for consumers in Christendom's confessionally contested religious markets abound. In Cologne, for example, his 'struggle to maintain Catholicism in a principality surrounded by Lutheran and Calvinist princes helped convince [Friedrich] von Wittelsbach in the late 1620s to unleash his full territorial machinery to enact a "final solution" to the witch question' (Waite, 2003, p. 163). Likewise, 'In Lorraine and the three archiepiscopal electorates in the Rhineland, all of which were close to Protestant lands, there was a "combative" religious attitude and there were also many witch-hunts' (Levack, 2016, p. 120). Karl von Liechtenstein and Karl Eusebius 'oversaw several witch-hunts as part of their recatholicisation efforts' in the duchies of Troppau and Jägerndorf (Waite, 2003, pp. 214–5). And 'In ... the attempt to win converts to Catholicism' in confessionally contested Switzerland, the then-cardinal, later-saint, Carlo Borromeo 'proved an energetic witch-hunter' (Greengrass, 2014, p. 494).

'The worst witch-hunts engulfed the southern Catholic prince-bishoprics where the ruling bishops were struggling to shore up Tridentine Catholicism within their small realms against ... Protestant incursions' (Waite, 2003, p. 156). Archbishop Johann VII von Schönenberg, for example, whose lands in the Holy Roman Empire already subject to his rule 'did not see particularly intense witch-hunting activity', supported the 'zealous pursuit of witches throughout his archdiocese outside the lands he ruled himself, particularly in areas over which he was trying to extend his authority' (Whaley, 2012, p. 555). Finding himself 'Surrounded by larger Protestant territories, the archbishop used popular demands for witch trials to drive out any residual doubts about the verity of Catholic dogma' (Waite, 2013, p. 502).

The prodigiousness of Catholic suppliers' witch-trial campaigns in religiously contested regions put pressure on neighbouring Protestant suppliers to step up their own, lest they appear less willing, or able, protectors of the public against diabolism. Having observed Catholic-conducted trials in Cologne, for instance, 'neighboring Protestants were impressed. When those at Wertheim petitioned their count at Christmas 1628 to increase his prosecution of witches, "since many places, especially Bamberg and Würzburg, are beginning to uproot this weed," he listened' (Monter, 2002, p. 27). Similarly, 'in Saxe-Coburg the Lutheran clergy tried to stimulate more

arrests of suspected witches in the late 1620s by pointing to the example of their Catholic neighbours in Würzburg' (Monter, 2002, p. 28).

Other Protestant suppliers were more proactive. 'In Livonia', for example, 'the Swedish Lutheran Superintendent Hermann Samson (r. 1622–63) inaugurated an anti-witch campaign' to 'dissuade citizens from returning to Catholicism' (Waite, 2003, p. 213). Indeed, 'Martin Luther himself approved of the execution of four witches at Wittenberg in 1541, while just a few years later his major Protestant opponent, John Calvin, was advising the Genevan authorities to "extirpate the race of witches" from its rural hinterland' (Waite, 2003, p. 134).

Our economic theory of European witch trials implies that the intensity of witch-trial activity should vary positively with the intensity of religious-market contestation over time and across Christendom. Specifically, witch-trial activity should:

(*i*) ascend in the early sixteenth century when Protestantism first penetrated Europe's religious market;
(*ii*) intensify in the mid-sixteenth century when the legalisation of Protestantism in much of Christendom, and the Peace of Augsburg in particular, inflamed confessional contestation;
(*iii*) decline in the mid-seventeenth century when the Peace of Westphalia permanently fixed Europe's confessional geography, dramatically reducing religious-market contestation; and
(*iv*) be more intense in confessional battlegrounds, such as Germany and Switzerland, less intense where the Church enjoyed long-standing loyalty and the Reformation never made headway, such as Spain and Italy, where coercive exclusion was effective.

3. Empirical Analysis

3.1. *Data and Preliminary Evidence*

To evaluate these implications empirically, we create two new data sets. The first, which we use to construct our measures of witch-trial activity, contains information on witch trials across 21 European countries between 1300 and 1850. We collect this information from 37 sources containing historical witch-trial records, catalogued in Appendix A. In online Appendix E, we detail the procedures we followed to create our witch-trial data set from these sources.

That data set provides dates and locations for 43,240 people prosecuted for witchcraft in no fewer than 10,805 separate trials.[17] 16,333 of these people's trials

[17] We say 'no fewer than 10,805 separate trials' because the number of witch trials reflected in our data is almost surely substantially larger than this. Our data consist of 10,805 separate witch-trial records involving the prosecution of 43,240 people for witchcraft. However, while we are able to observe the number of people prosecuted for witchcraft in our records, in many cases, we are unable to observe the number of trials that were used to prosecute the people involved. Since each record corresponds to no less than one trial, 10,805 separate trials is a very conservative estimate of the number of individual trials in our data. A trial record that contains, for example, 60 people prosecuted for witchcraft is counted as a single trial using this way of estimating the number of trials in our data. In fact, those 60 people may have been prosecuted for witchcraft in as many as 60 separate trials.

ended in their death.[18] Our trial dates refer to the decade (and sometimes year) in which people were prosecuted. Most of our trial locations refer to the city (county and country) or county (and country) in which people were prosecuted; the rest to only the country.[19]

To construct our measure of religious-market contestation, we create a second data set. Ideally we would use information on the proportion of Catholics and Protestants inhabiting Europe's territories over our time period for this purpose. Unfortunately, no systematic data along these lines exist. In lieu of them, we measure the intensity of religious-market contestation in historical Europe using data on confessional battles: the conflicts that comprised religiously motivated wars between denominationally divided factions in Christendom. As Barro and McCleary (2016, p. 402) point out, in historical Europe, 'intense Catholic–Protestant competition ... frequently showed up as religious wars'. Confessional battles thus provide a particularly useful measure of historical European religious-market contestation.

Trim (2010, pp. 278–99; see also, Heinze, 2005; Konnert, 2006) identifies nine 'European wars of religion': the Knights' Revolt (1522–1523); German Peasants' War (1524–1525); Swiss Religious Wars (1529–1602); Schmalkaldic Wars (1546–1553); French Wars of Religion (1562–1627); Marian Civil War (1562–1573); Eighty Years' War (1566–1645); Thirty Years' War (1609–1648); and British Wars of Religion (1639–1654). We collect information on the battles that comprised each from 14 historical sources, catalogued in Appendix B. In online Appendix E, we detail the procedures we followed to create our confessional-battle data set from these sources.

That data set contains the dates and locations of 424 religious conflicts between 1522 and 1654. Our battle dates refer to the year (and decade) in which a conflict occurred; our battle locations refer to the city (and country).[20]

Everywhere but in England and Scotland, these conflicts were between Catholics and Protestants. The British Wars of Religion, in contrast, were between competing Protestant factions after the Church of England's and Church of Scotland's establishment – Anglicans (supporters of the Church of England) and Presbyterians (supporters of the Church of Scotland).[21] The latter commonly suspected the former of harbouring 'popish' intentions, and these groups clashed bitterly over the variety of Protestantism that should prevail throughout Britain.

Table 1 summarises our witch-trial data by country and Table 2, our confessional-battle data. Two features stand out from these Tables. First, Germany, the Protestant Reformation's birthplace, was by far the country most affected by witch trials. Nearly 16,500 people were prosecuted for witchcraft here, 38% of the total in our data.

[18] While execution was responsible for most deaths attendant to witch trials, it was not responsible for them all. Deaths also occurred in the course of torture, while accused witches were incarcerated, and via the accused's suicide.

[19] County locations reflect level-two administrative areas per the Global Administrative Areas Database (GADM, 2012). Details of how we assign people tried for witchcraft temporally and geographically are provided in online Appendix E.

[20] Details of how we assign confessional battles temporally and geographically are provided in online Appendix E.

[21] The British wars of Religion in Ireland, however, were between Catholics and Protestants (Anglicans).

Table 1

Witch-trial Activity Across Countries, 1300–1850

Country	Population	Persons tried	Per cent of total	Persons tried per million	Deaths	Per cent of total	Deaths per million
Germany	12,000,000	16,474	38.1	1,373	6,887	42.2	574
Switzerland	1,000,000	9,796	22.7	9,796	5,691	34.8	5,691
France	18,500,000	4,159	9.6	225	1,663	10.2	90
Scotland	700,000	3,563	8.2	5,090	190	1.2	271
Spain	8,500,000	1,949	4.5	229	1	0	0
Hungary	1,250,000	1,644	3.8	1,315	474	2.9	379
England	3,667,750	1,197	2.8	326	367	2.2	100
Belgium	1,383,000	887	2.1	641	378	2.3	273
Norway	500,000	863	2	1,726	280	1.7	560
Finland	200,000	710	1.6	3,550	115	0.7	575
Italy	12,000,000	604	1.4	50	60	0.4	5
Netherlands	1,500,000	369	0.9	246	46	0.3	31
Sweden	1,000,000	353	0.8	353	0	0	0
Luxembourg	117,000	219	0.5	1,872	99	0.6	846
Estonia	125,000	205	0.5	1,640	65	0.4	520
Denmark	700,000	90	0.2	129	0	0	0
Austria	2,500,000	83	0.2	33	13	0.1	5
Ireland	1,043,750	52	0.1	50	1	0	1
Poland	5,000,000	12	0	2	3	0	1
Northern Ireland	206,250	9	0	44	0	0	0
Czech Republic	2,776,500	2	0	1	0	0	0

Notes. Population in 1600 (McEvedy and Jones, 1978). Estonian population in 1630 (Palli, 1980). Populations for England and Wales (individually) are tabulated using total population data for 'England and Wales' by multiplying each country's share of their combined land area by the total population of 'England and Wales'. Identical tabulations are made for Ireland and Northern Ireland, Belgium and Luxembourg, and the Czech Republic and Slovakia.

Table 2

Confessional-battle Activity Across Countries, 1300–1850

Country	Confessional battles	Per cent of total	Confessional battles per million
Germany	104	24.5	8.7
England	65	15.3	17.7
France	64	15.1	3.5
Netherlands	54	12.7	36
Scotland	32	7.5	45.7
Belgium	25	5.9	18.1
Ireland	22	5.2	21.1
Italy	15	3.5	1.2
Czech Republic	9	2.1	3.2
Spain	8	1.9	0.9
Northern Ireland	6	1.4	29.1
Austria	5	1.2	2
Switzerland	4	0.9	4
Wales	4	0.9	6.9
Poland	3	0.7	0.6
Denmark	2	0.5	2.9
Gibraltar	1	0.2	NA
Portugal	1	0.2	0.5

Germany was also the country most affected by Catholic–Protestant warfare. It hosted 104 confessional battles, nearly a quarter of all religious conflicts in our data.

Second, more generally, the majority of witchcraft prosecutions and confessional battles in Europe were concentrated in just a handful of countries. Nearly 75% of the former and 69% of the latter occurred in just five – Germany, Switzerland, France, England and the Netherlands – the former two, ground zero for the Reformation. In contrast, Spain, Italy, Portugal and Ireland – each a Catholic stronghold – saw minimal witch-trial activity and confessional warfare. Collectively, these four countries account for just 6% of people tried for witchcraft and less than 11% of religious conflicts in our data.

Figure 1 illustrates the relationship between confessional-battle and witch-trial activity in our data geographically. It plots the locations of confessional battles (solid circles) and witch trials (hollow circles) on a map of Europe, using the latitude and longitude coordinates of the cities or counties (centroid) in which they occurred. The pattern this Figure exhibits foreshadows our basic result geographically: where

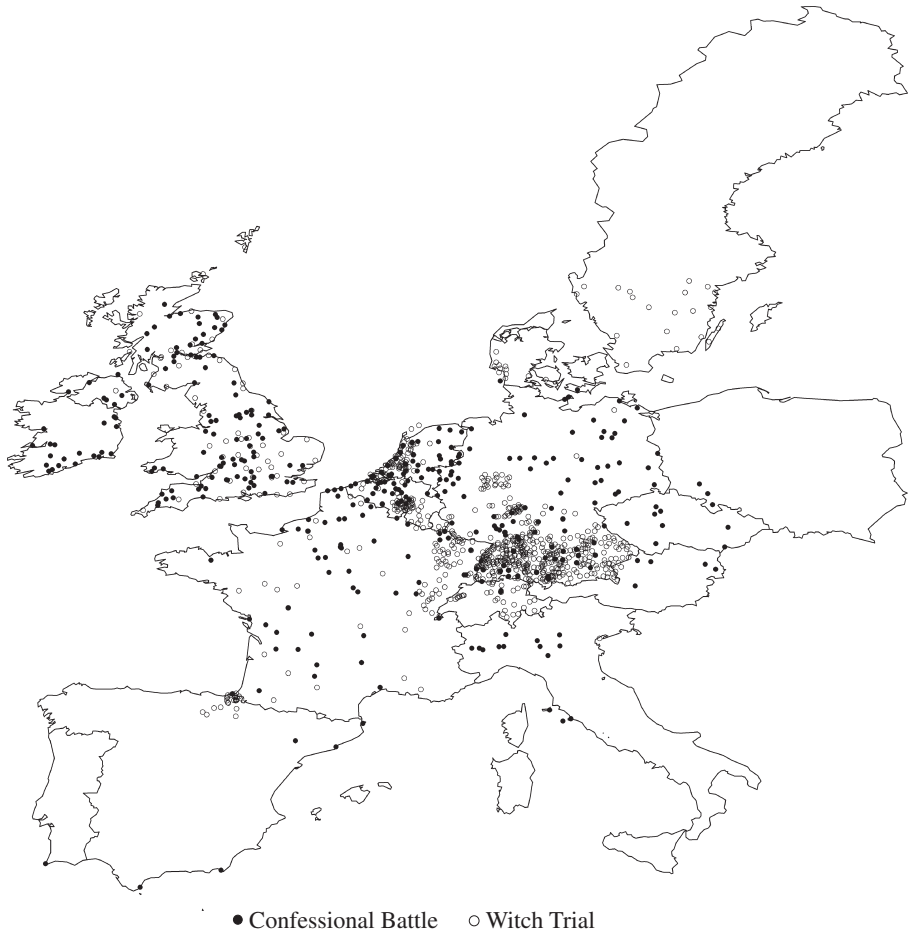

Fig. 1. *Confessional-battle and Witch-trial Activity Geographically, 1300–1850*

religious-market contestation was more intense, so was witch-trial activity, and *vice versa*.

Figure 2 illustrates the relationship between confessional-battle and witch-trial activity in our data temporally. The top panel summarises European witch-trial activity over time. It depicts virtually no witch trials until the turn of the fifteenth century, when noticeable but very modest activity first appeared. These trials were focused in a triangular region of the continent whose vertices are Lyon, France; Lucerne, Switzerland; and Freiburg, Germany – a mountainous area inhabited by remnants of the Cathar and Waldensian movements, the Church's medieval challengers. At the turn of the sixteenth century, witch-trial activity was again nearly non-existent. It then began slowly ascending in the decade following the spread of Luther's *Ninety-five Theses*, rising dramatically *c.* 1555. Witch-trial activity remained elevated for a century, declining substantially *c.* 1650. Some activity continued for the next 50 years but at greatly reduced levels, returning finally to its pre-1555 level *c.* 1700.

The bottom panel in Figure 2 summarises European confessional-battle activity over time. It depicts the first eruption of confessional warfare *c.* 1520, on the heels of Lutheranism's spread throughout Christendom. Confessional conflict then subsided, rising dramatically *c.* 1555. Confessional war remained elevated for most of the next century; though it declined temporarily between *c.* 1585 and *c.* 1615, a period Pearse (2006, p. 152) describes as one of religious 'cold war' between Catholics and Protestants in the Holy Roman Empire, when each formed confessional military alliances (the Roman Catholic German States in 1609 and Protestant Union in 1608) in reaction to confessional tension and in anticipation of confessional violence.[22] Following this cold-war buildup of Catholic–Protestant tension, skyrocketing confessional violence took off *c.* 1620 in the form of the Thirty Years' War, reflected in the highest peak in the bottom panel of Figure 2.[23] At the end of this war *c.* 1650, confessional violence abruptly ended.

Comparing the top and bottom panels of Figure 2, several features stand out.[24] First, both witch-trial and confessional-battle activity began climbing *c.* 1520 when the Reformation introduced Protestant religious-market competition in Europe. Second, both surged *c.* 1555 when Protestantism was legalised in most of Europe, establishing it as a permanent competitor to Catholicism in Christendom. Third, the vast majority of both phenomena manifested during the Counter-Reformation – the era of great Catholic response to intensified confesnal contestation following Protestantism's recognition as an official religion. Indeed, more than two-thirds of witch-trial activity and 90% of confessional battles in our data occurred between 1550 and 1650; and the two witch-trial peaks (*c.* 1590 and *c.* 1610) depicted in the top panel parallel the two major peaks in confessional warfare in the bottom, each occurring within a few decades of the other. Finally, both witch-trial and confessional-battle activity began plummeting *c.* 1650 when

[22] As Iyigun (2008) points out, a contributor to the dearth of Catholic–Protestant warfare leading up to the Thirty Years' War was the threat the Ottomans posed to Christendom, which, to address properly, required inter-confessional cooperation, such as providing for the military. The Ottoman threat was seriously diminished in the second half of the sixteenth century, reducing the need for such cooperation, hence contributing to the resumption of confessional warfare in the early seventeenth century.

[23] This peak also reflects battles that occurred during the later stages of the Eighty Years' War and the British Wars of Religion.

[24] Excluding Germany from Figure 2 does not alter the patterns it displays.

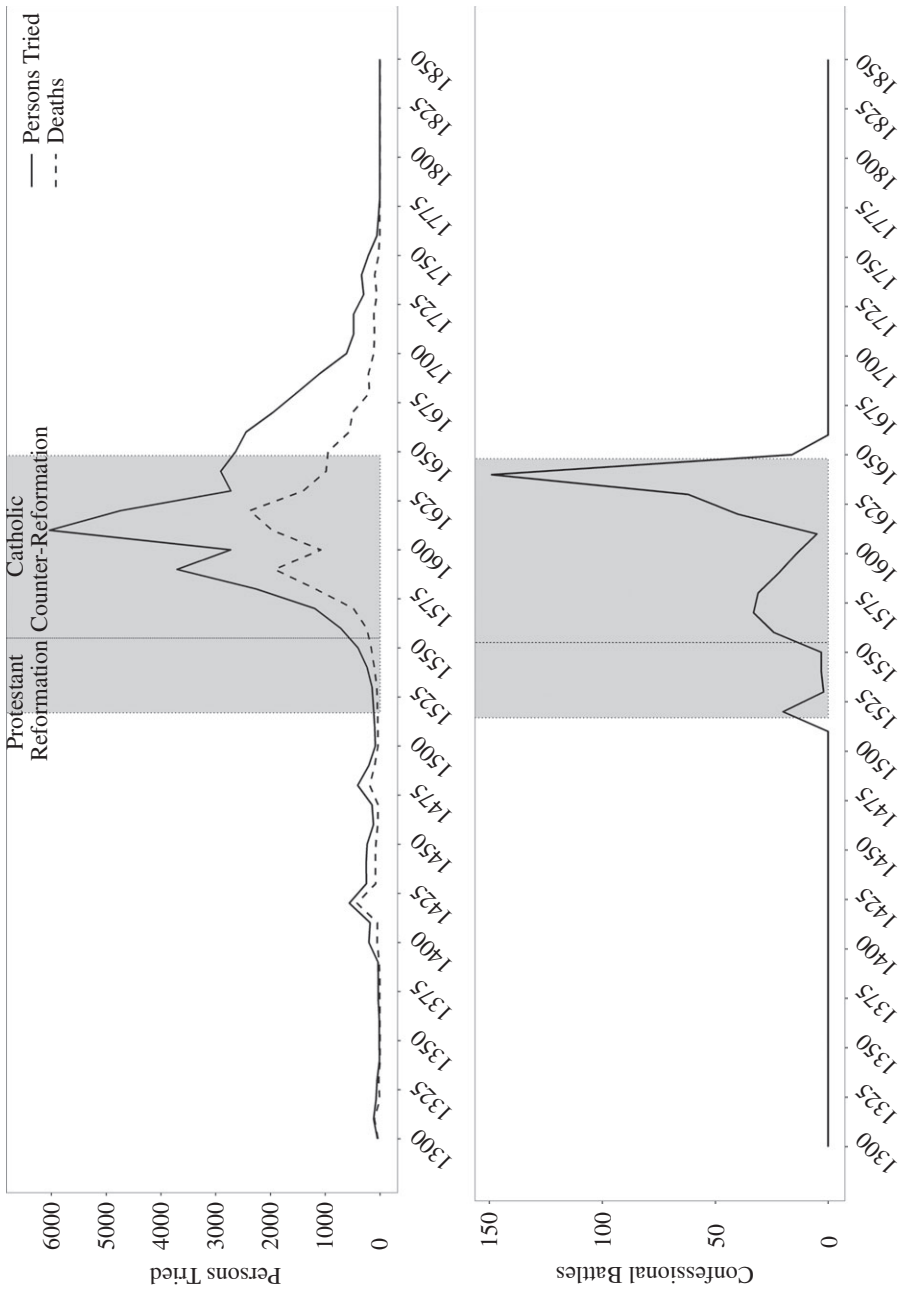

Fig. 2. *Confessional-battle and Witch-trial Activity Temporally, 1300–1850*

the Peace of Westphalia created permanent territorial confessional monopolies for Catholics and Protestants, fixing the confessional geography of Europe's religious marketplace. The pattern this Figure exhibits foreshadows our basic result temporally: when religious-market contestation was more intense, so was witch-trial activity, and *vice versa*.

3.2. *Evaluating the Economic Theory of European Witch Trials*

To evaluate our theory formally, we investigate the relationship between the intensity of religious-market contestation and witch-trial activity in early modern Europe econometrically using panel data that extend from 1500 to 1699 at decadal intervals, the shortest common time unit available in our witch-trial data.

An issue that arises for econometric analyses that consider historical data such as ours is how, given frequent, and often major, changes in borders over the course of centuries – including those under study – the data should be aggregated cross-sectionally. Aggregating at lower-level contemporary administrative units, such as states, preserves within-country variation but at the risk of characterising much cross-sectional variation incorrectly: the smaller the units, the more likely that changes in borders will interfere with accurate cross-sectional data assignment. On the other hand, aggregating at higher-level contemporary administrative units, such as countries, sacrifices within-country variation but the cross-sectional variation that is preserved is likely to be much more accurate.

Another option is to avoid aggregating the data into contemporary administrative units altogether, to aggregate them instead into artificially created cross-sectional units generated by imposing $N \times N$ dimensional grid cells on a map of Europe. The drawbacks here are that there is no reason to expect artificially created units to correspond meaningfully to historical administrative areas and, since grid-cell populations cannot be ascertained, it is not possible to perform analyses with grid cells that use population-adjusted variables.

To address the 'borders problem', we try both of the foregoing approaches. Our main regressions aggregate the data at the country level. To check their robustness, we rerun them aggregating the data into 250×250 km grid cells, described in greater detail later.

We consider two sets of regressions – alternative ways of measuring the intensity of witch-trial activity and religious-market contestation. The first (panel (*a*) in the Tables that follow) uses the number of confessional battles in a country-decade as our independent variable and the (log) number of people tried for witchcraft in a country-decade as our dependent variable. The second (panel (*b*)) uses the number of confessional battles per million citizens in a country-decade as our independent variable and the (log) number of people tried for witchcraft per million citizens in a country-decade as our dependent variable – both measured using country population data by century from McEvedy and Jones (1978).[25] Observations for which we lack witch-trial

[25] Populations for England and Wales (individually) are tabulated using total population data for 'England and Wales' by multiplying each country's share of their combined land area by the total population of 'England and Wales'. Identical tabulations are made for Ireland and Northern Ireland, Belgium and Luxembourg, and the Czech Republic and Slovakia.

Table 3
Summary Statistics

	N	Mean	SD	Min	Max
Sample: all, country-decades, 1500–1699					
Ln persons tried	233	3.57	1.81	0.00	7.88
Ln persons tried per million	233	3.16	1.92	−1.79	6.96
Confessional battles	233	1.58	5.56	0	62
Confessional battles per million	233	0.58	2.16	0.00	18.29
Urbanisation	218	8.52	8.75	0.00	27.68
Real wage	111	8.05	2.21	4.37	13.53
Tax revenue *per capita*	58	37.59	31.57	7.16	113.96
Sample: grid cell-decades, 1500–1699					
Ln persons tried	375	2.84	1.76	0.00	7.57
Confessional battles	375	0.90	2.72	0	34
Sample: weather, country-decades, 1520–1769					
Weather	143	−0.09	1.02	−2.85	2.98
Ln persons tried	143	3.64	1.77	0.00	6.80
Ln persons tried per million	143	3.25	2.25	−3.27	6.96
Confessional battles	143	1.15	5.68	0	62
Confessional battles per million	143	0.45	2.23	0.00	18.29

records are treated as missing and, in all regressions, we calculate robust standard errors clustered at the country level.[26] Table 3 presents summary statistics for our variables.

Table 4 presents our regression results. In every specification, using both measures of our variables, the intensity of religious-market contestation has a positive, statistically significant, and economically sizable effect on the intensity of witch-trial activity. Column (1) considers our baseline sample period, 1500–1699 and includes no controls. Here, each additional confessional battle is associated with an approximately 8% increase in the number of people tried for witchcraft; each additional confessional battle per million, with an approximately 11% increase in the number of people tried for witchcraft per million. Column (2) adds decade fixed effects; the results are nearly the same.

Columns (3) and (4) use the same specifications as (1) and (2), respectively, but a different sample period: 1500–1549. The idea here is to evaluate our theory in the period before the Peace of Augsburg and its subsequent breakdown leading to the Thirty Years' War. Though centrally confessional-conflict driven phenomena, Augsburg and the wars of religion that followed its collapse had multiple, nuanced dimensions. Finding the same results in the early sixteenth century, prior to Augsburg or any of its after effects, as we do in the entire sixteenth through seventeenth centuries should therefore strengthen confidence that the latter results are not driven by other factors that influenced Augsburg and subsequent religious conflicts.

Special caution must be exercised when interpreting these estimates, however: 20 of the 27 confessional battles that appear in this small sample occurred in a single

[26] We also rerun our regressions treating observations for which we lack witch-trial records as cases of zero trials (to log-transform zero values, we use a $\ln(x + 1)$ transformation). These estimates, which are typically larger, are available in Appendix C.

Table 4

Religious-market Contestation and Witch Trials

	(1)	(2)	(3)	(4)	(5)	(6)
Panel (*a*): Ln persons tried						
Confessional battles	0.078***	0.083***	0.109***	0.150***	0.031***	0.030***
	(0.024)	(0.026)	(0.038)	(0.046)	(0.008)	(0.009)
Confessional battles (t + 1)						0.012
						(0.012)
Confessional battles (t + 2)						0.006
						(0.017)
Sample	1500–1699	1500–1699	1500–1549	1500–1549	1500–1699	1500–1699
Decade/Country fixed effects	No/No	Yes/No	No/No	Yes/No	Yes/Yes	Yes/Yes
Observations	233	233	33	33	233	233
R^2	0.058	0.182	0.058	0.167	0.737	0.739
Panel (*b*): Ln persons tried per million						
Confessional battles	0.109**	0.102*	0.697*	0.817*	0.075**	0.073**
per million	(0.052)	(0.057)	(0.408)	(0.427)	(0.033)	(0.037)
Confessional battles per million (t + 1)						0.005
						(0.034)
Confessional battles per million (t + 2)						0.037
						(0.043)
Sample	1500–1699	1500–1699	1500–1549	1500–1549	1500–1699	1500–1699
Decade/Country fixed effects	No/No	Yes/No	No/No	Yes/No	Yes/Yes	Yes/Yes
Observations	233	233	33	33	233	233
R^2	0.015	0.153	0.053	0.163	0.767	0.769

Notes. OLS with robust standard errors clustered by country in parentheses. *p < 0.1, **p < 0.05, ***p < 0.01.

country – Germany – 17 in a single decade (1520–1529), the first of the Reformation. While useful for checking qualitatively whether the results for the entire sample period hold also in the early sixteenth century, it would be unwise to put stock in these estimates' quantitative magnitudes and we do not. Nevertheless, in each case – using both measures of witch-trial activity and religious-market contestation, and both excluding (column (3)) and including (column (4)) decade fixed effects – we find the qualitatively same results here as in the full sample period: more intense religious-market contestation is associated with significantly more intense witch-trial activity.

Our baseline specification (column (2)) includes decade fixed effects but not country fixed effects. As discussed above, an important historical source of variation in religious-market contestation precipitated by the Reformation was countries' loyalty to the Catholic Church: where existing loyalty was stronger, the Reformation never caught on; where existing loyalty was weaker, it did. We therefore consider the specifications that include country fixed effects, whose results are presented in columns (5) and (6), to be conservative.

In column (5), which includes decade and country fixed effects, each additional confessional battle leads to an approximately 3% increase in the number of people tried for witchcraft; each additional confessional battle per million, to a 7.5% increase

in the number of people tried for witchcraft per million. Column (6) also includes decade and country fixed effects but adds two confessional-battle 'lead' variables, which measure confessional battles one and two decades after that which our dependent variable considers. This permits a falsification test. The intensity of future religious-market contestation cannot have influenced the intensity of current witch-trial activity. In contrast to the coefficients on our contemporaneous confessional-battle variables, those on our lead variables should therefore be small and insignificant. They are. In both panels, the coefficients on the lead variables are insignificant and less than half the size of those on the contemporaneous confessional-battle variables, which are virtually unchanged from column (5).

Next, we rerun the regressions from panel (*a*) in Table 4 using 250 × 250 km grid cells as our cross-sectional units of observation. We do not rerun those in panel (*b*) using grid cells because we do not have grid-cell populations. Our cells' size corresponds roughly to that of the first-level NUTS regions of the European Union, devised by Eurostat. France, for example, has nine first-level NUTS regions, whose average area is similar to that of our grid cells.

To create our cells, we use a cylindrical (Lambert azimuthal) equal-area map projection with centroid latitude, longitude = 52.775, 10.44, near Sprakensehl, Germany. There are 37 cells in our baseline sample. We assign latitude and longitude coordinates to witchcraft prosecutions and confessional battles in the same way as in Figure 1.

Table 5 presents our results using grid cells. In every column, they are similar to those using countries. In the baseline sample, each additional confessional battle leads to a 10% increase in the number of people tried for witchcraft, both with and without decade fixed effects; when grid-cell fixed effects are added, to an increase of approximately 6%, both controlling for confessional-battle leads and not. The early sixteenth-century sample, whose qualitative rather than quantitative estimates again interest us, also produces similar results to before: more intense religious-market contestation is associated with significantly more intense witch-trial activity.

Table 5
Using Grid Cells

	Ln persons tried					
	(1)	(2)	(3)	(4)	(5)	(6)
Confessional battles	0.100***	0.109***	0.065*	0.098*	0.065***	0.063***
	(0.035)	(0.038)	(0.035)	(0.053)	(0.020)	(0.020)
Confessional battles (t + 1)						0.019
						(0.026)
Confessional battles (t + 2)						0.000
						(0.027)
Sample	1500–1699	1500–1699	1500–1549	1500–1549	1500–1699	1500–1699
Decade/Grid-cell fixed effects	No/No	Yes/No	No/No	Yes/No	Yes/Yes	Yes/Yes
Observations	346	346	44	44	346	346
R^2	0.024	0.133	0.010	0.054	0.667	0.668

Notes. OLS with robust standard errors clustered by grid cell in parentheses. *p < 0.1, ***p < 0.01.

4. Evaluating Existing Hypotheses for European Witch Trials

Several existing hypotheses have been offered for the great age of European witch trials.[27] Here, we evaluate them on their own and alongside our theory. This serves several purposes: first, to see what support can be found in the data for prevailing claims about the factors that influenced European witch-trial activity; second, to investigate the robustness of our results to potentially important omitted variables; third, to compare these other factors' importance to religious-market contestation's directly.

4.1. *Bad Weather*

The best-known explanation for European witch trials, sometimes called the 'scapegoat hypothesis', blames bad weather (Behringer, 1995, 1999). According to it, in historical Europe, colder-than-expected temperatures often led to hardship and people who experienced hardship looked for scapegoats. Popular European belief saw witches as capable of controlling the weather, so those scapegoats were witches. The early modern period experienced the worst of the 'Little Ice Age', driving down temperatures in Europe. The result: a flurry of witchcraft accusations and persecutions.[28]

Using data on witch trials in 11 European regions between 1520 and 1770, Oster (2004) examines this hypothesis empirically and finds support for it. Our empirical evaluation of the bad weather theory builds on hers. Oster's 11 trial regions reflect seven countries (England, Estonia, Finland, France, Hungary, Scotland, Switzerland) and five weather regions (English, German, Hungarian, Swiss, Russian) to which she assigns the former. Her measure of weather is a mixed index of temperature and 'winter severity', standardised relative to the country mean.

Using our more comprehensive witch-trial data, we begin by creating a panel that consists of the same seven countries that Oster's regions reflect, spanning the same period, 1520–1769, at decadal intervals, again per Oster. We also use the same weather variable as Oster, data for which are procured from her, and assign countries to the same weather regions that she does. We refer to this as our 'Oster sample'.

Next, we create another sample, identical to the former with one difference: it includes Germany, which is not among the countries reflected in any of Oster's regions. A potentially important addition, since Germany was the country most affected by witch trials, hosting nearly 40% of all witchcraft prosecutions in Europe. We assign Germany to Oster's German weather region and refer this as our 'Oster + Germany sample'.

Table 6 presents the results of our evaluation of the bad-weather theory.[29] All regressions include decade fixed effects and we again consider two alternative

[27] These hypotheses offer causal explanation for the European 'witch-craze' phenomenon in general, as our economic theory does. In contrast, an enormous historical literature has pointed to an enormous number of factors influencing particular trials in particular times and places. See, for instance, the examples given in Stark (2003) and Thurston (2007).

[28] Barstow (1994, pp. 153–4) argues that misogynist social views led to women being the preferred targets of such scapegoating. See also, Ehrenreich and English (1973).

[29] We also run regressions that test the bad-weather theory using Luterbacher *et al.*'s (2004) weather data, which furnish temperature measurements for grid cells (sized 0.5° × 0.5°) that cover European land areas between 25°W to 40°E and 35°N to 70°N by year and season, beginning in 1500. From these data, we construct a temperature variable that measures average degrees Celsius in each country-decade, standardised relative to the country mean. The results, which are similar to when we use Oster's (2004) data, are available in Appendix D.

Table 6
Weather and Witch Trials

	(1)	(2)	(3)	(4)	(5)	(6)
Panel (*a*): Ln persons tried						
Weather	−0.050		−0.084	−0.075		−0.156
	(0.157)		(0.155)	(0.155)		(0.147)
Confessional battles		0.046*	0.047*		0.069**	0.073**
		(0.024)	(0.025)		(0.030)	(0.032)
Sample	Oster	Oster	Oster	Oster + Germany	Oster + Germany	Oster + Germany
Observations	143	143	143	168	168	168
R^2	0.286	0.302	0.303	0.261	0.301	0.306
Panel (*b*): Ln persons tried per million						
Weather	−0.105		−0.125	−0.116		−0.132
	(0.198)		(0.200)	(0.166)		(0.168)
Confessional battles per million		0.138**	0.141**		0.144***	0.147***
		(0.059)	(0.058)		(0.054)	(0.052)
Sample	Oster	Oster	Oster	Oster + Germany	Oster + Germany	Oster + Germany
Observations	143	143	143	168	168	168
R^2	0.278	0.291	0.293	0.329	0.342	0.345

Notes. OLS with robust standard errors clustered by country in parentheses. All columns include decade fixed effects. Sample period: 1520–1769. *p < 0.1, **p < 0.05, ***p < 0.01.

measures of witch-trial activity and religious-market contestation. Columns (1) and (4) estimate the effect of weather by itself on witch-trial activity. Columns (2) and (5) do the same for religious-market contestation. Columns (3) and (6) consider both variables together.

The bad-weather theory does not fare well. In every column, in both panels, using both the Oster and Oster + Germany samples, considering weather by itself and together with confessional battles, weather's estimated effect on witch-trial activity is statistically insignificant from zero.

Our theory, on the other hand, fares very well. In every column, in both panels, using both the Oster and Oster + Germany samples, considering confessional battles by themselves and together with weather, confessional battles' effect on witch-trial activity is positive and statistically significant, the same whether we control for weather or not.

Perhaps the weather data are just noisy. Weather does have the 'correct' sign: colder temperatures are associated with more trials. Maybe its estimated effect is imprecise but much larger than confessional battles', suggesting its importance after all.

Just the opposite appears to be the case. Consider columns (3) and (6), where both variables are included together. In panel (*a*), a one standard deviation increase in confessional battles leads to a 27–46% increase in the number of people tried for witchcraft. In contrast, a one standard deviation decrease in temperature leads to a (statistically insignificant) 8–16% increase in the number of people tried for witchcraft. Similar, in panel (*b*), the same change in confessional battles per million leads to a 31% increase in the number of people tried for witchcraft per million; in temperature, to a (statistically insignificant) increase of 13%.

The statistical insignificance and much smaller magnitude of weather's estimated effect on witch-trial activity in Table 6 does not 'disprove' the bad-weather hypothesis. Historical weather is likely to be poorly measured and much of its variation may be absorbed by decade fixed effects. Nor do these findings deny that many early modern Europeans accused of witchcraft were accused of manipulating the weather. They do, however, cast doubt on the importance commonly attributed to bad weather, the 'Little Ice Age', in particular, in explaining the great age of European witch trials. They also demonstrate the robustness of our results to accounting for weather and suggest religious-market contestation's greater importance in driving European witch-trial activity.

4.2. *Negative Income Shocks*

Closely related to the bad-weather theory is the negative income-shock theory of witch persecution. The basic idea is similar: unfavourable outcomes cause people to accuse one another of witchcraft. Now, however, unfavourable outcomes refer exclusively to lower income (no 'mere scapegoating') and Mother Nature need not be the cause. No one has empirically evaluated this hypothesis in the context of early modern Europe. Miguel (2005), however, has done so in the context of witch killings in contemporary Tanzania and finds support for it.[30]

To evaluate the negative income-shock theory in the context of early modern European witch trials, we consider two measures of income. First, the standard income-*per capita* proxy used for historical Europe: urbanisation rates (Acemoglu *et al.*, 2002, 2005). Bairoch *et al.* (1988) provide historical population data for European cities; McEvedy and Jones (1978), historical population data for European countries – both by century. The former cover all countries in our sample but three (the Czech Republic, Estonia, Poland). To create our urbanisation variable, we divide each country's urban population in cities with at least 5,000 inhabitants by its total population.

As an alternative measure of income, we consider historical real wages (in grams of silver per day) using annual, city level craftsmen-wage data from Allen (2001). These data cover eight countries in our sample (Austria, Belgium, England, France, Germany, Italy, the Netherlands, Spain). To create our real-wage variable, we tabulate the average real wage for each country-decade it contains.

Table 7 presents the results of our evaluation of the negative income-shock hypothesis. All regressions again include decade fixed effects and we again consider both measures of witch-trial activity and religious-market contestation. Columns (1)–(3) report results measuring income with urbanisation rates, columns (4)–(6), with real wages.

The negative income-shock hypothesis fares much better than the bad-weather theory but our theory fares better still. Less urbanisation leads to significantly more witch-trial activity. More confessional-battle activity also leads to significantly more witch-trial activity: this is true whether urbanisation is controlled for or not and neither the significance nor magnitude of confessional battles' effect falls when urbanisation is added.

[30] On the relationship between witchcraft beliefs and trust in contemporary sub-Saharan Africa, see Gershman (2016); between witchcraft beliefs and redistributive norms, see Platteau (2009).

Table 7

Income and Witch Trials

	(1)	(2)	(3)	(4)	(5)	(6)
Panel (*a*): Ln persons tried						
Urbanisation	−0.020*		−0.026**			
	(0.011)		(0.011)			
Confessional battles		0.080***	0.085***		0.074***	0.063***
		(0.025)	(0.026)		(0.022)	(0.019)
Real wage				−0.329***		−0.303***
				(0.093)		(0.093)
Observations	218	218	218	111	111	111
R^2	0.130	0.177	0.193	0.333	0.278	0.380
Panel (*b*): Ln persons tried per million						
Urbanisation	−0.060***		−0.069***			
	(0.013)		(0.014)			
Confessional battles per million		0.111*	0.173***		0.119*	0.112*
		(0.059)	(0.044)		(0.062)	(0.064)
Real wage				0.063		0.045
				(0.081)		(0.083)
Observations	218	218	218	111	111	111
R^2	0.203	0.148	0.236	0.231	0.246	0.249

Notes OLS with robust standard errors clustered by country in parentheses. All columns include decade fixed effects. Sample period: 1500–1699. *p < 0.1, **p < 0.05, ***p < 0.01.

To compare these variables' effects, consider column (3), which includes both. In panel (*a*), a one standard deviation increase in confessional battles leads to a 49% increase in the number of people tried for witchcraft; a one standard deviation decrease in urbanisation, to a 23% increase in the number of people tried for witchcraft. In panel (*b*), the relative magnitudes reverse: the same change in confessional battles per million leads to a 39% increase in the number of people tried for witchcraft per million; in urbanisation, to an increase of 60%. In the former case, confessional battles' effect is more than twice that of urbanisation. In the latter, about two-thirds of it. Both panels suggest that religious-market contestation and income had a sizable effect on witch-trial activity. But the edge goes to religious-market contestation, whose average effect is slightly larger.

Moreover, when income is measured with real wages instead of urbanisation, the negative income-shock theory performs more poorly. Our theory does not.

In panel (*b*), the coefficients on real wages are small, insignificant and have the 'wrong' sign – higher wages are associated with more witch-trial activity. In contrast, confessional battles' effect on witch-trial activity is sizeable, positive and significant, the same is found whether we control for real wages or not.

In panel (*a*), real wages become significant and display the 'correct' sign. Confessional battles, which have displayed significance and the 'correct' sign in every regression thus far, do so again and their estimated effect on witch-trial activity is again nearly the same whether we control for real wages or not. In column (6), where both variables are included, a one standard deviation increase in confessional battles leads to a 48% increase in the number of people tried for witchcraft; a one standard

deviation decrease in real wages, to a 67% increase in the number of people tried for witchcraft. Here, real wages' effect is larger. But both effects are large and, unlike real wages, which are insignificant and 'incorrectly' signed in panel (*b*), confessional battles have a large, positive, significant effect in every specification in both panels.

Table 7 finds more support for income's importance to European witch-trial activity than Table 6 finds for weather's. On the whole, however, it suggests the still greater importance of religious-market contestation: accounting for income does not alter our results; religious-market contestation's effect on witch-trial activity is consistent, whereas income's is not; and, on average, the former is larger than the latter.

4.3. *Weak Government*

A third theory, sometimes called the 'legal-centralisation hypothesis', argues that weak government – low 'state capacity' – is responsible for Europe's witch trials (Soman, 1989). According to it, witch trials were often prosecuted by local authorities acting of their own accord. When and where central government was weaker, hence less able to enforce the rule of law, there was therefore more intense witch-trial activity, and *vice versa*.[31]

Using data on witch trials in France between 1550 and 1700, Johnson and Koyama (2014) examine this hypothesis and find support for it. To proxy governmental strength, they measure fiscal capacity: tax revenues *per capita*. To evaluate the weak-government hypothesis with our more comprehensive witch-trial data, we do the same.

We collect historical tax-revenue data from Karaman and Pamuk (2013), which are available for six countries in our sample (Austria, England, France, Italy, the Netherlands, Spain). These data provide average annual tax revenues *per capita* (in grams of silver) for four decades between 1500 and 1699: 1500–1509; 1550–1559; 1600–1609; and 1650–1659. Missing decades are completed using data from the previous decade.

Table 8 presents the results of our evaluation of the weak-government theory. As above, all regressions include decade fixed effects and we consider both measures of witch-trial activity and religious-market contestation.

The weak-government hypothesis does not perform well. Our theory, again, does. In panel (*b*), the coefficients on tax revenues are small, insignificant and have the 'wrong' sign – higher tax revenues *per capita* are associated with more witch-trial activity. In contrast, confessional battles' effect is sizeable, positive and significant, the same result is obtained whether we control for tax revenues or not.

In panel (*a*), tax revenues become significant and display the 'correct' sign. Confessional battles continue to have a (more) significant, positive effect on witch-trial activity, which is again nearly the same whether we control for tax revenues or not. And that effect is slightly larger: in column (3), where both variables are included, a one standard deviation increase in confessional battles leads to a 50% increase in the

[31] Levack (1996) surveys scholarship that suggests the reverse relationship: that witch trials could be used in the process of state building as a form of social control (Larner, 1981; Klaits, 1985). He concludes that centralising legal systems had a moderating influence on witch trials, as local courts tended to be more aggressive witch prosecutors than central courts.

Table 8
State Capacity and Witch Trials

	(1)	(2)	(3)
Panel (*a*): Ln persons tried			
Tax revenue *per capita*	−0.017**		−0.015*
	(0.008)		(0.008)
Confessional battles		0.062***	0.054***
		(0.019)	(0.018)
Observations	58	58	58
R^2	0.461	0.467	0.515
Panel (*b*): Ln persons tried per million			
Tax revenue *per capita*	0.0001		0.0004
	(0.006)		(0.006)
Confessional battles per million		0.232***	0.232***
		(0.033)	(0.033)
Observations	58	58	58
R^2	0.535	0.600	0.600

Notes. OLS with robust standard errors clustered by country in parentheses. All columns include decade fixed effects. Sample period: 1500–1699; *p < 0.1, **p < 0.05, ***p < 0.01.

number of people tried for witchcraft; a one standard deviation decrease in tax revenues *per capita* leads to a 47% increase in the number of people tried for witchcraft.

Table 8 provides some support for the claim that governmental strength mattered for witch-trial activity, but that support is limited. In contrast, the consistent, leading importance of religious-market contestation is as apparent here as in Tables 4–7. Our results are robust to accounting for governmental strength. And to the extent that the latter was important, Table 8 suggests it was less important than religious-market contestation.

4.4. *Horse Race*

As a final evaluation of existing theories of the great age of European witch trials and our own, we run a 'horse race': regressions of the same form as above that consider the same factors but at the same time. The sample these regressions use is necessarily limited to countries that overlap each of our variables. Unfortunately, that is but two: England and France, resulting in only 33 observations. With so limited a sample, the quantitative results of these estimations are unlikely to be informative and, given this, we do not attempt to draw any conclusions from them about the relative magnitudes of various effects, as we have done for Tables 6–8. Still, these regressions provide at least a qualitative test of robustness for the findings reported above, which is the manner in which we consider them.

Table 9 presents the results of the horse race. Qualitatively, they are similar to those in Tables 6–8. The clear 'winner' is the economic theory of European witch trials. Confessional battles are always positive and significant: more intense religious-market contestation led to more intense witch-trial activity. The runner-up is too close to call between the negative income-shock hypothesis and the weak-government hypothesis. Measured in terms of real wages (column (1)), lower income leads to more witch-trial

Table 9

Horse Race

	(1)	(2)
Panel (*a*): Ln persons tried		
Confessional battles	0.062***	0.042**
	(0.008)	(0.017)
Weather	−0.226	0.101
	(0.257)	(0.323)
Real wage	−0.907***	
	(0.166)	
Tax revenue *per capita*	−0.058**	0.066**
	(0.028)	(0.028)
Urbanisation		0.177
		(0.160)
Observations	33	33
R^2	0.857	0.752
Panel (*b*): Ln persons tried per million		
Confessional battles per million	0.260***	0.230***
	(0.021)	(0.013)
Weather	−0.161	−0.051
	(0.186)	(0.184)
Real wage	−0.286*	
	(0.166)	
Tax revenue *per capita*	−0.083***	−0.048**
	(0.028)	(0.022)
Urbanisation		0.001
		(0.094)
Observations	33	33
R^2	0.930	0.918

Notes. OLS with robust standard errors clustered by country in parentheses. All columns include decade fixed effects. Sample period: 1520–1699; *p < 0.1, **p < 0.05, ***p < 0.01.

activity. However, measured in terms of urbanisation (column (2)), lower income has the opposite effect and is insignificant. Likewise, lower tax revenues *per capita* are associated with more witch-trial activity when real wages are used to measure income. But, in panel (*a*), when urbanisation is used to measure income instead, lower tax revenues *per capita* have the opposite effect and are insignificant. The unequivocal 'loser' of this race is the bad weather hypothesis. Weather is always insignificant and, in panel (*a*), when urbanisation is used to measure income, it displays the 'wrong' sign.

There is one other prominent, existing theory of the great age of European witch trials, which we have not considered: the 'legal-torture hypothesis' (Trevor-Roper, 1967; Midelfort, 1972).[32] According to it, judicial torture is responsible for Europe's witch trials. In historical Europe, witchcraft was considered a *crimen exceptum* – an 'exceptional crime' – hence 'not amenable to the normal principles of proof'. To generate conclusive evidence of witchcraft, 'It was necessary to use torture to extract a

[32] Trevor-Roper (1967) and Midelfort (1972) describe but do not endorse the legal-torture hypothesis, which is instead attributed to Lea and Howland (1939). Kieckhefer (1976) offers a related argument according to which the rise of inquisitorial courts led to more witch accusations due to the impersonal nature of the court system.

confession' (Larner and Macfarlane, 1984, p. 44). Heavier reliance on judicial torture thus led to more witch-trial activity and *vice versa*.

We do not have data that would allow us to evaluate this theory empirically. But as an explanation for the great age of European witch trials, its timing is off. Legal torture became a regular part of European legal systems in the early thirteenth century and was eliminated in the second half of the eighteenth (Langbein, 1977; Peters, 1985). Europe's witch trials, in contrast, did not emerge until the early sixteenth century and went into decline in the second half of the seventeenth. Torture is therefore three centuries too early and one century too late, to explain the great age of European witch trials temporally.

This is not to say that torture did not play a significant role in early modern European witch trials. It did. However, torture's role may have been more important for the share of prosecuted witches who were ultimately executed than for the prosecution of witches *per se*.

People convicted of diabolical *maleficium* were ordinarily sentenced to death but not everyone prosecuted for witchcraft was convicted. Torture, naturally, made confession much more likely, hence conviction and execution. Consider, for instance, Pays de Vaud, Switzerland, where in the sixteenth century torture became a kind of grisly art form. '[N]ew torments were invented: they were pinched with red-hot tongs, subjected, sometimes nine times, to the martyrdom of the strappado, they were walled in . . . starved' (Janssen, 1910, p. 304). And where also, by doubtful coincidence, 'The executioner's arm became palsied under the stress of the work' (Janssen, 1910, p. 304). Indeed, in our data, witch trial-related deaths as a share of people tried for witchcraft (and per million) are higher in Switzerland than anywhere else in Europe – nearly 60% of them, executions in Vaud. While its timing problem prevents the legal-torture hypothesis from being a compelling explanation for the great age of European witch trials, as a factor influencing the share of prosecuted witches who were executed, it is more so.

4.5. *Altonji–Elder–Taber Results*

To quantify the degree to which selection bias may be affecting our results, we apply the method developed by Altonji *et al.* (2005). Under the assumption that 'selection on the observables equals selection on the unobservables', this method tabulates the ratio of selection on unobservables to observables that would be required to explain away the effect of religious-market contestation on witch-trial activity found in Tables 6–8.

To apply it, we consider two sets of regressions. The first uses the coefficients on our confessional-battle variables without any controls and the coefficients on those variables when our controls of interest are added (weather (Table 6); urbanisation or real wages (Table 7); or tax revenues *per capita* (Table 8)) to tabulate Altonji–Elder–Taber ratios. The second set of regressions uses the coefficients on our confessional-battle variables with decade fixed effects and the coefficients on those variables with decade fixed effects when our controls of interest are added to tabulate them.

We report Altonji–Elder–Taber ratios in Table 10. Thirteen of 20 are negative, suggesting that, if anything, religious-market contestation's effect on witch-trial activity is biased downward. The remaining ratios are large. The smallest implies that selection on unobservables would need to be 2.6 times as strong as selection on observables to

Table 10

Altonji–Elder–Taber Results

Controls in restricted set	Controls in full set	Confessional battles	Confessional battles per million
None	Weather (Oster)	<0	26.40
Decade FEs	Decade FEs + Weather (Oster)	<0	<0
None	Weather (Oster + Germany)	<0	60.2
Decade FEs	Decade FEs + Weather (Oster + Germany)	<0	<0
None	Urbanisation	<0	<0
Decade FEs	Decade FEs + Urbanisation	<0	<0
None	Real wage	2.6	<0
Decade FEs	Decade FEs + Real wage	5.5	15.7
None	Tax revenue *per capita*	14.9	<0
Decade FEs	Decade FEs + Tax revenue *per capita*	6.5	<0

explain our results; the second smallest, that it would need to be 5.5 times as strong to do so.

5. Concluding Remarks

Our economic theory of the great age of European witch trials explains these trials as non-price competition between the Catholic and Protestant churches for religious market share in confessionally contested parts of Christendom. By leveraging popular belief in witchcraft, witch-prosecutors advertised their confessional brands' commitment and power to protect citizens from worldly manifestations of Satan's evil. This competitive strategy was especially useful to religious producers when and where religious-market contestation was intense. Here, the benefit of confessional advertising was higher and religious producers could not rely on coercive exclusion via inquisitions and crusades to annihilate their competitors. On the other hand, throughout Europe before the Reformation, and where Protestantism never gained ground after it, weak religious-market contestation reduced the benefit of confessional advertisement, and what few religious rivals existed could be dealt with via coercive exclusion.

Analyses of new data covering more than 43,000 people tried for witchcraft across 21 European countries over a period of five-and-a-half centuries and more than 400 early modern European Catholic–Protestant conflicts, support our theory: more intense religious-market contestation led to more intense witch-trial activity. This result is robust to accounting for the factors that existing hypotheses for witch trials claim were important – weather, income, and state capacity – which, compared to religious-market contestation, were not.

The phenomenon we document – using public trials to advertise superior power along some dimension as a competitive strategy – is much broader than the prosecution of witches in early modern Europe. It appears in different forms elsewhere in the world at least as far back as the ninth century, all the way up to the twentieth, from the 'cadaver trial' of Pope Formosus to Stalin's 'show trials' in the Soviet Union.

There is one piece of the puzzle posed by the great age of European witch trials that we have not discussed, however: the continuation of witch-trial activity, albeit in much diminished form, between 1650, after the Peace of Westphalia, and 1700, when it finally returned fully to its pre-1550 level. What can our economic theory of European witch trials say about these years?

First, regarding witch trials' persistence: While competitive pressures were responsible for Christian authorities' initial reliance on witch trials, the alleviation of those pressures need not reduce witch-trial activity to zero. If, owing to religious suppliers' provision of witch trials for more than a century, religious consumers became accustomed to witch-trial activity – or more precisely, the protection from diabolism they believed it to provide – as part of the 'regular' package of religious goods provided by their suppliers, it may not have proved possible for religious producers to simply stop providing witch-policing services when competitive pressures became weaker, though they may have liked to. The very effectiveness of witch-trial activity as a competitive strategy in the face of intense confessional contestation may have made it more difficult for religious producers to disengage that strategy when confessional contestation waned and thus they desired to abandon it.

Second, regarding witch trials' demise: The extent to which consumer demand for witch trials might continue even after they have become less useful to religious suppliers as a competitive tool is likely to depend on the status of religious consumers' witch beliefs. Witch-trial advertising is only possible when consumers believe in witches and consumers will only continue to demand witch trials if that belief continues. The seventeenth century, however, was the time of the scientific revolution, whose effects may have eventually eroded popular belief in witchcraft, eroding popular demand for witchcraft prosecutions along with it until witch trials could finally be easily abandoned by religious producers.[33]

Appendix A. Witch-trial Records Catalogue

Table A1

Witch-trial Records by Country and Source

Country	Source	Persons tried	Deaths	Start decade	End decade
Austria	Behringer (1987)	5	1	1490	1680
Austria	Kieckhefer (1976)	67	1	1310	1490
Austria	Midelfort (1972)	11	11	1580	1580
Belgium	Brouette (1953)	365	148	1500	1640
Belgium	Carlson (2004)	1	1	1620	1620
Belgium	Dupont-Bouchat (1978)	215	48	1580	1640
Belgium	Kieckhefer (1976)	6	0	1380	1470
Belgium	Monballyu (2002)	160	160	1450	1680
Belgium	Vanysacker (1988)	140	21	1460	1650

[33] For example, Scarre and Callow (2001) argue that the Enlightenment removed the idea of Satan as someone who could exercise his will on earth, ushering out popular belief in witches. Relatedly, Levack (2016) argues that rising judicial scepticism over the course of the seventeenth century may have contributed to the ultimate decline of witch trials in Europe.

Table A1
(*Continued*)

Country	Source	Persons tried	Deaths	Start decade	End decade
Czech Republic	Kieckhefer (1976)	2	0	1350	1350
Denmark	Tørnsø (1986)	90	0	1570	1650
England	Kieckhefer (1976)	96	5	1300	1490
England	Notestein (1968)	856	270	1550	1710
England	Valletta (2000)	245	92	1630	1740
Estonia	Madar (1990)	205	65	1520	1720
Finland	Heikkinen and Kervinen (1990)	710	115	1520	1690
France	Briggs (2007)	1,167	0	1570	1620
France	Carlson (2004)	1,047	703	1300	1740
France	Hiegel (1961)	402	318	1580	1630
France	Kieckhefer (1976)	482	314	1300	1490
France	Klaits (1982)	92	64	1640	1690
France	Midelfort (1972)	32	30	1540	1630
France	Monballyu (2002)	63	63	1590	1660
France	Monter (1976)	203	81	1590	1660
France	Monter (1997)	376	90	1560	1650
France	Muchembled (1978)	295	0	1400	1790
Germany	Behringer (1987)	3,538	1,175	1340	1790
Germany	Briggs (2007)	16	0	1570	1620
Germany	Decker (1981)	1,122	894	1560	1730
Germany	Dillinger (2009)	1,216	1,013	1490	1710
Germany	Dupont-Bouchat (1978)	39	30	1580	1600
Germany	Durrant (2007)	241	0	1590	1630
Germany	Hiegel (1961)	240	156	1580	1630
Germany	Kauertz (2001)	245	0	1580	1620
Germany	Kieckhefer (1976)	189	78	1300	1490
Germany	Klaits (1982)	1	0	1670	1670
Germany	Midelfort (1972)	4,243	3,193	1300	1700
Germany	Moeller (2007)	3,844	0	1570	1700
Germany	Niess (1982)	556	0	1530	1690
Germany	Schraut and Beutter (1988)	90	48	1560	1750
Germany	Wilde (2003)	894	300	1400	1790
Hungary	Klaniczay (1990)	1,644	474	1520	1770
Ireland	Carlson (2013)	40	0	1570	1660
Ireland	Kieckhefer (1976)	12	1	1320	1320
Italy	Kieckhefer (1976)	94	60	1320	1490
Italy	Martin (1989)	510	0	1550	1650
Luxembourg	Dupont-Bouchat (1978)	216	99	1580	1640
Luxembourg	Kieckhefer (1976)	3	0	1470	1470
Netherlands	Gijswijt-Hofstra and Frijhoff (1991)	43	3	1450	1850
Netherlands	Kieckhefer (1976)	22	1	1320	1490
Netherlands	de Waardt (1991)	304	42	1370	1820
Northern Ireland	Carlson (2013)	9	0	1690	1710
Norway	Naess (1990)	863	280	1560	1750
Poland	Kieckhefer (1976)	12	3	1430	1490
Scotland	Goodare *et al.* (2003)	3,562	189	1560	1720
Scotland	Kieckhefer (1976)	1	1	1470	1470
Spain	Henningsen (1980)	1,946	0	1610	1610
Spain	Kieckhefer (1976)	3	1	1430	1450
Sweden	Sörlin (1999)	353	0	1630	1750
Switzerland	Bader (1945)	8,643	5,306	1350	1780
Switzerland	Carlson (2004)	106	104	1420	1570
Switzerland	Kieckhefer (1976)	334	167	1380	1490
Switzerland	Midelfort (1972)	79	43	1490	1690
Switzerland	Monter (1976)	634	71	1520	1680

Appendix B. Confessional-battle Records Catalogue

Table B1

Confessional-battle Records by War and Source

War	Source	Confessional battles	Start decade	End decade
German Peasants' War	Miller (2003)	17	1520	1520
Knights' Revolt	Hitchcock (1958)	2	1520	1520
Swiss Religious Wars	Heinze (2005)	1	1520	1520
Swiss Religious Wars	Jaques (2007)	3	1530	1600
Schmalkaldic Wars	Heinze (2005)	1	1540	1540
Schmalkaldic Wars	Jaques (2007)	2	1540	1550
Schmalkaldic Wars	Tracy (2002)	3	1540	1550
Eighty Years' War	Jaques (2007)	51	1560	1640
Eighty Years' War	Parker (1977)	9	1560	1590
French Wars of Religion	Jaques (2007)	32	1560	1620
French Wars of Religion	Knecht (2010)	8	1560	1590
Marian Civil War	Jaques (2007)	2	1560	1560
Marian Civil War	Wormald (2001)	4	1560	1570
Eighty Years' War	Tracy (2008)	20	1570	1580
Eighty Years' War	Israel (1997)	17	1580	1630
Thirty Years' War	Wilson (2009)	40	1600	1640
Thirty Years' War	Jaques (2007)	88	1610	1640
French Wars of Religion	Holt (2005)	2	1620	1620
British Wars of Religion	Jaques (2007)	86	1630	1650
British Wars of Religion	Royle (2004)	25	1630	1650
British Wars of Religion	Siochrú (1999)	11	1640	1650

Appendix C. Treating Missing Witch-trial Records as Cases of Zero Trials

Table C1

Religious-market Contestation and Witch Trials

	(1)	(2)	(3)	(4)	(5)	(6)
Panel (*a*): Ln persons tried						
Confessional battles	0.133***	0.117***	0.228***	0.233***	0.031***	0.030***
	(0.037)	(0.033)	(0.065)	(0.064)	(0.010)	(0.011)
Confessional battles (t + 1)						0.009
						(0.009)
Confessional battles (t + 2)						0.008
						(0.012)
Sample	1500–1699	1500–1699	1500–1549	1500–1549	1500–1699	1500–1699
Decade/Country fixed effects	No/No	Yes/No	No/No	Yes/No	Yes/Yes	Yes/Yes
Observations	420	420	105	105	420	420
R^2	0.067	0.192	0.084	0.105	0.757	0.758
Panel (*b*): Ln persons tried per million						
Confessional battles per million	0.147**	0.097	1.339***	1.358***	0.057	0.060
	(0.068)	(0.071)	(0.340)	(0.341)	(0.041)	(0.043)
Confessional battles per million (t + 1)						-0.010
						(0.038)
Confessional battles per million (t + 2)						0.009
						(0.044)
Sample	1500–1699	1500–1699	1500–1549	1500–1549	1500–1699	1500–1699
Decade/country fixed effects	No/No	Yes/No	No/No	Yes/No	Yes/Yes	Yes/Yes
Observations	420	420	105	105	420	420
R^2	0.018	0.161	0.112	0.149	0.705	0.705

Notes. OLS with robust standard errors clustered by country in parentheses. *p < 0.1, **p < 0.05, ***p < 0.01.

Table C2

Using Grid Cells

	Ln persons tried					
	(1)	(2)	(3)	(4)	(5)	(6)
Confessional battles	0.332***	0.336***	0.297***	0.300***	0.104***	0.096***
	(0.081)	(0.082)	(0.078)	(0.077)	(0.025)	(0.024)
Confessional battles (t + 1)						0.043*
						(0.025)
Confessional battles (t + 2)						0.043*
						(0.025)
Sample	1500–1699	1500–1699	1500–1549	1500–1549	1500–1699	1500–1699
Decade/Grid-cell fixed effects	No/No	Yes/No	No/No	Yes/No	Yes/Yes	Yes/Yes
Observations	3,760	3,760	940	940	3,760	3,760
R^2	0.096	0.110	0.055	0.057	0.718	0.722

Notes. OLS with robust standard errors clustered by grid cell in parentheses. *p < 0.1, **p < 0.05, ***p < 0.01.

Table C3

Weather and Witch Trials

	(1)	(2)	(3)	(4)	(5)	(6)
Panel (*a*): Ln persons tried						
Weather	−0.080		−0.111	−0.111		−0.182
	(0.152)		(0.151)	(0.147)		(0.141)
Confessional battles		0.049*	0.051*		0.072**	0.077**
		(0.026)	(0.027)		(0.031)	(0.033)
Sample	Oster	Oster	Oster	Oster + Germany	Oster + Germany	Oster + Germany
Observations	175	175	175	200	200	200
R^2	0.443	0.454	0.456	0.407	0.433	0.438
Panel (*b*): Ln persons tried per million						
Weather	−0.111		−0.128	−0.124		−0.137
	(0.163)		(0.164)	(0.138)		(0.139)
Confessional battles per million		0.144**	0.148***		0.151***	0.154***
		(0.058)	(0.056)		(0.053)	(0.051)
Sample	Oster	Oster	Oster	Oster + Germany	Oster + Germany	Oster + Germany
Observations	175	175	175	200	200	200
R^2	0.420	0.433	0.435	0.447	0.460	0.463

Notes. OLS with robust standard errors clustered by country in parentheses. All columns include decade fixed effects. Sample period: 1520–1769; *p < 0.1, **p < 0.05, ***p < 0.01.

Table C4

Income and Witch Trials

	(1)	(2)	(3)	(4)	(5)	(6)
Panel (*a*): Ln persons tried						
Urbanisation	0.038***		0.031***			
	(0.010)		(0.011)			
Confessional battles		0.118***	0.111***		0.126***	0.122***
		(0.033)	(0.032)		(0.036)	(0.035)
Real wage				−0.160		−0.120
				(0.105)		(0.100)
Observations	400	400	400	180	180	180
R^2	0.157	0.186	0.197	0.168	0.242	0.250
Panel (*b*): Ln persons tried per million						
Urbanisation	0.005		0.001			
	(0.011)		(0.012)			
Confessional battles per million		0.108	0.107		0.205***	0.193***
		(0.071)	(0.073)		(0.054)	(0.053)
Real wage				0.104		0.077
				(0.076)		(0.077)
Observations	400	400	400	180	180	180
R^2	0.145	0.154	0.154	0.187	0.222	0.229

Notes. OLS with robust standard errors clustered by country in parentheses. All columns include decade fixed effects. Sample period: 1500–1699; *p < 0.1, **p < 0.05, ***p < 0.01.

Table C5

State Capacity and Witch Trials

	(1)	(2)	(3)
Panel (*a*): Ln persons tried			
Tax revenue *per capita*	0.013**		0.015***
	(0.006)		(0.006)
Confessional battles		0.112***	0.117***
		(0.040)	(0.039)
Observations	115	115	115
R^2	0.260	0.315	0.345
Panel (*b*): Ln persons tried per million			
Tax revenue *per capita*	0.012***		0.012***
	(0.004)		(0.003)
Confessional battles per million		0.296***	0.295***
		(0.053)	(0.038)
Observations	115	115	115
R^2	0.356	0.391	0.442

Notes. OLS with robust standard errors clustered by country in parentheses. All columns include decade fixed effects. Sample period: 1500–1699. *p < 0.1, **p < 0.05, ***p < 0.01.

Table C6

Horse Race

	(1)	(2)
Panel (*a*): Ln persons tried		
Confessional battles	0.061***	0.034***
	(0.007)	(0.012)
Weather	−0.210	0.064
	(0.211)	(0.286)
Real wage	−0.880***	
	(0.079)	
Tax revenue *per capita*	−0.055**	0.077***
	(0.022)	(0.024)
Urbanisation		0.306***
		(0.103)
Observations	36	36
R^2	0.921	0.842
Panel (*b*): Ln persons tried per million		
Confessional battles per million	0.239***	0.209***
	(0.009)	(0.007)
Weather	−0.136	−0.062
	(0.124)	(0.136)
Real wage	−0.238***	
	(0.057)	
Tax revenue *per capita*	−0.068***	−0.035**
	(0.018)	(0.017)
Urbanisation		0.045
		(0.049)
Observations	36	36
R^2	0.943	0.924

Notes. OLS with robust standard errors clustered by country in parentheses. All columns include decade fixed effects. Sample period: 1520–1699. *p < 0.1, **p < 0.05, ***p < 0.01.

Appendix D. Alternative Weather Data

Table D1

Using Luterbacher et al. Weather Data

	(1)	(2)
Panel (*a*): Ln persons tried		
Temperature	−0.207	−0.221
	(0.280)	(0.274)
Confessional battles		0.083***
		(0.025)
Observations	233	233
R^2	0.127	0.184
Panel (*b*): Ln persons tried per million		
Temperature	0.054	0.010
	(0.341)	(0.340)
Confessional battles per million		0.102*
		(0.057)
Observations	233	233
R^2	0.141	0.153

Notes. OLS with robust standard errors clustered by country in parentheses. All columns include decade fixed effects. Sample period: 1500–1699. Temperature is average degrees Celsius, standardised relative to the country mean, constructed using data from Luterbacher *et al.* (2004); *p < 0.1, **p < 0.05, ***p < 0.01.

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Submitted: 6 June 2016
Accepted: 16 December 2016

Additional Supporting Information may be found in the online version of this article:

Appendix E. 'Witch Trials' Data Creation.
Data S1.

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