Witch trials and gender differences in trust*

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[PRELIMINARY, PLEASE DO NOT CITE]

Abstract

We document a strong, gender-specific association between witch trials in Europe in 1300–1850 and trust levels today. We link data covering more than 43,000 people tried for witchcraft across 21 European countries to the European Social Survey. Results suggest that women living in Nuts-2 regions where witch trials were more prominent significantly display lower levels of trust than men towards other people, the national parliament, the police, and politicians. These results suggest that historical events can have persistent effects on gender roles.

Keywords: Trust, Long-run persistence, Witchcraft, Gender.
JEL Classification Numbers: J16, Z13, N33.

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1 Introduction

History is an important determinant of economic outcomes today (Nunn 2009). One way in which historic events can have persistent effects is by affecting culture or norms of behavior (Bisin and Verdier 2001). There is ample empirical evidence linking events in the distant past to norms and preferences today, particularly under two circumstances: On the one hand, historical events that affected culture often involved extreme violence. For example, Nunn and Wantchekon (2011) show that a culture of mistrust emerged in Africa as a result of slave trade. Similarly, Voigtländer and Voth (2012) show that progroms after the Black Death can explain anti-semitism in interwar Germany. On the other hand, one aspect of culture that is likely affected by historical events are gender roles. Alesina, Giuliano, and Nunn (2013) and Grosjean and Khattar (2014) show, respectively, that traditional agricultural practices and historical sex-ratios determine gender roles and general attitudes towards women today. Despite the fact that historical events involving extreme violence often targeted women, and that gender roles are likely to be affected by history, the evidence linking historical violence against women to gender-specific cultural traits is scarce.

In this paper, we provide new evidence suggesting that historical violence against women can have gender-specific effects on trust levels today. To do so, we focus on the great age of European witch trials. Between 1200 and 1750, around one million Europeans were executed for the crime witchcraft (Oster 2004). Importantly, women were the preferred targets of witch hunts (Barstow 1994: 153-4). Eighty percent of tried individuals were women (Zika 2003: 238), who were often accused by neighbors or close relationships—including friends and family members. We hypothesize that in this environment, a culture of mistrust may have evolved amongst women, which may persist to this day.

We find a gender-specific association between the number of witch trials in Europe in 1300–1850 and trust levels today. We link data covering more than 43,000 people tried for witchcraft across 21 European countries (Leeson and Russ 2018) to seven waves of the European Social Survey. Results suggest that women living in Nuts-2 regions where witch trials were more prominent significantly display lower levels of trust and perceive other people as trying to take advantage of them. This is consistent with the hypothesis that witch trials prompted a culture of mistrust amongst women. The magnitude of the effect is small, but comparable to that of

age and one tenth of that of education, which are typically regarded as important determinats of trust. Furthermore, we show that the number of witch trials in the distant past is also significantly associated with women's trust towards the national parliament, politicians, or the police. This suggests that witch trials also deteriorated the perception of women towards pre-modern institutions, law enforcement, and legal structures, which seemingly persisted until today. In contrast, we generally find no association between witch trials and trust levels for the sample of men. Wald tests show that where witch trials were more prominent women significantly display lower levels of trust than men. The magnitude of the difference is non-trivial. For example, the estimated coefficient for the number of witch trials on trust towards the police is more than eight times larger for women than for men, and has the opposite sign.

This paper is relates to three strands of the literature. The first is a rich literature showing that historical events can influence norms of behavior several centuries later. In his seminal work, Weber (1930) emphasized the role of protestant work ethic in shaping caitalism. More recently, a large body of work has established an empirical link between history, culture, and development. Notable examples include slave trade (Nunn and Wantchekon 2011), progroms following the Black Death (Voigtländer and Voth 2012), the formation of italian city-states (Guiso, Sapienza, and Zingales 2016), or medieval trade (Greif 1994; Jha 2008). Similarly, Fernandez and Fogli (2009) and (Algan and Cahuc 2010) show that cultural norms persist amongst migrants who are exposed to environments with different sets of values and different institutions. Closer to our work, Alesina, Giuliano, and Nunn (2013) shows that the historical use of the plough affects gender roles today. Similarly, Grosjean and Khattar (2014) show that the transportation of convicts to Austrialia biased sex-ratios and, in turn, affected general attitudes towards women today. We contribute to this literature by showing that trust levels of women today are associated to the great age of European witch trials, an important historical event involving extreme violence towards women.

The second literature that motivates this paper is concerned with explaining gender differences in trust levels. In survey data, women and other historically discriminated groups typically display lower levels of trust (Alesina and Ferrara 2002). A number of lab experiments show that women send larger amounts of money in the trust game (Buchan, Croson, and Solnick 2008; Garbarino and Slonim 2009).[1] Re-

[1]In the trust game (or investment game), player one can send part of his endowment to player two, which is multiplied by 3. Player two can then return part of the money in her possesion to

viewing the literature, Croson and Gneezy (2009) concludes that "women trust less than or the same as men in [experimental] settings" (p. 460). We add to this literature by exploring the deep, historical roots of these gender differences in trust.

Finally, this paper also contributed to our understanding of witch trials. Most of the literature studying this phenomenom is concerned with the causes of witch trials rather than with its consequences. These different hypothesis are relevant for us to the extend that they can shed light on potential strategies for causal inference. Oster (2004) argues that the violence and scapegoating was prompted by a deterioration in economic conditions, in particular, by a decrease in temperature. Similarly, Miguel (2005) shows that witch killings in contemporary Tanzania respond to negative income shocks. Using data on witch trials in France, Johnson and Koyama (2014) find evidence that weak government and low-state capacity were responsible for the great age of European witch trials. In contrast, Leeson and Russ (2018) show that witch trials reflected non-price competition between the Catholic and Protestant churches in contested parts of Christendom. To the extent of our knowledge, this paper is the first to evaluate the long-term consequences of the great age of European witch trials.

2 Data

2.1 Witch trial dataset

We use data on witch trials collected by Leeson and Russ (2018). The dataset covers the entire period known as the great age of European witch trials (1300–1850). It provides information on more than 43,000 people accused in 10,805 witch trials across 21 European countries. The dataset also provides information on the decade (or year) of the trial, as well as the location where it took place (city, county, or country).

Figure 1 illustrates the geographical location of the witch trials for which the location is specified at the city or county level. Most of the recorded witch trials took place in southern Germany, Switzerland, Scotland, and the Netherlands. The number of witch trials varies considerably, from one trial in Vienna to 3,844 in the German state of Mecklenburg-West Pomerania.

[FIGURE 1 HERE]

player one. The amount sent is used as a measure of trust (Croson and Gneezy 2009).

Unfortunately, the Leeson and Russ (2018) dataset does not provide information on the gender of the tried people. However, other evidence suggests that women were the preferred target. For example, Zika (2003) (p. 238) estimates that eighty percent of tried individuals were women and Barstow (1994) (pp. 1534) argues that they were the usually accused of scapegoating.

2.2 European Social Survey

The European Social Survey (ESS) is a large scale survey covering the period 2002–2014 in 7 waves (2002, 2004, 2006, 2008, 2010, 2012, and 2014). It comprises 37 European countries, 334 Nuts 2 regions, and, pooling the seven waves, involves more than 300,000 individuals.

The ESS ask respondents how much they trust other people. Specifically, it measures the extent of agreement to the statement "Most people can be trusted or you can't be too careful." The variable ranges from 0 to 10, where 0 corresponds to "you can't be too careful" and 10 to "most people can be trusted." The survey also measures trust towards the respondent's national parliament, the police, and politicians. These variables also range from 0 to 10, where 0 corresponds to "no trust at all" and 10 to "complete trust." Finally, the survey asks whether "most people try to take advantage of you, or try to be fair," which again ranges from 0 ("most people try to take advantage of me") to 10 ("most people try to be fair"). In order to create a general trust variable, we create a composite trust index using principal components analysis. Specifically, the index is the first principal component from the aforementioned variables: trust in people, trust towards parliament, politicians, and the police, and whether people try to be fair.

Additional individual covariates are available by the ESS such as age, gender, education (nine categories, based on the International Standard Classification of Education, ES-ISCED), income source (wage, self employed, pensions, unemployment benefits, social benefits, investments or savings, and other sources), satisfaction with income (comfortable, coping, difficult, and very difficult), and religion. Finally, we add information at the Nuts 2 level on GDP per capita (PPP).

2.3 Data descriptives

From the ESS we have a potential sample of more than 333,723 respondants. We first drop 30,706 first-generation immigrants. Within the remaining sample, only 72.13 percent report their Nuts 2 region. Linking those to the number of witch trials at every Nuts 2 region leaves us with a sample of 44,061 individuals, from which 32,072 individuals report information on trust in people and the remaining covariates.

Table 1 presents descriptive statistics for the sample of 32,072 individuals for which we have information on trust and the historical incidence of witch trials. This is the main sample used in our empirical analysis. On average, respondents give a value of 5.3 to the question "Most people can be trusted or you can't be too careful," which corresponds to a middle ground position. The remaining trust variables display similar values, ranging from 3.79 to 5.97. Politicians and the national parliament are perceived as slightly less trustworthy than the police, and people are on average perceived as fair. Fifty-two percent of our sample respondents are women. In terms of education, 39 percent of our sample have secondary education, 7 percent lower tertiary and 8 percent higher tertiary education. Fifty-nine percent of respondents in our sample report wages as their main source of income, and 85 percent of them report to be comfortable or coping with their present income. Finally, 47 percent do not report religion, 39 percent identify as roman catholics and 12 percent as protestants.

[TABLE 1 HERE]

3 Empirical results

3.1 Baseline OLS estimates

We begin by estimating the relationship between the number of witch trials that occured in an individual's region (Nuts-2) and the individual's current level of trust. Our baseline estimating equation is:

$$trust_{i,r,c,e} = \beta\ witch\ trials_r + \mathbf{X}'_{i,r,c,e}\gamma + \theta X_r + \mu_c + \mu_e + \epsilon_{i,r,c,e} \tag{1}$$

where i indexes individuals, r regions (Nuts-2), c larger administrative units (Nuts-1), and e the ESS round used. The variable $trust_{i,r,c}$ denotes one of our six trust variables: trust in people, parliament, politicians, police, people try to be fair, and

the composite index of trust created using principal components analysis. These vary across individuals. The variable $witch\ trials_r$ measures the number of witch trials that took place in Nuts-2 region r during the great age of European witch trials (1300–1850). Since the source of variation is across regions r, I cluster standard errors by the 68 Nuts-2 regions in the sample. The coefficient β captures the association between witch trials in the past and trust levels today.

The vector $\mathbf{X}'_{i,r,c}$ includes a set of individual-level covariates that may also affect the level of trust: age, age squared, a gender indicator, seven income source fixed effects, four income satisfaction fixed effects, nine education fixed effects, and four religion fixed effects. We also include the log GDP per capita (PPP) at the Nuts-2 level, r. Finally, μ_e denotes fixed-effects for each ESS round. μ_c denotes fixed-effects for larger administrative units (Nuts-1), which are included to capture government regulations, law enforcement, institutional quality, etc. which may also affect trust.

Table 2 reports estimates of equation (1). In the first column, we consider responses to the question "Most people try to take advantage of you, or try to be fair." The estimated coefficient for witch trials, β, is negative but close to zero and not statistically significant. Similar results hold for trust in people (column 2), trust in the national parliament (column 3), and trust in the police (column 4). Only trust in politicians and our composite index using principal components analysis seem to be significantly associated to witch trials. The magnitudes are albeit small. For example, increasing the number of witch trials by a hundred in the average Nuts-2 region is associated to a decrease in our composite index of trust by only 0.013 units. In other words, one standard deviation in witch trials is associated to a decrease in 0.02 standard deviations in the composite index of trust.

The remaining covariates have expected signs. More educated individuals are more trusting, as well as those with seemengly higher incomes. For example, pensioners, those living of unemployment benefits, and individuals reporting a "very difficult" situation with their current income tend to trust less. As reported in the literature, women tend to be less trusting (Alesina and Ferrara 2002).

[TABLE 2 HERE]

3.2 Gender-specific Wald estimates

The baseline OLS estimates suggest that witch trials in the distant past do not have a large impact in overall trust levels. However, the effect of witch trials may be masked by the fact that we pooled men and women together. Women were the preferred targets of witch hunts (Barstow 1994: 153-4). Eighty percent of tried individuals were women (Zika 2003: 238), who were often accused by neighbors or close relationships—turning friends, families, and neighbors against each other. We hypothesize that in this environment, a culture of mistrust may have evolved amongst women, which may persist to this day.

To test this hypothesis we estimate two regressions of equation (1)'s form, one for women and one for men. Formally, H_w and H_m represent the two models:

$$\begin{aligned} &H_w : trust_{i,r,c} = \beta^w \ witch\ trials_r + \mathbf{X}'_{i,r,c}\gamma^w + \theta^w X_r + \mu_c + \mu_e + \epsilon^w_{i,r,c} \qquad \text{if } i \in \text{wom} \\ &\text{and} \\ &H_m : trust_{i,r,c} = \beta^m \ witch\ trials_r + \mathbf{X}'_{i,r,c}\gamma^m + \theta^m X_r + \mu_c + +\mu_e + \epsilon^m_{i,r,c} \quad \text{if } i \in \text{man} \end{aligned} \tag{2}$$

where the coefficients β^w and β^m capture the association between witch trials in the past and trust levels today for women and men respectively. We then compare these coefficients using a Wald chi-square estimator.

Note that this approach can be interpreted as difference-in-differences estimation. Specifically, the Wald test captures the differential effect of witch trials (treatment) on women (treated group) versus men (control group). In other words, under the assumption that men were not primarily affected by witch trials, the comparision between the coefficients β^w and β^m plausibly washes away confounding factors that are correlated with witch trials and may also affect trust. Admittedly, despite the fact that eighty percent of the individuals tried for witchcraft were women (Zika 2003: 238), we cannot conclusively state that men were not affected. Hence, we refrain from deriving strong causal statements from this estimation strategy.

Table 3 reports estimates of equation (2) and the corresponding Wald chi-square tests. In the first row, we consider, for women and men separately, the association between witch trials in the past and today's perception of whether people tries to be fair or to take advantage of you. For women, witch trials are negatively associated with the perception of other people's fairness (column 1). In contrast, for the sample of male respondents the estimated coefficient is close to zero and not statistically

significant (column 2). In absolute terms, the magnitude of the estimated coefficient is almost four times large for women than for men. In column 3, we report the Wald chi-square tests for the difference in the coefficients for witch trials. Results suggest that the estimates for men and women are significantly different. This is consistent with the hypothesis that a culture of mistrust may have evolved amongst women as a result of witch trials—which turned friends, families, and neighbors against each other and primarily targeted women.

Other measures of trust display similar results. For women, all variables are negatively associated with the number of witch trials in the past. The results for trust in the parliament, politicians, or the police suggest that witch trials are not only associated with women's trust in other people around them. Witch trials also resulted in a deterioration of the perception of women towards pre-modern institutions, law enforcement, and legal structures, which seemingly persisted until today. Differently, the estimated coefficients for men are close to zero and not statistically significant for most of the trust variables. The exceptions are trust in people and trust in politicians, which are, respectively, positively and negatively associated with witch trials. Since men were not the main target of witch hunts, we conjecture that these significant correlations plausibly reflect confounding factors that are correlated with witch trials and may also affect trust. Finally, except for trust in politicians, the Wald chi-square tests confirm that the estimated coefficients for witch trials are significantly different for men and women. In other words, witch trials are only associated with trust levels today for women—the primarily target of witch hunts.

Admittedly, the estimates in Table 3 are small. For example, increasing the number of witch trials in a given Nuts-2 region by one standard deviation is associated to a decrease by 0.03 standard deviations in our the composite index of trust for the sample of women. To assess the economic magnitude of the witch trial coefficients we perform a standard variance decomposition exercise. Specifically, we compare the explanatory power of witch trials to that of other variables that are typically considered important determinants of trust. We find that witch trials explain around one percent of the total variation of our composite trust index. This is comparable to the explanatory power of age and age squared and one tenth of the explanatory power of our 9 education indicators. The effects of our religion and income variables are, respectively, 14 and 22 times larger. This suggest that witch trials occuring several centuries ago display a smaller, yet non-trivial association with trust levels today.

[TABLE 3 HERE]

4 Summary and future research

Between 1200 and 1750, around one million Europeans were executed for the crime witchcraft (Oster 2004). Eighty percent of those were women (Zika 2003: 238), who were often accused by neighbors or close relationships—including friends and family members. In this paper we provided new evidence suggesting that, in this environment, a culture of mistrust emerged amonst women which seemingly persisted until today. Linking data covering more than 43,000 people tried for witchcraft across 21 European countries (Leeson and Russ 2018) to seven waves of the European Social Survey, we find that women in regions (Nuts-2) where witch trials were more prominent significantly display lower levels of trust towards other people, the national parliament, politicians, and the police, and furthermore perceive other people as trying to take advantage of them. The explanatory power of witch trials is comparable to that of age and one tenth of that of education.

In contrast, we generally find no association between witch trials and trust levels for the sample of men. In other words, witch trials are only associated with trust levels today for women—the primarily target of witch hunts. Where witch trials were more prominent women significantly display lower levels of trust than men. The magnitude of the difference is non-trivial. For example, the estimated coefficient for the number of witch trials on trust towards the police is more than eight times larger for women than for men, and has the opposite sign.

The negative association between witch trials and women's trust levels is consistent with our hypothesis that witch trials engendered a culture of mistrust amongst women. However, our estimates cannot be interpreted as causal. The correlation could be explained by omitted variables that simultaneously affected witch trials in the distant past and women's subsequent levels of trust. For example, if witch trials toke place where women were inherently less trusting, and these regions continue to be less trusting today, then this could generate the negative relationship that we documented in this paper.

As future research, we will examine whether the associations estimated so far can be interpreted as causal. Specifically, we plan to exploit exogenous variation in the difussion of an important instrument for witch hunts: the *Malleus Maleficarum*.

Published in 1486, this book provided important prescriptions for secular courts in order to extirpate witches. According to Guiley (1930) (p. 223),

> the *Malleus Maleficarum* proliferated into dozens of editions throughout Europe and England and had a profound impact on European witch trials for about 200 years. [...] It was second only to the Bible in sales until [...] 1678.

The geographical diffusion of the *Malleus Maleficarum* can be tracked with the Universal Short Title Catalogue database (USTC), which provides information on all books published in Europe between the invention of the printing press and the end of the sixteenth century.

Furthermore, we plan to use plausibly exogenous variation in the intensity of witch trials coming from two prominent theories on the origins of the great age of European witch trials: the first theory argues that the violence and scapegoating was prompted by a deterioration in economic conditions, in particular, by a decrease in temperature (Oster 2004). Hence, weather shocks can provide plausibly exogenous variation in the number of witch trials. Second, Leeson and Russ (2018) show that witch trials reflected non-price competition between the Catholic and Protestant churches in contested parts of Christendom. If Catholic-Protestant competition does not affect trust levels today, one could exploit historical differences in this dimension as an instrument for witch trials.

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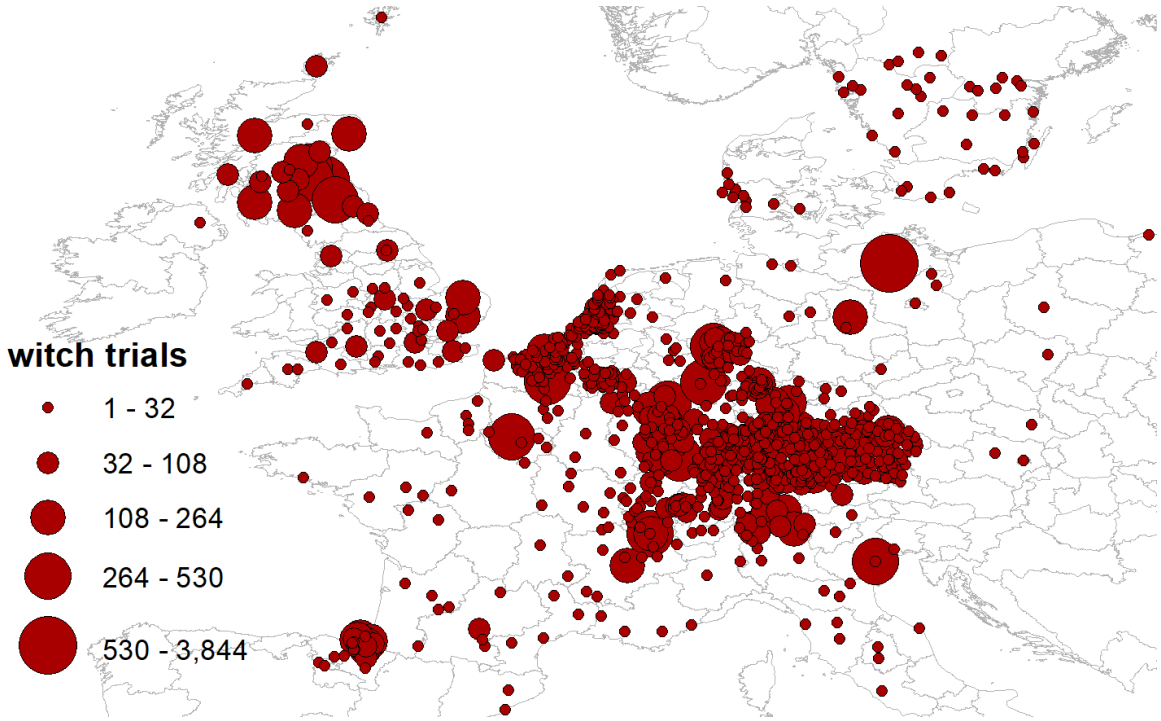
5 Figures and tables

Figure 1: Witch trials in Europe (1300–1850)



Source: Leeson and Russ (2018)

Table 1: Summary statistics

	mean	sd	min	max	N
Trust in people	5.30	2.29	0	10	32,072
Trust in national parliament	4.74	2.42	0	10	31,470
Trust in the police	6.25	2.27	0	10	31,912
Trust in politicians	3.79	2.32	0	10	31,762
Most people are fair	5.97	2.13	0	10	31,924
Trust (P.C.A)	0.36	1.50	-4.24	4.71	31,145
Education, ES-ISCED:					
Not harmonizable	0.29	0.46	0	1	32,072
I. < lower secondary	0.09	0.29	0	1	32,072
II. lower secondary	0.15	0.36	0	1	32,072
IIIb. upper secondary (low)	0.14	0.35	0	1	32,072
IIIa. upper secondary (high)	0.10	0.30	0	1	32,072
IV. advanced vocational	0.07	0.26	0	1	32,072
V1. lower tertiary	0.07	0.25	0	1	32,072
V2. higher tertiary	0.08	0.27	0	1	32,072
Other	0.00	0.03	0	1	32,072
Income source:					
Wages or salaries	0.59	0.49	0	1	32,072
Self employed / farming	0.08	0.27	0	1	32,072
Pensions	0.26	0.44	0	1	32,072
Unemployment benefit	0.02	0.14	0	1	32,072
Social benefits or grants	0.03	0.16	0	1	32,072
Investment-savings	0.01	0.07	0	1	32,072
Other sources	0.02	0.13	0	1	32,072
Satisfaction with income:					
Comfortable	0.40	0.49	0	1	32,072
Coping	0.45	0.50	0	1	32,072
Difficult	0.12	0.33	0	1	32,072
Very difficult	0.03	0.16	0	1	32,072
Religion:					
Missing	0.47	0.50	0	1	32,072
Roman catholic	0.39	0.49	0	1	32,072
Protestant	0.12	0.32	0	1	32,072
Islam	0.01	0.09	0	1	32,072
Other	0.02	0.12	0	1	32,072
Age	48.25	18.52	14	103	32,072
Women	0.52	0.50	0	1	32,072
log GDP p.c. (PPP)	10.16	0.27	9.20	10.92	68 (Nuts 2)
Number of witch trials	108.15	288.61	1	1,671	68 (Nuts 2)

Sources: Data on witch trials is from Leeson and Russ (2018). Log GDP p.c. (PPP) at the Nuts 2 level is from Eurostat. The remaining variables are from the European Social Survey, rounds 1–7.

Table 2: OLS estimates for the effect of witch trials on trust

	Are people fair? (1)	Trust in people (2)	Trust in parliament (3)	Trust in police (4)	Trust in politicians (5)	Trust P.C.A. (6)
Witch trials (100s)	-0.009	-0.004	-0.015	-0.016	-0.020***	-0.013***
	(0.007)	(0.005)	(0.009)	(0.010)	(0.006)	(0.004)
Observations	31,973	32,072	31,528	31,977	31,824	31,145
Individual controls	YES	YES	YES	YES	YES	YES
NUTS2 controls	YES	YES	YES	YES	YES	YES
NUTS1 FE	YES	YES	YES	YES	YES	YES
ESS FE	YES	YES	YES	YES	YES	YES
Adjusted-R2	0.143	0.181	0.173	0.122	0.200	0.272

Notes: The individual controls are for age, age squared, a gender indicator, seven income source fixed effects, four income satisfaction fixed effects, nine education fixed effects, and four religion fixed effects. NUTS2 controls include log GDP per capita (PPP). Standard errors clustered by NUTS2 in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 3: OLS estimates for the effect of witch trials on trust, by gender

	Women (1)	Men (2)	Difference (3)
Effect of witch trials (100s) on:			
Are people fair?	-0.023*	0.006	-0.029**
	(0.013)	(0.004)	p-val=0.04
	N=16,703	N=15,478	
Trust in people	-0.023***	0.016***	-0.039***
	(0.005)	(0.006)	p-val=0.00
	N=16,767	N=15,518	
Trust in parliament	-0.023**	-0.002	-0.021***
	(0.010)	(0.010)	p-val=0.00
	N=16,359	N=15,366	
Trust in police	-0.033***	0.004	-0.037***
	(0.009)	(0.011)	p-val=0.00
	N=16,671	N=15,512	
Trust in politicians	-0.014*	-0.025***	0.011
	(0.007)	(0.009)	p-val=0.15
	N=16,573	N=15,449	
Trust (P.C.A.)	-0.021***	-0.002	-0.019***
	(0.005)	(0.006)	p-val=0.00
	N=16,132	N=15,199	
Individual controls	YES	YES	YES
NUTS2 controls	YES	YES	YES
NUTS1 FE	YES	YES	YES
ESS FE	YES	YES	YES

Notes: The individual controls are for age, age squared, seven income source fixed effects, four income satisfaction fixed effects, nine education fixed effects, and four religion fixed effects. NUTS2 controls include log GDP per capita (PPP). Standard errors clustered by NUTS2 in parentheses; *** p<0.01, ** p<0.05, * p<0.1.