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Abstract

In an economic theory of suicide, we model social cohesion of the religious community and religious beliefs about afterlife as two mechanisms by which Protestantism increases suicide propensity. We build a unique micro-regional dataset of 452 Prussian counties in 1816-21 and 1869-71, when religiousness was still pervasive. Exploiting the concentric dispersion of Protestantism around Wittenberg, our instrumental-variable model finds that Protestantism had a substantial positive effect on suicide. We address issues of bias from mental illness, misreporting, weather conditions, within-county heterogeneity, religious concentration, and gender composition. Tests that discriminate between the two mechanisms based on historical church-attendance data and modern suicide data suggest that the sociological channel dominates the theological channel.

JEL-Code: Z120, N330.

Keywords: religion, suicide, social cohesion.

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I. Introduction

Every year, over 800,000 people commit suicide worldwide, making suicide a leading cause of death in particular among young adults (World Health Organization (2014)). This creates far-reaching emotional, social, and economic ramifications and invokes major policy efforts to prevent suicides. In the scientific literature, religious denomination has long been observed as an important factor related to suicide. Already in *Le suicide*, a classic example of quantitative investigation of socially framed individual behavior, Émile Durkheim (1897) presented aggregate indicators suggesting that Protestantism was a leading correlate of suicide incidence. The proposition that Protestants have higher suicide rates than Catholics has been "accepted widely enough for nomination as sociology's *one law*" (Pope and Danigelis (1981)). Even today, Protestant countries tend to have substantially higher suicide rates, suggesting that the relation of religion and suicide remains a vital topic.[1] Several contributions have so far revealed the usefulness of investigating suicide from an economics point of view (Hamermesh and Soss (1974); Becker and Posner (2004); Chen et al. (2012)).[2] But the leading established correlate of suicide in the sociological literature, religious denomination, has received surprisingly little attention in the economics literature, despite the recent burst of interest in issues of culture and religion.[3] While the economics literature on happiness and subjective well-being considers suicide as a measure of utmost unhappiness with the particular advantage over subjective self-reports of being a revealed-preference outcome measure (Oswald (1997); Layard (2005)), these analyses have so far not been linked to religious denomination.

This paper makes three contributions to the economic analysis of the relation between religion and suicide. First, we model social cohesion and religious beliefs as two channels through which Protestantism may affect suicide in the framework of an economic theory of

[1] This observation is based on the sample of ten OECD countries in which either Protestants or Catholics still make up more than 85 percent of the population in 2000; the average suicide rate among the four Protestant countries is 15.5 suicides per 100,000 inhabitants, whereas it is 8.9 among the six Catholic countries (suicide data from OECD (2009); religion data from Barrett, Kurian, and Johnson (2001)). See also Huang (1996) and Helliwell (2007) for cross-country studies of religion and suicide.

[2] Cutler, Glaeser, and Norberg (2001), Daly and Wilson (2009), Daly et al. (2011), and Daly, Wilson, and Johnson (2013) are further examples.

[3] The economics literature on culture and religion (see Iannaccone (1998) and Guiso, Sapienza, and Zingales (2006) for surveys) does not emphasize suicide as a possible outcome. A noteworthy exception is the economics of suicide bombers (Benmelech and Berrebi (2007); Berman and Laitin (2008)), which addresses a special case where the prime motivation for suicide is not to end one's life. Evidence suggests that the typical profile of suicide bombers is very different from those who commit suicide in general (Krueger and Malečková (2003)).

suicide. We show how a higher suicide rate of Protestants relative to Catholics can be understood as a rational[4] outcome of denominational differences in community integration and in theological doctrine. Second, we provide new micro-regional evidence from Prussia in the 19th century – a time when religiousness was still pervasive – that the effect of Protestantism on suicide may indeed be causal. Third, we use this empirical setting to devise tests that discriminate between the sociological and the theological explanations. Our results suggest that Protestantism is a leading explanatory factor for suicide rates and that this comes about mostly through the sociological rather than the theological mechanisms.

We start by integrating sociological and theological explanations for why Protestantism may affect suicide in a simple economic model (Section II). Durkheim (1897) stressed that Protestantism encourages independent thought and religious individualism, decreasing social cohesion relative to the unified Catholic community. He argued that this role of the religious group as an integrated community tends to protect man from committing suicide.

To this "sociological" mechanism, we add a couple of "theological" explanations. We argue that Protestant-Catholic differences rooted more deeply in religious doctrine affect the utility or disutility of afterlife. By adding religion and afterlife to the Becker and Posner (2004) version of the economic theory of suicide, we show that such doctrinal differences are relevant to suicidal behavior. In particular, Protestantism tends to stress that man's salvation is by God's grace alone and not by any merit of man's own work, whereas Catholicism allows man's deeds and sins to affect God's judgment. Committing suicide thus entails the disutility of forgoing paradise for Catholics but not for Protestants. Furthermore, the confession of sins is a holy sacrament in Catholicism but not in Protestantism. Since suicide is the only sin that (by definition) can no longer be confessed, this additionally creates a substitution effect that diverts Catholics from committing suicide towards other forms of behavior considered in times of desperation.

The empirical pattern of religion and suicide detected by Durkheim (1897) has created substantial controversies in the sociological literature to these days.[5] To test the prediction that Protestants have a higher propensity to commit suicide, we use the setting of Prussia in the 19th century (Section III). Apart from mirroring the perspective of Durkheim (1897)'s work, the 19th century has the advantage that virtually everybody was member of a religious denomination and

[4] Of course, many suicides are not rational acts but derive from affective emotions or mental illness. In the empirical part, we can control for physical and mental disabilities.

[5] See Bankston, Allen, and Cunningham (1983) and Simpson (1998) for two examples.

that religion pervaded all aspects of life. The Prussian perspective offers the opportunity to compare non-minority occurrences of the two religious denominations within an otherwise common setting of political governance, institutions, jurisdiction, language, and basic culture. Combining suicide data administered by local police departments in 1869-71 with rich census data on background information, we build a unique new micro-regional dataset on suicide, religion, and relevant covariates for 452 Prussian counties. We also use data from 1816-21.

A fundamental challenge for empirical identification is self-selection of more suicide-prone people into Protestantism, as hypothesized already in 1919 by the neurologist Kollarits (1919). However, the endogeneity bias may also go into the opposite direction: for example, during the Reformation Protestantism may have spread more easily to regions where people are willing to take matters into their own hands and change their lives, which may be negatively related to suicide proneness. While manifold, existing studies do not address this fundamental endogeneity problem. To identify the causal effect of Protestantism, we use distance to Wittenberg as an instrumental variable tracing the initial spread of the Protestant Reformation from its epicenter (Becker and Woessmann (2009)). We vindicate the validity of the instrument with evidence that it is orthogonal to several correlates of suicide rates in 1517, before the start of the Reformation.

Our results show that Protestantism had a significant positive effect on suicides in Prussia both in the early and late 19th century. Protestantism increased the annual suicide rate per 100,000 inhabitants, which has a mean of 13 suicides in 1869-71, by about 15-20 suicides. Channels such as economic modernization and literacy, which are also affected by Protestantism, seem to play only a minor role in this effect. Thus, Protestantism seems to bring positive effects for some people and negative effects for others: For the majority of the population, it raises economic prosperity through higher human capital (Becker and Woessmann (2009)); but for the select group of very unhappy people, it may tip the balance towards ending their lives.

The empirical result proves very robust to a large set of robustness tests. We control for local weather conditions and look into religious minority effects and competition effects captured by religious concentration. Cross-tabulated data confirm that the county-level results do not derive from ecological fallacy. To rule out bias from denomination-specific reporting bias (potentially relevant in the 1816-21 data), we analyze whether some suicides might be hidden as fatal accidents. If anything, the correlation between reported suicides and reported fatal accidents is positive, and controlling for the fatal accident rate does not alter our results. To account for the

possibility that not all suicides are rational choices but may rather derive from mental illness,[6] we use information on the share of people classified as having physical or mental disabilities, including being "insane." Mental illness does not vary by denomination in our data, and holding the shares of people with different disabilities constant does not affect our results.

While sociological and theological channels both predict a positive effect of Protestantism on suicide, we devise a number of tests that tentatively allow us to discriminate between the two classes of theoretical models (Section IV). All tests turn out to speak in favor of the empirical importance of sociological rather than theological channels. First, the effect of Protestantism on suicide is significantly lower in counties where church attendance is high. This is in line with the sociological channel where higher church attendance means that Protestants are more closely integrated in their community. But it speaks against the theological channel where higher church attendance would rather indicate a more devout belief in Protestant doctrine, consistent with higher suicide rates. Second, using modern-day individual-level data, we show that in 1992, suicide rates are higher among Protestants than among Catholics, but even higher among those without a religious affiliation. Furthermore, the Protestant-Catholic difference is substantially reduced by 2009, when only the religiously non-affiliated have substantially higher suicide rates. Again, this speaks against the theological channel because those who remain in the church are presumably the most devout believers in Protestant doctrine and because suicide rates are higher for those who left the church than for those who stayed. In addition, differing effects between urban and rural areas and differing suicide rates of Catholics between areas with low and high Protestant shares also speak in favor of sociological rather than theological channels.

II. A Theory of Religion-Specific Suicide

Based on the 5th Commandment ("Thou shalt not kill"), suicide was forbidden and viewed as sin both in Catholicism and in Protestantism. As Durkheim (1897) emphasized, "The Protestant believes in God and the immortality of the soul no less than the Catholic." (p. 170) However, we see two classes of theoretical reasoning – one related to social cohesion ("sociological channel" for short), the other to individual religious beliefs ("theological channel"

[6] See Becker and Posner (2004) for a discussion of the extent to which suicides by depressed and mentally disturbed persons may reflect utility maximizing behavior.

for short) – that have a bearing on the rationality of the act of suicide in the two denominations. We model these denominational differences in the framework of an economic theory of suicide.[7]

A. Model Framework: The Economic Theory of Suicide

To do so, we extend the economic theory of suicide developed by Becker and Posner (2004). In line with the pioneering work by Hamermesh and Soss (1974), suicide is modeled as forward-looking utility-maximizing behavior. In a process of rational decision-making, individuals compare the expected utility from living with that from death. If the latter is greater than the former, committing suicide will maximize utility.

Let $u(t)$ denote the utility of living at age t. Then, the necessary and sufficient condition for suicide to be rational at age t is that the discounted value of present and future utilities is not greater than the cost of committing suicide c, neither at age t nor at any segment starting at t and ending before or at the length of life without suicide T:

$$\sum_{i=t}^{A} \beta^{i-t} u(i) \leq -c_d, \quad for \quad all \quad A = t, t+1, \ldots, T \tag{1}$$

where β is the discount factor. The left-hand side of the condition depicts the utility derived from carrying on living, whereas the right-hand side depicts the utility from dying by suicide. In this case, the latter is comprised only of the disutility stemming from the cost of committing suicide c, which may vary by religious denomination d (Protestant or Catholic in our case). Note that the relation has to hold for all segments of life into the future that start in t, because otherwise it would be worth living a little longer to reap some positive utility before large negative utilities set in. In the Becker and Posner (2004) specification, c is normalized to zero by choice of the utility function, but given our aim to explicitly model inter-group differences in the cost of committing suicide, we add c_d as a variable that may differ across individuals and is expressed in units commensurate with the utility function. This is similar in spirit to the "distaste for suicide" variable in the Hamermesh and Soss (1974) specification, although the latter is only subject to random variation, whereas we model systematic differences by denomination.

[7] When describing Protestant doctrine, we mostly focus on the Lutheran type, which is the first variant of the Protestant Reformation and will also be the subject of our empirical application further below. In Prussia, the two Protestant factions, Lutherans and Reformists, were merged into the single Protestant Church in Prussia (Evangelische Kirche in Preußen) in 1817, and the official statistics dropped the distinction between them. However, statistics from just before the merge show that 94 percent of Protestants in Prussia were Lutherans (Mützell (1825)).

For simplicity, our setup assumes certainty about all future lifetime utilities. Thereby, we abstract from aspects introduced by uncertainty into the suicide decision, such as the option value of waiting (Cutler, Glaeser, and Norberg (2001); Becker and Posner (2004)) and implications for risk-taking behavior (Becker and Posner (2004)), as well as from further possible refinements of the model setup.[8] While these refinements raise important aspects of the suicide decision in general, we do not view them as pivotal for understanding denominational differences in suicide, so that their modeling would distract from the core mechanisms at work.

B. The Sociological Channel: Durkheim's Point of the Cohesion of the Community

To understand how religious differences may affect the propensity to commit suicide, we start by modelling a sociological aspect of denominational differences between Protestantism and Catholicism. Durkheim (1897) emphasized that Protestant doctrine encourages independent thought and religious individualism, which decreases the integration of the community. By contrast, Durkheim argued, Catholicism is generally more oriented towards the group, providing social support, and the specific Catholic credos, norms, and codices unify the Catholic community. As Becker and Posner (2004) point out, if there is mutual interdependence in preferences, the fact that there are others who would suffer from a person's suicide will tend to discourage people from committing suicide. In terms of our simple economic model of suicide, the greater cohesion of the Catholic community has two effects.

First, assuming that individual utility u depends on the extent to which other people care about oneself (with an otherwise uniform utility function u), the fact that Protestants are mostly surrounded by individualists means that, ceteris paribus, their utility derived from living at any point in time is lower than that of Catholics. Greater cohesion and social support in an integrated community mean that Catholics' utility from living is higher, thereby reducing the probability that their discounted stream of utilities falls below the suicide threshold. This aspect models the core of Durkheim (1897)'s argument, who observes an "indivisible unity of the Catholic Church" (p. 158) because its common beliefs and practices create an integrated religious community and are "capable of supporting a sufficiently intense collective life" (p. 170).

[8] In particular, our setup abstracts from differences in the probability of success between different methods of committing suicide (Becker and Posner (2004)), imitative aspects of suicide through contagion (Cutler, Glaeser, and Norberg (2001)), and signaling motives for (intentionally unsuccessful) suicide attempts (Rosenthal (1993); Cutler, Glaeser, and Norberg (2001); Marcotte (2003); Becker and Posner (2004)).

Second, the cost of committing suicide c_d will be higher if the denomination d is Catholic rather than Protestant, both because it entails breaking from a community with stronger common codices and because of the negative effect on other people for whom a person more strongly integrated in the community is concerned about more strongly. Together, these effects make it more unlikely that relation (1) holds. Thus, based on the sociological aspect, suicide rates would be predicted to be higher in Protestant communities than in Catholic communities.

C. The Theological Channel: Differences in Religious Beliefs about Afterlife

Beyond the sociological aspect stressed by Durkheim (1897), we suggest to take into account the theological aspect of the possibility of afterlife. Views about afterlife seem obviously crucial for considerations about ending one's life on earth.

Differences in Beliefs about the Impact of Man on God's Grace

Christians – both Catholics and Protestants – believe in life after death. We assume that from this afterlife a, they derive an expected utility $u(a)$ per unit of time. However, depending on denominational doctrine, the act of committing suicide may affect the probability of accomplishing these benefits of afterlife. We express this by the parameter p ($0 \leq p \leq 1$), which depicts the punishment in terms of expected loss of afterlife utility for the act of committing suicide. Considering the possibility of such punishment, there are two ways in which afterlife enters the optimality condition for committing suicide:

$$\sum_{i=t}^{A} \beta^{i-t} u(i) \leq (1-p_d) \sum_{i=t}^{A} \beta^{i-t} u(a) - \left(c_d + p_d \sum_{i=T+1}^{\infty} \beta^{i-t} u(a) \right), \quad for \ \ all \ \ A = t, t+1, \ldots, T \qquad (2)$$

The first term on the right-hand side depicts the utility of dying before year T. Because death now means that one may enter afterlife, there is a positive utility component to immediate death. For each period, the individual has to weigh the utility $u(t)$ from living on earth against the utility $u(a)$ from afterlife. In principle, the latter should be large, although given uncertainty about whether one actually reaches afterlife, the expected utility may be smaller than full afterlife utility. Still, in itself this aspect raises the suicide inclination of believers relative to non-religious people – "heaven can't wait." However, to the extent that the act of committing suicide lowers the probability of reaching afterlife (p), this effect is reduced. In addition, this punishment will not only affect the possible years in afterlife until T, but afterlife into eternity. As a

consequence, the expected loss of afterlife utility after T will add to the cost of committing suicide, as expressed by the additional term at the end of the right-hand side.

In total, then, the question whether suicide inclination is higher or lower for believers than for atheists depends on the relative size of punishment and expected afterlife utility. In particular, suicide incidence will, ceteris paribus, be smaller among religious than non-religious people if the punishment p is larger than the "short-run" gain of the additional time in afterlife until T (expressed relative to all afterlife utility until eternity).[9] This could explain why there tends to be a negative association between suicide and belief in God (Helliwell (2007); Layard (2005)).

More to the point of our topic of investigation, differences in denominational doctrines mean that punishment p will vary with denomination d. In Catholic doctrine, man can affect his entry into heaven by doing good deeds, while committing a deadly sin leads to a loss of God's grace. By contrast, Protestant doctrine does not provide for an impact of man on God's grace. Given that traditional Catholic doctrine views suicide as a deadly sin which forfeits God's grace and bars man from entering heaven, $p_C > p_P$. Thus, the utility from committing suicide – the right-hand side of inequality (2) – will be larger for Protestants than for Catholics. In the extreme, we can expect that $p_C=1$ – for Catholic believers, paradise is lost due to the act of committing suicide. In fact, if Catholics believe that suicide is a deadly sin which turns a possible afterlife of heaven into hell (or at least prolongs purgatory), the act of committing suicide may turn the very utility of afterlife $u(a)$ from positive to negative (respectively reduce it).

By contrast, following the Protestant "sola gratia" doctrine, suicide (or any other act of man) and the probability of going to heaven are orthogonal, as the latter depends only on God's grace, which is unaffected by any human deed. According to the predestination doctrine, salvation is by God's grace alone, not by any act of man.[10] As a consequence, in the extreme $p_P=0$ for Protestant believers. This reasoning is consistent with the fact that, at least in modern Protestant doctrine, the predestination aspect leads to a more lenient assessment of suicide. For example, the influential Protestant theologian Karl Barth (1951) argued that there may be cases where God commands the suicide, and man can commit suicide in a state of peace with God.

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[9] For $A = T$, the condition is: $p > \sum_{i=t}^{T} \beta^{i-t} u(a) \Big/ \sum_{i=t}^{\infty} \beta^{i-t} u(a)$.

[10] The Lutheran version of the predestination doctrine may not be as strict as the Calvinist version, but the two Protestant factions did accept the joint predestination doctrine of the 1973 Leuenberg Agreement. In Protestantism, success in life was sometimes viewed as a *sign* of God's contentment and election, but not as its *cause*.

As a consequence, the denominational differences in beliefs about the extent to (and manner in) which the deeds of man can impact God's grace will lead to a higher propensity to commit suicide of Protestants relative to Catholics.

Modeling the Impossibility of Confessing the Sin of Suicide

While Catholic doctrine has confession as a holy sacrament, Protestant doctrine (generally) does not. The confession of sins is one of the seven holy sacraments of Catholicism, of which Lutheranism accepts only two (baptism and communion). Due to the irreversibility of the act of successfully committing suicide, by definition it is impossible to confess a successful suicide. As Becker and Posner (2004) put it, "The dominant characteristic of suicide is its finality – there is no second chance." (p. 5) This fact reinforces the mechanism just discussed, because Catholics cannot use confession to evade the loss of afterlife utility due to the act of suicide.

But the finality of suicide gives rise to an additional mechanism by which confession affects the optimality of the suicide decision. When considering the possibility or impossibility of confession, the finality of the specific sin of suicide creates a substitution effect between committing suicide and other possible options considered by very unhappy people: The possibility of confessing sins raises the relative "price" of suicide relative to other sinful options, compared to a situation where confession is not a possibility at all.

When contemplating different possible actions in response to extreme unhappiness, a miserable person may thus view the cost of the specific sinful action of suicide (which cannot be confessed because the person will not be there to do so) as higher relative to the cost of other sinful actions such as heavy drinking, blindfold marriage, or committing crimes. This effect will be lower, the lower a doctrine views the influence of the act of confession; and it does not arise at all in a denomination whose doctrine does not allow for the possibility of confession. In light of the denominational differences discussed above, this creates an additional theological mechanism by which Catholics are predicted to be less prone to suicide than Protestants.

III. Evidence on the Effect of Protestantism on Suicide in 19th-Century Prussia

While both the sociological and the theological parts of our model predict that Protestantism tends to raise suicide proneness, there are also counterarguments against such theoretical

predictions.[11] This section thus provides evidence from 19th-century Prussia to test the hypothesized relationship between religious denomination and suicide as well as its causal underpinning. The next section then turns to tests that aim to discriminate between sociological and theological types of explanation.

A. Data and Descriptive Statistics

Prussia provides uniquely rich census-based data to study the relation between suicide, religion, and covariates at the county level in the 19th century. The focus on the 19th century has the advantage that religiosity was still pervasive at the time, in the sense that almost everybody had a religious affiliation and that religion affected virtually all dimensions of everyday life. The focus on Prussia allows the exploitation of variation between counties with non-minority Protestant and Catholic denominations within the setting of one country. In particular, the Prussian population was about two thirds Protestants and one third Catholics, and a majority of counties were close to having a uniformly Catholic or uniformly Protestant population. The even division and regional concentration means that no denomination was an extreme minority. This may be crucial in the context of suicide to exclude that religious factors are confounded with particular behavior in religious minorities. The religious division of Prussian territory goes back to Reformation times and was solidified by the exceptional individual religious freedom granted in Prussia at least since Frederick the Great in the mid-18th century. Also, in its 19th-century shape, Prussia had Wittenberg, the birthplace of the Reformation, at its center, where Protestantism originated and was conserved in its purest form. At the same time as there was substantial denominational variation, Prussia had uniform laws and institutional frameworks, and official suicide figures were collected as early as 1816. In contrast to cross-national analyses, this makes county-level data within Prussia directly comparable.

[11] Pope and Danigelis (1981) provide a brief summary of criticisms of Durkheim (1897)'s hypotheses. Among others, it has been argued that religious pluralism and free inquiry do not necessarily reduce social cohesion, that Durkheim misrepresents the characteristics of the two denominations or depicts crude stereotypes of them, and that doctrinal differences were not as stark or as relevant for suicidal behavior. The greater social cohesion of Catholicism may also have been oriented more towards the Catholic Church in general, so that the reference group of Catholics as the community of believers at large was rather global and impersonal, whereas the reference group of Protestants may have been more the local community. Stark, Doyle, and Rushing (1983) go as far as finding Durkheim's argument "inconsistent and unconvincing" and "amazingly uninformed and misleading about elementary features of religion in 19th century Europe" (p. 120). Recent research also suggests that Protestants had a well-developed system to ensure relief for the poor (Lorentzen (2008)), raising doubts about an emphasis on Protestantism as an individualistic religion. In addition, Protestantism furthered economic development (Becker and Woessmann (2009)) and the reduced economic hardship may have lowered suicide probability.

We have religion and suicide data for two points in time, one early (1816-21) and one late (1869-71) in the 19th century. Our analyses mainly focus on the latter period, as suicide data are more reliable and background data richer then. But the first time for which suicide statistics were collected for the whole of Prussia is 1816-21 (Mützell (1825)).[12] A favorable feature is that the data average suicides over several years, which reduces noise due to random jumps in suicide incidents. The data cover all 306 Prussian counties at the time. The 1816 Population Census provides data on population shares of religious denominations, as well as data on demographics, education, and development (see Appendix for details on the different data sources).

We also digitized suicide statistics for 1869-71, again averaged over consecutive years. We combine these data with a rich set of variables that the literature considers as determinants of suicide rates. Most prominently, the 1871 Population Census contains shares of Protestants in the county population, demographic characteristics, and literacy rates. The census also provides information on shares of the population with different forms of physical and mental disabilities – blind, deaf-mute, and insane. The 1882 Occupation Census provides data on the occupational structure, used as indicators of the stage of industrial development. We further geocoded the county capitals to obtain geographic data on latitude and longitude. The data cover all 452 Prussian counties (*Kreise*) at the time, divided into 11 provinces (*Provinzen*) and 35 districts (*Regierungsbezirke*).

There is a difference in the way suicide data were collected at the beginning and end of the 19th century (Hilse (1871)). In 1816-21, data on suicides were drawn from the local burial and death registers, which were often run by the church. This changed when, in 1868, dedicated suicide statistics were introduced. Every civilian suicide was now counted by the local state administration (the city council or the local police). For that purpose, each suicide was measured on a separate data sheet. Background information on the person committing suicide and on the suicide circumstances were collected with the explicit aim of understanding the factors explaining suicides. After a test period in the last quarter of 1868, the new data collection method was used as the basis of very detailed suicide statistics from 1869 onwards. The Prussian Statistical Office exerted extensive effort to ensure high data quality and dedicated 80 pages in its quarterly journal to providing background information and first results on the new suicide

[12] Official Prussian statistics published data on suicides as a cause of death from 1777 onwards (Wilke (2004)).

statistics (Hilse (1871)). The care given to data collection and the amount of detail given in the suicide tables is an impressive and reassuring sign of data quality.[13]

Descriptive statistics for the 1869-71 period (Table 1) reveal that the average annual suicide rate across all Prussian counties was 13.0 per 100,000 inhabitants, ranging between 0 in only one county (Adenau) to 37.1 (Schönau). Figure 1 shows that there is substantial geographic variation in suicide rates across Prussia. To account for differences in mortality rates across counties, we also consider the number of suicides divided by the flow of deaths in the same period, which we refer to as suicide proportion. Prussian suicide levels are somewhat higher than in modern-day Germany, where the suicide rate is 10.3 per 100,000 inhabitants in 2004 (OECD (2009)). The comparison of our historic data with modern data provides no indication of a systematic underreporting in the late 19th century, unless one believes that suicide rates had a significant downward trend over the 20th century.[14]

Another check on whether there is systematic underreporting of suicides in some counties is to cross-check the suicide data with other mortality data. Because in particular in Catholic parishes, a religious funeral ceremony was sometimes not granted for proven suicides, there may in principle be an incentive to underreport suicides and classify them as fatal accidents (Kollarits (1919)). If this were the case, the incidence of reported suicides and fatal accidents should be negatively correlated. In our dataset, suicide rates and fatal accident rates are in fact uncorrelated; their raw correlation is -0.004 (*p*-value 0.932). This indicates that systematic underreporting of suicides is unlikely. The pattern is in line with the assessment of Kollarits (1919) that the standard way to ensure a religious funeral ceremony was to invoke aberration as the suicide cause, in which case even the Catholic church approved a religious ceremony, so that suicide rates and their denominational differences are not misreported. Still, in robustness specifications, we use fatal accident rates as a control variable.[15]

[13] For instance, eleven different means of suicide are provided, hanging and drowning being the two most widespread categories (see Table A.1 in the Appendix). Three cases of "otherwise unclassified" means of suicide are described in quite some detail, e.g., the case of a woman who had filled a cooking pot with eight buckets of water which she put on the fireplace and sat down in the boiling water; she died of her wounds five minutes after she was removed from the pot (Hilse (1871)). Unfortunately, the detailed background information on the suicides is available only at the aggregate level, so that we cannot use it in our county-level analyses.

[14] Over the period 1955-1989, La Vecchia, Lucchini, and Levi (1994) do not find substantial trends in suicide rates in developed countries, and Chen et al. (2012) even refer to substantial increases in the last 45 years.

[15] The fact that, in contrast to 1869-71, in 1816-21 the church was partly responsible for the suicide statistics may mean that the 1816-21 suicide data might suffer from some overall degree of underreporting. However, in the 1816-21 data, suicide rates and fatal accident rates are actually slightly *positively* correlated (raw correlation of

The average share of Protestants in a county was 64.2 percent in 1871, against 34.5 percent Catholics (the remainder being 1.1 percent Jews and 0.2 percent other Christian denominations). Thus, both Protestants and Catholics are not just a small minority but constitute a sizeable fraction of the Prussian population. Furthermore, there is substantial variation across counties, ranging essentially from zero to 100 percent Protestants or Catholics. More than 75 percent of the counties have a share of at least 80 percent of either Protestants or Catholics, and more than 60 percent have a share of at least 90 percent of one denominational group. In restricted analyses below, we even focus on samples of countries where the share of Protestants is smaller than 2 percent or larger than 98 percent, or even 0.1 percent and 99.9 percent.

Figure 2 depicts the geographic variation of Protestant shares across Prussia. The close mapping between the geographic distribution of Protestant shares and suicide rates (Figure 1) is directly evident. In fact, the raw correlation between the two across the 452 counties is as high as 0.66 (statistically significant at the 1 percent level). Figure 3 plots the two against each other. There is a clear positive association between the share of Protestants in a county and the suicide rate, and the average suicide rate is notably higher in all-Protestant than in all-Catholic counties.

B. Basic Evidence from 1869-71

To probe the association between Protestantism and suicide in a multivariate setting, we estimate a simple least-squares model:

$$SUIC_i = \alpha + \beta\, PROT_i + X_i\, \gamma' + \varepsilon_i \qquad (3)$$

where $SUIC_i$ is the suicide rate (or the suicide proportion) in county i, $PROT$ is the share of Protestants in the county, and X is a set of control variables. Our most basic control model includes the shares of the county population below 15 years of age and above 60 years of age, respectively, and average household size. Such measures of age and family patterns are standard determinants considered in suicide equations. In richer models, we will also consider a host of additional possible correlates of suicide as control variables (see Helliwell (2007) and Chen et al. (2012) for extensive overviews of factors considered in empirical suicide research).

0.223, statistically significant at the 1 percent level), suggesting that there was no systematic hiding of suicides as fatal accidents even in these earlier and less reliable suicide data. For 1869, Hilse (1871) reports suicide numbers from the church registers alongside data from the police registers; in most districts, the count on the church register is actually higher than the one on the police register. We will return to this issue below.

The first column of Table 2 replicates the strong positive bivariate association between the share of Protestants and the suicide rate depicted in Figure 3 above. On average, all-Protestant counties have a suicide rate that is 14.5 suicides per 100,000 inhabitants higher than all-Catholic counties. Viewed against an average suicide rate of 13.0, this is a substantial difference across religious denominations. Column (2) adds the list of basic demographic control variables. The significant positive association between Protestantism and suicide remains largely unchanged in the multivariate specification. Suicide rates are significantly negatively related to larger shares of young (below 15 years) and old (over 60 years) population. The fact that suicide initially increases with age is a standard result in suicide research. The fact that, in an inversely U-shaped pattern, suicide rates decline again with larger shares of old people may indicate a declining suicide inclination after reaching a certain age. As an indicator of longevity, it may also capture an effect of the level of economic development which may protect from suicide disposition. The result that suicide rates are negatively related to average household size mirrors the importance of the family generally found in the suicide literature.

Columns (3) to (5) add further control variables. Previous work has found urbanization, economic conditions, and education to be factors related to suicide (Helliwell (2007); Chen et al. (2012)). We add the share of population living in towns, the share of the labor force working in manufacturing and services (as a measure of economic development), and the share of literates to the basic model. None of these measures enters the model significantly, and the point estimate on the share of Protestants is hardly affected.[16] Column (6) adds a whole set of dummies for the 35 Prussian districts (*Regierungsbezirke*), the administrative layer between counties and provinces, to the model. This specification excludes all the variation that exists across districts and exploits only the within-district variation. To the extent that there is unobserved regional heterogeneity, district dummies should capture most of its substance. While the estimated association between Protestantism and suicide is somewhat reduced in magnitude, it remains highly robust.

Column (7) uses the suicide proportion – suicides relative to total deaths – as an alternative dependent variable. This measure takes into account that average mortality rates differ across counties. Again, there is a significant association of Protestantism with suicides. The lower point estimate is in line with the smaller value range of this variable (see Table 1).

[16] Adding a squared term for urbanization provides some indication of an inverted-U shaped relationship but does not affect the estimate on Protestantism (not shown). We further probe the urbanization effect for non-linearities in section IV.B below.

C. Identifying Exogenous Variation in Protestantism

A remaining concern with the evidence so far is that religious affiliation may not be exogenous to the suicide model. Specifically, whether a person adheres to the Catholic or Protestant faith may to some extent be a choice variable that is correlated with the error term of equation (3). For example, already in the early 20th century, Kollarits (1919) – a Hungarian publishing in a German journal of neurology and psychiatry – hypothesized that the higher incidence of suicide among Protestants may simply result from selection of suicide-prone people into the Protestant denomination. However, direct conversion was in fact minimal in the 19th century: Only 0.01 percent of Catholics – or 766 out of more than 7 million Catholics – converted to Protestantism per year over the period 1859-67, mostly in the course of marriage to a Protestant partner (Hilse (1869)).

But endogeneity may rather take another form of unobserved heterogeneity, in that three centuries earlier during the Reformation, regional conversion to the new Protestant faith may not have been orthogonal to suicide proneness, which may exhibit strong intertemporal persistence. Most of the denominational variation across Prussia in the 19th century can be traced back to denominational choices of local rulers in the roughly 300 political entities that made up Germany during the Reformation in the 16th and early 17th centuries, mostly motivated by religious conviction and power politics vis-à-vis the Pope and the German Emperor. While it seems unlikely that the adoption of Protestantism was directly related to pre-Reformation patterns in suicide, it might have been indirectly related to correlates of suicide such as economic situation, urbanity, education, and mental disposition. For example, regions with people who are inclined to try to change a bad situation rather than turning away from it may have been more willing to adopt the new denomination that emerged from a protest movement ("Protestantism"), and such people may also be less prone to commit suicide when matters turn bad. Such issues of causality pose a fundamental challenge for empirical identification that has not been directly addressed in the (mostly sociological) literature so far.

To identify exogenous variation in Protestantism, we exploit the specific aspect that there was an initial tendency of the Reformation in the German Empire to spread out in a concentric fashion from Wittenberg, where Luther initiated the new denomination. As is visible in Figure 2, the Reformation spread in the areas around Wittenberg but had a diminishing impact, the further away from Wittenberg one gets. Reasons for the roughly circular dispersion include costs of

traveling and of information diffusion through space, increasing dissimilarity of German dialects, and the role of Electoral Saxony as an early leader and role model for the implementation of the new denomination that allowed observing Reformation ideals put in practice and forming regional Protestant alliances (see Becker and Woessmann (2009) for details).

The geographically concentric dispersion of the Reformation allows us to employ an instrumental-variable (IV) strategy that uses a county's distance to Wittenberg as an instrument for the share of Protestants in the county. Thereby, we restrict the analysis to a specific part of the denominational variation in Prussia that is arguably exogenous to variation in important drivers of suicide rates. Our identifying assumption is that the concentric pattern is unrelated to suicide apart from its possible indirect effect through Protestantism. The validity of the instrument is corroborated by evidence that the spread of the Reformation from Wittenberg did not just follow pre-existing differences in economic situations, urbanity, education, and cultural disposition – factors that the suicide literature has shown to be correlates of suicide (Helliwell (2007); Chen et al. (2012)). Thus, Becker and Woessmann (2009) provide detailed evidence that distance to Wittenberg is orthogonal to the following set of factors observed before the Reformation set on in 1517: the probability of being a free imperial city (measured in pre-Reformation status), considered to be centers of economic activity before the Reformation; the probability of being a Hanseatic city, which constituted major trading hubs in pre-Lutheran times; urban population density and city sizes in 1500, proxies often used for economic progressiveness before industrialization; the existence and year of foundation of schools and of universities before 1517; and the density of monasteries in 1517 as a proxy for religiosity.

Table 3 reports results of the IV estimation of the effect of Protestantism on suicide rates. Distance to Wittenberg is a strong instrument for the share of Protestants in a county, as is evident from an *F*-statistic of the instrument in the first stage of 30-70 (depending on the included controls). Each 100 km distance to Wittenberg is associated with a Protestant share that is 7-9 percentage points lower (columns (1)-(4)). The second stage uses only that part of the Protestant share that is due to distance to Wittenberg to predict suicide rates.

The positive effect of Protestantism on suicide rates is highly robust in the IV specifications (columns (5)-(8)). In fact, the IV point estimates are significantly higher than the OLS estimates. Depending on the variables included in the control model, a 10 percentage-point increase in the share of Protestants in a county increases the suicide rate by 2.0 to 2.4 suicides per 100,000

inhabitants. The pattern of IV and OLS results suggests that, without the Reformation, suicide rates would have been lower in regions that turned Protestant due to their proximity to Wittenberg than in regions that remained Catholic. This negative bias in the OLS estimates is consistent with a Reformation pattern where regions with less suicide-prone population tended to select into Protestantism. In the IV model, the estimates on the economic and educational controls get statistically significant: Suicide rates increase with the level of industrialization and decrease with the level of literacy.[17]

D. Robustness to Mental Disabilities, Misreporting, Bad Weather, and Other Factors

We proceed with a number of tests for robustness of the IV specification. Table 4 adds several further control variables. In the first column, we start with a set of additional demographic controls. As suicide rates are generally found to differ substantially by gender, we add the share of females (see below for more extensive analyses of gender patterns). The share of Jews accounts for the only other sizable religious group in Prussia (at 1.1 percent of the population on average) apart from Protestants and Catholics. Furthermore, we add the share of the population born in the municipality and the share of the population of Prussian origin to the model, since suicide research has shown that migrants tend to take suicide propensities with them. Of the three additional control variables, only the share of the population of Prussian origin enters statistically significantly, indicating higher suicide rates in counties with a stronger presence of foreigners. The estimated effect of Protestantism, however, is hardly affected.

Psychiatric research tends to link suicide to mental and depressive disorders (Mann et al. (2005); Ferrari et al. (2014)). To account for variation in mental and physical disabilities across counties, we use information on the share of the population classified as blind, deaf-mute, and insane, respectively. Controlling for these shares does not change the results (column (2)). In fact, in the data the incidence of mental illness is not significantly related to religious denomination (see also Guttstadt (1874)).

Suicide incidence has also been linked to military experience. In the 1882 occupational data, we can observe the share of the county population working in military and related services. This variable is not significantly related to the share of Protestants in the county (not shown),

[17] Similar to the share of population living in towns, population density measured as inhabitants per square kilometer does not enter the model significantly.

indicating that military suicides are unlikely to underlie the denominational pattern. Furthermore, special tables provided in Hilse (1871) indicate that only 4.1 percent of the suicides in 1869 were committed by persons whose residence was in military facilities, and 5.7 percent by persons working in the military or navy.[18] Given that suicide rates among Protestants are more than twice as large as among Catholics, suicides by soldiers thus cannot account for the main effect.

Suicides have also been related to absolute and relative economic conditions (Daly, Wilson, and Johnson (2013)), which may not be fully captured by the sectoral structure above. In column (3), we add controls for income levels (proxied by the average annual income of male elementary school teachers) and for income inequality (proxied by the relative income of teachers versus day laborer wages). Neither measure enters significantly or affects the estimate on Protestantism. The same holds for other measures of economic conditions such as the share of poor people (proxied by the share of day laborers in the total population) and income tax per capita (not shown).[19]

As discussed above, some observers have worried that there might have been attempts to hide suicides and classify them under different death causes in order to ensure a religious funeral ceremony. If such misreporting varied by denomination, this would bias our estimate on the effect of Protestantism. The most obvious other category of death causes where suicides might be hidden is the category of "fatal accidents." The specification in column (4) therefore adds the fatal accident rate in the county to account for potential underreporting of suicide rates. However, there is no statistically significant conditional association between reported suicide rates and reported fatal accident rates, and controlling for the latter leaves the effect of Protestantism on suicides unaffected. Further categories of death causes that might be possible places to hide suicides are "sudden incidents of illness" and "undetermined illnesses" (van Poppel and Day (1996)). Again, both death categories do not enter our suicide model significantly and do not affect the estimated Protestantism effect (not shown).[20]

As our IV identification builds on geographic variation, we next add geographic controls. Using latitude, longitude, and their interaction, the specification in column (5) controls for potentially systematic variation in suicide rates across geographical space, for instance due to

[18] Unfortunately, this information is not available by county or by religious denomination.

[19] Results are also robust to controlling for the existence and membership of sports clubs as proxies for non-religious sources of social cohesion in a county, available for 1864 from the *Zweites Statistisches Jahrbuch der Turnvereine Deutschlands* (not shown).

[20] Another possibility might be that Catholics tried to hide suicides by not reporting these deaths at all. However, when using total death rates as the dependent variable, they are in fact negatively related to Protestantism.

different climatic conditions. Column (6) adds a set of dummies indicating the year in which the county became part of Prussia. Depending on the duration of affiliation with Prussia, common norms may have settled in to a different degree. Our results indicate, however, that neither set of geographic controls affects the qualitative result on the effect of Protestantism on suicide.

Apart from general geographic patterns, suicide propensity may be affected by gloomy weather. If distance to Wittenberg were correlated with better weather conditions, this could introduce bias in the IV model so that the Protestantism effect is overestimated. To account for possible effects of unpleasant weather conditions on suicide, we make use of the high-resolution interpolated climate surfaces by Hijmans et al. (2005), whose climate model provides data on monthly precipitation and mean temperature based on rich input data from weather station records from a variety of sources for the 1950-2000 period (interpolated geographically using data on latitude, longitude, and elevation).[21] Assuming that the general pattern of climatic variation across the Prussian counties did not change substantially since the late 19th century, we can control for the weather situation in our suicide analysis using geo-coordinates of a county's main town to map the climate data into our dataset of Prussian counties.[22]

As the first part of Table 5 show, distance to Wittenberg is in fact *negatively* correlated with rainfall und *positively* with temperature: The further away from Wittenberg, the more pleasant is the weather. Thus, if unpleasant weather were predictive of higher suicide, our IV model would tend to underestimate the effect of Protestantism. However, when entering rainfall and temperature as control variables in our IV specification, neither of the two enters significantly to predict suicide rates. The strong effect of Protestantism on suicide is robust in this specification, although with a somewhat (though not statistically significantly) smaller point estimate.

E. Effects of Religious Concentration and Ecological Composition

As our analyses are performed at the county level, we further probe robustness of our results to issues of religious concentration and minority behavior. Counties that have a larger degree of heterogeneity in religious denominations may differ in their suicide rates from counties that do not. Also, people of the same denomination might behave differently when constituting a small

[21] Worldwide, the climate model draws on data from 47,554 weather stations for precipitation and 24,542 weather stations for temperature.

[22] Using instead the centroid of the county or the mean of all climate data points (on a 1 km grid) in the county to map the climate data into our Prussian county data leads to virtually identical results.

minority in the region than when their denomination is in the majority. As a first test of concentration effects, we compute the Herfindahl index of religious concentration in a county (computed over the shares of Protestants, Catholics, and Jews). Adding the Herfindahl index to our suicide model in the first column of Table 6 leaves the estimate of the Protestantism effect virtually unaffected. The Herfindahl index enters the IV model significantly negative, indicating a tendency of lower suicide rates in areas with higher religious concentration.

We can provide additional evidence on the relevance of religious heterogeneity in a county for our results by restricting our sample to counties with very high concentrations of one denomination. Thus, column (2) restricts the estimation sample to those 142 counties that have either more than 98 percent Protestants or less than 2 percent Protestants. In this smaller sample, the IV estimates get somewhat smaller, closer to the original OLS estimates. We can even restrict the sample to those 33 counties where Protestants make up more than 99.9 percent or less than 0.1 percent of the population. The effect of Protestantism on suicide rates is robust.

This subsample evidence also addresses the potential concern of ecological inferences of individual associations from aggregate data (Robinson (1950); Morgenstern (1995)).[23] Given the near universal denominational affiliation in these counties, the higher suicide rates in Protestant counties are unlikely to be driven by the Catholic minority living in those counties.

We can probe the issue of ecological composition in further detail by making use of special tables reported in Hilse (1871) that show simple cross-tabulations of suicide numbers by religious denomination within districts. These data refer to suicides in the year 1869 only (rather than averaging over three years, as in our county-level analyses).[24] While the available county-level data do not allow us to distinguish between suicides by Protestants and by Catholics within a county, for 25 districts the cross-tabulated data present information on suicides by the denomination of the individual person committing suicide.[25] The suicide rate in the Protestant population is indeed much higher than the suicide rate in the Catholic population (Table 7). Protestants have a suicide rate of 18.4, compared to the Catholic suicide rate of 6.5. The difference of 11.9 between the two denominations closely resembles our OLS estimates reported

[23] Note that Robinson (1950) showed that the difference between ecological and individual inference will usually be lower the more the variables are clustered within regions, and religious affiliation is very highly clustered in Prussian counties (see Figure 2).

[24] The data on districts' population by denomination that allow us to compute the suicide rates are available in the population census for the year 1871.

[25] For the other 10 Prussian districts, cross-tabulations of suicides by denomination are not available.

in Table 2 above, indicating that the latter are not driven by ecological fallacy. (Further analysis of ecological fallacy based on modern micro data is presented in Section IV.C below.)

The cross-tabulated data also allow us to distinguish the denomination-specific suicides by gender. Again, while the data are based on information for the individuals committing suicide, they are available only at the aggregate level.[26] The descriptive pattern clearly shows that suicides are substantially higher among males than among females, a pattern consistently found also in modern suicide research (Helliwell (2007)). Still, within both gender groups, suicide rates are substantially higher among Protestants than among Catholics. Specifically, average suicide rates of Protestant males are as high as 30.3 suicides per 100,000 inhabitants, compared to 11.3 for Catholic males. In the female population, suicide rates of Protestant females are at 6.9 suicides per 100,000 inhabitants, compared to only 2.0 for Catholic females.

The cross-tabulated district data also allow us to probe the issue of effects of being a religious minority on suicide rates in greater detail. For this, we subdivide the districts by increasing shares of Protestants and analyze denomination-specific suicide rates in the different groups of districts (see Table 7, bottom panel). Within each group of districts defined by brackets of the share of Protestants, the suicide rate of Protestants is higher than the suicide rate of Catholics. The suicide rate of Protestants does not vary systematically with the size of the Protestant population in the district, indicating that there is neither a substantial effect of being a religious minority nor of an increasing share of the Protestant community in the district. Also for Catholics, there is no monotonic relationship that would indicate a systematic minority effect.

This result is also confirmed in regression analyses estimated for the 50 district-by-denomination observations (25 districts with one observation each for the Protestant and the Catholic population): When regressing the suicide rate on a denomination dummy, the share of the own denomination in the district population, and the share of Protestants in the district population, only the own denomination enters strongly and significantly as a predictor of the denomination-specific suicide rate, whereas neither the size of the own denomination in the district nor the size of the Protestant community in the district enter significantly (not shown).

The presented evidence rejects the existence of important non-linearities in the effect of Protestantism on suicide. We have also probed this in further detail in our county-level regression analyses. While non-linear specifications become imprecise in IV models, OLS

[26] For county-level analysis of gender-specific suicide rates see our analysis of the 1816-21 data below.

models are quite precise and reject the existence of noteworthy non-linearities: A quadratic term in the share of Protestants is statistically insignificant, and a specification with a set of indicators for the Protestant share being larger than a quarter, half, and three quarters indicates that the Protestantism effect is linear along the value range of the share of Protestants (not shown).

As a final robustness test, we again find a sizeable and statistically significant effect of Protestantism on suicide also when using the suicide proportion (suicides per 1,000 death incidents) rather than the suicide rate (suicides per 100,000 inhabitants) as an alternative outcome measure (Table 6, column (4)).

F. Evidence from 1816-21

While the 1869-71 data are the first statistical investigation specifically devised to analyze suicides, official burial and death registers provide us with data on suicides as early as 1816-21. These are the earliest data covering all of Prussia, and they are again available at the county level. A particular feature of the 1816-21 data is that suicide rates are reported separately by gender for each county. As is evident from the descriptive statistics reported in Table A.2 in the Appendix, on average male suicide rates are about four times higher than female suicide rates. The set of control variables available in the 1816 Population Census is not as rich as in the later data. However, the same type of basic demographic control variables are available: the share of the population younger than 15 years and the share older than 60 years, as well as the share of the population living in towns. Furthermore, the number of public buildings per capita can serve as an indicator of economic development and the enrolment rate in primary schools as a measure of education. Furthermore, we again have information on fatal accident rates.

At 6.5 suicides per 100,000 inhabitants, the average suicide rate in the 1816-21 data is only half the average suicide rate reported in the 1869-71 data. This raises the concern of possible underreporting of suicides in the official burial and death registers, where part of the suicides may be classified as fatal accidents. This may be particularly the case where priests denied a church burial ceremony for those who committed suicide (a practice prohibited by Prussian law only in 1845, see Hilse (1871)). However, while underreporting of suicides might affect the *size* of the estimated effects, it would affect the qualitative results only to the extent that the degree of underreporting varies by denomination. If we take the 1869-71 data as a benchmark, we can assess the relative difference in reported suicides over time for Protestant and Catholic counties.

Counties with a share of Protestants higher than 90 percent have an average suicide rate of 9.3 suicides per 100,000 inhabitants in 1816-21, compared to 17.4 in 1869-21. In Protestant counties, reported suicides in 1816-21 are thus lower by a factor of 1.9. Counties with a share of Catholics higher than 90 percent have an average suicide rate of 2.8 in 1816-21, compared to 4.7 in 1869-21. In Catholic counties, reported suicides in 1816-21 are thus lower by a factor of 1.7. This is an indication that, if anything, Protestants underreport slightly more in 1816-21 compared to Catholics not only in absolute terms, but even in relative terms, putting the stakes against finding an effect of Protestantism in 1816-21. In addition, we can again control for fatal accident rates in our regressions to guard against bias from misclassification of suicides as fatal accidents.

Suicide rates in all-Protestant counties are 7.2 larger than in all-Catholic counties on average (Table 8). This difference is reduced to 4.7 but remains highly significant when we control for the age structure of the population, urbanization, public buildings, and school enrollment. As the remaining columns reveal, both male and female suicide rates are significantly higher in Protestant areas. However, as a direct corollary of the substantially higher male suicide rates, the point estimate on Protestantism is substantially higher for males than for females. In fact, the male effect in 1816-21 is quantitatively in the same range as the average effect in 1869-71.

Table 9 reports the respective IV results where, as before, we use distance to Wittenberg as an instrument for the share of Protestants in a county. The IV estimates suggest that Protestantism raises male suicide rates by 23.4 suicides per 100,000 inhabitants, female suicide rates by 7.1, and average suicide rates by 15.0. To exclude possible bias from underreporting of suicides as accidents, columns (3) to (5) control for fatal accident rates. Fatal accident rates are not significantly related to suicide rates in the multivariate regressions, and the estimated effect of Protestantism on suicide is hardly affected. Again, the positive effect of Protestantism is also evident when measuring suicides per deaths rather than per inhabitants (column (6)). The 1816-21 analyses thus confirm a strong positive effect of Protestantism on suicide also for the early 19th century and show it for both genders.

IV. Discriminating between Sociological and Theological Explanations

The evidence so far confirms a causal effect of Protestantism on suicide. But it does not discriminate between the sociological and the theological explanations for this effect. In this section, we devise a series of empirical tests that try to provide such discrimination.

A. Church Attendance and the Relevance of Social Cohesion and Religious Beliefs

A first test to discriminate between the two types of explanation builds on their differing predictions with respect to how the extent of church attendance in a community affects suicide rates and their dependence on Protestantism. From the sociological perspective, higher church attendance can be viewed as a sign of greater social cohesion. Thus, even if the integration into the Protestant community might be lower than in the Catholic community on average, in Protestant areas Protestants should be relatively more closely embedded in their community when more people attend church. The sociological explanation would thus predict that higher church attendance should dampen the effect of Protestantism on suicide. By contrast, from the theological perspective, higher church attendance can be viewed as a sign of greater devoutness of church members. Higher church attendance would thus signal stronger believe in Protestant doctrine, which should go along with an even stronger effect of Protestantism on suicide.

These opposite predictions of the two explanations on how suicide rates change with church attendance rates provide us with a way to test the two channels against each other. To do so, we make use of the unique database of church attendance provided by the statistical surveys of the Protestant Regional Churches of Germany on the expressions of churchly life (see Hölscher (2001) and Becker and Woessmann (2013) for additional detail). First in 1862 and then more regularly on an annual basis starting in 1881, parish priests were to count the number of participations in Holy Communion on a preprinted form following uniform surveying directives. The data are available from regional archives at the level of church districts (*Kirchenkreise*), which usually comprised 10-20 adjacent parishes. Our measure of church attendance is the number of participations in Holy Communion divided by the number of Protestants in a church district. To match our 1869-71 suicide statistics, we take a simple average of church attendance in 1862 and 1881, the closest years with available data for most church districts.[27] We map the church-district data into our administrative-county data by using GIS technology to compute the surface-weighted average of the available church district data for each county.[28] In cases where

[27] Results based on just the 1862 data are very similar, albeit in a slightly smaller sample of counties with available data. To ensure that the averaging is not affected by overall trends in church attendance, before taking the average of the two years we first regress the 1862 and 1881 data on each other and predict any missing value for a county in one year by the predicted value from these regressions.

[28] We treat a county as missing data if church attendance information is missing for more than half of its surface, but results are robust in larger samples that include all counties with any church attendance information.

more than one county falls within the same church district, we cluster our regression analyses at the church district level.[29]

We perform two types of analyses. First, we restrict the analyses to those 107 counties (with available church attendance data) that are virtually all Protestant (Protestant share larger than 97.5 percent)[30] to test whether Protestant church attendance is significantly related to suicide rates. As is evident from the first column of Table 10, suicide rates decline significantly with higher church attendance. If church attendance increases from the 10^{th} to the 90^{th} percentile in this sample (0.402 to 0.706), suicide rates are 3.5 suicides per 100,000 inhabitants lower, equivalent to a fifth of the sample mean. Declining suicides with increasing church attendance would be in line with the sociological channel, but not the theological channel.

Second, in the full sample we test whether the effect of Protestantism on suicide differs with church attendance rates. To allow for functional flexibility, we interacted the Protestantism effect with indicator variables for four quarters of church attendance. Given that effects for the upper three quarters do not significantly differ from one another, the specification in column (2) only includes an interaction with the bottom quarter of church attendance. As is evident, the effect of Protestantism on suicide is significantly larger in counties where Protestant church attendance is low. At 15.3 compared to 10.9 suicides per 100,000 inhabitants, the difference is again substantial. With higher church attendance dampening rather than heightening the effect of Protestantism on suicide, this finding again speaks in favor of the sociological channel and against the theological channel.

B. Further Evidence on Channels from Historical Patterns

In a similar spirit, it can be argued that the sociological aspect of a less tightly integrated Protestant community is particularly relevant in the anonymous environment of urban areas. By contrast, rural communities may exhibit more social cohesion irrespective of denomination, thereby dampening the effect of Protestantism on suicide if the sociological channel is indeed at work. The theological channel does not predict the Protestantism effect to differ with urbanization.

[29] This is particularly relevant for counties in the Regional Churches in the East (Anhalt, Brandenburg, Pommern, Posen, Westpreußen, Ostpreußen, and Schlesien), where church attendance data are available only at the regional church level.

[30] Results are robust in smaller samples that restrict the Protestant share to at least 98 percent (90 counties) or even 98.5 percent (65 counties).

Allowing for a flexible functional form, we interacted the Protestantism effect with indicator variables for four quarters of the share of the county population living in towns. With the lower three quartiles not significantly differing from one another, column (3) of Table 10 includes only the interaction with the top quarter of urbanization. The effect of Protestantism on suicide is indeed significantly larger in urban areas, supporting the relevance of the sociological channel.

Another way to gauge the relevance of the sociological community channel is to look at the suicide rates of Catholics depending on whether they live in a predominantly Catholic or Protestant area. While the results reported in the bottom panel of Table 7 above do not provide evidence for systematic minority effects, suicide rates of Catholics are in fact substantially larger in areas where Protestants have a majority. They are below 5 percent in districts with less than 40 percent Protestants but above 14 percent in districts with more than 60 percent Protestants (with the exception of districts with more than 98 percent Protestants, where it is 10.8 percent). This pattern may again cast doubt on the importance of religious beliefs in generating the observed results and rather indicate the relevance of social structure.

C. Evidence from Modern Data

A final piece of evidence to differentiate between relevant channels builds on modern data. In modern times, even more than before, the Protestant doctrine is more accommodating with suicides. As noted earlier, leading Protestant theologians have turned against condemning suicides, arguing that man can commit suicide in a state of peace with God. At the same time, the Catechism of the Catholic Church continues to be very explicit against suicide, noting in point 2325: “Suicide is seriously contrary to justice, hope, and charity. It is forbidden by the fifth commandment.” Based on the theological channel, one might thus expect the difference in suicide rates between true believers in Protestant and Catholic doctrine to sharpen in modern times, especially when large numbers of members have left both churches, presumably leaving behind members more committed to the doctrine of their church. In contrast, if the sociological channel dominates, a smaller flock of (firm) Protestant and Catholic believers should both find consolation in their congregations.

Data on suicides in modern-day Germany come from the Mortality Statistics accessible via controlled remote access (*Todesursachenstatistik*, EVAS 23211), covering all deaths at an individual level from 1992 to 2009. The Mortality Statistics are based on the death certificate

issued by the doctor declaring the death, in combination with the death registry certificate issued by the registrar of the municipality of residence. The death certificate contains information about diseases and significant other health issues that have contributed to death. The classification of causes of death follows the World Health Organization's International Classification of Diseases (ICD-9 until 1997 and ICD-10 since). In addition to the primary cause of death, the Mortality Statistics include demographic features such as gender, age, German citizenship, marital status, place of residence, date of death, and – importantly – religion.

We use the years 1992 and 2009, the earliest and latest year available. In 1992, the Mortality Statistics report 885,374 deaths, out of which 13,459 or 1.5 percent are suicides. In 2009, the number of deaths is 854,544, out of which 9,622 or 1.1 percent are suicides, indicating a considerable decline in the suicide rate over the 17 years.

Between 1992 and 2009, both the Catholic and Protestant churches lost many members due to secessions. But the share of Protestants leaving the church is nearly 50 percent higher. In 1991, the Protestant Church had 29.2 million members and the Catholic Church 27.7 million (Eicken and Schmitz-Veltin (2010)). The number of members actively seceding from the Protestant Church from 1992 to 2009 (not counting deaths or other movements) was 3.6 million: 12.2 percent of the initial stock left over the course of less than two decades. In the Catholic Church, the number of members seceding over the same period was 2.3 million or 8.2 percent of the initial stock.[31] Consequently, former Protestants make up a larger share of the non-affiliated, an important factor when assessing suicide rates by denomination and non-affiliation.[32]

Table 11 reports OLS regressions of a suicide indicator on religious affiliation, controlling for basic demographic characteristics – a quadratic in age, gender, German citizenship, and marital status.[33] In 1992, the regression reveals that suicide rates are 0.18 percentage points higher for Protestants than for Catholics. This estimate is equivalent to 13.7 percent of the raw Catholic suicide rate. The suicide rate of citizens without religious affiliation is 0.44 percentage

[31] Data source: http://www.kirchenaustritt.de/statistik (accessed 7/25/2014).

[32] The pattern of Protestant seceding from their church in higher numbers is consistent with the religious affiliation data in the Mortality Statistics. Among the people who died in 1992, 46.1 percent were Protestants, 33.9 percent were Catholics, and 16.0 percent were not religiously affiliated. By 2009, the share of Protestants had decreased to 39.9 percent, the share of Catholics had hardly changed at 33.2 percent, and the share of non-religiously affiliated had increased to 21.4 percent.

[33] As not only the choice to secede from the Church, but also strong post-war migration waves and increased regional mobility probably undermine the instrument characteristics of the historical spread of the Reformation for Protestantism in our modern data, the contemporary analysis stays purely descriptive.

points higher than that of Catholics. It thus far exceeds that of any affiliated deceased, including Protestants. When county fixed effects are included in the analysis, the estimates increase to 0.252 percentage points for Protestants and to 0.597 percentage points for the non-religiously affiliated. While the higher suicide proneness of Protestants compared to Catholics is still visible in 1992, the fact that suicide proneness of those not affiliated with a religion – which are disproportionately formerly Protestant – is even higher raises doubts that Protestant religious beliefs are the predominant factor in the denominational pattern of suicides.

Performing the same analysis in 2009, the estimate on Protestantism is reduced to an insignificant 0.03 percentage points, or just 2.8 percent of the raw Catholic suicide rate. With county fixed effects, the estimate regains statistical significance, but at 0.14 percentage points it is 43 percent lower than the respective estimate in 1992. At the same time, the suicide rate of those without religious affiliation remains 0.38 percentage points higher than that of Catholics. Under the assumption that the most devout believers in the respective religious doctrines are more likely to stay in their church, the declining difference in suicides between Protestants and Catholics again speaks against a paramount role for the theological explanation. The continuing fact that religiously non-affiliated people, which disproportionately draw on people leaving the Protestant church, have the highest suicides rate also speaks for a dominant role of socialization rather than religious beliefs.

Finally, the individual-level modern data allow us to probe some more into the issue of ecological fallacy. Religious affiliation at a regional level is only available in the last Population Census (*Volkszählung*) of 1987, available for West Germany only. As column (5) indicates, at 0.215 the point estimate on Protestantism in the 1992 specification with county fixed effects is slightly (although not statistically significantly) smaller in West Germany than the equivalent estimate of 0.252 for the whole of Germany. The estimate hardly changes when we replace the county fixed effects by county-level controls from the 1987 Population Census (the shares of the county population in 20 separate age groups, in four family-status groups, in five education groups, receiving social benefits, receiving financial support from relatives, the share of foreigners, the share of the work force in four sectors, and log county population). When we replace the indicator of individual Protestant affiliation with the share of Protestants among Protestants and Catholics in the county, the estimate is very similar at 0.244. But when we include individual and county-level Protestant affiliation together, only the individual Protestant

affiliation remains significant, with a point estimate that is hardly affected, while the point estimate on the Protestant share in the county is reduced to close to zero. This pattern suggests that the actual effect stems from the individual affiliation, but that estimates based on the county share provide unbiased estimates of the individual effect. That is, county-level estimates do not seem to suffer from ecological fallacy, which is reassuring for our historical analyses.

V. Conclusion

This paper has studied the effect of Protestantism on suicide both theoretically and empirically. Theoretically, we model both sociological and theological mechanisms through which Protestants are predicted to have higher suicide rates than Catholics. In the framework of an economic model of suicide, individuals compare the expected utility from living with that from death. First, there is a sociological aspect of religion based on denominational differences in group structure: If Protestant doctrine emphasizes religious individualism whereas Catholics have a more integrated religious community, as argued by Durkheim (1897), Protestants will have a lower utility from keeping on living and a lower cost of committing suicide relative to Catholics. To this sociological channel, we add two mechanisms based on denominational differences in theological doctrine that derive from a consideration of afterlife in individuals' utility maximization. In particular, Protestant doctrine tends to stress that man cannot affect God's decisions by his deeds but fully depends on God's grace ("sola gratia"), whereas Catholic doctrine grants that man's access to heaven is affected by his deeds. For Catholics, committing the deadly sin of suicide reduces the probability of reaching heaven, thereby lowering the optimality of the suicide threshold relative to Protestants. Furthermore, since Catholic doctrine views confession as a holy sacrament but Protestant doctrine does not, the impossibility of confessing the sin of suicide creates a substitution effect away from suicide to other possible actions considered by very unhappy Catholics, again reducing the optimality of suicide relative to Protestants. Thus, both sociological and theological differences between Protestants and Catholics make suicide more likely among Protestants.

When testing the model prediction that Protestantism increases suicides, our empirical model places particular emphasis on excluding biases from self-selection of suicide-prone individuals into religious denominations and from other forms of endogeneity and unobserved heterogeneity. For this, we construct a unique database from suicide statistics and censuses that

cover all Prussian counties in the early and late 19th century. In this setting, we exploit the concentric dispersion of Protestantism in Prussia in an instrumental-variable model that instruments the share of Protestants in a county by its distance to Wittenberg. We find that Protestantism increases the average annual suicide rate in 1869-71 by about 15-20 suicides per 100,000 inhabitants, a large effect compared to the mean suicide rate of 13 suicides per 100,000 inhabitants. The result is robust to a rich set of controls for demographic, economic, educational, and geographic background factors. Controls for the share of insane people in the population and for fatal accident rates address concerns of bias from denominational differences in non-rational suicide causes and in underreporting of suicides. Likewise, we exclude that the higher Protestant shares identified by our instrument are related to unpleasant weather conditions and that our results are driven by religious concentration or ecological fallacy. We find a positive effect of Protestantism on suicide also in 1816-21, where the effect is larger for males than for females.

Finally, we devise a number of tests that allow us to differentiate between the sociological and the theological channels. Most importantly, the effect of Protestantism on suicide tends to decrease rather than increase with church attendance, suggesting that the sociological role of a more integrated community dominates the theological aspect of a stronger devotion to religious beliefs. In addition, the difference in suicide rates between Protestants and Catholics recedes in modern data, whereas non-affiliated people (who have predominantly seceded from the Protestant church) have significantly higher suicide rates, again suggesting a dominant role for socialization rather than theological belief.

In terms of the effect of Protestantism on overall well-being, our result that Protestantism increases suicide rates contrasts with the finding that Protestantism furthers educational and economic development (Becker and Woessmann (2009)). Thus, the effect of Protestantism on well-being seems to be neither uniformly positive nor uniformly negative and may affect the average population differently than the very select subgroup of highly unhappy people. In fact, the two aspects may be related in a "dark-contrasts paradox" where suicide behavior is subject to a relative comparison of utility (Daly et al. (2011)). Still, our results hold conditional on proxies for economic development, suggesting that religious denomination in the form of Protestantism is a main independent driver of regional differences in suicide rates.

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Appendix: Data Sources

The county-level data available for Prussia in the 19th century is generally viewed as a unique source of highest-quality data for micro-regional analyses (Galloway, Hammel, and Lee (1994)). We have compiled the county-level data used in this paper from several archives.

1816 Population Census and 1816-21 Suicide Statistics

The Prussian Statistical Office, founded in 1805, collected detailed data at the county level for the first time in 1816. This is the earliest year that lends itself to a micro-regional analysis of religion and suicide. Suicide rates are reported for the years 1816-21 combined and are drawn from the local burial and death registers. The share of Protestants in the county population refers to the year 1816. In addition, the 1816 Population Census provides data on demographics, schooling, the number of public buildings per capita, and other death causes. The data refer to the 306 counties in Prussia in its borders at the time. The source of the 1816 Population Census data and the 1816-21 Suicide Statistics is Mützell (1825).

1869-71 Suicide Statistics

The second period for which we have county-level suicide data is 1869-71. In dedicated suicide statistics, introduced in the last quarter of 1868, the local state administration – the city council or the local police – had to count every suicide on a separate data sheet. The survey also collected background information on the person committing suicide with the explicit aim of understanding the factors affecting suicides. The data refer to the 452 counties existing at the time.[34] The source of the 1869-71 Suicide Statistics is Preussische Statistik (1874). The data are further described in a paper by Hilse (1871) which also contains interesting cross-tabulations of suicides by characteristics of the person committing suicide and of the suicide incident, although only at the district level.

1871 Population Census

The 1871 Population Census provides information on the share of different religious denominations – in particular, Protestants, Catholics, and Jews – in a county. In addition, the

[34] Prussia annexed several territories between 1816 and 1871, namely Hohenzollern-Sigmaringen, Schleswig-Holstein, the Kingdom of Hannover, Hessen-Kassel, Nassau, and the free city of Frankfurt.

majority of our control variables is drawn from the 1871 Population Census, including a host of demographic characteristics, literacy rates (measured as the ability to read and write among the population aged 10 years or older), and shares of the population with physical or mental disabilities (blind, deaf-mute, and insane). The source of the 1871 Population Census data is Preussische Statistik (1875).

1882 Occupation Census

The 1882 Occupation Census collected information on employment and self-employment across two-digit sectors. We calculate the share of the labor force working in the manufacturing sector and in the service sector, using the classification provided by the Prussian Statistical Office to classify the two sectors. The manufacturing sector (sector B in the 1882 classification) includes mining, construction, and manufacture of metals, machinery, equipment, chemicals, textiles, paper, leather, food products, and wood. The service sector (sector C in the 1882 classification) includes trade business, insurance, transport, lodging, and restaurants. The source of the 1882 Occupation Census data is Preussische Statistik (1884/85).

1862 and 1881 Church Attendance Data

Our measure of church attendance stems from the statistical surveys of the Protestant Regional Churches of Germany on the "Expressions of Churchly Life." The uniform annual surveys were organized by the Statistical Central Office at the Protestant Higher Church Council in Berlin in 1862 and then from 1880 to World War II. Parish priests collected the data on preprinted forms following uniform surveying directives. Regional Consistories combined these parish data into registers at the level of church districts, the level at which they are available today. Our measure of church attendance is the number of participations in Holy Communion divided by the number of Protestants in a church district. To match our 1869-71 suicide statistics, we take a simple average of church attendance in 1862 and 1881, the closest years with available data for most church districts. We map the church-district data into our administrative-county data by using GIS technology to compute the surface-weighted average of the available church district data for each county. The source of the 1862 and 1881 Church Attendance Data is Hölscher (2001), who gathered the data from regional archives covering modern Germany.

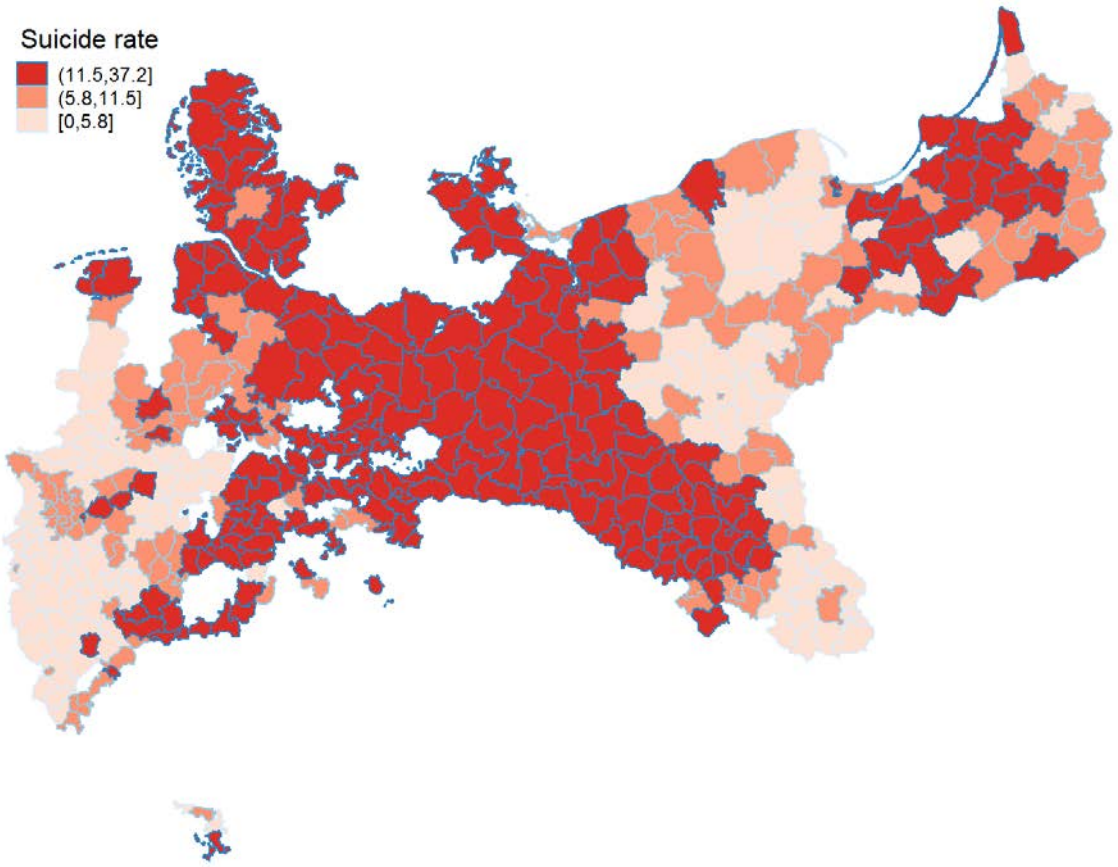
1992 and 2009 Mortality Statistics

Data on suicides in modern-day Germany come from the Mortality Statistics (*Todesursachenstatistik*), covering all deaths from 1992 to 2009 at an individual level. The Mortality Statistics are based on the death certificate issued by the doctor declaring the death, in combination with the death registry certificate issued by the registrar of the municipality of residence. The death certificate contains information about the causes of death: diseases and significant other health issues which have contributed to death. The classification of causes of death follows the World Health Organization's International Classification of Diseases (ICD-9 until 1997 and ICD-10 since). In addition to the primary disease, the Mortality Statistics include demographical features such as the date of death, gender, age, German citizenship, religion, marital status, and place of residence. The 1992-2009 Mortality Statistics are accessible via controlled remote access through the Research Data Centers of the Federal Statistical Office and the Statistical Offices of the Länder (EVAS 23211).

1987 Population Census

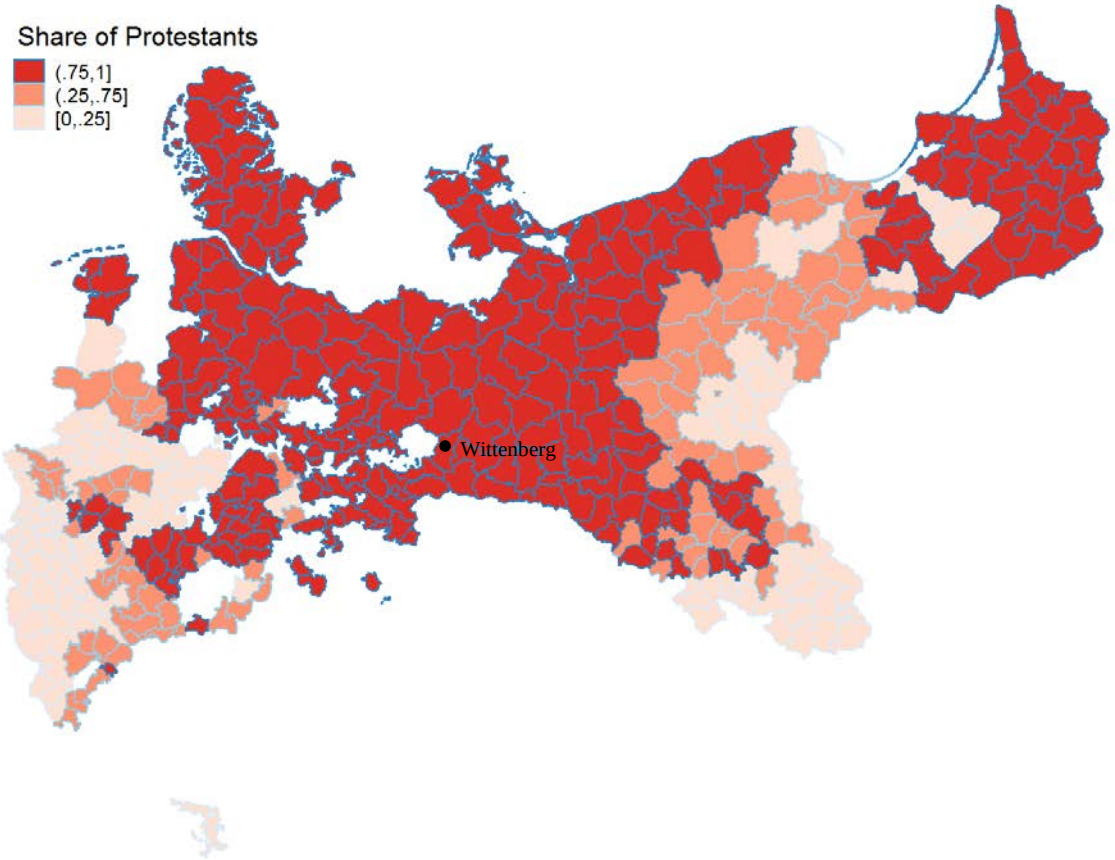
County-level variables entering some of our modern-day suicide regressions stem from the 1987 Population Census (*Volkszählung*) in (West) Germany. The county-level variables include the share of Protestants among Protestants and Catholics; the total county population; the share of the county population in 20 separate age groups; the share of the county population who are singles, widowed, married, divorced; the share of foreigners; the share of the work force in four separate sectors; the share of the population receiving social benefits; the share of the population receiving financial support from relatives; and the share of the population with five separate educational degrees. The county-level data from the 1987 Population Census are available from the Statistical Offices of the Länder.

Figure 1: Suicides in Prussia, 1869-71



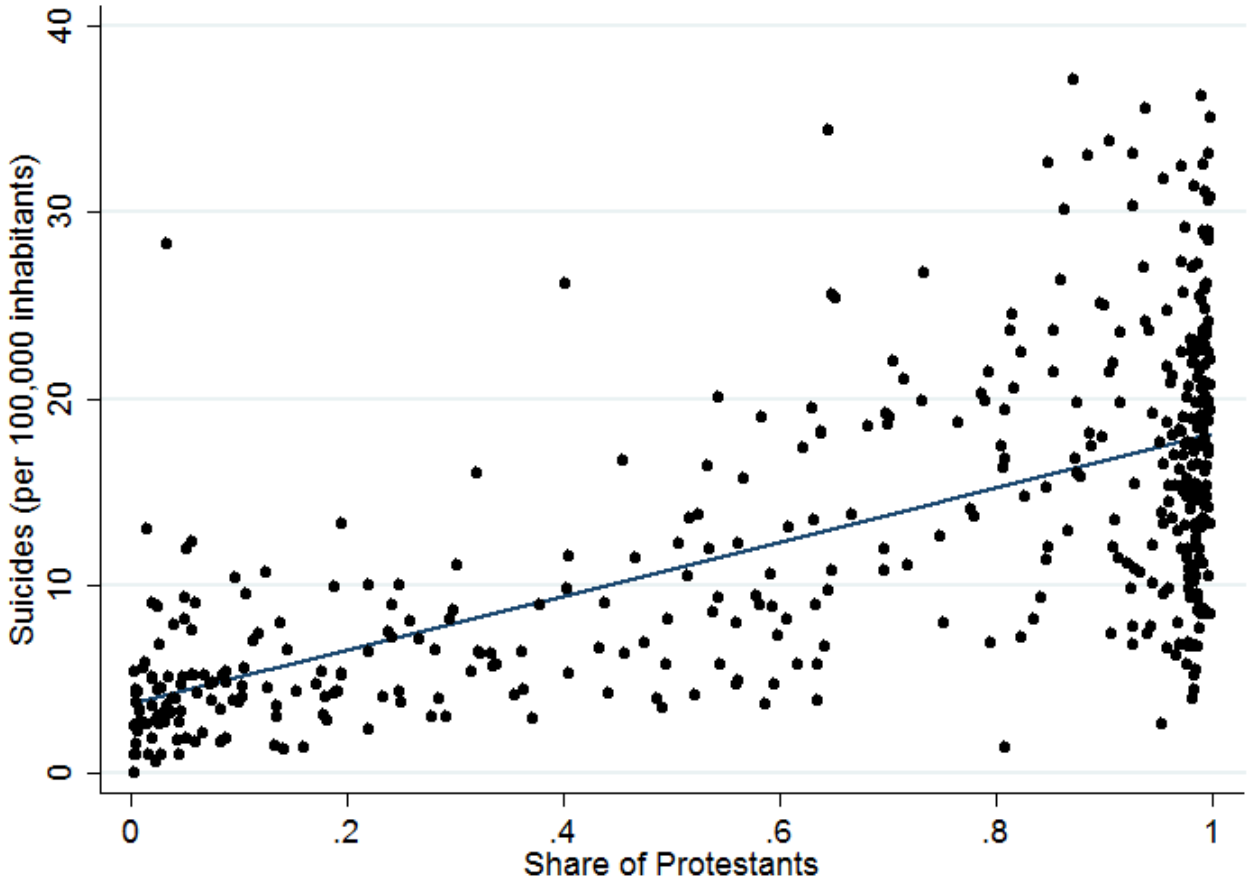
Suicide rate (average annual suicides per 100,000 inhabitants), 1869-71. County-level depiction based on 1869-71 Suicide Statistics. See Appendix for data details.

Figure 2: Protestantism in Prussia, 1871



Share of Protestants, 1871. County-level depiction based on 1871 Population Census. See Appendix for data details.

Figure 3: Protestantism and Suicide in Prussia, 1871



Share of Protestants 1871 and suicide rate 1869-71. County-level depiction based on 1871 Population Census and 1869-71 Suicide Statistics. See Appendix for details.

Table 1: Descriptive Statistics, Prussia 1871

	Mean	StdDev	Min	Max
	(1)	(2)	(3)	(4)
Suicide rate (per 100,000 inhabitants)	13.00	8.33	.00	37.06
Suicide proportion (per 1,000 deaths)	4.78	3.17	.00	15.76
Share of Protestants	.64	.38	.003	1.00
Share of population $<$ 15 years	.36	.03	.23	.43
Share of population $>$ 60 years	.07	.02	.03	.11
Average household size	4.79	.34	3.83	5.86
Share of population living in towns	.28	.22	.00	1.00
Share of labor force in manu. and serv. (1882)	.34	.15	.08	.82
Share of literate adults	.88	.13	.37	.99
Distance to Wittenberg (in 1,000 km)	.33	.15	.00	.73
Share of females	.51	.02	.44	.55
Share of Jews	.01	.01	.00	.13
Share of population born in municipality	.59	.12	.32	.87
Share of population of Prussian origin	.99	.02	.74	1.00
Share blind (x 100)	.09	.03	.03	.24
Share deaf-mute (x 100)	.10	.05	.02	.42
Share insane (x 100)	.23	.17	.02	1.56
Fatal accident rate (per 100,000 inhabitants)	42.35	15.80	9.37	114.52
Fatal accident proportion (per 1,000 deaths)	15.17	5.00	3.77	37.48
Latitude (in rad)	.91	.03	.84	.97
Longitude (in rad)	.22	.08	.11	.39
Year when annexed by Prussia	1751.69	111.05	1525	1866

Suicide rates are average annual rates in 1869-71. Data for 452 Prussian counties from the 1869-71 Suicide Statistics, the 1871 Population Census, and the 1882 Occupation census; see main text and Appendix for details.

Table 2: Protestantism and Suicide in Prussia 1871

Dependent variable:	Suicide rate (per 100,000 inhabitants)						Suicide proportion (per 1,000 deaths)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Share of Protestants	14.496 (.782)***	12.328 (.655)***	12.306 (.657)***	12.411 (.667)***	12.528 (.705)***	9.812 (1.124)***	4.928 (.275)***
Share of population < 15 years		-70.781 (8.653)***	-66.868 (12.050)***	-66.580 (12.056)***	-67.552 (12.212)***	-57.218 (14.122)***	-21.537 (4.760)***
Share of population > 60 years		-30.120 (18.060)*	-23.869 (22.491)	-22.354 (22.556)	-15.241 (26.429)	13.799 (34.418)	9.570 (10.301)
Average household size		-7.575 (.824)***	-7.529 (.831)***	-7.364 (.850)***	-7.317 (.856)***	-1.727 (1.357)	-2.077 (.333)***
Share of population living in towns			.754 (1.615)	.091 (1.770)	.089 (1.772)	.212 (1.872)	.548 (.691)
Share of labor force in manu. and serv.				1.807 (1.970)	2.437 (2.318)	5.550 (2.746)**	.118 (.903)
Share of literate adults					-1.614 (3.118)	3.900 (4.503)	.020 (1.215)
35 district dummies						yes	
Constant	3.691 (.582)***	68.928 (5.536)***	66.655 (7.375)***	65.148 (7.557)***	65.868 (7.690)***	23.571 (13.000)*	18.352 (2.997)***
Observations	452	452	452	452	452	452	452
R^2	.433	.627	.627	.628	.628	.738	.611

Ordinary least squares (OLS) estimation.
Standard errors in parentheses: * significance at ten, ** five, *** one percent.
Data for Prussian counties from the 1869-71 Suicide Statistics, the 1871 Population Census, and the 1882 Occupation Census; see main text and Appendix for details.

Table 3: Instrumental-Variable Estimates using Distance to Wittenberg

Dependent variable:	1st stage Share of Protestants				2nd stage Suicide rate (per 100,000 inhabitants)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Share of Protestants					28.019	20.485	19.969	24.016
					(2.736)***	(2.445)***	(2.275)***	(3.520)***
Distance to Wittenberg (in 1,000 km)	-.936	-.863	-.909	-.693				
	(.111)***	(.125)***	(.123)***	(.127)***				
Share of population < 15 years		-.599	-.747	.093		-68.989	-67.873	-79.150
		(.835)	(.818)	(.812)		(13.906)***	(13.582)***	(15.679)***
Share of population > 60 years		-2.550	-3.177	-7.136		-23.759	-19.051	61.177
		(1.584)	(1.557)**	(1.696)***		(25.930)	(25.419)	(40.122)
Average household size		-.155	-.195	-.226		-5.467	-5.163	-3.845
		(.057)***	(.057)***	(.056)***		(1.123)***	(1.144)***	(1.486)***
Share of population living in towns		-.048	.149	.172		-.686	-2.604	-3.605
		(.115)	(.121)	(.118)		(1.907)	(2.136)	(2.475)
Share of labor force in manu. and serv. (1882)			-.587	-.940			5.628	14.021
			(.131)***	(.144)***			(2.470)**	(4.498)***
Share of literate adults				1.053				-17.929
				(.204)***				(6.218)***
Constant	.947	2.084	2.535	1.797	-4.988	52.669	49.416	51.711
	(.040)***	(.502)***	(.502)***	(.508)***	(1.797)***	(9.386)***	(9.613)***	(10.509)***
Observations	452	452	452	452	452	452	452	452
R^2	.135	.152	.189	.235	.056	.498	.521	.406
F-statistic (instrument)					70.46	47.39	54.49	29.86

Instrumental-variable (IV) estimation.
Standard errors in parentheses: * significance at ten, ** five, *** one percent.
Data for Prussian counties from the 1869-71 Suicide Statistics, the 1871 Population Census, and the 1882 Occupation Census; see main text and Appendix for details.

Table 4: Robustness to Additional Factors, Prussia 1871

Dependent variable:	Suicide rate (per 100,000 inhabitants)					
	(1)	(2)	(3)	(4)	(5)	(6)
Share of Protestants	25.617 (4.033)***	24.759 (3.683)***	24.270 (3.475)***	23.919 (3.275)***	17.094 (2.263)***	26.076 (3.641)***
Share of females	-21.400 (30.956)	-5.420 (29.963)	-15.621 (32.042)	-5.976 (29.189)		
Share of Jews	46.201 (33.099)	52.915 (32.658)	51.880 (32.022)	52.957 (31.779)*		
Share of population born in municipality	11.725 (7.837)	10.671 (7.309)	10.871 (7.219)	7.340 (6.220)		
Share of population of Prussian origin	-66.155 (17.643)***	-62.765 (17.114)***	-68.569 (17.297)***	-61.172 (16.723)***		
Share blind (x 100)		7.160 (11.274)	6.443 (11.105)	9.121 (11.172)		
Share deaf-mute (x 100)		-23.586 (9.056)***	-22.470 (8.810)**	-21.633 (8.468)**		
Share insane (x 100)		.758 (1.957)	1.023 (1.961)	.603 (1.890)		
ln(Income of male elementary school teachers)			-1.517 (3.398)			
Teacher income / day laborer income			1.628 (1.263)			
Fatal accident rate (per 100,000 inhabitants)				-.038 (.026)		
Latitude, longitude and their interaction (in rad)					yes	
36 dummies for years when annexed by Prussia						yes
Standard controls	yes	yes	yes	yes	yes	yes
Obs.	452	452	452	452	452	452
R^2	.389	.432	.451	.463	.633	.547

Instrumental-variable (IV) estimation, where share of Protestants is instrumented by distance to Wittenberg.
Standard errors in parentheses: * significance at ten, ** five, *** one percent.
Standard controls: share of population < 15 years, share of population > 60 years, average household size, share of population living in towns, share of labor force in manufacturing and services, share of literate adults, and a constant.
Data for Prussian counties from the 1869-71 Suicide Statistics, the 1871 Population Census, and the 1882 Occupation Census; see main text and Appendix for details.

Table 5: Accounting for Unpleasant Weather Conditions

Dependent variable:	OLS		IV 1st stage	IV 2nd stage
	Rainfall	Temperature	Share Protestants	Suicide rate (per 100,000 inhabitants)
	(1)	(2)	(3)	(4)
Share of Protestants				18.479 (5.137)***
Distance to Wittenberg (in 1,000 km)	329.781 (33.323)***	-1.949 (.249)***	-.538 (.153)***	
Rainfall			-.0008 (.0002)***	-.006 (.007)
Temperature			-.222 (.022)***	.819 (1.172)
Standard controls			yes	yes
Observations	452	452	452	452
R^2	.179	.120	.387	.579

Instrumental-variable (IV) estimation, where share of Protestants is instrumented by distance to Wittenberg.
Standard errors in parentheses: * significance at ten, ** five, *** one percent.
Standard controls: share of population < 15 years, share of population > 60 years, average household size, share of population living in towns, share of labor force in manufacturing and services, share of literate adults, and a constant.
Data for Prussian counties from the 1869-71 Suicide Statistics, the 1871 Population Census, and the 1882 Occupation Census; see main text and Appendix for details.

Table 6: Religious Concentration and Further Robustness Specifications

Dependent variable:	Suicide rate (per 100,000 inhabitants)			Suicide proportion (per 1,000 deaths)
	All counties	Counties with share of Protestants		All counties
		<2% or >98%	<.1% or >99.9%	
	(1)	(2)	(3)	(4)
Share of Protestants	24.739	15.443	17.574	9.265
	(3.758)***	(3.800)***	(7.109)**	(1.356)***
Share of population < 15 years	-83.074	-54.081	-117.200	-25.914
	(16.095)***	(31.183)*	(72.056)	(6.040)***
Share of population > 60 years	69.192	80.997	81.524	38.417
	(41.817)*	(66.548)	(199.936)	(15.456)**
Average household size	-3.350	-4.717	-3.911	-.766
	(1.608)**	(2.613)*	(3.617)	(.573)
Share of population living in towns	-4.611	-1.672	-34.468	-.846
	(2.651)*	(6.189)	(22.622)	(.953)
Share of labor force in manu. and serv.	13.129	16.598	52.275	4.491
	(4.319)***	(6.905)**	(10.805)***	(1.733)***
Share of literate adults	-15.216	4.628	-39.946	-6.139
	(5.660)***	(8.790)	(25.164)	(2.395)**
Herfindahl index of religious distribution	-7.577			
	(2.982)**			
Constanst	54.062	29.687	85.792	13.008
	(10.308)***	(21.914)	(43.484)**	(4.048)***
Observations	452	142	33	452
R^2	.400	.623	.838	.393

Instrumental-variable (IV) estimation, where share of Protestants is instrumented by distance to Wittenberg.
Standard errors in parentheses: * significance at ten, ** five, *** one percent.
Data for Prussian counties from the 1869-71 Suicide Statistics, the 1871 Population Census, and the 1882 Occupation Census; see main text and Appendix for details.

Table 7: Suicide Rates by Individual-Level Religion and Gender

	Suicide rate (per 100,000)		
	Protestant	Catholic	Total
	(1)	(2)	(3)
Prussian total	18.4	6.5	14.1
By gender			
Male	30.3	11.3	23.4
Female	6.9	2.0	5.4
By share of Protestants in the district			
0% - 5%	21.1	3.8	4.4
5% - 15%	16.9	4.1	5.5
15% - 40%	17.5	4.7	7.7
40% - 60%	16.4	7.9	12.4
60% - 85%	19.6	14.3	18.4
85% - 98%	17.5	14.6	17.4
98% - 100%	24.9	10.8	24.8

Suicide rates (per 100,000 people in the sub-group) in the year 1869. Based on a total count of 2,560 suicides in the 25 (out of 35) Prussian districts with cross-tabulated data. Source: Hilse (1871).

Table 8: Protestantism and Suicide in Prussia 1816: OLS Estimates

Dependent variable:	Suicide rate (per 100,000 inhabitants)					
	All	Males	Females	All	Males	Females
	(1)	(2)	(3)	(4)	(5)	(6)
Share of Protestants	7.221	11.065	3.605	4.735	7.341	2.232
	(.574)***	(.970)***	(.346)***	(.596)***	(1.017)***	(.374)***
Share of population < 15 years				-36.224	-61.949	-12.448
				(10.361)***	(17.661)***	(6.493)*
Share of population > 60 years				-84.322	-134.666	-34.774
				(20.097)***	(34.257)***	(12.595)***
Share of population living in towns				5.978	10.974	1.680
				(1.056)***	(1.801)***	(.662)**
Public buildings (per 100 inhabitants)				2.529	2.488	2.584
				(.643)***	(1.096)**	(.403)***
School enrollment rate				3.135	5.396	1.070
				(1.250)**	(2.131)**	(.783)
Constant	2.262	4.023	.573	18.961	32.135	6.485
	(.411)***	(.694)***	(.247)**	(4.937)***	(8.415)***	(3.094)**
Observations	306	306	306	306	306	306
R^2	.342	.300	.263	.509	.468	.405

Ordinary least squares (OLS) estimation.
Standard errors in parentheses: * significance at ten, ** five, *** one percent.
Data for Prussian counties from the 1816 Census; see main text and Appendix for details.

Table 9: Protestantism and Suicide in Prussia 1816: IV Estimates

Dependent variable:	1st stage	2nd stage				
	Share of Protestants	Suicide rate (per 100,000 inhabitants)				Suicide proportion (per 1,000 deaths)
	All	All	All	Males	Females	All
	(1)	(2)	(3)	(4)	(5)	(6)
Share of Protestants		14.989 (2.771)***	14.971 (2.628)***	23.439 (4.310)***	7.066 (1.455)***	5.240 (.953)***
Distance to Wittenberg (in 1,000 km)	-.869 (.160)***					
Share of population < 15 years	-4.251 (.928)***	15.253 (19.613)	15.117 (18.901)	19.218 (31.001)	11.345 (10.467)	4.804 (6.853)
Share of population > 60 years	-8.089 (1.801)***	1.281 (35.661)	.555 (33.516)	4.341 (54.973)	-.576 (18.560)	7.929 (12.152)
Share of population living in towns	-.078 (.098)	6.570 (1.481)***	6.566 (1.477)***	11.932 (2.422)***	1.922 (.818)**	1.809 (.535)***
Public buildings (per 100 inhabitants)	.091 (.066)	-.262 (1.149)	-.256 (1.120)	-1.900 (1.836)	1.278 (.620)**	.087 (.406)
School enrollment rate	.443 (.113)***	-2.074 (2.200)	-2.045 (2.089)	-2.941 (3.427)	-1.174 (1.157)	-.886 (.758)
Fatal accident rate (per 100,000 inhabitants)			-.001 (.020)	.010 (.033)	-.014 (.011)	.0001 (.007)
Constant	2.647 (.434)***	-7.369 (9.666)	-7.225 (9.026)	-9.985 (14.803)	-4.881 (4.998)	-2.761 (3.272)
Observations	306	306	306	306	306	306
R^2	.360	.024	.026	.023	.078	.092

Instrumental variables (IV) estimation.
Standard errors in parentheses: * significance at ten, ** five, *** one percent.
Data for Prussian counties from the 1816 Census; see main text and Appendix for details.

Table 10: Discriminating between Sociological and Theological Explanations 1871

Dependent variable:	Suicide rate		
	Counties with >97.5% Protestants	All counties	
	(1)	(2)	(3)
Church attendance	-11.440 (3.422)***		
Share of Protestants		10.934 (1.231)***	11.825 (.754)***
Bottom quartile of church attendance		-2.131 (1.409)	
Share Protestants * Bottom quartile of church attendance		4.386 (1.903)**	
Top quarter of urbanization			-1.353 (1.377)
Share Protestants * Top quarter of urbanization			3.344 (1.649)**
Further controls (as in Table 2)	yes	yes	yes
Observations	107	396	452
Number of clusters	76	258	
R^2	.481	.642	.634

Ordinary least squares (OLS) estimation.
Standard errors in parentheses: * significance at ten, ** five, *** one percent.
Data for Prussian counties from the 1869-71 Suicide Statistics, the 1871 Population Census, the 1882 Occupation Census, and the 1862-1881 Church Attendance Data; see main text and Appendix for details.

Table 11: Protestantism and Suicide in Germany: 1992 and 2009

Dependent variable:	Suicide[a]							
	1992		2009		West Germany, 1992			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Protestant	.180	.252	.027	.143	.215	.217		.213
	(.029)***	(.034)***	(.026)	(.030)***	(.037)***	(.034)***		(.037)***
Share Protestants in county							.244	.046
							(.120)**	(.130)
No religious affiliation	.443	.597	.161	.381	1.098	1.065	.927	1.062
	(.039)***	(.049)***	(.032)***	(.040)***	(.125)***	(.121)***	(.129)***	(.122)***
Other religious affiliations	yes	yes	yes	yes	yes	yes	yes	yes
Age	-.314	-.312	-.265	-.263	-.338	-.338	-.339	-.338
	(.005)***	(.005)***	(.004)***	(.004)***	(.014)***	(.014)***	(.014)***	(.014)***
Age squared	.140	.138	.113	.111	.155	.155	.156	.155
	(.004)***	(.004)***	(.003)***	(.003)***	(.009)***	(.009)***	(.009)***	(.009)***
Male	.720	.715	.738	.731	.702	.702	.703	.702
	(.029)***	(.029)***	(.025)***	(.025)***	(.036)***	(.036)***	(.036)***	(.036)***
German citizenship	.423	.417	.112	.163	.162	.155	.199	.155
	(.120)***	(.122)***	(.080)	(.081)**	(.206)	(.206)	(.205)	(.206)
Family status controls	yes	yes	yes	yes	yes	yes	yes	yes
County fixed effects	no	yes	no	yes	yes	no	no	no
County-level controls	no	no	no	no	no	yes	yes	yes
Observations	885,374	885,374	854,544	854,544	666,261	666,261	666,261	666,261
R^2	.032	.033	.029	.030	.038	.037	.037	.037

Ordinary least squares (OLS) estimation. [a] Dependent variable multiplied by 100.
Standard errors in parentheses: * significance at ten, ** five, *** one percent. Standard errors in specifications with county-level controls are clustered at the level of 327 counties.
Other religious affiliations: Jewish; Muslim; other Christian; other religion; religion unknown (reference category: Catholic). Family status controls: single; widowed; divorced; unknown (reference category: married). County-level controls: log(county population); share of county population in 20 separate age groups; share of county population who are singles, widowed, married, divorced; share of foreigners; share of work force in four separate sectors; share of population receiving social benefits; share of population receiving financial support from relatives; share of population with five separate educational degrees.
Data: Mortality Statistics (Todesursachenstatistik), 1992 and 2009; county-level variables: Population Census (Volkszählung), 1987; see main text and Appendix for details.

Table A.1: Suicide Methods

	Male (1)	Female (2)	Total (3)
Hanging	63.5	43.2	59.6
Drowning	16.5	42.7	21.6
Shooting	12.4	0.2	10.1
Poisoning	2.3	7.3	3.3
Cutting throat	2.8	2.8	2.8
Plunging	0.7	1.1	0.8
Have oneself ridden over	0.6	0.3	0.6
Cutting artery	0.3	0.7	0.4
Stabbing	0.3	0.2	0.3
Inhaling gases	0.1	1.1	0.3
Strangling	0.3	0.2	0.3
Other means	0.0	0.3	0.1
Undisclosed means	0.1	0.0	0.1
Total	100.0	100.0	100.0

Suicides in the year 1869, in percent. Based on a total number of 3,187 classified suicides (2,573 male and 614 female). Source: Hilse (1871).

Table A.2: Descriptive Statistics, Prussia 1816

	Mean	StdDev	Min	Max
	(1)	(2)	(3)	(4)
Suicide rate (per 100,000 inhabitants)	6.50	5.06	.00	26.06
Suicide rate males (per 100,000 inhabitants)	10.52	8.28	.00	47.50
Suicide rate females (per 100,000 inhabitants)	2.69	2.88	.00	22.42
Suicide proportion (per 1,000 deaths)	2.30	1.90	.00	8.82
Share of Protestants	.59	.41	.00	1.00
Distance to Wittenberg (in 1,000 km)	.32	.15	.00	.73
Share of population < 15 years	.36	.03	.26	.46
Share of population > 60 years	.07	.01	.04	.11
Share of population living in towns	.12	.21	.00	1.00
Public buildings (per 100 inhabitants)	.33	.38	.00	2.09
School enrollment rate	.59	.20	.02	1.10
Fatal accident rate (per 100,000 inhabitants)	42.96	16.73	14.01	123.54
Fatal accident proportion (per 1,000 deaths)	15.39	6.77	4.23	54.90

Suicide rates are average annual rates in 1816-21. Data for 306 Prussian counties from the 1816-21 Suicide Statistics and the 1816 Population Census; see main text and Appendix for details.