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Not the Opium of the People:
Income and Secularization in a Panel of Prussian Counties*

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The interplay between religion and the economy has occupied social scientists for long. We construct a unique panel of income and Protestant church attendance for six waves of up to 175 Prussian counties spanning 1886-1911. The data reveal a marked decline in church attendance coinciding with increasing income. The cross-section also shows a negative association between income and church attendance. But the association disappears in panel analyses, including first-differenced models of the 1886-1911 change, panel models with county and time fixed effects, and panel Granger-causality tests. The results cast doubt on causal interpretations of the religion-economy nexus in Prussian secularization.

Keywords: Religion, secularization, Prussian economic history

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The interplay between religion and the economy has occupied social scientists for long. We construct a unique panel of income and Protestant church attendance for six waves of up to 175 Prussian counties spanning 1886-1911. The data reveal a marked decline in church attendance (secularization) coinciding with increasing income. The cross-section also shows a negative association between income and church attendance. But the association disappears once using the panel structure: In first-differenced models of the 1886-1911 change, counties with larger increases in income did not see significantly larger reductions in church attendance; in panel models with county and time fixed effects, counties with earlier increases in income than others did not see earlier reductions in church attendance; and in panel Granger-causality tests, initial income is not significantly related to subsequent church attendance, or vice versa. These findings cast doubt on causal interpretations of the religion-economy nexus during this important phase of secularization in Prussia.

I. Concepts

Religion and the economy may interact in both directions (Iannaccone (1998); McCleary and Barro (2006)). On the one hand, classic secularization hypothesis suggests that improved material conditions may reduce the demand for religious consolation. The point was perhaps most forcefully made by Karl Marx (1844), who referred to religion as "opium of the people" (p. 72) that is required only to alleviate the ailments of poor economic conditions, implying that improved economic conditions would result in reduced religious beliefs and participation. More generally, increasing opportunity costs may restrain religious participation (e.g., Gruber and Hungerman (2008)).

On the other hand, religious beliefs may influence economic behavior and outcomes. Weber (1904/05) argued that a Protestant ethic furthers the spirit of capitalism. But religiously motivated refusal of materialism may also limit economic development. More generally, religion may affect beliefs, behaviors, and network interactions that in turn affect economic outcomes.

Existing empirical evidence is far from conclusive. In cross-country analyses, McCleary and Barro (2006) find that per-capita GDP negatively predicts religious participation and beliefs and that economic growth relates negatively to church attendance, but positively to religious beliefs. At the micro level, for example, Guiso, Sapienza, and Zingales (2003) find that religious beliefs are positively associated with economic attitudes, whereas Lipford and Tollison (2003) find a mildly negative two-way relationship between church membership and income. It is unclear, however, to what extent such cross-sectional identification can rule out that omitted factors affect the observed associations.

In our analysis, we can draw on county-level panel data. Such within-country analysis is less plagued by the substantial cultural and institutional differences that aggravate identification in a cross-country setting. In addition, the panel structure of our data allows us to condition on county fixed effects, thereby holding constant any unobserved time-invariant county characteristics and identifying from longitudinal variation within counties.

Our application relates to Prussia, a core European state, during a historical period (1886-1911) when secularization tendencies were a leading public concern in Europe (Hölscher (2001), pp. 16, 29-30). While in the United States, religious participation did not decline in the setting of a vivid religious market (Finke and Stark (1992)), Prussia remained dominated by two mainline churches, making officially observed church membership hardly informative of actual religious involvement. Church membership barely changed over our period of investigation: On average

across all Prussian counties, 98.7 percent of inhabitants formally were members of the Protestant or Catholic Churches both in 1885 and in 1910.[1]

But as our analysis below shows, Protestant church attendance – a direct measure of participation in church life – in fact declined significantly during the same period. As such, active church attendance reflects "demonstrations of churchly life … that were considered already by contemporaries as indicators of churchliness" (Hölscher (2001), p. 4). Of course, reduced church attendance does not necessarily imply a reduction in "religiosity" in the sense of inner attitudes towards belief in God. But it does depict people's active involvement with the institutionalized church and its rituals. It is in this way that we use the term "secularization" here.

II. Data

Our unique database on historical church attendance stems from the practice of the Protestant Church in Germany to count the number of participants in Holy Communion every year, which Hölscher (2001) gathered at the district (*Kirchenkreis*) level from regional archives covering modern Germany. This exceptional database "unlocks source material that is internationally unique in its scope and historical depth: the statistical surveys of the Protestant Regional Churches of Germany on the Expressions of Churchly Life" (Hölscher (2001), p. 29).

The Sacrament Statistics (*Abendmahlsstatistik*) stem from a uniform annual survey organized by the Statistical Central Office at the Protestant Higher Church Council in Berlin from 1880 (with precursors) to World War II. Data collection was done by the parish priests on a

[1] On average across the 508 (593) Prussian counties in 1885 (1910), 65.9 (63.4) percent were Protestants, 32.8 (35.3) percent Catholics, 0.25 (0.43) percent other Christians, 0.99 (0.65) percent Jews, and only 0.01 (0.16) percent "adherents of other religions, with undetermined or without religious designation."

preprinted form following uniform surveying directives. Regional Consistories combined these parish data into registers at the level of church districts, which usually comprised 10-20 adjacent parishes. To our knowledge, the data have not yet been used in microeconometric analyses.

Our main indicator of church attendance is the number of participants in Holy Communion divided by the number of Protestants in a district. The general Protestant norm at the time was to attend Holy Communion only once a year (Hölscher (2001), p. 37), but there were regional differences. By the end of the 19th century, the Church also started to propagate the possibility of attending Holy Communion more than once a year (Hölscher (2001), p. 37), which will lead our indicator to underestimate any decline in church involvement over time. In addition, participants were counted in the parish where Communion was taken, not in their host parish (unlikely to introduce substantial bias at the district level), and children who were not yet confirmed and thus not allowed to participate in Holy Communion (on average roughly one third of parishioners) are counted among the Protestants in the denominator. Still, sacrament participation is a useful proxy for church attendance, already used by contemporaries, that "best allows to discover the long-term change in churchliness" (Hölscher (2001), p. 31).[2]

Our income data refer to the average annual income of male elementary-school teachers, available for every five years between 1886 and 1911 for all Prussian counties (*Kreise*) from respective Education Censuses. Following Galloway, Hammel, and Lee (1994), we use teacher income as a proxy for overall income, as teaching is a well-defined occupation that facilitates comparison and as teacher income was almost entirely financed from local contributions, thus

[2] Actual data on church attendance collected at specific Count Sundays, available only in few Regional Churches, indicate a largely parallel movement of church attendance and sacrament participation both in the cross-section and in the time-series (Hölscher (2001), pp. 37-38).

likely reflecting the overall income in the county. Teacher incomes are the only income data consistently available across counties and time in this period and are highly correlated with other measures of economic development in the cross-section (see Data Appendix).

Our dataset covers an unbalanced panel of 175 territorial entities ("counties") in 1886-1911. This sample of Prussian counties is specific and not necessarily representative of Prussia or of Germany; it constitutes the intersection between modern Germany and end-of-19th-century Prussia. To this dataset, we merge cross-sectional data for Prussian counties used in Becker and Woessmann (2009). The Data Appendix provides details on data sources and construction.

III. Evidence on Secularization

The Sacrament Statistics clearly suggest that a process of secularization was underway in the late 19th and early 20th centuries in the Protestant Church in Prussia (s.a. Hölscher (2001), pp. 15-16). For the 89 counties with data both in 1886 and in 1911, average church attendance (proxied by participants in Holy Communion over Protestants) decreased from 0.508 to 0.443, or by 12.8 percent of the initial value. From 1862 to 1930 (59 counties), church attendance declined by more than half from 0.561 to 0.258.

Panel estimates with county fixed effects suggest an average annual decrease in church attendance by 0.25 percentage points per year over the quarter century 1886-1911 (Table 1, col. 1).[3] Non-linear inspection shows that church attendance was largely flat between 1886 and 1896

[3] Throughout, to reduce measurement error we measure church attendance as average of the actual (e.g., 1886), the proceeding (1885), and the subsequent (1887) years; qualitative results are identical when using the actual year only. Table 1 is based on the five-yearly structure of the income data. When replicating col. 1 on the annual church-attendance data and without averaging, where we have 3,633 data points for our 175 counties in 1886-1911, we get

and then declined steadily from 1896 to 1911 (col. 2). Earlier data suggest significant decreases also in 1862-1876 (8.6 percentage points) and in 1876-1886 (3.2 percentage points).

At the same time, income (proxied by teacher income) increased on average by 1.65 percent per year from 1886 to 1911, with the strongest increases from 1891 to 1906 (cols. 3, 4).[4] Thus, over the period, a process of secularization coincided with increasing income in Prussia.

IV. Income and Secularization: Empirical Models and Results

We start our investigation of the interrelationship between income and secularization by looking separately at cross-sectional variation and at time-series variation, respectively. In a model that uses only cross-sectional variation – pooled cross-sectional estimation with year fixed effects – there is a significant negative association between log income and church attendance; a 10 percentage-point (0.356 standard-deviation) increase in the church attendance measure is related to a 3.0 percent (0.145 standard-deviation) decline in income (Table 2, col. 1).[5] This pooled estimate reflects a consistent negative cross-sectional association that is relatively stable over time (e.g., -0.291 in 1886 and -0.309 in 1911, see Table A2 and Figure A1 in the Appendix). The cross-sectional association remains significantly negative when adding controls for age structure,

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almost exactly the same estimate (coef. -0.0026, std. err. 0.00008). When we extend the analysis to 1850-1931 (7,261 data points), the average annual decline in church attendance is even larger (coef. -0.0036, std. err. 0.00004).

[4] Given that no general price deflator is available at the time and that the currency is pegged to gold throughout the period of observation, the analysis is performed with nominal income. When following Galloway, Hammel, and Lee (1994) in estimating real income using Kuczynski's estimate of a cost of living index (which covers food and rent for Germany), the average increase in real income is 0.7 percent (statistically highly significant).

[5] We do not show the alternative model of regressing church attendance on log teacher income here because direction and statistical precision of the estimates are identical to the reported ones in the bivariate models.

gender distribution, urbanization, literacy, migration, Protestant share, and Province fixed effects (see Table A3 in the Appendix).[6]

In a model that uses only time-series variation – fixed-effects estimation with fixed effects for counties but not for years – there is again a significant negative association between income and church attendance, now indicating an 18.5 percent decline in income for each 10 percentage-point increase in church attendance (col. 2).[7] This reflects the overall coincidence of increasing income and declining church attendance in Prussia during this period.

However, once we make direct use of the panel structure of our data, there is little evidence that these negative associations reflect any causal relationship between income and secularization. First, in a simple long first-differenced model that regresses the change in log income between 1886 and 1911 on the change in church attendance over the same period, the association becomes statistically insignificant (col. 3). The point estimate is small and significantly different from the first two columns. That is, counties with larger decreases in church attendance did not see significantly larger increases in income, or vice versa.

Second, the association also becomes statistically and quantitatively insignificant in a panel model with county and year fixed effects (col. 4). That is, counties that saw relatively strong decreases in church attendance from one period to the next relative to other counties did not contemporaneously see significantly different relative increases in income.

Finally, there are also no significant associations when adding lagged church attendance to the model (col. 5). The same is true when regressing church attendance on income and its lag

[6] Unfortunately, none of these cross-sectional control variables is available in the panel dimension.

[7] This is the only model of Table 2 affected by using the estimate of real (rather than nominal) income, which reduces the coefficient estimate to -0.443 (std. err. 0.102), more in line with the cross-sectional estimate of col. 1.

(col. 6). That is, lagged church attendance does not predict income and lagged income does not predict church attendance: There is no causality in the spirit of Granger (in that cause happens before consequence) in either direction.[8]

The pattern of results is confirmed in a number of robustness checks (see Tables A4-A6 in the Appendix). First, results are robust in the subsample of 116 counties with more than 90 percent Protestant population, which shows that results are not affected by the fact that income refers to all teachers while church attendance refers to Protestants. Second, results are robust in a balanced sample of 87 counties with full data in all six waves. Third, results are robust in a balanced sample of 160 counties with original data for at least four waves, after interpolating missing values based on county-specific regressions of available annual church attendance data on a third-order polynomial in time in 1881-1916. Finally, results are robust when dropping Berlin (which has the highest income level in most waves) and when dropping the two counties with participants in Holy Communion over Protestants larger than one in 1911 (see Figure A1).

V. Conclusion

Annual surveys of the Protestant Regional Churches of Germany on "Expressions of Churchly Life" uniquely document active religious involvement for a panel of Prussian counties in the late 19th and early 20th centuries. The church attendance data clearly show that – contrary to what church membership data suggest for the United States – a process of secularization was

[8] The same is true in specifications with just the lagged variable (without the contemporaneous one); when adding the twice-lagged variable (here, the first lag of income even is marginally significantly positive in predicting church attendance); and when including the lag, the contemporaneous, and the lead of the variable (in which case the contemporaneous variable is significantly positive, whereas lead and lag are insignificant).

underway among Prussian Protestants between 1886 and 1911. Furthermore, using only variation across counties or using only variation within counties over time, church attendance is strongly negatively associated with income. However, this association disappears in first-differenced models of the 1886-1911 change, in panel models with county and time fixed effects, and in panel Granger-causality tests where secularization does not follow increased income, or vice versa. That is, the historical facts are not in line with an interpretation that income was a causal driver of secularization or that changing religious participation affected income.

While the panel analyses cast strong doubt on a causal interpretation of the simple associations, future research should aim to directly model exogenous variation in income and in church attendance that would allow for a causal identification of their mutual interdependence. An investigation of the omitted factors underlying the observed associations would also be revealing. Furthermore, a comparable analysis of Catholics would be welcome. Finally, different dimensions of development like income and education may have differing relevance for religious participation. In fact, in a companion project (Becker, Nagler, and Woessmann (2012)), we find panel evidence of a relation between increasing enrollment in advanced schools and decreasing church attendance in a panel of German cities before World War I.

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Table 1
Trends in Church Attendance and in Income, 1886-1911

Dependent variable:	Church attendance		ln(teacher income)	
	(1)	(2)	(3)	(4)
Linear time trend	-0.0025		0.016	
	(0.0001)***		(0.0003)***	
Year 1891		0.002		0.034
		(0.004)		(0.006)***
Year 1896		-0.0006		0.106
		(0.004)		(0.006)***
Year 1901		-0.011		0.303
		(0.004)***		(0.006)***
Year 1906		-0.032		0.347
		(0.004)***		(0.006)***
Year 1911		-0.062		0.349
		(0.004)***		(0.006)***
Const.	0.519	0.490	7.118	7.232
	(0.003)***	(0.003)***	(0.005)***	(0.004)***
Obs.	898	898	1050	1050
Number of counties	175	175	175	175
R^2	0.299	0.378	0.821	0.902

Panel estimation with county fixed effects. Unbalanced panel of counties observed every five years in 1886-1911. Dependent variable in col. (1) and (2): participants in Holy Communion over Protestants; in col. (3) and (4): log income of male elementary school teachers. Standard errors in parentheses: significant at the *** 1, ** 5, * 10 percent level.
Data sources: church attendance: Hölscher (2001) based on Sacrament Statistics; teacher income: Galloway (2007) based on Education Censuses.

Table 2
Income and Church Attendance, 1886-1911

Dependent variable:	ln(teacher income)					Church attendance
	Pooled OLS	Fixed effects	First difference 1886-1911	Fixed effects	Fixed effects	Fixed effects
	(1)	(2)	(3)	(4)	(5)	(6)
Church attendance	-0.298 (0.014)***	-1.852 (0.137)***	-0.071 (0.127)	0.066 (0.062)	0.046 (0.085)	
Church attendance $(t-5)$					0.018 (0.089)	
ln(teacher income)						0.009 (0.025)
ln(teacher income) $(t-5)$						0.035 (0.024)
Time fixed effects	yes	no	no	yes	yes	yes
Const.	7.368 (0.013)***	8.301 (0.065)***	0.355 (0.012)***	7.549 (0.027)***	7.218 (0.04)***	0.169 (0.215)
Obs.	898	898	101	898	705	775
Number of counties	175	175	101	175	167	175
R^2	0.691	0.203	0.003	0.899	0.900	0.430

Unbalanced panel of counties observed every five years in 1886-1911. Dependent variable in col. (1)-(5): log income of male elementary school teachers; in col. (6): participants in Holy Communion over Protestants. Church attendance refers to participants in Holy Communion over Protestants. In col. (3), both dependent and explanatory variables refer to the change between 1886 and 1911. Standard errors in parentheses: significant at the *** 1, ** 5, * 10 percent level.
Data sources: church attendance: Hölscher (2001) based on Sacrament Statistics; teacher income: Galloway (2007) based on Education Censuses.

Data Appendix

A1. Church Attendance Data

The Protestant Regional Churches of Germany conducted annual surveys of "Expressions of Churchly Life" between 1880 (with precursors) and World War II (see main text for further information). Our main indicator of church attendance is the "sacrament participation" (Hölscher (2001)), measured as the number of participations in Holy Communion divided by the number of Protestants in a district. Counting sacrament participations is deemed relatively reliable because the established practice was to count the number of issued wafers from the number of wafers before and after the sacrament. As indicated in the main text, the possibility of multiple individual attendances, the possibility of attending Holy Communion outside the home parish, and the counting of non-confirmed children among the number of Protestants in the denominator constitute reasons why the indicator does not directly measure the actual sacrament participation of parishioners.

While the data were contemporaneously regularly published in a comparative manner at the level of the Regional Churches, Hölscher (2001)'s "Data Atlas on the Religious Geography in Protestant Germany: From the Mid-19th Century to the Second World War" for the first time brings together the district-level data, gathered from regional archives, for the geographic coverage of modern Germany. Hölscher kindly provided us with digital versions of the data as published in the Data Atlas. After assigning IDs to every church district (*Kirchenkreis*) and cross-checking the data, we combined the data into one panel dataset. In a few cases, data were reported as double years, e.g., 1892/93. Attendance numbers for double years turned out to be in

the same range as those in single calendar years, so we assigned attendance numbers to the first year of a double year.

In our analysis, in order to reduce potential measurement error, we take three-year averages of church attendance around our years of analysis. However, results are equivalent when using the original year-specific data.[9]

A2. Income Data

Income data refer to income of male elementary school teachers, the only income data we are aware of that are available at the county level in a panel fashion over our period of investigation. Becker and Woessmann (2009) show that across the 452 Prussian counties, log teacher income in 1886 is highly correlated with other measures of economic development such as the size of the non-agricultural sector in 1882 (correlation coefficient 0.74) and a proxy for average income constructed from data on income tax and wages of unskilled day laborers in 1900 (0.71).

The data were collected by the Prussian Statistical Office and reported at the level of administrative counties (*Kreise*). Teacher income data are available for all Prussian counties in all the years 1886, 1891, 1896, 1901, 1906, and 1911. The data are drawn from the Galloway (2007) Prussia Database and are based on the following volumes of the *Preussische Statistik*: Volume 101, pp. 2-391 (for 1886); Volume 120, part II, pp. 2-313 (for 1891); Volume 151, part II, pp. 2-315 (for 1896); Volume 176, part III, pp. 2-485 (for 1901); Volume 209, part III, pp. 2-513 (for 1906); and Volume 231, part II, pp. 2-599 (for 1911).

[9] Beyond our pre-WW I data, in post-WW II West Germany the share of Protestants reporting to regularly attend church service declined from 13 percent in 1952 to 8 percent in 2005 (Pollack (2006), Table 1); among Catholics, the same measure declined from 51 percent to 23 percent over the same period.

In several cases, county reforms led to the split of counties into smaller units over time; typically, with increasing urbanization, counties were split into urban counties (*Stadtkreise*) and rural counties (*Landkreise*). In those cases, we aggregated data in later years up to the boundaries as of earlier years. This yields a balanced panel of teacher income data in constant county borders.

There are two changes in how teacher income is reported over time. First, in 1886 and 1891, teacher income covers only direct wage payments, but not extras such as housing allowances and any other allowances. From 1896 onwards, data include all components of income. To make data consistent over time, we pre-multiply direct wage payments in 1886 and 1891 by the county-specific ratio of total income over (only) wage payments observed in 1896.

Second, in 1911, income is only reported as total income of male and female elementary school teachers combined, whereas for all other years both genders are reported separately. In 1911, we impute income of male elementary school teachers by pre-multiplying total income of elementary school teachers by the county-specific share of male teachers in total income observed in 1906.

A3. Additional Data

The control variables used in Appendix Table A3 are taken from the Prussian Population Census in 1871. First used in Becker and Woessmann (2009), who provide variable definitions and detailed documentation, they are based on Königliches Statistisches Bureau, *Die Gemeinden und Gutsbezirke des Preussischen Staates und ihre Bevölkerung: Nach den Urmaterialien der allgemeinen Volkszählung vom 1. December 1871* (Berlin: Verlag des Königlichen Statistischen Bureaus, 1874). For additional information, see the ifo Prussian Economic History Database (iPEHD; Becker, Cinnirella, Hornung, and Woessmann (2012)).

The Population Census provides data on several measures that are often used in the church attendance literature and in the income literature, such as the age structure (where, in addition to the share of the population below 10 years of age, we also use the share of the population of age 60 and older from Galloway (2007)), gender distribution, the share of the county population that lives in urban areas, literacy, migration, and the share of Protestants in the population.

In the province of Hannover, county borders changed substantially between 1871 and 1886 in a fashion that prevents re-aggregation (for example, two old counties split and merged into three new counties). Counties in the province of Hannover are therefore dropped in the regression analyses in Table A3 that involve control variables from 1871.

A4. Merging the Datasets

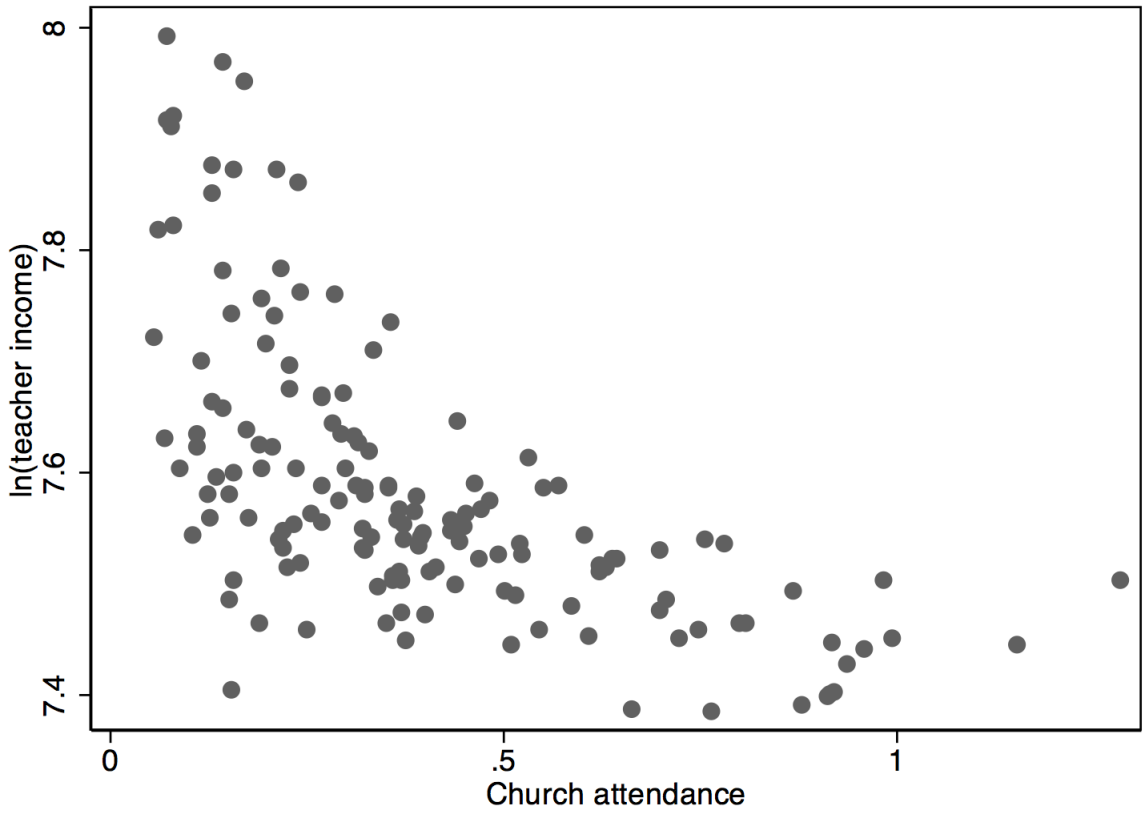
We merge the church attendance and income data by assigning the income data, available at the level of the administrative county, to that church district (for which we have church attendance data) which contains the capital of the administrative county (same for the 1871 control variables available for administrative counties). In cases where several county capitals are located in the same district, we aggregated the county data up to the church district level (taking population-weighted averages of income data).

To make regional entities comparable over time in face of territorial changes during our period of observation, we aggregated district and county data up to the highest level at which consistency over time is given. Our resulting dataset covers an unbalanced panel of 175 separate territorial entities (which we refer to as "counties") spanning 1886-1911. These counties constitute the intersection between modern Germany (for which Hölscher (2001) collected church attendance data) and Prussia at the end of the 19th century (for which Prussian census

records provide income data). Due to the intersection requirement, our analysis does not cover the non-Prussian parts of modern Germany (esp. the Southern parts) and the parts of Prussia not situated in modern Germany (esp. the Eastern Provinces situated in modern Poland and Russia). Due to lack of district-level data, we also miss the Province of Brandenburg (except for Berlin) and Western Pomerania. Table A1 in the Appendix provides descriptive statistics.

While teacher income data are complete for all years 1886, 1891, …, 1911, church attendance data have gaps for some church districts. Our main analyses in Table 2 use an unbalanced panel of observed church attendance (using three-year averaged data). Appendix Table A5 uses a balanced panel of counties where church attendance is also observed in all six waves. Appendix Table A6 uses an extended balanced panel that starts from all counties with at least four of the six waves of observed data and interpolates (the up to two remaining) missing years based on county-specific regressions of annual church attendance on a third-order polynomial in time in 1881-1916.

Figure A1
Income and Church Attendance, 1911



Note: Ln(teacher income) refers to log income of male elementary school teachers. Church attendance refers to participants in Holy Communion over Protestants.
Data sources: church attendance: Hölscher (2001) based on Sacrament Statistics; teacher income: Galloway (2007) based on Education Census.

Table A1
Descriptive Statistics

	Obs.	Mean	Std. Dev.	Min	Max
	(1)	(2)	(3)	(4)	(5)
Church attendance					
Pooled	898	0.47	0.28	0.06	1.48
1886	123	0.53	0.28	0.07	1.48
1891	149	0.50	0.28	0.07	1.42
1896	156	0.49	0.28	0.07	1.43
1901	162	0.48	0.29	0.07	1.40
1906	160	0.46	0.28	0.06	1.35
1911	148	0.39	0.25	0.06	1.29
ln(teacher income)					
Pooled	1,050	7.42	0.21	6.94	8.08
1886	175	7.23	0.16	6.95	7.78
1891	175	7.27	0.16	6.94	7.91
1896	175	7.34	0.15	7.08	8.06
1901	175	7.54	0.13	7.25	8.04
1906	175	7.58	0.15	7.29	8.08
1911	175	7.58	0.12	7.39	7.99
Control variables from 1871 cross-section					
Share of population $<$ 10 years	100	0.24	0.02	0.19	0.28
Share of population $>$ 60 years	100	0.08	0.01	0.04	0.10
Share female	100	0.51	0.02	0.44	0.54
Share of county pop. in urban areas	100	0.31	0.19	0.06	1.00
Share literate	100	0.95	0.02	0.87	0.99
Share born in municipality	100	0.66	0.10	0.40	0.85
Share of Protestants	100	0.81	0.28	0.03	1.00

Church attendance refers to participants in Holy Communion over Protestants. Ln(teacher income) refers to log income of male elementary school teachers.
Data sources: church attendance: Hölscher (2001) based on Sacrament Statistics; teacher income: Galloway (2007) based on Education Censuses; control variables: Becker and Woessmann (2009) based on Population Census.

Table A2
Income and Church Attendance: Year-by-Year Cross-Sections

	1886	1891	1896	1901	1906	1911
	(1)	(2)	(3)	(4)	(5)	(6)
Church attendance	-0.291	-0.334	-0.321	-0.256	-0.286	-0.309
	(0.040)***	(0.035)***	(0.033)***	(0.030)***	(0.033)***	(0.033)***
Const.	7.365	7.426	7.497	7.657	7.705	7.705
	(0.024)***	(0.020)***	(0.019)***	(0.017)***	(0.018)***	(0.015)***
Obs. = number of counties	123	149	156	162	160	148
R^2	0.308	0.384	0.381	0.314	0.321	0.376

Ordinary least squares (OLS) estimations in cross-sections of counties for respective year indicated in header. Dependent variable: log income of male elementary school teachers. Church attendance refers to participants in Holy Communion over Protestants. Standard errors in parentheses: significant at the *** 1, ** 5, * 10 percent level.
Data sources: church attendance: Hölscher (2001) based on Sacrament Statistics; teacher income: Galloway (2007) based on Education Censuses.

Table A3
Income and Church Attendance, 1886

Dependent variable:	ln(teacher income)		Church attendance	
	(1)	(2)	(3)	(4)
Church attendance	-0.285	-0.183		
	(0.048)***	(0.042)***		
ln(teacher income)			-0.927	-1.000
			(0.156)***	(0.228)***
Share of population < 10 years		-0.009		-0.022
		(0.007)		(0.016)
Share of population > 60 years		-3.298		-3.424
		(1.193)***		(2.885)
Share female		-0.242		1.591
		(0.962)		(2.241)
Share of county pop. in urban areas		0.049		-0.461
		(0.068)		(0.152)***
Share literate		-0.612		-0.326
		(0.489)		(1.151)
Share born in municipality		-0.259		-0.176
		(0.142)*		(0.337)
Share of Protestants		0.009		0.077
		(0.042)		(0.099)
Fixed effects for six Provinces		yes		yes
Const.	7.377	8.906	7.209	8.501
	(0.027)***	(0.683)***	(1.130)***	(2.596)***
Obs.	100	100	100	100
R^2	0.264	0.706	0.264	0.507

Ordinary least squares (OLS) estimation in cross-section of counties in 1886. Ln(teacher income) refers to log income of male elementary school teachers. Church attendance refers to participants in Holy Communion over Protestants. Control variables refer to the year 1871. Standard errors in parentheses: significant at the *** 1, ** 5, * 10 percent level.
Data sources: church attendance: Hölscher (2001) based on Sacrament Statistics; teacher income: Galloway (2007) based on Education Censuses; control variables: Becker and Woessmann (2009) based on Population Census.

Table A4
Restriction to Counties with at least 90 Percent Protestants

Dependent variable:	ln(teacher income)					Church attendance
	Pooled OLS	Fixed effects	First difference	Fixed effects	Fixed effects	Fixed effects
			1886-1911			
	(1)	(2)	(3)	(4)	(5)	(6)
Church attendance	-0.224	-1.610	-0.003	0.109	0.104	
	(0.013)***	(0.164)***	(0.133)	(0.069)	(0.096)	
Church attendance $(t-5)$					-0.010	
					(0.099)	
ln(teacher income)						0.025
						(0.032)
ln(teacher income) $(t-5)$						0.043
						(0.031)
Time fixed effects	yes	no	no	yes	yes	yes
Const.	7.294	8.195	0.364	7.495	7.165	0.024
	(0.013)***	(0.082)***	(0.013)***	(0.032)***	(0.046)***	(0.268)
Obs.	620	620	71	620	495	536
Number of counties	116	116	71	116	113	116
R^2	0.755	0.160	0.000	0.901	0.907	0.386

Unbalanced panel of counties observed every five years in 1886-1911. Sample restricted to counties with a share of Protestants in the population of at least 90 percent in 1885. Dependent variable in col. (1)-(5): log income of male elementary school teachers; in col. (6): participants in Holy Communion over Protestants. Church attendance refers to participants in Holy Communion over Protestants. In col. (3), both dependent and explanatory variables refer to the change between 1886 and 1911. Standard errors in parentheses: significant at the *** 1, ** 5, * 10 percent level. *Data sources*: church attendance: Hölscher (2001) based on Sacrament Statistics; teacher income: Galloway (2007) based on Education Censuses.

Table A5
Balanced Panel of Counties with Observed Data in All Waves

Dependent variable:	ln(teacher income)					Church attendance
	Pooled OLS	Fixed effects	First difference 1886-1911	Fixed effects	Fixed effects	Fixed effects
	(1)	(2)	(3)	(4)	(5)	(6)
Church attendance	-0.277 (0.018)***	-2.512 (0.166)***	-0.095 (0.139)	0.029 (0.086)	-0.160 (0.141)	
Church attendance $(t-5)$					0.133 (0.145)	
ln(teacher income)						-0.021 (0.029)
ln(teacher income) $(t-5)$						0.003 (0.029)
Time fixed effects	yes	no	no	yes	yes	yes
Const.	7.375 (0.015)***	8.601 (0.079)***	0.349 (0.014)***	7.222 (0.043)***	7.565 (0.054)***	0.588 (0.262)**
Obs.	522	522	87	522	435	435
Number of counties	87	87	87	87	87	87
R^2	0.690	0.347	0.005	0.913	0.903	0.554

Balanced panel of counties observed every five years in 1886-1911. Dependent variable in col. (1)-(5): log income of male elementary school teachers; in col. (6): participants in Holy Communion over Protestants. Church attendance refers to participants in Holy Communion over Protestants. In col. (3), both dependent and explanatory variables refer to the change between 1886 and 1911. Standard errors in parentheses: significant at the *** 1, ** 5, * 10 percent level.
Data sources: church attendance: Hölscher (2001) based on Sacrament Statistics; teacher income: Galloway (2007) based on Education Censuses.

Table A6
Balanced Panel of Counties after Interpolation of Missing Data

Dependent variable:	ln(teacher income)					Church attendance
	Pooled OLS	Fixed effects	First difference 1886-1911	Fixed effects	Fixed effects	Fixed effects
	(1)	(2)	(3)	(4)	(5)	(6)
Church attendance	-0.291 (0.013)***	-0.926 (0.107)***	0.0004 (0.064)	0.079 (0.039)**	0.009 (0.065)	
Church attendance $(t-5)$					0.050 (0.080)	
ln(teacher income)						0.015 (0.029)
ln(teacher income) $(t-5)$						0.006 (0.028)
Time fixed effects	yes	no	no	yes	yes	yes
Const.	7.409 (0.011)***	7.857 (0.051)***	0.351 (0.008)***	7.227 (0.019)***	7.219 (0.036)***	0.278 (0.263)
Obs.	960	960	160	960	733	800
Number of counties	160	160	160	160	160	160
R^2	0.680	0.086	0.000	0.902	0.903	0.316

Balanced panel of counties observed every five years in 1886-1911. Counties with original data in at least four of the six waves; missing values of church attendance interpolated based on county-specific regressions of annual church attendance data on a third-order polynomial in time in 1881-1916. Dependent variable in col. (1)-(5): log income of male elementary school teachers; in col. (6): participants in Holy Communion over Protestants. Church attendance refers to participants in Holy Communion over Protestants. In col. (3), both dependent and explanatory variables refer to the change between 1886 and 1911. Standard errors in parentheses: significant at the *** 1, ** 5, * 10 percent level.
Data sources: church attendance: Hölscher (2001) based on Sacrament Statistics; teacher income: Galloway (2007) based on Education Censuses.