Economic Inquiry

PROTESTANTISM AND EDUCATION: READING (THE BIBLE) AND OTHER SKILLS

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During industrialization, Protestants were more literate than Catholics. This paper investigates whether this fact may be led back to the intrinsic motivation of Protestants to read the bible and to what extent other education motives might have been involved as well. We employ a historical data set from Switzerland which allows us to differentiate between different cognitive skills: reading, numeracy, essay writing, and Swiss history. We develop an estimation strategy to examine whether the impact of religious denomination was particularly large with respect to reading capabilities. We find support for this hypothesis. However, we also find evidence which is consistent with the view that Protestants' education motives went beyond acquiring reading skills. (*JEL* I20)

I. INTRODUCTION

Recent research motivated by Weber (1905), who hypothesized that Protestants' work ethic is conducive to faster economic development, has delivered interesting novel insights. For instance, Becker and Woessmann (2009) argue that Protestant regions in late nineteenth-century Prussia grew faster than Catholic areas owing to higher literacy rates among Protestants. Becker and Woessmann (2010) provide evidence for preindustrialization Prussia (the year 1816) that both the density of primary schools and primary school enrollment were higher in Protestant regions.[1] In a similar vein, Boppart et al. (2013) show that, on average, Protestant regions in nineteenth-century Switzerland were associated with higher school expenditure and higher educational performance.[2]

This paper attempts to identify the educational motives of Protestants.[3] Was there a particular emphasis of Protestants for reading capabilities, possibly to read the bible? Were Protestants also better skilled in other fields like mathematics, that is, had they been motivated to

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1. This rules out that the emphasis on schools of Protestant regions was merely a response to higher demand for human capital during industrialization. Rather, it may have been a result of the reformation process itself, which in Germany had been led by Martin Luther. According to Painter (1886, 147): "Though no complete system of popular instruction was established, the foundation for it was laid. To this great result Luther contributed more than any other man of his time; and this fact makes him the leading educational reformer of the sixteenth century."

2. In addition, they find an important interaction effect with other cultural attitudes. Religious denomination primarily mattered for educational performance in a conservative environment, characterized by referenda results on issues which could be associated with conservative values.

3. By focusing on education we do not deny, of course, that religion may shape economically relevant human behavior through many other channels, as discussed, for instance, in the survey by Iannaccone (1998).

ABBREVIATIONS

IV: Instrumental Variable
OLS: Ordinary Least Squares

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develop cognitive skills in general? Distinguishing several dimensions of cognitive skills is critical to answer these questions. The answers are potentially important to understand the fundamental sources of differential regional economic development. For instance, if Protestants reveal higher educational efforts not just in reading, but also in other fields, then in line with Weberian thoughts, we have indications of a Protestant work ethic which extended toward education.[4]

We employ a unique data set from the second half of nineteenth-century Switzerland (Woitek and Wüthrich 2010), which allows us to measure cognitive skills by conscripts' marks in the pedagogical examinations on reading, essay writing, numeracy, and Swiss history. The pedagogical examinations were based on standardized tests and covered the whole male population. The data set enables us to examine in which education fields there are differences in test scores between Protestant and Catholic districts and whether possible differences are more pronounced with respect to reading capabilities than for the other three fields covered by the tests. If the hypothesis is correct that bible reading was an important motivation for Protestants to acquire education, the comparatively high emphasis of Protestants on reading capabilities should materialize in high test scores for reading, relative to, say, mathematics. One could argue that there exist positive spillovers between different skills. For instance, reading as a basic skill may have positive spillovers on the acquisition of other skills. But still, unless one relies on sufficiently large spillover effects the question remains if differentials across religious denominations in test scores can be attributed to different motives for acquiring education.

For identifying a "Protestant reading bias" we propose a simple model of individual (effort) investment for developing different kinds of cognitive skills. Under the assumption that spillover effects are not too large, theoretical considerations provide us with a structural approach where we estimate the impact of Protestantism on reading skills while controlling for other cognitive skills, like math capability. As in Boppart et al. (2013), we employ analogously to Becker and Woessmann (2009, 2010) an instrumentation strategy which relates religious denomination in a district to its distance to the centers of Protestantism in Switzerland (Zurich and Geneva) while at the same time controlling for distance to bigger cities in general (which had no important effect on cognitive skills).

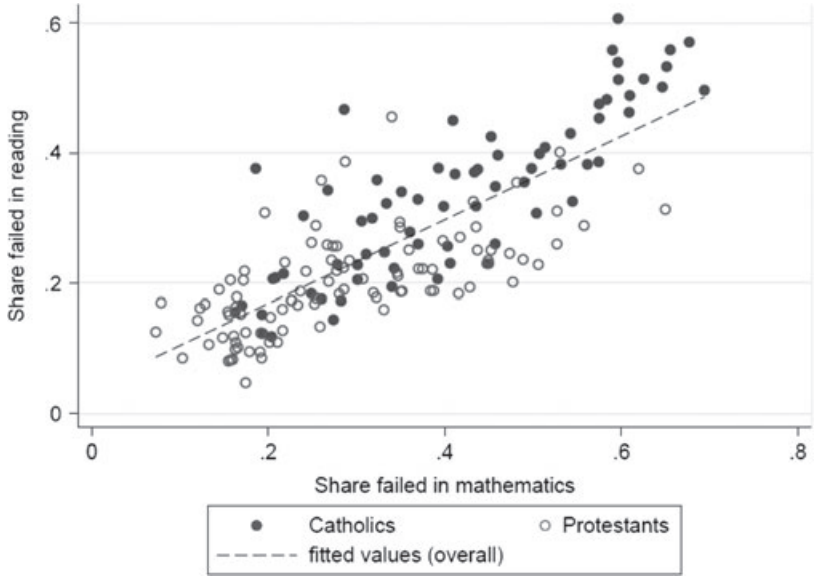
Studying within-country variation of cognitive skills in Switzerland at the time of industrialization is particularly appropriate for our purpose. First, Swiss districts had a common constitution and consequently little regional differences in institutions, typically hard to control for in cross-country studies. Second, the reformation process in the first half of the sixteenth century spread directly from Prussia to Switzerland.[5] The first main reformer in the Old Confederation was Ulrich Zwingli. Zwingli began to preach ideas of reforming the Catholic church after becoming pastor in 1519 at one of the major churches in Zurich (the Grossmünster), shortly after Martin Luther published his 95 theses (October 1517). The city of Zurich converted to Protestantism in 1523, followed by the rural areas in Zurich and then by the cities of St. Gall, Schaffhausen, Basel, Bienne, Mulhouse, Bern, and Geneva (in 1536). Since 1541, the French theologian John Calvin (Jean Cauvin) gradually implemented a close connection between state and church in Geneva until his death in 1564. His predestination doctrine was the main basis for the Weberian idea of a Protestant work ethic. It holds that Protestants are particularly motivated by material well-being in order to receive a signal of God to be chosen for salvation.

The Calvinist doctrine raises the question whether higher literacy of Protestants was merely a by-product of their motive to read the bible or if Protestants followed other education motives as well. Our evidence suggests that Protestants were indeed particularly motivated to develop reading skills relative to other cognitive skills. However, we also find that Protestants were better skilled in all other educational fields in our data set. Thus, our analysis suggests that Protestants were also motivated, and more so than Catholics, to invest in other types of education.

4. Our research question is thus only loosely related to the contemporaneous debate in the United States whether private secondary schools organized by the church, like Catholic schools, perform better. For instance, Sander and Krautmann (1995) find that Catholic schools have lower dropout rates, but do not have higher education attainment, when selection effects are taken into account. Sander (1996) argues that pupils of Catholic schools have better test results in some fields. However, this finding is fully driven by non-Catholic pupils attending Catholic schools.

5. See Boppart et al. (2013) for a more detailed account of the religious and political situation as well as the education system in Switzerland during and after the Reformation period.

FIGURE 1
The Share of Failed Conscripts in Math and Reading 1870 by Religious Denomination



The basic messages of this paper are visualized in Figure 1. It plots the share of those conscripts who failed the test in mathematics against the share who failed the reading test in the year 1870.[6] The black dots indicate a district where the majority is Catholic and the white circles one which is primarily Protestant. Not surprisingly, there is a strongly positive correlation between the fraction of low performers in the math test and that in the reading test. Two features are striking, however. First, many Protestant districts are at the bottom-left, whereas many Catholic districts are located at the upper-right part of the scatterplot. This reflects better average performance of Protestants in both educational fields. Second, most Catholic districts are above the fitted line, whereas most Protestant districts are below it. This illustrates what we call "Protestant reading bias": for a given fraction of low performers in math or other fields, Protestants have a lower fraction of low performers in reading (analogously for high performers). In fact, the districts shown in Figure 1 in which the share of those who failed the reading test was particularly high (above 50%) were all districts with a Catholic population share of 97% or higher.[7] All of these districts are clearly above the fitted line.

There is of course a large literature on the economics of education. Our rich data set on public school inputs relates our study to the literature on the effects of school resources on educational production or, more precisely, on standardized test scores. For the United States, the literature is reviewed, inter alia, by Hanushek (1986, 1996, 2002) and Greenwald, Hedges, and Laine (1996). Woessmann (2005) provides a detailed account of evidence from Western European countries. The reviews provide mixed conclusions about the effectiveness of school resources in raising test scores. For instance, many ordinary least squares (OLS) estimates with school-level data suggest that raising school expenditure to lower the pupil-teacher ratio has little impact on test scores. As theoretically shown by Lazear (2001), class size effects on individual test scores are biased toward zero when behavior of students is not controlled for and low-performing pupils are put into smaller classes. In this paper, this problem is substantially reduced by aggregating

6. One may, of course, also look at average test scores, which would convey similar results than the ones in this paper. In order to capture the distribution of grades we consider two measures rather than one, the fraction of conscripts with the best grades (1–2) and the fraction of those with the worst grades (4–5) as measures for educational performance.

7. These were the districts Gersau and March (canton of Schwyz), Riviera (Ticino), and Goms, Raron, and Visp (Valais).

to the district level. Hanushek, Rivkin, and Taylor (1996) argue that existing studies using state-level or district-level data show higher effects of school resources on test scores, and point out the necessity to control for nonschool district or state characteristics. Closest to this paper, Feijgin (1995) deals with the potential effects of learning the Torah on academic excellence. Examining both reading and mathematics achievement scores in a contemporaneous sample of U.S. students, she finds that Jewish students (along with Asian students) perform better than the average, particularly in mathematics. This raises the question to what extent this result can be attributed to the reading of the Torah.

The paper is organized as follows. Section II discusses that, consistent with Figure 1 and our econometric findings, the main reformers Luther, Zwingli, and Calvin themselves were not only concerned with enabling the masses to read the bible, but also had broader educational goals. This section also addresses some differences between Catholics and Protestants in their attitudes toward the role of schooling in the eighteenth and nineteenth centuries. Section III then outlines a simple theoretical model from which we develop the estimation strategy. Section IV describes the data. Section V presents the empirical results. Section VI concludes.

II. ATTITUDES OF PROTESTANT REFORMERS TOWARD EDUCATION

The reformation process was primarily motivated by the dissatisfaction of Catholics about doctrines and malpractices such as the sale of indulgence, selling and buying clerical offices, the authority of the Pope, and mandatory celibacy of priests. The Protestant movement may thus be perceived as an attempt to focus on the contents of the bible and thereby limit abuses of power of the Catholic church. Thus, general knowledge of the Gospel by the masses may have been viewed by reformers as being conducive to sustain the Protestant movement.

In this section we confirm that the main Protestant reformers in Switzerland and Germany indeed emphasized education to enable masses to read the bible. Our evidence on a Protestant reading bias is consistent with this motivation. However, as we also argue in the following, one should be cautious to conclude that higher literacy of Protestants "was an unintended side effect of Luther's exhortation that everyone be able to read the Gospel" (Becker and Woessmann 2009, 581). In fact, the main reformers in Switzerland and Germany followed several educational goals. These could have particularly materialized in good reading skills but may also have led to better skills in other fields like math, consistent with our evidence.

The Swiss reformation which was initiated in the early 1520s in Zurich by Zwingli in the German-speaking part of the Confederation had many similarities with the one initiated by Luther in Prussia. Zwingli preached and took action against mendicants and the mercenary service, challenging Lenten fasting, the veneration of saints, and clerical celibacy (Gordon 2002).[8] Moreover, importantly for our education context, Kemp (1901, 164) points out:

> *In 1523 he wrote [...], almost beyond a doubt, was the first Protestant treatise on education. It was entitled The Christian Education of Youth.*

There, Zwingli (1523, 67–69) explicitly referred to the need of the youth to be taught to read the bible:

> *[..] the Gospel should be taught most diligently and, as much as may be, in all its purity. [...] the youth should, in consequence of this, order well and adorn beautifully his own heart. [...] He cannot order his mind and prepare his heart better, however, than by engaging in the study of the Word of God, day and night.*

However, what is less recognized is that Zwingli was heavily concerned with promoting education beyond the goal to enable masses to read the bible. In fact, he also mentioned mathematics. Kemp (1901, 165) summarizes Zwingli's treatise on education as follows:

> *He outlined a course on Scriptural study [...] He advocated the study of objects in nature, regarding the beautiful structure of the world and the harmonious arrangement of its parts as revelations of wisdom, skill, and loving providence of God. He proposed also the study of the classics and Hebrew, and with them the study of arithmetic, surveying, and music.*

In the Francophone part of Switzerland, the main reformer was the French theologian

8. The reformation process met huge resistance from some cantons of the Old Confederation in Switzerland, leading to the two wars of Kappel in 1529 and 1531 between the Protestant and the Catholic cantons. Zwingli died on the battlefield on October 11, 1531, 2 days after the Catholic cantons declared war on Zurich.

Calvin. Weber (1905) has argued that Calvin's doctrine about predestination of salvation helped Protestants to develop a work ethic, although in a subtle manner. While in Roman Catholicism individual behavior can affect salvation, Calvinism would hold that economic success may be a signal of God of being appointed to salvation.[9] Calvin was not only a theology professor and preacher, but during his time in Geneva also a church ruler[10] and superintendent of schools (Schaff 1892). Similar to Luther and Zwingli, he emphasized the need for universal education, "for every person to be adequately equipped to 'rightly divide' God's Word" (Armstrong 1992).

In sum, the concern for education of Zwingli and Calvin seems to have gone beyond promoting reading capabilities, although bible reading was an important concern. Interestingly, the same applies to Luther. On the one hand, also Luther (1520, 325–326) supported the goal to enable reading the bible:

> *Above all, in schools of all kinds the chief and most common lesson should be the Scriptures, and for young boys the Gospel; and would to God each town had also a girls' school, in which girls might be taught the Gospel for an hour daily, either in German or Latin!*[11]

On the other hand, Luther emphasized the role of education for shaping society:

> *In support for his plea for schools Luther clearly and vigorously set forth a number of arguments. The first was based on a moral value of education. He claimed that neither reason nor Christian love could suffer any part of the population to grow up undisciplined, and thus become [...] sources of destruction to the community. The public school plan [...] included secondary schools with courses in Latin, Greek, Hebrew, history, and mathematics. [...] His general argument for these secondary schools was the relation of education to prosperity. "A city's prosperity", he declared, "does not consist alone in the accumulation of treasure, in strong walls, beautiful houses, many weapons and equipments; but its greatest wealth, its health and power, does consist in [...] sensible, honest, and well-disciplined citizens".* (Kemp 1901, 168f.)

In a similar vein, Ornstein and Levine (2008) argue that Luther saw education as instrumental for developing character traits of children. Moreover, the authors also see economic motives behind Luther's emphasis of education:

> *Luther recognized education as an important ally of religious reformation. He saw church, state, family, and school as crucial reform agencies. Believing that the family had a key role in forming children's character and behavior, Luther encouraged family bible reading and prayer. He also wanted parents to make sure that children had vocational training so that they could support themselves as adults and become productive citizens.* (Ornstein and Levine 2008, 86)

In sum, Protestant reformers not only emphasized education based on reading the bible but also recognized that education was, inter alia, instrumental to other educational goals. As outlined in the brief history of education and the federal state in Switzerland presented in Boppart et al. (2013), the dogmatic attitudes toward education after the period of Reformation lost ground after the end of the confessional wars in 1712. In the eighteenth century, in particular, the Protestant schools underwent some secularization which led to an integration of more "worldly" things into the curriculum. After the fall of Napoleon the restaurative forces gained power in Europe in the first half of the nineteenth century. They led also in Switzerland to a strong opposition to reforms with the opposition coming from supporters of Rome and catholic Austria. In 1848, the federal state was founded, which was followed by a period of controversial public debate between liberal and conservative forces, in particular also about reforms in the school system and its secularization. There was overlap between Protestantism and support of liberal ideas like separation of religious instruction and other subjects, although the frontline did not fully coincide with religious denomination. In 1874, Switzerland adopted a new constitution (against opposition of conservative catholic cantons) which among other things introduced the referendum as an important instrument of direct democracy and also contained an article on education. The article fixed at a federal level compulsory schooling (existing in many cantons previously). Moreover, schooling should be free of charge, under the

9. Cavalcanti, Parente, and Zhao (2007) introduce these different beliefs about salvation into a dynamic general equilibrium model. They infer from simulations of a calibrated version of their model that differences in thrift and labor supply implied by the different beliefs can account for delays in the start of industrialization across countries and regions.

10. Although Calvin's church organization had democratic elements, he also instituted a rigid inspection of household conduct. Many recreational activities as well as blasphemy and ribaldry were forbidden. Nonconformists were persecuted and even sentenced to death.

11. Becker and Woessmann (2008) show that Protestantism mitigates the gender gap in education, which may be associated with Luther's concern for the education of girls.

control of the state and satisfy minimal standards. Although surveillance of the standards by a federal office of education was rejected in a referendum 1882, the pedagogical examination of conscripts by a standardized test in reading, essay-writing, mathematics, and Swiss history provided an alternative instrument for the statistical monitoring of variations of educational performance across Swiss districts. The results of these examinations build the basis of the data set we exploit in the empirical analysis. Before turning to this analysis, we set up a simple model which motivates our estimation strategy.

III. A SIMPLE MODEL

Consider a representative individual in a district. Denote cognitive skill in reading and math by R and M, respectively. Suppose R and M are functions f_R and f_M of "effort," e_R and e_M, invested in the respective type of education. Moreover, we allow for positive spillovers from reading to math skill. Other variables which affect educational outcomes are summarized in vector x. Let f_R and f_M be given by the following linear functions:[12]

(1)
$$R = f_R(e_R, \mathbf{x}) = a_0 + a_1 e_R + \mathbf{x}'\mathbf{a}_x,\ a_1 > 0,$$

(2)
$$M = f_M(e_M, R, \mathbf{x}) = b_0 + b_1 e_M + b_2 R + \mathbf{x}'\mathbf{b}_x,\ b_1, b_2 > 0.$$

We assume $a_1 b_2 < b_1$, which means that the spillover effect from reading skills to mathematical skills cannot fully substitute mathematical learning. This excludes the corner solution $e_M = 0$ in the individual effort choice problem. Suppose the individual has preferences for both consumption (c) and cognitive skills (R, M), that is, values education per se. Moreover, suppose that religious denomination affects preferences (e.g., the marginal rate of substitution between consumption and cognitive skills and/or between different cognitive skills). Let P indicate whether the individual is a Protestant ($P = 1$) or not ($P = 0$). Preferences are represented by the utility function $u(c, R, M; P)$.

12. One may argue that math skills also determine reading performance. This would not change our derived estimation strategy as long as math effort would not be more important in the production of reading skills than reading effort. We therefore abstract from such a spillover to leave the motivating theory as simple as possible.

Disposable income and thus consumption level c is given by a function F which may positively depend on cognitive skills (R, M) and is decreasing in total effort invested in education, $e = e_R + e_M$:

$$c = F(R, M, e). \tag{3}$$

For instance, more effort allocated to education reduces the time spent to work.

Define $\tilde{f}_M(e_M, e_R, \mathbf{x}) \equiv f_M(e_M, f_R(e_R, \mathbf{x}), \mathbf{x})$. Optimal effort provision toward skills (R, M) is given by

$$(e_R^*(\mathbf{x}; P), e_M^*(\mathbf{x}; P)) \equiv$$

$$\arg\max_{(e_R, e_M)} u(F(f_R(e_R, \mathbf{x}), \tilde{f}_M(e_M, e_R, \mathbf{x}), e_R + e_M), f_R(e_R, \mathbf{x}), \tilde{f}_M(e_M, e_R, \mathbf{x}); P). \tag{4}$$

Inserting a colinear approximation of function e_R^* for reading effort e_R in Equation (1) we obtain

$$R = \alpha_0 + \alpha_1 P + \mathbf{x}'\alpha_x. \tag{5}$$

Similarly for math. This suggests to regress measures for different cognitive skills separately on a measure for Protestantism and other controls.

The approach in Equation (5) does not allow us, however, to compare the effects of religious denomination on different cognitive skills, like reading versus math skills. This is because both kinds of skills are likely to be highly related to each other and differently distributed. In order to be able to identify whether Protestants were particularly motivated to develop reading skills vis-à-vis math skills (or others), we divide the optimization problem (4) into two parts, finding first the optimal allocation between e_R and e_M for given total effort e and then, secondly, choosing the optimal level e. We focus on the optimal choice in the first part to examine whether there is a "Protestant reading bias." Optimal effort choice for given e reads

$$(\tilde{e}_R(e, \mathbf{x}; P), \tilde{e}_M(e, \mathbf{x}; P)) \equiv$$

$$\arg\max_{(e_R, e_M)} u(F(f_R(e_R, \mathbf{x}), \tilde{f}_M(e_M, e_R, \mathbf{x}), e), f_R(e_R, \mathbf{x}), \tilde{f}_M(e_M, e_R, \mathbf{x}); P) \text{ s.t. } e_R + e_M = e. \tag{6}$$

Suppose function $\tilde{e}_M$ can be inverted such that we can write $e = E(e_M, \mathbf{x}; P)$. We then obtain

$$e_R = e - e_M = E(e_M, \mathbf{x}; P) - e_M. \tag{7}$$

Let us also invert the function $M = f_M(e_M, R, \mathbf{x})$ in (2) to obtain

$$(8) \quad e_M = (M - b_0 - \mathbf{x}'\mathbf{b}_x - b_2 R)/(b_1) \equiv g(M, R, \mathbf{x}).$$

When we plug $e_M = g(M, R, \mathbf{x})$ into the right-hand side of (7) and the resulting expression for e_R into $R = f_R(e_R, \mathbf{x})$ we get

$$(9) \quad R = f_R(E(g(M, R, \mathbf{x}), \mathbf{x}; P) - g(M, R, \mathbf{x}), \mathbf{x}),$$

implicitly defining a relation between R, M and P. For instance, consider a linear approximation of $\tilde{e}_M$:

$$(10) \quad \tilde{e}_M(e, \mathbf{x}; P) \simeq \gamma_0 + \gamma_1 e + \mathbf{x}'\gamma_x - \theta P = e_M.$$

Solving the latter for e to obtain $E(e_M, x; P)$ and substituting it into (7) leads to

$$(11) \quad e_R = ((1 - \gamma_1)e_M - \gamma_0 - \mathbf{x}'\gamma_x + \theta P)/(\gamma_1).$$

Note that, plausibly, $\gamma_1 \in (0, 1)$, which means that a marginal increase in total effort e raises both $\tilde{e}_R$ and $\tilde{e}_M$. Moreover, and importantly, if Protestantism affects the educational effort structure (e_R, e_M) toward reading, then $\theta > 0$.

Substituting Equation (8) into Equation (11) and then the resulting expression for e_R into Equation (1) we find that

$$(12) \quad R = \beta_0 + \beta_1 P + \beta_2 M + \mathbf{x}'\beta_x,$$

$$\text{with } \beta_1 \equiv \frac{a_1\theta}{z\gamma_1}, \ \beta_2 \equiv (a_1(1 - \gamma_1))/(zb_1\gamma_1),$$

where $z \equiv (a_1 b_2 + \gamma_1 (b_1 - a_1 b_2))/(\gamma_1 b_1) > 0$.[13] We run this type of regression to examine a possible Protestant reading bias.[14] Recall that higher effort raises cognitive skills, $a_1, b_1 > 0$, and that $\gamma_1 \in (0, 1)$. Thus, if $\beta_1 > 0$, we conclude that there is an effort bias of Protestants toward reading ($\theta > 0$). Moreover, we expect $\beta_2 > 0$.[15]

An immediate implication of the simple decision framework is the following. If there is a Protestant reading bias ($\theta > 0$) but Protestants did not value education per se more than Catholics, that is, have chosen a similar total effort level e, then their effort in other skills like math, e_M, must have been lower. For instance, consider the utility function $u(c, R, M; P) = \log c + \kappa(P)R + \eta(P)M$, where $\kappa(P)$ and $\eta(P)$ reflect the nonmaterial motivation for reading and math, respectively, possibly depending on religious denomination, $P \in \{0, 1\}$. A Protestant reading bias is captured by $\kappa(1) > \kappa(0)$. If all other things were equal, reading effort e_R would be higher for Protestants, whereas effort devoted to acquire math skills, e_M, would be lower. Evidence on higher math performance of Protestants and higher reading performance for a given math performance would thus be consistent with the hypotheses $\eta(1) > \eta(0)$ and $\kappa(1) >> \kappa(0)$. In fact, the previous section suggests that Protestants were also motivated to learn arithmetic and other skills, although particularly emphasizing reading skills.

IV. DATA AND IDENTIFICATION

This section describes the data employed in our empirical analysis and discusses identification issues. Data sources are provided in Appendix A.

A. *Cognitive Skills and Some Statistics*

The fraction of Protestants in a district is our main independent variable of interest (*Protestants*). Cognitive skills are measured by the results of pedagogical examinations of conscripts in the military service. The tests were compulsory for every male citizen. They were explicitly introduced by the federal state to survey the efficiency of school systems, with high priority given to comparability of results. We use three 5-year averages of test scores for the periods 1875–1879, 1885–1889, and 1899–1903 in panel regressions with time fixed effects.

13. Note that $z = 1$ if there is no spillover from reading to math skill ($b_2 = 0$).

14. As the linear approximation of function $\tilde{e}_M$ in Equation (10) may be too crude, we also allowed, in robustness checks, for an additional term $\beta_3 P \times M$ on the right-hand side of Equation (12) when examining the effects of Protestantism and math performance on reading performance (results not shown). The estimations suggest that the effect of Protestantism remains stable, although β_3 sometimes enters significantly. In principle, there may also be a nonlinear effect of Protestantism on reading performance. However, because our measure for P, the share of Protestants in a district, is concentrated on zero and one, we cannot allow for such a nonlinear effect due to multicollinearity. For instance, the correlation coefficient between the fraction of Protestants and its squared value is 0.982.

15. The coefficients β_0 and β_x are unimportant and we have no prediction. They are given by $\beta_0 \equiv \frac{1}{z}(a_0 - ((a_1 b_0(1 - \gamma_1))/(b_1\gamma_1)) - (a_1\gamma_0/\gamma_1))$, $\beta_x \equiv \frac{1}{z}(\mathbf{a}_x - (a_1(1 - \gamma_1)\mathbf{b}_x)/(b_1\gamma_1) - a_1\gamma_x/\gamma_1)$.

TABLE 1
Summary Statistics

Variable	Mean	SD	Min.	Max.
Best reading	0.4029031	0.1432474	0.0427046	0.8618654
Best essay	0.2468622	0.1044783	0.0200803	0.7508855
Best math	0.2994142	0.1167105	0.0462633	0.7260921
Best history	0.1820285	0.0859801	0.0167598	0.5301062
Failed reading	0.1151478	0.1193597	0	0.5589623
Failed essay	0.2146129	0.1731524	0.007874	0.759434
Failed math	0.1882927	0.136435	0.011811	0.6556604
Failed history	0.333545	0.2156219	0.0145631	0.8564669
Protestants	0.5635065	0.4124564	0	0.9993389
Best grade (all topics)	0.282802	0.1056755	0.0453737	0.7172373
Failed (all topics)	0.2128996	0.1553381	0.0133495	0.6963444

Note: Summary statistics of the pooled sample.

There were standardized test in four subjects: reading, essay-writing, mathematics (written and oral) as well as knowledge of Swiss history and constitution. In the first 5 years (1875–1879), the grades ranged from 1 (very good) to 4 (poor), and thereafter from 1 to 5. We use the fraction of conscripts with the best grades (1–2) in the four subjects and the fraction of pupils with insufficient grades (4–5) as measures for four kinds of cognitive skills in a district.[16]

Reading capability, R, is measured in two ways: by the fraction of the best conscripts ($Best\ Reading$) and by the fraction who failed ($Failed\ Reading$). Similar measures apply to math, M, and the other two fields, essay-writing and history. Table 1 provides summary statistics for the pooled sample (all three time periods) of the educational performance measures and the share of Protestants. The variation in the data is remarkable. The fractions of both high performers and low performers in all education fields range from below 5% to above 50%. In some districts, both fractions were as high as 86%. The average fraction of high performers among the fields is highest in reading (40.3%). Variable $Best\ Reading$ also has a high standard deviation of 14.3%. On average, 11.5% of conscripts failed the reading test ($Failed\ Reading$). When all educational fields are combined, the mean fraction of high performers is 28.3% and that of low performers is 21.3%, with standard deviation of 10.6% and 15.5%, respectively.

16. Conscripts had incentive to do well. Those with grades 4–5 in more than one subject had to take repetition courses during military service. It was also common that names and grades were published in local newspapers.

The mean fraction of Protestants averaged over all districts was 56.4%. However, the distribution of the share of Protestants in the data is bipolar, with peaks close to zero and one. This is reflected in the very high standard deviation of 0.41.

Table 2 provides correlation coefficients between the fractions of high and low performers in reading and math on the one hand and between cognitive skills in a district and the share of Protestants on the other hand. One sees that Protestants do better in all fields. They have more high performers and less low performers, with correlation coefficients between religion and skills of magnitudes between 0.22 and 0.30. The share of low performers in reading is very strongly (albeit far from perfectly) correlated with the share of low performers in math; an analogous pattern holds for high performers. Moreover, also not surprisingly, the share of high performers is negatively correlated with the share of low performers in and across fields.

B. Other Variables

We control for the economic, geographical and sociocultural environment of a district by a large set of controls suggested in the literature.[17] The stage of economic development is captured by the proportion of population employed in the primary sector ($Primary$) and by population density in logs ($Density$). Thereby, we address the potential concern that our results are driven by a different demand for human capital in Protestant and Catholic districts. We also

17. For a more detailed description of the control variables, see Boppart et al. (2013).

TABLE 2
Correlation

Variable	Protestants	Best Reading	Best Math	Failed Reading	Failed Math
Protestants	1.0000				
Best reading	0.2797*	1.0000			
Best math	0.2964*	0.8419*	1.0000		
Failed reading	−0.2297*	−0.5811*	−0.4702*	1.0000	
Failed math	−0.2243*	−0.5557*	−0.5998*	0.8961*	1.0000

*Significant at the 1% level.

control for the altitude above sea level in logs of the main town of a district (*Altitude*) as a measure of a district's remoteness. Moreover, we include dummy variables for the majority language in a district (*French*, *Italian*, *Romansh*, i.e., German language is the omitted category), since language may be related to religion and may affect attitudes toward schooling. Finally, we account for the ratio of children (below 16 years old) to total population (*Children*). We want to rule out that our results are driven by a correlation between religious denomination and fertility, with the number of children being negatively related to their skills (labeled "quality-quantity trade-off" in fertility choice models). For instance, it could be the case that Catholics have more children and therefore put less emphasis on education.

In some regressions we also employ various measures of primary school inputs at the district level, which have been suggested by the literature on educational production. This helps us to examine whether possible effects of religious denomination work through regional differences in school organization and public school finance. The data were collected for a prize-winning contribution to the World Exhibition in Vienna in 1873 and follow-ups in National Exhibitions. School inputs are aggregated by districts. They cover the years 1871/1872 (156 observations), 1881/1882 (168 observations), and 1894/1895 (169 observations). We allow school inputs in 1871/1872 to affect results of the pedagogical examinations in the period 1875–1879, and inputs in 1881/1882 and 1894/1895 to affect outcomes in 1885–1889 and 1899–1903, respectively. We use total annual real public school expenditure per pupil in logs (*Expenditure*), the real capital stock per pupil in logs (*Capital*), the pupil-teacher ratio (*Class Size*), and the number of school weeks (*Weeks*). Moreover, we control for the number of school days per year a pupil is absent from school in logs (*Absenteeism*). This variable can be interpreted as an inverse measure of the degree of utilization of the supply of school services. We also account for characteristics of teachers: the fraction of clerical teachers which either belongs to a religious order or works in a parish (*Clerics*), the fraction of teachers who do not possess vocational education from university, teacher training seminars, or grammar schools (*Poor Training*), the fraction of teachers older than 40 years (*Age*), the fraction of teachers with more than 20 years of service (*Length of Service*), and the fraction of female teachers (*Female*).

C. Identification Strategy

We address the concern that OLS estimates (with time fixed effects) of the impact of Protestantism on cognitive skills may not represent causal effects. For instance, when we run regression (5) it could be possible that (average) unobserved ability to acquire education in a district determined, at the time of Reformation, whether a district became Protestant or remained Roman Catholic and then ability was transmitted from generation to generation. In this case, the coefficient on religion would be biased in an OLS estimation. As argued in Boppart et al. (2013), however, the reformation process in Switzerland does not suggest that the distribution of religious denomination is endogenous. Furthermore, with regard to regression (12), endogeneity is even more unlikely. β_1 would be biased if Protestantism is correlated with an unobserved variable which affects the reading bias. We control in our estimations for many sociocultural characteristics as well as for school inputs and absenteeism. Hence, such an unobserved variable is not easy to think of.

Nevertheless, we follow an instrumental variable (IV) strategy which is similar in spirit to Becker and Woessmann (2009) for Prussia, who use the distance to Wittenberg as instrument for

Protestantism.[18] As discussed in Section II, in Switzerland the Reformation began in the city of Zurich under church leader Zwingli and then spread to the canton of Zurich before reaching other cities. In the Francophone part, after Geneva adopted Protestantism, the influential figure was Calvin who led the Reformation process in the west of Switzerland. We therefore take the shorter (log) distance of the main town of a district to one of the two cities Zurich and Geneva as an instrument for the share of Protestants in a district.

Anectodal evidence suggests that Zurich and Geneva had—compared with other cities—no special affinity to education. For instance, the first Swiss university was founded in Basel in the year 1460 far before the ones in Geneva and Zurich (in 1559 and 1833, respectively). Moreover, the number of monasteries before the time of the reformation in Zurich and Geneva were only slightly above the average of bigger cities:[19] There were 11 monasteries in Basel, 6 in Bern, 3 in Lucerne, and 2 in St. Gall, compared with seven monasteries in Zurich and Geneva.

More importantly, we run a "placebo instrument test" where we use the distance to St. Gall, Basel, Bern, or Lucerne as an instrument for Protestantism (instead of the distance to Zurich/Geneva) and indeed verify that any of these distances enter the first stage insignificantly or even with a "wrong" sign (results not reported). The distances are calculated using historical sources to be able to measure the actual length of routes between the main town of a district and Zurich/Geneva. We provide first-stage results for our IV estimates, with the distance to Zurich/Geneva as instrument for the share of Protestants in a district, in Appendix B.

With regard to regression (5), one potential problem with instrumenting Protestantism in that way could be that ability was generally more concentrated closer to cities. In this case the identifying assumption, that the distance to Zurich/Geneva is uncorrelated with unobserved variables which affect human capital formation, would be violated. To address the concern that there is such a "city-bias" we additionally control for the (shortest) log distance to one of the six big cities (Zurich, Geneva, St. Gall, Basel, Bern, and Lucerne) in the IV regressions. Then, the identifying assumption is fulfilled as long as unobserved characteristics (as ability) are uncorrelated to the distance to Zurich and Geneva for given proximity to the next big city, population density, and altitude. This assumption should be met as long as Zurich and Geneva had—compared to other big cities—no special affinity to education.

18. See also Dittmar (2011) and Jared (2013) who use in an analogous fashion the distance to Mainz (home of Johannes Gutenberg) as an instrument for the adoption of the printing press, which Gutenberg invented in Europe.

19. We are grateful to Ulrich Woitek for providing us with the data on the regional distribution of monasteries in Switzerland.

V. EMPIRICAL RESULTS

We first present the estimation results for all four fields separated (regression (5)), before coming to the question if there was a Protestant reading bias (regression (12)).

A. Protestantism and Different Skills

In this section we show the results from regressing our measures for cognitive skills in reading, numeracy, essay-writing, and history separately on the share of Protestants and other controls. We allow for time fixed effects to take into account the panel data structure.

Table 3 presents the regression results when the share of high performers in one of the four subjects is the dependent variable. We control for the stage of development (*Primary*, *Density*), geography (*Log Altitude*), family structure (*Children*), and majority language. In all non-IV estimations (columns (1)–(4)), the effect of Protestantism is significant at the 1% level. Column (1) shows that, on average, a fully Protestant district has a 10.6 percentage points higher fraction of high performers in reading than a fully Catholic district (coefficient α_1 in Equation (5)). The effects on math and essay-writing skills are somewhat lower, the one on history much lower. The ranking of the sizes of effects corresponds to the average share of high performers (highest in reading and lowest in history; see Table 1). Owing to the different distribution of test scores across fields and their strong correlation it is not possible to identify a motivational bias toward certain skills from these and the following results in this section, however. Columns (5)–(8) show IV results for the same regression equations. As typically the case with instrumentation, standard errors increase such that the coefficient on Protestantism sometimes becomes less

TABLE 3
Effect of Protestantism on the Share with Best Grade

	Reading (1)	Essay (2)	Math (3)	History (4)	Reading (5)	Essay (6)	Math (7)	History (8)
Protestants	0.106***	0.079***	0.091***	0.037***	0.182***	0.111**	0.192***	0.093*
	(0.013)	(0.010)	(0.013)	(0.010)	(0.068)	(0.046)	(0.070)	(0.049)
Children	−1.465***	−1.201***	−1.403***	−1.046***	−1.593***	−1.159***	−1.711***	−1.163***
	(0.154)	(0.137)	(0.158)	(0.124)	(0.299)	(0.190)	(0.314)	(0.205)
Primary	−0.231***	−0.241***	−0.063	−0.118**	−0.177**	−0.225***	0.004	−0.085
	(0.070)	(0.058)	(0.073)	(0.053)	(0.083)	(0.065)	(0.085)	(0.063)
Romansh	0.001	0.015	0.002	−0.029	−0.019	−0.011	−0.029	−0.058***
	(0.028)	(0.019)	(0.030)	(0.020)	(0.027)	(0.019)	(0.026)	(0.021)
Italian	0.051**	0.051***	−0.022	−0.036**	0.084**	0.042	0.006	−0.041
	(0.024)	(0.018)	(0.020)	(0.015)	(0.037)	(0.026)	(0.035)	(0.027)
French	−0.023**	−0.003	0.004	0.004	−0.019	−0.004	0.004	0.001
	(0.010)	(0.008)	(0.011)	(0.009)	(0.013)	(0.010)	(0.013)	(0.010)
Log altitude	−0.030	−0.005	−0.013	−0.010	−0.049**	−0.033**	−0.042**	−0.044***
	(0.020)	(0.018)	(0.019)	(0.019)	(0.023)	(0.016)	(0.020)	(0.015)
Log density	0.027***	0.026***	0.017**	0.011	0.005	0.009	−0.005	−0.006
	(0.007)	(0.007)	(0.008)	(0.007)	(0.014)	(0.009)	(0.014)	(0.010)
Log next city					−0.009	0.010	−0.001	0.011
					(0.010)	(0.007)	(0.011)	(0.008)
Observations	493	493	493	493	475	475	475	475
R^2	0.673	0.687	0.581	0.567	0.602	0.622	0.451	0.485
IV	No	No	No	No	Yes	Yes	Yes	Yes

Notes: Clustered standard errors in parenthesis. All regressions include time fixed effects.
***Significant at or below 1%; **significant at or below 5%; *significant at or below 10%.

significant. However, the magnitudes of the Protestant impact even increase substantially.

Examining how Protestantism affects the fraction of low performers gives rise to similar conclusions. According to Table 4, Protestantism is clearly associated with lower failure rates in all four fields, reducing them by almost 10 percentage points in the non-IV estimates. In the IV regressions, again, not only standard errors but also estimated coefficients on Protestantism increase substantially, such that significance levels remain at the 1% level.

Regarding other control variables, all regressions show that the fraction of children in a district has a highly significant and negative effect on cognitive skills, consistent with the well-known notion of a quality-quantity trade-off. A more advanced stage of development (lower agricultural labor share and higher population density) tends to positively affect the share of high performers but has little effect on low performers. Altitude tends to be adversely related to skills. The majority language often has no clear effect. However, reading and writing performance tends to be better when Italian is the majority language.

In Tables 3 and 4 we did not control for school inputs. Tables 5 and 6 suggest that the main results remain fairly robust to the inclusion of inputs in public schools. Hence, a substantial part of the effect of Protestantism on educational performance seems to work through "effort," rather than through school inputs and absenteeism. The sizes of effects of Protestantism drop somewhat in the IV estimations compared to Tables 3 and 4, now being closer to the non-IV estimates. Higher school expenditure is significantly related to cognitive skills in non-IV estimates (except in history), but not in the IV regressions.[20] In contrast, higher class size significantly reduces cognitive skills in all four education fields, including in the IV regressions. Higher absenteeism from school enters in the expected fashion in all fields except in reading, where it has no effect. This indicates that learning effort at home, including that of parents, is particularly important to develop reading skills.

20. Given that we control for school capital, class size and teacher characteristics, the effect of school expenditure may best be interpreted as the effect of higher salary of teachers. See Boppart et al. (2013) for a discussion based on a theoretical model. Unfortunately, we do have data on teacher salaries at the district level.

TABLE 4
Effect of Protestantism on the Share Who Failed

	Reading (1)	Essay (2)	Math (3)	History (4)	Reading (5)	Essay (6)	Math (7)	History (8)
Protestants	−0.082***	−0.097***	−0.098***	−0.097***	−0.153***	−0.143***	−0.278***	−0.301***
	(0.008)	(0.010)	(0.013)	(0.015)	(0.048)	(0.050)	(0.091)	(0.106)
Children	0.508***	0.634***	0.986***	1.238***	0.744***	0.755***	1.682***	1.983***
	(0.097)	(0.122)	(0.145)	(0.170)	(0.211)	(0.224)	(0.428)	(0.481)
Primary	0.055	0.030	−0.072	−0.121	−0.001	−0.010	−0.197*	−0.264**
	(0.048)	(0.060)	(0.077)	(0.094)	(0.054)	(0.064)	(0.106)	(0.125)
Romansh	−0.004	−0.002	−0.008	0.073**	0.002	0.006	0.034	0.132***
	(0.014)	(0.021)	(0.022)	(0.029)	(0.022)	(0.028)	(0.040)	(0.042)
Italian	−0.009	−0.041*	0.035	0.101***	−0.056**	−0.067**	−0.040	0.037
	(0.017)	(0.021)	(0.024)	(0.023)	(0.026)	(0.030)	(0.046)	(0.054)
French	0.017**	0.010	0.005	−0.018	0.012	0.007	0.007	−0.012
	(0.007)	(0.008)	(0.011)	(0.015)	(0.008)	(0.009)	(0.015)	(0.020)
Log altitude	0.025**	0.034**	0.037**	0.052**	0.026	0.038**	0.055*	0.088**
	(0.012)	(0.015)	(0.017)	(0.022)	(0.016)	(0.017)	(0.028)	(0.034)
Log density	−0.007*	−0.015***	−0.010	−0.012	0.004	−0.006	0.017	0.022
	(0.004)	(0.005)	(0.006)	(0.007)	(0.010)	(0.010)	(0.017)	(0.021)
Log next city					0.018**	0.009	0.017	0.006
					(0.007)	(0.008)	(0.014)	(0.017)
Observations	493	493	493	493	475	475	475	475
R^2	0.722	0.852	0.653	0.848	0.688	0.847	0.438	0.740
IV	No	No	No	No	Yes	Yes	Yes	Yes

Notes: Clustered standard errors in parenthesis. All regressions include time fixed effects.
***Significant at or below 1%, **significant at or below 5%; *significant at or below 10%.

B. Protestant Reading Bias

We now examine the hypothesis of a Protestant reading bias. We first consider the determinants of reading performance when controlling for the performance in one other educational field separately (Tables 7 and 8), as suggested in the simple model of Section 3. Then we turn to control for more than one other educational field (Tables 9 and 10). For most regressions, we abstain from controlling for the test results on essay-writing because writing and reading are very closely related cognitive skills.

Table 7 shows the results of estimating Equation (12), that is, regressing the share of high performers in reading on Protestantism and on the fraction of high performers in math and history, respectively. The results show that indeed $\beta_1 > 0$ (the coefficient on Protestantism) and as expected also $\beta_2 > 0$ (the coefficient on skills which are different to reading capability) hold in an estimation of Equation (12). Columns (1)–(3) as well as columns (5)–(7) are non-IV estimations where we hold the fraction of high performers in math constant. The coefficients of interest (β_1, β_2) seem to be quite robust to the inclusion of more control variables.

Column (3) suggests that a (purely) Protestant district has 3.1 percentage points more high performers than a (purely) Catholic district ($\beta_1 = 0.031$), given that both kinds of districts have the same fraction of high performers in math. Column (4) provides IV estimation results when all controls are included with again math skill held constant. Coefficient β_1 more than doubles to 0.082, suggesting an even higher Protestant reading bias. Again, significance declines in the IV estimation, as standard errors are substantially enlarged by instrumentation. Moreover, as expected, math performance and reading performance are highly related ($\beta_2 > 0$).

Columns (5)–(8) of Table 7 present analogous results to columns (1)–(4), now holding fixed the share of high performers in history rather than in math. The Protestant reading bias is about twice as high compared to columns (1)–(4). Column (8) shows that the Protestant reading bias not only increases in the IV regression but also stays significant at the 1% level. It suggests that a Protestant district has 14.2 percentage points more high performers in reading than a Catholic district when holding constant

TABLE 5
Effect of Protestantism on the Share with Best Grade

	Reading (1)	Essay (2)	Math (3)	History (4)	Reading (5)	Essay (6)	Math (7)	History (8)
Protestants	0.097***	0.068***	0.093***	0.042***	0.169***	0.091**	0.138**	0.042
	(0.014)	(0.010)	(0.013)	(0.010)	(0.064)	(0.043)	(0.067)	(0.046)
Children	−1.138***	−0.875***	−0.765***	−0.683***	−1.211***	−0.746***	−0.795***	−0.580***
	(0.157)	(0.132)	(0.146)	(0.118)	(0.207)	(0.148)	(0.244)	(0.147)
Primary	−0.129*	−0.216***	−0.032	−0.125**	−0.098	−0.200***	−0.008	−0.110**
	(0.073)	(0.057)	(0.077)	(0.053)	(0.076)	(0.052)	(0.077)	(0.052)
Romansh	−0.026	−0.025	−0.040	−0.054**	−0.047*	−0.041**	−0.052*	−0.060***
	(0.025)	(0.020)	(0.027)	(0.021)	(0.025)	(0.019)	(0.029)	(0.022)
Italian	0.064***	0.045**	0.045**	−0.021	0.100**	0.050*	0.064	−0.035
	(0.023)	(0.018)	(0.020)	(0.020)	(0.044)	(0.027)	(0.041)	(0.031)
French	−0.033**	−0.002	0.042***	0.018	−0.017	0.004	0.052***	0.017
	(0.015)	(0.011)	(0.014)	(0.012)	(0.020)	(0.013)	(0.019)	(0.015)
Log altitude	−0.009	0.001	0.009	0.002	−0.024	−0.020	−0.009	−0.019
	(0.016)	(0.014)	(0.015)	(0.016)	(0.023)	(0.013)	(0.019)	(0.013)
Log density	0.034***	0.030***	0.032***	0.018***	0.029***	0.016***	0.025***	0.008
	(0.007)	(0.006)	(0.007)	(0.007)	(0.010)	(0.006)	(0.009)	(0.006)
Log absenteeism	0.001	−0.019***	−0.025***	−0.031***	−0.002	−0.020***	−0.027***	−0.029***
	(0.008)	(0.006)	(0.007)	(0.006)	(0.010)	(0.006)	(0.008)	(0.007)
Week	−0.001	−0.002**	−0.001	−0.000	−0.001	−0.001	−0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Class size	−0.052**	−0.038**	−0.065***	−0.044***	−0.053**	−0.033**	−0.063***	−0.035**
	(0.021)	(0.016)	(0.021)	(0.016)	(0.024)	(0.015)	(0.022)	(0.016)
Capital	0.025**	0.026***	0.026***	0.022***	0.024**	0.026***	0.027***	0.023***
	(0.010)	(0.007)	(0.008)	(0.006)	(0.011)	(0.007)	(0.009)	(0.006)
Poor training	−0.022	0.005	−0.034	−0.024	−0.007	0.009	−0.027	−0.026
	(0.020)	(0.015)	(0.022)	(0.017)	(0.023)	(0.017)	(0.026)	(0.019)
Female teachers	−0.028	−0.005	−0.149***	−0.012	−0.082	−0.034	−0.179***	−0.017
	(0.038)	(0.027)	(0.038)	(0.030)	(0.054)	(0.035)	(0.050)	(0.039)
Clerics	0.128***	0.019	0.179***	0.071*	0.205***	0.037	0.216***	0.063
	(0.045)	(0.033)	(0.047)	(0.038)	(0.075)	(0.049)	(0.072)	(0.058)
Length of service	0.183**	0.040	0.091	0.101*	0.166	0.051	0.077	0.122*
	(0.082)	(0.055)	(0.076)	(0.054)	(0.102)	(0.062)	(0.091)	(0.062)
Age	−0.223***	−0.046	−0.127*	−0.076	−0.244***	−0.084	−0.143*	−0.111**
	(0.084)	(0.053)	(0.074)	(0.053)	(0.089)	(0.052)	(0.076)	(0.053)
Expenditure	0.048***	0.034***	0.032**	0.010	0.022	0.024	0.010	0.004
	(0.016)	(0.013)	(0.015)	(0.013)	(0.027)	(0.019)	(0.028)	(0.021)
Log next city					−0.003	0.008	−0.000	0.013
					(0.011)	(0.007)	(0.012)	(0.008)
Observations	493	493	493	493	475	475	475	475
R^2	0.716	0.740	0.658	0.636	0.663	0.694	0.621	0.617
IV	No	No	No	No	Yes	Yes	Yes	Yes

Notes: Clustered standard errors in parenthesis. All regressions include time fixed effects.
***Significant at or below 1%; **significant at or below 5%; *significant at or below 10%.

the fraction of high performers in history. The size of the effect is remarkably high. Its magnitude corresponds to about one standard deviation of the dependent variable (see Table 1).

Table 8 presents the analogous results to Table 7 for low performers. It confirms the Protestant reading bias. Switching from a Catholic to a Protestant district reduces the fraction of low performers by about 2–3 percentage points for a given fraction of low performers in math (columns (1)–(4)). The coefficients of Protestantism are not significant in the IV estimates (columns (4) and (8)). However, again, their increased magnitude (compared with columns (3) and (7), respectively) suggests a higher Protestant reading bias than

TABLE 6
Effect of Protestantism on the Share Who Failed

	Reading (1)	Essay (2)	Math (3)	History (4)	Reading (5)	Essay (6)	Math (7)	History (8)
Protestants	−0.070***	−0.079***	−0.095***	−0.105***	−0.132***	−0.115**	−0.197***	−0.209**
	(0.009)	(0.011)	(0.014)	(0.018)	(0.048)	(0.050)	(0.075)	(0.084)
Children	0.171	0.237**	0.313**	0.616***	0.324**	0.272	0.590**	0.848***
	(0.105)	(0.115)	(0.151)	(0.172)	(0.163)	(0.174)	(0.264)	(0.293)
Primary	−0.024	−0.034	−0.082	−0.107	−0.053	−0.063	−0.123	−0.159
	(0.053)	(0.062)	(0.077)	(0.094)	(0.055)	(0.062)	(0.084)	(0.105)
Romansh	0.007	0.033	0.015	0.094***	0.017	0.040	0.035	0.117***
	(0.016)	(0.024)	(0.023)	(0.029)	(0.025)	(0.030)	(0.037)	(0.038)
Italian	−0.053**	−0.051**	−0.041*	0.055**	−0.093**	−0.077**	−0.096*	0.010
	(0.021)	(0.023)	(0.023)	(0.026)	(0.038)	(0.037)	(0.051)	(0.054)
French	0.006	0.016	−0.029*	−0.045**	−0.007	0.008	−0.049**	−0.063**
	(0.011)	(0.013)	(0.015)	(0.017)	(0.015)	(0.015)	(0.022)	(0.025)
Log altitude	−0.001	0.010	0.004	0.024	−0.000	0.009	0.014	0.049**
	(0.012)	(0.014)	(0.016)	(0.017)	(0.017)	(0.016)	(0.023)	(0.023)
Log density	−0.014***	−0.019***	−0.020***	−0.021**	−0.016***	−0.019***	−0.022**	−0.017
	(0.005)	(0.006)	(0.007)	(0.008)	(0.006)	(0.007)	(0.009)	(0.012)
Log absenteeism	−0.005	0.007	0.029***	0.051***	−0.001	0.011	0.035***	0.055***
	(0.007)	(0.008)	(0.009)	(0.011)	(0.008)	(0.009)	(0.011)	(0.013)
Week	0.000	−0.000	−0.001	−0.002*	0.001	−0.000	−0.000	−0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Class size	0.034**	0.062***	0.073***	0.065***	0.039**	0.063***	0.078***	0.067**
	(0.015)	(0.019)	(0.021)	(0.023)	(0.018)	(0.021)	(0.026)	(0.027)
Capital	−0.016**	−0.026***	−0.017*	−0.023**	−0.017**	−0.028***	−0.017	−0.024**
	(0.008)	(0.008)	(0.010)	(0.011)	(0.008)	(0.008)	(0.011)	(0.012)
Poor training	−0.003	−0.007	0.107***	0.058**	−0.017	−0.015	0.088**	0.037
	(0.019)	(0.019)	(0.028)	(0.027)	(0.022)	(0.022)	(0.035)	(0.034)
Female teachers	0.085***	0.039	0.124***	0.045	0.120***	0.061	0.180***	0.101
	(0.031)	(0.036)	(0.043)	(0.046)	(0.046)	(0.050)	(0.064)	(0.066)
Clerics	−0.123***	−0.049	−0.163***	−0.120**	−0.188***	−0.086	−0.267***	−0.217**
	(0.036)	(0.043)	(0.050)	(0.055)	(0.057)	(0.066)	(0.085)	(0.091)
Length of service	−0.251***	−0.169**	−0.167*	−0.210**	−0.213**	−0.154*	−0.104	−0.156
	(0.076)	(0.081)	(0.090)	(0.087)	(0.087)	(0.091)	(0.111)	(0.112)
Age	0.234***	0.161*	0.186**	0.176**	0.219***	0.160*	0.165*	0.173*
	(0.075)	(0.082)	(0.093)	(0.087)	(0.079)	(0.084)	(0.099)	(0.095)
Expenditure	−0.032**	−0.033**	−0.033**	−0.014	−0.013	−0.023	−0.001	0.026
	(0.013)	(0.014)	(0.014)	(0.017)	(0.022)	(0.022)	(0.030)	(0.035)
Log next city					0.011	0.006	0.013	0.006
					(0.008)	(0.009)	(0.013)	(0.014)
Observations	493	493	493	493	475	475	475	475
R^2	0.760	0.874	0.714	0.874	0.745	0.876	0.669	0.858
IV	No	No	No	No	Yes	Yes	Yes	Yes

Notes: Clustered standard errors in parenthesis. All regressions include time fixed effects.
***Significant at or below 1%; **significant at or below 5%; *significant at or below 10%.

the non-IV estimates. The magnitude of β_1 is generally smaller than for the high performers in Table 8. This is understandable in the light of the low failure rates in reading tests: according to Table 1, on average, only 11.5% failed the test compared to a fraction of high performers in reading of 40.2%.

Tables 9 and 10 show that when we control for performance in both math and history rather than just math, the results are basically unchanged. This can be seen in columns (1)–(4) in Tables 9 and 10 which are very similar to columns (1)–(4) in Tables 7 and 8, respectively. In this sense, the Protestant reading bias is remarkably robust. If, however, we control for the performance in essay-writing as well (columns (5)–(8)), then the reading bias becomes much smaller and often is insignificant

TABLE 7
Dependent Variable: Share with Best Grade in Reading

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Protestants	0.024**	0.041***	0.031***	0.082*	0.058***	0.078***	0.067***	0.142***
	(0.010)	(0.008)	(0.009)	(0.045)	(0.012)	(0.008)	(0.010)	(0.053)
Best grade math	0.896***	0.708***	0.713***	0.632***				
	(0.044)	(0.039)	(0.045)	(0.076)				
Best grade history					1.038***	0.741***	0.710***	0.647***
					(0.062)	(0.058)	(0.069)	(0.091)
Children		−0.471***	−0.593***	−0.708***		−0.690***	−0.653***	−0.836***
		(0.108)	(0.107)	(0.165)		(0.131)	(0.138)	(0.203)
Primary		−0.187***	−0.106**	−0.093**		−0.144***	−0.040	−0.027
		(0.044)	(0.045)	(0.047)		(0.055)	(0.058)	(0.063)
Romansh		−0.000	0.002	−0.014		0.023	0.012	−0.007
		(0.012)	(0.014)	(0.016)		(0.018)	(0.018)	(0.022)
Italian		0.066***	0.032*	0.060**		0.077***	0.079***	0.123***
		(0.015)	(0.017)	(0.029)		(0.020)	(0.023)	(0.039)
French		−0.026***	−0.062***	−0.050***		−0.026***	−0.045***	−0.028
		(0.006)	(0.009)	(0.014)		(0.007)	(0.012)	(0.018)
Log altitude		−0.021	−0.015	−0.019		−0.022	−0.011	−0.012
		(0.013)	(0.013)	(0.016)		(0.016)	(0.017)	(0.021)
Log density		0.015***	0.011**	0.013*		0.018***	0.021***	0.023***
		(0.004)	(0.005)	(0.007)		(0.005)	(0.007)	(0.008)
Log absenteeism			0.019***	0.015*			0.024***	0.016*
			(0.006)	(0.007)			(0.007)	(0.009)
Week			−0.001	−0.001			−0.001	−0.002*
			(0.001)	(0.001)			(0.001)	(0.001)
Class size			−0.005	−0.014			−0.021	−0.031
			(0.015)	(0.018)			(0.016)	(0.020)
Capital			0.006	0.007			0.009	0.009
			(0.007)	(0.008)			(0.009)	(0.010)
Poor training			0.003	0.010			−0.005	0.010
			(0.020)	(0.019)			(0.021)	(0.021)
Female teachers			0.078***	0.031			−0.020	−0.071
			(0.024)	(0.040)			(0.033)	(0.046)
Clerics			0.000	0.068			0.078**	0.163**
			(0.032)	(0.060)			(0.039)	(0.068)
Length of service			0.118*	0.117*			0.112	0.087
			(0.060)	(0.070)			(0.068)	(0.081)
Age			−0.132**	−0.153**			−0.169**	−0.172**
			(0.061)	(0.064)			(0.071)	(0.075)
Expenditure			0.025**	0.016			0.041***	0.020
			(0.011)	(0.017)			(0.012)	(0.020)
Log next city				−0.003				−0.011
				(0.006)				(0.008)
Observations	493	493	493	475	493	493	493	475
R^2	0.745	0.812	0.832	0.802	0.675	0.759	0.782	0.737
IV	No	No	No	Yes	No	No	No	Yes

Notes: Clustered standard errors in parenthesis. All regressions include time fixed effects.
***Significant at or below 1%; **significant at or below 5%; *significant at or below 10%.

even in OLS estimates (although coefficients on variable *Protestants* keep the "right" sign). This is not surprising as reading and writing are highly related cognitive skills.

Again, we also find that $\beta_2 > 0$ in Tables 7–10 which confirms that performance in reading is correlated to performance in the other fields. There is also evidence for a reading bias related to language rather than to religious denomination. The reading bias is positive in Italian-speaking districts and negative in Francophone districts (relative to German-speaking

TABLE 8
Dependent Variable: Share Who Failed in Reading

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Protestants	−0.029***	−0.028***	−0.017**	−0.025	−0.041***	−0.042***	−0.027***	−0.052
	(0.006)	(0.006)	(0.008)	(0.034)	(0.008)	(0.007)	(0.009)	(0.041)
Failed math	0.565***	0.554***	0.564***	0.547***				
	(0.033)	(0.033)	(0.034)	(0.058)				
Failed history					0.395***	0.412***	0.417***	0.385***
					(0.025)	(0.029)	(0.031)	(0.063)
Children		−0.038	−0.005	0.001		−0.002	−0.086	−0.003
		(0.067)	(0.074)	(0.111)		(0.084)	(0.090)	(0.136)
Primary		0.095***	0.022	0.015		0.105***	0.021	0.009
		(0.031)	(0.036)	(0.036)		(0.039)	(0.043)	(0.042)
Romansh		−0.000	−0.001	−0.002		−0.035**	−0.032*	−0.028
		(0.009)	(0.011)	(0.013)		(0.016)	(0.019)	(0.022)
Italian		−0.029***	−0.030**	−0.040		−0.051***	−0.076***	−0.097***
		(0.011)	(0.015)	(0.024)		(0.012)	(0.020)	(0.030)
French		0.014***	0.023***	0.019**		0.024***	0.025***	0.017
		(0.004)	(0.006)	(0.010)		(0.005)	(0.009)	(0.014)
Log altitude		0.005	−0.003	−0.008		0.004	−0.011	−0.019
		(0.008)	(0.008)	(0.009)		(0.011)	(0.012)	(0.014)
Log density		−0.002	−0.002	−0.004		−0.003	−0.005	−0.010**
		(0.003)	(0.003)	(0.004)		(0.004)	(0.004)	(0.004)
Log absenteeism			−0.022***	−0.020***			−0.027***	−0.022***
			(0.005)	(0.005)			(0.007)	(0.008)
Week			0.001**	0.001**			0.001**	0.002***
			(0.000)	(0.000)			(0.001)	(0.001)
Class size			−0.007	−0.004			0.007	0.013
			(0.009)	(0.011)			(0.012)	(0.014)
Capital			−0.006	−0.007			−0.006	−0.007
			(0.005)	(0.006)			(0.006)	(0.006)
Poor training			−0.063***	−0.065***			−0.027	−0.031*
			(0.018)	(0.018)			(0.016)	(0.017)
Female teachers			0.015	0.022			0.066***	0.081**
			(0.018)	(0.031)			(0.024)	(0.037)
Clerics			−0.031	−0.042			−0.072**	−0.104**
			(0.024)	(0.045)			(0.028)	(0.049)
Length of service			−0.157***	−0.156***			−0.163***	−0.153**
			(0.045)	(0.049)			(0.057)	(0.060)
Age			0.130***	0.129***			0.161***	0.152***
			(0.044)	(0.046)			(0.053)	(0.056)
Expenditure			−0.013	−0.013			−0.026**	−0.023
			(0.009)	(0.014)			(0.010)	(0.017)
Log next city				0.004				0.009
				(0.005)				(0.006)
Observations	493	493	493	475	493	493	493	475
R^2	0.850	0.861	0.879	0.880	0.781	0.806	0.831	0.833
IV	No	No	No	Yes	No	No	No	Yes

Notes: Clustered standard errors in parenthesis. All regression include time fixed effects.
***Significant at or below 1%; **significant at or below 5%; *significant at or below 10%.

ones). Regarding high performers, Tables 7 and 9 also suggest an adverse reading bias from more children. The number of children has no clear effect, however, on the share of low performers in reading, holding other skills constant (Tables 8 and 10). If anything, a higher stage of development produces a positive reading bias. Both a higher population density and a lower primary sector share seems to improve reading skills when holding fixed other skills,

TABLE 9
Dependent Variable: Share with Best Grade in Reading

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Protestants	0.028***	0.043***	0.031***	0.088**	0.001	0.012	0.010	0.053
	(0.010)	(0.008)	(0.009)	(0.044)	(0.008)	(0.008)	(0.008)	(0.044)
Best grade math	0.708***	0.618***	0.627***	0.522***	0.436***	0.448***	0.463***	0.388***
	(0.066)	(0.059)	(0.063)	(0.091)	(0.053)	(0.051)	(0.054)	(0.072)
Best history	0.310***	0.176**	0.174**	0.220***	−0.238***	−0.207***	−0.204**	−0.132
	(0.089)	(0.074)	(0.080)	(0.082)	(0.075)	(0.076)	(0.081)	(0.094)
Best essay					0.884***	0.770***	0.772***	0.746***
					(0.046)	(0.059)	(0.058)	(0.092)
Children		−0.414***	−0.539***	−0.669***		−0.130	−0.247***	−0.423**
		(0.109)	(0.111)	(0.164)		(0.101)	(0.093)	(0.166)
Primary		−0.172***	−0.087*	−0.070		−0.042	0.027	0.040
		(0.044)	(0.045)	(0.047)		(0.040)	(0.041)	(0.044)
Romansh		0.005	0.008	−0.006		−0.017	0.001	−0.004
		(0.012)	(0.014)	(0.017)		(0.011)	(0.011)	(0.014)
Italian		0.070***	0.040**	0.075**		0.014	0.004	0.033
		(0.016)	(0.018)	(0.032)		(0.012)	(0.015)	(0.031)
French		−0.026***	−0.062***	−0.048***		−0.022***	−0.047***	−0.038***
		(0.006)	(0.009)	(0.015)		(0.005)	(0.008)	(0.012)
Log altitude		−0.020	−0.015	−0.015		−0.022**	−0.013	−0.009
		(0.013)	(0.013)	(0.016)		(0.010)	(0.011)	(0.014)
Log density		0.014***	0.011**	0.014**		0.001	−0.000	0.008
		(0.005)	(0.005)	(0.007)		(0.004)	(0.005)	(0.006)
Log absenteeism			0.023***	0.018**			0.021***	0.019***
			(0.006)	(0.008)			(0.005)	(0.007)
Week			−0.001	−0.001			0.001	−0.000
			(0.001)	(0.001)			(0.001)	(0.001)
Class size			−0.003	−0.013			−0.001	−0.010
			(0.014)	(0.018)			(0.012)	(0.015)
Capital			0.005	0.005			−0.003	−0.003
			(0.007)	(0.008)			(0.007)	(0.008)
Poor training			0.004	0.013			−0.015	−0.007
			(0.020)	(0.019)			(0.016)	(0.017)
Female teachers			0.068***	0.015			0.043**	0.010
			(0.025)	(0.040)			(0.020)	(0.034)
Clerics			0.003	0.078			0.045	0.102**
			(0.032)	(0.061)			(0.028)	(0.050)
Length of service			0.108*	0.099			0.131**	0.114*
			(0.060)	(0.069)			(0.052)	(0.061)
Age			−0.130**	−0.145**			−0.144***	−0.140**
			(0.060)	(0.064)			(0.052)	(0.055)
Expenditure			0.026**	0.016			0.009	0.001
			(0.010)	(0.016)			(0.009)	(0.014)
Log next city				−0.006				−0.007
				(0.006)				(0.006)
Observations	493	493	493	475	493	493	493	475
R^2	0.754	0.815	0.834	0.804	0.854	0.864	0.878	0.857
IV	No	No	No	Yes	No	No	No	Yes

Notes: Clustered standard errors in parenthesis. All regressions are with time fixed effects.
***Significant at or below 1%; **significant at or below 5%; *significant at or below 10%.

particularly with respect to high performers. The altitude of a district almost never has a significant effect, although point estimates suggest that it biases downward the share of high performers (Tables 7 and 9). Teacher characteristics sometimes do matter. A higher fraction of teachers with more than 20 years of service generally improves reading skills for given

TABLE 10
Dependent Variable: Share Who Failed in Reading

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Protestants	−0.029***	−0.027***	−0.014	−0.017	−0.014***	−0.011*	−0.008	−0.031
	(0.006)	(0.006)	(0.008)	(0.038)	(0.005)	(0.006)	(0.008)	(0.037)
Failed math	0.544***	0.507***	0.498***	0.486***	0.286***	0.285***	0.297***	0.288***
	(0.052)	(0.050)	(0.047)	(0.054)	(0.043)	(0.044)	(0.046)	(0.049)
Failed history	0.025	0.063	0.092**	0.093*	−0.051*	−0.034	−0.004	−0.014
	(0.036)	(0.039)	(0.038)	(0.053)	(0.030)	(0.034)	(0.035)	(0.048)
Failed essay					0.500***	0.488***	0.442***	0.415***
					(0.042)	(0.048)	(0.053)	(0.061)
Children		−0.069	−0.041	−0.042		−0.040	−0.024	0.053
		(0.068)	(0.076)	(0.124)		(0.063)	(0.071)	(0.107)
Primary		0.099***	0.027	0.022		0.056**	0.015	0.007
		(0.032)	(0.037)	(0.037)		(0.027)	(0.032)	(0.033)
Romansh		−0.005	−0.009	−0.011		0.001	−0.012	−0.008
		(0.010)	(0.013)	(0.016)		(0.008)	(0.010)	(0.014)
Italian		−0.033***	−0.037**	−0.047*		0.004	−0.018	−0.033
		(0.011)	(0.016)	(0.024)		(0.008)	(0.013)	(0.022)
French		0.016***	0.025***	0.022**		0.010***	0.007	0.003
		(0.004)	(0.006)	(0.011)		(0.004)	(0.006)	(0.010)
Log altitude		0.003	−0.005	−0.011		0.000	−0.007	−0.007
		(0.009)	(0.008)	(0.010)		(0.007)	(0.007)	(0.010)
Log density		−0.002	−0.002	−0.004		0.003	0.001	−0.002
		(0.003)	(0.004)	(0.004)		(0.002)	(0.003)	(0.004)
Log absenteeism			−0.025***	−0.023***			−0.017***	−0.015***
			(0.005)	(0.006)			(0.004)	(0.006)
Week			0.001***	0.001***			0.001*	0.001**
			(0.000)	(0.000)			(0.000)	(0.000)
Class size			−0.008	−0.005			−0.015	−0.009
			(0.010)	(0.012)			(0.009)	(0.012)
Capital			−0.005	−0.006			0.000	−0.001
			(0.005)	(0.005)			(0.004)	(0.005)
Poor training			−0.062***	−0.063***			−0.031**	−0.035**
			(0.018)	(0.018)			(0.013)	(0.014)
Female teachers			0.019	0.023			0.031*	0.044
			(0.019)	(0.031)			(0.016)	(0.028)
Clerics			−0.030	−0.038			−0.053**	−0.078*
			(0.024)	(0.046)			(0.020)	(0.042)
Length of service			−0.148***	−0.148***			−0.127***	−0.121***
			(0.046)	(0.049)			(0.040)	(0.043)
Age			0.126***	0.123***			0.109***	0.107**
			(0.044)	(0.045)			(0.040)	(0.043)
Expenditure			−0.014	−0.015			−0.007	−0.003
			(0.009)	(0.015)			(0.008)	(0.014)
Log next city				0.005				0.005
				(0.005)				(0.005)
Observations	493	493	493	475	493	493	493	475
R^2	0.850	0.862	0.881	0.883	0.892	0.895	0.903	0.900
IV	No	No	No	Yes	No	No	No	Yes

Notes: Clustered standard errors in parenthesis. All regressions are with time fixed effects.
***Significant at or below 1%; **significant at or below 5%; *significant at or below 10%.

other skills. A higher fraction of older teachers (above age 40), however, when holding fixed teachers' experience, seems to produce an opposite bias away from reading skills. Higher absenteeism, by contrast, gives rise to a positive reading bias. Again, consistent with Tables 5 and 6, this suggests that participation in school is more important for other fields than

reading. School capital does not seem to matter. Finally, if anything, higher public expenditure per pupil gives rise to a rather weak reading bias. In none of the regressions does a doubling of per pupil spending have a larger effect than switching from a Catholic to a Protestant district. As average spending is higher in Protestant districts (see Boppart et al. 2013), this suggests that the Protestant reading bias mainly comes from effort choices of parents or children outside school, rather than reflecting the use of public expenditure for primary schools.

VI. CONCLUSION

This paper has employed a historical data set from Switzerland which allowed us to differentiate between different cognitive skills: reading, numeracy, essay-writing, and Swiss history. We have shown that Protestants had developed higher cognitive skills in all education fields at the time of industrialization. We also developed an estimation strategy to examine whether the impact of religious denomination was particularly large with respect to reading capabilities, consistent with a particular motivation of the Protestant movement to enable the masses to read the bible. We find support for this hypothesis of a Protestant reading bias. However, we also find evidence which is consistent with Protestants' education motives going beyond reading the bible. This evidence is in line with both the broad intentions of Protestant reformers with respect to education we documented and with the stylized theoretical model we presented.

APPENDIX A

Data Sources

• *Pedagogical examinations:* Statistisches Bureau des eidgenössischen Departement des Innern, *Schweizerische Statistik*, Lieferungen 27 (1876), 34 (1877), 36 (1878), 38 (1879), 61 (1885), 64 (1886), 67 (1886), 71 (1888), 75 (1889), 120 (1899), 124 (1900), 129 (1901), 134 (1901), 138 (1903).

• *School inputs:*

– Grob, J.K. (1883). Statistik über das Unterrichtswesen in der Schweiz im Jahr 1881, Zürich: Schabelitz.

– Huber, A. (1897). Schweizerische Schulstatistik 1894/95, Zürich: Buchdruckerei des Schweizerischen Grütlivereins.

– Kinkelin, H. (1875). Statistik des Unterrichtswesens in der Schweiz im Jahre 1871, Zweiter Theil, Statistik der Primarschulen und Ergänzungen zum ersten Theil, Basel, Genf, Lyon: H. Georg's Verlag.

• *Distance to Zurich, Geneva, Basel, Berne, Lucerne:* Bundesamt für Landestopographie (2003): Topographische Karte der Schweiz (Dufour Map), CD Rom (first publication: 1845–1865); Bundesinventar der historischen Verkehrswege der Schweiz (http://www.ivs.admin.ch/).

• *Altitude*: Vogt, A. (1896). Ein vitalstatistisches Nivellement der 182 Bezirke der Schweiz. *Zeitschrift für Schweizerische Statistik* 32, 364–368.

• *Census information:* Statistisches Bureau des eidgenössischen Departement des Innern, *Schweizerische Statistik*.

– Primary sector share, population density: Lieferungen 28 (1876), 59 (1884), 97 (1894).

– Catholic share, majority language: Lieferungen 15 (1872), 51 (1891), 84 (1892).

– Ratio of children (aged 0–15): Lieferungen 20 (1874), 56 (1883), 88 (1892).

For more detailed background information on the data, particularly on data quality and the historical context, see Woitek and Wüthrich (2010) and Boppart et al. (2013).

APPENDIX B

First-Stage Results

Table A1 presents first-stage results for our IV estimates employed in Tables 3–10. As expected, the share of Protestants is the higher, the closer a district lies to a center of Protestantism at the time of Reformation (Zurich/Geneva). Interestingly, given the shorter (log) distance to Zurich and Geneva, the (log) distance to the next bigger city (*Log Next City*) is positively related to Protestantism. Protestantism is thus not a general "city-phenomenon" but indeed seems to be related to the home of Zwingli and Calvin. One also sees that the number of children was higher in Protestant regions. Regarding school inputs, there were less clerical teachers, more female teachers, and more absenteeism in Protestant regions.[21]

21. That absenteeism is positively related to Protestantism does not necessarily mean that Protestants were attending school less frequently. It may also be explained by the behavior of Protestant teachers who may have documented absenteeism more accurately.

TABLE A1
First-Stage Regressions

	(1) Tables 3 and 4	(2) Tables 5 and 6	(3) Table 7	(4) Table 7	(5) Table 8	(6) Table 8	(7) Table 9	(8) Table 9	(9) Table 10	(10) Table 10
Distance to ZH/GE	−0.164***	−0.161***	−0.129**	−0.152***	−0.122**	−0.119**	−0.128**	−0.120**	−0.113**	−0.116**
	(0.060)	(0.056)	(0.052)	(0.054)	(0.054)	(0.054)	(0.052)	(0.050)	(0.054)	(0.053)
Log next city	0.119***	0.149***	0.120***	0.123***	0.128***	0.117***	0.120***	0.110***	0.118***	0.119***
	(0.042)	(0.038)	(0.036)	(0.038)	(0.036)	(0.036)	(0.037)	(0.035)	(0.036)	(0.035)
Children	5.305***	4.018***	4.361***	4.563***	3.768***	4.026***	4.339***	4.514***	3.900***	3.836***
	(0.926)	(0.848)	(0.778)	(0.842)	(0.784)	(0.777)	(0.810)	(0.802)	(0.780)	(0.778)
Primary	−0.614	−0.297	−0.227	−0.133	−0.378	−0.419	−0.234	−0.020	−0.418	−0.402
	(0.384)	(0.381)	(0.353)	(0.362)	(0.354)	(0.369)	(0.352)	(0.338)	(0.362)	(0.359)
Romansh	0.309*	0.217	0.248*	0.285*	0.207	0.307**	0.245*	0.234*	0.272*	0.274*
	(0.181)	(0.172)	(0.141)	(0.158)	(0.165)	(0.153)	(0.141)	(0.133)	(0.157)	(0.163)
Italian	−0.266*	−0.391**	−0.405***	−0.322**	−0.414***	−0.276*	−0.409***	−0.459***	−0.326**	−0.355**
	(0.140)	(0.157)	(0.149)	(0.148)	(0.152)	(0.144)	(0.155)	(0.148)	(0.150)	(0.156)
French	0.031	−0.168**	−0.210***	−0.181**	−0.187***	−0.203***	−0.210***	−0.179**	−0.201***	−0.174**
	(0.066)	(0.075)	(0.071)	(0.075)	(0.070)	(0.071)	(0.071)	(0.070)	(0.070)	(0.071)
Log altitude	0.189*	0.222**	0.191*	0.234**	0.185*	0.225**	0.190*	0.191**	0.206**	0.204**
	(0.113)	(0.108)	(0.097)	(0.102)	(0.100)	(0.097)	(0.097)	(0.095)	(0.097)	(0.097)
Log density	0.158***	0.015	−0.024	0.003	−0.016	−0.011	−0.025	−0.034	−0.017	−0.020
	(0.040)	(0.042)	(0.038)	(0.040)	(0.037)	(0.039)	(0.038)	(0.037)	(0.038)	(0.038)
Log absenteeism		0.091**	0.111***	0.123***	0.112***	0.136***	0.109***	0.105***	0.131***	0.121***
		(0.040)	(0.035)	(0.037)	(0.035)	(0.035)	(0.036)	(0.035)	(0.034)	(0.034)
Week		0.002	0.003	0.001	0.001	−0.001	0.003	0.004	−0.000	−0.000
		(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Class size		0.029	0.113	0.074	0.119	0.105	0.113	0.112	0.124	0.132
		(0.094)	(0.086)	(0.093)	(0.088)	(0.090)	(0.086)	(0.083)	(0.088)	(0.089)
Capital		0.015	−0.027	−0.016	−0.009	−0.019	−0.026	−0.039	−0.020	−0.029
		(0.053)	(0.049)	(0.053)	(0.047)	(0.047)	(0.050)	(0.048)	(0.046)	(0.045)
Poor training		−0.151	−0.082	−0.107	−0.005	−0.064	−0.083	−0.114	−0.022	−0.066
		(0.100)	(0.099)	(0.100)	(0.100)	(0.096)	(0.099)	(0.097)	(0.098)	(0.095)
Female teachers		0.464**	0.630***	0.460**	0.574***	0.469**	0.634***	0.585***	0.521***	0.500***
		(0.204)	(0.195)	(0.197)	(0.193)	(0.189)	(0.201)	(0.195)	(0.189)	(0.191)
Clerics		−0.946***	−1.068***	−0.977***	−1.045***	−0.969***	−1.069***	−0.959***	−1.010***	−0.968***
		(0.205)	(0.188)	(0.193)	(0.188)	(0.184)	(0.189)	(0.186)	(0.186)	(0.184)
Length of service		0.676**	0.431*	0.475*	0.382	0.303	0.437*	0.437*	0.283	0.247
		(0.291)	(0.254)	(0.273)	(0.276)	(0.273)	(0.254)	(0.252)	(0.276)	(0.275)

TABLE A1
Continued

	(1) Tables 3 and 4	(2) Tables 5 and 6	(3) Table 7	(4) Table 7	(5) Table 8	(6) Table 8	(7) Table 9	(8) Table 9	(9) Table 10	(10) Table 10
Age		−0.238	0.015	−0.077	0.024	0.041	0.012	0.020	0.076	0.102
		(0.307)	(0.261)	(0.278)	(0.279)	(0.279)	(0.260)	(0.252)	(0.279)	(0.276)
Expenditure		0.286***	0.215***	0.264***	0.215***	0.243***	0.214***	0.174**	0.223***	0.208***
		(0.080)	(0.072)	(0.079)	(0.073)	(0.074)	(0.072)	(0.070)	(0.075)	(0.075)
Best grade math			1.437***				1.472***	1.136***		
			(0.225)				(0.255)	(0.239)		
Best grade math				1.334***			−0.074	−0.710*		
				(0.352)			(0.373)	(0.424)		
Failed math					−1.236***				−0.608***	−0.308
					(0.195)				(0.201)	(0.229)
Failed history						−1.253***			−0.833***	−0.683***
						(0.202)			(0.240)	(0.244)
Best grade essay								1.357***		
								(0.337)		
Failed essay										−0.656**
										(0.296)
Observations	475	475	475	475	475	475	475	475	475	475
R^2	0.311	0.535	0.598	0.561	0.587	0.594	0.598	0.613	0.600	0.604

Notes: Clustered standard errors in parenthesis. All regressions include time fixed effects.
***Significant at or below 1%; **significant at or below 5%; *significant at or below 10%.

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