Year: 2013

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Income Inequality of Swiss Primary School Teachers in the Late 19th Century

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Abstract

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Keywords: Inequality, Teachers' Income, Switzerland
JEL Code: N33, D31

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1 Introduction

From 1870 on the Swiss cantons implemented minimum wages for teachers, making the teachers better off. This was the starting point for the teachers to climb the social ladder up to the middle class.[1] In the historical literature, Switzerland's middle class in the late 19th century is traditionally divided into an old and a new middle class.[2] To the former belonged self-employed people in services as well as independent professionals and partly the farmers. To the latter belonged employees and public servants. Compared to other social classes, research on the new middle class in the late 19th century is rare. As the teachers form clearly part of the new middle class, our analysis of income across Swiss primary school teachers is a contribution to reduce this research deficit. We want to shed light on one particular aspect of teachers' standard of living at the end of the 19th century: income inequality and its determinants.

Two interrelated issues characterize the teachers' profession in Switzerland in the course of the 19th century. On the one hand, education was a controversial subject between and within religious denominations, cantons and parties. On the other hand, teaching activities became more and more professional.[3] In addition to teachers' education getting more formalized, subjects and teaching methods changed radically compared to the 18th century. One reason for the professionalization was the introduction of compulsory school attendance, which required more and better instructed teachers. In the 19th century, there has never been one single Swiss school system but rather 25 different cantonal school systems. The question of allocation of state tasks to the cantons or to the federal level has always been a major issue in Switzerland. In the end, most of the legal foundations governing the different Swiss school systems in the 20th century were laid down between 1870 and 1910.[4]

As in other European countries, public schooling in Switzerland was reshaped in the 18th century. The ongoing economic and social changes required an increasing secularization of the traditionally religious and dogmatic school curricula.[5] In a nutshell, the suggested

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1   *H.-U. Grunder*, Lehrer: 19. und 20. Jahrhundert, Historisches Lexikon der Schweiz, URL: http://www.hls-dhs-dss.ch/textes/d/D10428.php April 2012.

2   *A. Tanner*, Mittelstand, Historisches Lexikon der Schweiz, URL: http://www.hls-dhs-dss.ch/textes/d/D13791.php April 2012.

3   *L. Criblez/C. Jenzer/ R. Hofstetter/C. Magnin* (Ed.), Eine Schule für die Demokratie: Zur Entwicklung der Volksschule in der Schweiz im 19. Jahrhundert, Bern 1999.

4   *Criblez/Jenzer/Hofstetter/Magnin*, Eine Schule für die Demokratie; *L. Criblez*, Zur Einleitung: Vom Bildungsföderalismus zum Bildungsraum Schweiz, In *L. Criblez* (Ed.), Bildungsraum Schweiz: Historische Entwicklung und aktuelle Herausforderung, Bern 2008.

5   *M. Späni*, Umstrittene Fächer in der Pädagogik, In *H. Badertscher/H.-U. Grunder* (Ed.), Geschichte der Erziehung und Schule in der Schweiz im 19. und 20. Jahrhundert, Bern 1997, p. 17-19; *F. Osterwalder*, Schule denken: Schule als linear gegliederte, staatliche und öffentliche Institution, In *H. Badertscher/H.-U. Grunder* (Ed.), Geschichte der Erziehung und Schule in der Schweiz im 19. und 20. Jahrhundert, Bern 1997, p 241-242.

pedagogical reforms were based on the philosophy of the Enlightenment: knowledge and education was supposed to be spread among wider parts of the public[1]. The centralistic Helvetic Republic (1798-1803) brought further incentives to reform the school system. It saw its most important role in national education.[2] Philipp Albert Stapfer, Minister of Education, saw in the broad education of the people the only way to secure division of labor in the society and to enable people to participate in the public democratic arena controlling and correcting state and society.[3] The main characteristics of the school system at the end of the 19th century was largely influenced by Stapfer's ideas, among them compulsory school attendance, free of charge education and a pyramidally structured school system. Furthermore, he wanted to implement a public instruction law and to introduce councils of education (*Erziehungsräte*) and school supervisors (*Schulinspektoren*)[4]. And Stapfer intended to raise the social status of the teachers. So far they did not earn enough and were seen as subordinates to the clerics. Therefore, the proposed legal framework included financial improvement, with a regular retirement scheme, as well as a scientific instruction of young teacher trainees in a national teacher education seminar (*Lehrerseminar*).[5]

All these reform projects were delayed because of the downfall of the Helvetic Republic and the subsequent partial return to the old pre-revolutionary regimes. The significant reforms of the educational systems started again in the 1830s with changes in teacher education.[6] Until the 1830s, candidates were still mainly informally instructed by experienced teachers, by attending incoherent courses and by learning in reading societies.[7] After implementing formal courses to qualify experienced teachers, several cantons implemented teacher education seminars for young trainees in the 1830s.[8]

Although the educational system remained in the competence of the cantons after the founding of the federal state, some common characteristics developed across the country at the end of the 19th century. The 1874 constitution stated four points: first, primary schooling is compulsory; second, public schooling is free of charge; third, schooling is under state control, i. e. total secularization of education; fourth, implementation of minimal standards.[9] The main factors and actors driving the standardization were the constitution of 1874, the republican government form, the emerging teacher associations as well as the pedagogical examinations at recruitment. Especially bad results at the pedagogical

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1 *Osterwalder*, Schule denken, p. 243.

2 *Osterwalder*, Schule denken, p. 247-252.

3 *Osterwalder*, Schule denken, p. 247-252; *A. Rohr*, Stapfer, Philipp Albert, Historisches Lexikon der Schweiz, URL: http://www.hls-dhs-dss.ch/textes/d/D9078.php April 2012.

4 *Osterwalder*, Schule denken, p. 251-258.

5 *Späni*, Umstrittene Fächer, p. 22; *Osterwalder*, Schule denken, p. 255.

6 *Criblez/Jenzer/Hofstetter/Magnin*, Eine Schule für die Demokratie; *Osterwalder*, Schule denken.

7 *H.-U. Grunder*, Lehrerseminar, Historisches Lexikon der Schweiz, URL: http://www.hls-dhs-dss.ch/textes/d/D28711.php April 2012.

8 *Osterwalder*, Schule denken, p. 266.

9 *L. Criblez*, Der Bildungsartikel in der Bundesverfassung vom 29. Mai 1874, In *L. Criblez/C. Jenzer/ R. Hofstetter/C. Magnin* (Ed.), Eine Schule für die Demokratie: Zur Entwicklung der Volksschule in der Schweiz im 19. Jahrhundert, Bern 1999, p. 342-343.

examinations at recruitment gave incentives to reform the school system. In the course of the 19th century teachers gained in reputation: being a teacher was not an additional occupation any more, but became a professional job. One reason for the gain in reputation was the professionalization of teachers' training as well as the changes on the methodological side: separate tuition of every student was replaced by collective lessons.[1] Furthermore, the teachers began to organize themselves in interest groups. However, although the first interest group *Schweizerischer Lehrerverein* (the Swiss teacher association) was already founded in 1849, there has never been one single union across all levels of education.[2] The paper is organized as follows: Section 2 contains a description of the data,[3] in Section 3 we present the results on the standard of living and the income distribution of teachers, and section 4 concludes.

2 Data

The first of a series of four extensive collections of regional education statistics was published by Hermann Kinkelin,[4] initiated by the Federal Department of Home Affairs as a contribution to the World Exhibition in Vienna in 1873.[5] On the occasion of the first National Exhibition 1883 in Zurich, a second collection was compiled by Johann Kaspar Grob.[6] In 1894/1895, Albert Huber was assigned to renew the school statistics for the National Exhibition 1896 in Geneva,[7] and again in 1911/12 for the National Exhibition in Bern 1914.[8] The exhibitions legitimated the collection of statistical material on education in Switzerland, because federal intervention was out of the question after the vote on the Secretary of Education in 1882.[9]

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1   *Grunder*, Lehrer.
2   *Grunder*, Lehrer.
3   This is an extension of the data description in *T. Boppart/J. Falkinger/V. Grossmann/U. Woitek/G. Wüthrich*, Qualifying Religion: The Role of Plural Identities for Educational Production, (Working Paper University of Zurich, 2008).
4   *H. Kinkelin*, Statistik des Unterrichtswesens in der Schweiz im Jahre 1871. Zweiter Theil. Statistik der Primarschulen und Ergänzungen zum ersten Theil. Basel, Genf, Lyon 1875.
5   Earlier attempts to present quantitative information on the Swiss education sector are *S. Franscini*, Neue Statistik der Schweiz, Bern 1848-1851 and *M. Wirth* (Ed.), Allgemeine Beschreibung und Statistik der Schweiz. Im Verein mit einer Anzahl schweizerischer Gelehrter und Staatsmänner, Zürich: Orell Füssli & Comp. 1871-1875. These collections share the problem of not being comparable across cantons.
    The World Exhibitions offered the prospering industrial economies a possibility to present their products to an international audience, reflecting their economic capacity. Economic competitiveness was understood as a sign of general mental flexibility and learning aptitude. High-quality goods could only be produced by well-trained workers, who unquestionably needed a thorough base of knowledge to be able to adapt new techniques. In that context, education policy became a basic issue of modern economies. See *P. Gonon*, Weltausstellungen im 19. Jahrhundert als Ansporn für Schulreformen, In *L. Criblez/C. Jenzer/ R. Hofstetter/C. Magnin* (Ed.),, Eine Schule für die Demokratie: zur Entwicklung der Volksschule in der Schweiz im 19. Jahrhundert, Bern 1999, p. 384-386.
6   *J. K. Grob*, Statistik über das Unterrichtswesen in der Schweiz im Jahr 1881, Zürich 1883.
7   *A. Huber*, Schweizerische Schulstatistik 1894/95, Zürich 1897.
8   *A. Huber/J. G. A. Bay*, Schweizerische Schulstatistik 1911/12, Bern 1915.
9   This does not mean that data collection was free of problems. All the authors stress the tight time schedule and the reluctance of the local authorities to comply. *Grob*, Statistik, Vol. VI, p. X reports an incident with a school official in the canton Fribourg, who answered to the second reminder to send the required material: "cela ne vous regarde pas" ("this is none of your business").

From these collections, we use the individual teachers' data from 1881 and 1894/95. For each individual, we have information on sex, age, length of service, whether they were paid in kind, the education level, marital status, status (cleric or layperson), and annual income. The number of observations for 1881 is 7795 and 7755 for 1894/95. We exclude clerics (1881: 308 individuals, 1894/95: 434 individuals) from the further analysis to avoid the problem of dealing with zero incomes. Table 1 contains an overview of teachers' characteristics and how they change over time. In Table 2, we show the regional distribution of teachers, and Figure 1 displays age and length of service distribution for 1881 and 1994/95.

Table 1 about here

Table 2 about here

Figure 1 about here

The pedagogical examinations had been introduced in several cantons as early as the 1850s to check the efficiency of their school systems. In spite of the lack of consistency, the examinations showed a clear tendency: as repetition lacked, the skills acquired at school were lost by adult age. Asked about reasons for their poor performance, the recruits gave very similar answers: forgetting what was learned at school was the most prominent one, along with extended periods of truancy. Poverty, illness, lack of talent, inadequately trained teachers, child labor, hiring out, neglect and early drop out were other reasons given.[1]

The results came as a shock to the public, who had deeply trusted in the efficiency and benefit of their established schools. The public opinion agreed that the educational reforms had not gone far enough to create sufficiently educated conscripts - let alone citizens - for a republican state. As a reaction, evening schools were introduced in barracks, and many of the cantons established or extended further education ("*Fortbildungsschulen*") after primary school. The idea of surveying the output of education definitely won recognition with the introduction of those early cantonal examinations.[2]

The new federal constitution of 1874 demanded "adequate" education, but provided no legal background for controls by the federation. The only means to check the cantonal education systems was to implement pedagogical examinations in the military service, which was compulsory for each male citizen. With the new constitution, the federal state had also received more competences in the military sector. It immediately installed a new military law providing standards for the different branches of service, including a paragraph with

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1 *W. Lustenberger*, Pädagogische Rekrutenprüfungen. Ein Beitrag zur Schweizer Schulgeschichte, Zürich 1996, p. 27.

2 *Lustenberger*, Rekrutenprüfungen, p. 25-34; *W. Lustenberger*, Die pädagogischen Rekrutenprüfungen als Instrument der eidgenössischen Schulpolitik (1830-1885), In *L. Criblez/C. Jenzer/ R. Hofstetter/C. Magnin* (Ed.), Eine Schule für die Demokratie: zur Entwicklung der Volksschule in der Schweiz im 19. Jahrhundert, Bern 1999, p. 364f.

rules for the pedagogical examinations (April 1875).[1] Every recruit had to undergo a test of general knowledge in four subjects: reading, essay-writing, mathematics (written and oral) as well as knowledge of Swiss history and constitution.[2] Only recruits with higher education, i.e. at least one year at an institution superior to primary school, were exempted if they were able to provide acceptable records. These higher-educated men were generally given grade 1 in all subjects, i.e. the best performance in the statistics. In the first three years (1875 to 1878), the grades ranged from 1 (very good) to 4 (poor), and thereafter from 1 to 5. Those recruits who did poorly in more than one subject were compelled to take repetition courses during military training. The average results for the periods 1875-1885 and 1890-1900, decomposed by region, are displayed in Table 3.

Table 3 about here

3 Results

3.1 Teachers' Standard of Living

Figure 2 about here

In 1912, the workers' association (*Schweizerisches Arbeitersekretariat*) collected budgets from workers' and civil servants' households across Switzerland, thus allowing the calculation of class specific average budgets and cost of living indices. First results were already published in 1913,[3] but the final outcome was not available before 1922.[4] All in all, there were 791 contributing households (541 workers, 250 civil servants). Older examples for published expenditure statistics focusing on individual households were the family budgets from the canton Thurgau 1866-1885[5], the family budget 1907-1917,[6] a Zurich family budget 1883-1910,[7] a budget of a textile worker family from Eastern-Switzerland (1892-1916),[8] and a budget of a teacher family 1885-1915, again from Eastern-Switzerland,[9]

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1 For more detail on the pedagogical examinations, see *Boppart/Falkinger/Grossmann/Woitek/Wüthrich*, Qualifying Religion.
2 *O. Zimmer*, A Contested Nation. History, Memory and Nationalism in Switzerland, 1761-1891, Cambridge 2003, p. 181.
3 *O. H. Jenny*, Die nominelle und die effektive Teuerung, in: Zeitschrift für Schweizerische Statistik, 54 1918, p. 76-77.
4 *J. Lorenz*, Die Lebenshaltung schweizerischer Arbeiter und Angestellter vor dem Kriege. Ergebnisse der Haushaltstatistik des Schweizerischen Arbeitersekretariates, Olten 1922.
5 *E. Hofmann*, Zwei Haushaltungsbudgets aus dem Kanton Thurgau, in: Zeitschrift für Schweizerische Statistik, 28 1892; *E. Hofmann*, Vier thurgauische Haushaltungsbudgets, in: Zeitschrift für Schweizerische Statistik, 29 1893.
6 *O. H. Jenny*, Die nominelle und die effektive Teuerung, in: Zeitschrift für Schweizerische Statistik, 54 1918.
7 *M. Duttweiler*, Eine Zürcher Wirtschaftsrechnung von 1883-1910, in: Zeitschrift für die gesamte Staatswissenschaft, 71 1915.
8 *E. Ackermann*, Einnahme- und Ausgabebewegung eines ostschweizerischen Textilarbeiterhaushaltes in 21 Jahren, In *F. Eulenburg* (Ed.), Untersuchungen über die Lebenskosten in der Schweiz, Schriften des Vereins für Sozialpolitik, Volume 146, München, Leipzig 1917.
9 *E. Ackermann*, Einnahme- und Ausgabebewegung einer westschweizerischen Lehrerfamilie (1885-1915), In *F. Eulenburg* (Ed.),

which is interesting in the present context, because it covers more or less the observation period. Income and expenditure of this family are displayed in Figure 2. The average difference between income and expenditure is 382.20 Fr.,[1] but one has to take into account that there is a substantial part of auxiliary income. For example, the teacher holds an additional occupation for the entire period, which amounts, on average, to 11 per cent of his annual income. In his conclusion, Ackermann points out that without these additional income components, the teacher's income would not have been sufficient to cover the family's cost of living.[2]

The relatively low income of teachers was a topic central to the public discussion about improving primary schooling. An article in the *Schweizerische Lehrerzeitung* from 1907 compares the income of teachers from the canton Berne to the income of other occupations, with the conclusion that gendarmes in Berne (1500-2500 Fr. annual income) earned more than the teachers.[3] To underline the importance of the relationship between income and teaching quality, teachers from the canton Solothurn quoted Ignaz Thomas Scherr (1801-1870)[4], a well-known school reformer from Zurich, in a 1898 petition: Scherr said that without sufficient income, there will not be enough good teachers, without good teachers, there will not be improvements in schooling performance, without these improvements, there will not be a higher level of overall education, and this would lead to a deterioration of general "nobleness", welfare, and freedom.[5] The increasing competition between male and female teachers within a canton as well as competition across cantons created a possibility for municipalities to replace teaching staff with lower-played teachers, thus lowering the quality level of teaching.[6] Another reaction to the teacher shortage were lower qualification requirements, e.g. 1884 in the canton Berne, where the required number of study years for teachers was cut to 3.5 years.[7]

Because of all these problems, the federal state tried to intervene, but it failed. The most prominent example for the failure of direct intervention is the referendum against the

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Untersuchungen über die Lebenskosten in der Schweiz, Schriften des Vereins für Sozialpolitik, Volume 146, München, Leipzig 1917.

1   *Ackermann*, Lehrerfamilie, p. 136, p. 177.

2   "*Die durchschnittlichen jährlichen Gehaltseinnahmen genügen nicht zur Bestreitung eines auf solider wirtschaftlichen Grundlage aufgebauten Haushaltes. Nur dank der Nebeneinnahmen, Nebenbeschäftigung des Mannes, der Kapitalzinse usw. ist es ermöglicht den Kindern eine sorgfältige Erziehung und Bildung angedeihen zu lassen, sowie noch etwas auf die Seite zu legen.*"

3   *M. von Wartburg-Adler*, Die Lehrerinnen. Ein Beitrag zur ihrer Sozialgeschichte von 1862-1918 im Spiegel der Schweizerischen Lehrerinnenzeitung und der Schweizerischen Lehrerzeitung, Ph. D thesis, University of Zurich 1988, p. 110.

4   *G. Wyrsch-Ineichen*, Scherr, Ignaz Thomas, Historisches Lexikon der Schweiz, URL: http://www.hls-dhs-dss.ch/textes/d/D13409.php April 2012.

5   "*Ohne genügendes Einkommen keine genügende Anzahl guter Lehrer; ohne gute Lehrer keine gute Schule; ohne gute Schule keine emporhebende Bildung des Volkes; ohne allgemeine Volksbildung keine allgemein verbreitete edlere Gesinnung, kein glückender Wohlstand, keine Freiheit*" cited in in: *G. Hodel*, "Kinder, immer nur Kinder, aber Lehrer bringt keiner!" Bildungspolitische Massnahmen zur Steuerung des Bedarfs an Primarlehrkräften in den Kantonen Bern und Solothurn zwischen 1848 und 1998, Ph. D thesis, University of Zurich 2002, p. 315.

6   *von Wartburg-Adler*, Lehrerinnen, p. 94.

7   *Hodel*, Bildungspolitsiche Massnahmen, p. 487.

school secretary, polemically called the "*Schulvogt*" in 1882, the climax of catholic and federalist resistance against a centralized control of education.[1] The federal state, however, succeeded in supporting the "weaker" cantons with financial subsidies, granted in 1902. These subsidies mostly benefited the conservative catholic cantons, which in turn moderated their opposition against intervention in the educational area.[2] Another important and successful indirect measure of control was the pedagogical examinations described above.

3.2 Income Inequality

There is a distinct difference between cantons with a catholic majority and protestant cantons in terms of overall education expenditure per pupil (17.6 per cent on average).[3] Instead in the present paper, the focus is on potential determinants of teachers' income inequality. At a first glance, the teachers' income distribution for the years 1881 and 1894 show a distinct shift in mean income (1881: 1190 Fr.; 1894: 1367 Fr.), which can partly be attributed to inflation, but also a change in dispersion (coefficient of variation 1881: 0.49; coefficient of variation 1894: 0.52). Some cantons regulated teachers' income, for example by fixing minimum income and/or introducing and increasing the cantonal financial contribution. In addition, supplementary allowances for length of service were introduced.

Figure 3 about here

Table 4 around here

To put these numbers into perspective, we can compare them with the average income of other members of the middle class for which data are available in our observation period. The income information is organized in three blocks. The first block of Table 5 contains a comparison for all teachers, while information on income differences depending on age and experience are displayed in the second and the third block, respectively. The evidence is of course sketchy, but it seems that teachers had a significantly lower salary than other middle class employees: comparing starting salaries of male teachers with railway employees, the income differential was as high as 20 per cent. The starting salary of a female clerk was 7 per cent higher than the starting salary of a female teacher. Moreover, as the comparison in the third block of Table 5 shows, these differences did not become smaller with increasing experience or length of service.

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1   In the debate catholic cantons were accused of neglecting education because they paid smaller teachers salaries, required less years of schooling, and had more absenteeism. Federalist cantons, on the other hand, did accept minimal standards, but opposed the idea of the federal state as the controlling institution, insisting on the cantonal sovereignty in the area of education.

2   *Lustenberger*, Rekrutenprüfungen, p. 116-119.

3   This difference is driven by the "conservative" catholic cantons, where the degree of "conservatism" is measured by the voting behaviour in the referenda on civil marriage (1875), the "Factory Law" (1877), and the death penalty (1879). See the detailed discussion in *Boppart/Falkinger/Grossmann/Woitek/Wüthrich*, Qualifying Religion.

In addition to looking at the differences between teachers' income and the income of other subgroups of the middle class, it is also interesting to see the differences among teachers. In the following, we will analyze the distribution of teachers' income by focusing on the corresponding Gini coefficient and the generalized entropy measure as measures for inequality.[1]

Table 5 around here

Figure 4 about here

The Lorenz curve for the years 1881 and 1894/95 does not show a dramatic change over time. The Gini coefficient measures the ratio of the area between the Lorenz curve and the 45 degrees line to the area below the 45 degree line and is defined as[2]

$$Gini_t = \frac{1}{2\,N_t^2\,\bar{y}_t} \sum_{k=1}^{N_t} \sum_{k=l}^{N_t} |y_{k,t} - y_{l,t}|,$$ (1)

where N is the total number of teachers at time t, $\bar{y}_t$ is their average annual income, and $y_{k/l,t}$ is the income of teacher $k\,/\,l$ at time t. Calculating the Gini coefficient for $t = 1881$ and $t = 1894\,/\,95$, we again find not much change over time (1881: 0.26; 1894/95: 0.27). Comparing these figures with available information on income (and wealth) inequality in two districts (Dielsdorf, Zurich) of the canton Zurich, we see that the distribution among teachers is less spread out than the distribution within the relevant group (administration, education, arts, Table 6).[3]

Table 6 around here

What are the sources of inequality in teachers' incomes? As pointed out above, the data set contains about teachers' characteristics, such as sex, length of service, training, marital status, and the canton. It is not possible to decompose inequality as measured by the Gini coefficient by subgroups.[4] Therefore, we have to switch to another measure, allowing a decomposition of total inequality into between-group and within-group inequality[5]

1 F. A. Cowell/S. P. Jenkins, How Much Inequality Can We Explain? A Methodology and an Application to the United States, in: Economic Journal, 105 1995.

2 F. A. Cowell, Measuring Inequality, 3rd edition. Oxford 2011, Table A.1, p. 155.

3 The Gini coefficient for income can only be calculated for the district Zurich (0.42), because for Dielsdorf, information on incomes over 4000 Fr. is not reported.

4 This would only be possible in the unlikely case that the groups can be strictly ordered by income levels, see Cowell, Inequality, p. 165.

5 Cowell, Inequality, p. 166.

$$I_{total} = I_{between} + I_{within}. \tag{2}$$

This decomposition allows calculating measures of the amount of inequality attributable to group characteristics as[1]

$$R_{between} = \frac{I_{between}}{I_{total}}. \tag{3}$$

The simple additive decomposition can be based on the generalized entropy measure[2]

$$E_{\theta,t} = \frac{1}{\theta^2 - \theta} \left(\frac{1}{N_t} \sum_{j=1}^{N_t} \left(\frac{y_{y,t}}{\bar{y}_t} \right)^\theta - 1 \right); \theta \neq 0,1, \tag{4}$$

where θ is the weight attached to distances between incomes at different parts of the distribution. Choosing a low θ has the effect that $E_{\theta,t}$ reacts stronger to changes affecting lower incomes, and a high θ leads to stronger reactions to changes in the upper tail of the distribution.

Divide the teachers into K subgroups and define the relative frequency in subgroup k as $f_k, \sum_{k=1}^{K} f_k = 1$. The mean income in subgroup k is $\bar{y}_k$, and the share of subgroup k in total income is $g_k, \sum_{k=1}^{K} g_k = 1$. Between group inequality is then given as

$$I_{between} = \frac{1}{\theta^2 - \theta} \left(\sum_{k=1}^{K} f_k \left(\frac{\bar{y}_k}{\bar{y}} \right)^\theta - 1 \right), \tag{5}$$

and within-group inequality is

$$I_{within} = \sum_{k=1}^{K} w_k I_k; \; w_k = g_k^\theta f_k^{1-\theta}. \tag{6}$$

Table 7 around here

We examine the influence of teachers' characteristics by focusing on sex, training, payment

1 See *Cowell/Jenkins*, How Much Inequality.
2 *Cowell*, Inequality, p. 66-67.

in kind, civil status (married/not married), and length of service.[1] The three variables sex, training (teachers' seminar yes/no) and payment in kind are dummy variables, and allow breaking up the income data into subgroups. For length of service we create a dummy variable with 10 years as break point. In addition, we add as a cantonal characteristic the share of Catholics (break point: share of Catholics > 50 per cent, census years 1880 and mean of 1888 and 1900), following the discussion of the importance of religion for education in the literature.[2] As can be seen from the results in Table 7, there is not much of a difference between the years 1881 and 1894/95, apart from the increasing importance of length of service. The division into subgroups can account for a between-groups share of about 30 per cent of total inequality, if all subgroups are taken into account. The most important contributions seem to be the inequality between male and female teachers, and the inequality between cantons with and without catholic majority, which echoes on the discussion in the sections above. Payment in kind, civil status, and training play less of a role, while training seems to be more important in 1894/95. However, the most important part of total inequality is within-group inequality.

As a side exercise, we ask the question whether we can also say something about the consequences of inequality on the marks of conscripts in the pedagogical examination. The qualitative evidence discussed above suggests that we should expect a negative impact. To answer this question, we calculate the Gini coefficient for each canton j in $t = 1881$ and $t = 1894 / 95$ modifying equation (1) as

$$Gini_{j,t} = \frac{1}{2\, N_{j,t}^2\, \overline{y_{J,t}}} \sum_{k=1}^{N_{j,t}} \sum_{k=l}^{N_{j,t}} |y_{k,j,t} - y_{l,j,t}|, \qquad (1')$$

where $N_{j,t}$ is the number of teachers in canton j at time t, $y_{k/l,j,t}$ is the annual income of individuum k / l in canton j at time t, and $\bar{y}_{j,t}$ is average teachers' income in canton j at time t.

Table 8 around here

For each of the four subjects, we estimate the following model to test the influence of inequality in teachers' income on the performance of conscripts in the pedagogical examinations. The equation for canton j at time $t, t = 1881, 1894$ is given by

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1 We do not report the results for age, because they are not distinguishable from the outcome for length of service.

2 E.g. *S. Becker/L. Woessmann*, Luther and the Girls. Religious Denomination and the Female Education Gap in 19th Century Prussia, in: Scandinavian Journal of Economics, 110 2008; *S. Becker/L. Woessmann*, Was Weber Wrong? A Human Capital Theory of Protestant Economic History, in: Quarterly Journal of Economics, 124 2009, *Boppart/Falkinger/Grossmann/Woitek/Wüthrich*, Qualifying Religion.

$$M_{j,t} = \alpha_0 + \alpha_1 D_{j,1894} + \alpha_2 Gini_{j,t} + \alpha_3 D_{j,1894} \times Gini_{j,t} + \alpha_4 Catholics_{j,t} + \epsilon_{j,t}, \qquad (7)$$

where $M_{j,t}$ is the average cantonal mark in the subjects reading, essay, math and history at time t. Since one represents the best mark and four, respectively five, the worst mark,[1] the scatterplots displayed in Figures 5 and 6 suggest a detrimental effect of inequality on the marks obtained in the pedagogical examinations. If we control for the share of Catholics in equation 7, we find that this relationship vanishes, suggesting that to explain the differences in the performance of conscripts, teachers' income inequality plays less of a role compared with the determinants identified in Boppart *et al.*[2]

Figures 5 and 6 about here

4 Conclusion

Apparently, the overall low income level has been the main problem for the standard of living of Swiss teachers at the end of the 19th Century, not so much income inequality. To measure inequality and decompose it into subgroup contributions, we follow Cowell and Jenkins[3] employing, in addition to the familiar Gini coefficient, a generalized entropy measure, which allows for a straightforward additive decomposition.

For the two points in time we examine (1881 and 1894/95), there is not much difference in terms of inequality. Among the characteristics of individual teachers, the between-group inequality between male and female teachers contributes the most to total inequality, and cantonal differences reflected in the share of Catholics are even more important. The gender specific inequality can be interpreted as quantitative evidence for the role of female teachers as a buffer on the labor market,[4] and the contribution of cantonal differences represented by the share of Catholics justifies to some extend the accusations against catholic cantons to neglect education. But the overall between-group contribution is only 30 per cent, which means that the more important source for inequality lies within the subgroups we are able to analyze.

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1 See the description in Section 2.
2 *Boppart/Falkinger/Grossmann/Woitek/Wüthrich*, Qualifying Religion.
3 *Cowell/Jenkins*, How Much Inequality.
4 *von Wartburg-Adler*, Lehrerinnen.