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Female teachers and the rise of primary education in Italy and Spain, 1861–1921: evidence from a new dataset[†]

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This article provides the first harmonized quantitative evidence on the rise of mass education across the provinces (today's NUTS 3) of Italy and Spain in the period *c.* 1861–1921. Visual analysis of this new dataset suggests that an important factor linked to the expansion of schooling was the feminization of the teaching profession, something that has been largely neglected so far in quantitative historical studies of educational development. This hypothesis is put to the test using panel-data models. The results show that the feminization of teaching went hand in hand with the rise of schooling rates by prompting more girls to enrol into primary education. By the beginning of the twentieth century, Italy's gross enrolment rate had surpassed that of Spain—partly as the result of increasing feminization within the primary-school teaching profession.

This article provides the first harmonized quantitative evidence on the rise of mass schooling and the extent of feminization in the teaching profession across the provinces of Italy and Spain in the period *c.* 1861–1921. Although the two countries were characterized by similar income trends throughout the period concerned, the rise of mass education followed two very different paths: in 1861, primary-schooling rates in Spain were slightly higher than Italy's; yet by the end of the First World War, Italy had forged ahead of Spain in terms of enrolment rates. Our data show that one aspect that differed substantially between the two economies was the rate of feminization in the teaching profession within primary education. While the number of female primary-school teachers as a percentage of all primary-school teachers was similar in the two countries in the 1860s, by the

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end of the period it had reached 75 per cent in Italy, whereas it stood at around 50 per cent in Spain.

Drawing on this, we test the hypothesis that a central factor linked to the expansion of education was the growing feminization of teaching. Our results, though preliminary and subject to further development, show that the feminization of teaching went hand in hand with the rise of gross enrolment rates—and it was one of the features that allowed Italy to perform better than Spain, with important implications for the diffusion of literacy, as well as long-term economic growth and development. We argue that a larger share of female teachers prompted more girls to enrol in primary education, which sustained the expansion of total enrolment rates.

Although it goes beyond the scope of the present article, we put forward some explanations as to why Spain did not manage to mobilize as many female primary-school teachers as Italy did. A crucial role was played by institutions, in the form of national school acts: while in Italy the legislation did not prevent women from being employed in any schools, the Spanish norms hampered the feminization of teaching by imposing several formal constraints. Our argument thus reinforces the view that institutions (formal norms regulating schooling) were crucial determinants of human and economic development. At the same time, we acknowledge the possibility that factors exogenous to the school system might have affected the selection of women into the teaching profession; preliminary evidence, though scant, suggests that in Spain the average salary of female teachers was relatively low compared to female wages in other occupations—perhaps preventing skilled women from working as teachers, further limiting primary-school female enrolment and thus overall enrolment rates. By contrast, in Italy, female teachers' salaries were more attractive relative to other occupations.

Our analysis and results are linked to the literature on the determinants of long-term human capital accumulation and its impact on economic growth. Human capital is a fundamental determinant of long-term economic and human development.¹ Economic theory now puts human capital at the centre of the transition from a pre-industrial economy to sustained technological progress and economic growth.² Stemming from such theories, a line of research within economic history has sought to shed light on what determined more rapid human capital formation during the era that saw the diffusion of mass schooling and literacy—roughly from 1850 to 1950—by focusing on demographic, socio-economic, institutional, and political determinants.³

Demographic trends are connected to the rise of mass education; a decline in fertility had a positive impact on education in France throughout the nineteenth century, a relationship that was favoured by gender equality.⁴ Economic factors influenced human capital accumulation, too; the diffusion of steam during the industrial revolution had an overall negative effect on school enrolment rates and literacy in England, even though it prompted the rise of more skilled occupations.⁵

¹ Hanushek and Woessmann, 'Education and economic growth'.

² Galor, *Unified growth theory*.

³ Mitch, 'Economic history of education'; Mitch and Cappelli, eds., *Globalization*.

⁴ Diebolt, Menard, and Perrin, 'Behind the fertility–education nexus'.

⁵ de Pleijt, Nuvolari, and Weisdorf, 'Human capital formation'.

During the industrial revolution in France, however, steam-engine technology improved schooling and literacy.⁶

The literature has also highlighted the role played by the political economy of schooling. According to this view, regions characterized by strong land inequality did not experience sustained growth in public education, because restricted elites did not want to raise taxes on land—their own property—to fund schooling for all.⁷ Empirical evidence is not unambiguous on the issue. Go and Lindert find support for this argument across US counties in the mid-nineteenth century, while Cinnirella and Hornung, and Beltran Tapia and Martinez-Galarraga, provide similar results concerning Prussia and Spain, respectively, in the same period.⁸ However, limited evidence of a direct relationship between access to voting and schooling is found across Italy and Sweden.⁹

National school acts were relevant to the rise of mass education: top-down legislation is linked to the diverse routes to schooling for all.¹⁰ Quantitative evidence on increasing school centralization confirms that institutions, and the important reforms that brought about changes in these institutions, played a central role: in twentieth-century Portugal, increasing state funding was linked to a decisive improvement in access to mass schooling and the growth of literacy; in Italy, the move towards centralization in the first decade of the twentieth century—which culminated in the Daneo-Credaro Reform of 1911—is found to have prompted more rapid human capital accumulation.¹¹

Even if the literature on the historical determinants of schooling and human capital has expanded considerably in the last decade, contributions focusing on the link between gender inequality and the rise of mass education are still few in number. Despite growing attention being paid to gender issues within economic history,¹² evidence on the link between gender inequality and the rise of mass education is quite scant.¹³ Two gaps remain to be filled: first, most of the existing studies on the topic take into account educational trends by gender, yet very few of them analyse the impact that gender equality exerts on the expansion of schooling; and second, most of the economic history literature has remained silent so far on the economic consequences of one of the most important known trends in the history of primary education, namely, the feminization of teaching during the long nineteenth century.¹⁴ This article is a first step towards filling in these gaps.

The rate of feminization within primary schooling—measured as the share of female teachers—varied widely across countries during the late nineteenth and early twentieth centuries.¹⁵ Such differences are mostly ascribed to cultural views

⁶ Diebolt, le Chapelain, and Menard, ‘Learning outside the factory’.

⁷ Lindert, *Growing public*.

⁸ Go and Lindert, ‘Uneven rise’; Cinnirella and Hornung, ‘Landownership concentration’; Beltrán Tapia and Martínez-Galarraga, ‘Inequality and education’.

⁹ Cappelli, ‘One size that didn’t fit all?’; Andersson and Berger, ‘Elites and the expansion of education’.

¹⁰ Westberg, Boser, and Brühwiler, eds., *School acts*.

¹¹ Gomes and Machado, ‘Literacy and primary school expansion’; Cappelli and Vasta, ‘School centralization’.

¹² van Nederveen Meerkerk, ‘Gender and economic history’; Sarasua, ‘Women’s work’.

¹³ There are exceptions: Bertocchi and Bozzano, ‘Women’; Diebolt et al., ‘Behind the fertility–education nexus’; Ciccarelli and Weisdorf, ‘Pioneering into the past’; Cappelli and Vasta, ‘“Silent revolution”’. See Bertocchi and Bozzano, ‘Gender gaps in education’, for a comprehensive overview of the literature.

¹⁴ Even though the economic role of female labour has been addressed more comprehensively; see Sarasua, ‘Women’s work’.

¹⁵ Albisetti, ‘Feminization of teaching’.

of women as teachers within society, the lower cost of female teachers compared to that of men, fewer occupational opportunities for women outside pre-primary and primary education, and different extents of urbanization—which is generally found to be positively associated with the employment of female teachers. Such patterns and links have been highlighted by Carter, Margo, Rury, and Strober and Lanford, concerning the history of teaching across US states and counties.¹⁶ Despite this line of research within the history of education, however, economic history has largely neglected this aspect.

The remainder of the article is organized as follows. Section I describes the Italian and Spanish national school acts and their link with gender inequalities in the teaching profession; section II presents the methodology; section III shows the data and historical sources used, while also presenting descriptive evidence; section IV discusses the econometric results and the mechanisms linking the feminization of teaching to enrolment rates; and section V concludes.

I. Italy and Spain: school acts and the gender gap in teaching, c. 1861–1921

Italy's primary-school system shared several features with the Spanish one. The school acts that regulated primary education in the second half of the nineteenth century were passed at about the same time: the Spanish Moyano Law (1857) reformed an existing set of rules, whereas the Casati Law (1859) represented the first national school legislation of unified Italy.

Both the Casati Law in Italy and the Spanish Moyano Law set forth the norms that regulated schooling and education from kindergarten to university. In the case of primary education, the content of schooling (the curriculum) was controlled by the central governments, which established nationally homogeneous norms regulating schooling. Despite this, the actual responsibility of funding and managing primary education lay with the municipalities.¹⁷ Thus, between 1861 and 1901, the school systems of Italy and Spain may be interpreted as strongly decentralized.¹⁸ Due to slow progress in fostering primary education and literacy, particularly in some regions and rural areas, Spain assigned primary education funding to the state in 1902. Although, within Italy, increasing state expenditure for primary schooling started roughly at the same time (1904), the Daneo-Credaro Reform fully re-assigned funding and management responsibilities from the municipalities to the state in 1911.¹⁹

Primary education in Italy had to be offered free of charge in a manner proportional to the municipalities' spending capacity and according to residents' needs—meaning that households would not be charged for public primary schooling. This feature was shared by Spain, even though families and charitable institutions could (formally) participate in the funding of public schools. Municipalities were obliged to build schools, hire teachers, and enforce compulsory

¹⁶ Carter, 'Occupational segregation'; Margo, 'Explaining feminization'; Rury, 'Who became teachers?'; Strober and Lanford, 'Feminization of public school teaching'.

¹⁷ Cappelli, 'Capitale umano'; Núñez, *La fuente de la riqueza*.

¹⁸ Bray, 'Centralization versus decentralization'.

¹⁹ Cappelli and Vasta, 'School centralization'.

attendance in both countries. If Italian municipalities—particularly in rural areas and in the poorer south—had very limited resources to fund primary education, this was even more so in Spain: starting in the eighteenth century and especially in the first half of the nineteenth century, local spending capacity had strongly declined due to the sale of common-pool resources that were previously managed by local authorities. Due to this, Spanish municipalities lost a large share of their estates and, with them, revenues. Furthermore, the state never paid interest on the debt that it had forced the municipalities to subscribe to in exchange for the privatization of their common-pool resources, which aggravated the pressure on municipal budgets and school funding.²⁰ This development is linked to the different role played by private education: in Italy, the share of primary-school enrolments in private institutions declined from 9 per cent in 1877 to about 4 per cent in 1907; in Spain, instead, the share of private enrolments grew from 16 per cent in 1877 to about 25 per cent in 1921.

Although the main pillars of the primary-schooling system were common to both countries, important institutional differences can be discerned concerning girls' education compared to boys'. First, although the Casati Law did not specifically promote schooling for Italian girls, there was no explicit discrimination: each municipality was compelled to establish at least a boys' and a girls' school. Spain was different: the law differentiated between primary schools called *completa* (a standard primary-education institute) and *incompleta* (a rural primary school with fewer subjects being taught). A boys' school (even if just an *incompleta*) had to be established in every municipality, whereas a boys' *completa* was compulsory in municipalities with more than 500 inhabitants. By contrast, a girl's *incompleta* was only compulsory in municipalities with more than 500 inhabitants, while a standard (*completa*) girls' primary school had to be established in places with more than 2,000 inhabitants.

Similarly, mixed schools—that is, those open to both boys and girls—could be established in Italy by any city council; even in more populated and prosperous municipalities, a small rural village that did not have a sufficient number of pupils to set up two single-sex institutions could open a mixed school to guarantee broad access to schooling. By contrast, in Spain, the Moyano Law allowed mixed schools to be opened only in very small and rural municipalities, that is, those with less than 500 inhabitants, where economic and cultural factors may have hampered the feminization of the teaching profession. Importantly for educational gender equality, Italian female primary-school teachers could work in all schools. None of the elements of the Casati Law prevented them from teaching in boys' schools; instead, article 324 prevented men from teaching in girls' schools. In Spain, by contrast, female teachers were explicitly forbidden from working in boys' schools.

It is also important to note that, from the very beginning, the training of male and female teachers was promoted equally within Italy's national education system: normal schools (teacher-training colleges) were established across the country, in equal numbers for men and women.²¹ In Spain, male normal schools were the

²⁰ Comin, *Historia de la Hacienda Pública*; Beltrán Tapia, 'Common lands'.

²¹ The Italian statistical yearbook 1878 (Ministero dell'interno, Direzione generale di statistica, *Annuario statistico italiano*) reports a larger number of female normal schools across the country's provinces in 1872 compared to male ones. In Spain, in 1860, there were 55 male normal schools and just 24 female ones. The situation had not changed by 1880, when there were 47 male normal schools and 29 female normal institutes.

majority, and the distribution of female normal schools (where women had to study) across the country prevented the supply of female teachers from growing substantially in areas that were far away from these schools.

Finally, the Casati Law recognized that, if there was a strong demand for teachers and limited supply of teachers possessing the required formal qualification, both men and women lacking a formal certificate could be allowed by the provincial inspector to join a school. In Spain, only male teachers could start to work without a formal qualification, whereas women were obliged to acquire one through normal schools.

Both the Casati and the Moyano Laws established centralized rules for the salaries of teachers, determining the upper and lower limits for their earnings according to a municipality's prosperity and population size.²² Under both laws, female teachers were to earn 33 per cent less than male teachers, independently of the location of the schools—implying strong wage inequality within the teaching profession. Although the salaries of teachers were formally regulated by the national legislation, the actual figures were the result of bargaining between the city councils and local teachers, as well as local conditions; salaries were sometimes below the formal minimum established by the national norms, implying that teachers had other occupations. This latter aspect is linked to another important difference between Italy and Spain. While, in the former, the law did not prevent women from having other occupations, in Spain they were barred from having alternative occupations provided by public authorities—for example, the city councils: only men could increase their salary by relying on additional jobs within the public sphere.

II. Methodology

Our main hypothesis is that the different trends in the gross enrolment rate (hereafter GER, defined in the next section) across the provinces of Italy and Spain can be partly explained by the shift from a male teaching workforce to a female one. Although, at this stage, we cannot identify causality through an ad hoc strategy, we can nonetheless test whether such a relationship existed; that is, whether more feminized schools are associated systematically with higher schooling rates. We analyse this relationship by relying on the full variation over time and across Spanish and Italian provinces that is provided by our new dataset, differentiating between total schooling (including private) versus public education only. We rely on the following panel-data econometric model (we provide details of each variable and the respective sources in the next section):²³

$$ger_{it} = \beta_0 + \beta_1 fem_{it} + \beta_2 SC'_{it} + \beta_3 X'_{it} + \delta_i + \gamma_t + \varepsilon_{it} \quad (1)$$

where ger_{it} is the average GER for province i in year t . Our main explanatory variable is fem , the extent of teaching feminization. We divide between feminization

²² In Spain, municipalities with less than 500 inhabitants decided autonomously on teachers' salaries, independent of the government's norms.

²³ Although, in our opinion, panel-data models are the most suitable to address our research question (since it is the different feminization trends that are remarkably clear in the data), we provide results based on repeated cross sections in online app. S3.

occurring in public versus private schools. SC is a vector of educational variables: this includes the number of teachers per 1,000 children, the density of schools (schools per square kilometre), the overall number of schools, and school expenditure per child, all of which are expected to be positively correlated with the outcome variable. The share of private enrolments is expected to be negatively associated with overall enrolment rates, although this relationship may vary between countries more than across their provinces; private education, as discussed earlier, was more prominent in Spain than Italy.

To the set of educational variables, we add X' as a vector of further controls. This includes electoral franchise, measured by the share of males aged 25 years and over who possessed voting rights; according to the political-economy literature concerning nineteenth-century education, a larger franchise under a decentralized system of public-good management implies a larger supply of locally provided public goods, particularly education. We include the squared term of electoral franchise to model potential non-linear effects of access to voting on enrolment rates, since the last men to be allowed to participate in local elections (that is, the poorest) might oppose taxes on public schooling as much as the richest (that is, the landed elites).²⁴ This is particularly relevant for Italy, which saw a gradual increase in the franchise; by contrast, in Spain, suffrage switched from restricted to universal a few times within the period concerned, so that no robust relationship is expected between this aspect and schooling.²⁵ The share of the population working in agriculture should be negatively correlated with schooling, since basic occupations in agriculture did not require particularly high levels of education. Instead, the urbanization rate and population density should be associated with more education—even though some bias may be introduced by the so-called agro-towns, that is, large agglomerations usually of more than 10,000 people, which shared few features with cities (for example, they had a very small share of manufacturing activities). More urbanized regions are also more likely to be involved in trade, which is a correlate of education and low gender inequality in schooling.²⁶ Fertility rates and a proxy aimed at capturing patterns of migration are included. We also include time dummies to capture common trends (for example, common trends in school reforms towards centralization that occurred roughly at the same time) and provincial fixed effects to control for time-invariant features: these include plausible persistent differences across provinces and countries in, for example, marriage patterns and cultural aspects (patriarchy), as well as religion—which should not affect the comparison in any case, since both Italy and Spain were virtually fully Catholic countries.²⁷

As a robustness check, we also add literacy for the group aged six years and over as a proxy for existing parental human capital. We do this because part of the effect of feminization rates on enrolments that we expect to observe might be

²⁴ Go and Lindert, 'Uneven rise', p. 17.

²⁵ In Spain, there were abrupt changes between universal male suffrage (1868–78, and from 1890 onwards) and the restricted electoral franchise (1860–8, 1878–90). We have also tested models that include only the linear effect of the electoral franchise; in this case, the core results concerning the schooling–feminization relationship remain the same, but the coefficient of the linear franchise–GER relationship turns out to be negative, due to omission of the squared term.

²⁶ Bertocchi and Bozzano, 'Gender gaps in education'.

²⁷ We consider these factors to be time-invariant in the span of 60 years, although of course they may vary in the very long run. See *ibid.*

due to more girls becoming teachers in places with more literate parents. Even so, using literacy at age six and over is a second-best option; conceptually, to capture parental human-capital stocks and reduce potential bias, one should focus on the literacy of people in their 20s (for example, 21–5 years). However, such a figure can only be obtained for 1911 concerning both countries—which did not allow the variable to be included among the time-varying controls. We checked whether this was a major issue biasing our results in two ways. First, for 1911, we constructed a scatter plot comparing literacy at age six and over and a proxy for parental literacy (literacy in the 21- to 25-year age group) separately for provinces of Italy and Spain, as well as for males versus females. The resulting index of correlation is, for both countries and independently of gender, around 0.95 to 0.98. Therefore, we argue that literacy rates at age six and over can be used as a proxy for pre-existing human capital stocks. Second, we also ran the same econometric models by including the first lag (roughly 10 years earlier) of literacy at age six and over. Independently of the robustness check performed (with literacy at age six and over or its lag) the results remain virtually the same with respect to the baseline model.²⁸

III. Data and sources

This article is the first contribution to provide a dataset on schooling and educational variables for all the provinces (roughly today's NUTS 3²⁹ statistical divisions) of Italy and Spain, during the years *c.* 1861–1921.³⁰ We rely on known printed sources published by the Italian and Spanish governments throughout the period considered; for the first time, the figures have been re-assessed and harmonized to form a comparable set of historical statistics concerning the regional diffusion of primary schooling during the era that saw the rise of mass education in the European south.³¹ We provide harmonized figures for several years—even though the panel is not fully balanced due to data availability: 1861, 1870, 1877, 1887, 1901, 1907, and 1921. Italy's school data are available for the years just listed; however, population figures had to be estimated via linear interpolation.³² Spanish census data were available for virtually the same years, that is, 1860, 1877, 1887, 1900, 1910, and 1920. Spanish educational figures were gathered for the years 1860, 1880, 1885, 1900, 1908, and 1921.³³

The resulting dataset covers the following primary-education variables (for detailed references to the primary sources used, see online appendix S1). In the case of both countries, virtually all the school-related variables, excluding some figures on educational expenditure (discussed later in this section), come from

²⁸ We just include the model with literacy rates for those aged six and over as a control among the results presented in section IV, while we omit the others including the lag of literacy for those aged six and over for the sake of brevity. They can be found in online app. S5 (cols. 1 and 2).

²⁹ This corresponds to present-day provinces in both countries.

³⁰ This research effort is part of a project funded by the Swedish Research Council (PI: Johannes Westberg), grant no. 2016-05230.

³¹ Westberg and Cappelli, 'Divergent paths', have provided similar results for Italy and Sweden, focusing on the 1880s.

³² This is a common procedure among economic historians, since population figures are known to change slowly throughout time—the censuses were taken every 10 years (excluding the 1891 one, which was never conducted due to budget constraints): 1861, 1871, 1881, 1901, 1911, and 1921.

³³ Minor adjustments, where needed, were obtained by means of linear interpolations.

inquiries into and statistics on the condition of primary schooling, while literacy and population figures are drawn from population censuses. For each available province and year available, we estimate a large set of variables.

First, the GER, which is based on both public and total enrolments (thus including those in private schools), is calculated as the ratio between all children enrolled in primary schools (including repeaters and pupils older than the usual school age) and the number of school-aged children. We adopt a common school age, defined as the interval from six to 14 years—roughly similar to today's ISCED 2011 levels 1 and 2—to ease comparisons over time and across countries.³⁴ All institutions defined as primary schools by the reports and statistics are included in our calculations.

The ratio of teachers per 1,000 children is based on both teachers in public institutions and total teachers (thus including those working in private schools); we use this ratio as a variable capturing the availability of primary-school teachers. All teachers working in institutions defined as primary schools by the reports and statistics are included in our calculations. The denominator is the number of school-aged children.

We include gender inequality in teaching through a variable capturing the feminization of teaching, defined as the ratio between female teachers and total teachers.³⁵ We decompose the index into feminization in public versus private schooling.

For schools per square kilometre, the ratio is based on either total schools (thus including private ones) or public institutions only; we use this ratio as a variable capturing the availability of primary schools across the territory of a given province. The denominator is the provincial territory measured in square kilometres. All institutions defined as primary schools by the reports and statistics are included in our calculations. We include all male, female and, when present, mixed schools.

The total (absolute) number of schools is included to control for economies of scale in schooling within provinces. Furthermore, the absolute number of schools partly depended on the school acts: for example, in Spain, the Moyano Law stated that every municipality with more than 500 inhabitants had to build at least one school.

Expenditure per child is current total expenditure for primary education divided by the number of school-aged children. Current expenditure in national currencies is converted into 1913 (constant) values using historical national price trends;³⁶ we then convert both series into 1913 British pounds by relying on historical exchange rates.³⁷ We could not retrieve information on the resources invested in private

³⁴ ISCED is the acronym for UNESCO's International Standard Classification of Education. Since the compulsory-education age varied across countries, we defined a common denominator to allow for smooth comparisons. However, it should be noted that the duration of compulsory primary schooling was broadly similar in Italy and Spain, with minor differences—for example, Italy switched from two years of compulsory primary education to three in 1877. In online app. S5 (col. 3), we report the results of our analysis based on country-specific time trends, to account for potential bias due to asynchronous changes in the duration of compulsory education (which are consistent with the ones reported in the text).

³⁵ See Strober and Lanford, 'Feminization of public school teaching', for a similar approach.

³⁶ Ciocca and Ulizzi, 'I tassi di cambio nominali'; Maluquer de Motes, 'Consumo y precios'.

³⁷ We relied on data provided by Measuring Worth, <https://www.measuringworth.com/> (accessed on 20 April 2020). It is worth noting that we could not directly apply PPP exchange rates, since they were only available for Spain. However, our procedure should not lead to bias in the constant-prices estimates, since most of our series

primary schooling—either by private institutions, such as charitable organizations, or by households. Therefore, our analysis concerning expenditure remains limited to public primary schooling, which is a constraint that we cannot overcome due to the source material. We include both ordinary and extraordinary expenditure (*spese ordinarie e straordinarie* in Italian, and *gastos ordinarios y extraordinarios*, in Spanish) but leave out discretionary expenditure (*spese facoltative* in Italian) since virtually none of this related to primary schooling. In Italy, the system of school funding was radically changed by the Daneo-Credaro Reform in 1911, which declared that the state would play a more important role in primary education.³⁸ Therefore, municipal budgets are suitable for covering all primary education expenditure up to and including 1907; expenditure data by province are not available for 1921. For Spain, we can track expenditure figures at the provincial level and over time independently of the nature of the school system; data are available from 1861 to 1921.³⁹

Literacy rates for the population aged six and over are calculated from census data or secondary sources.⁴⁰

Apart from schooling-related variables, we include a set of controls in our analysis. The share of adult males (aged 25 years and over) allowed to vote in local (municipal and provincial) elections captures the political economy of primary-school provision under a decentralized system of school funding and management, following the related literature presented earlier. We rely on electoral statistics and census figures on the male population to obtain the ratio. The age threshold to be an elector was 21 years in Italy, but we harmonize it with figures concerning Spain, where that age was 25. While in Italy the access to (male) suffrage grew slowly but steadily over time, in Spain there were abrupt changes between universal male suffrage (1868–78, and from 1890 onwards) and a restricted electoral franchise (1860–8, 1878–90). As explained earlier, we include a squared term of franchise to model potential non-linear effects.

The share of the population working in agriculture is an index used, first, to capture the sectoral composition of the local economy, and second, as a broad proxy of economic performance in the nineteenth century and up to the First World War. We do not divide total agricultural workers by the labour force, due to issues in the harmonization of the latter figures between Italy and Spain and the consistency of national figures over time, using the whole population instead.

The urbanization rate is obtained, for each province, as the ratio between the population living in municipalities with more than 30,000 inhabitants and the total population. Data mostly come from census figures.⁴¹ Actual city-level data could

concern the gold standard period, when both prices and exchange rates were very stable over time—at least up to 1914. Indeed, both exchange rates with the pound follow broadly parallel trends in that period, similar to the behaviour of national price levels. Even if we try to use the Spanish price index to deflate the Italian series, the results hardly change. For the years 1915–23 the bias from our procedure may increase; yet dropping this year from the econometric analysis shown below does not change the results in terms of the alleged literacy–feminization nexus, nor does it change the estimated marginal effect of per-child expenditure on literacy or schooling.

³⁸ Cappelli and Vasta, ‘School centralization’.

³⁹ See online app. S2 for details of the expenditure indices.

⁴⁰ We elaborated literacy rates by gender. For Italy, censuses are available in years close to 1877 and 1907, namely, 1881 and 1911, respectively. We adjusted the series by means of linear interpolation to match the Spanish census data. No census was conducted in 1891 or any neighbouring year. Therefore, we also obtain the 1887 values by means of linear interpolation.

⁴¹ Nuvolari and Vasta, ‘Geography of innovation’.

not be retrieved and harmonized. We choose the 30,000-inhabitant threshold to limit bias arising from agro-towns. Given their presence in the south of Italy and, even more so, in the south of Spain, this method cannot rule out some measurement bias concerning urbanization. Despite this, the inclusion of a proxy for the sectoral structure of the economy should limit potential bias from the presence of agro-towns in the econometric analysis.

The population density is the ratio between total population (residents where specified, as in the Italian statistics) and the total geographical surface area in square kilometres.

The relative importance of private education (when we include private education in the analysis) is the ratio between children enrolled in private schooling and total enrolment.

The fertility rate is defined as the number of children born (including stillbirths) divided by the number of women aged 15 to 50 years.

With regard to a proxy for migration, we faced a trade-off between, on the one hand, the inclusion of this important aspect in relation to schooling and human capital, and, on the other hand, the absence of provincial-level migration data for both countries.⁴² Our solution is pragmatic and aims at capturing the impact that migration has on provincial populations. For every country and benchmark year (for example, an Italian province in 1861), we compare the number of people aged five to 10 years with the same cohort counted in the following census; that is, 1871 in the example just given; the cohort being aged 15 to 20 years at that time. The intuition is that, by and large, a ratio larger than one means that people are moving elsewhere (although we do not know where), whereas a ratio smaller than one means that there is an influx of people towards the province.⁴³

Although these figures do not address several variables that are commonly included in nationally focused studies on schooling, human capital, and the economy, they do cover (albeit broadly) many aspects related to demography, the economy, society, and politics. Most importantly, the figures we built are fully harmonized, and allow for a systematic quantitative analysis that has been impossible thus far.

The resulting panel is unbalanced to some extent, particularly concerning the analysis of feminization from 1901 to 1921, but more balanced (except for a handful of Italian provinces in the 1860s, since they were not yet part of the Kingdom) concerning public-schooling variables. Table 1 shows the summary statistics for 1877 as an example, since this is the first year when the panel is strongly balanced.⁴⁴

⁴² For Italy, official sources report outward-migration data by province, yet internal migration is not known. By contrast, while Spanish internal migration rates have been studied before, we are unaware of historical data on outward migration for Spanish provinces.

⁴³ Naturally, such figures capture aspects other than migration, such as different mortality rates. However, the provincial distribution of our index seems to reflect known migration patterns quite well; in the case of Spain in the late nineteenth century, for example, scholars argue that migration inflows concerned primarily—if not exclusively—Madrid and Barcelona. According to our index, until the end of the 1880s, only Madrid and Barcelona were characterized by a ratio smaller than one, meaning they were the only provinces to attract migrants (despite their own outflow of people abroad). Later in the nineteenth century, the provinces of Cádiz and Vizcaya became relevant destinations too, albeit to a smaller extent; our index captures this change as well. Due to widespread provincial border changes in the 1920s under the Fascist regime, we cannot calculate the migration proxy for Italy in 1921.

⁴⁴ Enrolments, the number of teachers, and the number of schools are available for public education in all provinces and years; however, private-school enrolments and teachers are missing for all Spanish provinces in

Table 1. *Gross enrolment rates (public schooling) and main schooling variables in 1877: Italy and Spain compared*

	Italy					Spain				
	<i>N</i>	<i>Mean</i>	<i>Std. dev.</i>	<i>Min.</i>	<i>Max.</i>	<i>N</i>	<i>Mean</i>	<i>Std. dev.</i>	<i>Min.</i>	<i>Max.</i>
Primary GER (public)	69	35.08	16.67	12.65	76.87	49	41.77	14.09	17.93	72.16
Teachers per 1,000 children (public)	69	7.90	2.89	3.45	17.03	49	9.02	4.60	3.20	20.84
Schools per square km (public)	69	0.17	0.12	0.03	0.84	49	0.05	0.03	0.01	0.12
Expenditure per child (1913 \$)	69	1.15	0.41	0.52	2.50	49	1.45	0.53	0.39	2.70
Enrolled private % total	68	9.11	8.29	0.82	43.48	49	15.82	11.60	3.35	52.11
Electors % adult males	69	22.44	9.34	10.99	49.87	49	34.85	19.36	1.28	86.76
Agricultural workers % population	69	31.93	8.32	6.15	55.50	49	30.96	9.25	14.62	63.58
Urbanization rate (>30,000)	69	14.40	16.19	0	80.69	49	8.60	14.19	0	66.95
Population density	69	121.85	112.42	23.70	904.17	49	40.06	24.22	12.82	108.25
Dependency ratio	69	18.13	0.89	15.93	20.19	49	17.94	1.50	13.80	21.87
Literacy rate	69	33.25	16.71	13.04	71.44	49	36.05	14.53	15.18	69.37
Female/total teachers (public)	69	0.49	0.06	0.36	0.65	49	0.35	0.13	0.08	0.57
Female/total teachers (private)	68	0.60	0.20	0	0.95	49	0.62	0.15	0.20	0.89
Fertility rate (%)	69	15.62	1.45	10.88	19.31	49	14.40	1.92	8.61	17.34
Migration proxy	69	1.04	0.08	0.81	1.28	49	1.21	0.14	0.77	1.48

Notes: The only missing value for Italy concerns the province of Lecce, for which private schooling is not available in 1877. For Italy, 10 provinces are not reported in the national statistics until 1871—the eight provinces of Veneto, plus Mantova and the province of Roma (in the Lazio region). Concerning 1861, we could not retrieve data on private schooling for additional provinces, that is, Cagliari and Sassari (Sardinia), Grosseto (Tuscany), Girgenti, Siracusa, and Trapani (Sicily), and Reggio Calabria (Calabria).

Sources: See section III.

Since Italy and Spain follow the same trend in per capita GDP over time (figure 1), and provided that their education systems shared very similar features until at least 1900, economic and institutional aspects can hardly be directly linked to the reversal of relative GERs (figure 2) and literacy rates (figure 3) observed during the period considered.⁴⁵ When looking at table 1, it becomes apparent that two features that differed between Italy's and Spain's provinces were population density and urbanization. However, even if economic geography may explain the variation in literacy between the two countries and across their regions to some extent, the average trend in urbanization (as we measure it) was basically the same in Italy and Spain—and population densities showed only slightly diverging developments over time.

One aspect that certainly differed both across provinces (and countries) and over time is the feminization of the teaching profession. In the case of public schooling, the share of female teachers reached 70 per cent in Italy by 1907, while it remained as low as 45 per cent in Spain in 1921, more than a decade later (figure 4a). Similar

1901 and 1907 and for Italy in 1921, with the number of private schools being missing for both countries in 1921. Unfortunately, data divided by gender are not always available, so our feminization index is missing for Spain in 1901 and 1907 and for Italy in 1921, for both public and private education. The control variables are never missing—except from the proxy for migration that could not be estimated for Italy in 1921, due to several important changes in the provincial borders that would make a 1921/1931 comparison cumbersome.

⁴⁵ Part of the stagnation in enrolment rates in Spain depends on the stagnation in education spending per child, which in turn can be linked to the limited resources possessed by the Spanish municipalities (see section I). This is directly linked to the issue of the feminization of teaching. Given the level of educational expenditure, hiring female teachers should have lowered the cost of primary schooling due to the norms for female teachers' salaries. Indeed, at the beginning of the period, Spain spent more than Italy on education (per school-aged child), but over the entire period Italy took the lead. In 1907, expenditure per child in Spain was 50% of Italy's.

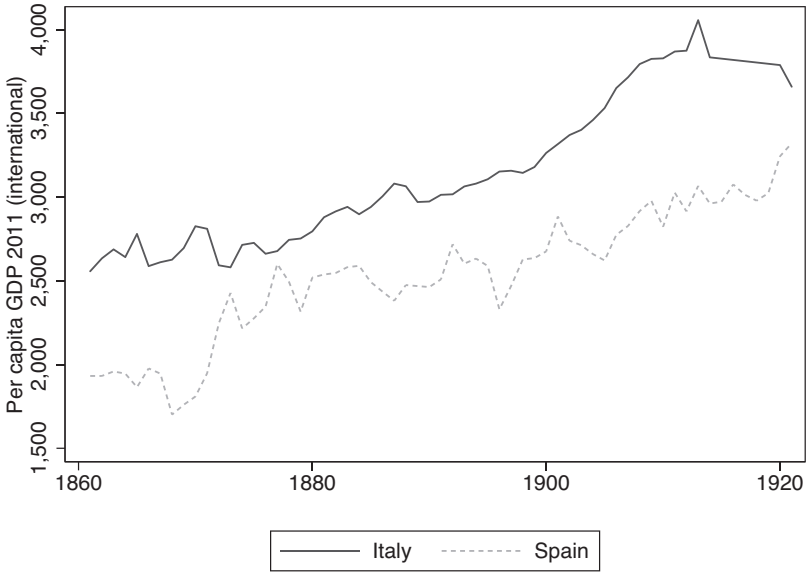


Figure 1. *Real per capita GDP in 2011 international US\$: Italy and Spain compared, 1861–1921*

Note: In previous versions of the Maddison Project Database (2010 and 2013), Italian and Spanish per capita income levels look more similar; yet the trends over time look almost the same, as in this figure.

Source: The Maddison Project Database version 2020 (Bolt and van Zanden, ‘Maddison style estimates’).

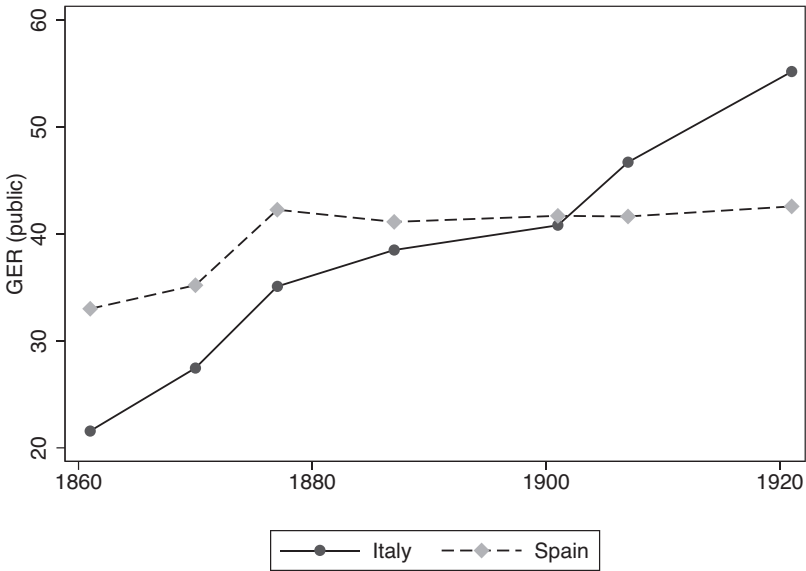


Figure 2. *Average gross enrolment ratio in public primary schools: Italy and Spain compared, 1861–1921*

Note: The figure is based on unweighted averages of provincial values.

Sources: See online app. S1.

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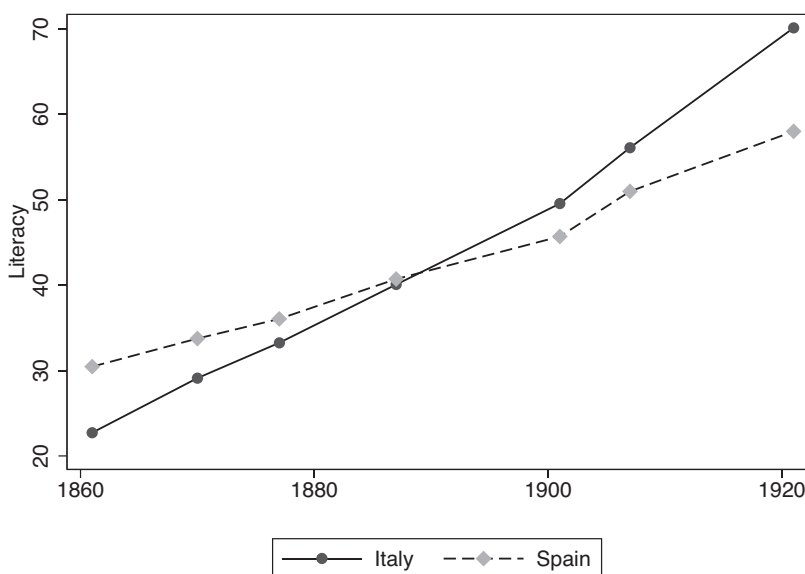


Figure 3. *Average literacy rate (population aged six years and over) in Italy and Spain*

Notes: For Italy, censuses are available in years close to 1877 and 1907, that is, 1881 and 1911, respectively. We adjusted the series by means of linear interpolation to match the Spanish census data, and due to the fact that schooling data from special inquiries into the matter are available for both countries in 1877 and 1907. No census was conducted in 1891 or any year close to it. Therefore, we also obtain the 1887 values by means of linear interpolation. The figure is based on unweighted averages of provincial values.

Sources: See online app. S1

figures are found for private schooling—80 per cent and 60 per cent, respectively (figure 4b).

Concerning the spatial distribution of education, there is a positive correlation between schooling (GER) and feminization rates in Italy at the beginning of our period (figure 5a), while in Spain this relationship appears to have been weak, if not negative (figure 6a). Over the following decades, the growth in feminization rates is associated with positive increases in the GER—more so in Italy than in Spain. Figure 5b shows that, in Italy, the relationship between growth in feminization and increases in enrolment rates is positive, if we exclude Piedmont and Lombardy, where the scope for expanding enrolment rates was modest. By contrast, several areas of Spain show a negative correlation between the growth of feminization and increases in enrolment rates—for example, provinces within Galicia, Asturias, and parts of Castilla y León, as well as Murcia and Almeria. Below, we put this diachronic schooling–feminization relationship to the test.

IV. Econometric results

First, we regress overall GERs on the feminization of teaching (split between public and private schooling) in a fixed effects model with time dummies and robust standard errors that includes both private and public primary schooling (table 2a). Since private-schooling figures are not available in all the sources that we used, we also expand our set of province-year observations by focusing on public schooling

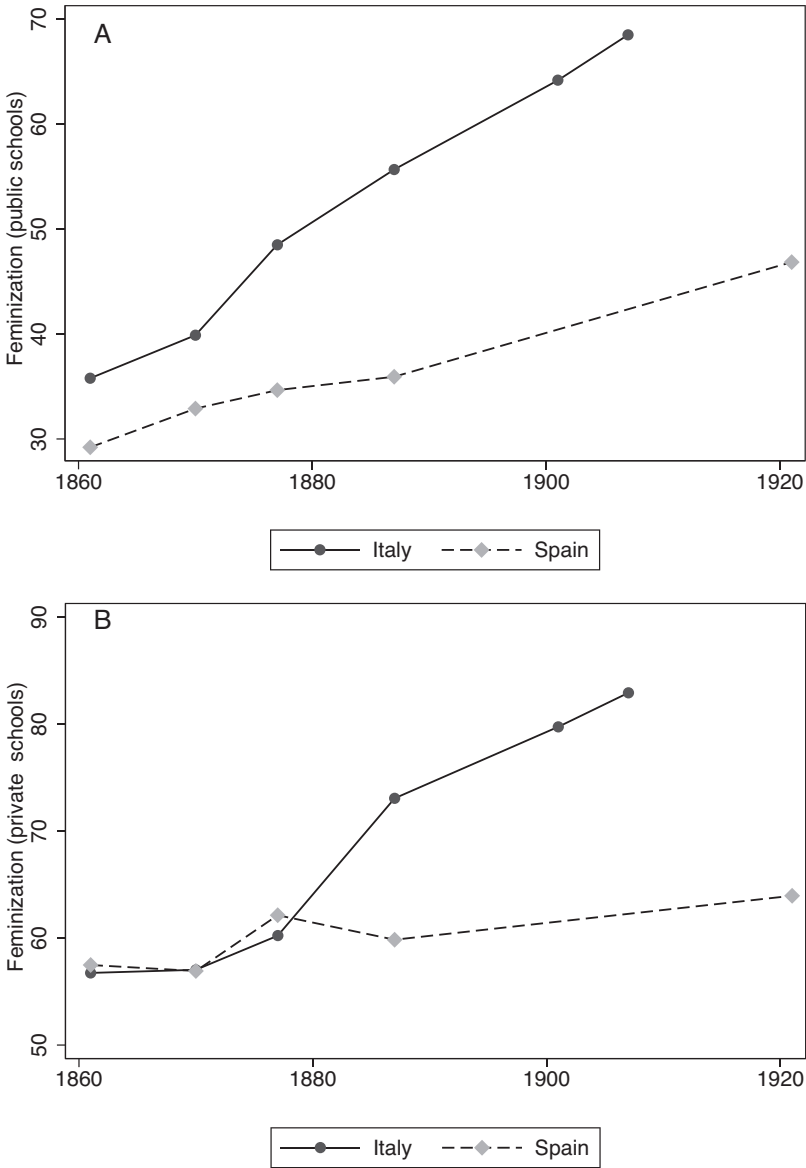


Figure 4. *Feminization of the teaching profession: Italy and Spain compared, 1861–1921*

Notes: The index shown is calculated as the ratio between female teachers and total teachers in primary schools, separating between public and private schooling. The figure is based on unweighted averages of provincial values. Sources: See online app. S1.

only (table 2b). Column 1 includes only the feminization index in private and public schooling; column 2 adds all schooling-related variables (excluding literacy); column 3 includes all other controls; column 4 focuses on Italy’s provinces, while column 5 concerns the provinces of Spain; finally, column 6 presents the model of column 3, with the addition of literacy at ages six and over on the right-hand

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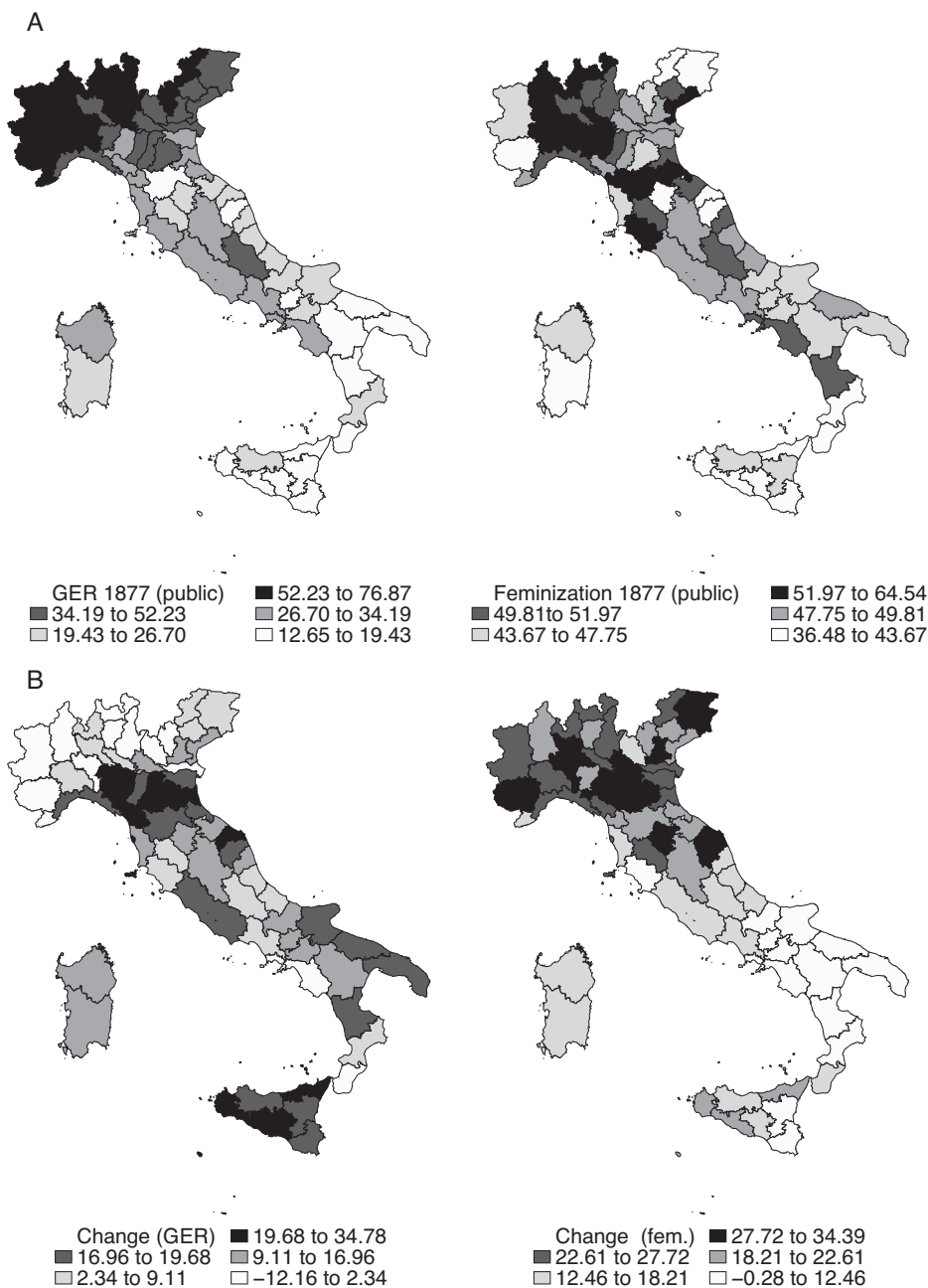


Figure 5. (a) *Enrolment rates and feminization rates (public schooling) in Italy in 1877 and (b) their absolute changes over the period 1877–1907*

Notes: We focus on 1877 because this is the first year showing all Italian provinces (we focus on the same year in fig. 6, for Spain). The province of Mantova originated from border changes within the country, while the other excluded provinces (the Venetian territory and the province of Rome) were annexed to the Kingdom of Italy in the period 1861–70. Gross enrolment rates are shown for public schooling only. Since the last year when the feminization index (for public schooling) is available for Italy is 1907, the maps in the lower panel (5b) focus on changes in the period 1877–1907, which are shown in percentage points.

Sources: See online app. S1.

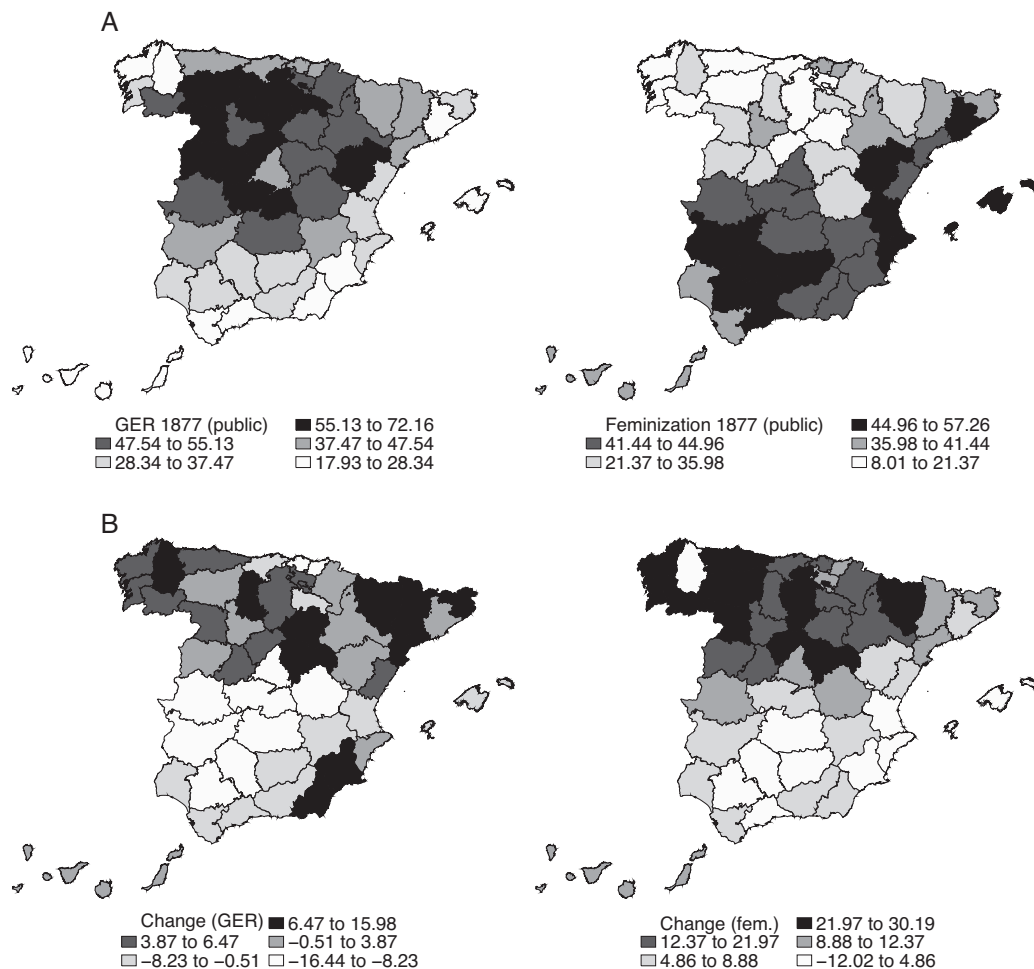


Figure 6. (a) *Enrolment rates and feminization rates (public schooling) in Spain in 1877 and (b) their absolute changes over the period 1877–1921*

Notes: See fig. 5. The changes in the variables reported in the lower panel (6b) focus on the period 1877–1921. Changes in the lower panel are shown in percentage points.

Sources: See online app. S1.

side of the equation. We explored whether interesting differences concerning the feminization–schooling nexus emerged across different areas (for example, the north compared to the south), but this was not the case.⁴⁶

⁴⁶ We tested whether results differed between the northern and southern provinces, for the overall sample and separately for Italy and Spain. The ‘south’ is defined in terms of present-day NUTS 2 statistical divisions. The Italian south is defined as including the regions of Abruzzi (with Molise), Campania, Puglia, Basilicata, Calabria, Sicily, and Sardinia, while the Spanish south includes the regions of Andalucía, Murcia, Extremadura, and Castilla–La Mancha. When analysing the whole sample (Italy and Spain together), the feminization–GER relationship was statistically significant for both the north and the south, even though the magnitude of the coefficient is reduced for the latter (0.24 vs. 0.15). The feminization–GER relationship is not statistically different from zero in either the north or the south of Spain with regard to public schooling, even though a weak positive effect can be noticed

Table 2a. Panel-data regressions concerning all schools (private and public)

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	All Primary GER	All Primary GER	All Primary GER	Italy Primary GER	Spain Primary GER	All (iteracy) Primary GER
Female/total teachers (public)	0.246*** (0.044)	0.176*** (0.043)	0.231*** (0.040)	0.266*** (0.044)	0.170 (0.135)	0.132*** (0.048)
Female/total teachers (private)	0.086*** (0.023)	0.015 (0.018)	0.007 (0.016)	0.002 (0.015)	0.009 (0.040)	0.016 (0.015)
Teachers per 1,000 children		2.025*** (0.306)	1.829*** (0.327)	2.360*** (0.278)	0.802* (0.445)	1.875*** (0.350)
Schools per square km		3.070 (3.863)	8.433* (5.083)	3.208 (7.224)	-47.668 (112.251)	8.045 (5.064)
Total schools		-0.004 (0.003)	-0.002 (0.003)	-0.005 (0.003)	0.019 (0.015)	-0.002 (0.003)
Expenditure per child (1913 \$)		-0.262 (0.441)	-0.070 (0.443)	0.001 (0.305)	1.414 (1.875)	-0.241 (0.487)
Enrolled private % total		-0.195*** (0.055)	-0.157*** (0.053)	-0.161*** (0.059)	0.055 (0.079)	-0.179*** (0.052)
Electors % adult males			0.303*** (0.072)	0.542*** (0.120)	0.089 (0.102)	0.336*** (0.072)
Electors % adult males squared			-0.003*** (0.001)	-0.005*** (0.001)	-0.001 (0.001)	-0.003*** (0.001)
Agricultural workers % population			0.035 (0.080)	0.100 (0.082)	-0.117 (0.083)	0.020 (0.075)
Urbanization rate (>30,000)			0.014 (0.098)	0.042 (0.102)	-0.038 (0.155)	0.024 (0.092)
Population density			-0.039 (0.025)	-0.009 (0.037)	-0.297* (0.158)	-0.039 (0.025)
Fertility rate (%)			0.273 (0.312)	-0.259 (0.299)	1.571** (0.648)	0.264 (0.297)
Migration proxy			-1.469 (2.823)	0.260 (2.566)	-0.875 (5.502)	-2.121 (2.880)
Literacy rate (6+ years)						0.295*** (0.089)
Constant	32.153*** (3.158)	21.728*** (3.031)	11.262 (9.189)	-2.878 (10.908)	13.792 (16.385)	0.860 (9.153)
Time fixed effects	Y	Y	Y	Y	Y	Y
Provincial fixed effects	Y	Y	Y	Y	Y	Y
Controls	N	N	Y	Y	Y	Y
Observations	637	588	588	393	195	588
No. of provinces	118	118	118	69	49	118
Adjusted R ²	0.701	0.784	0.807	0.879	0.701	0.814

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Sources: See sections II and III.

Table 2b. Panel-data regressions concerning public schooling only

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	All Primary GER	All Primary GER	All Primary GER	Italy Primary GER	Spain Primary GER	All (literacy) Primary GER
Female/total teachers (public)	0.346*** (0.042)	0.143*** (0.046)	0.184*** (0.041)	0.242*** (0.043)	-0.015 (0.076)	0.123*** (0.040)
Teachers/1,000 children (public)		2.152*** (0.236)	1.822*** (0.222)	3.300*** (0.379)	1.261*** (0.344)	1.805*** (0.230)
Schools per square km (public)		9.670 (8.102)	25.904*** (9.051)	-5.050 (12.767)	61.805 (68.320)	27.690*** (8.767)
Total schools (public)		-0.004 (0.004)	-0.002 (0.004)	-0.007** (0.003)	0.008 (0.011)	-0.002 (0.004)
Expenditure per child (1913 \$)		-1.251* (0.695)	-0.869 (0.542)	-0.151 (0.409)	0.223 (1.671)	-0.989* (0.552)
Electors % adult males			0.326*** (0.067)	0.432*** (0.117)	-0.018 (0.081)	0.351*** (0.067)
Electors % adult males squared			-0.003*** (0.001)	-0.004*** (0.001)	0.000 (0.001)	-0.003*** (0.001)
Agricultural workers % population			0.052 (0.049)	0.084 (0.077)	0.012 (0.049)	0.059 (0.045)
Urbanization rate (> 30,000)			0.032 (0.084)	0.006 (0.104)	-0.045 (0.107)	0.032 (0.080)
Population density			-0.073** (0.032)	0.025 (0.048)	-0.111* (0.062)	-0.082*** (0.031)
Fertility rate (%)			0.036 (0.251)	-0.118 (0.299)	0.136 (0.344)	0.104 (0.246)
Migration proxy			-3.262 (2.502)	1.590 (2.738)	-0.665 (4.308)	-3.341 (2.549)
Literacy rate (6+ years)						0.215*** (0.060)
Constant	19.508*** (2.599)	1.434 (2.974)	6.963 (7.632)	-9.140 (11.881)	20.240** (9.540)	-1.733 (7.806)
Time fixed effects	Y	Y	Y	Y	Y	Y
Provincial fixed effects	Y	Y	Y	Y	Y	Y
Controls	N	N	Y	Y	Y	Y
Observations	647	647	647	403	244	647
No. of provinces	118	118	118	69	49	118
Adjusted R ²	0.682	0.781	0.808	0.898	0.619	0.813

Notes: Robust standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

Sources: See sections II and III.

The within-province relationship between the GER and the feminization of teaching—including private as well as public education—is positive and statistically significant (columns 1 to 3). The estimated coefficients for the feminization index are quite stable across different models: a 10-percentage-point increase in the share of female public-school teachers is associated with a percentage-point rise in the GER ranging from 2.30 to 1.30 in the fullest models, without and including literacy, respectively. The coefficient in the baseline model remains virtually unchanged when focusing on Italy (2.6 percentage points) but it becomes statistically equal to zero when only Spain is considered.⁴⁷

The magnitude of this coefficient is far from negligible: at the end of the period that we analyse (1921), the total GER for both Italy and Spain stood at about 55 per cent—mainly public enrolments in the former, more mixed in the latter—yet Spain had started from about 35 per cent, while Italy had a GER equal to 25 per cent in 1861. The cumulated GER growth differential between the two school systems in the period 1861–1921 is therefore equal to about 10 percentage points. At the same time, during this phase, the feminization rate increased in Italy from 35 to 70 per cent, and in Spain from 30 to 45 per cent. Thus, the feminization cumulated growth differential is equal to 20 percentage points. According to our estimates above, had the Spanish feminization rate increased like Italy's between 1861 and 1921, its GER would have been higher by three to five percentage points (depending on the chosen model)—that is, roughly between a third and a half of the cumulated GER-growth difference in 1921 of 10 percentage points.⁴⁸

The other major factor that was linked to differences in the evolution of the GER between countries was the share of enrolment in private schools compared with the total. A similar back-of-the-envelope calculation can be carried out given the diverging trends in the share of private enrolment. Since in Italy private enrolment declined from about 15 to less than 5 per cent, while in Spain it grew from 10 to 25 per cent of the total, the cumulative difference is 25 percentage points. Given the coefficient in table 2a (column 3), which is -0.16 , this explains around four percentage points of the total cumulative difference in the GER. Thus, the extent of private schooling can also be seen as an important difference favouring Italy over Spain between 1861 and 1921. At the same time, this calculation may overestimate the role played by private education; within Spain, private education was not negatively associated with overall enrolment rates, even though public-schooling rates might have been depressed by this preference.

Another statistically significant correlate of enrolment rates in our regressions is the supply of teachers (teachers per 1,000 children). This increased substantially across provinces, yet the average country-specific increase was similar—and actually Spain performed better than Italy (eight percentage points, compared to six)—so this variable does not contribute to explaining between-country differences in terms of enrolment rates to a large extent.

for private education; instead, concerning Italy, the relationship is statistically significant for feminization in public schooling in the north (with a coefficient of 0.17), while it is found to be statistically equal to zero in the south.

⁴⁷ In online app. S4, we show that the result is robust if we drop the feminization index and instead include teachers per 1,000 children split by gender, that is, males vs. females.

⁴⁸ The figure of 3 to 5 percentage points is obtained by multiplying the feminization growth gap in 1921 (20 percentage points) by the coefficient of the chosen model; for example, in tab. 1, col. 3, this is 0.231, which translates into 4.6 percentage points.

Once school inputs (particularly teachers) are taken into account, the marginal effect of additional resources invested in schooling is close to zero: the coefficient of per-child expenditure is not statistically significant. This is somewhat to be expected, since more than 80 per cent of the municipal budget for education was allocated to teaching personnel. While increased spending might have had a residual effect on learning outcomes, such as literacy (through better quality of didactic material, better maintenance of school buildings, and so on), the direct effect of more funding once inputs are considered might have been negligible for the *quantity* of schooling, as captured by enrolment rates.⁴⁹

Among the general controls concerning the full sample (model 3), in the case of Italy, access to voting is positively related to enrolment rates, though with a non-linear effect, as expected; the coefficient of agricultural employment over total population is positive, against expectations: yet an inspection of the data shows that this is driven by the fact that the south of Italy (which saw a rapid increase in schooling post-1900) experienced a slight increase in agricultural employment, as worldwide openness and further market integration pushed it to grow along its comparative advantages, which was actually accompanied by increasing income and wages during the first decade of the twentieth century.⁵⁰ Population density is negatively (but very weakly) correlated with enrolment rates; since we are looking at the average within-province relationship between density and enrolment rates, this might be explained by the fact that the ratio of enrolled to school-age children grew more when population density (linked to population growth) increased at a slow pace given lower demographic pressure—when holding everything else constant (for example, urbanization).

In the case of Spain, the fertility rate is characterized by a positive, yet spurious, within-province coefficient: since Spanish data on male and female teachers end in 1887 and resume for public schooling (only) in 1921, the panel does not capture the decline in fertility that occurred in Spain mostly post-1900. Indeed, when the whole public education panel is considered, thus including 1921, the coefficient of fertility is not statistically significant.

To shed more light on the schooling–feminization nexus, we test whether feminization influenced enrolment rates by bringing more girls into primary education. In tables 3a and 3b, we present models where the dependent variable is the female GER (female pupils as a percentage of school-aged girls), while the right-hand-side variables are those included in the baseline model presented in tables 2a and 2b. As the results clearly show, the coefficient of the feminization variable doubles when examining the relationship between feminization and female enrolment rates: an increase of 10 percentage points in the share of female teachers is associated with an increase of about three to four percentage points in female enrolment rates. This effect is actually split between Italy and Spain: while for the

⁴⁹ Where public schooling is concerned (tab. 2b), expenditure per child displays a negative sign that is statistically significant at the 10% level when literacy is included. This might depend on the fact that, towards the end of the nineteenth century, in the most literate provinces, the number of pupils older than the usual school age and those repeating a year decreased markedly, since schooling started to become widespread—while at the same time expenditure grew due to an increase in state funding (among the other things). Indeed, if one drops the most literate provinces (those with higher than 60% literacy for those aged six and over, roughly the 75th percentile), the coefficient of expenditure per child converges to zero and is not statistically significant. The main result concerning the feminization–schooling nexus remains virtually unchanged.

⁵⁰ Felice, *Perché il Sud è rimasto indietro*; Federico, Nuvolari, and Vasta, ‘Origins’.

Table 3. *The feminization–schooling nexus through female enrolment rates*

<i>Variables</i>	(1)	(2)	(3)	(4)	(5)
	<i>All</i>	<i>All</i>	<i>All</i>	<i>Italy</i>	<i>Spain</i>
	<i>Female GER</i>	<i>Female GER</i>	<i>Female GER</i>	<i>Female GER</i>	<i>Female GER</i>
<i>A. Public and private</i>					
Female/total teachers (public)	0.287*** (0.048)	0.287*** (0.049)	0.341*** (0.049)	0.440*** (0.052)	0.221 (0.161)
Female/total teachers (private)	0.088*** (0.022)	0.046** (0.018)	0.044** (0.017)	0.040** (0.017)	0.046 (0.036)
Time fixed effects	Y	Y	Y	Y	Y
Provincial fixed effects	Y	Y	Y	Y	Y
Controls	N	N	Y	Y	Y
Observations	520	520	520	325	195
No. of provinces	118	118	118	69	49
Adjusted R ²	0.733	0.792	0.802	0.868	0.792
<i>B. Public schools only</i>					
	(1)	(2)	(3)	(4)	(5)
	<i>All</i>	<i>All</i>	<i>All</i>	<i>Italy</i>	<i>Spain</i>
	<i>Female GER</i>	<i>Female GER</i>	<i>Female GER</i>	<i>Female GER</i>	<i>Female GER</i>
Female/total teachers (public)	0.398*** (0.046)	0.276*** (0.046)	0.305*** (0.048)	0.427*** (0.049)	0.031 (0.136)
Time fixed effects	Y	Y	Y	Y	Y
Provincial fixed effects	Y	Y	Y	Y	Y
Controls	N	N	Y	Y	Y
Observations	529	529	529	334	195
No. of provinces	118	118	118	69	49
Adjusted R ²	0.739	0.788	0.799	0.881	0.697

Notes: The urbanization rate, the primary GER, schools per s. km. and expenditure per child (1913 \$), as well as other controls, are all included in the model. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Source: See sections II and III.

former the coefficient reaches four percentage points, for the latter it is basically zero. When testing a model with male enrolment rates as the dependent variable, the coefficient is either much smaller or not statistically significant (the results are not reported for brevity). All in all, the main mechanism linking feminization and overall enrolment rates was the positive influence of hiring female teachers on female education.

Our findings are thus consistent with recent narratives that put the agency of women, and female autonomy, at the centre of economic history:⁵¹ female teachers were crucial to the expansion of schooling and, in turn, literacy and early human capital formation, thus favouring long-term economic development. We also contribute to a line of research in development economics, offering evidence of a nexus between improving gender equality and mass education.⁵²

At this stage, we cannot offer a definitive explanation as to why the trend in feminization was different between Italy and Spain. We can only put forward hypotheses on the determinants of the varying degrees of feminization across the two countries. Indeed, the two national school acts may be seen as virtually equal in a variety of respects, such as the fact that female teachers earned a salary that was (by law) 33 per cent less than that of their male colleagues. Despite this, and very

⁵¹ Baten and de Pleijt, 'Female autonomy'.

⁵² Klasen, 'Low schooling for girls'.

similar socio-economic features, Spain failed to mobilize a larger number of women to work as teachers. We argue that institutional features—such as rules regulating teaching at different schools, the training of teachers, and gendered education more generally—are linked to this aspect.

The supply of schools in which women could teach, and therefore the demand for female teachers, was more limited in Spain compared to Italy due to the Moyano Law, which meant that, first, no girls' school was compulsory in municipalities with less than 500 inhabitants, and fully functioning primary institutes had to be established in places with more than 2,000 inhabitants, thus excluding a large share of the female population from mass education and reducing the need for female teachers. Second, this mechanism was amplified by the fact that mixed schools were to be established only in the rural municipalities with less than 500 inhabitants, whereas female schooling and the number of female teachers, historically, have grown more in contexts of greater urbanization. Third, the demand for female teachers in Spain was reduced by the rule that women could not teach boys; and fourth, by the fact that women without a formal qualification were barred from teaching, unlike men. It is worth noting that obtaining a qualification from Spanish normal schools was more difficult for women than for men. In 1880, there were only 27 female normal schools across the Spanish territory, while the figure for men was 47.

Despite this, Spain did produce female teachers: for example, in 1880, 2,523 female teacher qualifications were issued, compared to 2,761 for men. Indeed, a second problem was that even when the school system managed to mobilize women, their presence was not associated with higher enrolment rates—even female ones. We believe (although it is clearly beyond the scope of the article to reach clear-cut conclusions on this issue) that teachers' salaries and wages linked to other occupations were relevant determinants of the selection of skilled women into the teaching profession, as Margo has discussed for the case of the US—even though we cannot assert this with certainty at this stage.⁵³

Data on wages by gender are quite scant for the late nineteenth century, for both countries. A comprehensive series offering some information on wages by gender have been provided for Italy by Federico et al.⁵⁴ They have estimated an average female–male wage ratio for Italy in the 1860s of around 50 per cent. We consulted their primary sources, which indicate that, within manufacturing (mainly textiles) and performing roughly the same tasks, women could expect to earn from 25 to 55 per cent of men's wages. Considering that the female–male salary ratio for teachers ranged from 80 to 90 per cent, women were strongly incentivized to work as teachers, while city councils had an incentive to hire them, given their lower cost compared to that of men.⁵⁵

Series and data on wages by gender for the late nineteenth century are less comprehensive concerning Spain. Available evidence shows that the female–male ratio for agricultural workers (*jornaleros*) in rural Navarra stood at *c.* 50 per cent in the 1860s; the female–male ratio was also 50 per cent in the steel

⁵³ Margo, 'Explaining feminization'.

⁵⁴ Federico, Nuvolari, Ridolfi, and Vasta, 'Race'.

⁵⁵ The sources clearly indicate that the 33% salary gap for teachers was disregarded by the Italian municipalities—this was possible given their autonomy concerning the matter.

industry in Vizcaya, but reached *c.* 65–70 per cent in the textile industry in Alcoy (province of Alicante) and the city of Barcelona.⁵⁶ Since, according to our data, the average female–male salary ratio for teachers in municipalities with more than 500 inhabitants was *c.* 65 per cent, the figures suggest that Spanish women may have found teaching less attractive than their Italian counterparts did.

The question remains as to why more women did not join mixed schools in municipalities with less than 500 inhabitants, at least the few times when they were offered salaries that were sometimes equal to or even higher than those of men—at least up to the 1880s. One explanation may be that these villages were far away from the centres where educated women had studied in, for example, normal schools; furthermore, rural villages may have represented a long journey, far away from places where educated women could take up better-remunerated occupations, had their family networks, and benefited from a cultural attitude that was less hostile to women—that is, large, more urban centres, where, for example, girls' schools and female teachers were an established reality. Last but not least, small Spanish municipalities might have just preferred male teachers, which is indicated by the number of jobs offered to men (87.5 per cent) compared to those available to women (12.5 per cent) in the sample that we studied.

Indeed, we find that the feminization of teaching was more strongly associated with enrolment rates in urban places—another mechanism that has been highlighted by the historiography. Feminization was a more urban phenomenon in Spain, while the rate of feminization across Italian provinces was more independent of urbanization rates (figure 7; the same is true if, in the case of Spain, we focus on provincial capitals only).

Another factor that has been discussed by the literature on the determinants of feminization in the teaching profession is the availability of a pool of literate women who could become future teachers. Indeed, one important aspect highlighted by our data is that, despite overall literacy and enrolment rates being lower in Italy compared to Spain in the 1860s, the Gender Parity Index (GPI) concerning both indices was actually *higher* in the former. In Italy in 1861, more than 70 girls were formally enrolled in primary schooling for every 100 boys; the same figure stood at 60 in Spain. The gap remained roughly the same over the period concerned. The availability of more literate women despite limited overall schooling might have positively influenced the availability of female teachers, initiating a virtuous circle between feminization and female (and thus overall) schooling in Italy. At the same time, the different shape of the gender–equality–feminization relationship (figure 8) in Italy and Spain suggests that the supply of literate women is not a crucial factor in explaining cross-country differences. It was an important feature within Italy, but across the Spanish territory, provinces with the same literacy GPI could have enrolment rates ranging from 20 to 60 per cent. As we have briefly argued above, a broad variety of factors was at play.⁵⁷

Finally, the presence of opportunities for men within the school system at higher grades—for example, second-grade primary schools or secondary schools—

⁵⁶ Lana Berasain, 'Jornales, salarios, ingresos'; Beneito and García-Gómez, 'Gender gaps in wages'; Borderías, 'Salarios y subsistencia'.

⁵⁷ We tested our baseline model with the addition of this variable, but the within-province feminization–GER relationship remains significant. The results can be found in online app. S4.

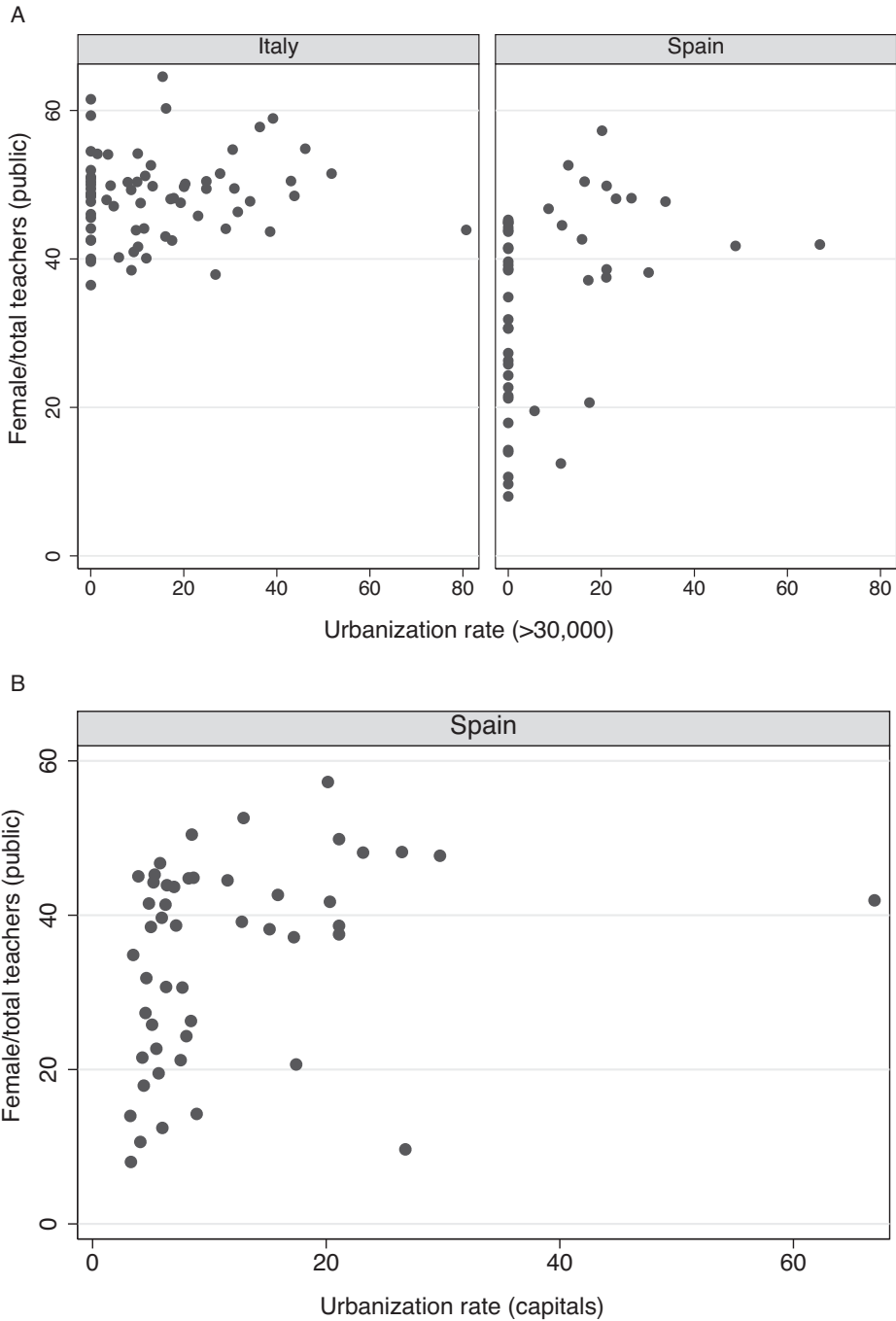


Figure 7. Urbanization rate and feminization rate (including private and public schooling), 1877: (a) Italy vs. Spain; and (b) Spain, using urbanization rates based only on provincial capitals

Sources: See online app. S1.

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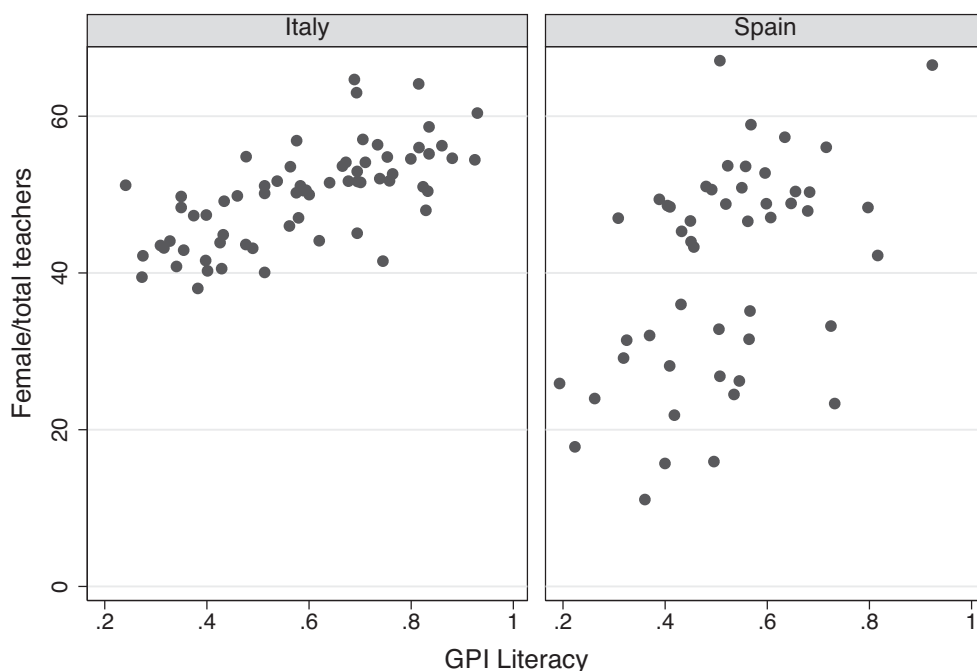


Figure 8. *Gender parity index (literacy) and feminization rates, Italy and Spain compared, 1877*

Sources: See online app. S1.

is another important factor that has been addressed by the literature. We do not find any correlation between the presence of second-grade primary schools and feminization rates across the provinces of Italy and Spain in the 1860s. Although we cannot measure it at the provincial level, the pull effect from secondary schooling was probably at work, as argued by, for example, Fegan with reference to the US: the fact that women entered standard teaching positions was not opposed by men, as men aimed to become secondary teachers and administrators. Interestingly, this resulted in a ‘gendered division of labour’, where the push to increase female autonomy went hand in hand with the fact that men freed up positions in primary schools—in order to pursue roles in secondary education. In that sense, chauvinism and feminism worked together towards an increase in female teachers.⁵⁸ A quick look at the data for Italy and Spain is consistent with this hypothesis: secondary gross enrolment rates had reached 1.4 per cent in Italy by 1871, while they stood at 0.91 in the case of Spain. Even though the figures seem very small, the difference was important in the context of the European periphery in the late nineteenth century.⁵⁹

To sum up, institutional factors played a central role. Furthermore, the lower salaries of female teachers compared to men in rural areas of Italy, as opposed to Spain, seem to have been an important feature—yet this interpretation is still

⁵⁸ Fegan, ‘Gender divide’.

⁵⁹ Vasta, ‘Il sistema innovativo italiano’; Nuvolari and Vasta, ‘Ghost in the attic?’; Núñez, *La fuente de la riqueza*.

tentative and subject to future research on the topic. This difference in gender–salary gap between Italy and Spain faded out during the 1880s, but might have pushed public authorities in rural areas on to two different paths regarding the role of women in teaching, with long-lasting implications. Likewise, different cultural values concerning women and their work, which very often varied between urban and rural places, might have affected the rate of feminization and its evolution over time.

V. Conclusions

Italy and Spain were two late-comer economies in the mid-nineteenth century, that were about to embark on their respective industrial revolutions, which led to sustained—albeit comparatively slow—economic growth. Human capital played a role in this phase, and changes in education accompanied and supported economic development: Italy had slightly lower enrolment rates than Spain in 1861, yet by the First World War it had caught up with and surpassed the Iberian economy. Data on education show a striking difference in the rate of feminization within primary schooling that may be linked to differences in GERs and, thus, human capital accumulation.

We have tested this hypothesis by constructing a new, harmonized dataset on primary-schooling variables and other contextual factors for all Italian and Spanish provinces for different benchmark years (1861–1921). We relied on panel-data econometric models and identified a strong correlation between the feminization of teaching and GERs, even when controlling for time trends, time-invariant features, and other controls, including a variety of political, social, economic, and demographic aspects. A within-province increase equal to one percentage point in the share of female teachers is associated with a rise in GER equal to around 0.2 percentage points. We argue that this relationship explains between 30 and 50 per cent of the cumulated difference in enrolment rates between Italy and Spain from 1861 to the First World War.

The effect of feminization on enrolments was driven by public education and took place through the positive effect exerted by female teachers on the enrolment of girls. This process was influenced by institutional features; the Moyano Law did establish some divide along gender lines, while the Casati Law, by not mentioning women throughout most of its articles, inadvertently promoted full equality between boys and girls as well as female and male teachers.⁶⁰

Although information on this aspect is still scant and thus the evidence is quite tentative, the interaction between the female–male salary ratio within education and the wage gap in other sectors seems to have been related to the extent of feminization: a lower opportunity cost of being a teacher, combined with a lower female–male salary gap for teachers in rural areas that incentivized the hiring of women by the city councils, brought about an advantage for Italy, particularly in more rural places. Indeed, feminization seems to have been somewhat related to urban agglomeration in Spain (even when accounting for the bias due to agrotowns in the south), while in Italy all provinces reached at least a 40+ per cent share

⁶⁰ Cappelli and Vasta, “Silent revolution”.

of female teachers. Overall, as suggested by literature explaining different rates of feminization of teaching across countries, urbanization was an important aspect. One final aspect that was linked to growing feminization and female enrolments was educational gender equality; even though Italy had lower literacy levels than Spain in 1861, gender equality in education was stronger in the former, which probably prompted higher feminization and thus enrolment rates in the medium-to-long run.

All in all, our evidence lends support to the argument that female agency and gender equality were central to economic development in the past and that, via human capital formation, they influenced economic divergence and development paths, as exemplified by the economic histories of Italy and Spain on the eve of the twentieth century.⁶¹

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⁶¹ Baten and de Pleijt, 'Female autonomy'.

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Supporting information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

- S1. Details of the quantitative sources used to build the harmonized dataset
- S2. Information on expenditure data and adjustments
- S3. Regression models based on cross sections
- S4. Results using teachers per 1,000 children by gender and focusing on female GERS
- S5. Further robustness checks

Data and replication files