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# ABSTRACT

## The Gender Wage Gap among College Graduates in Italy*

The paper investigates the gender wage gap among recently graduated people, controlling for job and academic variables and for the field of study, as women lag in highly remunerative majors. The raw gender gap in hourly wages is 5.6%. Although including academic variables and the field of study, on top of job-related variables, slightly reduces the unexplained gap, the latter still accounts for most of the total difference. Using quantile decomposition, the paper shows that the unexplained gap increases along the wage distribution, indicating a glass ceiling effect. Heterogeneities arise across fields of study: the largest total gap emerges in Law, Political-Social sciences, and Economics-Statistics. In most disciplines, there is a significant unexplained gap – from 3.3% (Medicine), to 8.7% (Law), up to 9.6% (Agriculture) – which constitutes the largest share of the difference, confirming that most of the wage gap remains unexplained also by major. Finally, I use geographical differences to explore the influence of institutional and macro-economic variables, as well as of attitudes towards gender norms. Results indicate that childcare and part-time availability are correlated with lower gender wage gaps, while traditional gender norms are associated with higher gaps.

**JEL Classification:** J16, J31, J71

**Keywords:** gender wage gap, Oaxaca-Blinder decomposition, college graduates, quantile decomposition, field of study, regional differences

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# NON-TECHNICAL SUMMARY

Several researchers have investigated the sources of the gender gaps in labour market outcomes, which, even if decreasing, are still evident. For instance, In Italy the gender overall earnings gap is estimated by Eurostat at 43.7% for 2014.

Among others, one of the main causes of the gender wage gap is considered the male-female sorting into different sectors and occupations: even if declining since the 1970s, in recent years it is still large and declining at a diminished pace. During the same period, in most developed countries there was a reversal of the gender education differential, with women catching up to men in college graduation in the 1980s, and subsequently surpassing them. In addition, the type of education that women receives has also changed, moving towards more mathematics fields. However, the trend in gender sorting into different majors is symmetrical to what have happened for occupations: a decrease in the degree of field segregation in 1970–1980, which stagnated afterwards. Moreover, women tend to lag particularly in Science, Technology, Engineering and Mathematics (STEM), while the gap narrowed in Biological and Natural sciences. The sorting of women in some majors is highly interconnected with their absence from the most profitable occupations, and thus considered among the causes of the persistent gender wage gap.

The paper investigates the role of graduating in different fields on the gender hourly wage gap of recently college graduates in Italy; second, it analyses the patterns of the gender wage gap within the different fields of study when controlling for relevant characteristics; finally, the paper explores regional differences in wage gaps and how institutional and macro-economic variables are related to them.

In Italy, the gender wage gap among recent college graduates is about 5.6%; adding academic controls and the field of study only slightly reduces the gap, which remains completely unexplained by observable characteristics. When considering the wage gap within each field, the total gap is largest in Law (16.3%), Political-Social sciences (12.3%), and Economics-Statistics (10.8%). However, with few exceptions there exists a significant unexplained gap in all majors.

The analysis of regional differences provides interesting results, even though the evidence is only descriptive. The gender wage gap is larger in the South of Italy. Notably, childcare coverage and part-time availability reduce the unexplained wage gap, which is remarkable considering that the focus is on recently graduated people. Finally, more traditional attitudes towards gender roles are associated with larger gender wage gaps.

## 1. Introduction

Several researchers have investigated the sources of the gender gaps in labour market outcomes. Among others, one of the main causes of the gender wage gap is considered the male-female sorting into different sectors and occupations: according to Blau and Kahn (2017), the Duncan and Duncan (1955) segregation index for the US declined from 1970, but in 2009 was still 51%. Moreover, the index has declined at a diminished pace in recent years.

During the same period, in most developed countries there was a reversal of the gender education differential, with women catching up to men in college graduation in the 1980s, and subsequently surpassing them. In addition, the type of education that women receives has also changed, moving towards more mathematics fields (Mann and DiPrete 2013). However, the trend in gender sorting into different majors is symmetrical to what have happened for occupations: a decrease in the degree of field segregation in 1970-1980, which stagnated afterwards. Moreover, women tend to lag particularly in Science, Technology, Engineering and Mathematics (STEM), while the gap narrowed in Biological and Natural sciences. The sorting of women in some majors is highly interconnected with their absence from the most profitable professions (Flabbi 2011; Blau and Kahn 2017), and thus considered among the causes of the persistent gender wage gap.

This paper aims at investigating the role of graduating in different fields on the gender hourly wage gap of recently college graduates in Italy; second, it analyses the patterns of the gender wage gap within the different fields of study when controlling for relevant characteristics; finally, the paper explores regional differences in wage gaps and how institutional and macro-economic variables are related to them.

I first apply OLS regressions, adding several control variables: I estimate a standard wage equation including demographic variables, and then I add academic variables, field of study, and job-related variables. Results show that being a woman is associated with having lower wages (-6.3% to -7.2%), similar across different specifications, and that adding academic controls – on top of job-related variables – slightly reduces the coefficient. I then estimate an Oaxaca-Blinder decomposition: the total gap of 5.6% is completely unexplained by observable characteristics. Mirroring OLS findings, when adding academic variables and the field of study to job controls the unexplained component is slightly reduced, but it still accounts for most of the gap. The evolution of the gap at different percentiles reveals that the total gap increases along the wage distribution, up to the $90^{th}$ percentile, and then it declines. However, the unexplained gap accounts for most of the wage difference at all levels and it keeps increasing also for top wages, indicating the existence of a glass ceiling effect.

When considering the wage gap within each field, the total gap is largest in Law (16.3%), Political-Social sciences (12.3%), and Economics-Statistics (10.8%). However, with few exceptions there exist a significant unexplained gap in all majors – ranging between 3.3% (Medicine), to 8.7% (Law), up to 9.6% (Agriculture) – which accounts for most of the total difference, even in disciplines with small total gaps. The quantile decomposition by field of study confirms the existence of a glass ceiling effect.

The analysis of regional differences provides interesting results, even though the evidence is only descriptive. The gender wage gap is larger in the South of Italy. Most notably, childcare coverage and part-time availability reduce the unexplained wage gap: even if it is not a novelty in studies on gender wages gaps (see for instance Christofides et al. 2013), it is relevant, considering that the sample is composed by recently graduated people. Finally, more traditional attitudes towards gender roles is associated with larger gaps.

## 2. Italian context

Italy has a low gender pay gap per hour if compared to other European countries (5.5% vs. 16.3% in 2015; Eurostat 2017a). However, the female employment rate is only 47.2% (2015), while the European average is 60.4%. Moreover, most women who work part-time do so on an involuntary basis (60.3% vs. 25.7% in Europe, Eurostat 2017b). To take into account all these aspects, Eurostat provides the gender overall earnings gap, a synthetic indicator which includes the average earnings per hour, the number of hours worked per month, and the employment rate. When these factors are combined, the gender overall earnings gap rises to 43.7% for Italy (39.7% in Europe; Eurostat 2017a).

Moreover, when controlling for gender differences in individual characteristics, in Italy the gender wage gap is even larger, suggesting that women are endowed with qualifications that should ensure larger wages. This result is common across several papers (e.g. Christofides et al. 2013; Mussida and Picchio 2014b; Piazzalunga and Di Tommaso 2016), which found an unexplained gender gap of about 10-11% (without self-selection correction) up to 14-18% (with self-selection correction). However, although those researches control for the level of education and broad categories of occupations and professions, they do not control for the college major, which is likely to explain a proportion of the remaining wage gap.

Albeit the number of graduates is smaller than in the rest of Europe, Italy makes no exception when considering gender differences in educational outcomes. Women with a tertiary degree largely outnumber men: in 2015, 20.1% of women aged 25-64 have a tertiary degree, compared to 15.3% of men (Eurostat 2017a), i.e. there is a gender gap in favour of women of 23.9%. The difference is likely to increase, given that 58.9% of graduates in 2011 (last year available) were women (Istat 2016). Yet, women tend to be under-represented in STEM and economics fields, where wages are higher, and over-represented in humanistic fields, where wages are lower (Istat 2009, 2012; Anelli and Peri 2015). This may be at least partially due to the presence of a gender gap in mathematics: Contini et al. (2017) show that in Italy being a girl has a negative effect on maths scores, even after controlling for a large set of variables, including math self-belief; moreover, the gap is increasing with age. Possible causes of the underrepresentation of women in STEM fields are discussed in the next section. However, it should be noticed that a raw gender pay gap in terms of monthly wages arises even within the same major, ranging between 1.2% and 13.9% (Istat 2012).

## 3. Literature review

The most recent analysis on the gender wage gap in Italy is the one provided by Piazzalunga and Di Tommaso (2016): among employees aged 20-65 years old, the raw gap is estimated between 4% and 9% during the years 2004-2012.

Addabbo and Favaro (2011) and Mussida and Picchio (2014a) recently published two papers that link the gender pay gap in Italy to educational attainment, considering low educated workers those individuals with compulsory education and high educated workers those individuals with a higher level diploma. They both show that the gap is larger among low educated people. However, they do not separate people with a university degree from the others, nor they are able to control for the choice of college majors. Anelli and Peri (2015) investigate the gender wage gap among graduates, taking into account the choice of college major, using a sample of individuals who graduated in Milan, which – as the authors point out – is a "large service-oriented metropolitan area in the richest part of Italy" (p. 82). As such, their results may be difficult to be extended to other part of Italy.

Standard explanations for the gender wage gap include the following ones (Blau and Kahn 2017): (i) education and test scores in mathematics; (ii) labour force experience and workforce interruptions; (iii) work hours, work flexibility, and organization of labour at the work place; (iv) gender differences in occupations and sectors; (v) glass ceiling; (vi) motherhood wage penalty; (vii) unequal division of housework and care responsibilities; (viii) male networks; and (ix) discrimination (taste discrimination by employers, colleagues, and customers;[1] statistical discrimination;[2] and implicit discrimination[3]).

Recently, additional explanations have been explored, focusing on the impact of gender differences in "soft" skills (Bertrand 2011; Azmat and Petrongolo 2014): (i) risk aversion; (ii) attitude towards competition; (iii) propensity to bargaining; (iv) personality traits and non-cognitive skills, such as self-esteem, "big-five" personality traits, and locus of control; (v) norms and gender identity; and (vi) preferences. How much preferences and personality traits have biological roots ("nature") or are due to social factors ("nurture") is being still under debate (see Cobb-Clark 2016 for a review), but overall it seems that the two explanations complement one another, rather than competing with one another (Bertrand 2011).

Most of the above-mentioned sources of gender pay gap interact among each other. Moreover, a cumulative effect is possible. In particular, with respect to the focus of this paper, the sorting into different sectors and occupations is closely related to the choice of college major.

The evidence of sorting into different college majors concern not only Italy, but several countries (Charles and Bradley 2009; Barone 2011; Flabbi 2011; Mann and DiPrete 2013); moreover, research indicates that after a period of "desegregation", recently there is a stagnation in the integration of fields of study.

Why women continue to prefer less remunerative fields, and in particular non-STEM fields, is still under discussion. The following are considered the main potential causes of women underrepresentation in maths-intensive fields: (i) gender differences in maths and spacial abilities; (ii) women's undervaluation of their skills in mathematics; and (iii) gender differences in career preferences and lifestyle choices. Most authors exclude gender differences in skills as a relevant explanation (Barone et al. 2017), also because they are narrowing at a faster rate than the choice of field of study. Ceci and

[1] Becker (1971).
[2] Phelps (1972).
[3] Bertrand et al. (2005).

Williams (2010) conclude that gender differences in preferences and choices are the most significant reasons, taking into account that both biology and society can influence them. However, the argument of career preferences is difficult to reconcile with the increasing number of women in law and medicine, which are demanding in terms of working hours and work schedule. Mann and DiPrete (2013) stress the importance of different preferences for subjects (humanistic subjects) and the role of gender differences in the link between college major and occupations. An interesting field experiment conducted by Barone et al. (2017) tests a novel explanation: the misperception of economic returns to field of study. The authors find that girls are more reactive than boys to information about occupational profitability of fields of study.

Identifying the causes of the gender wage gap is out of the scope of this paper, as it is isolating the reasons for sorting into different majors. However, it is worth exploring if the field of study, on top of other standard control variables, reduces the unexplained gap due to gender. With respect to Anelli and Peri (2015), I extend the analysis to entire Italy. Moreover, I explore the gap within each college major. I also perform quantile decompositions for all graduates and by field of study, to investigate how the gender gap changes across the wage distribution.[4]

## 4. Methodology

### 4.1 Wage equation

First, I estimate the following wage regression (spec. I), building on the standard Mincer human capital model:

$$Y = F\beta_1 + D\beta_2 + B\beta_3 + S\beta_4 + u \tag{1}$$

where $Y$ is the log of hourly wages, F is a dummy variable equal to 1 if the individual is a woman, $D$ is a vector of demographic control variables, $B$ is a vector of individual background variables, $S$ is a vector of family socio-economic background, and $u$ is the random error, normally distributed. $\beta_1$, $\ldots\beta_4$ are the vectors of parameters to be estimated with OLS, and $\beta_1$ is the parameter of interest,

[4] There are other additional differences: (i) I use wages per hour as a dependent variable, while Anelli and Peri (2015) have only information about income per year; (ii) I consider recently graduated individuals, while they have a pooled sample of people graduated between five and fifteen years earlier; (iv) in the regressions, I include a much larger set of control variables that may reduce the gender gap – detailed in Section 4.

which identifies the conditional wage differentials between men and women, when controlling for other independent variables.

To conclude that $\beta_1$ identifies the causal effect of being a woman on wages, one need to assume that being a woman is not correlated with any unobservable, included in the error term. This is a strong assumption in this case: despite the large number of control variables included, the estimated wage equations are prone to both selection bias and omitted variables issues, which will be discussed afterwards. Consequently, the results below should be referred to as correlations, rather than as causal factors.[5]

In following specifications, I progressively add to equation 1 a number of control variables. Specification II and III add to the baseline equation academic controls (II) and the field of study (III).[6] Specification IV and V adds to equation 1 job-related variables (IV) and sector of employment (V). Finally, specification VI and VII include academic variables the field of study, job-related variables (VI) and sector (VII). The last specification is the preferred one.

Thanks to the richness of the dataset, I am able to control for a large set of variables, not only standard variables usually included in human capital wage equations, but also detailed variables related to individual and family background, as well as university-related variables. More specifically, I include the following control variables: demographic controls (marital/living status, presence of children, and region of residence); individual background (high school track, high school grade, working during college); job-related variables (tenure, experience, sector of employment, profession, type of contract, and a dummy indicating if the individual moved to work); socio-economic background (father's and mother's education and occupation); and academic variables. With respect to the university, in addition to the field of study, I control for the type of degree obtained in 2007 (bachelor or master) [7], the final grade, whether s/he spent a period abroad, whether s/he obtained the degree late,[8] whether s/he

[5] Sometimes, I may use the world "effect" to simplify the exposition, but the reader should interpret the results as correlations.
[6] The field of study control may be endogenous. For this reason, I include it in a subsequent specifications, after having included only other academic variables.
[7] Master degree includes both master degrees and single-cycle 5-year degrees, at the end of which the student obtains directly a master degree.
[8] I.e. the student has not completed the degree within set time period (usually 3 years for bachelor and 2 years for master) ("*fuori corso*").

obtained other college degrees after the one in 2007 (e.g. a master degree, or a Ph.D.) or undertook other training (e.g. internship), and the age when s/he graduated.

One may expect the field of study to be highly correlated with the sector of employment and the type of occupation. To address this issue, I estimate wage equations both with and without job-related variables, as described above. Moreover, such information are usually available even in less detailed dataset (such as the Labour Force Survey, or EU-SILC), often used to estimate wage equations. Including the field of study on top of job-related variables helps understanding if the field of study add to information about sector and occupation.

Female participation into the labour market raises the issue of selection bias (Heckman 1979): wages are observed only for those who work, but participation into the labour market is not random; instead, individuals work if their offered wage exceed their reservation wage. If unobserved variables that affect the decision to work also influence wages, results will be biased. This issue is more problematic for women than for men, as women usually exhibit a lower employment rate. In most cases, employed women tend to have a higher wage than what would be offered to non-employed women; consequently, the gender pay gap tend to be lower, simply because low-wage women do not appear in the sample (Olivetti and Petrongolo 2008). In Italy, the low participation rate of women is considered one of the causes of a gender wage gap lower than in the rest of Europe. Despite this, I decided not to correct for self-selection with the standard Heckman procedure, for the following reasons. Compared to the full population, among recently graduated people the difference in the probability of being employed between men (74.2%) and women (67.3%) is much smaller. Women are more attached to the labour market and less likely to be at home for family reasons. In most cases, non-working people would like to continue studying or are doing some form of paid training, and this is true for both men and women, with few differences (Table 1). Moreover, the usual variables included as exclusion restrictions[9] in the Heckman procedure, such as children or non-labour income, could be argued to directly affect wages, and also alternative methodologies have been questioned (see Blau and Kahn 2017). In addition, such exclusion restrictions are even less suited to address selection bias issue among college graduates.

[9] The variables that should affect labour supply but not wages.

The characteristics of employed and not employed individuals in the full sample are presented in the Appendix (Table A1): the differences between the two groups are similar among men and women. Employed people are more likely to have studied Engineering and Economics-Statistics (and less likely to have studied Natural sciences and Law). They are less likely to have top grades, to come from academic high-school tracks, and from advantaged socio-economic backgrounds. However, they are also more likely to have worked during the university. The only difference between the two sexes is that employed men are less likely to have a master degree than non-employed ones, while this is not the case for women. It is difficult to infer the direction of wages in the absence of selection: some observables suggest that employed individuals are endowed with better skills, while others suggest an opposite trend. Most notably, this descriptive evidence suggests that, even though selection takes place, men and women follow a similar pattern. Taking into account all these aspects, I have decided not to perform any correction for selection. However, it is difficult to claim if, in the absence of selection, the gender wage gap would be smaller or larger.

A second potential problem comes from the existence of omitted variables, correlated with gender and with wages. While high-school grades could be considered a proxy for ability, there may exists other unobserved differences between men and women, such as the one described as "soft" skills in Section 3. In particular, if men have better characteristics than women have, the negative effect of being a woman is overestimated.

Keeping into account these caveats, as mentioned earlier the parameter of interest should not be interpreted in causal terms, but rather in descriptive terms.

Table 1 - Reason for not working, by gender, 2011

| Reason for not working | Women | Men | Total |
|---|---|---|---|
| I want to continue studying | 25.00 | 28.94 | 26.60 |
| Paid training | 26.95 | 26.97 | 26.96 |
| I am not able to find a job | 26.42 | 23.81 | 25.36 |
| I have already found a job which will start in the future | 5.94 | 8.82 | 6.30 |
| I cannot find a job which interests me | 2.23 | 2.28 | 2.25 |
| Personal reasons (health problems, wedding, looking after other relatives, …) | 5.38 | 1.15 | 3.67 |
| Other reasons | 8.08 | 8.02 | 7.78 |
| Observations | 9,905 | 6,766 | 16,671 |

### 4.2 Oaxaca-Blinder decomposition

One of the drawbacks of estimating wage equations with a female dummy is that independent variables have the same return for both men and women. The Oaxaca-Blinder (O-B) decomposition overcomes this limitation, by estimating a wage equation for men and one for women (Blinder 1973; Oaxaca 1973). Then, it decomposes the wage gap into a component due to male-female differences in characteristics and a component due to differences in returns to the same characteristic (unexplained component). The same equations described above (specification I to VII), without the female dummy, are estimated separately for men ($m$) and women ($f$):

$$Y_g = X_g \gamma_g + \varepsilon_g \tag{2}$$

where $g = \{m, f\}$, $X_g$ is the vector of all explanatory variables (which varies depending on the specification), $\gamma_g$ is the vector of coefficients, and $\varepsilon_g$ is the stochastic component.

The O-B decomposition is:

$$\bar{Y}_m - \bar{Y}_f = \bar{X}_m \hat{\gamma}_m - \bar{X}_f \hat{\gamma}_f = (\bar{X}_m - \bar{X}_f)\hat{\gamma}_m + \bar{X}_f(\hat{\gamma}_m - \hat{\gamma}_f) \tag{3}$$

The first term corresponds to the gender wage gap due to differences in characteristics, evaluated using male returns, while the second term correspond to the unexplained component, due to differences in returns between men and women. Alternative formulations use female returns and male average characteristics, or returns from a pooled equation with both men and women. I describe here the most standard formulation, and hereafter I comment briefly the results from alternative ones.

The second term is often labelled as "discrimination", as there should be no market reason to have different wage returns to the same characteristics for men and women. However, the unexplained component may include unobserved characteristics' effect. If men have better unobserved characteristics than women, discrimination would be overestimated. In the opposite case, discrimination would be underestimated, as it would be if some control variables were themselves affected by discrimination (Azmat and Petrongolo 2014).

### 4.3 Quantile decomposition

Finally, I analyse how the total and the unexplained gender wage gaps among graduates change along the wage distribution. To decompose the total gap, in order to evaluate the role of covariates and of wage coefficients at different point of the distribution, I apply the method developed by Chernozhukov et al. (2013). The unconditional distribution of wages $F_{Y[m,m]}$ for men, with male characteristics and male wage function, is the following one:

$$F_{Y[m,m]}(y) = \int F_{Y_m|X_m}(y|x)dF_{X_m}(x) \tag{4}$$

where $F_{Y_m|X_m}$ refers to the conditional distribution of male wages and $F_{X_m}$ refers to the distribution of male characteristics. The same applies for women:

$$F_{Y[f,f]}(y) = \int F_{Y_f|X_f}(y|x)dF_{X_f}(x) \tag{5}$$

The hypothetical counterfactual unconditional wage distribution that women would face if they had their own characteristics and the wage structure of men (i.e. male wage returns along the entire distribution) is $F_{Y[m,f]}$, as follows:

$$F_{Y[m,f]}(y) = \int F_{Y_m|X_m}(y|x)dF_{X_f}(x) \tag{6}$$

As proposed by Chernozhukov et al. (2013), the empirical distribution of $X$ is computed, while the conditional wage distribution is estimated using quantile regressions (Koenker and Bassett 1978).

The difference between the unconditional wage distribution of men and that of women can be decomposed mirroring the O-B decomposition:

$$F_{Y[m,m]} - F_{Y[f,f]} = \{F_{Y_m|X_m} - F_{Y[m,f]}\} + \{F_{Y[m,f]} - F_{Y[f,f]}\} \tag{7}$$

As in the O-B decomposition, the first part is due to the different distribution of characteristics, the second one is the effect of different wage structures between men and women. Standard errors are estimated using bootstrap techniques. I estimated 100 quantiles and 100 bootstraps.

Finally, both the O-B and the quantile decompositions are replicated by field of study. Sectors of employment and occupations are grouped into less detailed categories, to deal with the reduced number of observations and with the fact that both sectors and occupations are much more homogeneous among people with the same major. Moreover, only 20 quantiles (instead of 100) are estimated.

## 5. Data and descriptive statistics

The analysis is based on the 2011 "University graduates' vocational integration" dataset, released by ISTAT. The survey covers 62,000 graduates who obtained a university degree in Italy in 2007 and aims at detecting their employment conditions 4 years later. In addition to the standard demographic variables, the dataset provides information on high school and university curriculum, on labour market outcomes, and on the family background.

The 2011 survey is the eighth wave of a repeated cross-section, conducted every 3-4 years since 1989, by means of CATI since 2001. The reference population is the universe of 300,338 students graduated in 2007, whose list has been collected from universities as a first step. This means that the 2011 wave comprises students with either a bachelor degree, a master degree, or a single-cycle 5-year degree. Instead, 2007 wave comprised students with a bachelor or a single-cycle 5-year degree, while previous waves comprised only students with a single-cycle degree. In fact, this was the only degree available before the implementation of the Bologna process in Italy in 2001, which introduced the 3+2 system.[10]

It should be noticed also that the dataset is composed by graduates, and there is no information about enrolment. Among people who enrolled in a bachelor degree, after 4 years the drop-out rates is on average 34% for men and 25% for women (cohorts enrolled in 2003-2010); figures are better for those who enrolled in a master degree, with similar drop-out rates for men and women (14%) (Checchi 2016).

From the initial sample, I consider only Italian citizens, living in Italy before and after attending the university, excluding approximately 3,000 individuals. In so doing, I reduce confounding factors coming from having lived in a different country or from working abroad. I also exclude those that had a different degree before the one obtained in 2007 (about 2,500 observations). This is what I refer to as "full sample" (56,505 observations). Then, I focus on employed individuals, excluding everyone who is not working at the moment of the interview for whatever reason, dropping 16,671 observations. Moreover, information about wage is not asked to those who have highly precarious jobs (casual work; self-employed not working over the full year) – about 5,300 observations – and I lose about 3,000 additional observations because the wage is missing. The final sample is composed by 31,547

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[10] See Vergolini and Vlach (2016) for a description of the Italian educational system.

observations, and includes both self-employed (working the entire year) and employees, as well as part-time and full-time workers.

The effects of sample selection on the characteristics of the final sample are summarised in the Appendix (Table A2). In the final sample, the relative proportion of fields slightly changes, due to the different likelihood of being employed, but to a small extent: there are more people from Economics (17% instead of 14%) and Engineering (15% instead of 12%), and less from Natural sciences and Humanities. People are also more likely to come from a technical high school, to have had a continuous job during university, and to live in northern regions. As noticed when comparing employed and not-employed people, in the final sample individuals are less likely to have top grades and come from high socio-economic background, who might intend to pursue their studies.

I decided to keep in the final sample a group that is still heterogeneous under different aspects: (i) graduated at different ages; (ii) graduated from a bachelor, master, or single-cycle course. The reason of this choice lies in the fact that these characteristics are correlated with gender, wage, and field of study. For instance, women are more likely to be have health-related degrees (e.g. nurses), with relatively good wages; at the same time, people with these degrees are more likely to obtain only a bachelor degree, and thus are less represented among master students. For age, the reasoning is similar, considering that people obtain a bachelor or a master degree at different ages. Selecting the final sample based on these characteristics may artificially affect the gender wage gap, depending on the choice, and there is no specific reason to focus on one group with respect to the other. I thus prefer to simply control for such characteristics in the regressions.

### 5.1 Descriptive statistics

Table 2 presents the share of women graduated in the different fields, in the full and in the final sample. On average, women constitute 54% of graduated people, a percentage that is reduced to 51% when non-employed individuals are excluded. Albeit slightly reduced, the share of women by field of study is similar in the two samples (the difference is between 0 and 7 percentage points, depending on the field).

Table 2 - Share of women by field of study, 2011

| | Full sample | Final sample |
|---|---|---|
| Math-Sciences | 0.38 | 0.34 |
| Pharmacy-Chemistry | 0.59 | 0.60 |
| Natural sciences | 0.59 | 0.56 |
| Medicine | 0.64 | 0.64 |
| Engineering | 0.28 | 0.28 |
| Architecture | 0.50 | 0.46 |
| Agriculture | 0.41 | 0.36 |
| Economics-statistics | 0.50 | 0.49 |
| Political-social sciences | 0.59 | 0.57 |
| Law | 0.55 | 0.48 |
| Humanities | 0.56 | 0.56 |
| Modern Languages | 0.74 | 0.76 |
| Education | 0.79 | 0.77 |
| Psychology | 0.65 | 0.58 |
| Physical education | 0.44 | 0.42 |
| Total | 0.54 | 0.51 |
| Observations | 56,505 | 31,547 |

Notes: the final sample includes only employed individuals with non-missing information about wages (details about sample selection in the text).

As expected, the share of women in STEM majors is very small: only 28% in Engineering and 34% in Math-Sciences[11] (final sample). However, other scientific fields, such as Pharmacy-Chemistry and Natural sciences, have a much larger share of women (56-60%), a finding common to other countries (e.g. Mann and DiPrete 2013 for the US). Despite much closer to 50%, the share of graduated women is less than the average also in Architecture, Agriculture, Economics-Statistics, Physical education, and, notably, in Law. It is interesting to notice that, for Law, this is not the case in the full sample, but only when we focus on employed individuals, suggesting a different probability of being employed for men and women graduated in Law.

Table 3 shows the average final high school grade by gender and by field of study, as well as the rank. While one should keep in mind that these figures provide merely descriptive evidence, it is interesting to notice that both at the average and in every college major women obtained about 5 points more in

[11] Math-Sciences includes mathematics, physics, and computer science (distinguished from Natural sciences).

high school grades. Moreover, while best- and worst-performing male and female students choose the same field of study (respectively: Engineering and Math-Sciences; Education and Physical education), the rank in between is slightly different. For instance, Economics-Statistics and Architecture rank 3rd and 4th in terms of high school grade for women, whereas for men there are Modern languages and Pharmacy-Chemistry at the same positions.

Table 3 - High school grade by field choice, by gender (final sample), 2011

| | Women | | | Men | | |
|---|---|---|---|---|---|---|
| | Rank | Mean | St. dev. | Rank | Mean | St. dev. |
| Engineering | 1 | 92.40 | 9.26 | 1 | 87.64 | 11.20 |
| Math-Sciences | 2 | 89.02 | 10.82 | 2 | 83.80 | 12.53 |
| Economics-Statistics | 3 | 87.99 | 11.07 | 5 | 81.12 | 12.26 |
| Architecture | 4 | 85.82 | 11.21 | 6 | 81.10 | 12.23 |
| Law | 5 | 85.70 | 11.38 | 9 | 79.89 | 12.02 |
| Modern languages | 6 | 85.18 | 11.63 | 3 | 81.69 | 12.12 |
| Pharmacy-Chemistry | 7 | 84.70 | 11.28 | 4 | 81.66 | 12.18 |
| Natural sciences | 8 | 84.01 | 11.89 | 12 | 78.02 | 11.65 |
| Agriculture | 9 | 83.79 | 11.37 | 8 | 80.29 | 12.37 |
| Humanities | 10 | 83.75 | 11.90 | 7 | 80.43 | 12.22 |
| Political-Social sciences | 11 | 83.54 | 11.83 | 11 | 78.36 | 12.11 |
| Psychology | 12 | 83.37 | 11.89 | 10 | 78.54 | 11.43 |
| Medicine (a) | 13 | 81.29 | 12.00 | 13 | 76.62 | 11.84 |
| Education | 14 | 79.18 | 11.53 | 14 | 76.06 | 11.09 |
| Physical education | 15 | 77.98 | 11.20 | 15 | 74.08 | 10.68 |
| Average | | 84.57 | 11.97 | | 81.22 | 12.50 |
| Observations | | 16,137 | | | 15,410 | |

Notes: the minimum high school grade is 60 and the maximum is 100. The rank is ordered according to women's score. The final sample includes only employed individuals with non-missing information about wage.
(a) "Medicine" includes all health-related fields of study.

Labour market outcomes also differ between men and women. As can be seen from Table 4, in the full sample 74.2% of men are employed, compared to 67.3% of women. The gap is much smaller than in the entire population, underlying that graduated women have a stronger attachment to the labour market. However, not only women are less likely to be employed, but also more at risk of having a precarious job (10.4% vs. 8.7% of men). In the full sample, women are more often self-employed (22.4% versus 15.6%), a figure reversed in the final sample, from which are excluded self-employed who are not working the entire year. This confirms the higher percentage of precarious work among women, even among self-employed. The average wage per month is between 1,329€ and 1,372€ for women, and around 1,560€ for men, with a gender gap between 12.5% and 14.5%. However, there is also a relevant gap in terms of hours worked, with women working about 3 hours less per week. Consequently, the gender wage gap in terms of hourly wages is reduced to 5.6%, very close to the unadjusted gap in the entire population (5.7% in 2011 according to Eurostat 2017a).

Table 4 - Labour market outcomes by gender and gaps, 2011

| | Full sample | | Final sample | | |
|---|---|---|---|---|---|
| | Women | Men | Women | Men | Gap |
| Employed | 67.26% | 74.22% | | | |
| Self-employed | 22.39% | 15.62% | 9.01% | 14.65% | |
| Precarious employment | 10.44% | 8.73% | 9.26% | 7.85% | |
| Monthly wage (employees) | | | 1,371.67 € | 1,567.11 € | 12.47% |
| Monthly wage (self-employed) | | | 1,328.79 € | 1,552.71 € | 14.42% |
| Hourly wages | | | 9.13 € | 9.66 € | 5.54% |
| Log hourly wages | | | 2.16 € | 2.22 € | 5.57% |
| Hours per week | | | 35.77 | 38.43 | 6.92% |
| Observations | 30,258 | 26,247 | 16,137 | 15,410 | |

Notes: The final sample includes only employed individuals with non-missing information about wages.

While there are minor differences between the full sample and the final sample, as can be seen from Table 4 women are more likely to be precarious self-employed, a group that disappear from the final sample. The gender wage gap is likely to be larger if highly precarious job had to be included, given the disproportionate representation of women in these groups.

Table 5 describes the summary statistics by gender in the final sample. The preferred field choice for women is health-related major ("Medicine"), while for men it is Engineering. Men are more likely to have a master degree, while women are much more likely to graduate with honours. In principle, the last figure should be read with caution, as there are relevant differences in the probability of having top grades across fields, but it is confirmed within each field.[12]

Both men and women are mostly employed in Health and social sector, but women are highly represented in Education and in Commerce, while men in Manufacturing and in Scientific sectors. Men are twice as likely to be managers, and more likely to be "professionals" (despite teaching professionals being also included), whereas women more represented among technicians and other professions.

There are few differences in terms of socio-economic background, even if small: men are slightly more likely to have high-educated and high-skilled parents, suggesting that maybe the family of origin is more important in pushing men towards tertiary education.

## 6. Results

Table 6 presents the main findings of the OLS regressions, showing the association between wages and being a woman when controlling for several demographic and human capital variables. In the baseline specification, which includes demographic and background controls, women earn on average 6.3% less than men per hour (column (a)). The results is similar when controlling for academic variables (column (b)), while it increases at 7.2% if I also include the field of study (column (c)) and in specifications with jobs-related variables and sectors (columns (d) and (e)). In the richest specification, being a woman is associated with a wage loss of 6.5% (column (g)). Keeping in mind that I include a richer set of variables than standard wage equations, this result is relevant, as it is the fact that the included variables do not reduce the magnitude remarkably. Moreover, the focus is on graduated people, few years after graduation: the usual explanations – such as career interruptions due to childrearing – do not apply here.

[12] Not shown, available upon request.

## Table 5 - Summary statistics, by gender, 2011

| | Women | Men |
|---|---|---|
| Hourly wage | 9.13 | 9.66 |
| Academic variables | | |
| *Field* | | |
| Math-Sciences | 0.03 | 0.05 |
| Pharmacy-Chemistry | 0.03 | 0.02 |
| Natural sciences | 0.04 | 0.03 |
| Medicine (a) | 0.25 | 0.15 |
| Engineering | 0.08 | 0.22 |
| Architecture | 0.04 | 0.05 |
| Agriculture | 0.01 | 0.02 |
| Economics-statistics | 0.16 | 0.17 |
| Political- social sciences | 0.11 | 0.09 |
| Law | 0.07 | 0.08 |
| Humanities | 0.04 | 0.04 |
| Modern Languages | 0.04 | 0.01 |
| Education | 0.05 | 0.02 |
| Psychology | 0.02 | 0.01 |
| Physical education | 0.02 | 0.03 |
| *Type of degree* | | |
| Bachelor | 0.50 | 0.48 |
| Master (b) | 0.50 | 0.52 |
| *Grade* | | |
| Grade 66-90 | 0.06 | 0.13 |
| Grade 91-100 | 0.22 | 0.30 |
| Grade 101-105 | 0.19 | 0.18 |
| Grade 106-110 | 0.25 | 0.19 |
| Grade 110 with honours | 0.28 | 0.20 |
| Period abroad | 0.07 | 0.07 |
| Late degree (c) | 0.42 | 0.49 |
| Other college degrees | 0.24 | 0.26 |
| Other training | 0.50 | 0.47 |
| 21-22 y.o. when graduated | 0.12 | 0.07 |
| 23-24 y.o. when graduated | 0.27 | 0.22 |
| 25-29 y.o. when graduated | 0.42 | 0.46 |
| > 30 y.o. when graduated | 0.19 | 0.25 |
| Individual background | | |
| *High school track* | | |
| Academic-scientific | 0.36 | 0.42 |
| Academic-classical | 0.13 | 0.08 |
| Linguistic | 0.07 | 0.01 |
| Social sciences-arts | 0.14 | 0.02 |
| Technical | 0.25 | 0.41 |
| Vocational/professional | 0.05 | 0.05 |
| High school grade | 84.57 | 81.22 |
| *Worked while studying* | | |
| No | 0.31 | 0.28 |
| Occasionally | 0.45 | 0.43 |
| Continuous work | 0.24 | 0.29 |
| Demographic controls | | |
| *Family* | | |
| Single living with parents | 0.37 | 0.39 |
| Single living alone (d) | 0.22 | 0.27 |
| Married or cohabiting | 0.42 | 0.34 |
| Children | 0.17 | 0.17 |
| *Region* | | |
| North-West | 0.10 | 0.09 |
| Lombardy | 0.21 | 0.21 |
| North-East | 0.23 | 0.21 |
| Centre | 0.23 | 0.24 |
| South | 0.23 | 0.25 |

| Job variables | Women | Men |
|---|---|---|
| Tenure | 2.81 | 2.93 |
| Experience | 3.06 | 3.18 |
| *Sector* | | |
| Agriculture | 0.00 | 0.01 |
| Manufacturing | 0.08 | 0.14 |
| Construction | 0.02 | 0.04 |
| Commerce and transports | 0.11 | 0.10 |
| Finance | 0.10 | 0.10 |
| Scientific | 0.09 | 0.11 |
| ICT | 0.03 | 0.07 |
| Communication | 0.05 | 0.05 |
| Education | 0.12 | 0.06 |
| Health and social | 0.30 | 0.18 |
| Public admin | 0.04 | 0.09 |
| Other services | 0.06 | 0.06 |
| *Profession* | | |
| Managers/legislators | 0.02 | 0.05 |
| Science professionals | 0.02 | 0.07 |
| Engineering professionals | 0.06 | 0.12 |
| Biology-health professionals | 0.05 | 0.04 |
| Legal, social, cultural professionals | 0.10 | 0.12 |
| Teaching and research professionals | 0.09 | 0.04 |
| Science and engineering technicians | 0.05 | 0.11 |
| Health and biology technicians | 0.24 | 0.14 |
| Business-administration technicians | 0.13 | 0.13 |
| Public-personal services technicians | 0.05 | 0.05 |
| Other professions (e) | 0.18 | 0.14 |
| *Type of contract* | | |
| Permanent contract | 0.58 | 0.59 |
| Temporary contract | 0.33 | 0.27 |
| Self-employed | 0.09 | 0.15 |
| Moved to work | 0.23 | 0.29 |
| SES background | | |
| Dad primary education | 0.13 | 0.13 |
| Dad lower sec. education | 0.30 | 0.26 |
| Dad upper sec. education | 0.42 | 0.44 |
| Dad tertiary education | 0.14 | 0.17 |
| Mother primary education | 0.16 | 0.17 |
| Mother lower sec. education | 0.31 | 0.29 |
| Mother upper sec. education | 0.42 | 0.43 |
| Mother tertiary education | 0.10 | 0.12 |
| Father manager/businessman | 0.09 | 0.10 |
| Father supervisor | 0.08 | 0.09 |
| Father high qualified employee | 0.18 | 0.19 |
| Father low qualified employee | 0.13 | 0.15 |
| Father workman | 0.24 | 0.22 |
| Father self employed | 0.23 | 0.20 |
| Father not employed | 0.05 | 0.05 |
| Mother manager/supervisor/business. | 0.09 | 0.10 |
| Mother high qualified employees | 0.16 | 0.17 |
| Mother low qualified employees | 0.13 | 0.13 |
| Mother workman | 0.09 | 0.07 |
| Mother self employed | 0.07 | 0.06 |
| Mother housewife | 0.43 | 0.44 |
| Mother not employed other | 0.03 | 0.03 |
| Observations | 16,137 | 15,410 |

Notes: (a) "Medicine" includes all health-related fields of study; (b) "Master" includes single-cycle 5-year degree and master; (c) "Late degree": the student has not completed the degree within set time period (e.g. 3 years for bachelors); (d) "Single living alone": alone or with friends; (e) "Other professions": includes professions less than technical (clerks, sales workers, services, skilled and elementary workers).

Flabbi (2011) reports similar OLS estimates for a sample of recent graduates, who got their degree in 2000, from 14 OECD countries. The conditional wage differential between men and women ranges between 3% (Belgium - Flanders) and 18.5% (Japan). For Italy, he estimates a conditional differential of about 10%. For the US, Black et al. (2008) estimate in 1993 a wage gap of about 21% among college graduates (much larger, but the sample include all people with a college degree).

Table 6 - OLS regression: female coefficient, 2011

| | Baseline | With academic controls | | With job controls | | With academic and job controls | |
|---|---|---|---|---|---|---|---|
| | (a) | (b) | (c) | (d) | (e) | (f) | (g) |
| Female | -0.063*** | -0.062*** | -0.072*** | -0.071*** | -0.070*** | -0.068*** | -0.065*** |
| | (0.004) | (0.004) | (0.004) | (0.003) | (0.003) | (0.003) | (0.003) |
| $R^2$ | 0.10 | 0.13 | 0.18 | 0.23 | 0.26 | 0.26 | 0.28 |
| Obs. | 31,547 | | | | | | |
| Controls | | | | | | | |
| Demographic contr. | X | X | X | X | X | X | X |
| Individual backgr. | X | X | X | X | X | X | X |
| SES background | X | X | X | X | X | X | X |
| Academic var. | | X | X | | | X | X |
| Field of study | | | X | | | X | X |
| Job-related var. | | | | X | X | X | X |
| Sector of empl. | | | | | X | | X |

* *p*<0.1; ** *p*<0.05; *** *p*<0.01. Robust s.e. in parenthesis.
Notes: "Demographic contr." include marital/living status, presence of children, and region of residence. "Individual backgr." includes high school track, high school grade, working during college studies. "SES background" includes father's and mother's education and occupation. "Academic var." include type of degree, university grade, period abroad, late degree, other college degrees, other training, age when graduated. "Job-related var." include tenure, experience, profession, type of contract, and a dummy indicating if the individual moved to work.

Table 7 reports selected OLS coefficients from the last specification, namely the one using the full list of controls, in the pooled sample and by gender: these are the underlying equations for the O-B decomposition.[13] People graduated in Medicine, which includes all health-related majors, have significantly higher wages, especially women. The next most rewarded majors are Engineering, Math-Sciences (reference category), and Economics-Statistics, as well as Pharmacy-Chemistry and Psychology among women, possibly suggesting that women's wages are more compressed, independently from the field of study. On the other hand, Architecture, Agriculture, and Natural sciences have significantly lower returns for both genders, and Education and Psychology for men.[14]

[13] Controlling for all the independent variables, excluding sectors of employment (as column (f) in Table 6) yields the same results, reported in Table A3 in the Appendix.
[14] As discussed above for the coefficient associated to the gender dummy, also coefficients associated to the field of study should not be interpreted in causal terms, but as partial correlations.

Table 7 - OLS regression: Academic and high school related coefficients (full specification), 2011

| | Pooled sample | | Women | | Men | |
|---|---|---|---|---|---|---|
| | | *St. err.* | | *St. err.* | | *St. err.* |
| Female | -0.065*** | *0.003* | | | | |
| *Field of study* | | | | | | |
| Pharmacy-Chemistry | -0.038*** | *0.012* | -0.014 | *0.019* | -0.065*** | *0.017* |
| Natural sciences | -0.091*** | *0.013* | -0.083*** | *0.019* | -0.097*** | *0.018* |
| Medicine (a) | 0.071*** | *0.012* | 0.088*** | *0.018* | 0.059*** | *0.017* |
| Engineering | 0.011 | *0.008* | 0.019 | *0.015* | 0.006 | *0.010* |
| Architecture | -0.109*** | *0.012* | -0.104*** | *0.019* | -0.111*** | *0.016* |
| Agriculture | -0.087*** | *0.016* | -0.099*** | *0.025* | -0.080*** | *0.020* |
| Economics-statistics | -0.006 | *0.009* | -0.004 | *0.015* | -0.005 | *0.012* |
| Political- social sciences | -0.054*** | *0.010* | -0.052*** | *0.016* | -0.050*** | *0.014* |
| Law | -0.034*** | *0.011* | -0.038** | *0.017* | -0.027* | *0.015* |
| Humanities | -0.074*** | *0.013* | -0.073*** | *0.019* | -0.067*** | *0.019* |
| Modern Languages | -0.039*** | *0.013* | -0.032* | *0.018* | -0.045* | *0.026* |
| Education | -0.063*** | *0.013* | -0.047** | *0.018* | -0.092*** | *0.023* |
| Psychology | -0.049*** | *0.016* | -0.032 | *0.024* | -0.074*** | *0.022* |
| Physical education | 0.011 | *0.015* | 0.008 | *0.024* | 0.017 | *0.019* |
| Bachelor | -0.020*** | *0.004* | -0.034*** | *0.006* | -0.012** | *0.006* |
| Grade 91-100 | 0.001 | *0.006* | 0.007 | *0.010* | 0.003 | *0.007* |
| Grade 101-105 | 0.006 | *0.006* | 0.010 | *0.010* | 0.009 | *0.008* |
| Grade 106-110 | 0.009 | *0.006* | 0.018* | *0.010* | 0.007 | *0.009* |
| Grade 110 with honours | 0.025*** | *0.007* | 0.035*** | *0.010* | 0.020** | *0.009* |
| Period abroad | 0.027*** | *0.006* | 0.026*** | *0.009* | 0.028*** | *0.009* |
| Late degree ( c) | -0.033*** | *0.004* | -0.024*** | *0.005* | -0.039*** | *0.005* |
| Other degrees | -0.004 | *0.004* | 0.001 | *0.006* | -0.007 | *0.006* |
| Other training | -0.005 | *0.003* | -0.005 | *0.004* | -0.004 | *0.005* |
| 23-24 y.o. when graduated | 0.002 | *0.006* | 0.001 | *0.007* | 0.006 | *0.009* |
| 25-29 y.o. when graduated | 0.015** | *0.006* | 0.014* | *0.008* | 0.021** | *0.010* |
| > 30 y.o. when graduated | 0.071*** | *0.008* | 0.078*** | *0.010* | 0.068*** | *0.012* |
| Work during uni - Occasionally | -0.007** | *0.004* | -0.010* | *0.005* | -0.005 | *0.005* |
| Work during uni - Continuous | 0.032*** | *0.005* | 0.018*** | *0.007* | 0.044*** | *0.007* |
| High school grade | 0.001*** | *0.000* | 0.001** | *0.000* | 0.001*** | *0.000* |
| *High school track* | | | | | | |
| Academic-classical | -0.002 | *0.006* | 0.006 | *0.007* | -0.015 | *0.010* |
| Linguistic | -0.004 | *0.008* | -0.003 | *0.009* | -0.005 | *0.025* |
| Social sciences-arts | -0.005 | *0.006* | 0.001 | *0.007* | -0.040*** | *0.015* |
| Technical | -0.004 | *0.004* | -0.007 | *0.006* | -0.001 | *0.005* |
| Vocational/professional | -0.018** | *0.007* | -0.020** | *0.010* | -0.012 | *0.011* |
| *Region* | | | | | | |
| Lombardy | 0.025*** | *0.006* | 0.019** | *0.008* | 0.033*** | *0.008* |
| North-East | 0.002 | *0.006* | 0.001 | *0.007* | 0.004 | *0.008* |
| Centre | -0.027*** | *0.006* | -0.037*** | *0.008* | -0.017** | *0.008* |
| South | -0.058*** | *0.006* | -0.081*** | *0.008* | -0.036*** | *0.009* |
| Constant | 2.165*** | *0.030* | 2.101*** | *0.047* | 2.133*** | *0.040* |
| Observations | 31,547 | | 16,137 | | 15,410 | |

* p<0.1; ** p<0.05; *** p<0.01.

Notes: controlling also for all the variables included in specification VII (column (g) of Table 6): demographic controls, individual background, SES background, job-related variables, and sector of employment.

Reference categories: male (in the pooled sample), Math-Sciences field of study, master degree, grade 60-90, 21-22 years old when graduated, did not work during university, academic-scientific high school track, living in North-West.

A few other differences between men and women arise. Graduating with the highest grade is associated with significantly higher wages, and the return is much larger for women. On the contrary, while having a continuous job during the university predicts higher wages for both, the return is more than twice as larger for men. These two findings may indicate that obtaining a college degree is particularly important for women to get higher wages, and especially for top performers. It is possible that for women the employers interpret both college degree and high grades as a signal of ability and of attachment to the labour market. Alternatively, it is also plausible that getting a college degree helps women exiting non-qualified clerical jobs.

The results of the Oaxaca-Blinder decomposition are summarized in Table 8: the unadjusted gender gap is 5.6%, similar to the one in the full population (Eurostat 2017a). In all specifications, the gap is unexplained by differences in observable characteristics: the unexplained gap accounts for 91%-109% of the total one. Using a different reference population for non-discriminatory coefficients (either female coefficients or coefficients from a pooled equation) led to similar results, in which the unexplained component tend to be even larger.[15]

These results are striking, if one thinks that only 17% of women have children, usually considered among the major causes of generating a persistent gap (the so-called "motherhood penalty"; see Waldfogel 1997 and Juhn and McCue 2017). It is remarkable that even among graduated people, highly attached to the labour market, and who have recently started working, the raw gap is similar to the one in the total population and it is entirely unexplained by observable characteristics. The group under investigation should be much more homogeneous across the two genders than in the full population, but there are unobserved factors that still cause a gender wage gap. As discussed above, such factors may be individual preferences and choices, soft skills and personality traits, different bargaining power, or different wage offers by employers.

Nevertheless, estimates with EU-SILC data show that in the total population the unexplained gap is even larger (12%-16%) and accounts for 170% of the total one (Piazzalunga and Di Tommaso 2016).

[15] As robustness checks, I have estimated the OLS regression and the O-B decomposition (full specification) also on three subgroups: (i) only bachelor students; (ii) only master students; (iii) only students graduated before age 30 (Table A4). In the first group, the raw gender gap is slightly larger (6.2%), whereas in the second and third case it is slightly smaller (4.8% and 4.5%), while the OLS female coefficients are very similar to the one estimated in the main analysis. Moreover, the main conclusions are unaffected: the gender gap is not explained by observable characteristics.

This comparison suggests that, even if large, the unexplained gap among recently graduated students is smaller than in the full population.[16]

Table 8 - Oaxaca-Blinder decomposition, 2011

| | Baseline | With academic controls | | With job controls | | With academic and job controls | |
|---|---|---|---|---|---|---|---|
| | (a) | (b) | (c) | (d) | (e) | (f) | (g) |
| Men | 2.220*** | 2.220*** | 2.220*** | 2.220*** | 2.220*** | 2.220*** | 2.220*** |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| Women | 2.164*** | 2.164*** | 2.164*** | 2.164*** | 2.164*** | 2.164*** | 2.164*** |
| | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| Gap | 0.056*** | 0.056*** | 0.056*** | 0.056*** | 0.056*** | 0.056*** | 0.056*** |
| | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) |
| Explained | 0.002 | 0.005 | -0.004 | -0.006* | -0.006* | -0.002 | 0.000 |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| Unexplained | 0.054*** | 0.051*** | 0.059*** | 0.061*** | 0.061*** | 0.057*** | 0.055*** |
| | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) |
| Obs. men | | | | 15,410 | | | |
| Obs. women | | | | 16,137 | | | |
| Controls | | | | | | | |
| Demogr. contr. | X | X | X | X | X | X | X |
| Individual backgr. | X | X | X | X | X | X | X |
| SES background | X | X | X | X | X | X | X |
| Academic var. | | X | X | | | X | X |
| Field of study | | | X | | | X | X |
| Job-related var. | | | | X | X | X | X |
| Sector of empl. | | | | | X | | X |

* $p$<0.1; ** $p$<0.05; *** $p$<0.01. Robust s.e. in parenthesis.
Notes: "Demogr. contr." include marital/living status, presence of children, and region of residence. "Individual backgr." includes high school track, high school grade, working during college studies. "SES background" includes father's and mother's education and occupation. "Academic var." include type of degree, university grade, period abroad, late degree, other college degrees, other training, age when graduated. "Job-related var." include tenure, experience, profession, type of contract, and a dummy indicating if the individual moved to work.

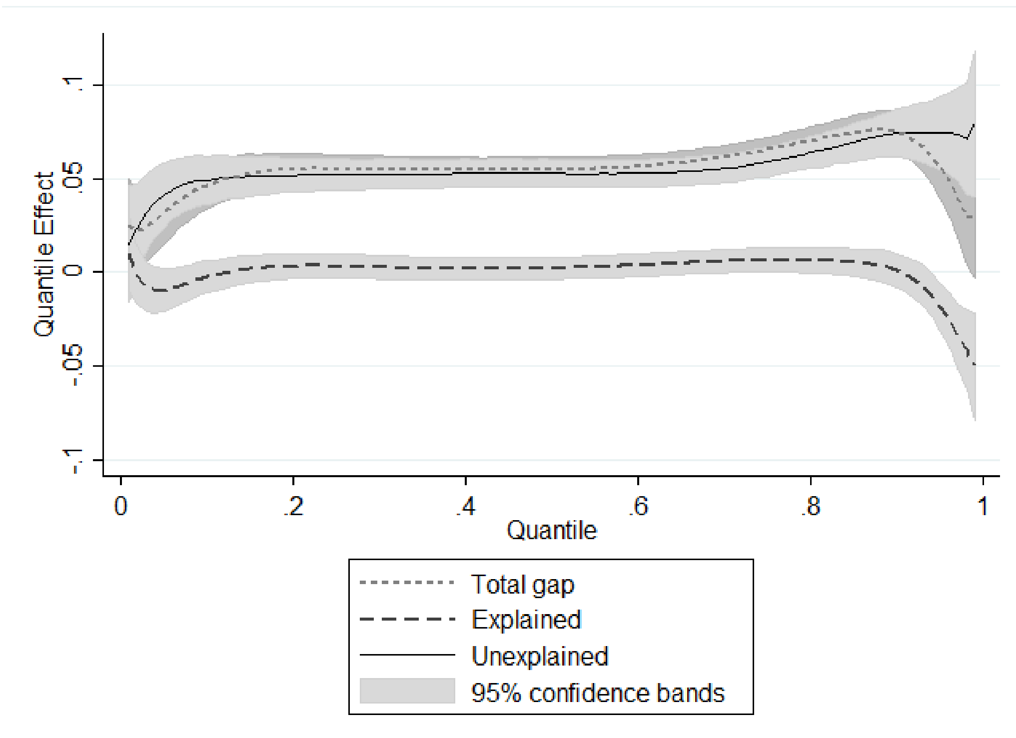
The evolution of the gap at different percentiles reveals that the total gap slightly increases along the wage distribution, with an inverted-U shape (Figure 1). It is low and not significantly different from 0 at the bottom of the distribution, and it slightly increases, reaching about 5% at the 10th percentiles. The total gap is flat at about 5.5% until the 60th percentile, it increases in the second half of the wage distribution until 7.5% (90th percentile) and then it declines again until 3%. The quantile regressions

[16] I have also estimated the O-B decomposition without any control variable not included in Piazzalunga and Di Tommaso (2016). Also in such case (available upon request), the unexplained gap among graduated students is smaller than in the full population.

underlying the decomposition allows individual characteristics to have different effects at different points of the wage distribution: the explained gap is not significantly different from 0 until the 90th percentile, confirming that graduate women and men have similar characteristics, not only on average, but also along the wage distribution. Only at the top, the explained gap decreases, lowering the total gap.

Instead, the unexplained gap, which accounts for most of the wage difference at all levels, keeps increasing also for top wages (up to almost 8%), indicating the existence of a glass ceiling effect among Italian college graduates. This suggests that recently graduated women are relatively more endowed with better observable characteristics at the top of the distribution, but especially at top wages their characteristics are less rewarded. Still, the glass ceiling effect is less pronounced than in the entire population for the same years (Piazzalunga and Di Tommaso 2016).

Figure 1 - Quantile decomposition of the gender wage gap among college graduates, 2011




Notes: controlling for demographic controls, individual background, SES background, job-related variables, sector of employment, academic variables, and field of study.

Analysing the gender wage gap within each field of study provides additional insights into wage differences between men and women (Table 9), even if it is difficult to identify specific trends. In most cases, there exists a wage gap among men and women with the same major, with some exceptions: there is no total gap in Math-Sciences and Natural sciences, Pharmacy, Modern languages, Education, and Psychology. However, in Math-Sciences, Modern languages, and Education there is a significant unexplained gap. The largest total gender wage gap is found among those who graduated in Law (16.3%) and in Political-Social sciences (12.3%), but in both cases about half the gap is due to differences in characteristics. On the other hand, Economics-Statistics and Agriculture fields of study exhibit a wage gap of about 10-11%, and most of it is not explained by observable differences: respectively 75% and 91% is due to differences in returns. This is the case also for remaining majors, with a total gap ranging from around 5% (Medicine, Engineering) to 7% (Humanities, Architecture), largely unexplained.

Differences in the gender pay gap across fields of study could be due to several reasons. First, self-selection into the different majors can play a role, if men and women follow different pattern that are not accounted for by observables characteristics. Second, men and women may have different commitment in working long hours, something required by fields such as Law and Economics (e.g. business consultants). Finally, a higher gap seems also linked to majors with no defined professional outcomes, such as Political-Social sciences: in this case, there can be large differences in the type of job found after the degree, driving differences in wages.

Table 9 provides also interesting descriptive evidence: men with the highest wages per hour are those who study Medicine, but also Education, Law, Physical education, and – to a less extent – Economics, Math-Sciences, and Political sciences. Instead, women with the highest wages are those who studied Medicine, Education, Math-Sciences, Pharmacy, Physical education, and Engineering. Clearly, this may not correspond to the highest wages per month, if there are different requirements or possibilities in terms of hours worked per week and overtime payment. The conclusion is that for women it would pay off to study in STEM fields, in particular in Math-Sciences and Engineering, but it also pays off to be in some of those majors in which women are already well represented, such as Medicine and Pharmacy. If the wages would remain so large for women in STEM fields after an increase of female labour supply in those fields is uncertain.

Table 9 - Oaxaca-Blinder decomposition by field of study, 2011

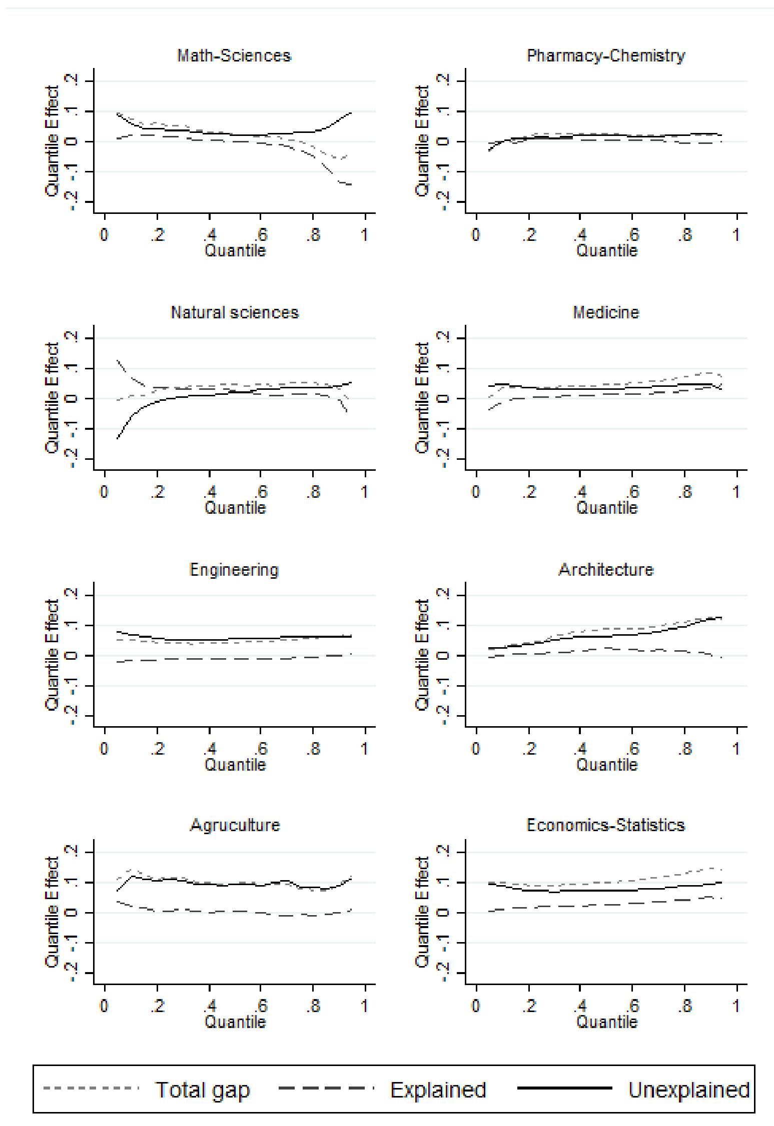
| | Math-Sciences | Pharmacy Chemistry | Natural sciences | Medicine | Engineering | Architect. | Agricult. | Economics statistics |
|---|---|---|---|---|---|---|---|---|
| Men | 2.214*** | 2.184*** | 2.099*** | 2.344*** | 2.199*** | 2.042*** | 2.117*** | 2.231*** |
| | (0.010) | (0.014) | (0.016) | (0.005) | (0.004) | (0.013) | (0.018) | (0.006) |
| Women | 2.191*** | 2.173*** | 2.065*** | 2.296*** | 2.149*** | 1.964*** | 2.012*** | 2.124*** |
| | (0.016) | (0.011) | (0.014) | (0.004) | (0.007) | (0.013) | (0.025) | (0.006) |
| Gap | 0.023 | 0.011 | 0.034 | 0.047*** | 0.050*** | 0.078*** | 0.105*** | 0.108*** |
| | (0.019) | (0.018) | (0.022) | (0.007) | (0.008) | (0.019) | (0.031) | (0.008) |
| Expl. | -0.014 | -0.006 | -0.008 | 0.014** | -0.009 | 0.004 | 0.009 | 0.026*** |
| | (0.016) | (0.019) | (0.027) | (0.007) | (0.006) | (0.017) | (0.027) | (0.006) |
| Unexpl. | 0.038* | 0.016 | 0.042 | 0.033*** | 0.059*** | 0.074*** | 0.096*** | 0.082*** |
| | (0.021) | (0.021) | (0.031) | (0.008) | (0.008) | (0.022) | (0.033) | (0.008) |
| N men | 773 | 349 | 465 | 2,282 | 3,375 | 798 | 380 | 2,677 |
| N women | 405 | 520 | 589 | 4,054 | 1,305 | 690 | 212 | 2,561 |

| | Political-social sc. | Law | Humanities | Modern Languages | Education | Psychology | Physical education |
|---|---|---|---|---|---|---|---|
| Men | 2.217*** | 2.253*** | 2.165*** | 2.158*** | 2.272*** | 2.182*** | 2.250*** |
| | (0.009) | (0.011) | (0.017) | (0.029) | (0.023) | (0.024) | (0.018) |
| Women | 2.095*** | 2.090*** | 2.095*** | 2.119*** | 2.284*** | 2.132*** | 2.172*** |
| | (0.007) | (0.010) | (0.015) | (0.012) | (0.012) | (0.021) | (0.021) |
| Gap | 0.123*** | 0.163*** | 0.071*** | 0.039 | -0.012 | 0.051 | 0.078*** |
| | (0.012) | (0.015) | (0.023) | (0.031) | (0.026) | (0.032) | (0.028) |
| Expl. | 0.069*** | 0.077*** | 0.028 | -0.033 | -0.086** | 0.076** | -0.017 |
| | (0.012) | (0.015) | (0.020) | (0.036) | (0.035) | (0.035) | (0.032) |
| Unexpl. | 0.054*** | 0.087*** | 0.042* | 0.072* | 0.074* | -0.025 | 0.094** |
| | (0.014) | (0.018) | (0.025) | (0.037) | (0.039) | (0.039) | (0.037) |
| N men | 1,315 | 1,269 | 562 | 207 | 247 | 224 | 487 |
| N women | 1,767 | 1,153 | 722 | 660 | 832 | 314 | 353 |

* $p$<0.1; ** $p$<0.05; *** $p$<0.01. Robust s.e. in parenthesis.
Notes: controlling for demographic controls, individual background, SES background, job-related variables, sector of employment, and academic variables.

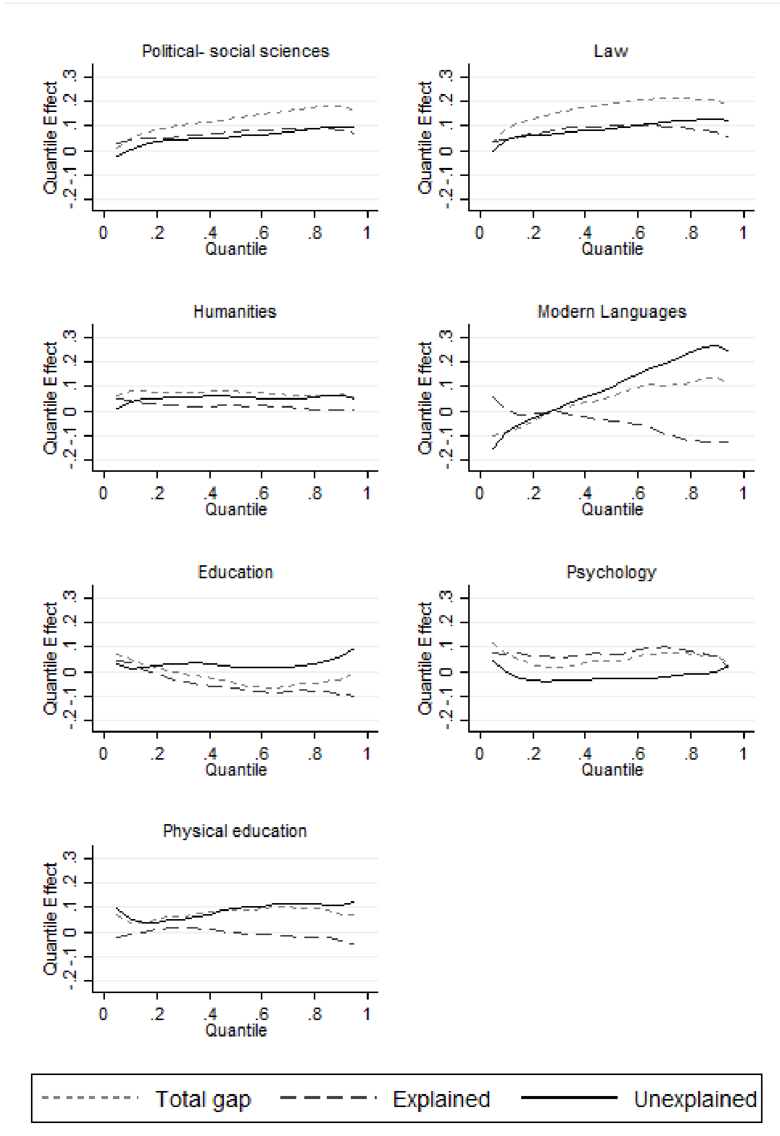
Figure 2 and Figure 3 present the quantile decompositions for each field of study. In most fields, the total gender wage gap tend to increase along the wage distribution (even though with different patterns), along with the unexplained gap. Exceptions are Math-Sciences and Education – where the total gap decreases, while the unexplained gap growths – and few cases with a flat pattern (Pharmacy, Engineering, Agriculture, and Humanities). These findings suggest that also when considering within each major a glass ceiling effect for women exists.

Figure 2 - Quantile decomposition of the gender wage gap by field of study (I), 2011




Notes: controlling for demographic controls, individual background, SES background, job-related variables, sector of employment, and academic variables.

Figure 3 - Quantile decomposition of the gender wage gap by field of study (II), 2011




Notes: controlling for demographic controls, individual background, SES background, job-related variables, sector of employment, and academic variables.

Thanks to the availability of other waves of the same survey, it is possible to compare 2011 findings (individuals graduated in 2007) with those for wave 2007, which comprises individuals graduated in 2004. Wave 2007 has one main advantage: the survey took place before the economic crisis started, while people interviewed in 2011 entered into the labour market at the beginning of the economic crisis. This may have affected wages of both men and women, and possibly the gender wage gap.

As can be seen from Table 10 (bottom panel), in 2007 the raw gender gap was larger than in 2011: about 7.5%. Indeed, nominal male wages increased less than female wages between 2007 and 2011 (+12.5% vs. +14.6%). The unexplained gender gap ranges between 5.1% up to 9.2% in 2007, larger than in 2011. However, in both periods observable characteristics do not explain the total gap.

Table 10 - OLS regression (female coefficient) and Oaxaca-Blinder decomposition, 2007

| | Baseline | With academic controls | | With job controls | | With academic and job controls | |
|---|---|---|---|---|---|---|---|
| | (a) | (b) | (c) | (d) | (e) | (f) | (g) |
| | | | | OLS | | | |
| Female | -0.079*** | -0.085*** | -0.091*** | -0.055*** | -0.081*** | -0.066*** | -0.074*** |
| | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) |
| $R^2$ | 0.05 | 0.06 | 0.11 | 0.09 | 0.18 | 0.14 | 0.20 |
| Obs. | | | | 24,133 | | | |
| | | | | Oaxaca-Blinder decomposition | | | |
| Men | 2.094*** | 2.094*** | 2.094*** | 2.094*** | 2.094*** | 2.094*** | 2.094*** |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| Women | 2.019*** | 2.019*** | 2.019*** | 2.019*** | 2.019*** | 2.019*** | 2.019*** |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| Gap | 0.075*** | 0.075*** | 0.075*** | 0.075*** | 0.075*** | 0.075*** | 0.075*** |
| | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) |
| Expl. | -0.005 | -0.011*** | -0.017*** | 0.024*** | 0.024*** | 0.012*** | 0.003 |
| | (0.004) | (0.004) | (0.005) | (0.004) | (0.004) | (0.005) | (0.005) |
| Unexpl. | 0.079*** | 0.085*** | 0.092*** | 0.051*** | 0.051*** | 0.062*** | 0.071*** |
| | (0.006) | (0.006) | (0.006) | (0.006) | (0.006) | (0.006) | (0.006) |
| Obs. men | | | | 12,082 | | | |
| Obs. women | | | | 12,051 | | | |
| Controls | | | | | | | |
| Demogr. contr. | X | X | X | X | X | X | X |
| Individual backgr. | X | X | X | X | X | X | X |
| SES background | X | X | X | X | X | X | X |
| Academic var. | | X | X | | | X | X |
| Field of study | | | X | | | X | X |
| Job-related var. | | | | X | X | X | X |
| Sector of empl. | | | | | X | | X |

* $p$<0.1; ** $p$<0.05; *** $p$<0.01. Robust s.e. in parenthesis.
Notes: "Demogr. contr." include marital/living status, presence of children, and region of residence. "Individual backgr." includes high school track, high school grade, working during college studies. "SES background" includes father's and mother's education and occupation. "Academic var." include type of degree, university grade, period abroad, late degree, other college degrees, other training, age when graduated. "Job-related var." include tenure, experience, profession, type of contract, and a dummy indicating if the individual moved to work.

Among the majors with the largest total gap, there are Political-Social sciences (15.2%), Economics-Statistics (13.2%), and Law (11.7%); however, as in 2011, in these cases the gap is largely explained by observable characteristics, which account for 40-60% of the total gap. Differences with respect to 2011 results emerge in terms of unexplained gender gap, which is the largest for people graduated in Natural sciences and Architecture (about 10%).

Table 11 - Oaxaca-Blinder decomposition by field of study, 2007

| | Math-Sciences | Pharmacy Chemistry | Natural sciences | Medicine | Engineering | Architect. | Agricult. | Economics statistics |
|---|---|---|---|---|---|---|---|---|
| Men | 2.069*** | 2.053*** | 2.013*** | 2.259*** | 2.056*** | 1.978*** | 1.968*** | 2.088*** |
| | (0.017) | (0.016) | (0.026) | (0.010) | (0.006) | (0.017) | (0.028) | (0.008) |
| Women | 2.104*** | 2.020*** | 1.956*** | 2.164*** | 1.999*** | 1.875*** | 1.926*** | 1.955*** |
| | (0.030) | (0.016) | (0.027) | (0.005) | (0.014) | (0.018) | (0.049) | (0.007) |
| Gap | -0.035 | 0.033 | 0.057 | 0.095*** | 0.057*** | 0.103*** | 0.042 | 0.132*** |
| | (0.034) | (0.023) | (0.038) | (0.011) | (0.015) | (0.025) | (0.056) | (0.010) |
| Expl. | -0.050** | -0.012 | -0.051 | 0.054*** | -0.020** | 0.003 | -0.006 | 0.049*** |
| | (0.024) | (0.023) | (0.043) | (0.016) | (0.010) | (0.024) | (0.057) | (0.009) |
| Unexpl. | 0.016 | 0.045 | 0.109** | 0.041** | 0.077*** | 0.100*** | 0.047 | 0.083*** |
| | (0.037) | (0.029) | (0.053) | (0.017) | (0.017) | (0.032) | (0.077) | (0.012) |
| N men | 362 | 289 | 256 | 1,128 | 1,966 | 542 | 207 | 1,651 |
| N women | 198 | 360 | 305 | 2,264 | 415 | 505 | 140 | 1,392 |

| | Political-social sc. | Law | Humanities | Modern Languages | Education | Psychology | Physical education |
|---|---|---|---|---|---|---|---|
| Men | 2.074*** | 2.062*** | 2.085*** | 2.019*** | 2.160*** | 2.048*** | 2.145*** |
| | (0.013) | (0.016) | (0.030) | (0.053) | (0.053) | (0.049) | (0.028) |
| Women | 1.922*** | 1.945*** | 2.051*** | 1.983*** | 2.019*** | 1.986*** | 2.105*** |
| | (0.009) | (0.015) | (0.021) | (0.018) | (0.014) | (0.030) | (0.025) |
| Gap | 0.152*** | 0.117*** | 0.034 | 0.036 | 0.141** | 0.062 | 0.040 |
| | (0.016) | (0.022) | (0.037) | (0.056) | (0.055) | (0.058) | (0.038) |
| Expl. | 0.090*** | 0.059*** | -0.023 | 0.052 | 0.510*** | 0.050 | -0.053 |
| | (0.022) | (0.019) | (0.035) | (0.117) | (0.105) | (0.085) | (0.045) |
| Unexpl. | 0.062** | 0.058** | 0.057 | -0.016 | -0.369*** | 0.012 | 0.093* |
| | (0.025) | (0.024) | (0.043) | (0.105) | (0.092) | (0.092) | (0.049) |
| N men | 667 | 715 | 255 | 49 | 45 | 124 | 249 |
| N women | 1,104 | 669 | 469 | 516 | 618 | 257 | 247 |

* $p<0.1$; ** $p<0.05$; *** $p<0.01$. Robust s.e. in parenthesis.
Notes: controlling for demographic controls, individual background, SES background, job-related variables, sector of employment, and academic variables.

## 7. Regional differences, institutional setting, and social norms

The economic differences among Italian regions suggest investigating further the geographical heterogeneities of the gender wage gap. On the one hand, regional differences in the self-selection of women into the labour market may influence the total gap (Olivetti and Petrongolo 2008). If there are different rates of positive self-selection among women, one should expect a lower gender wage gap in regions where the female activity rate is lower, namely in southern regions (see Table A5, columns (a) and (b)). On the other hand, the gap may be affected by geographical differences in prevailing social norms towards gender and family roles (Fortin 2005): one may expect a larger gender gap in more conservative regions, as regions in the South of Italy are (Table A6; see also Campa et al. 2011 and De Pascali 2017). On top of that, institutional characteristics, such as childcare coverage, may correlate with the gender wage gap (Blau and Kahn 2003). Finally, the level of discrimination can differ across regions.

Table 7 above provides a first glimpse in regional differences in wages: for both men and women, wages are lower in central and southern Italy, but the negative association is much larger for women, who experience a drop of 8.1%, compared to 3.6% for men, if they live in the South of Italy. Consequently, we may expect larger wage gaps in southern regions.

Table 12 confirms those expectations: the largest total gender wage gap arise in the South of Italy (9.4%), followed by the Centre (6.7%) and by Lombardy (4.9%). North-West and North-East have the lowest gaps, respectively 3.6% and 2%. The unexplained gap follows the same pattern. However, while in Centre and in South of Italy observable characteristics explains respectively 15% and 20% of the total gap, this is not the case in other regions, where the gap is completely unexplained.

Detailed regional results can be found in the Appendix (Table A7).

Table 12 - Oaxaca-Blinder decomposition by macro-region, 2011

| | North-West | Lombardy | North-East | Centre | South |
|---|---|---|---|---|---|
| Men | 2.234*** | 2.239*** | 2.208*** | 2.221*** | 2.208*** |
| | (0.008) | (0.005) | (0.005) | (0.005) | (0.006) |
| Women | 2.198*** | 2.191*** | 2.188*** | 2.154*** | 2.114*** |
| | (0.007) | (0.005) | (0.005) | (0.005) | (0.006) |
| Gap | 0.036*** | 0.049*** | 0.020*** | 0.067*** | 0.094*** |
| | (0.011) | (0.007) | (0.007) | (0.007) | (0.008) |
| Explained | -0.010 | 0.000 | -0.018** | 0.010 | 0.016* |
| | (0.011) | (0.007) | (0.007) | (0.007) | (0.008) |
| Unexplained | 0.045*** | 0.049*** | 0.038*** | 0.057*** | 0.078*** |
| | (0.014) | (0.009) | (0.009) | (0.009) | (0.010) |
| Obs. men | 1,384 | 3,214 | 3,234 | 3,661 | 3,917 |
| Obs. women | 1,662 | 3,310 | 3,642 | 3,753 | 3,770 |

* $p$<0.1; ** $p$<0.05; *** $p$<0.01. Robust s.e. in parenthesis.
Notes: controlling for demographic controls, individual background, SES background, job-related variables, sector of employment, academic variables, and field of study.

These findings exclude the self-selection channel as main driver of regional heterogeneities in the gender gap. Instead, it is more difficult is to disentangle between attitudes towards gender roles, institutional settings, and discrimination.

The last step of this analysis links the total and unexplained gap to some institutional and macro variables and to social norms. First, the total gap and the unexplained gap – as estimated with the Oaxaca-Blinder decomposition (shown in Table A7) – are included as dependent variables in simple linear regressions, where the independent variable is one of those the following ones (2011): (i) childcare coverage; (ii) part-time employment rate (difference between women and men); (iii) elderly home-based assistance; (iv) informal economy; and (v) share of public employment.[18] I also perform a regression in which both childcare coverage and part-time employment rates are included as regressors. Then, the total and the unexplained wage gaps are included as dependent variables in simple linear regressions where the independent variable is the percentage of people, which agree or disagree with a specific statement, capturing social norms about gender roles. Agreement with the following statement have been used (European Value Survey, 2008): (i) A working mother can establish just as warm and secure a relationship with her children as a mother who does not work; (ii) A pre-school child is likely to suffer if his or her mother works; (iii) A job is alright but what most women really

[18] Summary statistics are presented in Table A5, columns (c) to (g). Definition of the variables and sources are presented in Table A8.

want is a home and children; (iv) Being a housewife is just as fulfilling as working for pay; (v) In general, fathers are as well suited to look after their children as mothers; (vi) Men should take as much responsibility as women for the home and children; (vii) When jobs are scarce, men have more right to a job than women.[19] Note that all findings should be interpreted as correlations and not in causal terms.

Results on the association with institutional and macro variables are presented in Table 13. Findings are very similar for total gender wage gap and unexplained gap, even though in the second case the coefficients are smaller. There is no significant association with elderly assistance and public employment, while larger share of informal employment correlates with higher gender wage gaps. One may expect larger gender wage gaps in the informal economy due to the lack of regulations; moreover, a larger informal economy reduces the bargaining power of workers even in the formal sector, increasing wage dispersions, and consequently the gender wage gap.[20]

On the other hand, both childcare coverage and the availability of part-time are negatively correlated with wage gaps. Both the availability of childcare and of part-time can be considered as factors favouring work-family reconciliation, as studies on their impacts on employment show (Del Boca 2002; Brilli et al. 2016). Reconciling work and family, they can have a positive effect on women's wages, increasing women attachment to the firm and their investment in firm-specific skills (Christofides et al. 2013; Triventi 2013). Interestingly, these findings are confirmed when both variables are included in a unique regression.

Finally, Table 14 shows the association between attitudes towards gender roles and the total and unexplained gender wage gaps. Four variables result in a statistically significant correlation (warm relationship of working mothers; pre-school child suffers is mother works; father suited to look after children; men should take as much responsibility for home and children as women), but all variables have the expected sign: higher share of agreement with traditional gender norms increases the gender wage gaps, while progressive attitudes are associated with lower gaps.

[19] Summary statistics are presented in Table A6.
[20] Checchi and Peragine (2010) show that the South of Italy is characterized by higher level of inequality.

Table 13 - Gender wage gap and institutional and macro indicators, 2011

Dependent variable: total gender wage gap

| | (a) | (b) | (c) | (d) | (e) | (f) |
|---|---|---|---|---|---|---|
| Childcare cov. | -0.004*** | | | | | -0.002** |
| | (0.001) | | | | | (0.001) |
| Part-time diff. | | -0.009*** | | | | -0.007** |
| | | (0.002) | | | | (0.003) |
| Elderly ass. | | | -0.004 | | | |
| | | | (0.004) | | | |
| Informal econ. | | | | 0.005*** | | |
| | | | | (0.001) | | |
| Public empl. | | | | | -0.001 | |
| | | | | | (0.002) | |
| Constant | 0.111*** | 0.276*** | 0.069** | -0.014 | 0.107 | 0.254*** |
| | (0.007) | (0.048) | (0.026) | (0.024) | (0.092) | (0.064) |
| $R^2$ | 0.45 | 0.62 | 0.04 | 0.44 | 0.04 | 0.71 |
| Obs. | 17 | | | | | |

Dependent variable: unexplained gender wage gap

| | (a) | (b) | (c) | (d) | (e) | (f) |
|---|---|---|---|---|---|---|
| Childcare cov. | -0.003*** | | | | | -0.002* |
| | (0.001) | | | | | (0.001) |
| Part-time diff. | | -0.006*** | | | | -0.004** |
| | | (0.002) | | | | (0.002) |
| Elderly ass. | | | -0.004 | | | |
| | | | (0.004) | | | |
| Informal econ. | | | | 0.003*** | | |
| | | | | (0.001) | | |
| Public empl. | | | | | -0.000 | |
| | | | | | (0.001) | |
| Constant | 0.098*** | 0.201*** | 0.068*** | 0.006 | 0.056 | 0.254*** |
| | (0.012) | (0.037) | (0.018) | (0.017) | (0.059) | (0.064) |
| $R^2$ | 0.38 | 0.39 | 0.05 | 0.33 | 0.00 | 0.51 |
| Obs. | 17 | | | | | |

* $p$<0.1; ** $p$<0.05; *** $p$<0.01. Robust s.e. in parenthesis.
Notes: the dependent variable is the total gender wage gap (top panel) and unexplained gender wage gap (bottom panel), by region, as estimated with an Oaxaca-Blinder decomposition (see Table A7). In some cases, regions are aggregated, if the small number of observations prevented from estimating the O-B decomposition.
Results are confirmed if both year 2011 and 2007 are included.

Table 14 - Gender wage gap and social norms, 2011

| Dependent variable: total gender wage gap | | | | | | | |
|---|---|---|---|---|---|---|---|
| | (i) | (ii) | (iii) | (iv) | (v) | (vi) | (vii) |
| (i) Working mother warm relationship w child | -0.254** | | | | | | |
| | (0.101) | | | | | | |
| (ii) Pre-school child suffers of mum works | | 0.236** | | | | | |
| | | (0.101) | | | | | |
| (iii) Women really want home and children | | | 0.068 | | | | |
| | | | (0.168) | | | | |
| (iv) Housewife fulfilling as paid job | | | | 0.144 | | | |
| | | | | (0.093) | | | |
| (v) Father suited to look after children as mum | | | | | -0.201* | | |
| | | | | | (0.105) | | |
| (vi) Men same responsibility for home, children | | | | | | -0.429*** | |
| | | | | | | (0.121) | |
| (vii) Men more right to a job if scarce (disagree) | | | | | | | -0.073 |
| | | | | | | | (0.148) |
| Constant | 0.214*** | -0.111 | 0.013 | -0.013 | 0.185** | 0.428*** | 0.099 |
| | (0.061) | (0.073) | (0.090) | (0.046) | (0.066) | (0.103) | (0.102) |
| $R^2$ | 0.30 | 0.37 | 0.02 | 0.06 | 0.22 | 0.53 | 0.03 |
| Obs. | | | | 17 | | | |

| Dependent variable: unexplained gender wage gap | | | | | | | |
|---|---|---|---|---|---|---|---|
| | (i) | (ii) | (iii) | (iv) | (v) | (vi) | (vii) |
| (i) Working mother warm relationship w child | -0.170** | | | | | | |
| | (0.079) | | | | | | |
| (ii) Pre-school child suffers of mum works | | 0.128 | | | | | |
| | | (0.086) | | | | | |
| (iii) Women really want home and children | | | 0.066 | | | | |
| | | | (0.121) | | | | |
| (iv) Housewife fulfilling as paid job | | | | 0.119 | | | |
| | | | | (0.105) | | | |
| (v) Father suited to look after children as mum | | | | | -0.048 | | |
| | | | | | (0.102) | | |
| (vi) Men same responsibility for home, children | | | | | | -0.229* | |
| | | | | | | (0.109) | |
| (vii) Men more right to a job if scarce (disagree) | | | | | | | -0.075 |
| | | | | | | | (0.106) |
| Constant | 0.161*** | -0.035 | 0.015 | -0.001 | 0.085 | 0.254** | 0.101 |
| | (0.052) | (0.058) | (0.065) | (0.048) | (0.069) | (0.097) | (0.070) |
| $R^2$ | 0.19 | 0.16 | 0.02 | 0.06 | 0.02 | 0.22 | 0.04 |
| Obs. | | | | 17 | | | |

* $p$<0.1; ** $p$<0.05; *** $p$<0.01

Notes: social norms refers to 2008, while the gender gaps to 2011. The dependent variable is the total gender wage gap (top panel) and unexplained gender wage gap (bottom panel), by region, as estimated with an Oaxaca-Blinder decomposition (see Table A7). In some cases, regions are aggregated, if the small number of observations prevented from estimating the O-B decomposition.

## 8. Conclusions

In this paper, I have explored the gender wage gap among recent graduates in Italy, controlling for job and academic variables, including the field of study.

Despite nowadays more women than men have a college degree, women still lag in more math-intense fields of study, such as Mathematics, Physics, Computer Science, and Engineering, which have the highest wage prospects. This is often considered among the causes that negatively influence female wages, and one of the unobserved factors that is not possible to control for in standard wage equations, eventually included in the residual wage gap between men and women. Instead, investigating the wage gap among college graduates, controlling for academic variables and for the field of study, allows capturing the importance of academic choices.

The paper shows that in Italy women graduated in some highly remunerative fields, such as Medicine and Pharmacy-Chemistry, but it confirms that they lag from others, most notably Math-Sciences and Engineering.

Findings indicate that in 2011 there is a significant gender wage gap among recent college graduates (5.6%), even if they are at the beginning of their career and women appear to be as attached to the labour market as men. Applying an Oaxaca-Blinder decomposition, I show that the unexplained gap accounts for a slightly smaller proportion when including also academic controls and field of study on top of job-related variables. Despite this, the gap is almost completely unexplained by observable characteristics, including job and academic variables. When considering the pattern along the wage distribution, the total gap has an inverted-U shape; however, the unexplained gap increases at all percentiles, indicating the existence of a glass ceiling effect.

Within each field of study, the largest total gap is found in Law, Political-Social sciences, and Economics-Statistics, while there is no gap in some scientific fields, such as Math-Sciences, Natural sciences, and Pharmacy-Chemistry, but also in Modern languages, Education, and Psychology. However, there is a significant unexplained gap in most majors, ranging between 3.3% up to 9.6%.

Overall, the field of study seems to be a relevant variable in explaining the gender wage gap among graduates, but not a major one, and it does not eliminate the unexplained difference.

Finally, the paper shows that in the South of Italy the gender wage gap is larger and it thus explores if macro-institutional variables and attitudes towards gender norms are associated with different lever of wage gaps. Confirming results from cross-country investigations, the availability of childcare and of part-time reduce the wage gap, while a larger informal economy increases it. Moreover, traditional gender norms are associated with higher wage gaps.

Future research should investigate gender differences due to the field of study in other labour market outcomes, such as the employment probability, type of occupations, but also hours worked, as they all affect the overall earnings gap between men and women.

From a policy perspective, it remains important understanding what drives the different choices of majors between men and women and possibly reducing the sorting. However, the focus should not be only on STEM fields, but span also to other fields, keeping in mind that the fields with largest hourly wages do not always match for men and women. For instance, Pharmacy-Chemistry is among the fields with highest wages for women and the major with the lowest gender wage gap, and women already represents 60% of its graduates.

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## APPENDIX

Table A1 - Summary statistics for employed and non-employed, by gender, 2011

| | Women | | Men | |
|---|---|---|---|---|
| | Empl. | Not empl. | Empl. | Not empl. |
| Academic variables | | | | |
| *Field* | | | | |
| Math-Sciences | 0.02 | 0.02 | 0.05 | 0.04 |
| Pharmacy-Chemistry | 0.03 | 0.02 | 0.02 | 0.02 |
| Natural sciences | 0.04 | 0.08 | 0.03 | 0.06 |
| Medicine (a) | 0.24 | 0.25 | 0.15 | 0.19 |
| Engineering | 0.07 | 0.04 | 0.20 | 0.13 |
| Architecture | 0.05 | 0.05 | 0.06 | 0.05 |
| Agriculture | 0.02 | 0.02 | 0.03 | 0.02 |
| Economics-statistics | 0.15 | 0.11 | 0.17 | 0.12 |
| Political-social sciences | 0.11 | 0.08 | 0.08 | 0.06 |
| Law | 0.08 | 0.17 | 0.09 | 0.15 |
| Humanities | 0.05 | 0.06 | 0.04 | 0.07 |
| Modern languages | 0.04 | 0.04 | 0.02 | 0.02 |
| Education | 0.05 | 0.02 | 0.02 | 0.01 |
| Psychology | 0.02 | 0.03 | 0.01 | 0.02 |
| Physical education | 0.03 | 0.02 | 0.04 | 0.03 |
| *Type of degree* | | | | |
| Bachelor | 0.51 | 0.51 | 0.51 | 0.46 |
| Master (b) | 0.49 | 0.49 | 0.49 | 0.54 |
| *Grade* | | | | |
| Grade 66-90 | 0.06 | 0.06 | 0.13 | 0.12 |
| Grade 91-100 | 0.23 | 0.23 | 0.30 | 0.27 |
| Grade 101-105 | 0.19 | 0.18 | 0.18 | 0.17 |
| Grade 106-110 | 0.25 | 0.23 | 0.19 | 0.18 |
| Grade 110 with honors | 0.27 | 0.30 | 0.19 | 0.26 |
| Period abroad | 0.07 | 0.08 | 0.07 | 0.09 |
| Late degree (c) | 0.43 | 0.53 | 0.51 | 0.57 |
| Other degrees | 0.26 | 0.36 | 0.27 | 0.40 |
| Other training | 0.51 | 0.46 | 0.47 | 0.45 |
| 21-22 y.o. when graduated | 0.12 | 0.11 | 0.07 | 0.11 |
| 23-24 y.o. when graduated | 0.27 | 0.31 | 0.22 | 0.32 |
| 25-29 y.o. when graduated | 0.43 | 0.47 | 0.46 | 0.46 |
| > 30 y.o. when graduated | 0.18 | 0.10 | 0.24 | 0.11 |
| Individual background | | | | |
| *High school track* | | | | |
| Academic-scientific | 0.36 | 0.40 | 0.42 | 0.49 |
| Academic-classical | 0.15 | 0.26 | 0.09 | 0.19 |
| Linguistic | 0.07 | 0.06 | 0.01 | 0.01 |
| Social sciences-arts | 0.14 | 0.10 | 0.03 | 0.02 |
| Technical | 0.24 | 0.16 | 0.40 | 0.25 |
| Vocational/professional | 0.04 | 0.02 | 0.05 | 0.03 |

| | Women | | Men | |
|---|---|---|---|---|
| | Empl. | Not empl. | Empl. | Not empl. |
| High school grade | 84.59 | 87.07 | 81.04 | 83.71 |
| *Worked while studying* | | | | |
| No | 0.32 | 0.52 | 0.28 | 0.48 |
| Occasionally | 0.45 | 0.42 | 0.44 | 0.44 |
| Continuous work | 0.22 | 0.06 | 0.28 | 0.08 |
| Demographic controls | | | | |
| *Family* | | | | |
| Single living w/ parents | 0.39 | 0.51 | 0.41 | 0.63 |
| Single living alone (c) | 0.21 | 0.20 | 0.27 | 0.24 |
| Married or cohabiting | 0.40 | 0.29 | 0.32 | 0.14 |
| Children | 0.16 | 0.13 | 0.16 | 0.04 |
| *Region* | | | | |
| North-West | 0.10 | 0.06 | 0.09 | 0.07 |
| Lombardy | 0.20 | 0.12 | 0.20 | 0.12 |
| North-East | 0.22 | 0.15 | 0.20 | 0.16 |
| Centre | 0.23 | 0.23 | 0.23 | 0.24 |
| South | 0.25 | 0.44 | 0.27 | 0.41 |
| SES background | | | | |
| Father primary education | 0.13 | 0.09 | 0.13 | 0.07 |
| Father lower sec. education | 0.30 | 0.25 | 0.26 | 0.21 |
| Father upper sec. education | 0.42 | 0.43 | 0.44 | 0.43 |
| Father tertiary education | 0.15 | 0.22 | 0.18 | 0.29 |
| Mother primary education | 0.15 | 0.11 | 0.16 | 0.09 |
| Mother lower sec. education | 0.31 | 0.26 | 0.28 | 0.23 |
| Mother upper sec. education | 0.43 | 0.46 | 0.43 | 0.48 |
| Mother tertiary education | 0.11 | 0.17 | 0.13 | 0.21 |
| Father manager/businessman | 0.09 | 0.10 | 0.10 | 0.11 |
| Father supervisor | 0.08 | 0.12 | 0.09 | 0.14 |
| Father high qualified employee | 0.18 | 0.19 | 0.19 | 0.20 |
| Father low qualified employee | 0.13 | 0.13 | 0.14 | 0.14 |
| Father workman | 0.23 | 0.19 | 0.21 | 0.17 |
| Father self employed | 0.23 | 0.22 | 0.21 | 0.20 |
| Father not employed | 0.05 | 0.05 | 0.05 | 0.05 |
| Mother manager/superv./business. | 0.10 | 0.14 | 0.11 | 0.16 |
| Mother high qualified employees | 0.16 | 0.17 | 0.17 | 0.20 |
| Mother low qualified employees | 0.13 | 0.12 | 0.12 | 0.12 |
| Mother workman | 0.09 | 0.06 | 0.07 | 0.05 |
| Mother self employed | 0.07 | 0.07 | 0.07 | 0.06 |
| Mother housewife | 0.42 | 0.40 | 0.44 | 0.38 |
| Mother not employed other | 0.03 | 0.03 | 0.03 | 0.03 |
| Observations | 20,353 | 9,905 | 19,481 | 6,766 |

Notes: the sample is composed by individuals in the full sample, excluding non-Italian and those who already obtained other degree before (column (c) of Table A2). Employed individuals include also those to which wage is not asked or missing (column (d) of Table A2).

Table A2 - Sample selection, 2011

| | Initial sample<br>(a) | Only Italian<br>(b) | No other degree before (Full sample)<br>(c) | Employed<br>(d) | No highly precarious jobs<br>(e) | No missing wage (Final sample)<br>(f) |
|---|---|---|---|---|---|---|
| Academic variables | | | | | | |
| *Field* | | | | | | |
| Math-Sciences | 0.03 | 0.03 | 0.03 | 0.03 | 0.04 | 0.04 |
| Pharmacy-Chemistry | 0.03 | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 |
| Natural sciences | 0.05 | 0.04 | 0.05 | 0.04 | 0.03 | 0.03 |
| Medicine (a) | 0.21 | 0.21 | 0.20 | 0.19 | 0.20 | 0.20 |
| Engineering | 0.12 | 0.12 | 0.12 | 0.14 | 0.15 | 0.15 |
| Architecture | 0.05 | 0.05 | 0.05 | 0.06 | 0.05 | 0.05 |
| Agriculture | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| Economics-statistics | 0.14 | 0.14 | 0.14 | 0.16 | 0.17 | 0.17 |
| Political- social sciences | 0.09 | 0.09 | 0.09 | 0.10 | 0.10 | 0.10 |
| Law | 0.10 | 0.11 | 0.11 | 0.08 | 0.08 | 0.08 |
| Humanities | 0.05 | 0.05 | 0.05 | 0.04 | 0.04 | 0.04 |
| Modern languges | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| Education | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| Psychology | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| Physical education | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| *Type of degree* | | | | | | |
| Bachelor | 0.50 | 0.50 | 0.50 | 0.51 | 0.51 | 0.51 |
| Master (b) | 0.50 | 0.50 | 0.50 | 0.49 | 0.49 | 0.49 |
| *Grade* | | | | | | |
| Grade 66-90 | 0.09 | 0.09 | 0.09 | 0.10 | 0.10 | 0.09 |
| Grade 91-100 | 0.26 | 0.25 | 0.26 | 0.26 | 0.26 | 0.26 |
| Grade 101-105 | 0.18 | 0.18 | 0.18 | 0.19 | 0.19 | 0.19 |
| Grade 106-110 | 0.22 | 0.22 | 0.22 | 0.22 | 0.22 | 0.22 |
| Grade 110 with honors | 0.25 | 0.25 | 0.25 | 0.23 | 0.23 | 0.24 |
| Period abroad | 0.08 | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 |
| Late degree (c) | 0.48 | 0.48 | 0.49 | 0.47 | 0.45 | 0.45 |
| Other degrees | 0.30 | 0.29 | 0.30 | 0.26 | 0.25 | 0.25 |
| Other training | 0.48 | 0.48 | 0.48 | 0.49 | 0.48 | 0.49 |
| 21-22 y.o. when graduated | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| 23-24 y.o. when graduated | 0.26 | 0.26 | 0.27 | 0.25 | 0.24 | 0.24 |
| 25-29 y.o. when graduated | 0.44 | 0.44 | 0.45 | 0.44 | 0.43 | 0.44 |
| > 30 y.o. when graduated | 0.21 | 0.21 | 0.18 | 0.21 | 0.23 | 0.22 |
| Individual background | | | | | | |
| *High school track* | | | | | | |
| Academic-scientific | 0.40 | 0.40 | 0.40 | 0.39 | 0.39 | 0.39 |
| Academic-classical | 0.15 | 0.15 | 0.15 | 0.12 | 0.11 | 0.11 |
| Linguistic | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| Social sciences-arts | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.09 |
| Technical | 0.28 | 0.29 | 0.28 | 0.32 | 0.33 | 0.33 |
| Vocational/professional | 0.04 | 0.04 | 0.04 | 0.05 | 0.05 | 0.05 |
| High school grade | 83.70 | 83.52 | 83.70 | 82.85 | 82.86 | 82.93 |

*continuing*

Table A2 (continued)

| | Initial sample (a) | Only Italian (b) | No other degree before (Full sample) (c) | Employed (d) | No highly precarious jobs (e) | No missing wage (Final sample) (f) |
|---|---|---|---|---|---|---|
| *Worked while studying* | | | | | | |
| No | 0.35 | 0.35 | 0.36 | 0.30 | 0.30 | 0.29 |
| Occasionally | 0.44 | 0.43 | 0.44 | 0.45 | 0.43 | 0.44 |
| Continuous work | 0.22 | 0.22 | 0.20 | 0.25 | 0.27 | 0.27 |
| Job variables | | | | | | |
| Hourly wage | 9.55 | 9.51 | 9.39 | 9.39 | 9.39 | 9.39 |
| Tenure | 2.87 | 2.90 | 2.82 | 2.82 | 2.88 | 2.87 |
| Experience | 3.11 | 3.13 | 3.06 | 3.07 | 3.13 | 3.12 |
| *Sector* | | | | | | |
| Agriculture | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Manufacturing | 0.09 | 0.09 | 0.10 | 0.10 | 0.11 | 0.11 |
| Construction | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| Commerce and transports | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 |
| Finance | 0.09 | 0.09 | 0.10 | 0.10 | 0.10 | 0.10 |
| Scientific | 0.11 | 0.12 | 0.12 | 0.12 | 0.11 | 0.10 |
| ICT | 0.04 | 0.04 | 0.04 | 0.04 | 0.05 | 0.05 |
| Communication | 0.05 | 0.04 | 0.05 | 0.05 | 0.04 | 0.05 |
| Education | 0.10 | 0.10 | 0.09 | 0.09 | 0.09 | 0.09 |
| Health and social | 0.24 | 0.25 | 0.23 | 0.23 | 0.24 | 0.24 |
| Public admin | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 |
| Other services | 0.07 | 0.07 | 0.07 | 0.07 | 0.06 | 0.06 |
| *Profession* | | | | | | |
| Managers/legislators/armed forces | 0.04 | 0.04 | 0.03 | 0.03 | 0.03 | 0.03 |
| Science professionals | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| Engineering professionals | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 |
| Biology-health professionals | 0.05 | 0.05 | 0.06 | 0.06 | 0.05 | 0.05 |
| Legal, social, cultural professionals | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 | 0.11 |
| Teaching and research professionals | 0.08 | 0.08 | 0.07 | 0.07 | 0.07 | 0.07 |
| Science and engineering technicians | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 | 0.08 |
| Health and biology technicians | 0.19 | 0.19 | 0.17 | 0.17 | 0.19 | 0.19 |
| Business-administration technicians | 0.12 | 0.12 | 0.12 | 0.12 | 0.13 | 0.13 |
| Public-personal services technicians | 0.05 | 0.06 | 0.05 | 0.05 | 0.05 | 0.05 |
| Other professions (d) | 0.15 | 0.15 | 0.16 | 0.16 | 0.16 | 0.16 |
| *Type of contract* | | | | | | |
| Permanent contract | 0.50 | 0.50 | 0.49 | 0.49 | 0.56 | 0.58 |
| Temporary contract | 0.31 | 0.31 | 0.32 | 0.32 | 0.29 | 0.30 |
| Self-employed | 0.19 | 0.19 | 0.19 | 0.19 | 0.14 | 0.12 |
| Moved to work | 0.26 | 0.25 | 0.25 | 0.25 | 0.26 | 0.26 |
| Demographic controls | | | | | | |
| *Family* | | | | | | |
| Single living with parents | 0.42 | 0.43 | 0.44 | 0.40 | 0.38 | 0.38 |
| Single living alone (c) | 0.24 | 0.23 | 0.23 | 0.24 | 0.24 | 0.24 |
| Married or cohabiting | 0.34 | 0.34 | 0.32 | 0.36 | 0.38 | 0.38 |
| Children | 0.16 | 0.16 | 0.14 | 0.16 | 0.17 | 0.17 |

*continuing*

Table A2 (continued)

| | Initial sample<br>(a) | Only Italian<br>(b) | No other degree before (Full sample)<br>(c) | Employed<br>(d) | No highly precarious jobs<br>(e) | No missing wage (Final sample)<br>(f) |
|---|---|---|---|---|---|---|
| *Region* | | | | | | |
| North-West | 0.08 | 0.09 | 0.08 | 0.09 | 0.10 | 0.10 |
| Lombardy | 0.17 | 0.17 | 0.18 | 0.20 | 0.21 | 0.21 |
| North-East | 0.19 | 0.19 | 0.19 | 0.21 | 0.22 | 0.22 |
| Centre | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.24 |
| South | 0.30 | 0.32 | 0.31 | 0.26 | 0.25 | 0.24 |
| SES background | | | | | | |
| Father primary education | 0.12 | 0.12 | 0.11 | 0.13 | 0.13 | 0.13 |
| Father lower sec. education | 0.26 | 0.27 | 0.27 | 0.28 | 0.28 | 0.28 |
| Father upper sec. education | 0.43 | 0.43 | 0.43 | 0.43 | 0.43 | 0.43 |
| Father tertiary education | 0.19 | 0.19 | 0.19 | 0.16 | 0.16 | 0.15 |
| Mother primary education | 0.14 | 0.15 | 0.14 | 0.16 | 0.16 | 0.16 |
| Mother lower sec. education | 0.28 | 0.28 | 0.28 | 0.30 | 0.30 | 0.30 |
| Mother upper sec. education | 0.44 | 0.43 | 0.44 | 0.43 | 0.42 | 0.42 |
| Mother tertiary education | 0.14 | 0.14 | 0.14 | 0.12 | 0.11 | 0.11 |
| Father manager/businessman | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| Father supervisor | 0.10 | 0.10 | 0.10 | 0.09 | 0.09 | 0.09 |
| Father high qualified employee | 0.18 | 0.18 | 0.19 | 0.18 | 0.18 | 0.18 |
| Father low qualified employee | 0.13 | 0.14 | 0.14 | 0.14 | 0.14 | 0.14 |
| Father workman | 0.21 | 0.21 | 0.21 | 0.22 | 0.23 | 0.23 |
| Father self employed | 0.22 | 0.22 | 0.22 | 0.22 | 0.22 | 0.22 |
| Father not employed | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| Mother manager/supervisor/business. | 0.12 | 0.11 | 0.12 | 0.10 | 0.10 | 0.10 |
| Mother high qualified employees | 0.17 | 0.17 | 0.17 | 0.16 | 0.16 | 0.16 |
| Mother low qualified employees | 0.12 | 0.12 | 0.13 | 0.13 | 0.13 | 0.13 |
| Mother workman | 0.07 | 0.07 | 0.07 | 0.08 | 0.08 | 0.08 |
| Mother self employed | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 |
| Mother housewife | 0.42 | 0.42 | 0.42 | 0.43 | 0.43 | 0.43 |
| Mother not employed other | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| Observations | | | | | | |
| Max obs. | 62,000 | 58,979 | 56,505 | 39,834 | 34,495 | 31,547 |
| Work related variables – max obs. | 44,131 | 42,083 | 39,834 | 39,834 | 34,495 | 31,547 |
| Wage – obs. | 35,054 | 33,462 | 31,547 | 31,547 | 31,547 | 31,547 |

Table A3 - OLS regression: Academic and high school related coefficients (full spec. w/o sectors), 2011

| | Pooled sample | | Women | | Men | |
|---|---|---|---|---|---|---|
| | | *St. err.* | | *St. err.* | | *St. err.* |
| Female | -0.068*** | *0.003* | | | | |
| *Field of study* | | | | | | |
| Pharmacy-Chemistry | -0.023* | *0.012* | -0.012 | *0.018* | -0.043*** | *0.017* |
| Natural sciences | -0.092*** | *0.012* | -0.095*** | *0.019* | -0.092*** | *0.017* |
| Medicine (a) | 0.088*** | *0.011* | 0.099*** | *0.017* | 0.077*** | *0.015* |
| Engineering | 0.015* | *0.008* | 0.017 | *0.015* | 0.013 | *0.010* |
| Architecture | -0.117*** | *0.012* | -0.127*** | *0.019* | -0.110*** | *0.016* |
| Agriculture | -0.104*** | *0.015* | -0.122*** | *0.024* | -0.090*** | *0.019* |
| Economics-statistics | 0.016* | *0.009* | 0.009 | *0.015* | 0.022* | *0.012* |
| Political- social sciences | -0.045*** | *0.010* | -0.052*** | *0.015* | -0.036*** | *0.014* |
| Law | -0.014 | *0.011* | -0.032** | *0.017* | -0.001 | *0.015* |
| Humanities | -0.074*** | *0.013* | -0.082*** | *0.019* | -0.062*** | *0.019* |
| Modern Languages | -0.036*** | *0.013* | -0.040** | *0.018* | -0.037 | *0.026* |
| Education | -0.052*** | *0.013* | -0.046** | *0.018* | -0.076*** | *0.023* |
| Psychology | -0.027 | *0.017* | -0.012 | *0.024* | -0.056** | *0.023* |
| Physical education | 0.013 | *0.015* | 0.001 | *0.024* | 0.024 | *0.019* |
| Bachelor | -0.020*** | *0.004* | -0.034*** | *0.006* | -0.012* | *0.006* |
| Grade 91-100 | 0.000 | *0.006* | 0.006 | *0.010* | 0.002 | *0.007* |
| Grade 101-105 | 0.007 | *0.006* | 0.012 | *0.010* | 0.010 | *0.009* |
| Grade 106-110 | 0.010 | *0.007* | 0.020* | *0.010* | 0.006 | *0.009* |
| Grade 110 with honours | 0.026*** | *0.007* | 0.038*** | *0.011* | 0.020** | *0.009* |
| Period abroad | 0.024*** | *0.006* | 0.023** | *0.009* | 0.026*** | *0.009* |
| Late degree (c) | -0.038*** | *0.004* | -0.027*** | *0.005* | -0.044*** | *0.005* |
| Other degrees | -0.004 | *0.004* | 0.000 | *0.006* | -0.006 | *0.006* |
| Other training | -0.007** | *0.003* | -0.007* | *0.004* | -0.007 | *0.005* |
| 23-24 y.o. when graduated | 0.001 | *0.006* | 0.002 | *0.007* | 0.004 | *0.009* |
| 25-29 y.o. when graduated | 0.014** | *0.006* | 0.013 | *0.008* | 0.018* | *0.010* |
| > 30 y.o. when graduated | 0.075*** | *0.008* | 0.082*** | *0.010* | 0.069*** | *0.012* |
| Work during uni - Occasionally | -0.009** | *0.004* | -0.011** | *0.005* | -0.006 | *0.006* |
| Work during uni - Continuous | 0.033*** | *0.005* | 0.018** | *0.007* | 0.046*** | *0.007* |
| High school grade | 0.001*** | *0.000* | 0.000** | *0.000* | 0.001*** | *0.000* |
| *High school track* | | | | | | |
| Academic-classical | -0.004 | *0.006* | 0.005 | *0.007* | -0.018* | *0.010* |
| Linguistic | -0.010 | *0.008* | -0.009 | *0.009* | -0.013 | *0.025* |
| Social sciences-arts | -0.007 | *0.006* | 0.001 | *0.007* | -0.045*** | *0.015* |
| Technical | -0.005 | *0.004* | -0.008 | *0.006* | -0.002 | *0.005* |
| Vocational/professional | -0.019*** | *0.007* | -0.023** | *0.010* | -0.011 | *0.011* |
| *Region* | | | | | | |
| Lombardy | 0.024*** | *0.006* | 0.018** | *0.008* | 0.031*** | *0.008* |
| North-East | 0.004 | *0.006* | 0.003 | *0.008* | 0.005 | *0.008* |
| Centre | -0.028*** | *0.006* | -0.038*** | *0.008* | -0.019** | *0.008* |
| South | -0.059*** | *0.006* | -0.082*** | *0.008* | -0.037*** | *0.009* |
| Constant | 2.245*** | *0.022* | 2.177*** | *0.035* | 2.211*** | *0.031* |

* p<0.1; ** p<0.05; *** p<0.01.

Notes: controlling also for all the variables included in specification VI (column (f) of Table 6): demographic controls, individual background, SES background, and job-related variables.

Reference categories: male (in the pooled sample), Math-Sciences field of study, master degree, grade 60-90, 21-22 years old when graduated, did not work during university, academic-scientific high school track, living in North-West.

Table A4 - Robustness checks: OLS regression and O-B decomposition on subpopulations, 2011

| | Only bachelor students | | Only master students | | Students max 29 y.o. | |
|---|---|---|---|---|---|---|
| | OLS | O-B | OLS | O-B | OLS | O-B |
| Female | -0.065*** | | -0.063*** | | -0.065*** | |
| | (0.005) | | (0.005) | | (0.004) | |
| Men | | 2.203*** | | 2.236*** | | 2.175*** |
| | | (0.004) | | (0.004) | | (0.003) |
| Women | | 2.141*** | | 2.187*** | | 2.130*** |
| | | (0.003) | | (0.004) | | (0.003) |
| Gap | | 0.062*** | | 0.048*** | | 0.045*** |
| | | (0.005) | | (0.005) | | (0.004) |
| Explained | | 0.012** | | -0.008* | | -0.013*** |
| | | (0.005) | | (0.005) | | (0.004) |
| Unexplained | | 0.050*** | | 0.056*** | | 0.058*** |
| | | (0.006) | | (0.006) | | (0.005) |
| $R^2$ | 0.29 | | 0.29 | | 0.24 | |
| Obs. | 15,430 | | 16,117 | | 24,590 | |
| Obs. men | | 7,411 | | 7,999 | | 11,518 |
| Obs. women | | 8,019 | | 8,118 | | 13,072 |

* $p$<0.1; ** $p$<0.05; *** $p$<0.01
Notes: controlling for demographic controls, individual background, SES background, job-related variables, sector of employment, academic variables and field of study.

Table A5 - Institutional and macro variables, by region, 2011

| Region | % empl. graduated men | % empl. graduated women | Childcare coverage | Part-time diff. | Elderly ass. | Informal economy | Public empl. |
|---|---|---|---|---|---|---|---|
| | (a) | (b) | (c) | (e) | (d) | (f) | (g) |
| Piedmont-Aosta V. | 0.80 | 0.78 | 15.51 | 22.23 | 1.96 | 12.33 | 52.11 |
| Lombardy | 0.82 | 0.77 | 18.11 | 24.50 | 4.13 | 7.34 | 42.31 |
| Trentino-South T. | 0.81 | 0.80 | 17.46 | 31.73 | 2.09 | 7.46 | 77.19 |
| Veneto | 0.79 | 0.74 | 13.35 | 27.20 | 5.41 | 9.05 | 46.87 |
| Friuli V.G. | 0.73 | 0.72 | 21.13 | 24.54 | 6.03 | 11.75 | 69.84 |
| Liguria | 0.75 | 0.77 | 17.65 | 27.21 | 3.80 | 12.59 | 63.20 |
| Emilia R. | 0.79 | 0.75 | 27.25 | 21.82 | 10.63 | 8.66 | 52.32 |
| Tuscany | 0.71 | 0.68 | 20.84 | 23.52 | 2.37 | 9.45 | 56.92 |
| Marches | 0.76 | 0.72 | 17.25 | 22.01 | 3.43 | 10.37 | 53.62 |
| Umbria | 0.72 | 0.67 | 23.76 | 25.61 | 7.25 | 12.31 | 55.75 |
| Lazio | 0.75 | 0.66 | 17.28 | 22.71 | 4.86 | 10.08 | 73.41 |
| Abruzzo Molise | 0.69 | 0.61 | 10.14 | 23.39 | 4.48 | 16.04 | 57.21 |
| Campania | 0.63 | 0.50 | 2.93 | 16.91 | 2.42 | 15.93 | 52.31 |
| Apulia Basilicata | 0.69 | 0.57 | 4.98 | 20.75 | 2.47 | 25.36 | 53.59 |
| Calabria | 0.63 | 0.51 | 2.51 | 17.94 | 2.91 | 26.30 | 59.60 |
| Sicily | 0.64 | 0.52 | 5.55 | 21.73 | 2.13 | 18.80 | 58.51 |
| Sardinia | 0.68 | 0.57 | 13.06 | 26.75 | 3.80 | 21.15 | 66.76 |

Source: ISTAT 2011, several sources (see Table A8), own elaborations.

Table A6 - Attitudes toward gender equality and family roles, by region, 2008

| | Agree or strongly agree with: | | | | | | Disagree with: |
|---|---|---|---|---|---|---|---|
| Region | Working mother warm relationship with child | Pre-school child suffers if mother works | Women really want home and children | Housewife fulfilling as paid job | Father suited to look after children as mother | Men same responsibility for home and children | Men more right to a job when scarce[a] |
| Piedmont-Aosta V. | 0.79 | 0.70 | 0.55 | 0.40 | 0.67 | 0.93 | 0.59 |
| Lombardy | 0.81 | 0.63 | 0.56 | 0.45 | 0.74 | 0.93 | 0.71 |
| Trentino-South T. | 0.72 | 0.48 | 0.68 | 0.44 | 0.76 | 1.00 | 0.48 |
| Veneto | 0.58 | 0.78 | 0.57 | 0.42 | 0.74 | 0.95 | 0.73 |
| Friuli V.G. | 0.64 | 0.58 | 0.52 | 0.52 | 0.79 | 0.94 | 0.67 |
| Liguria | 0.59 | 0.76 | 0.51 | 0.51 | 0.71 | 0.88 | 0.76 |
| Emilia R. | 0.69 | 0.65 | 0.50 | 0.37 | 0.73 | 0.88 | 0.79 |
| Tuscany | 0.76 | 0.51 | 0.48 | 0.42 | 0.73 | 0.89 | 0.66 |
| Marches | 0.65 | 0.65 | 0.65 | 0.39 | 0.63 | 0.90 | 0.61 |
| Umbria | 0.60 | 0.80 | 0.60 | 0.43 | 0.57 | 0.83 | 0.73 |
| Lazio | 0.63 | 0.66 | 0.49 | 0.45 | 0.68 | 0.81 | 0.66 |
| Abruzzo Molise | 0.55 | 0.69 | 0.58 | 0.52 | 0.49 | 0.77 | 0.45 |
| Campania | 0.58 | 0.83 | 0.65 | 0.41 | 0.55 | 0.84 | 0.58 |
| Apulia Basilicata | 0.54 | 0.82 | 0.67 | 0.49 | 0.78 | 0.85 | 0.63 |
| Calabria | 0.48 | 0.86 | 0.71 | 0.52 | 0.52 | 0.71 | 0.52 |
| Sicily | 0.57 | 0.78 | 0.68 | 0.44 | 0.54 | 0.81 | 0.53 |
| Sardinia | 0.65 | 0.65 | 0.46 | 0.69 | 0.56 | 0.92 | 0.63 |

Source: European Values Survey 2008, own elaborations.
Notes: [a] The alternative group includes both people who agree and those who opt for "neither".

Table A7 Oaxaca-blinder decomposition by region, 2011

| | Piedmont Aosta V. | Lombardy | Trentino-South T. | Veneto | Friuli-V. G. | Liguria | Emilia R. | Tuscany | Marches |
|---|---|---|---|---|---|---|---|---|---|
| Men | 2.244*** | 2.239*** | 2.315*** | 2.187*** | 2.214*** | 2.209*** | 2.200*** | 2.223*** | 2.158*** |
| | (0.010) | (0.005) | (0.019) | (0.009) | (0.017) | (0.016) | (0.008) | (0.010) | (0.014) |
| Women | 2.206*** | 2.191*** | 2.379*** | 2.147*** | 2.157*** | 2.177*** | 2.181*** | 2.181*** | 2.121*** |
| | (0.009) | (0.005) | (0.017) | (0.008) | (0.015) | (0.014) | (0.007) | (0.009) | (0.013) |
| Gap | 0.038*** | 0.049*** | -0.064** | 0.040*** | 0.057** | 0.032 | 0.019* | 0.043*** | 0.037** |
| | (0.013) | (0.007) | (0.025) | (0.012) | (0.023) | (0.022) | (0.011) | (0.013) | (0.019) |
| Expl. | -0.014 | -0.004 | -0.055 | -0.008 | -0.040 | -0.017 | -0.019* | 0.013 | 0.005 |
| | (0.013) | (0.007) | (0.034) | (0.011) | (0.025) | (0.022) | (0.011) | (0.014) | (0.021) |
| Unexpl. | 0.051*** | 0.053*** | -0.009 | 0.049*** | 0.097*** | 0.048** | 0.038*** | 0.030* | 0.032 |
| | (0.017) | (0.009) | (0.038) | (0.014) | (0.028) | (0.024) | (0.013) | (0.016) | (0.024) |
| N men | 985 | 3,214 | 336 | 1,223 | 354 | 399 | 1,321 | 950 | 532 |
| N women | 1,209 | 3,310 | 406 | 1,314 | 404 | 453 | 1,518 | 1,058 | 614 |

| | Umbria | Lazio | Abruzzo Molise | Campania | Apulia Basilicata | Calabria | Sicily | Sardinia |
|---|---|---|---|---|---|---|---|---|
| Men | 2.152*** | 2.245*** | 2.170*** | 2.220*** | 2.201*** | 2.196*** | 2.238*** | 2.179*** |
| | (0.023) | (0.007) | (0.019) | (0.012) | (0.011) | (0.019) | (0.013) | (0.016) |
| Women | 2.135*** | 2.152*** | 2.100*** | 2.119*** | 2.114*** | 2.077*** | 2.138*** | 2.116*** |
| | (0.020) | (0.007) | (0.016) | (0.012) | (0.012) | (0.017) | (0.014) | (0.014) |
| Gap | 0.017 | 0.093*** | 0.070*** | 0.102*** | 0.087*** | 0.119*** | 0.100*** | 0.063*** |
| | (0.030) | (0.010) | (0.025) | (0.017) | (0.017) | (0.026) | (0.019) | (0.022) |
| Expl. | 0.039 | 0.015 | 0.019 | 0.028 | 0.006 | 0.002 | 0.004 | 0.015 |
| | (0.044) | (0.010) | (0.030) | (0.020) | (0.018) | (0.026) | (0.017) | (0.022) |
| Unexpl. | -0.022 | 0.078*** | 0.051 | 0.074*** | 0.081*** | 0.116*** | 0.096*** | 0.048* |
| | (0.044) | (0.013) | (0.033) | (0.023) | (0.020) | (0.031) | (0.021) | (0.025) |
| N men | 224 | 1,955 | 398 | 974 | 871 | 393 | 832 | 449 |
| N women | 271 | 1,810 | 477 | 876 | 804 | 422 | 683 | 508 |

* *p*<0.1; ** *p*<0.05; *** *p*<0.01. Robust s.e. in parenthesis.
Notes: controlling for demographic controls, individual background, SES background, job-related variables, sector of employment, academic variables, and field of study.
In order to aggregate data for small regions, population weights have been used.

Table A8 - Regional variables and social norms: definition and sources

| Variable | Definition | Source | Year |
|---|---|---|---|
| % empl. graduated men | Percentage of employed graduated men in the full sample. | Istat, University graduates' vocational integration (own elaborations) | 2011 |
| % empl. graduated women | Percentage of employed graduated women in the full sample. | Istat, University graduates' vocational integration (own elaborations) | 2011 |
| Childcare coverage | Percentage of children 0-3 who have used formal childcare on the total number of children aged 0-3. | | 2011 |
| Elderly formal home-based assistance | Percentage of elderly people (aged 65 and more) who use formal home-based assistance (*assistenza domiciliare integrata, ADI*) – provided by the Italian National Health Service and local municipalities – on the total number of elderly (65+) people. | Istat, Regional indicators for development policies (*Indicatori territoriali per le politiche di sviluppo*) available at http://www.istat.it/it/archivio/16777 | 2011 |
| Informal employment | Percentage of irregular worker units on the total number of worker units. | | 2011 |
| Part-time difference | Difference between female and male part-time employment rate (age 15+). Part-time employment rates is calculated as the percentage of people aged 15 y.o. or more working part-time on the total number of employed people, separately for men and women. | Istat, dati.istat.it (original source: Labour Force Survey) | 2011 |
| Public employment | Public sector employees per 1000 inhabitants | *Public sector employees*: MEF, Ragioneria generale dello stato, Conto Annuale (http://www.contoannuale.tesoro.it/) *Population*: Istat, dati.istat.it | 2011 |
| Attitudes toward gender equality and family roles | | | |
| Working mother warm relationship w child | A working mother can establish just as warm and secure a relationship with her children as a mother who does not work | | |
| Pre-school child suffers of mum works | A pre-school child is likely to suffer if his or her mother works | | |
| Women really want home and children | A job is alright but what most women really want is a home and children | | |
| Housewife fulfilling as paid job | Being a housewife is just as fulfilling as working for pay | European Values Survey | 2008 |
| Father suited to look after children as mum | In general, fathers are as well suited to look after their children as mothers | | |
| Men same responsibility for home, children | Men should take as much responsibility as women for the home and children | | |
| Men more right to a job if scarce (disagree) | When jobs are scarce, men have more right to a job than women | | |

Notes: in order to aggregate data for small regions, population weights have been used.