Subject of degree and the gender wage gap: Evidence from Italy

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Abstract

This paper investigates the extent to which differences in the subject of degree studied by men and women contribute to the gender pay gap in Italy.

Using micro-data from the "Survey of Household Income and Wealth" collected by Bank of Italy (1995-2006), we studied the evolution of the gender pay gap before and after 2000.

We show that also in Italy like in other countries women are over-represented in Humanities while men in Engineering. We show that the gender wage gap has widened after 2000, especially in the private sector.

Using Oaxaca decomposition (1973), we show that controlling for the type of degree accounts for about 42% of the "unexplained" component, and that represents about *tot* of the total pay gap. This effect is greater in the private than in the public sector.

JEL Classification: J16, J24, J31, J71
Key Words: Gender wage gap, degree subject, self selection, university, Italy

Introduction

A significant amount of research in labour economics has been devoted to understanding the existence of a wage gap between men and women (see Altonji and Blank, 1999 and Blau and Kahn, 2003 among others).

Gender pay gap is a common phenomenon in almost all Western countries and in many developing countries. According to EU[1] Statistics, in 2006, the mean of gender pay gap in Europe was equal to 15%[2]. Italy presents a lower raw wage gender gap equal to 9%, but persistent over time.

The problem of the position of women in the labour market is a concern for the European Commission which gives guidelines to reach equal opportunity between men and women in all European countries: eliminating gender stereotypes, favouring equal participation to political decision process among genders and moreover closing gender pay gap[3].

The most used analysis of gender wage gap refers to human capital theory (Becker, 1964; Mincer, 1974), and adopts the decomposition method suggested by Blinder (1973) and Oaxaca (1973) to distinguish the part explained by differences in characteristics form, the part due to gender rewards to these characteristics. But the large part of gender wage gap still remains unexplained.

Even though studies of gender wage gap generally include some measure of the *quantity* of education, they often do not control for the *type* of schooling. However, the type of education may be important in explaining the gender-based gap.

First, in Italy and in many Western countries, there are heterogeneous returns among different degrees in the labour market. Research on Italian graduate cohorts shows that "quantitative" university majors (especially Engineering and Hard Science) give better returns than "qualitative" ones in terms of a higher wage premium, a higher likelihood

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[1] EU 27, adjusted pay gap calculated as difference between men's and women's average gross hourly earnings as a percentage of men's average gross hourly earnings.

[2] It is measured among workers who are from 15 to 65 years old, see "Report on Equality between Women and Men 2008".

[3] Cfr Directive 2006/54 of The European Parliament and of The Council on the implementation of the principle of equal opportunities and equal treatment of men and women in terms of employment and occupation.

of employment, a lower likelihood of obtaining low status jobs and a lower waiting time to the first job[4].

Second, men and women choose differently among majors. There is a behaviour which is consistent across countries: men are over-represented in Technical subjects, while women are over-represented in Social Science, Education, Humanities and Arts[5]. Moreover, some researcher emphasize that the type of university degree matters for explaining gender wage gap (see the next section) and they find that including subjects of degree explains from 10 to 30 percent of overall gender wage gap[6].

There is also some evidence that type of degree can contribute to explaining a sizeable portion of gender gaps in both unemployment and low status job (see Reimer and Sheinmetz, 2009).

These facts lead us to believe that also in Italy there is a link between gender wage gap and the field of university degree. Hence, the current paper aims to evaluate how much the type of subject degree accounts for the gender wage gap in Italy.

We consider also the evolution of the gender wage gap from 1995 to 2006, by separating two periods, the one before and the one after 2000[7]. Between 1995 and 2004, the educational wage premium decreased (see Naticchioni et al. 2007), but because the distribution of subject is different among men and women, the effect might have been different among genders.

We also distinguish between the public and the private sector, There is in fact some evidence that gender wage gap is different across sectors (see section 2.3). Besides the public sector was subject to some reforms concerning wage bargaining until 1998.

For our analysis, we use data from the Survey of Households Income and Wealth (SHIW, hereafter) collected by the Bank of Italy from 1995 to 2006.

Our estimates show that also in Italy the mean gender wage gap among graduates has widened after 2000, especially in the private sector. The type of degree subject increase

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[4] See paragraph 2.2.
[5] See chapter 2 for Italy, Charles and Brodley (2002), Charles (2002), Jacobs (1995).
[6] See among others Machin and Puhani, (2003); Napari, (2006).
[7] After 2000, the Bank of Italy collected information also on the type of contract (permanent or temporary). After 2000 there is a large spread of temporary contracts, especially among women and youths, thanks to "pacchetto Treu".

about 35% the explained component with respect the Blinder Oaxaca decomposition that does not include subjects.

The inclusion of subject of degree change the percentage of explained component in the Blinder- Oaxaca decomposition on the private sector more than in the public one.

We find similar results also using a Juhn-Murphy-Pierce decomposition to evaluate the wage gap at different points in the distribution.

Our chapter, although descriptive in nature, is important because, to the best of our knowledge, it is the first attempt to measure and to understand the wage gender gap for graduates for Italy. At the same time this is the first attempt to measure it along the whole age distribution and not only three years after graduating, when working careers has just began.

The paper is organized as follows. Section 1 reports a brief survey of the existing literature. Section 2 describes the data set, the sample used in our estimation and some descriptive statistics. Section 3 outlines the econometric model and the empirical results are discussed in section 4. Section 5 concludes.

1 The Literature

It is a well known empirical fact that women present worse labour market outcomes than men: women are paid less, they have a higher likelihood of being unemployed, they are more likely to obtain both temporary and part-time contracts[8].

Many studies have attempted to explain the gender gap in wages and to identify how much of this difference is due to discrimination, or unobserved factors, or differences in tastes and how much is due to different characteristics across genders.

The more recent debate on gender wage gap is direct to understanding "the black-box" of the discrimination part of the gap and the reasons why the discrimination is larger at the top of the distribution, which include sociological and psychological explanations (Booth, 2008).

[8] Often both part-time and temporary contracts are characterized by worse condition in terms of wage penalty and higher turnover (Cfr Pissarides et al. , 2004).

In the next sections, we first briefly reports an overview of the theories on the gender wage gap, then we present some empirical evidence on gender wage gap in Italy and third we show the literature on the reduction of gender pay gap when the type of university subject is accounted for.

1.1 The Theories on the gender wage gap

The human capital theory (Becker, 1967) is used to identify the explained part of the wage gap, while others are proposed to explain the "discrimination" part.

The human capital theory links potential earnings differentials between genders to the time spent in the labour market during the expected working life; women should have a comparative advantage to work at home so, for biologically or sociologically (also stereotyping) reasons, women participate less in the labour market and they have less incentives to invest in human capital than men. Hence different returns on human capital for men and for women derive from sexual division of labour between them.

Polacheck (2004) shows that in the last twenty years lifetime work expectations have become more similar for men and women. These facts contribute to explaining the reduction of wage gap since '80s.

In order to explain the differences on wages by field of university degree and the impact on gender wage gap, Polachek (1981) argues that each individual chooses both the amount and the type of human capitals. Different kinds of human capital are characterized by different losses in potential earnings due to disuse periods. Because of the fact that women and men differ in their career interruptions, women invest in different types of human capital.

Blakemore and Low (1984) apply the human capital theory to the choice of college major. They define the atrophy concept as the obsolescence rate. For example, Science has a higher rate of atrophy than History, so for women, who interrupt more their labour market experiences, is rational to choose majors in which the obsolescence rate is low and low penalties are associated with interruptions of careers.

The "taste based" theory of discrimination (Becker, 1957) assumes that men may receive preferential treatment because employers prefer men to women or male workers dislike to work with women. In those cases, the utility of the employer is rising in profits and is decreasing in the proportion of women in the labour force. Women are employed only if the expected disutility can be compensated by increasing profits. Both scenarios are inefficient, they are based on misallocation of resources and cannot survive in the long period unless the employer has monopoly power or taste of discrimination is common to all employers.

The theory of statistical discrimination assumes that in presence of incomplete and imperfect information, there are no indicators on the individual worker's productivity or it may be too costly for employers to obtain information on the exact productivity, so a profit maximizing employer would have a preference for hiring men, if they expect that men are on average more productive or they may require higher credentials for females (Arrow, 1972; Phelps 1972, Aiger and Cain, 1977).

Arrow (1972) highlights that the phenomenon can survive in the long run, if employers believe that women are less productive, allocate them in bad jobs with higher turnover and at the end women expect these behaviours, have less incentive to invest in human capital, and turn out to be less productive in the labour market (Coute and Loury, 1993). In this case, there exists a vicious circle in which women believing to be discriminated decide to invest less in human capital or in a different type of human capital.

The theory on discrimination is often linked with occupational segregation[9:] women crowd out some sectors, this generates an excess of supply and hence a fall in wages. Gender becomes a signal to divide and allocate workers in two separate sectors. Women and men are "not competing group" of workers and women do not reach male "primary" sectors because of discrimination or existing barriers, they are relegated to secondary sector.

In a similar way, dual labour market theories assume that labour market is segmented into the formal sector characterised by good jobs in terms of working condition, pay, security and the informal sector with low pay and worse conditions. Women in the

[9] Women are segregated in few occupations and sectors in many industrialized countries.

formal sector are underrepresented in the private sector and over represented in the public one, in the informal sector women are over-represented in low pay and low skilled occupations.

1.2 The gender wage gap in Italy

The value of gender wage gap in Italy is different according to the type of data considered, and the measure of earnings and the estimation techniques adopted. Anyway, the gender wage gap is a persistent phenomenon and the greater part of this differential (about 70%-84%) is due to differences in returns between men and women[10].

The recent literature underlines the importance to evaluate the wage differential not only at the median, but across the whole distribution. Arulampalam et al. (2007), using ECHP[11] from 1994 to 2001, study the gender pay gap across the wage distribution by sectors for eleven European countries and find that the mean gender pay gap hides large variations in the gap across the wages distribution for ten of the eleven countries. They find that gender pay gaps are bigger at the top of the distribution ("glass ceiling" effect[12)] and in some countries the wage gap is also wider at the bottom end ("sticky floors" effect[13)] and these are due to different returns. In particular for Italy, they underline that the gender pay gap is highest at the 90th percentile compared to other parts of the distribution in the public sector, while in the private one there is evidence of both "glass ceiling" and "sticky floor" effects.

Favaro and Magrini (2005), using administrative data on a sample of 15-29 years old workers in the private sector, show a different size of gender wage gap across individual educational levels.

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[10] Cfr "ISFOL Report" (2008), Flabbi (1997).
[11] European Community Household Panel.
[12] When the gender pay gap increases across the wages distribution and accelerates in the upper tail is commonly labelled "glass ceiling effect".
[13] When the gender pay gap widens at the bottom of the wage distribution is called « sticky floor ».

Addabbo e Favaro (2006), using 2001 ECHP data, evaluate the gender wage gap across the whole distribution of wages for Italy distinguishing for low-educated and highly educated[14] workers.

Male workers show an advantage at all points of the distributions independently of educational attainments.

They point out that the gap due to differences in the returns to characteristics is higher in the low-educated female group than in the highly-educated sample, at any decile but the last. At the 90th centile of the two distributions, the more educated women show the higher proportion of the wage gap due to different returns. The gap for highly educated women initially decreases (from 0.10 to 0.07) and sharply increases (up to 0.17) across the highest deciles of the distribution. This effect is consistent with a "glass ceiling" effect connected to the observed lower access of women to apical positions and to the lower rewards for women in these positions.

The set of rules governing terms and conditions of employment and pay are quite different across sectors, although in Italy some changes were introduced in the public sectors from 1993 and 1998 in order to increase the competitiveness also in the public sector.

Some researches highlight that the public sector pays more on average especially for women, also when quantile estimation is used. There exists a public premium declining across the distribution and that remains higher for females (cfr Lucifora and Meurs, 2006).

Comi and Ghinetti (2002) underline that returns on educational attainments are different between the two sectors: the public wage premium is higher (twice) for females with higher levels of education and larger for men with lower levels of education. Empirical evidence confirms that the public sector reduces pay differences by gender and compresses pay dispersion with respect to the private sector.

It is interesting to note that the procedure of recruitment and career advancements in the public sector is regulated by strict rules, a fact that should guarantee absence of discrimination. However, although gender wage gap in this sector is lower than in the private one, a gap still exists and persists.

[14] They consider highly educated those individuals who have almost secondary high school.

One relevant reform in the Italian labour market is due to the attempt to introduce flexibility with temporary contracts, starting with Law No. 196/1997 (also called "Law Treu") and then with Legislative Decree No. 368/2001.

Picchio (2006) in line with the overall European evidence find a wage penalty for Italian temporary workers using SHIW data[15]. On average temporary contracts are used more often for women, younger and low-skilled workers.

There is a wage penalty between permanent and temporary workers but it seems that among women temporary workers are slightly more disadvantaged with respect permanent than among man.

This behaviour suggests us to include robustness checks of our results by also including a dummy for temporary contracts in the post-2000 period[16].

Our empirical analysis show that in Italy there exists a low raw gender wage gap that hides variations across highly and lower educated people and also that the wage distributions between public and private sectors are different.

1.3 The return on subject degree and the gender wage gap

The great part of research on Italy is focused on the rate of return to years of education without taking into account the type of studies.

These studies estimate an average rate of return on years of education equal to about 6%[17] which is higher for females by almost 1% (cfr Bradolini and Cipollone, 2002; Ciccone et al, 2006; Mendolicchio, 2006).

Only one paper, to our knowledge, calculates the rate of return on education considering also the type of education both at secondary and tertiary levels18. Naticchioni et al. (2007) are interested on the evolution of the wage premium between

[15] He use the 2002 wave.

[16] The information on the type of contracts is collected in this Survey from 2000, but the last relevant reform on temporary contracts was made in 2001.

[17] The rate of return on education changes between 6% to 10%, depending on data considered.

[18] At secondary level, they distinguish "liceo" (general upper secondary schools) and vocational upper secondary schools, including technical and professional schools, also three years upper secondary schools. At tertiary level, they distinguish Humanities subjects including Humanities, Social Science and Sociology; Professional subjects, including Law, Economics, Accounting and Architecture; Scientific subjects including Physics, Mathematics, Medicine and Engineering.

1993 and 2004 along the wage distribution and, using SHIW data, show that wage premium declined from 1993 to 2004. For example the decline for university degree with respect to no formal education was equal to 39.4% at the 10th percentile and 17.8% at the 90th percentile.

Their results highlight that graduates in Humanities and Professional are associated to falling educational wage premia. Graduates in Humanities majors loose more than graduates in Professionals majors. We can also note that graduates in Scientific subjects perform better than other subjects both in 1995[19] and in 2004. They run a regression for all employees in the private sector, without separating women and men.

There is also considerable research on performances of field of university degree in labour market for individuals at three years from degree[20]. Generally these studies estimate separate regression for males and females, but do not focus directly on differences between genders. As we underline above quantitative subjects give better performance in labour market.

But women are over-represented in Humanities, so it may be possible that the effect of the falling wage premium are not equally distributed by sex and women are affected more from this phenomenon. If returns to university differ by major, then changes in the relative male-female skills could lead to changes in the gender wage differentials for university graduates.

It is clear that there are wage differences by subjects of degree and also in the choice made by women and men about field of study. Both these facts give good reasons to believe that there are some links between the subject of study and gender wage gap.

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[19] The information on the type of educational attainment is collected from 1995.

[20] Among others, using GES data, Boero et al. (2004), Ballarino and Bratti (2006), Di Pietro and Cutillo (2006), Buonanno e Pozzoli (2008).
Di Pietro and Cutillo (2006) find that men and women graduates in Engineering have higher likelihood of being employed about 6% and 5% than graduates in Economics. Engineering gives a wage premium with respect to Economics of around 8% for women, also controlling for selection problems and industry, sector, region, part-time age, familiar background,. Buonanno and Pozzoli (2008) using different econometric models find an advantage for graduates in Engineering around 6% for women and 7% for men with respect to Humanities. At the same time, men (women) graduated in Engineering present an employment rate that is 27% (18%) higher relative to Humanities, and the time to get the first job for men graduates in Engineering is lower 26% relative to Humanities, for a women is about 18%.
Ballarino and Bratti (2006) evaluate (together for man and women) the probability of getting a stable job that is for Technical fields higher by about 21% than Humanities and the probability of being in an unstable job is 11% lower than for Humanities.

In the literature on gender wage differentials, the subject of university degree has no received great attention until last ten years in Europe, maybe because of the lack of data, while in the US, this kind of studies are more spread.

The US studies find a sizeable contribution of major in 1970s\1980s, more recently also some European studies find similar evidence.

Daymont and Andrisani (1984) using the National Longitudinal Studies of the High School Class of 1972 (NLS72) find that differences in college majors account for 43 percent of the earnings gap when the male coefficients were used as a benchmark and 28 percent when the female ones are used. The difference in majors account for one-third to two-third of the total gap in hourly earnings about three years after college graduation.

Brown and Corcoran (1997) using the Survey of Income and Program Participation (SIPP) and the National Longitudinal Studies of the High School Class of 1972 (NLS72) to estimate which high school courses and college majors are related to wages for prime age adults. Their results show that differences in majors have large effects on earnings.

On SIPP they find for college graduates that demographic characteristics, years of schooling and work experience explain about half of sex based wage gap. College majors account for about 20 percent after controlling for demographic characteristics and work experience. Controlling for employer's variables and the percentage of females in occupation reduces this effect to 12 percent.

On NLS72, they use differently from Daymont and Adrisani (1984) the earnings ten years after college graduation (1986 wages). About one third of the effect of college major on wage gap occurs because college major and highest degree affect industries and occupations in which men and women work.

For college graduates, after controlling for demographic and work experience variables, there is a remaining log wage gap of 0.18-0.20 in their sample, college majors account for 0.08-0.09 of this 0.20. Job characteristics reduces the effect of degree majors, which remains significant.

Gerhart (1990) using data on employee in 1976 and 1986 find results similar to Andrisani and Daymont (1984). In the college graduates sample, the addition of college major reduced the salary advantage of men by almost one-half.

Eide (1994), using NLS72 and High School and Beyond (HSB), find that convergence in the distribution of major among genders (the move of females away from traditionally female majors towards traditionally male ones) contributed to a decline in the gender wage gap during the 1980s in the US.

Black et al. (2008) use a matching technique to evaluate the role of major on gender wages gap; their compare men and women who are similar in pre labour market skills and individual characteristics and they find that the college major is important for subsequent earnings. The gender gap with the inclusion of the highest degree, age and major falls from 33 percent to 19 percent.

Weinberger (1999) using a 1985 Survey on college graduates find that women earn an unexplained 9 percent less than men with the same college major. The average female college graduate earns an additional 8 percent less than men because she is likely to choose a less technical college major. She concludes that policies aimed at increasing the participation of women to technical majors are effective at increasing the relative wages of female graduates.

Morgan (2008) tries to understand the linkages between gender differences in education and pay inequality by focusing on within field gender pay differentials. She underline that closing gap in majors may effectively contribute to reduce pay inequality among graduates only if the within field gender pay differentials are small. In fact, she finds that women's occupational disadvantage relative to men is determined primarily through the choice of major of study, not from a disproportionate presence of women in lower paying occupations at least for graduates at their early stages of career.

In the European context, Machin and Puhani (2003), using the UK and German Labour Forces Surveys of 1996, study how much subject of degree contributes to the gender wage differential. They use a standard Blinder-Oaxaca (1973) decomposition drawn from specifications with accounting and not accounting for subject of degree and they show that in both countries the subjects of degree explain about 2-4 percent higher wages of male over female graduates after controlling for age, industry, region, part-

time and public sector. This amounts to a significant part of the overall male\female gender wage between 8-20 percent.

Chevalier (2007) using a cohort of graduates in 1995 from 33 UK higher education institutions study the determinant of wage gender gap. He show that job values and life expectations are important components of the gender wage gap, accounting for 21 percent and 12 percent of the explained gap, while subject of study and job characteristics represent another 25 percent each, confirming the high relevance of the subject of study.

Napari (2006) using Finnish data on the manufacturing sector finds that gender differences in majors explain about 15 percent of the gender gap after controlling for age, year, gender, region, industry and firm size. He studied also the contribution of major to explaining gender differences distinguishing new entrants and more experienced workers, but irrespective of the stage of career the contribution of majors is remarkably large for a single (type of education) factors.

Pouliakas and Ilias (2008) using the Greek Labour Force Data from 2000 to 2004 find that gender differences in subjects of degree explain 22,5 percent of the female-male gap. They run also separate estimations for public and private sectors. The raw gender gap is higher (almost double) in the private than in the public sector and the contribution of degree majors is higher in the private (21%) than in public sectors (16%).

2 Data and descriptive statistics.

2.1 Data and sample selection

We use data from "Survey of Household Income and Wealth" (SHIW) collected by the Bank of Italy. The survey was conducted annually from 1977 to 1987 and biannually from 1989 to 2006. It collects information on household characteristics, occupational status, income, consumption, housing properties and financial assets and liabilities.

We use waves since 1995 to 2006, because information on university field of study is collected in this Survey since 1995. They contain information respectively on 8,165 households in 1995, 7,147 households in 1998, 8,001 households in 2000, 8,011 households in 2002, 8,012 households in 2004 and 7,768 households in 2006.

In Italy the percentage of graduates is still low with respect to European countries and in our data. They represent about 10% of whole sample, the last two waves the percentage is increasing by around 1% with respect to previous ones.

From OECD data, Italy presents a percentage of people between 25-64 with a degree equal to 13%, that is much lower than the average percentage in OECD (33%); the share of degree-holders is increasing in the younger cohorts and in 2006 the percentage of tertiary educated people is equal to 17% among 25-34 year old, 14% among 35-44 year old, 11% 45-54 year old and 9% among 55-64 year older. The percentage is higher for women than man, except for older cohorts.

We are interested in studying the gender gap among graduates, so we include in our sample only paid employees who have a degree, completed their study and who are aged between 24 and 65[21]. We exclude people working in both agricultural and international organisation sectors and self-employment. At the end we have 3717 observations, 52% females and 48% males.

Our samples reflect the educational trends, women have on average more a degree than men[22], but men have more years of work experience on average.

We split the sample in two parts in order to evaluate the evolution of gender wages gap for graduates before 2000 year and after 2000; The first sample (with 1995, 1998, 2000 waves) [23] has 1913 observations, 49,3% are males and 51,7% are females. The sample with waves from 2002 to 2006[24] is constituted of 1804 individuals, with 53,6% females and 46,4% males.

[21] The typical age of degree in Italy is 24-25 year, before the reform called 3+2, students enrolled at 19 year old and the legal duration of degree was 4 or 5 years. So the expected age of degree is 24-25. We consider only individuals with a "old" 4 years degree and new "specialistica".

[22] For individuals between 44-64 years old, women have a degree in similar percentage than men (about 9%).

[23] We called sample from 1995 to 2000 waves as pre-2000 sample.

[24] We called sample from 2002 to 2006 waves as post-2000 sample.

The pre-2000 sample has an over-representation of the public sector, that constituted 62,4% of the whole sample, in particular 72,1% of women are working in the public sectors against 52,4% of men. In the post-2000 sample, public and private sectors have similar size (51% public and 49% private), women working in public sector are always more represented (57,4% of total).

The survey collects information on the highest level of education achieved and the type of university major, distinguishing the subject of degree in ten categories: Physical, Mathematical and Natural Science, Chemistry, Biology and Pharmacy; Agriculture Science and Veterinary; Medicine; Engineering; Architecture and Planning; Economics and Statistics; Sociology and Political Science; Law; Humanities, Psychology, Languages studies, Education and Philosophy; and Others.

For our estimation we distinguish six broad subjects[25]: Hard Science; Medicine; Engineering and Architecture; Economics and Statistics; Political Science, Sociology and Law; Humanities. We drop from our sample the category of degree subject Others, because it includes many heterogeneous types of degree[26].

Earnings are calculated on total net earning divided by the number of working hours in a year, adjusted for the Index of Prices at Consumption[27]. We use the logarithm of hourly wages as dependent variable.

Coherently with previous literature on both wage gender gap and subject of degree, we use as explanatory variables: region of residence, industry, firm sizes, a dummy indicating public or private sectors, age and age squared (proxies for experience), a dummy for working part time, and field of study. We also include a dummy for permanent contract in the analysis on the post-2000 sample in order to make robustness check analysis. See appendix for descriptive statistics[28].

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[25] We use the same categories as in the chapter 2.

[26] A similar selection is made by Naticchioni et al., 2007.

[27] We use the "L'indice dei prezzi al consumo per l'intera collettività" calculated by ISTAT, including "tabacchi" on 1995 base. In this way we convert all wages in 1995 prices.
http://www.istat.it/prezzi/precon/aproposito/tavolasinottica2008.xls

[28] We are aware that our data are small in size, but these are the only data that contains information on wages for individuals who are between 24 and 65 years old and type of degree. GES data, often used for analysis on graduates contain wages at three years from graduation. Anyway the estimates present true expected signs and are quite precise.

One concern with assessing gender wage gap, especially for Southern European countries, is the sample selection bias.

The rate of participation in the labour market is lower for women than men, especially for women with children. The result is that the measured gender wage gap is lower than when selection on participation is accounted for. Moreover, the lower rate of participation of women in Italy can explain the lower value of gender pay gap compared with other European countries. Among others, Petrongolo and Olivetti (2008) show that the correction for employment selection of women explain around 45% of observed negative correlation between wage and employment gaps and in Italy, Greece, Spain and Portugal increase the gender wage gap up to comparable levels to the US.

But, it is a well known empirical fact that many differences arise among women with different levels of education; The rate of participation in the labour market increases with the level of education and for highly educated women the participation rate is similar to male's one[29]; generally, highly educated women show a higher attachment to the labour market, and a lower discouraging effect of the presence of young children than lower educated women (see Addabbo, 1999 and Bettio and Villa, 1999).

Bratti et al. (2005) find that the level of education raises the probability of being in the labour force after childbirth; Having a university degree as compared to having primary or no educational qualifications increase the probability of participating by about 28% at 12 months since birth.

Moreover, using 1998 waves of GES data, Di Pietro and Cutillo (2006) estimate separate wage premium equations for men and women, correcting for participation selection bias. Their results are similar with or without participation.

These fact allowed us to not worry too much about the participation selection bias for university educated women.

Men and women highly educated should be similar for participation rate and hours of work, we expect that they have identical productive characteristics and so they should

[29] The rate of participation between men and women with 25-34 years old differs less around 5%, the difference is increasing over age distribution, but less than women with low and medium level of education. Between 35 and 44 years, about 10%, between 45and 54 about 13% and higher for 55 and 64 about 28% (ISFOL, 2001).

receive the same rewards, when this does not happen, there is "post-entry" discrimination.

2.2 Descriptive statistics

The average wage has remained almost stable in the pre-2000 and post-2000 samples[30,] but when we look at wage separately for men and women we can note that male's wages increased, while female's ones slightly decreased and the differential increased. In fact, the gender gap in mean earnings went from 7% to 11% (See table 1).

	Wage			
	Male	**Female**	**All**	**Wf/Wm**
1995	**14.14**	**13.73**	**13.95**	**0.97**
1998	**13.76**	**12.65**	**13.16**	**0.92**
2000	**13.38**	**12.12**	**12.75**	**0.90**
1995-2000	**13.75**	**12.79**	**13.26**	**0.93**
2002	**14.41**	**12.40**	**13.31**	**0.86**
2004	**13.70**	**12.63**	**13.14**	**0.92**
2006	**14.30**	**12.76**	**13.47**	**0.89**
2002-2006	**14.14**	**12.60**	**13.31**	**0.89**

Table1: Net Hourly Average earnings by years and gender

Data present very marked gender differences in degree subjects: females are heavily represented in Humanities, while males are represented more in Engineering in both samples; while the percentage of men graduated in Engineering is stable in the two samples (around 25% against less than 6% of women), the percentage of women graduated in Humanities decreases from 57% to 44% (see Table 2)

[30] Since 1998 to 2006, real wages remain stable, the growth of wages is about 2,7% on average yearly but the inflation increases more (3,2%). "Rapporto IRES, 2007"

	Pre-2000			Post-2000		
Subject	**Male**	**Female**	**All**	**Male**	**Female**	**All**
Hard Science	**19.35**	**18.12**	**18.73**	**18.03**	**17.07**	**17.52**
Medicine	**8.82**	**4.11**	**6.44**	**9.84**	**5.75**	**7.65**
Engineering	**24.62**	**2.42**	**13.41**	**24.87**	**5.57**	**14.53**
Economics	**16.13**	**7.69**	**11.87**	**15.85**	**10.78**	**13.14**
Political Science, Law	**15.91**	**10.33**	**13.09**	**20.31**	**16.89**	**18.48**
Humanities, Languages	**15.16**	**57.32**	**36.46**	**11.09**	**43.94**	**28.68**
N. Observation	**943**	**970**	**1913**	**836**	**968**	**1804**

Table 2: Percentage of graduate by university subjects and gender in both sample

It seems that male graduates increases moreover in Political Science, Sociology and Law.

It is interesting to note that in the post-2000 sample, the percentage of females graduates is increasing in each university major due to the effect of younger cohorts of birth.

When we observe the hourly wages, we can see that there are large differences among subjects and among men and women in any subject.

Graduates in Medicine, men and women, obtain the highest hourly wages in both sectors in both samples, even though the private sector sample is really small. Medicine is also the subject with the highest differences between men and women (the ratio is 0.81 point).

Hard Science pays higher wages on average for men in both samples. In the pre-2000 waves men graduates in Humanities have higher wages, they perform better than graduates both in Engineering and in Economics, this fact can appear in contrast to the literature, but this may depend on the large share of public sector in our sample[31] (see Table 3).

[31] We stress that the public sector has higher wages.

	Pre-2000				Post-2000			
Subject	**Male**	**Female**	**All**	**W_f/W_m**	**Male**	**Female**	**All**	**W_f/W_m**
Hard Science	**14.21**	**12.25**	**13.25**	**0.86**	**14.75**	**12.84**	**13.78**	**0.87**
Medicine	**16.47**	**13.52**	**15.52**	**0.82**	**18.55**	**15.04**	**17.16**	**0.81**
Engineering	**13.15**	**13.53**	**13.18**	**1.02**	**13.21**	**10.94**	**12.77**	**0.83**
Economics	**12.75**	**11.03**	**12.19**	**0.86**	**13.57**	**11.06**	**12.51**	**0.81**
Political Science,	**13.13**	**10.85**	**12.22**	**0.83**	**13.35**	**10.31**	**11.90**	**0.77**
Humanities,	**14.28**	**13.46**	**13.63**	**0.94**	**13.23**	**13.39**	**13.35**	**1.01**

Table 3: Hourly Net Earnings by subject and by gender

When we look at females' wages, in the pre-2000 sample, quantitative subjects (Engineering, Economics and Hard Science) give a wage premium with respect to Political Science. Graduates in Humanities instead have a higher wage, but also in this case this may depend on the fact that women graduated in Humanities are primarily employed in the public sector.

In the post-2000 sample, besides Medicine, graduates in Hard Science, both men and women have higher hourly earnings. Male graduates in other fields seem to have similar hourly wage.

It is interesting to break down the data according to the sector (public-private) in which the respondents are employed. In Italy this is important because the literature shows that in the public sector the wage distribution tends to be more compressed.

In the pre-2000 sample, the public sector is around 62.7 percent, while in the post-2000 the public sector is 51 percent. Women are employed more in the public sector, in the pre-2000 sample 72.5 percent of women against the 52.7 percent of men working there, while in the post-2000 sample women working in the public sector are about 57 percent and men are only 43.5 percent.

It is important to keep in mind that comparisons of gross pay levels across public and private sectors give some problems. For example, some activities are typically spread in the public sector, the vast majority of doctors, nurses and teachers are employed in the public sectors.

Indeed, the public sector pays higher wages and the gender wage differentials is higher in the private than in the public sector. In the private sector the wage of women on average represents only 85% of men's one.

We can note that gender pay gap increases from the pre-2000 to the post-2000 sample in both sectors, women loose about 3 percent points (see Table 4)

	Public sector			Private sector		
	Male	**Female**	**All**	**Male**	**Female**	**All**
			Pre-2000			
% composition	**52.39**	**72.06**	**62.36**	**47.61**	**27.94**	**37.64**
Hourly Wage	**14.71**	**13.51**	**13.52**	**12.70**	**10.89**	**11.07**
W_f/W_m		**0.92**			**0.85**	
			Post-2000			
% composition	**39.43**	**60.57**	**50.89**	**53.50**	**46.50**	**49.11**
Hourly Wage	**15.85**	**14.18**	**14.84**	**12.82**	**10.47**	**11.73**
W_f/W_m		**0.89**			**0.82**	

Table 4: Share of private and public sectors and hourly net earning on average

When we look at wages by subject and sector, it is interesting to note that women are less discriminated. In Humanities, the public sector pays quite high wages, in the public sectors women seem more discriminated in "quantitative" subjects, while in the private sector Engineering and Hard science seem more neutral to genders (see Table 5).

	Public			Private		
	Post-2000					
	Male	Female	W_f/W_m	Male	Female	W_f/W_m
Hard Science	**17.74**	**14.69**	**0.83**	**12.44**	**10.80**	**0.87**
Medicine	**19.22**	**15.27**	**0.79**	**16.84**	**14.15**	**0.84**
Engineering	**14.09**	**10.87**	**0.77**	**12.79**	**10.99**	**0.86**
Economics	**14.99**	**13.56**	**0.90**	**13.11**	**10.03**	**0.76**
Political Science	**13.52**	**11.62**	**0.86**	**13.20**	**9.15**	**0.69**
Humanities	**15.39**	**14.66**	**0.95**	**9.81**	**10.68**	**1.09**

Table 5: Net hourly wages by subject and sectors

3 Methodological issues

According to Human Capital Theory earnings depend on the amount of time devoted to the accumulation of human capital stock that reflects individual potential productivity.

Economists define wage discrimination by comparing wages for equally productive workers, that is the different returns received by men and women to the same characteristics.

In fact, the raw gender wage gap can be decomposed into a part due to differences in characteristics (the means of variables entering in the earnings function) and a part due to the differences in the returns to characteristics (differences in coefficients estimated in the earnings equations).

Much debate exists on the specification of the earning equations, in particular on the choice of variables to include in the wage regression (Appleton et al., 1999). The specification should have only gender neutral variables in order to have unbiased estimation of gender differentials.

Some debate exists about the inclusion of occupations. In many industrialized countries strong occupational segregation is observed by genders, taking the distribution of sexes across occupations as exogenous may not consider an important dimension of discrimination (see Rosti, 2006).

Another problem is about the working experience. Generally proxies are used as individual's age or potential work experience (measured as age minus years of formal schooling minus the age of starting school). In fact it seems that these proxies are less correlated with women work experience because of more interruptions in their working life than men.

Studies on gender wage gap use the Standard Mincer Equation including age and schooling and augment it for any characteristic that can explain different wages:

$$\ln W_{ij} = \sum_j^J S_{ij}\alpha + X_i\beta + \varepsilon_i$$

where ln W_{ij} is the natural logarithm of hourly net earnings of individual i in the subject j, depends on subject j in which individual i is graduated S_j, a vector of personal and job characteristics which affect occupational earnings Xi and a random error term, ε_i. α represents the different earnings premia with respect to the subject chosen as the base category (Humanities in our estimation).

We estimate two separate earnings equations for men and women and then the mean observed gender differences in wages are decomposed in two components (Blinder-Oaxaca, 1973): one part refers to the differences in productivity characterristics and the other part refers to the returns to characteristics.

$$\ln\left(\overline{W_m}\right) - \ln\left(\overline{W_f}\right) = \left(\overline{X}_m - \overline{X}_f\right)\beta_m + \left(\beta_m - \beta_f\right)\overline{X_f} \qquad [1]$$

where lnW is the average log of wages for each gender group of the sample, X is the mean of characteristics of females and males, β denotes the estimated coefficients.

Referring to the first equation: the first term represents the so called "explained part" or "endowment effect", the differences in the average of characteristics, evaluated at male returns; while the second term is the "coefficient effect", the differences in the

return to men and women evaluated at the mean of women characteristics. This last component is called also "unexplained" part and it is the "discrimination" component.

In equation [1], male wage structure is used as the non discriminatory benchmark[32], so women receive the competitive wages, but it is also possible to use as a benchmark the female wage structure33, see equation [2], or a weighted wage structure.

$$\ln(\overline{W_m}) - \ln(\overline{W_f}) = (\overline{X}_m - \overline{X}_f)\beta_f + (\beta_m - \beta_f)\overline{X_m} \qquad [2]$$

In literature are proposed different weights to coefficients β_s: Reimers (1983) proposes to use an average coefficient over both groups[34,] while Cotton (1988) suggests to weight the coefficient by group size. Neumark (1988) propose to use as β the coefficient estimated from a pooled regression over both groups.

Oaxaca and Ramson (1994) propose a non-discriminatory wage structure that is obtained by estimated returns on the pooled sample of male and women, an equivalent to Newmark method:

$$\Omega = \left(X_m^{'} X_m + X_f^{'} X_f\right)^{-1}\left(X_m^{'} X_m\right)$$

Depending on which wage structure prevails, there will be a different estimate of the discrimination component.

Besides the total decomposition of wage differential into "explained" and "unexplained" parts, it is possible to evaluate the contribution of the single component, for example, experience. While identifying the contribution of a predictor for the "explained" part is easy, for the "unexplained" part this is not possible[35]. A related issue is that the decomposition for categorical variables depends on the choice

[32] We are assuming in this formulation of decomposition that there exist wage discrimination only directed against women, but there are no (positive) discrimination of men.

[33] We assume in the equation 2 that there is no discrimination of women, but only a positive discrimination of men.

[34] $\beta=0.5*\beta_f+0.5*\beta_m$.

[35] A solution to the problem is proposed by Gardeazabal and Ugidos (2004), the idea is to restrict the coefficient for the single categories to sum to zero, that is to express the effect as deviation from the mean.

of the omitted base category, in particular there are not problem for the "explained" component.

Another widespread decomposition used to evaluate the gender wage gap is the Juhn-Murpy-Pierce (1993).

This decomposition gives us the advantage to look at how the differences in characteristics affect the entire wage distribution

$$\ln W_i^M - \ln W_i^F = \hat{\beta}^M \left(X_i^M - X_i^F \right) + X_i^F \left(\hat{\beta}^M - \hat{\beta}^F \right) + \left(\hat{\varepsilon}_i^M - \hat{\varepsilon}_I^f \right)$$

where the first component represents the "quantity effect", the second component refers to "price effect", while the last term captures the effect of unmeasured prices and the differences in unmeasured characteristics.

4 Empirical results

Following the previous literature, we first estimate separate wage equations for men and women, then we calculate the Blinder-Oaxaca (1973) decomposition in order to evaluate the size of the two components, the "explained" and the "unexplained" parts.

We estimate three specifications, the first includes only age and age squared (as measure of potential experience), geographical area, dummies for different waves; in the second we augment equation with controls for sectors, firm sizes, part-time contracts and industries; in the third we include a dummy for occupation distinguishing white collars[36]from other qualifications.

For each of these specifications we run estimations without and with controls for the type of field, where Humanities is used as the default case.

In our estimates, as usual we find that wage increases with experience for both men and women at a decreasing rate[37].

[36] White collar includes "impiegati direttivi, quadri, dirigenti, preside, docente universitario e magistrato".

[37] Experience increases wages, but while for men the increase is about 6% in the second specification and 4,7% (when we account for occupations), for women is about 4% and 3,5% respectively.

Women living in the South of Italy receive less with respect to women living in the North-West. These results is strong in all specifications.

Women who works in the public sector receive on average 28 percent, and 22 percent more than women working in the private sector; men who work in the public sector instead receive a lower wage premium with respect to women, but it is still positive and equal to 19 percent. When the occupation is controlled for, the public premium becomes insignificant.

It is interesting to note that women working in large firms have a premium (around 20 percent), while men do not.

Wage regressions indicate that for men there exists a different wage premium according to the type of subject degree considered; Medicine has a larger earnings premium (around 28 percent) but wage premia exist also for Hard Science (11 percent), Engineering and Economics (about 9%), Political Science does not show significant differences from Humanities.

For women instead only Medicine and Hard Science give a wage premium, but lower than for men, 14 percent and 6 percent respectively. Women in private sectors obtain a premium from Medicine and Hard Science, while in the public sector only for Medicine.

Then, we estimate wage regressions for public and private sectors, Medicine and Hard Science give a wage premium in both sectors (public and private) for males. In the private sector, any degree gives a wage premium with respect to Humanities, especially "quantitative" subjects.

In the post-2000 sample, the raw gender gap is equal to 0.121 log points.

Our first decomposition shows that potential experience and geographical areas explain about 28 percent of gender wage differential; our basic specification[38] explains slightly more than for the UK and Germany (where age and age squared explain about 24% for the UK and 21% for Germany).

[38] We estimate a specification that controls only for age, age squared similarly to UK and Germany in order to make a comparison.

The inclusion of the type of subject in this specification more than doubles the "explained" component (from 28,1 percent when the type of degree is not controlled to 69,4 percent in the first specification).

When the Micerian equation is augmented with sectors, industry, part-time, the inclusion of type of degree shows a fairly large effect, in fact the "coefficient" component halves.

In the last specification the explained part is slightly small than in previous ones, this may depend on the gender distribution of qualifications. But also in this case including subjects of degree reduces the unexplained part.

In order to evaluate "discrimination effects", we use a male wage structure as benchmark. As we said it also possible to use a pooled wage structure, so we check the robustness of our results by using this alternative. Our results confirm that controlling for the type of degree reduces "discrimination" effects, although the effect is smaller[39].

There are large differences across private and public sectors, we can see that the gender wage gap in the private sector is bigger than in the public one (0.220 log points in the private against only 0.098 log points in the Public).

We calculate separate decompositions, and find that the type of university major matters. In the public sector the inclusion of majors increases by about 20 percent the explained component, while for the private sector, the inclusion of degree increases about 37 percent the "explained" component in the first specification.

When we control also for temporary contract, we find similar results (see Table A in appendix).

When we compare pre-2000 and post-2000 samples, results show that the type of degree seems to have a greater explained effect in the public sector in pre-2000 sample with respect to post-2000, while in the private sector the effect is slightly bigger in post-2000 than in pre-2000. This last fact could depend on the greater diffusion of university education and hence on the greater relevance of the type of university degree for labour outcomes.

[39] For the whole sample, the explained component increases about 17,3% in the last specification, while for the private sector the explained component increases by about 10,4%.

Obviously, when we use the lasts two specifications, the effect of controlling for the type of degree is lower, but it remains important. These facts happen because occupational segregation and the distribution of white collars may be a source of discrimination.

Previous research focusing on gender wage gap either consider both sectors separately, but in this case they consider all levels of education (measured in year of schooling and educational attainments), or both sectors together with a dummy for working in the public sector with separate estimations for levels of education. We do not find comparable results on Italian data, our results are similar to Greek ones, Pouliakas and Ilias (2008) find lower gender pay gap among graduates in the public sector than in the private sector and the type of degree have more explanatory power in the private sector.

Now we use a Juhn-Murphy Pierce (1993) method that allows us to distinguish the gender wage gap in three components, one part due to the differences in quantities (observable characteristics), one due to differences in prices and a third component that captures the residual part, that is variation in unobservable prices and quantities. This method is useful to evaluate the decomposition not only at the mean, but also at the tenth and ninth percentile, and also the differences in wage dispersion as measured by wage gap between various percentiles.

Results are shown in Table II. Examining the gap at different points of the distribution, we find that the raw wage gap is increasing until the 50^{th} percentile, but it seems lower at the 90^{th}.

At the 10^{th} percentile gender wag gap is higher than at the 50^{th} percentile, this could signal over-education problems. Women reaching highest wages present little differences from men, however, this lower differences depend almost completely by differences in prices (coefficient).

It is interesting to note that controlling for degree subjects reduce the “price” effect, the characteristics component increases. In fact, when we consider the decomposition without degree subjects, the larger component of the gap is due to “prices” differences, instead when subject are considered the characteristics become the larger part to explain the gap.

These happen across the whole distribution, the effect of type of degree seems particularly large at the top of the distribution. This could be explained by the fact that graduates at the bottom of the distribution may be overeducated and subjects may have low effects on wages.

It is also interesting to note that differences in price between genders are higher at the top of the distribution more than at the mean. We believe that this effect is a sort of "glass ceiling" effect.

When we look at the Juhn Murphy Pierce decomposition in the public sector, we note that gender wage gap increases along the distribution, but the inclusion of the type of study explain almost all of the gender gap and the "price component" become very small, except at the 90th percentile, where the "price component" decrease but remain quite large. This may depend on the "glass ceiling effect" (see Table C)[40].

Our results show that including the type of degree subject matters for the wage gender gap among graduates.

5 Concluding Remarks

Italy presents, according to EU statistics, a lower gender gap equal to 9%, however Italy show a "glass ceiling" effect, especially for highly educated women.

The great part of the literature on gender wage gap accounts only for quantity of education, measured as years of schooling or educational attainments, without controlling for type of education. Moreover, some studies show that the type of education affects differently wages and also other labour market outcomes.

In Italy, as in many Western countries, women are over-represented in Humanities, while men are over-represented in Engineering.

Literature on US and European data show the relevance of subject of degree in explaining the overall gender wage gap.

[40] We calculate the Juhn Murphy Pierce decomposition including dummy for permanent contract. We do not find different results (see Table B in appendix).

In this paper, I focussed on how much the field of university degree contributes to explaining the existence of gender wage gap among graduates in Italy.

Using data collected by the Bank of Italy SHIW, from1995 wave to 2006, we constructed two samples, one with the firsts three waves and the other is constituted by the last three in order to evaluate the evolution of gender wage gap over time. In this way, we can consider whether the type of studies affects gender wage gap and the evolution over time.

We use Oaxaca-Blinder decomposition that distinguishes the gender wage gap in two components, one part due to differences in characteristics and one part, called "unexplained", due to differences in coefficients. Our estimations suggest that controlling for type of degree increases the explained part by about 20-35% according to the choice of specification.

Our results are comparable to those from other European countries.

Literature show that public and private sectors in Italy show different gender wage gap considering all level of education. We find that gender wage gap is lower in the public sector and also the effect of the type of study is lower.

We compute a robustness check analysis in order to evaluate weather the widening of gender wage gap may be attribute to the different diffusion of temporary contracts. The inclusion of a control for temporary contract seems more important in the private sector, but results are similar without controlling for it.

In order to take into account the whole distribution, we use also Juhn-Murphy-Pierce decomposition that confirms the importance of field at different points (10^{th} percentile, 50^{th} percentile and 90^{th} percentile) of wage distribution.

The private sector shows a higher wage gap at each percentile considered, the public sector shows an increasing wage gender gap along the distribution. When type of degree subject is considered the "characteristic" component explain almost all gender wage gap. We find some "glass ceiling" effects.

For the future, it could be interesting to compute similar analysis on large dataset that accounts for the type of education, earnings, employment conditions and family background. Politicies aimed at increasing the participation of women to technical/scientific subjects may contribute to reducing gender wage gap for graduate

women and through this may contribute to reducing overall gender pay gap. In Western countries where women enrol and take a degree more than men, this may be important in the political agenda[41].

[41] One concern with these estimations is the self-selection problem, that is the possibility that unobservable characteristics as abilities or preferences, affect both earnings and subject choice. To our knowledge only one paper tries to control for self-selection issue, Napari (2006) using panel component in his dataset, estimate both OLS and a fixed effect estimations to check for time-invariant unobserved factors and he find similar results. This can be a future topic of research.

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Table I : Oaxaca-Blinder Decomposition on Wages

	Pre 2000						Post- 2000					
	Without	With	Without	With	Without	With	Without	With	Without	With	Without	With
	All		Private		Public		All		Private		Public	
Raw gender wage gap	0.075		0.151		0.092		0.121		0.220		0.098	
Specification I												
Explained component	0.028	0.060	0.048	0.090	0.056	0.088	0.034	0.084	0.051	0.132	0.064	0.083
Unexplained component	0.047	0.015	0.103	0.061	0.036	0.004	0.087	0.037	0.169	0.088	0.034	0.015
Absolute gap		*0.032*		*0.042*		*0.032*		*0.050*		*0.081*		*0.019*
% of gap explained by subject		*42,7*		*27,8*		*34,7*		*41,3*		*36,8*		*19,4*
Specification II												
Explained component	0.031	0.059	0.075	0.103			0.047	0.089	0.104	0.153		
Unexplained component	0.044	0.016	0.076	0.048			0.074	0.032	0.116	0.067		
Absolute gap		0.028		0.028				0.042		0.049		
% gap explained by subjects		*37,3*		*18,5*				*34,7*		*22,3*		
Specification III												
Explained component	0.018	0.052	0.072	0.100			0.031	0.077	0.109	0.153		
Unexplained component	0.057	0.023	0.079	0.051			0.090	0.044	0.111	0.067		
Absolute gap		0.034		0.028				0.046		0.044		
% gap explained by subject degree		*45,3*		*18,5*				*38,0*		*20,0*		

I specification include age, age squared, geographical area, dummies for surveys; II specification include also industry, dummy for part-time, dummy for public sector, firm sizes; III specification include also dummies for "white collar".

Table II: Juhn Murphy Pierce Decomposition

	Whole sample						
	Raw wage gap	Quantity	Price	Unexplained	Quantity	Price	Unexplained
		Without subject			With subject		
	I specification						
10	0.116	0.021	0.082	0.013	0.077	0.015	0.024
50	0.132	0.040	0.085	0.007	0.045	0.026	0.001
90	0.079	0.027	0.090	-0.038	0.070	0.048	-0.040
	II specification						
10	0.116	0.045	0.058	0.013	0.073	0.028	0.015
50	0.132	0.051	0.080	0.001	0.097	0.028	0.007
90	0.079	0.035	0.050	-0.006	0.058	0.041	-0.02
	III specification						
10	0.116	0.019	0.080	0.005	0.049	0.051	0.016
50	0.132	0.042	0.085	0.05	0.094	0.035	0.003
90	0.079	0.014	0.086	-0.021	0.062	0.040	-0.024
	Private Sector only						
	II specification						
10	0.212	0.070	0.070	0.07	0.151	-0.007	0.07
50	0.255	0.062	0.184	0.002	0.169	0.083	0.03
90	0.127	-0.046	0.093	-0.012	0.102	0.049	-0.024
	III specification						
10	0.212	0.087	0.066	0.058	0.154	-0.005	0.063
50	0.255	0.140	0.112	0.003	0.177	0.073	0.005
90	0.127	0.044	0.118	-0.034	0.124	0.045	-0.042

I specification include age, age squared, geographical area, dummies for surveys.
II specification include also industry, dummy for part-time, dummy for public sector, firm sizes.
III specification include also dummies for "white collar".

APPENDIX

Table A: Blinder-Oaxaca decomposition with controlling for permanent contracts.

	All						
	Raw wage gap	Quantity	Price	Unexplained	Quantity	Price	Unexplained
		Without subject			With subject		
II specification							
10	0.116	0.039	0.063	0.014	0.077	0.023	0.015
50	0.132	0.047	0.079	0.006	0.094	0.030	0.007
90	0.079	0.033	0.060	-0.001	0.052	0.048	-0.021
III specification							
10	0.116	0.015	0.088	0.012	0.050	0.041	0.023
50	0.132	0.031	0.094	0.006	0.081	0.044	0.006
90	0.079	0.023	0.085	-0.029	0.063	0.045	-0.029
Private Sector							
II specification							
10	0.211	0.080	0.077	0.05	0.133	0.024	0.05
50	0.255	0.122	0.126	0.07	0.167	0.091	-0.003
90	0.127	0.038	0.115	-0.02	0.129	0.024	-0.026
III specification							
10	0.211	0.100	0.048	0.06	0.151	0.002	0.06
50	0.255	0.135	0.119	0.002	0.162	0.093	0.0008
90	0.127	0.070	0.106	-0.048	0.124	0.042	-0.039

I specification include age, age squared, geographical area, dummies for surveys.
II specification include also industry, dummy for part-time, dummy for public sector, firm sizes.
III specification include also dummies for "white collar".

Table B: Juhn-Murphy-Pierce decomposition with a dummy for permanent contract.

	Without permanent				With permanent			
	Without	With	Without	With	Without	With	Without	With
	All		Private Sector		All		Private Sector	
Raw gender wage gap	0.121		0.220		0.121		0.220	
				I specification				
Explained component	0.034	0.084	0.051	0.132				
Unexplained component	0.087	0.037*	0.169	0.088				
Absolute gap		*0.050*		*0.081*				
% of gap explained by subject				*36,8*				
				II specification				
Explained component	0.047	0.089	0.104	0.153	0.046	0.084	0.103	0.152
Unexplained component	0.074	0.032*	0.117	0.068	0.074	0.036*	0.117	0.068
Absolute gap		0.042		0.049				0.049
% gap explained by subjects		*34,7*		*22,3*				*22,3*
				III specification				
Explained component	0.031	0.077	0.109	0.153	0.030	0.074	0.109	0.153
Unexplained component	0.090	0.044	0.111	0.067	0.091	0.047	0.111	0.067
Absolute increase		0.046		0.044		0.044		0.044
% gap explained by subject degree		*38,0*		*20,0*		*36,4*		*20,0*

I specification include age, age squared, geographical area, dummies for surveys.
II specification include also industry, dummy for part-time, dummy for public sector, firm sizes.
III specification include also dummies for "white collar".

Table C: Juhn-Murphy-Pierce Decomposition on the Public Sector

	Public Sector						
	Raw wage gap	Quantity	Price	Unexplained	Quantity	Price	Unexplained
		Without subject			With subject		
10	0.055	0.037	0.038	-0.02	0.054	0.001	-0.000
50	0.090	0.077	0.013	-0.0004	0.089	-0.004	0.005
90	0.162	0.094	0.045	0.023	0.110	0.040	0.012

I specification include age, age squared, geographical area, dummies for surveys.

Appendix 2

In this section we report wage regressions separated by gender relative to the specification II for both the private and the public sector togheter for both the post-2000 (see Table 1) and pre-2000 sample (see Table 3).

We also report wage regressions for the private sample only (see Table 2 and Table 4) relative to specification 2.

Table 1: Wage regression for the post-2000 sample for the private and the public sector.

	Women	Men
North-East	−0.044	0.032
	(0.03)	(0.03)
Centre	−0.014	0.046
	(0.03)	(0.03)
South	−0.102***	0.013
	(0.03)	(0.06)
Age	0.046***	0.066***
	(0.01)	(0.01)
Age squared	−0.0004**	−0.0005***
	(0.00)	(0.000)
parttime	−0.104**	−0.025
	(0.04)	(0.08)
public	0.314***	0.178**
	(0.07)	(0.09)
Manifacturing	−0.127*	0.068
	(0.07)	(0.05)
Building and construction	0.117	−0.003
	(0.123)	(0.07)
Wholesale and retail trade	−0.013	−0.090
	(0.07)	(0.08)
Transport and communication	−0.109	−0.082
	(0.119)	(0.09)
Credit and Insurance	0.096	0.177***
	(0.07)	(0.06)
Domestic service	−0.254***	−0.308**
	(0.09)	(0.06)
Public Administration, Education, Health	0.018	0.010
	(0.05)	(0.05)
From 5 to 19	−0.050	0.060
	(0.07)	(0.09)
From 20 to 49	0.063	0.036
	(0.07)	(0.09)
From 50 to 99	0.225***	0.111
	(0.08)	(0.09)
From 100 to 499	0.257***	0.170*
	(0.08)	(0.09)
500 or more	0.254***	0.134
	(0.08)	(0.09)
Hard Science	0.050	0.128**
	(0.03)	(0.04)
Medicine	0.103**	0.275***
	(0.05)	(0.05)
Engineering	−0.018	0.102***
	(0.05)	(0.04)
Economics	−0.116**	0.104***
	(0.04)	(0.05)
Political Science and Law	−0.095***	0.026
	(0.04)	(0.04)
Constant	0.748***	0.365
	(0.26)	(0.24)
N. Observation	968	836

Note: All estimations control for Surveys. The omitted categories are firm up to 5 workers, business services as sectors. Standard errors are in paranthesis. * significant at 1%. ** significant at 5%. * significant at 10%.**

Table 2: Wage regression for the post-2000 sample for the private sector and the public sector.

	Private Sector		Public Sector	
	Women	Men	Women	Men
North-East	−0.012	0.033	−0.084	0.013
	(0.05)	(0.04)	(0.05)	(0.06)
Centre	−0.018	0.088*	0.042	−0.031
	(0.06)	(0.04)	(0.04)	(0.06)
South	−0.094*	0.035	−0.104***	−0.023
	(0.05)	(0.04)	(0.04)	(0.04)
Age	0.017	0.079***	0.069***	0.048
	(0.02)	(0.01)	(0.02)	(0.02)
Age squared	−0.00003	−0.0007***	−0.0006***	−0.0003
	(0.00)	(0.00)	(0.0001)	(0.0001)
parttime	−0.079	−0.161*		
	(0.06)	(0.09)		
Manifacturing	−0.111	0.074		
	(0.07)	(0.05)		
Building and construction	0.143	−0.055		
	(0.14)	(0.07)		
Wholesale and retail trade	−0.014	−0.067		
	(0.08)	(0.08)		
Transport and communication	−0.096	−0.057		
	(0.12)	(0.09)		
Credit and Insurance	0.126	0.207***		
	(0.08)	(0.06)		
Domestic service	−0.309***	−0.249**		
	(0.10)	(0.12)		
Public Administration, Education, Health	0.047	0.049		
	(0.06)	(0.06)		
From 5 to 19	−0.057	0.052		
	(0.08)	(0.09)		
From 20 to 49	0.064	0.013		
	(0.08)	(0.09)		
From 50 to 99	0.248***	0.080		
	(0.09)	(0.09)		
From 100 to 499	0.271***	0.129		
	(0.09)	(0.09)		
500 or more	0.247***	0.106		
	(0.08)	(0.09)		
Hard Science	0.102*	0.163**	0.022	0.142***
	(0.06)	(0.06)	(0.04)	(0.06)
Medicine	0.217*	0.285***	0.041	0.245***
	(0.12)	(0.09)	(0.06)	(0.06)
Engineering	0.113	0.220***	−0.184**	0.057
	(0.06)	(0.06)	(0.08)	(0.07)
Economics	−0.108*	0.195***	−0.069	−0.011
	(0.06)	(0.07)	(0.07)	(0.06)
Political Science and Law	−0.048	0.118*	0.106**	0.051
	(0.06)	(0.07)	(0.05)	(0.06)
Constant	1.247***	−0.098	0.768	1.000***
	(0.38)	0.30	(0.36)	(0.04)
N. Observation	412	474	556	362

Note: All estimations control for Surveys. The omitted categories are firm up to 5 workers, business services as sectors. Standard errors are in paranthesis. * significant at 1%. ** significant at 5%. * significant at 10%.**

Table 3: Wage regression for the pre-2000 sample for the private and the public sector.

	Women	Men
North-East	-0.049	-0.051
	(0.04)	(0.03)
Centre	-0.045	-0.098***
	(0.03)	(0.03)
South	-0.0003	-0.080***
	(0.03)	(0.03)
Age	0.066***	0.074***
	(0.01)	(0.01)
Age squared	-0.00006***	-0.0006***
	(0.0001)	(0.00)
Part-time	0.022	-0.017
	(0.05)	(0.07)
Public	0.219***	0.095
	(0.10)	(0.10)
Manifacturing	0.040	0.029
	(0.08)	(0.05)
Building and construction	-0.091	-0.133
	(0.18)	(0.09)
Wholesale and retail trade	0.065	-0.116
	(0.01)	(0.08)
Transport and communication	0.271**	0.065
	(0.13)	(0.08)
Credit and Insurance	0.164**	0.119**
	(0.08)	(0.06)
Domestic service	0.100	-0.415***
	(0.18)	(0.12)
Public Administration, Education, Health	0.118	0.030
	(0.07)	(0.05)
From 5 to 19	0.040	-0.022
	(0.10)	(0.10)
From 20 to 49	0.059	0.028
	(0.10)	(0.10)
From 50 to 99	0.213**	0.045
	(0.11)	(0.10)
From 100 to 499	0.206**	0.111
	(0.10)	(0.10)
500 or more	0.225***	0.116
	(0.10)	(0.10)
Hard Science	-0.039	0.035
	(0.03)	(0.04)
Medicine	0.033	0.191***
	(0.06)	(0.04)
Engineering	0.089	0.056
	(0.08)	(0.04)
Economics	-0.004	0.032
	(0.05)	(0.04)
Political Science and Law	-0.063	0.037
	(0.04)	(0.04)
Constant	0.208	0.174
	(0.27)	0.23
N. Observation	983	967

Note: All estimations control for Surveys. The omitted categories are firm up to 5 workers, business services as sectors. Standard errors are in paranthesis. * significant at 1%. ** significant at 5%. * significant at 10%.**

Table 4: Wage regression for the pre-2000 sample for the private sector

	Women	Men
North-East	−0.067	−0.056
	(0.06)	(0.04)
Centre	−0.093	−0.121**
	(0.06)	(0.04)
South	−0.141**	−0.115**
	(0.06)	(0.04)
Age	0.054*	0.099***
	(0.02)	0.01)
Age squared	−0.0004	−0.0009***
	(0.0003)	0.00001)
parttime	−0.106	−0.164*
	(0.07)	(0.09)
Manifacturing	0.031	0.001
	(0.08)	(0.05)
Building and construction	−0.164	−0.073
	(0.19)	(0.10)
Wholesale and retail trade	0.069	−0.121
	(0.09)	(0.08)
Transport and communication	0.123	0.064
	(0.13)	(0.08)
Credit and Insurance	0.123	0.103
	(0.08)	(0.06)
Domestic service	0.005	−0.351***
	(0.20)	(0.14)
Public Administration, Education, Health	0.223***	0.044
	(0.07)	(0.06)
From 5 to 19	0.053	−0.003
	(0.09)	(0.12)
From 20 to 49	0.067	0.0006
	(0.09)	(0.11)
From 50 to 99	0.202**	0.020
	(0.09)	(0.12)
From 100 to 499	0.200**	0.098
	(0.09)	(0.11)
500 or more	0.217**	0.102
	(0.09)	(0.11)
Hard Science	−0.006	0.031
	(0.06)	(0.07)
Medicine	−0.005	0.135
	(0.12)	(0.14)
Engineering	0.210*	0.104
	(0.11)	(0.07)
Economics	0.074	0.095
	(0.07)	(0.07)
Political Science and Law	0.079	0.075
	(0.07)	(0.08)
Constant	0.046	−0.302
	(0.47)	(0.36)
N. Observation	271	449

Note: All estimations control for Surveys. The omitted categories are firm up to 5 workers, business services as sectors. * significant at 1%. ** significant at 5%. * significant at 10%.**