The Italian gender gap in pay and regional heterogeneity

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Summary

1.Introduction

Historically, in Italy, women's presence in the job market, either as employed or unemployed, has always been lower than their male counterparts. Using the census data from Istat, 1901 men's activity rate (over 15 years old) was more than double of the women's (89%, 42%). Female's activity rate declined during Fascism and continued its descent till 1971 (25%) when it started growing again hitting 41% in 2019. By contrast, the men's labour force continued its reduction since the start of the census, reaching 59% in 2019. Most of the men's lowering is caused by an ageing population, 15-64 years old activity rate provides a much more reliable measure in the last 40 years, from 1977 to 2019 men activity rate was stable above 75% while women's grew 18% reaching 56% in 2019.

Women faced hurdles to improve their engagement in the job market because gender culture compressed their job's choice and as a consequence their pay. They started a slow process of emancipation and Italy saw the first women in what were believed to be "only male's jobs". Today the presence of women at the top of organizations is normal showing the decreasing of gender culture.

People show their value at work by competing with equals and stereotypes start to shake. Therefore, the employment of women is useful to reduce the gender culture and the different roles attributed to the sexes.

Needless to say, women participation has consequences on expanding the labour force of a country. Expanding the labour force helps a country's economy, the skill of the inactive population may be valuable to the production engine, a growth of competition in the job market decreases stipends and the production cost of goods, making an economy more competitive in export as shown in Tsani (2013).

Discrimination in the job market is a factor contributing to the difference between males and females. People evaluate expected wage as a parameter in the decision between working or not. Moreover, people feeling unsatisfied with their prospects are less prone to work and abandon the labour force. The perspective of being discriminated against is a deterrent to engagement with the job market. On top of that, non-working years make people less attractive to recruiters, unemployed people that are not satisfied with their work possibility will see their perspectives worsening and become more inclined to leave the labour force.

Most of the public debate focuses on the discrimination factor of the wage's disparity while ignoring other variables playing a role in the gender pay gap (GPG). GPG represents the comparison between men's and women's pay. Some of the other factors explored by research are the human capital, the sector, industry, firms and people's attitude towards working women as in Fortin (2005), Campa, Casarico and Profeta (2011). Adjusting the gap using these factors may reduce it to a lower percentage and indicate the disparity's amount accounting for discrimination and other unexplored aspects.

It is important to understand which are the determinants of this gap to enable the thinking of specific policies to improve women's wages. In addition, more competitive

female's salaries improve the participation rate of women making them more capable to escape gender's roles.

In this paper, I try to find the share of the pay gap accounting for human capital, sector, segregation and discrimination by applying the decomposition model of Oaxaca and Blinder (1973) in the Italian gap making comparisons between different years and macroregions to evaluate what drives the change in GPG. In addition, I address the model's residual explaining discrimination by looking at the World Value Survey data's change between the two-period object of the exam.

In my analysis, I will use Microdata from Istat. The analyzed subjects are employees, full-time working between 20-70 hours weekly in 2008-2020 with a quarter partition. The dependent variable is an hourly wage, extracted from the quotient between income and hours worked. The Istat database sets the maximum stipend to 3000€ and the same for salaries exceeding the limit.

The following pages are structured in parts:

- 2 Literacy review and the gender pay gap in Italy
- 3 Explaining the independent variables, human capital and segregation
- 4 Models to analyze gender wage ratio and discussion of the results
- 5 Conclusions

2. Explaining the dependent variable

A part of the gender pay gap accounts for discrimination, a definition of which could be "different returns on identical productive characteristics between majorities and minorities".

One of the principal theories of discrimination is contained in "The Economics of discrimination" by Becker (1957). He treated discrimination as a taste-based variable. There he pointed out that the differences in pay between majorities and minorities arise only if the demand for minority workers at the same price of the majorities is not enough to sustain the supply. If this is the case then minorities saw lower returns on their human capital. In a competitive market, where an employee earns his marginal product, non-discriminating employers expand by paying minorities more than prejudiced employers that slide out of the market.

Another path to analyse discrimination is the one taken by Phelps (1972) and Arrow (1973). They think of the limited information about job candidates that goes to the employers. This incentives them to use observable characteristics like race, gender to forecast future productivity on the job and as a consequence pay.

The discussion turned on the differences in Human capital after Mincer and Polachek (1974) investigated disparities in Human capital investments within family members. Mothers more occupied in time-consuming activities such as childcare and housework cannot develop their human capital as men do. This disposition within family members is due to gender culture.

A more recent study from Blau and Kahn (1999-2000) used Oaxaca and Blinder decomposition to understand differences in returns on Human capital in genders, discrimination. They developed a clear view of the distance between raw GPG and the same metrics accounting for sector and industry. Moreover, they focused on the importance of wage structure to have a limpid view of GPG in the world. Without accounting for wage structure differences, European countries' raw metrics were lower than the US, after adjusting the direction became the opposite.

Another interesting correction is the one done by Olivetti and Petrongolo (2006), by comparing OECD countries in GPG they account for self-selection in job markets, using Heckman self-selection model. Self-selection implies that the women working are just a part of the potential female workers, due to gender culture this share is the one with the highest human capital. So the raw GPG is distorted by the presence of a smaller group of women in the job market that do not represent all the potential workers. In the standard pay gap metric, Mediterranean countries like Italy, Spain and France showed low levels of raw GPG. By contrast, these countries where the gender gap in employment rate is high, a signal of self-selection, accounted for a higher share of hidden GPG.

A remark on the metrics. One of the traditional GPG measures is made from the comparison between women's median earnings and men's. This measure is insensitive to changes that do not touch the median: if the lower 20% of the women's salaries grow without moving the median the GPG remains stable. In addition, by using hourly wage, GPG shows its limits. Gender wage ratio, as used in Blau and Kahn (1999), becomes more accurate and sensible to describe the same phenomenon.

2.1 The gender wage ratio, Italy 2008-2020

First, what is the gender wage ratio (GWR)? The GWR is the ratio of women's hourly mean income to men's. Ww represent the average of women's hourly wage while Wm is the men's.

$$GWR = \exp(\ln(\overline{W}_w) - \ln(\overline{W}_m)) \quad (1)$$

The wider it is and the more women's wages are compared to men's, the unity displays parity. In the graph below I show the GWR of full-time employees. I used quarterly data, 2008 to 2020, from the three Italian macro-regions to compute the GWR and plot the moving average using four quarters.

Figure 1, the variable used to compute GWR is the hourly wage from 2008 to 2020, using a moving average on 4 periods the x axis contains 2008Q4 to 2020Q4.

The overall trend of Italian GWR (red-dashed line, ITA AVG) is positive following most developed countries in the world. Furthermore, during the period between 2008-2020, the Italian GWR raised from 95,5% to 97% with a long pause between the end of 2011 and the second half of 2014 backing below 95,5% at the end of 2012. Northern Italy has a more stable GWR while other areas appear to be more volatile.

In contrast, the long contraction of 2011-2012 is present all over the Italian territories, somewhere steeper and faster in recovery than in other areas. It coincides with the European debt crisis and as Di Tommaso, Piazzalunga (2016) said it is caused by the wage's freeze in the public sector, especially in education, that did not allow those incomes to grow from seniority. Since most employees in teaching (75%) and public administration are and were women, GWR decreased.

On the other hand, this conclusion seemed counterintuitive if we think that men suffered from the most job losses during the 2008-2012 crisis. Consequently, even the "added worker effect", wives joining the labour force after their husband's dismissal, plays a role in lowering women's salary due to the employment of wives with a low Human Capital.

2.2 Gender wage ratio by age

After exploring the heterogeneity of GWR from 2008 to 2020, a view on another dimension can be useful. Using age as a dimension it is possible to see where the gender gap is positioned. It is important to understand if the driver of a future decrease in GPG could be the “new entries effect”. The new young cohorts suffer less segregation and gender culture lowering the total GWR without changing the pay gap of older workers. Blau and Khan (2000) pointed out the effect of the reduction in the US GWR.

Another interesting part of this view is the maternity effect, if women after the first son/daughter stop improving their Human Capital working fewer hours due to childcare and gender culture. These effects are stronger where parental leave policies are weaker. Waldfogel (1998) found that the wage ratio of mothers at 30 was 70% while the non-mothers were 90% in the US and 64%-84% in the UK. Moreover, women are hit negatively by becoming mothers while men are not. Proper maternity leave policies can reduce the gap.

In “Gender differences in pay” Blau and Kahn pointed out that the US GWR declines with age. From 95% (age 18-24) to 69% (age 55-64) in 1990. The same tendency is present if we look at the 2019 UK pay gap from national statistics. In contrast, Italy seems to be different. While North and Center have positive slopes in the first interval and then negative (as the US and UK) the South is different, its GWR never decreases and touches 110% in the end.

The Italian behaviour looks irrational compared to the UK and US. Women that started working 40 years ago rushed into bigger discrimination than the new generations. They saw their careers finding hard time to advance and to get a larger earning. Moreover, as time passed, job’s segregation (I will prove this later) tends to reduce and women exited low-paying positions typical of gender culture and started to be employed in the once claimed men’s job. “Gender jobs” paid less because all the women compete to work there. If a strong gender culture is present, assuming a flexible job market, women’s stipends are lower due to the abundance of unemployed women competing for the same spots.

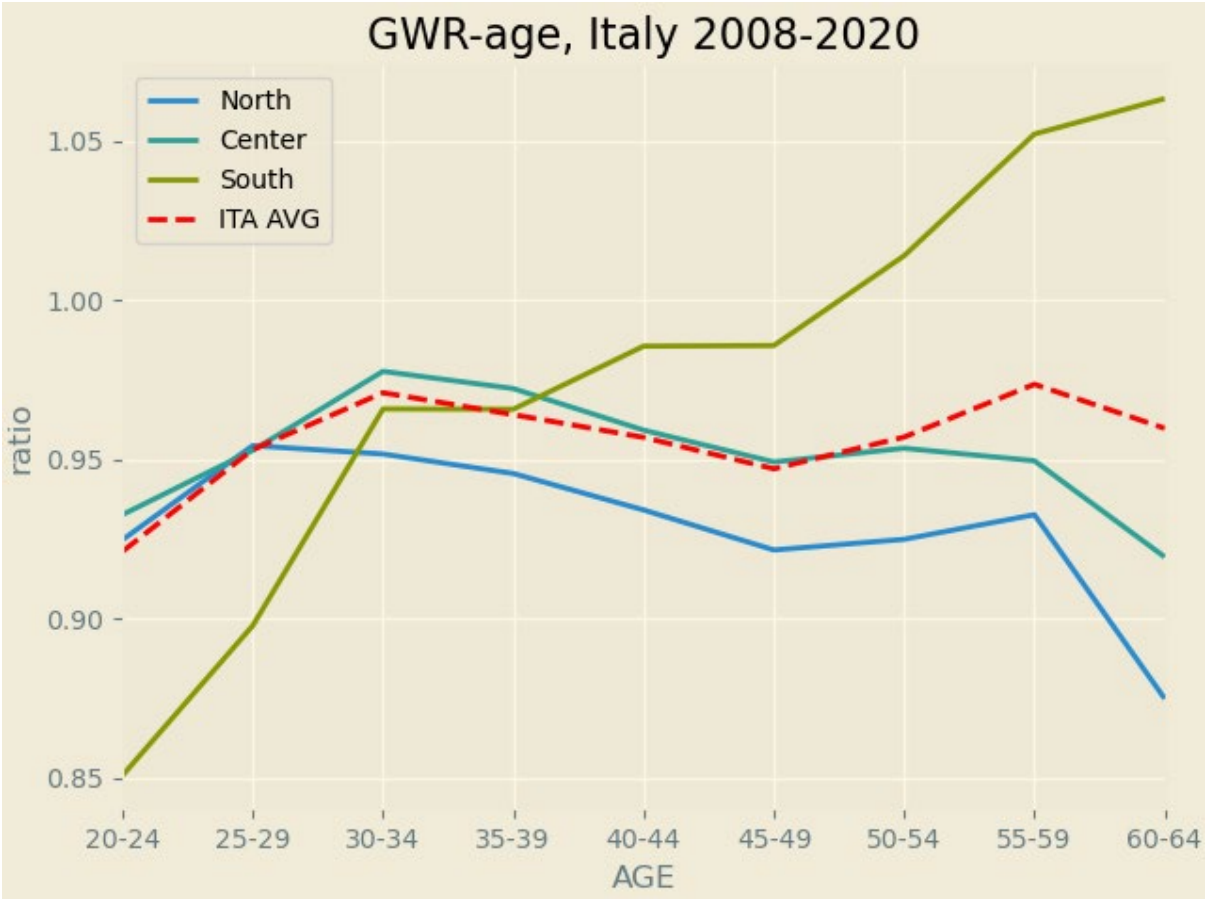

Figure 2, I used the age bands supplied by Istat and excluded the last and first for the scarcity of records. As in Figure 1 the variable used for the computation of GWR is the hourly wage. To do the calculation between different year I discounted the hourly wage using inflation from Federal Reserve Economic Data, Italian Inflation.

2.3 GWR by percentile of income

Another interesting look is obtainable by comparing the distribution of men's and women's income to understand the GWR on different quantiles and gather a view on where the presence of a pay gap is higher.

Most of the literature focuses on the presence of "sticky floors" and "glass ceilings", lower GWRs in the first and the last quantiles. These two effects may imply higher discrimination towards women in chief roles, glass ceilings, and women in low pay occupation, sticky floors.

Arulampalam, Booth and Bryan (2005) denoted that the presence of sticky floors is associated with the absence of parental leave policies. This absence triggers discontinuity in women's job career making them less attached to the workforce so, less valuable.

They enhanced the presence of trade unions that showed less favour to women than men due to their lower bond with the workforce. On the other hand, trade unions represent more the interests of females towards the top of the wages distribution, so are inversely correlated with glass ceilings.

The dissolvency of unions was one of the main causes of the decrease of GWR in the US between 1979-1989 as described by Blau and Kahn (2006)

Nicodemo (2009) confirmed the presence of sticky floors in most European Mediterranean countries like Spain, Italy and Greece and denoted that the difference in human capital (endowment effect) between genders was negative in Italy in 2001. This means that discrimination accounted for more than the gender pay gap.

Speaking of glass ceilings, Hiau Joo Kee (2005) says that differently from the sticky floors, where possible causes are the differences in gender characteristics of low pay employees (endowment effect), the reason can be found in different returns on the same skills, discrimination. She found that glass ceilings in Australia were most common in the private sector.

In the Italian country we expect both effects, but surprisingly only the second is present. Figure 3 shows the typical setting of a sticky floor country, GWR increases with the growth of the percentile. All the lines present a discontinuity at 5%, where there are minimum points. If we use the 5-25 percentile difference as an indicator of a sticky floor then their presence is in all of the lines, if we use 1-25 only in the South it is significant. The opposite is true for glass ceilings, never present with the measure 95-75, present in the South using 99-75.

A remark needs to be made. All the lines tend to be above 1 in the 99 percentiles. It is due to a feature of Istat datasets, the wage maximum is 3000€, which implies a maximum hourly salary that in women is slightly higher than in men, the reason is the long hours worked by men. This said the Southern Italy distribution shows divergence compared to the other lines in the graph, the same situation appeared in Figure 2.

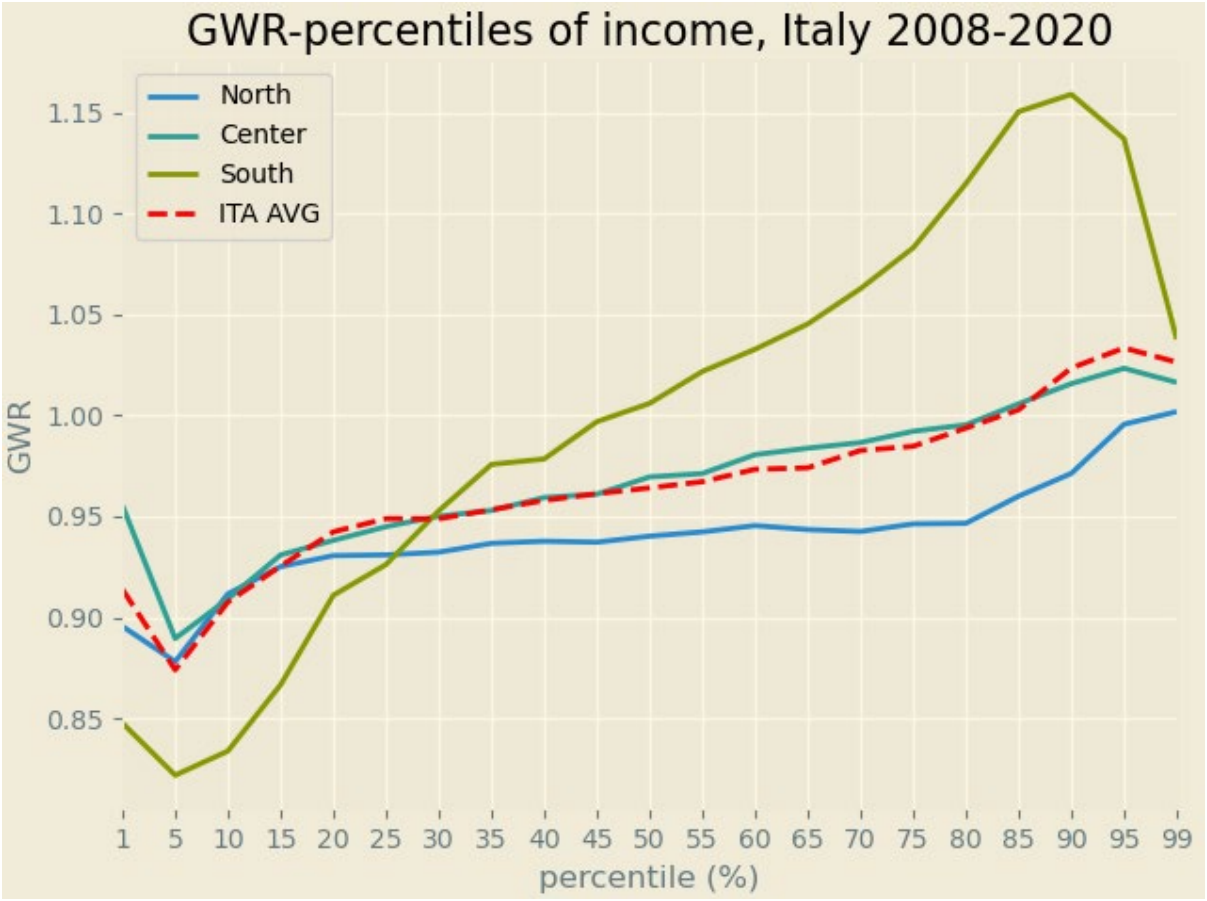

Figure 3, as done in the figures before I used hourly wage. The percentile is a punctual data and using the min and max would not add much information since they show extreme cases. To do the calculation between different year I discounted the hourly wage using inflation from Federal Reserve Economic Data, Italian Inflation.

3. Independent variables and Genders

In the past pages, I introduced the concept of the endowment effect, the difference in human capital (HC) between genders. This effect plays a role in the results of the Oaxaca and Blinder decomposition. If positive it means that the discrimination is less than the pay gap and a part of it is justified by differences in HC, lower education, experience etc. Instead, a negative one means that the discrimination accounts for more than the pay gap, the wage ratio must be higher than its level in absence of discrimination.

In the following section, I show differences in HC, sector and positions between genders with a view on Italian macro-regions heterogeneity.

It is worth remembering that the descriptive statistics below are about full-time employees, not population. Women self-selection to the job market needs to be considered.

3.1 Sector and Employment

3.1.1 Public employment

The division between the public and private sector has been done by myself. It may contain errors since Istat did not supply me with this kind of information. The bisection has been done by considering these sectors as public: public administration, defence, social services, health, education, public services and social insurance. The other sectors presented by the variable CAT12, were: agriculture and fishing, transformation industry, building industry, energetic and mining industry, hotels and restaurants, transportation and communication, finance and real estate, business to business (B2B).

In 2.1, there was the comparison of public employment during the wage freeze of 2011-2014. Public jobs are a source of employment for a big share of the Italian population and its distribution can be another view of the heterogeneity describing the Peninsula.

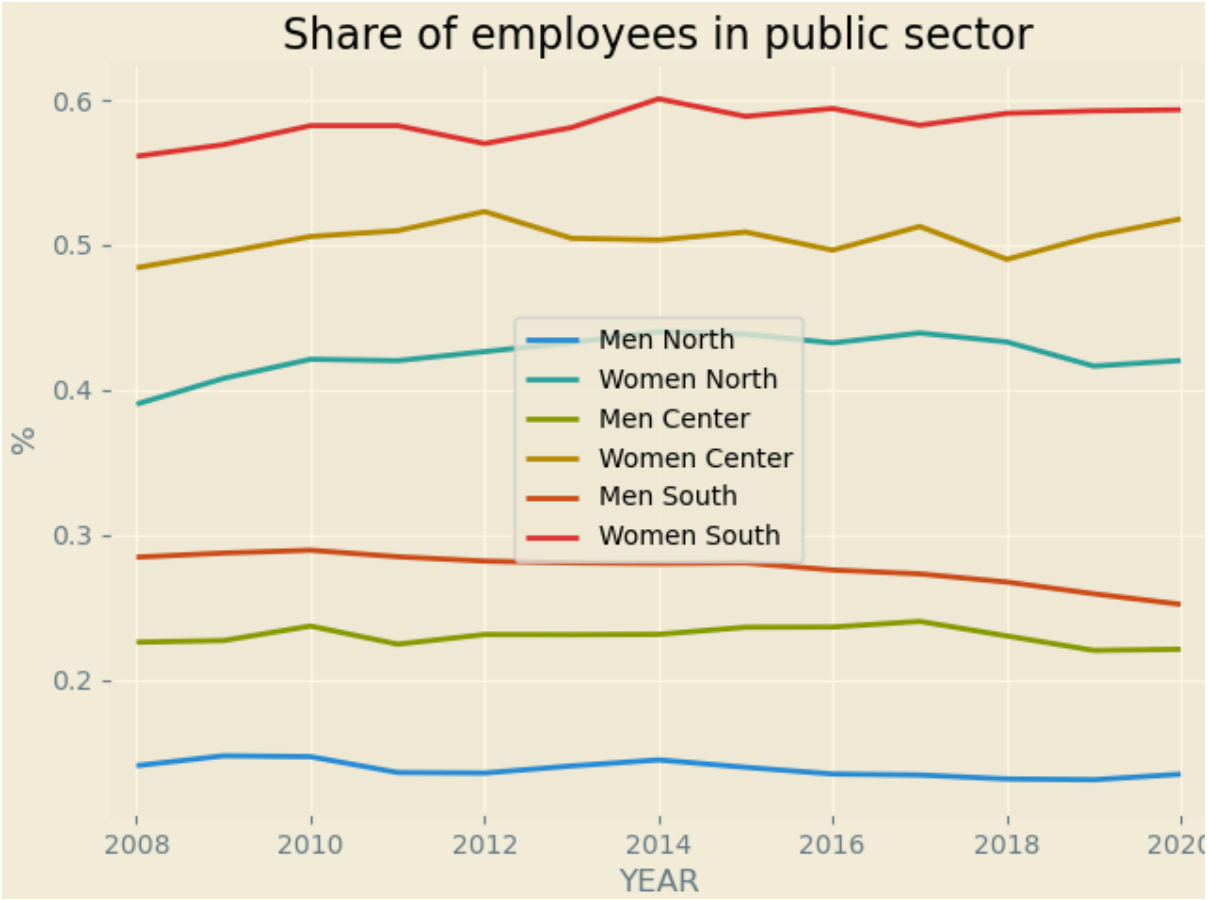

Figure 4, the percentages has been computed yearly, the data was sampled by using the weight supplied by Istat.

On top of that, to complete our look of public employment wage ratio with private employment is an important feature. Public wages are set by the central government without accounting for the cost of living in the regions making the opportunities of public employment different.

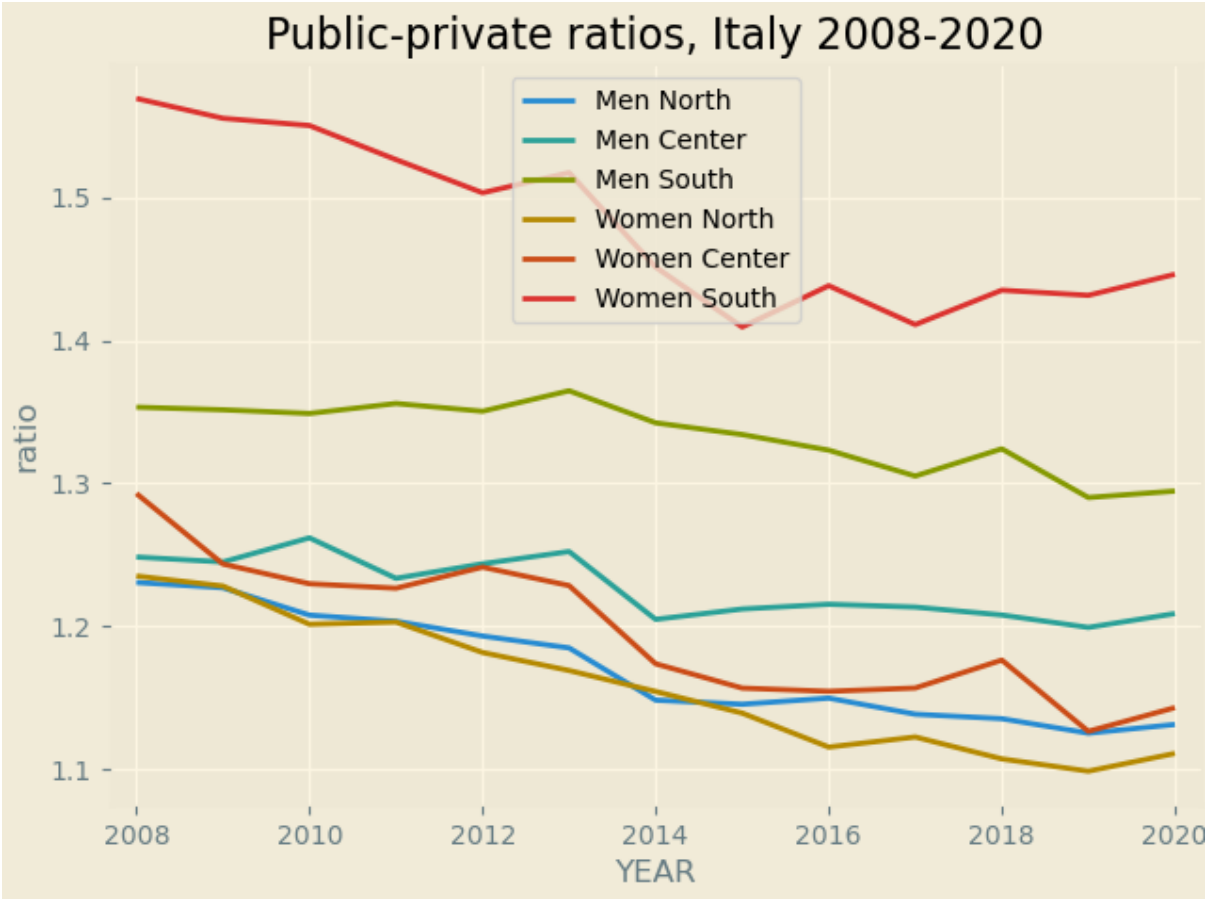

Figure 5, the ratio were computed by using nominal wages each year in the period between 2008 and 2020. The ratio is computed by using public hourly wages and private hourly wage.

It is easy to discern that the rest of Italy is far behind the South, North and Center have larger ratios in men's stipend than women's. North and Center Italian women even managed to diminish this ratio below 1.2 since 2010 and 2014. On the other hand, the South women working in the public sector accounted for an average of 48% more than their private counterparts over the last 12 years and the South men PP ratio at 1.33. In the last twelve years, all the ratios declined, some of them by a big portion (Women North, Women Center, Men North, Women South).

The research about the Italian differences in public employment is enormous. Dell'Aringa, Lucifora and Origo (2005) examined the public sector pay and regional competitiveness between 1991-2002 describing the correlation between public and private wages with unemployment. Private wages were showed dependency with unemployment while public were poorly correlated. As a consequence, they pointed out that not only the value of the PP ratio was higher descending the peninsula, but even the unexplained part of the wage premium followed the same path.

Alesina, Danninger and Rostagno (2001) denoted that public employment in Southern Italy is used as a redistribution policy, most of the South public stipend bill (43-52,5%) was a hidden subsidy between 1993-1995. This is due to two effects: the excessive public employment rate of 37-43% and public wage premium that was higher in the South than in the North by a 17.7%. The bigger spending did not result in better public services. They pointed out the consequences of a culture dependent on public

employment were seen in the depression in entrepreneurship, the underdevelopment of a private sector's job demand due to the high PP ratio, and political reward in enlarging work with public employment.

The results seem to be confirmed by the activity rate. Activity rate decreases going South from 72.4% in 2019 in the Northern area to below 60% in "Mezzogiorno". The same happens for unemployment from 6.1% to 17.6%, the 15-24 age band goes from 19.4% to 45.5%, even worse when the focus is on women.

Finally, a region where the alternatives of a job in the private market are incomparables to the public employment is strongly dependent on the second. This influences the GWR through self-selection.

3.1.2 Sectors (CAT12)

In 3.1.1 I have shown the importance of the division between public or private employment and their differences in terms of gap and macro-regions. Beside these two categories, there are wide differences between North, Center and South. Sectors are another measure of the heterogeneity that describes the Italian peninsula. They can have a weight on the GWR. People with the same HC may earn more in manufacturing than agriculture, due to the higher productivity and a more efficient management of their work. It is easy to understand that if all the women were occupied in agriculture and all the men in manufacturing the GWR would be lower. To derive an unbiased view of discrimination it is useful to account for sectors.

Agriculture employed more in the South (male 6%, female 5%) than in the other areas where women never reach 1% and men are below 2,5%. All over Italy there is a growth in the share of people working in agriculture.

As a consequence, Industry employs more in the North than in other parts of the peninsula, 58% of the men and 30% of women. In the other two areas women do not reach 20% and men do not surpass 42%, with the South behind the Center. There has been a switch between transformation industries to the energetic sector.

On the other hand, Services are mainly dominated by women. People employed by those services do not change much across the peninsula, business to business and financial services are lower in Southern Italy.

Speaking of public employees, the South and Center have larger shares than the North. Curiously, education, health and social services account for 40% of the women employed in the South while this share is below 30% in the other areas.

By contrast, 'public administration, defense and social insurance' in Center and South tends to employ a larger share of men than women. The opposite is true when it comes to 'other public services'.

3.1.3 Segregation

Another useful concept is segregation. It could be defined as the confinement of a determined category of people into specific jobs, female-nurse, male-workmen etc. The consequences are the same as for sectors. Lower segregation may imply lower gender roles, a country where women can be policemen or doctors is one where

gender culture is shakening and discrimination is lower. To get a proper view of the job's segregation in the Italian territories I use Duncan Segregation Index.

The higher it is and the more segregation is present. The index range is from 0 to

$$D = \frac{1}{2}\sum | f_i - m_i | \quad (2)$$

1. To calculate the Duncan index I decided to use the ISCO08 job's classification offered by the Istat Microdata. Fi present the share of women in a certain job and Mi the same for men.

In figure 6 the results are shown, Duncan segregation Index seems to be highly variable, but declining in all of the macro-areas. Moreover as for other indicators before, the South line looks to move detached from the other two lines. The indicator present high variance and all the macro-regions showed the same result: a decrease in the index of half a percentage point.

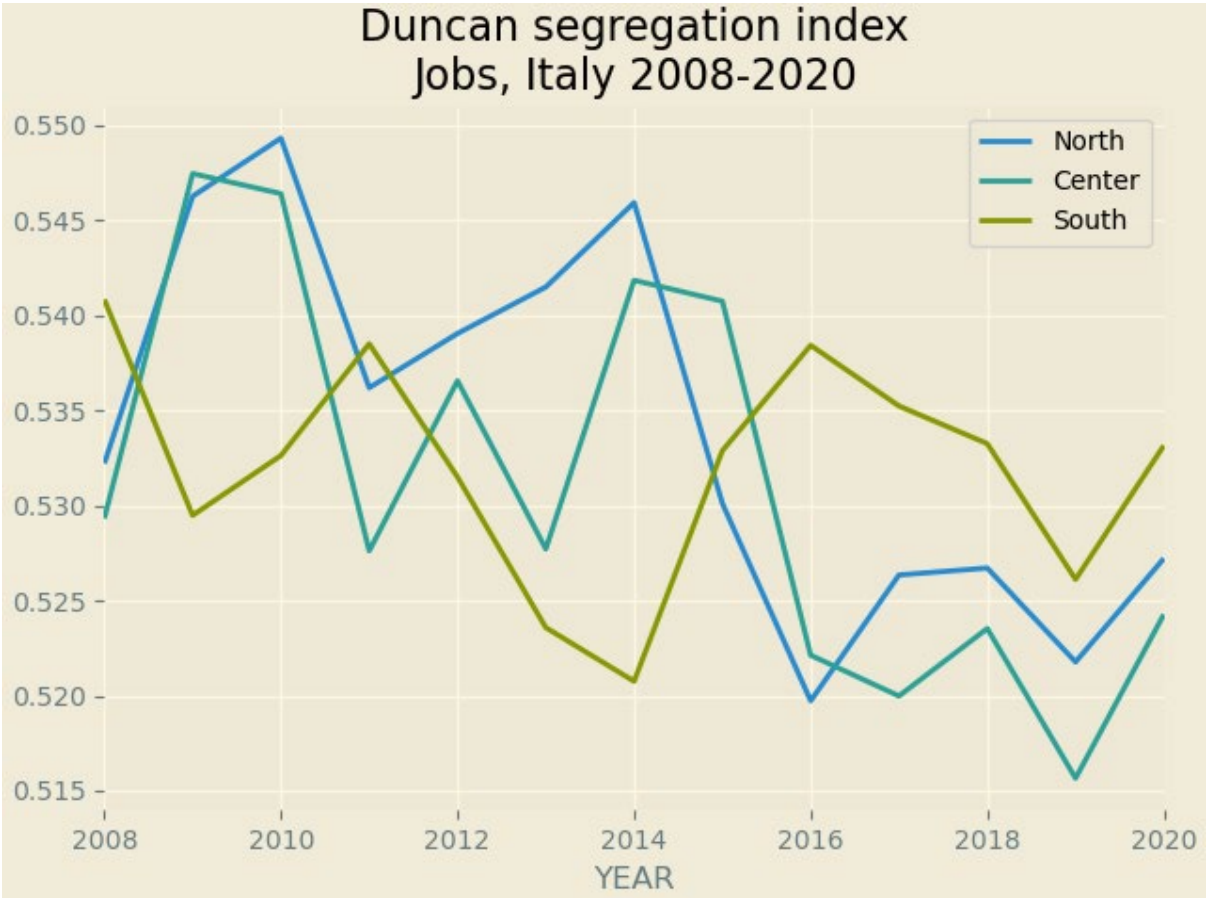

Figure 6, the ISCO8 variable in the Istat database contained 145 job's from farmer to university professor. The Duncan index resulted to have high variance in all the areas.

3.2 Human capital

3.2.1 Education level

Education is one of the main components of HC and is highly evaluated in the job market. People with higher education will achieve higher salaries and will secure themselves a place to work. Therefore, it becomes essential to have a glimpse of the differences in education between men and women. I partitioned education into three categories, below upper secondary (BUPPS), upper secondary (UPPS) and tertiary (TER).

Regional heterogeneity is present in the education of the employees. In 2008 Central Italy's men having at least upper secondary education, not BUPPS, were 55%, 48% and 45% in the North and South. The same is true for women, 73% in the Center, 62% and 69%. Overall, women employees in 2008 were more educated than men and in 2020 they managed to strengthen their position. A gap in education between genders can be computed, considering not BUPPS, 28% in the Center, 24% in the other two macro-areas. Things changed between 2008 and 2020 (Figure 7). New cohorts coming into work were more educated than the ones leaving it and the result is a higher education level for both men and women.

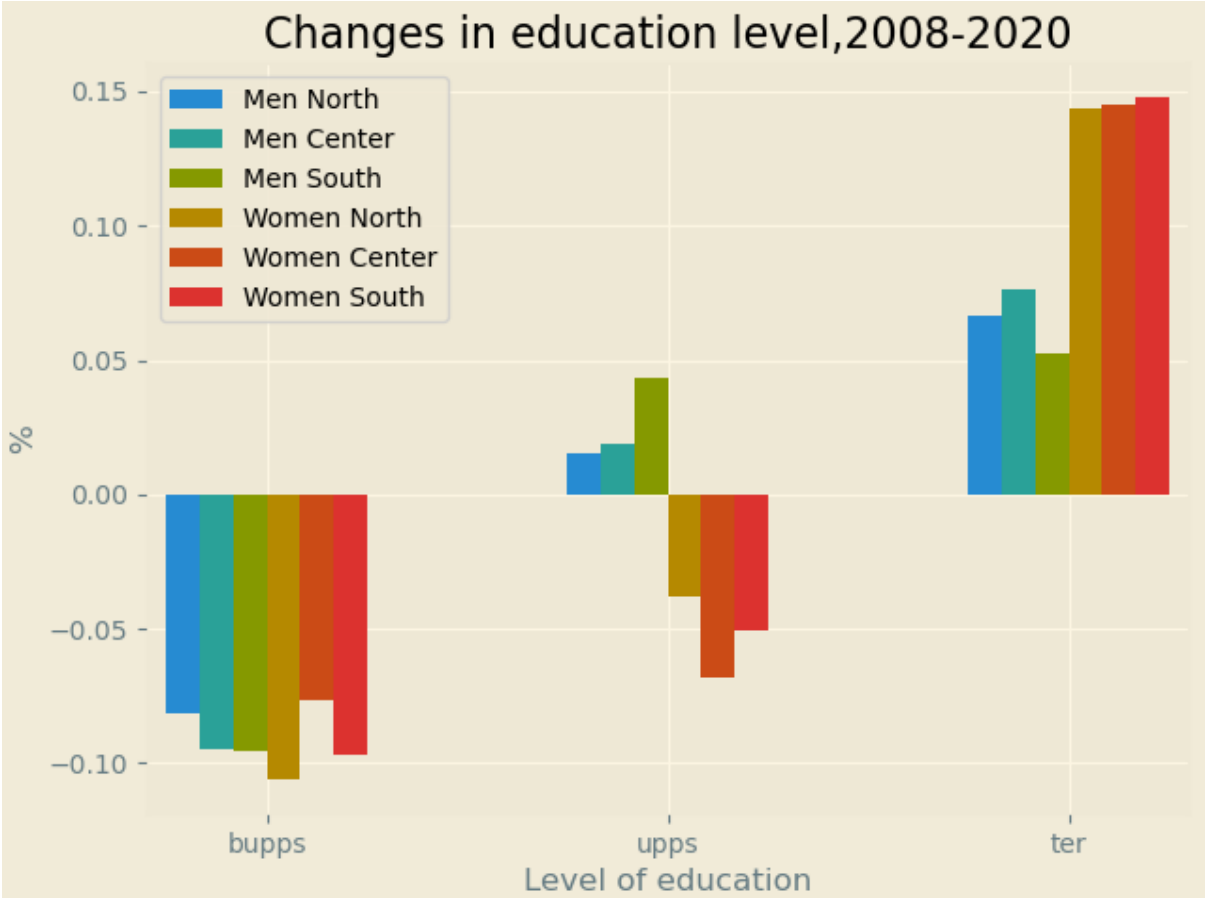

Figure 7, BUPPS contains all the education below a high school diploma, elementary and below, middle school and high school without a diploma. UPPS contains all the people with a high school diploma that did not reach a university degree. TER include all the people with at least a university degree.

On the other hand, in twelve years, gender gaps become wider mostly in tertiary education, from 4.5% to 12% in the North, 8%-15% in the Center and 10%-19% in the South as seen in tab x. Moreover, the gaps accelerated in women, while less in men, even if new cohorts share similar education distributions.

RIP3	SEX	MEN			WOMEN		
	ed_lvl	BUPPS	UPPS	TER	BUPPS	UPPS	TER
NORTH	2008	52,2%	37,1%	10,7%	38,4%	46,4%	15,2%
	2020	44,0%	38,7%	17,3%	27,8%	42,6%	29,6%
CENTER	2008	44,6%	43,4%	12,0%	27,9%	51,7%	20,4%
	2020	35,1%	45,3%	19,6%	20,2%	44,9%	34,9%
SOUTH	2008	55,0%	36,7%	8,2%	30,3%	51,8%	17,9%
	2020	45,4%	41,1%	13,5%	20,6%	46,7%	32,7%

Table 1, the variable is education in its three level. As said before, the population represented in the table are full time workers.

Before claiming that the job market requires a higher education level for women if they want to participate in the job market, it is useful to see the distribution of population education level, not employees.

A useful indicator is the gap in education between population and employees. It is normal to expect a negative gap at the bottom, BUPPS and, as a consequence, a positive one at the top, TER, since people with lower education will not participate in the job market.

RIP3	SEX	MEN			WOMEN		
	ed_lvl	BUPPS	UPPS	TER	BUPPS	UPPS	TER
NORTH	2008	-3,8%	5,2%	-1,3%	-15,5%	14,8%	0,6%
	2020	-4,8%	3,7%	1,1%	-15,5%	7,7%	7,8%
CENTER	2008	-5,0%	6,6%	-1,6%	-18,5%	15,2%	3,3%
	2020	-6,4%	5,0%	1,4%	-15,4%	5,3%	10,1%
SOUTH	2008	-3,8%	5,1%	-1,2%	-27,0%	20,7%	6,3%
	2020	-5,3%	4,0%	1,4%	-26,4%	10,2%	16,3%

Table 2, in which are computed the gaps between population and full-time workers, a negative gap imply that population possess a higher share of people at a certain level of education.

The biggest difference is in women at the bottom of the education ladder. By contrast the gap is widening only in men while in women the trend is the opposite. Both the sexes suffered an erosion of the gap in UPPS to favor one in TER. If in men the growth of the gap in TER is motivated by a contraction in both the UPPS and BUPPS, in women it is not. The gap in UPPS fed an increment in both the other categories. This is true in the Center and in the South with less intensity.

The fact that the job market may require higher education for women to occupy the same role of men with a lower level. Another explanation could be that less educated

women live in families with a higher gender's culture that do not allow them to work exiting their family role of wives. While the first is the definition of discrimination the second touch self-selection.

Moreover, the comparison of the two distributions, employees and population, between the three areas can be done using the Duncan segregation index (2).

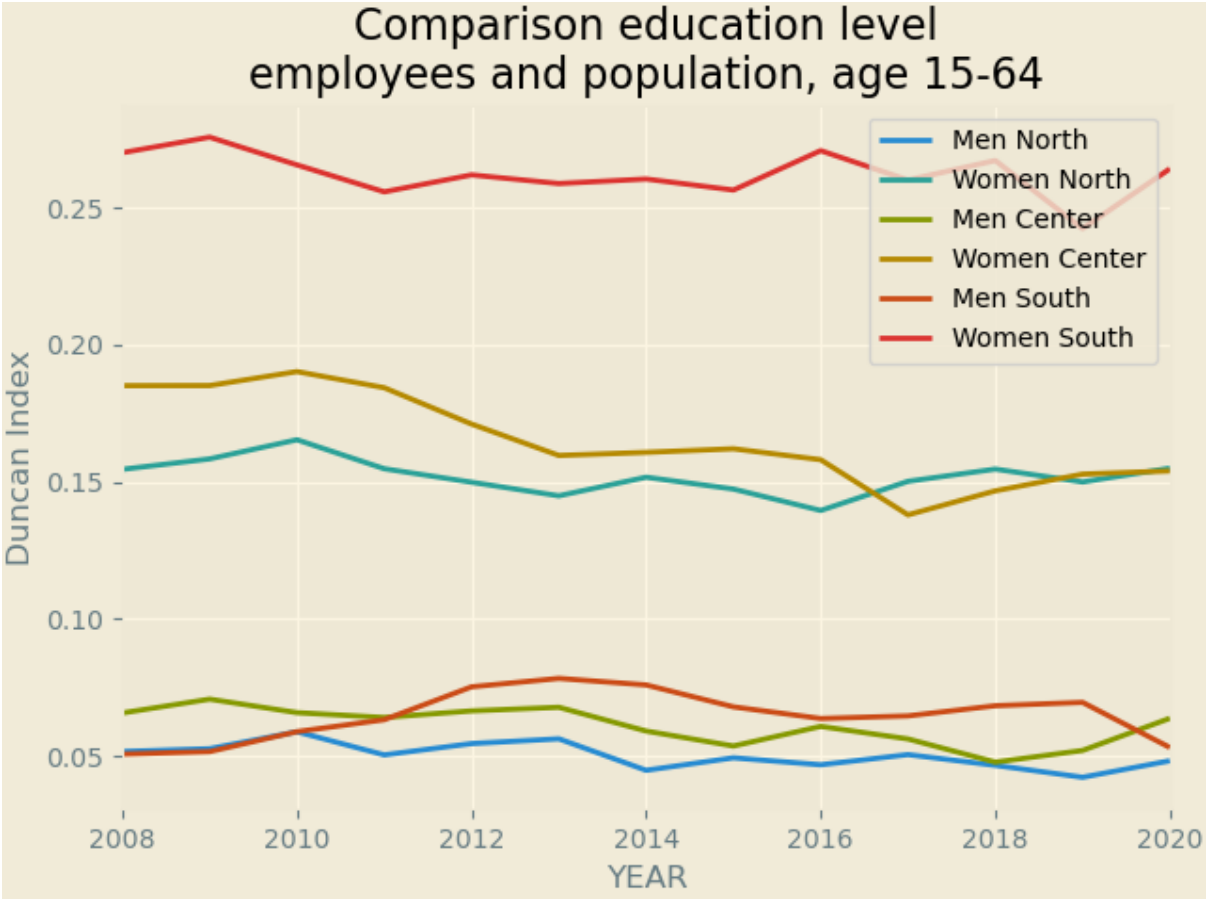

Figure 8, I computed the Duncan segregation index (2) on education using the gaps in table 2 for each year under analysis.

All the lines do not change much among twelve years, the only one is 'Women Center' that visibly reduced their difference in education between employees and population. This measure, Fig 6, could be an indicator of self-selection. As done in the work of Petrongolo and Olivetti (2006), accounting for all the women outside of the employees would reduce the GWR more in the South than in the North and Center.

3.2.2 Position

A big theme in labour economics is the difference between genders when it comes to career progression, and how gender roles influenced the outcomes. Even if that is far from my focus, a view on the position may be interesting. In non-discriminating economies where gender's culture is absent, the role covered may be an indicator of specific qualities, risk appetite, leadership, attachment to the firms and productivity.

However, this is not the case, but it is interesting to see the differences between the two distributions.

All the macro-regions display nearly the same distribution and differences between men and women. Most of the men are workmen (>51%, women 30%) while women are office workers (>57%, men>30%). Differences lessened from 2008 to 2020 where most of the changes implied bigger employment as office workers both for men and women. Only Southern Italy's men increased workmen's shares and decreased office workers. This reduction could have improved the GWR in Southern Italy by lowering the men's average earning. The reduction of 'South men' in the first three categories (manager, sub-manager, office workers) that managed to enlarge the share of workmen comes with a price since workmen earn a lower hourly wage than other categories.

If in 2008 the manager's share in North men accounts for 4% of their employees while 2% for women the gap has been reduced, in 2020 there is 0.9% gap. Center and South accounted for lower gaps in 2008 and managed to reduce them below 0.5% in 2020. The sub-manager's gap became negative in each macroarea, even the North in 2020 accounted for a negative one. The workmen's gap decreases in the Center area while rising in the other two parts.

RIP3	ANNO	MANAGER	SUB_MANAGER	WHITE_COLLAR	WORKMEN	INTERN
NORTH	2008	1,86%	1,56%	-26,97%	23,36%	0,20%
	2020	0,90%	-0,40%	-26,51%	25,57%	0,44%
CENTER	2008	1,30%	-0,46%	-22,22%	21,59%	0,07%
	2020	0,38%	-0,54%	-21,01%	20,65%	0,61%
SOUTH	2008	0,23%	-1,72%	-26,56%	28,03%	0,03%
	2020	0,02%	-3,59%	-27,95%	31,51%	0,02%

Table 3, a positive difference implies that men possess a higher share of employees in a certain position, a negative implies the opposite.

Moreover, everywhere in the Italian peninsula, macro-areas reduced the number of trainees during the last decade. In the North, they accounted for 1.5% of the workers in 2008 and became nearly below 1% while in the other areas they are even less in 2020 (Center 0.6% and South 0.4%).

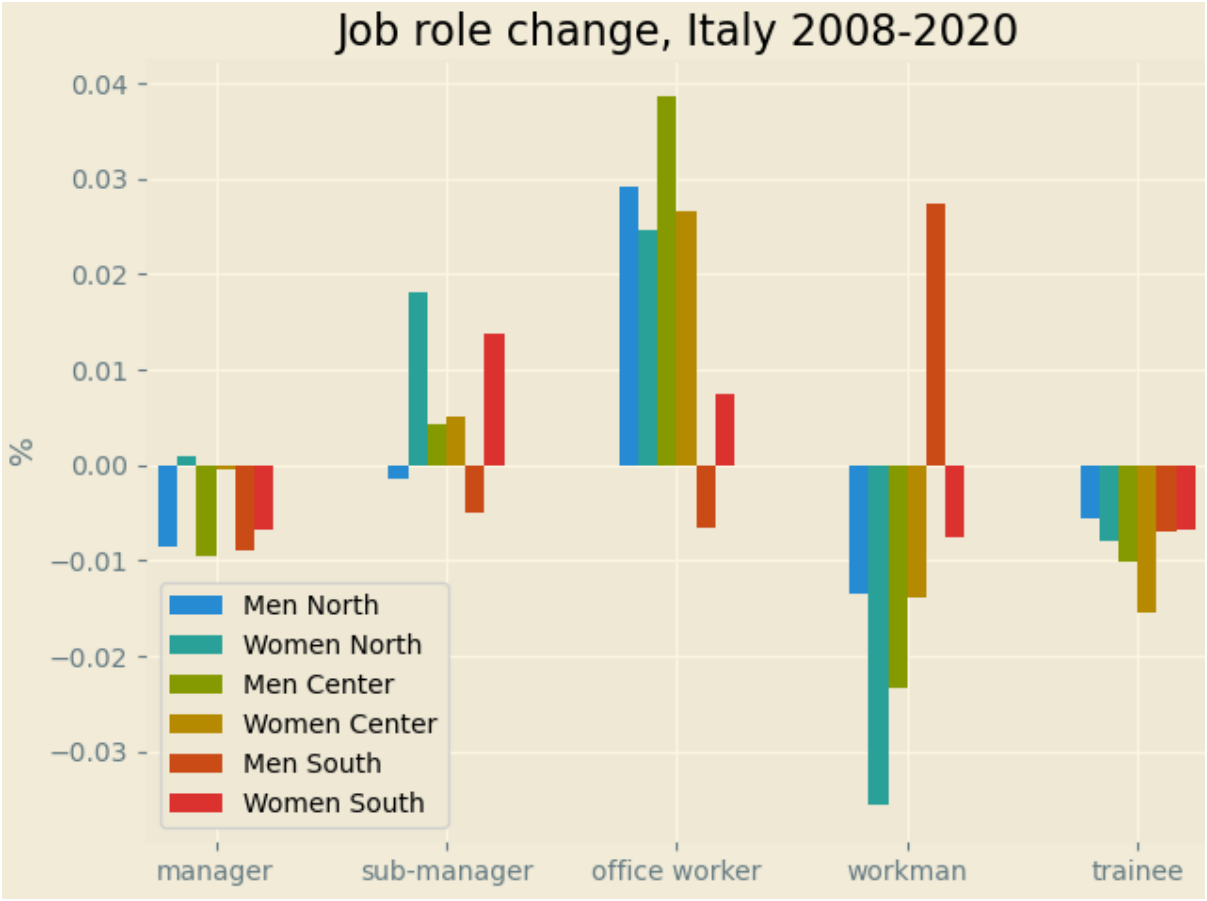

Figure 9, above the differences in work's position between 2020 and 2008 are plotted, a positive imply that in 2020 the share of a certain position is higher than in 2008.

3.2.3 Experience and duration of current employment

Unfortunately, the Istat does not provide a specific experience variable. The start to work age is mostly not available. The best proxy is the duration of current employment (DURATT), exploiting the rigidity of the Italian job market.

Overall it tends to be higher in men than women, higher in public than private.

descending the Italian peninsula DURATT lowers in the private sector while increasing in the public one. There is a big difference between men and women in the private sector in the South, 2 years while in the other macro regions it is less than 6 months. Overall DURATT in 2020 grew from the levels of 2008, more in the South and the Center than in the North due to the larger part of public employees.

Experience and education are the main elements of HC. Experience is one of the main aspects requested in job offers. The time spent working increases one's productivity due to learning specific tasks and processes. This variable is relevant in explaining the distance between men and women salaries, Blau and Kahn (2000) said that accounted for a third of the gap. The absence of experience will leave a great lack in the results of the regressions later in this writing.

4 Model

The model used will be Oaxaca and Ransom (1994) inspired from Oaxaca (1973) and Blinder (1973). The model is composed of two parts. In the first one, it is needed to fit three linear regressions, one considering men (A), another one considering women (B) and the last considering both (R). All of them use the log of hourly wage as a dependent variable. The parameters' estimates (Betas) and the matrix containing independent variables (X) are used to compute the gap below.

$$\Delta\bar{Y} = \underbrace{(\bar{\boldsymbol{X}}_A - \bar{\boldsymbol{X}}_B)'\hat{\boldsymbol{\beta}}_R}_{\text{explained}} + \underbrace{\underbrace{\bar{\boldsymbol{X}}'_A(\hat{\boldsymbol{\beta}}_A - \hat{\boldsymbol{\beta}}_R)}_{\text{unexplained A}} + \underbrace{\bar{\boldsymbol{X}}'_B(\hat{\boldsymbol{\beta}}_R - \hat{\boldsymbol{\beta}}_B)}_{\text{unexplained B}}}_{\text{unexplained}} \quad (3)$$

In the X, there are the variables used to estimate the model. To estimate sector and position: private/public dummy, sector dummies (12) interaction terms with private/public dummy, job's dummies (144). To estimate HC: age dummies (linear by a factor of 5), duration of current employment, job position (4), education dummies (2).

Equation (3) is divided into two parts. The first is the above cited endowment effect, how much the difference in HC and sector account for pay gap, the second is the unexplained part, composed of discrimination and unaccounted for parameters.

The unexplained part is split into two parts. I will refer to the first (unexplained A) as unexplained men and the second as unexplained women. Endowment can be split into Sector and HC (human capital) to have a clearer view of their impact on the GWR.

The computation will be done for each year and macro-area.

4.1 Oaxaca and Blinder 2008-2020.

A comparison between GWR (5) and Adj GWR (6) is useful to make.

$$\Delta\overline{Y} = -\left(\ln(\overline{W}_w) - \ln(\overline{W}_m)\right) \quad (4)$$

$$GWR = \exp(-\Delta\overline{Y}) \quad (5)$$

$$ADJ\,GWR = \exp\left(-(\Delta\overline{Y} - (\overline{X}_A - \overline{X}_B)'\,\widehat{B}_R)\right) \quad (6)$$

$$\Delta\overline{Y} - (\overline{X}_A - \overline{X}_B)'\,\widehat{B}_R = \overline{X}'_A\,(\widehat{B}_A - \widehat{B}_R) + \overline{X}'_B\,(\widehat{B}_R - \widehat{B}_B) \quad (7)$$

The view of the pay gap after the adjustments is completely new and unexpected. The Adjusted GWR become the gap accounting for endowments effects (6) and the sum of unexplained gaps (7). The terms in the equation (4,5,6,7) are the same as (3). It shows the hypothesis of the GWR in absence of difference in the measured characteristics.

Adj GWR becomes higher than the GWR only if the endowment effect is positive and justifies a GWR below 1 in the absence of discrimination.

From first to last, the ‘Mezzogiorno’ becomes the place where the gap is higher. In fact, the endowment accounted for an average of -6.21%, implying that the GWR needed to grow to 106% to reach equality. On the other hand, Central and Northern Italy recorded -0.96% and 0.72% of the endowment's effect, implying that an equal pay would make the Center GWR slightly above the unity and the North a little below. The first member of equation 2 is always negative in the Center and South, excluding 2016, while it is always positive after 2011 in the North.

These results are in accordance with “unequal pay or unequal employment” where countries with higher self-selection to the job market resulted in bigger discrimination and a hidden pay gap since the endowment effect will be negative.

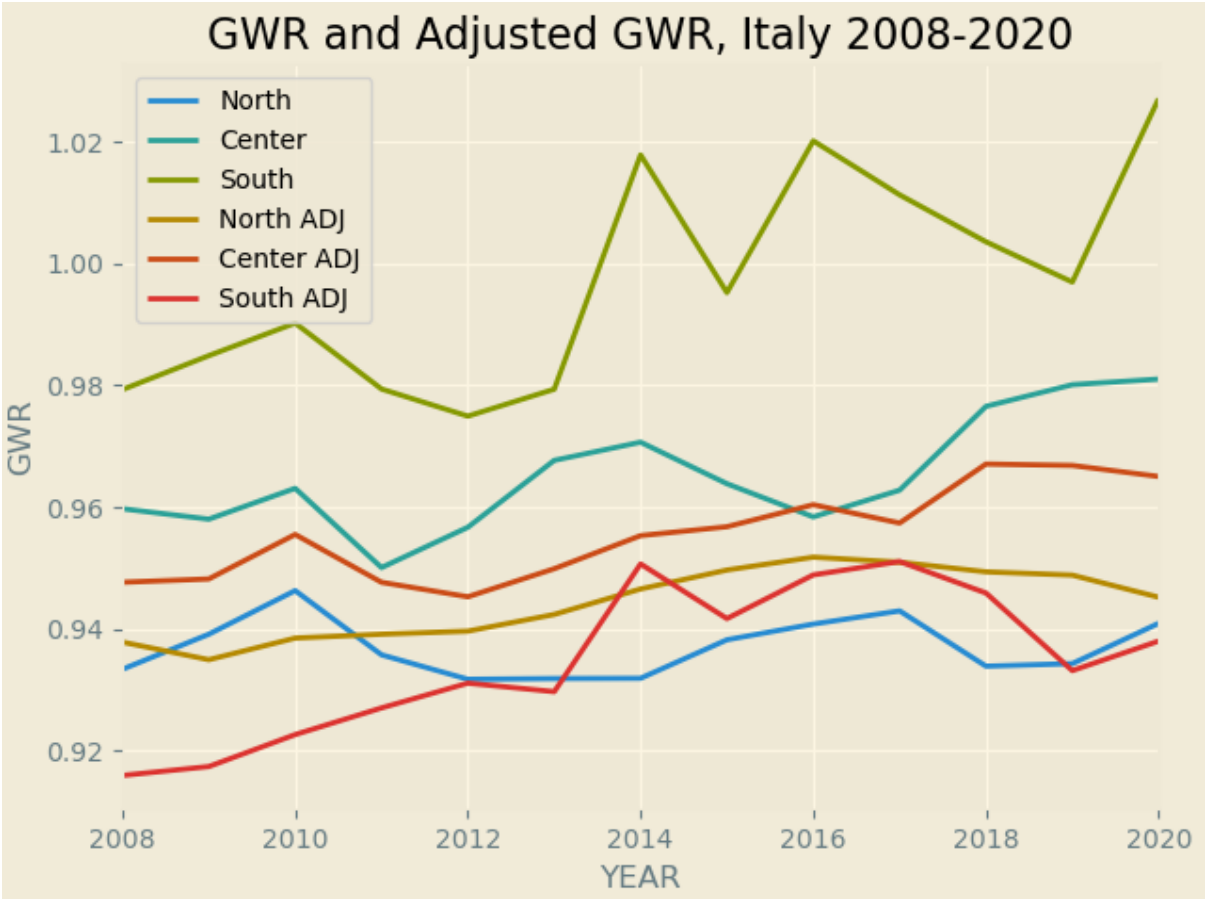

Figure 10, GWR = 1 – gap, ADJ GWR = 1 – unexplained gap. The adjusted GWR account for the endowment effect.

An interesting partition of endowment and discrimination is given in table 4, where are represented the mean effect of specific categories. By using equation (3) it is possible to understand the effect of the independent variables used in the models. A negative endowment suggests a positive effect on the ADJ GWR, since, with a zero effect of the unexplained parts, the gap would be lower than zero and the ADJ GWR would be bigger than one. Two negative unexplained terms reveal a women's coefficient as the highest and the one used to evaluate both sexes bigger than the

men’s. On the other hand, two unexplained terms with contrasting signs result in the parameter’s estimates, Br being less or more than both of them.

The intercept was taken considering as a base case an unqualified worker in agriculture with a below upper secondary education. In the North and South is the highest parameter contributing to GPG, 10.8% and 6.1% whereas in the Center resulted in a negative 2.3%. By definition the intercept cannot trigger an endowment effect different from 0. Surprisingly in the Center a negative unexplained women effect was registered.

The sector variables are positive in terms of endowment in each macro-area, but other than the Center all registered a negative gap implying that adjusting for sector center would record a lower GWR, it justifies a 5.5% of pay gap. In the other two macro-regions is slightly negative, the effect of the unexplained gap, mostly men’s, is higher.

Professions recorded a positive endowment in both North and Center while a negative one in the South. A bigger unexplained effect made the job’s impact negative on the gap in the North, while the opposite is true in the other two regions.

Position and Education recorded negative endowments and gaps everywhere. Women do earn more than men by becoming managers, but not by becoming sub-managers ceteris paribus. On the other hand, Age and DURATT reported negative endowments everywhere, but positive and null gaps in Center and North. Ceteris paribus being one age older is more valuable to men than women whereas for duration of current employment is the opposite.

Finally, the endowment effect is different in the peninsula, higher in the North and lower in the South, while the unexplained women is always higher than the unexplained terms that account for differences with men.

It is important to mention that the unexplained terms, unmeasured features and discrimination, are not always positive, for example in education. Looking at equation (3), unexplained women is the third member, a degree is more valuable in evaluating women's pay than men’s or both.

RIP3	PARAMS	ENDOWMENT	UNEXPLAINED_MEN	UNEXPLAINED_WOMEN	GAP
NORTH	AGE_DURATT	-0,332%	-0,057%	0,382%	-0,006%
	EDUCATION	-0,770%	-0,391%	-0,997%	-2,158%
	POSITION	-1,621%	0,573%	0,777%	-0,270%
	PROF_TOT	1,922%	0,528%	-3,475%	-1,026%
	SECTOR_TOT	1,521%	-1,699%	-0,858%	-1,035%
	intercept	0,000%	3,186%	7,610%	10,796%
	TOT	0,721%	2,140%	3,439%	6,301%
CENTER	AGE_DURATT	-0,466%	0,178%	0,554%	0,266%
	EDUCATION	-1,027%	-0,189%	-1,027%	-2,243%
	POSITION	-1,700%	0,475%	0,932%	-0,293%
	PROF_TOT	1,428%	0,458%	0,611%	2,497%
	SECTOR_TOT	0,798%	0,335%	4,420%	5,553%
	intercept	0,000%	0,460%	-2,769%	-2,309%
	TOT	-0,967%	1,716%	2,722%	3,471%
SOUTH	AGE_DURATT	-0,526%	-0,355%	-0,130%	-1,011%
	EDUCATION	-1,714%	0,105%	-1,721%	-3,330%
	POSITION	-2,520%	0,071%	-0,532%	-2,982%
	PROF_TOT	-1,658%	0,730%	3,542%	2,614%
	SECTOR_TOT	0,205%	-1,291%	-0,048%	-1,134%
	intercept	0,000%	2,787%	3,359%	6,146%
	TOT	-6,213%	2,046%	4,470%	0,303%

Table 4, in the table above are computed the means of the terms of equation (3) grouped by the type of variables. The column GAP is the sum of the previous three.

4.2 Oaxaca and Blinder using age

Another interesting view of the Italian heterogeneity could be looking at a decomposition explaining the GWR by age.

In the first two age bands, the Adjusted GWR of North and Center is the maximum of the series and is higher than the non-adjusted one. The endowment effect is positive and explains a part of the gap. North and Center follow more or less the same path. Both of them conclude with a positive endowment effect, Center in the last two age bands, North from 40 years old. Only in the South 20-24 band is the minimum of the adjusted line, but account for a positive endowment too. In contrast, Mezzogiorno does not arrive at 60-64 with a positive endowment effect, but with its deeper negative, -12%.

The hypothesis of higher discrimination in older people is refused if the unexplained part is considered as discrimination. Probably, a more precise view of segregation could give us a reliable answer.

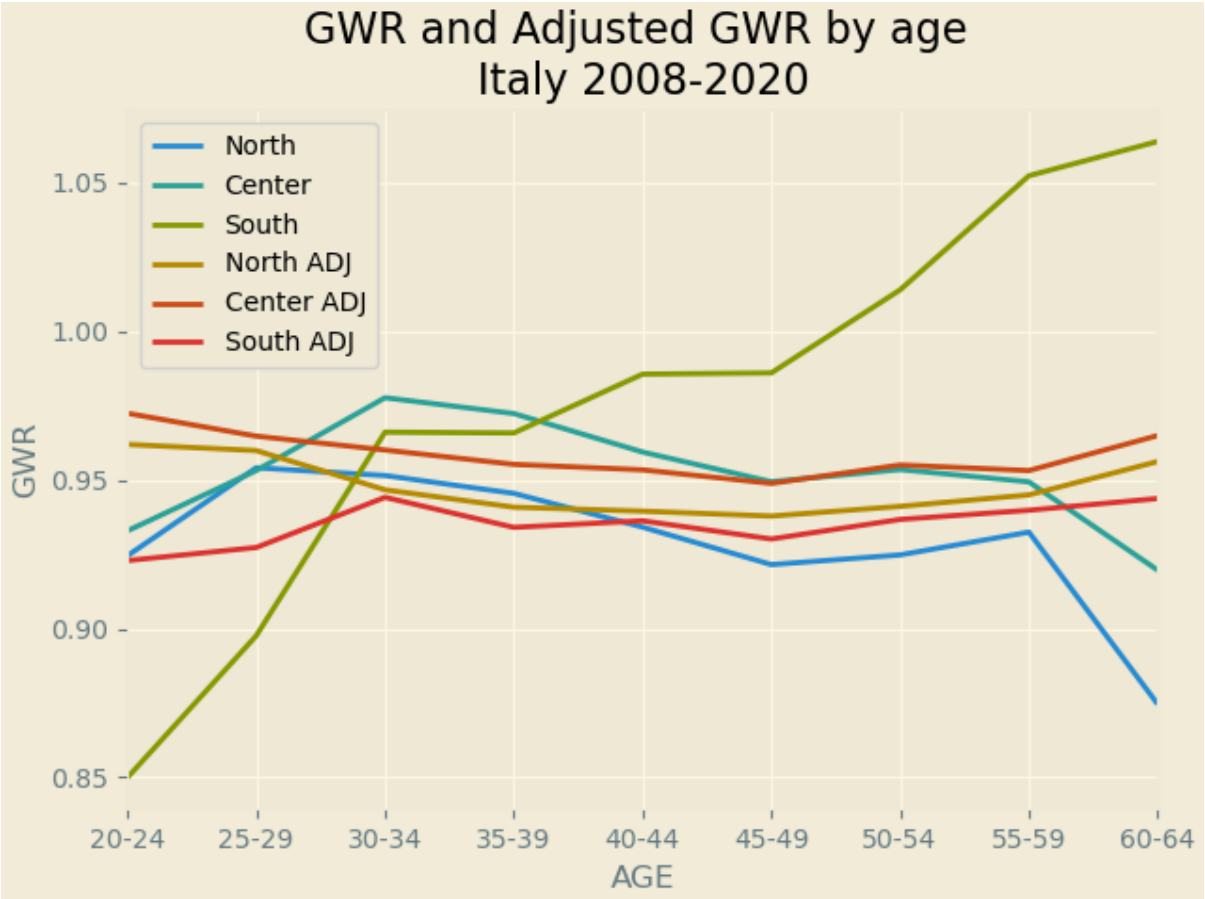

Figure 11, above the GWR and the ADJ GWR are represented, using as x-axis the Age, as done in figure 2.

Education and Position displayed a negative endowment in most of the groups in the partition. A bigger part of the impact of Education on the gender pay gap is increased by a negative sign of the unexplained members. It holds till the 60-64 years band where it becomes positive, a higher level of education is more valuable to men in the older cohorts. A university degree ceteris paribus increases the log hourly wage of 0.3 of the youngest women in the South, while just 0.21 in the corresponding male part. Even in Central Italy the higher impact of a university degree is the first cohort for men (0.17), but not for women where it is the 45-49 interval (0.13). In the North it is 40-45 (0.12) for women and 60-64 (0.12) for men.

On the other hand, the women's Position, excluding Mezzogiorno, displayed a positive endowment in the last age band. Both in men and women the effect of becoming manager or submanager is lower with the increasing of the age while it is not the one of white collar, higher in men than women.

Sector's variables revealed a negative endowment in people older than 35 in the South. This implies that women in North and Center were employed in less remunerative sectors than their male counterparts. While in the South this statement is true for younger cohorts.

Duration of current employment exhibits negative endowments in people older than 55, older women registered higher values of attachment to works. Job's type (PROF_TOT) demonstrates the hypothesis of higher self-selection in Southern Italy's

women, it became negative after age 40 and always increased their endowment value implying that only women in high pay jobs worked. In addition, the last cohorts of South women registered as negative all the endowments parameters.

In table 5 the total gaps, the sum of the explained and unexplained part, is shown.

RIP3	AGE	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
NORTH	DURATT	-1,54%	-0,30%	0,67%	-0,25%	-1,75%	-2,02%	-1,50%	-2,48%	-4,16%
	EDUCATION	-0,62%	-1,54%	-2,77%	-3,19%	-2,82%	-2,51%	-2,24%	-1,36%	2,47%
	POSITION	-2,93%	-2,71%	-0,46%	0,05%	-0,21%	0,87%	1,47%	2,64%	5,52%
	PROF_TOT	4,70%	-60,14%	-10,87%	-0,63%	-4,83%	20,63%	-2,23%	2,72%	24,32%
	SECTOR_TOT	-3,89%	-0,24%	9,03%	-2,42%	-7,74%	-3,84%	4,27%	-5,75%	3,31%
	intercept	11,84%	69,53%	9,25%	11,90%	23,94%	-5,28%	7,76%	10,99%	-18,92%
	TOT	7,55%	4,59%	4,86%	5,46%	6,59%	7,85%	7,52%	6,76%	12,54%
CENTER	DURATT	-0,88%	0,45%	1,24%	-0,71%	-0,94%	-1,63%	-2,60%	-1,61%	1,85%
	EDUCATION	0,04%	-2,79%	-1,23%	-1,67%	-2,42%	-4,65%	-2,17%	-1,51%	0,69%
	POSITION	-2,03%	-0,51%	-2,30%	-0,47%	-2,45%	-0,64%	2,15%	2,52%	3,87%
	PROF_TOT	5,22%	3,83%	18,41%	-0,90%	10,38%	9,27%	25,92%	0,57%	-2,83%
	SECTOR_TOT	-0,23%	6,81%	19,67%	14,80%	3,40%	4,14%	-3,05%	7,45%	-9,79%
	intercept	4,61%	-3,09%	-33,56%	-8,28%	-3,91%	-1,43%	-15,60%	-2,36%	14,25%
	TOT	6,71%	4,69%	2,24%	2,77%	4,07%	5,06%	4,65%	5,07%	8,04%
SOUTH	DURATT	-1,81%	1,02%	0,85%	0,58%	0,01%	-1,25%	-1,04%	-2,51%	-0,58%
	EDUCATION	-3,73%	-7,33%	-3,72%	-3,01%	-3,25%	-3,86%	-3,59%	-1,92%	-1,01%
	POSITION	-0,64%	-2,92%	-3,58%	-3,04%	-2,46%	-3,93%	-2,34%	-3,39%	-5,34%
	PROF_TOT	34,59%	-11,83%	1,75%	23,23%	18,45%	30,23%	0,66%	-13,74%	-6,15%
	SECTOR_TOT	11,47%	8,24%	5,98%	-2,19%	-6,21%	-10,00%	-7,57%	-11,35%	-9,29%
	intercept	-24,87%	23,05%	2,12%	-12,16%	-5,09%	-9,79%	12,50%	27,70%	16,00%
	TOT	15,01%	10,24%	3,40%	3,42%	1,45%	1,41%	-1,38%	-5,22%	-6,37%

Table 5, gaps, sums of explained and unexplained effects, are shown partitioned by age and macro-regions.

5 Conclusion

Italy has demonstrated to be full of its intriguing heterogeneity that pushed me to the gender pay gap in the Peninsula focusing on macro-areas.

The biggest factors of distinction are public employment, public-private wage ratios, differences in duration of current employment, position trends with the South alone growing its share of male workmen. In contrast, there are some common points like the descending job segregation, the gap between men and women in education.

In certain characteristics, Central Italy positioned in the middle between North and South, share of public employment, in others revealed to be less far from the Northern part of the country. Clear views could be GWR by age and income and segregation in education where the two converged.

A convergence did not appear in discrimination where the stances were motionless. After the adjustment, Mezzogiorno's position at the bottom of the three and differently from the raw indicator registered a 2% in growth of adjusted GWR instead of 4%, whereas North and Center scored the same as before with different paths. North and South remained below Central Italy in adjusted GWR even when it comes to age. The hypothesis of lower discrimination in the younger generation holds in North and Center while was not confirmed in the South.

Women demonstrated that an equal pay gap would be slightly below the unity in the North, above in the Center and 7% over in the South. Education and Position were the features that, in each area, contributed more with negative effects on the endowments.

Finally, this research lacks a great component, an experience variable that could explain better the differences in pay, building or obtaining a reliable measure would be a great improvement of the model. Future works could go in the direction of building a reliable estimate of self-selection to understand more of its dependence with the GWR by age in the South. Another point of view could be understanding why certain steps, for example working as a collar worker, are more valuable to one of the two sexes and why their effect increases or diminishes with aging. An additional variable could be the firm's size and the dimension of the city where people live, using regional or macro-area partitions.

6 References

Alesina, A., Danninger, S., & Rostagno, M. (2001). Redistribution through public employment: the case of Italy. *IMF Staff Papers*, *48*(3), 447-473.

Arrow, K. J. (1972). Models of job discrimination. *Racial discrimination in economic life*, *83*.

Arulampalam, W., Booth, A. L., & Bryan, M. L. (2007). Is there a glass ceiling over Europe? Exploring the gender pay gap across the wage distribution. *ILR Review*, *60*(2), 163-186.

Becker, G. S. (2010). *The economics of discrimination*. University of Chicago press.

Blau, F. D., & Kahn, L. M. (1999). Analyzing the gender pay gap. *The Quarterly Review of Economics and Finance*, *39*(5), 625-646.

Blau, F. D., & Kahn, L. M. (2000). Gender differences in pay. *Journal of Economic perspectives*, *14*(4), 75-99.

Blau, F. D., & Kahn, L. M. (2006). The US gender pay gap in the 1990s: Slowing convergence. *Ilr Review*, *60*(1), 45-66.

Blinder, A. S. (1973). Wage discrimination: reduced form and structural estimates. *Journal of Human resources*, 436-455.

Campa, P., Casarico, A., & Profeta, P. (2011). Gender culture and gender gap in employment. *CESifo Economic Studies*, *57*(1), 156-182.

Dell'Aringa, C., Lucifora, C., & Origo, F. (2007). Public sector pay and regional competitiveness. A first look at regional public–private wage differentials in Italy. *The Manchester School*, *75*(4), 445-478.

Fortin, N. M. (2005). Gender role attitudes and the labour-market outcomes of women across OECD countries. *oxford review of Economic Policy*, *21*(3), 416-438.

Mincer, J., & Polachek, S. (1974). Family investments in human capital: Earnings of women. *Journal of political Economy*, *82*(2, Part 2), S76-S108.

Kee, H. J. (2006). Glass ceiling or sticky floor? Exploring the Australian gender pay gap. *Economic Record*, *82*(259), 408-427.

Nicodemo, C. (2009). Gender pay gap and quantile regression in European families.

Oaxaca, R. L., & Ransom, M. R. (1994). On discrimination and the decomposition of wage differentials. *Journal of econometrics*, *61*(1), 5-21.

Oaxaca, R. (1973). Male-female wage differentials in urban labor markets. *International economic review*, 693-709.

Olivetti, C., & Petrongolo, B. (2008). Unequal pay or unequal employment? A cross-country analysis of gender gaps. *Journal of Labor Economics*, *26*(4), 621-654.

Phelps, E. S. (1972). The statistical theory of racism and sexism. *The american economic review*, *62*(4), 659-661.

Piazzalunga, D., & Di Tommaso, M. L. (2019). The increase of the gender wage gap in Italy during the 2008-2012 economic crisis. *The Journal of Economic Inequality*, *17*(2), 171-193.

Tsani, S., Paroussos, L., Fragiadakis, C., Charalambidis, I., & Capros, P. (2013). Female labour force participation and economic growth in the South Mediterranean countries. *Economics Letters*, *120*(2), 323-328.

Waldfogel, J. (1998). The family gap for young women in the United States and Britain: can maternity leave make a difference?. *Journal of labor economics*, *16*(3), 505-545.