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**The lifetime gender gap in Italy.
Do the pension system countervails labour market outcomes?**

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Abstract

In Italy large work career gender gaps currently exists, particularly regarding wages and activity rates. The paper investigates the issue looking at lifetime incomes, where from the one side all the career gaps tend to accumulate, from the other the redistribution acted by the pension system may mitigate the differences. Exploiting an original database on the entire work careers, we document how the pay gap constantly opens with age and how women tend to cumulate lower seniority. Both gaps have an impact in the pension calculation, so that the day after retirement gender differences are even higher. By means of a microsimulation model we show that the pension system partially countervails labour market outcomes, implying lower differences in lifetime incomes. However, due to the current transition to an actuarially neutral system, the effect is going to vanish in following decades, posing some concerns about future prospects of gender income inequality.

Introduction

Taken at their face value, the differences in average wages earned by men and women in Italy do not seem particularly worrying. The most recent estimates on the unconditional gender wage gap are below 6%, which are among the lowest levels among developed countries (EC 2011; OECD 2010). A consistent literature, however, has showed that if one turns to conditional differences, controlling for the main socio-economic characteristics of workers and possible selection effects of women into employment, the gender bias is much higher and more in line with what is currently found in many countries (Isfol 2011; Centra and Cuttillo 2009; Olivetti and Petrongolo 2008; Addabbo and Favaro 2007; Rustichelli 2005; Istat 2005). Plus, a

“glass ceiling” seems to exist, meaning that gender discrimination is binding particularly for high wages and top professions (Isfol 2011; Arulampalam et al. 2005).

Another area where gender differences do raise concerns in Italy is about employment. From the one side, women labour market participation is far below the targets the European Council set in Lisbon and Stockholm and is far below men participation. Statistics say that Italy, with Malta and Greece, is the only European country where the gender activity gap is over 20 percentage points, to be compared with the Nordic and Baltic countries where the gap is 7 percentage points or less (Eurostat 2010). From the other side, women who do participate to the labour supply face in Italy a probability of unemployment sensibly higher than men (Leombruni and Richiardi 2006; OECD 2004; Azmat, Güell and Manning 2004; European Commission 2002). Both factors translate into a gender employment gap which is the highest among European countries (Olivetti and Petrongolo 2008).

A unifying perspective to address the various gender gaps that may open in a work career is that of lifetime incomes. A large employment gap, even when associated with just mild wage differences, translates into a large lifetime work income gap. Moreover, in most countries both the seniority and the average pay are taken into account in the pension calculation, so that the two kind of gaps do translate also into low pensions. It has been estimated that on average in Europe 22% of women aged 65 and over are at risk of poverty compared to 16% of men, and the pay gap is considered a driver of the difference (European Commission, 2011). Under this respect, Italy is again a country where the gender bias is high. In 2003, 50% of retired women were earning a pension about € 520, which is barely above the minimum pension threshold, to be compared with a median pension for males which was roughly two times higher (Mundo 2007).

Although relevant, the empirical evidence on gender differences in lifetime incomes is scant, mostly due to the limited availability of sufficiently long panel data. Exploiting two different databases of administrative source – the *Work Histories Italian Panel* (WHIP) and the National Social Security Administration (INPS) *Contribution Accounts* (CA) archive – we have been able to recover the entire work career of a sample of people who retired at mid 2000s. The first contribution of the paper is to exploit these data to study how gender differences evolve over the work career and how they translate into differences in lifetime work incomes. The main result is that the differences in weekly wages do amplify with age: they are low at the very start of the career (under 10%) and reach 23.4% just before retirement, with a sensibly worse situation among white collar women. Looking at lifetime work income the gap is higher, at 27.7%, due to the lower seniority accrued by women.

We then turn to the question whether the pension system mitigates these gaps. This is of particular importance in Italy, since the old defined benefit system is being gradually abandoned towards a regime inspired by actuarial fairness. For all workers under the new regime the lifetime work income will matter, so that whichever differences have accumulated during the work career will be reflected also during retirement. Was the old system really mitigating the gender differences? If so, next

decades could witness a further deterioration of the situation of elder women in Italy. Actually, the old system was progressive in the books but contained also many other sources of horizontal redistribution, so that to assess whether it was really redistributive or not is by all means an empirical matter. To address this, we build a microsimulation model social security contributions, pension calculation- and updating rules active in the period. The main result is that for the cohort under investigation the pension system partially countervails labour market outcomes, implying a lifetime income gap 30% lower than the lifetime pay gap.

The paper is organized as follows. In next section we review the current evidence about the gender pay- and employment gap in Italy. We then present the main features of Italian pension system pre- and after the reforms, with the focus on its redistributive features. In sections four we describe the data we collected on work careers and the microsimulation model we used to extend them after retirement. We then move to the analysis of the various gender career gaps that we can measure in the data and how they are modified taking into account the pension system. A final section will resume the main results and briefly discuss the policy implications.

An overview on gender career gaps in Italy

The gender pay gap

Looking at the magnitude of the pay gap, gender disparities in Italy are unquestionably low when compared to most developed countries. The OECD average gap in 2008 was about 18% for full time workers', slightly over 15% considering the gap in median earnings instead than average ones (OECD 2010). The same figures for Italy were as low as 1.2% and 1.3% respectively. Within Europe, the European Commission reported that in 2009 women earned in average 17% less gross hourly wages than men in the EU-27 as well as in the euro area (EC 2011, public administration and defence workers excluded). Italy had the second lowest gap, at 5.5%.

This is not a recent achievement. Even though the trend observed in last decades has been that of a reduction, a consistent literature had shown that already in the Nineties the unadjusted pay gap in Italy was among the lowest¹. Moreover, it is the only country where the gap is completely absent in the public sector – to be compared, for instance, with a gap over 20% in Britain, Finland and the Netherlands (Arulampalam et al. 2005; European Commission 2002).

As we will discuss, this is just as a first-round evidence, which has to be checked for possible composition and/or selection effects and complemented taking into

¹ See Centra and Cutillo 2009; Olivetti and Petrongolo 2008; Addabbo and Favaro 2007; Arulampalam et al. 2005; European Commission 2002. The reduction in the unadjusted gap has been documented in Mundo e Rustichelli 2007; Favaro and Magrini 2005; Rustichelli 2005. For a recent assessment considering a wider set of countries see Nopo et al. (2011). For a review of the studies measuring the wage gap in Italy see Addabbo e Favaro (2007).

consideration also other career aspects. Before we do this, however, let us briefly summarize the current discussion on gender differences in wages.

Many theories have been put forward to explain the pay gap and its variability across countries, with the intent of understanding whether there is an economic rationale behind it or we should take it as a sign of gender discrimination. The most immediate is to try and explain unadjusted differences in wages with differences in observable characteristics that the labour markets rewards, such as education. The general conclusion that one can drive from the literature is that an important component of the differential remains unexplained, pointing to some form of discrimination (Ñopo et al. 2011). To our purposes, the most interesting strand of the literature is focused on how and when these differentials emerge during work careers.

A common stylized fact under this respect is that gender differences are relatively modest at the labor market entry and increase over time, with the exception of Germany, where there is a high entry wage differential (Hospido 2009; Manning and Swaffield 2008; Napari 2006; Kunze 2002). A common explanation traces back this stylized fact to differences in human capital accumulation. Women accumulate less work experience because they have a more irregular labour market attachment and engage more often in part-time work. Moreover, the anticipation of their lower attachment may affect current investments in human capital (Ben-Porath, 1967). Another important approach is the job-shopping theory (Topel and Ward, 1992), which states that an important part of wage growth is associated with moving from worse to better-paying jobs. Under this respect, women are typically more constrained in their opportunities to change jobs than men and are less concerned with money when they do (Manning 2003a).

Manning and Swaffield (2008) investigate this in the UK. At labour market entry the differences are negligible but ten years after they measure a gap of 25 log points. They try and decompose the gap resorting to human capital and job shopping theory, plus a theory put forth by Babcock and Laschever (2003) which argues that women tend to have a lower opinion of themselves than men so do not ask their bosses for what they want and passively accept wage offers rather than bargain for better conditions. Manning and Swaffield's estimate that human capital factors can explain about 12 log points of the overall gap, job-shopping 1.5 log points and the psychological factor half a log point. This means that a substantial unexplained gap remains: women who have continuous full-time employment, have had no children and express no desire to have them earn about 12 log points less than equivalent men after 10 years in the labour market.

Also in Finland (Napari 2006) the gender wage gap increases significantly during the first 10 years of the career. Focalizing on university graduates, the author shows that gender differences in the accumulation of work experience and in the type of education explain about 16 percent of the gap; differences in employer characteristics account about 10 percent; differences in background characteristics account about 27 percent. The most important single factor contributing to the gender wage gap is the

family type: Women seem to suffer considerable larger wage losses due to marriage and children than men.

Spain is another country where the opening of the wage gap in the early phase of the career has been associated both to a gender wage penalty to interruptions and a gender wage penalty to mobility (Hospido 2009).

Indeed, the origins of the wage gap have been vastly investigated also for Italy. For what concern both the conditional level of the gap and the “return to characteristics” story, the general result is not a positive one: as it seems, the conditional gap is much higher than the unadjusted one, and the part due to different returns to characteristics, usually interpreted as discriminatory, is high and increasing in time. Istat (2005), focusing in the industry and service sectors and considering only companies with at least 10 workers find for 2002 a wage gap around 16 percentage points; the Oaxaca-Blinder decomposition shows that the 69.4% of the gap is due to the different returns to characteristics. Rustichelli (2005) estimates a random effect model to explain wages of private sector non agricultural employees in 1996-2002, obtaining a wage gap of 39 log points, that for the 69% is due to the different returns to characteristics – a share which is increasing in time. The latter evidence is confirmed by the “Comitato nazionale parità e pari opportunità” (*National Committee for Parity and Equal Opportunities* 2001), which reported a discriminatory part rising from 81% to 84% from 1993 to 1995 (the gender wage gap moving from 25 points to 20); and by Flabbi (2001), which estimated a discriminatory part going from 54.3% in 1977 to 72.8% in 1995 (the gender wage gap moving from 29.4 points to 18.9).

A recent study exploiting an *ad hoc* survey delivered in 2007 confirms these results (Isfol 2011). Actually, just a negligible role for composition effects is reported, which moreover is negative in sign – meaning that women carry in the labour market characteristics which on average are more valued than those brought by men. A further result reported is that, although the discriminatory part is decreasing in education, a “glass ceiling” exists, meaning that gender discrimination is binding particularly for high wages and top professions. The latter result was reported also in Arulampalam et al. (2005), who found a glass ceiling in Italy and in four other European countries (Denmark, Finland, France and the Netherlands).

For what concerns work careers, Del Bono and Vuri (2008) find confirmative evidence that the wage gap is modest at labour market entry and increases over the time. They find that the average female to male wage ratio is as high as 94.8% at the time of entry into the labour market, but decreases to about 84.9% after the first ten years of working experience. They find a substantial difference in wage growth due to job changes and that this gender differential is particularly large when considering between-firm, rather than within-firm job changes. Similar results are reported also in Biagioli (2007) and Tronti (2007).

The employment gap

Olivetti and Petrongolo (2008) put the accent on other gaps, mostly the one on employment rates. Their starting point is the observed negative correlation in Europe between the gender wage- and the employment gap. The authors argue that the differences in employment should not be taken as random and that the selection of women into work may play an important role in explaining the observed wage gaps. The idea is that, if women who are employed tend to have relatively high-wage characteristics, low female employment rates are consistent with low a wage gap simply because low-wage women are not featured in the wage distribution. Using various techniques they impute wages for those not in work in a given year, obtaining higher median wage gaps for most countries. The increase is small in the US, the UK and most central and northern EU countries, and becomes sizeable in Ireland, France and southern EU, all countries in which gender employment gaps are high. In particular, in Italy the median wage gap on the imputed wage distribution reaches closely comparable levels to the other countries.

Actually, if we take a life cycle perspective, the existence of an employment gap is *per se* important for its consequences on life time incomes. A large employment gap, even when associated with just mild unitary wage differences, translates into a large lifetime work income gap. Moreover, in most countries both the employment intensity during the life course and the average pay are taken into account in the pension calculation, so that a given lifetime work income gap translates further into a pension gap.

Under this respect, Italy has one of the worst performances among developed Countries. The first part of the story is about activity rates, that is, the difference in how many women participate to the labour market with respect to men. Up to a two decades ago this was by all means a common issue across Europe, particularly in Continental and Southern Countries, but while most of them have succeeded in reaching or at least approaching the targets the European Council set in Lisbon and Stockholm, the employment gains that we have witnessed in Italy have not been sizeable enough to significantly narrow the gender gap in employment. Current statistics say that Italy, with Malta and Greece, is the only European country where the gender activity gap is over 20 percentage points, to be compared with the Nordic and Baltic countries where the gap is 7 percentage points or less (Eurostat 2010; the EU average is about 13 p.p.). This is a long standing issue that has to do with many cultural, institutional and socio-economic aspects that we can not here review². What is worth citing here is that, in the years that we will analyze, a prominent role was played by the pension system, which allowed a widespread praxis of early retirement for women, with a large impact on their activity rates at prime- and elder ages (Leombruni and Villosio 2006; Blondal and Scarpetta 1998 and 1999).

In turn, those women that do participate to the labour supply face in Italy a probability of unemployment which is sensibly higher than men, both unadjusted and controlling for observable characteristics (Leombruni and Richiardi 2006; OECD

² The reader is referred to Del Boca et al. 2009 and 2005; Del Boca and Sauer 2009).

2004; Azmat, Güell and Manning 2004; European Commission 2002). Low activity rates and high unemployment probabilities translate into an employment rate which, in 2010, was almost double with respect to EU27 average (21.6 percentage points *versus* 11.9)³.

The pension gap

How the two gaps actually translate into lifetime income differences? Direct evidence on the topic is scant, mostly due to the limited availability of sufficiently long panel data. Actually, the first objective of the paper is exactly to fill this gap, exploiting an original database on entire work careers. What has already been documented is that in many developed countries older women receive considerably less pension income than older men⁴.

In Italy too pension incomes are highly gender-biased. In 2003, 50% of retired women were earning a pension about € 520, which was barely above the minimum pension threshold, to be compared with a median pension for males which was roughly two times higher (Mundo 2007). This seems to correlate mainly with very large differences in the seniority accumulated by women: the median retired women had accumulated a seniority just up to 20 years, and only 10% had a seniority of 35 years or plus. To a closer look, the seniority distribution is bimodal: a large share of women actually withdraw from the labour market once they reached the minimum seniority requirement, than staying idle until they met also the age requirement. This seldom happens with men: more than half male pensioners had a career of 35 years or more.

The question that we may ask is whether such a high pension gap is due to overwhelming differences in lifetime incomes or to a malfunctioning of the redistributive mechanisms. In a sense, the latter point is not an open issue: a wide literature has already pointed out several pervert redistributions that were (and in part still are) present in the defined benefit Italian scheme. What has not yet been investigated is what is the net effect of the various redistributions put forth by the system, particularly under a gender perspective, which is the second objective of our paper.

The redistributive features of the pension system

The redistribution in the books

The Dini reform in 1995 put into action a gradual transition from a defined benefit regime towards a notional defined contribution one inspired by actuarial fairness. The old system is still entirely in force for workers who had a seniority of 18 years or more at the time of the reform; for those below the threshold, a *pro quota* formula is

³ Our elaborations on Eurostat data from Eurostat Website/Population and social conditions/Labour market, at <http://ec.europa.eu/eurostat>, extracted on October 2011.

⁴ See for instance Bardasi and Jenkins (2010) and the seminal paper by Even and Macpherson (1994).

adopted to calculate the pension: part of the benefit is computed with the old rules, part with the new ones⁵.

The bottom line is, for all workers who are currently retiring in Italy the pension regime is for the most part still the old one, which, at least in the books, was inspired by a strong progressive principle. The progressivity was implemented in three ways: in the provision of a Minimum Pension Benefit (MPB); in the pension calculation formula; in the pension indexation formula.

The pension calculation applies a typical defined benefit formula. Whatever the total amount of contributions paid by a worker during her career, the pension P is equal to:

$$(1) \quad P = \alpha S Y_t$$

where α is the accrual rate for each year of work, S is the number of years of seniority (with a maximum of 40) and Y_t is the so called “pensionable income”, computed as the average of last five years earnings at final year values:

$$(2) \quad Y_t = \frac{\sum_{i=0}^4 Y_{t-i} \prod_{j=1}^i (1 + \pi_{t-j})}{5}$$

where π_t is a price index at time t ⁶. The progressivity is implemented in the accrual rate α , which has a base value of 2% and gradually decreases for pensionable incomes exceeding a threshold (the so called “pensionable ceiling”), as in Table 1.

Tab 1: The decreasing annual accrual rate

Pensionable earnings brackets	Law	
	66/88	503/92
0 to PC	2	2
PC to 1.33*PC	1.5	1.6
1.33*PC to 1.66*PC	1.25	1.35
1.66*PC to 1.90*PC	1	1,1
1.90*PC and over	1	0.9

Notes: PC is the Pensionable Ceiling (in 2010, 42.364 yearly euros).

After retirement a further redistribution of resources is put in place by the incomplete price-indexation of pension benefits for the amount exceeding two times the MPB. The scheme has been modified several times: table 2 display the values

⁵ Here and in what follows we focus just on the rules for private sector employees whose pension is administered by the National Institute for Social Security (INPS) by means of the Pension Fund for Private Employees (FPLD). We also limit our discussion just to the redistributive features of the system and how the reforms changed them. A brief outlook to the functioning of the current pension system may be found in Guardiancich (2010). For a more general discussion of the reforms see, for instance, Fornero and Sestito (2005).

⁶ The price index used is different according to a further transition put forth by the Amato reform in the defined benefit formula. See next footnote.

active for the cohorts of pensioners that we will study. As an example, after 2007 the amount of pension exceeding 5 times the MPB is updated just at 75% of the inflation rate.

Table 2: Evolution in the Incomplete Price-Indexation Scheme

Brackets	Law		
	449/97	388/00	127/07
0 to 2*MPB	1	1	1
2*MPB to 3*MPB	0.9	1	1
3*MPB to 5*MPB	0.75	0.9	1
5*MPB	0	0.75	0.75

Notes: MPB is the Minimum Pension Benefit (in 2010, 5.992,61 monthly euros)

The redistribution in action

The pension calculation we reported in formulas (1)-(2) actually do imply a further redistribution with respect to a purely actuarial rule. From the one side, in (1) there is no consideration of age or gender, but only seniority. For what concern gender, the higher life expectancy of women imply that on average they will receive benefits for a longer period of time. A similar situation is produced by the absence of age in the formula. Keeping the seniority constant, those who start working earlier may retire at a younger age and hence receive the benefit for a longer time with no penalization in the pension benefit: they too receive an actuarial premium. Since those who start earlier are on average less qualified workers with lower wages, we may presume that this mechanism tend to add progressivity in the system.

From the other side, in (2) there is an implicit actuarial premium to highly dynamic careers, since only the wages in the final years are taken into account. Since dynamic careers are typical of workers in the top quantiles of the wage distribution, we may presume that the premium turns out to be a disparity of treatment between the poorest and the rich, in favour of the latter. Actually, the Amato reform in 1992 addressed this issue and partially corrected it, gradually extending the window over which to compute pensionable earnings⁷.

The (very long) path to neutrality

The Dini Law introduced in the system the principle of actuarial neutrality, but did it so very gradually: it will fully apply to workers entered in the labour market after 1995; it applies *pro quota* to workers with less than 18 years of seniority at 1995⁸; it does not apply for the other workers.

⁷ The Amato Law addressed the potentially pervert redistribution implied by the dynamic careers premium, extending the computation of the wage average, in the planned regime phase of the reform, to the entire working life. A gradual transition was designed, which still applies at least *pro quota* to all workers who are going to retire up to 2020s, where the window over which the average wage is computer is progressively extended from 5 to 15 (25) years for workers with a seniority higher (lower) than 15 years at the time of the reform (1992).

⁸ A part (a *quota*) of the pension, will be computed under the Amato rules, a part under the Dini ones. The Amato *quota* will gradually decrease in time.

Summing up, although in the long run the system will be a neutral one, workers retiring today and up to 2015-2020 will be under a pure Amato regime. As regards its redistributive character, we may expect:

- a progressive tendency due the decreasing accrual rate (Table 1);
- a progressive tendency due the decreasing pension updating rule (Table 2);
- a progressive tendency due to the early retirement effect;
- a regressive tendency for the dynamic career effect.

What is the gender balance among the four is entirely an empirical question that will be addressed later in the paper.

Data and methods

Work histories from labour market entry to pension

We exploit two databases. The first is the *Work Histories Italian Panel* (WHIP), a linked employer-employee longitudinal database built at the University of Torino in cooperation with the Statistics and actuarial department of the National Social Security Administration (INPS) out of a 1% sample of INPS's administrative data⁹.

We used the employee section of the database, which is very accurate about wages, seniority and pensions for private sector dependent workers in Italy. The reference population is made up by all the people – Italian and foreign – who have worked in Italy even for only a part of their career. For each of them the main episodes of the career are observed: working spells – including dependent employees, quasi-dependent work (the “parasubordinato” work), self-employment activities as artisan, trader and freelancer –; retirement; non-working spells in which the individual received social benefits, like unemployment subsidies. Looked from the other way round, the workers who stay out of WHIP are those working in the public sector plus some categories of high professional self employed, such as lawyers or notaries, who have an independent social security fund.

From WHIP we extracted the flow of workers who entered into retirement in 2004 for whom we observed at least a part of their work career¹⁰. The very limit of the sample for our purposes is that it does not contain information on employment spells prior to 1985, which is necessary to study lifetime work incomes.

To this purpose we exploited the Contributions Accounts archive (CA), a database maintained at INPS which collects summary information on all kind of social security contributions paid or credited in favour of workers. The data are driven from the same administrative sources and with the same sampling frame as WHIP.

⁹ A complete documentation about the database and its access policies can be found at www.laboratoriorevelli.it/whip.

¹⁰ Actually, in WHIP also pensioners from other pension funds are observed, most notably pensioners coming from a public dependent careers. Since we have no information on their career we do not consider them.

Although the information it provides is less rich and accurate with respect to WHIP, it includes all incomes and worked weeks starting from 1975 on, plus information on worked weeks prior to 1975. Thanks to a deterministic link among the two sources, then, we obtained data on complete work careers for individuals who entered retirement in 2004 with all the necessary information to compute lifetime work incomes and social security contributions, with the only exception of wages before 1975 (see Figure 1).

Figure 1. Data sources on the work careers of individuals in the sample



Notes: WHIP: *Work Histories Italian Panel*; CA: *INPS' Contributions Accounts archive*.

To recover missing wages before 1975 we used propensity score matching as a nearest-neighbour imputation technique (Chen and Shao, 2000 and 2001)¹¹. We defined as receivers those who entered in the labour market *prior* to 1975, for which the initial wages are missing (remember that the exact year of entry is known since the number of yearly worked weeks is included in the data). We defined as donors those who entered the labour market *after* 1975, for which we have data about their entire career (up to 2004). The idea has been that of matching donors and receivers with similar wage profiles in the ages for which the career is observed for both. For instance, if the receiver entered in the labour market in 1970 at the age of 20, the wages are observed from when s/he is 24 on. Then, we look for a donor who started working after 1975 who has similar demographic and job characteristics *and* a similar wage profile for the ages from 24 on¹². Once a match has been found, the information on the donor career in the ages 20 to 24 is used to impute wages to the receiver.

To take into account the different phases of the economic cycle in which donors and receivers are active, wage growth differentials with respect to aggregate income growth rates have been used as matching variables. Similarly, we did not directly impute wages, but wage growth differentials that we used – together with the GDP growth time series – to backward calculate the needed average weekly wages.

The technique has been validated masking wages in three years (1976-1978) and imputing them back using receivers and donors around the year 1978. Regressing the true wage on the imputed values we obtain an R-squared between 0.6 and 0.7¹³.

¹¹ More precisely, we used the “Mahalanobis metric matching within calipers defined by the propensity score” (see Rosenbaum and Rubin 1983), as implemented in the macro “%psMatching()” for the SAS statistical package (Leombruni and Mosca 2011).

¹² We used as matching characteristics all the (few) variables available in the CA archive (gender, region of work, age of labour market entry, classification in white and blue collar) plus the wage differentials and the amount of work in the first available five ages.

¹³ Data available upon request.

Pension incomes from retirement on

To add pensions to lifetime incomes we need all the flow of pension benefits after retirement and up to death. Additionally, to evaluate eventual systematic gender differences in the actuarial premia/losses individuals receive, we need to compare the actual pension received by individuals with an actuarially neutral one. In order to achieve both goals we built a dynamic microsimulation model, which computes social security contributions and the pension benefits flow. We may classify it as an arithmetic model, since it does not contain any true behaviours on the part of individuals. Our sample is composed by workers who actually decided to retire in 2004, so that their entire work career is already completed – and hence their contributions are just to be computed applying the appropriate contribution rates – and their subsequent income history is entirely determined by the pension updating rule, the mortality event and the inflation scenarios. The unique quasi-behaviour included is due to the consideration of survivors benefits, which we implemented with a rather simple probabilistic model.

The microsimulation is made up of several modules¹⁴. The main ones are the “*Contributions Module*”, which computes the pension contributions paid or credited in favour of workers during their working lives, in order to obtain the total contributions accrued during the whole career capitalized at GDP’s nominal rate of growth.

Total contributions are then used in the “*Pension Calculation Module*” to compute the benchmark, actuarially neutral pension. As a benchmark we choose the benefit computed using the Dini rule without the topping up to the minimum pension benefit. Indeed, the neutrality of the Dini rule has been questioned, mostly because of the somewhat outdated life expectancies used to calibrate the formula’s coefficients, but overall it is considered a good approximation of an actuarially fair and neutral system (Belloni and Maccheroni 2006). The pension module models also the possibility that a retired individual will earn a survivor pension. The model has two steps: we first estimated a logistic model to compute the probability of earning a survivor pension, stratified by gender, as a function of cohort and age; we then estimated the amount of the benefit regressing it on gender, cohort, age and the (direct) pension benefit amount¹⁵.

Once all the benefits amount are available in the data (the actual-, the survivor- and the benchmark one), the “*Pension Indexation Module*” updates them using the mechanism of incomplete price-indexation in force in the simulated year as in table 2 above¹⁶.

¹⁴ We implemented it using ModGen (Model Generator), a generic microsimulation programming language supporting the creation, maintenance and documentation of dynamic microsimulation models, created by Statistics Canada. See <http://www.statcan.gc.ca/microsimulation/modgen/modgen-eng.htm>. A more detailed description of the model can be found in Leombruni and Mosca (2011).

¹⁵ We estimated the two models on the entire WHIP population in order to have a higher statistical power; the results are available upon requests. Note that also active workers may receive a survivor or an indirect pension, but empirically this is a negligible event for the cohort and the selection considered in the sample that enters in the microsimulation.

¹⁶ We used a base scenario with an inflation rate of 1.7%, stable in time.

Finally, a “*Mortality Module*” applies to individuals a fixed horizon mortality using age and gender specific life expectancies as computed by the National Institute of Statistics for the general population¹⁷. We do not use Monte Carlo draws on the age and gender mortality probabilities to avoid introducing a purely random redistribution across individuals.

The gender lifetime income gap

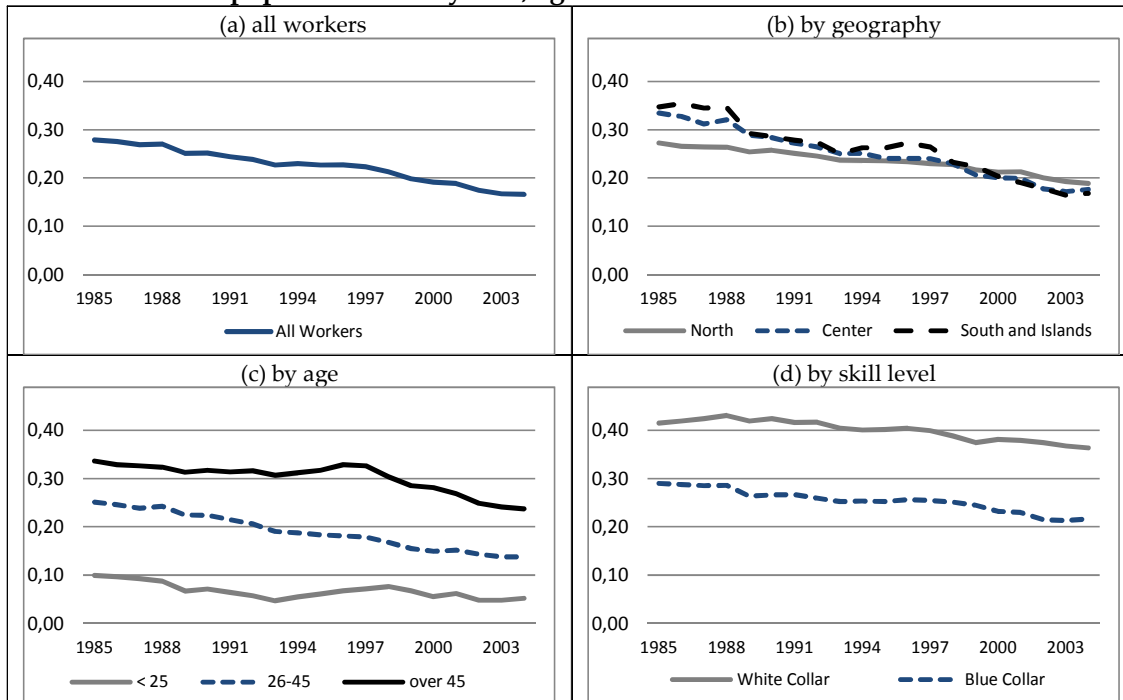
Work career gaps

We start presenting some results on the gender pay gap in the WHIP sample, that is, among all non agricultural dependent employees in the private sector in Italy in the years 1985 to 2004. The unadjusted gap has been declining during all the period, from 28% in 1985 to about 16% in 2004 (Figure 2, panel a). Taking into consideration that we are not considering public sector workers, where the gap in Italy, if any, is positive, the picture seems coherent to the values under 10% measured in last years by the reports of the European Commission.

Looking at some subpopulations, we may note that the regions where the gap was higher during the Eighties (the Centre and South of Italy) are catching up the levels measured for the North. By age, we have a confirmation for young workers the gap is lower. We also note that the gap among the young steeply decreases in the first part of the period and then it does not change much in the following decade. The most notable result, however, is about skill level. The decrease notwithstanding, the pay gap within blue and white collars at the end of the period is as high as 22% and 36% respectively, which are values far above the average for the whole population. It is apparent that the population figure is mainly driven by a skill level composition effect: female workers are in these years mostly white collar ones, and white collars earn on average much more than manual workers. This is coherent with the conditional gaps that we reported in the literature review, which were systematically higher to the unadjusted one.

¹⁷ See <http://demo.istat.it>. Actually, there is evidence that there are mortality differences for the working population with respect to the entire one, which is relevant particularly for women (see Leombruni *et al*, 2010). As complete mortality tables are not still available, we leave the exploration of this to a future work.

Figure 2. Wage gap among non agricultural, private sector Italian dependent employees, 1985-2004. Whole population and by area, age class and skill level.



Source: our calculations on WHIP data

We now limit the scope to the individuals in our sample, that is, workers who retired in 2004 from a career spent in the private sector.

In table 3, rows 1-3, we report the career gaps we can measure around retirement. At the moment in which they stop working, women have a unitary wage level which is 23.5% lower with respect to men. Also the cumulated employment gap is high: on average, they have been working 14.7% less. The immediate implication of this is that the day after retirement the income gap sensibly widens: women's initial pension on average is 31.5% lower than men's one.

To a closer investigation, the individuals in our sample by and large confirm the evidence we already quoted from Mundo (2007), who reported a bimodal distribution of seniority among retired women¹⁸. As it seems, there are two rather distinct career paths followed by women: those with a short career which ends in their prime age years, who then stay idle up to the time they become eligible for old age pension¹⁹; those with a more "traditional", male-style career, staying in the labour market up to the time of retirement. If we partition our sample according to the time gap between the end of work activities and the start of pension, we see that the gender seniority gap roughly doubles for workers who staid idle more that two years with respect to individuals with a work-retirement transition within 9 months (table 3, columns 2-3). The share of women in the two groups increases also (38% versus 28% respectively), although also the share of men who stay idle is far from negligible. As a matter of fact, in this group there are both individuals who decide to

¹⁸ For the sake of brevity we do not report the seniority distributions by gender. They are available upon request.

¹⁹ In the social security jargon, these are the workers who are referred to as "silent".

early withdraw from the labour market even if they are not yet eligible for a pension (presumably, the majority of them being women); and individuals who have been laid off by their employer and are under a long term unemployment scheme which pays them a benefit up to their pension eligibility (the so called “mobilità lunga”; in this group there are not particular gender selections in action, see Paggiaro et al. 2009).

In order to have a more homogeneous population and more interpretable results, in what follows we will focus only on individuals with a direct work-retirement transition (within 9 months). Among them, the wage gap measured just before retirement is still high, at 23.4%. The employment gap however is lower (8.4%), so that the day after retirement the gender gap increases less dramatically, to 25.2%.

Looking at how the unadjusted gap evolved during their entire life cycle, we may note three distinct phases (see Figure 3, panel a). In the very initial years of their career, from 16 up to about 22 years old, gender differences are low and a bit erratic. Then the gap steeply increases for about ten years. From then on, the gap remains roughly stable but for a further slight increase towards the end of the career. The employment gap also shows two distinct phases: At very young ages it is women that do work more (see panel b). This is explained by the call for compulsory military service that the men of this cohort had to answer. From 24-25 years old on, men’s employment intensity is systematically higher with respect to women’s. Skill level is again an interesting viewpoint (panel c and d). White collars women see the gap steeply and continuously increase up to retirement. For blue collars on the opposite the wage gap opens mostly in the first ten years of the career, then from 30 years old on it is stable, at around 20% up to retirement. Their employment gap is particularly high (and higher than for white collars) in the ages of high fertility.

Figure 3. Career gaps over the working life cycle among non agricultural, private sector Italian dependent employees who retired in 2004. Whole population and by skill level.



Source: our calculations on WHIP and EC data

Notes: ages 17-24 in panels (c)-(d) not reported for white collars due to the small number of individuals in the sample (less than 30 units, males and females together).

Does the pension system mitigate the differences?

To analyze how the redistribution put in action by the pension system modifies the gender gaps accumulated during the work career, let us take as a starting point the lifetime work income. Summing up all the wages earned by the individuals, in real values at the moment of retirement, the resulting lifetime work income gap is 27.7% (Table 3). In an actuarially neutral system, this is the gap that we would measure also in lifetime incomes (wages and pension benefits together).

The first redistribution put in action by the pension system is at retirement, due to the pension calculation rule (see the normative section above). We can immediately note that the lifetime income gap is actually higher than that measured in the initial amount of the pension benefits (25.2%), meaning that the progressive character of the pension calculation rule prevails with respect to the other sources of redistribution we discussed. To estimate the size of the effect on a lifetime perspective we sum the present value of all wages (net of the social security contributions) and the present value of the entire stream of pension benefits, but without considering the other possible causes of departure from actuarial neutrality – namely, assuming no partial indexation of high pensions, no gender differences in life expectancy, no survivor benefits. The resulting net effect of the pension calculation rule is of about 1.2 percentage points, the lifetime income gap decreasing to 26.5%.

Considering step by step the other sources of redistributions occurring after retirement, it results that the partial pension indexation of high pensions has an

almost negligible effect in reducing the lifetime income gap, of about 0.1 percentage points. The most sizeable effect (4.2 p.p.) is due to the gender differences in life expectancies at the time of retirement, which, in 2004, were about 4 years in favour of women. The different probability of being entitled to a survivors benefit and the higher average benefit earned act again in favour of women in a sizeable way (2.6 p.p.). Summing up, pension rules reduce the substantial gender gap that opens up during the work careers by almost 30%, from 27.7% to 19.7%.

Tab 3: Gender Gaps Measures

Gender Gaps	All sample	Delay over 2 years	Direct Transitions
Last Wage	23.47	19.71	23.37
Seniority	14.69	16.05	8.39
First Pension Income	31.52	34.44	25.18
Lifetime Work Income			27.68
<i>Effect of:</i>			
<i>Pension calculation rule</i>		-1.19	26.50
<i>Incomplete price indexation</i>		-0.06	26.44
<i>Different life expectancy</i>		-4.21	22.23
<i>Survivors pension</i>		-2.57	19.66
Lifetime Income			19.66
N. obs.	2047	658	1027
% Women	31%	38%	28%

Notes: column "Delay over 2 years" refers workers who retire after at least two years after the end of last employment episode; column "Direct Transitions" refers to workers who retire within nine months after the end of last employment episode.

Concluding remarks

In this paper we provided the first evidence about Italy on how the gender wage gap evolves during the entire work career of individuals and how it translates into a further gap during retirement.

The evidence on work careers is by and large coherent with the main evidences on the wage gap that we already know from the literature. The main point is that, although the average, unconditional wage gap is low – lower than what is currently reported for many developed countries – this is entirely due to composition effects. Even controlling for just the main socio economic characteristics of the individual, the gender bias appears to be wide. Looking at the dynamic story, at career start gender differences are moderate; they open up dramatically during the first decade of the career; in the case of white collar women they continue to increase up to

retirement. Conditioning just on the skill level, at retirement the gender wage gap is as high as 19.5% and 33.8% for blue and white collars respectively.

Also the employment gap is sizeable: on average, women entered into retirement in 2004 had accumulated 14.7% less seniority with respect to men. Since seniority is a key variable in the pension calculation rule, the direct consequence of this is that the day after retirement the income gap further increases: it is 23.5% of the wage just before retirement, it is as high as 31.5% of the initial amount of the pension benefit. The latter figure is driven at least partly by a career pattern which was very common within Italian women of these cohorts, namely the choice to early withdraw from the labour market and stay out of it up to old-age pension eligibility.

To investigate the eventual moderating role played by the pension system, we focussed on women with a more “traditional”, male-style career, with a direct transition from work to retirement. By means of a microsimulation model we recovered the entire social security contributions and pension career of the individuals in the sample and compared it with an actuarially neutral system. It results that on average the pension rules active at mid 2000s are redistributive in favour of women. This is due to several factors. First, the system has an overall progressive character that naturally tends to smooth out income differences. Second, the pension calculation rule does not consider any life expectancy differences, which bring an actuarial premium to women. Third, survivor pensions – as one could expect – do entail a further positive bias for women. Empirically, it is women who have a higher probability of surviving to a pension earner, and also the average survivor benefit they earn is higher. Taken together, all these factors reduce the lifetime income gap by almost 30%, from 27.7% to 19.7%.

Although a positive role emerges from the pension system functioning as regards gender differentials, two considerations have to be made.

The first is that the pension rules are gradually changing towards an actuarially fair system. If we do not consider the effect of the progressivity in current rules, the reduction in lifetime income gap would be around 25% instead of 30%. Of course, in a defined contribution system a lower pension is directly attributable to lower contributions. While this has to be accounted for as an equal treatment, to cancel any progressivity will likely contribute to the failure of the system in providing a decent standard of living to a large share of women.

The second is about survivor pensions, which is the second most important factor reducing lifetime income differences. While it may be considered a pillar of family policies within the pension legislation, it is becoming an outdated one due to the changes in households composition that also in Italy we are witnessing. In particular, single parent families are becoming a widely discussed topic in Europe, one of the issues being their difficulty in staying in the labour market. Life after retirement will simply amplify these issues. We saw in our data that most of the employment gap is accumulated during fertility ages. For those women who live in two parent families the survivor pension is the continuation of the family support they already had during the entire life cycle. Quite the opposite, women without this support will see

the career gaps they accumulated during the work career perpetuated almost unchanged during retirement.

We can expect both aspects to further aggravate due a secular change we are witnessing in work careers. Italy, like most developed countries, has deeply deregulated its labour market. Similarly to Spain, however, the main reforms have been “at the margin” of the labour market, exacerbating the dualism between long term, highly protected dependent jobs and precarious work (Schindler 2009; Arellano 2005). As a recent Resolution adopted by the European parliament acknowledged (19 October 2010), precarious work affects women more than men. Moreover, the over-representation of women in precarious work is a key contributing factor to the gender pay gap. This means that the issue of pension adequacy for women who will retire in next decades will probably get worse, while at the same time the pension system will fade out part of its features which are nowadays correcting the gender bias. We leave the investigation of this issue to a future extension of this paper.

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