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The structure of the labour market and wage inequality using RIF-OLS: the Italian case

Giangregorio Luca (Pompeu Fabra University), Fana Marta (Joint Research Center, Seville)

Abstract

This paper aims at identifying how and to what extent the Italian labour market structure in terms of job composition and institutional changes shape the dynamics of wages and wage inequality in the decade 2007-2017. We investigate the main determinants behind the rise in wage inequality in Italy using Recentered Influence Function (RIF) regressions. This econometric approach allows – on one side – to directly assess the effects over the unconditional distribution and on statistics beyond the mean, like the Gini coefficient. On the other, it decomposes the inequality difference into the endowment and wage effects, following the standard Oaxaca-Blinder technique.

We observe that the occupational structure and institutional changes - contractual arrangements (permanent vs temporary contract) and working time (full-time vs part-time) - are the main factors in explaining the wage downgrade at the bottom of the income distribution and the consequent increase in wage inequality.

Keywords: inequality, labour market, wages, RIF

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1 Introduction

Until recently, massive unemployment, increased inequality among workers and the surge in in-work poverty have been considered a side effect of ongoing historical change, mostly related to the Fourth industrial revolution and globalization. These approaches gained an unprecedented consensus among the political debate especially in Europe and the US (Atkinson, 2001; Bogliacino, 2014). More interestingly, the resulting hegemonic narrative, according to which the asymmetric gains from technical change are a deterministic outcome, disempowers policy makers since ongoing outside their good will. An explicit corollary of this stream of thought puts individuals and their choices at the forefront of historical challenges and assumes institutions being neutral and inclusive by default. To respond to the historical challenges, whether in the form of mass unemployment or increasing inequality, the political agenda put upfront the competitiveness of productive systems as resilient practice in line with supranational institutions recommendations: "Adaptation is fundamental to progress in a world of new technologies, globalization and intense national and international competition" (OECD, 1994). Resilience can therefore be reached by implementing a series of policies, nowadays known as "structural reforms", such as more flexible working-time and wages, reskilling of the workforce. These types of recommendations have been suggested and/or imposed to solve the downturn of the Great Recession and to better recover from it as well as during expansion of the business cycles to gain competitiveness. All in all, the political agenda and hegemonic ideas to tackle contemporary challenges have never changed during the last few decades, although eventually the same international institutions that supported them had to acknowledge that labour market liberalisation has a disequalizing effect among workers and between workers and profit earners (Dabla-Norris et al., 2015; OECD, 2015). After decades, inequality is still rising and even the labour market does not feel very well, at least from the workers' standpoint.

During the '80s the steady increase in the wage inequality in the US held the attention of scholars from different fields interested in explaining the causes of this trend. Katz & Murphy (1992) firstly introduced the Skill-Bias Technological Change (SBTC) arguing that the increasing inequality within a country is a direct consequence of the technological development and of the expansion of higher education, whose supply of high skilled workers lag behind the outbreak in demand. Their higher and increasing wages, compared to less skilled workers, stem simply from their complementarity (and therefore higher productivity) with respect to machines. In this framework, the resulting higher wage inequality is simply the consequence of the supply-demand dynamics in the labour market.

According to the SBTC, advanced economies should have experienced a progressive upgrading in the occupational structure. However, available empirical evidence shows different and puzzling patterns for both US and some European countries. Indeed, the SBTC hypothesis could not even match empirical evidence for the US economy, where employment expansion occurred not only at the top but also at the bottom of the wage distribution, leading to the so-called employment polarisation (Wright and Dwyer, 2003). To meet this evidence, the SBTC was revised into Routine-Biased Technological Change (RBTC), according to which employment changes (and wage inequality) can be better understood shifting the focus of analysis from individual skills endowment to tasks, i.e., the unit of input labour required to produce a unit of output (Acemoglu and Autor, 2011; Autor et al., 2003). More specifically, the substitution/complementarity between human labour and machines (capital) depends on the degree of routine tasks of a certain job. More routine tasks are easier to codify and therefore to be substituted by machines. It is for this reason that we should expect a drop in the middle-occupations (clerical routine jobs) and an increase at the extremes of the distribution.

On the other side, other theoretical arguments aimed at explaining the relationship between wage inequality and the labour structure. Phrased as the "revisionists" by Autor et al. (2008) authors like Card and Di Nardo (2002), Lemieux (2006), Di Nardo and Pischke (1997) criticize the SBTC argument and claim that the real causal factors are non-market driven but rather institutional. Specifically, the "revisionists" claim that the main factors driving the rise in inequality relate to the declining real value of the minimum wage and the de-unionization process (Card, 1996; Visser and Checchi, 2011). Others, like Piketty and Saez (2003) and Piketty et al. (2018), argue that the rising wage inequality is the

consequence of the enormous gains in terms of labour income for those at the very top of the income distribution; consequently, technological change cannot be the real cause of wage inequality. This literature is more coherent with the sociological theory calling for the importance of the institutional design in terms of welfare system and of the characteristics of the labour structure in terms of power relations and regulation (Fernández-Macías, 2012; G. Esping-Andersen, 1990, 2000).

In this paper, we focus on Italy, which represents a textbook case characterised by a bulimic process of labour reforms spamming the whole period since the Lira crisis in 1992 and a hard privatisation process that took place in the following years, to last with the strong fiscal consolidation policies adopted to face the Debt crisis in 2011.

In Italy, wage inequality started to widen in the '90s. Brandolini et al. (2001) show how all inequality measures decreased substantially between the 1977 and the 1989 – where both mean and median net wages were growing at 1.8 percent per year. This effect is due to a particular indexation mechanism – the Scala mobile, literally the escalator – which, since 1975, granted equal absolute increase to all employees as prices rose, as shown by Manacorda (2004). Since its abolition in 1993 inequality started and kept increasing. Considering a longer time-period (1975-2017), the trend is confirmed: a substantial decrease during the '80s was followed by a sharp continuous increasing path after the Lira crisis and "structural reform" process (Italian National Social Security Institute, INPS, (2019).

Lilla and Staffolani (2009) decompose wage inequality to understand the dynamics both between and within groups. They observe that the rise in inequality starting from the '90s is basically between inequality due to the slow growth in white-collars wages and the depression of blue-collars' wages. The authors also claim that the main sources of within inequality are cohort differences and the higher volatility in youngest workers' wages, a result explained by the reforms of the Italian labour market started in the '90s. Naticchioni et al. (Naticchioni et al., 2010, 2008) deepen the analysis of inequality determinants within and between groups by putting into test SBTC arguments. The authors conclude that those arguments do not apply to the Italian case, characterised by a decrease in the Educational Wage Premium along the entire wage distribution between 1993 and 2004. According to the authors, a lagging labour demand for high skilled occupations may explain such pattern, at least at the top of the wage distribution. Indeed, Rosolia and Torrini (2016) find a persistent wage penalty for the youngest cohorts compared to the older generations: those entering in the new flexible labour market experience a relative wage loss not recovered by faster career paths. Naticchioni et al. (2016) consider the heterogeneity of this penalty across skill levels and observe that the high-skilled youngest workers are more heavily penalized, compared to the older cohorts, than the youngest unskilled. This evidence suggests that other mechanisms - beyond SBTC - more grounded on the institutions of the labour market are at play in influencing wage inequality. Furthermore, also occupational shifts may affect the wage dynamics and, in turn, wage inequality.

The present paper contributes to this last strand of literature on Italian wage inequality and its trends during the period 2007-2017 by studying these phenomena along the entire income distribution and accounting for changes in the labour market structure. More precisely, our study inspects – in a non-causal way – trends and determinants of inequality at different points of the wage distribution so to capture if and to what extent individual characteristics and the employment and structural compositions affect those changes. To do so, we rely on the RIF approach developed by Firpo et al. (2009, 2018) and the revised RIF- Oaxaca decomposition method.

The rest of the paper is organised as follow. Section 2 reviews some important stylised facts for Italy. Section 3 introduces the methodology and data used for the analysis. Section 4 presents summary statistics on the Italian employment structure as well as distributive statistics and inequality trends. In Section 5 we discuss the RIF-OLS and decomposition results and finally section 6 concludes the paper synthetising our main findings.

2 The Italian case

From the annual report by the Italian National Social Security Institute (INPS, 2019) it emerges that, between 1993 and 2017, annual labour income remained on average almost flat since 1992-1993, while the share of workers earning below the 60% of the median increased from 26 to 31 percent between 1993 and 2017. Overall, during the last decades, Italy experienced an increase in income and wealth inequality[1], wage stagnation and increased profit share.

Other stylised facts are useful to describe the Italian socio-economic context and its evolution in recent times.

As many other Western countries (ILO, 2020) Italy experienced a significant fall in the labour share (from just below 70% of the '60s to just above 50% in 2017) and an increase in wage inequality. Indeed, INPS (INPS, 2019) reports that starting from the middle of '90s the bottom 10 percentiles wages started to lag behind at the expenses of both top 90 and top 99 percentiles. The employability effect of more flexibilization both at the extensive and intensive margin did not pay off. According to official statistics (Istat, 2021), Italy never recovered to the volume of hours worked of the pre-crisis period, whose index reaches 104 in the third quarter of 2020 compared to 112 in the same period of 2008. The national productive capacity declined both in terms of quality of production and quantity (Celi et al., 2017; Fana and Villani, 2021). To get an idea, during the decade 2007-2017, employment declined in the manufacturing sector (excluding construction activities) by 368 thousand units, while increasing by 642 thousand in the entire service sector (including the Public Administration), mostly due to other services and retail and accommodation activities.

A sizable increase in non standard contracts is reported by facts. The share of temporary and part-time contracts reached respectively around 20% and 14% at the end of 2018[2], with involuntary part-time more than doubling the European average: 67% compared to EU average of 35% (Eurostat, 2020). Moreover, 70% of the employment recovery occurring between 2014 and 2019 is characterised by employees under fixed contract arrangement (Istat, 2021). This period refers to the deployment of the last major labour market reform – the Jobs-Act – acting over two main pillars: first, the decree law n. 34 of 20 March 2014, which intensively promotes temporary contracts allowing the renewal 8 times for a maximum of 36 months without any request of justification. Second, legislative decree n. 23 of 4 March 2015 abolished the Art. 18 of the Workers' Charter ("Statuto dei Lavoratori"), previously amended by Fornero reform[3], in a way that reinstatement is now only admitted for cases of discriminatory individual dismissal and in some cases of collective dismissal.

The detrimental effect of labour market flexibilization has been widely documented in recent years (Kleinknecht, 2020). A recent work by Cirillo and Ricci (2019) shows that the increase in temporary employment led to a decline in labour productivity and wages, together with an increase in profits. Temporary jobs are also associated with weaker innovation, especially in sectors relying more on tacit knowledge as a driver of innovation (Cetrulo et al., 2019). These findings go in line with the weak

[1] For a reference: Morelli et al., 2015; Hasell et al., 2019; Acciari et al., 2021

[2] The share of part-time workers using survey data seems to underestimate actual figures emerging form administrative databases. Indeed, according to Inps (2019), the share of part-timers in 2017 was 30.8% over total employment, reaching 48% for female workers.

[3] Law 92/2012, the so-called "Fornero reform". In this framework, the temporary contracts and the apprenticeship contracts are defined as the standard forms for young workers to enter the labour market, enhancing the duality problem. The reforms also liberalize the utilization of voucher in all production sectors with a ceiling at 5.000€ in the fiscal year. In addition, the reform amended the art. 18 making easier the dismissal of an employee as the reinstatement is defined as the last consequence for the employer, which now only bears monetary costs. At the same time an unemployment insurance scheme (ASPI) was introduced, in addition to the standard and dominant protection provided by the lay-off scheme (cassa integrazione). The insurance nature of the passive policy implied that those with no sufficient contributions and unemployed who never entered the market remained excluded (a mini-ASPI was introduced for those with at least 13 weeks in the last year).

dynamic in R&D activities documenting a shift toward cost-competitiveness strategies based on labour cost compression (Guarascio and Dosi, 2016; Guarascio and Simonazzi, 2016).

Raitano and Fana (2019), studying the almost full liberalisation of fixed-term contracts in 2001, found a substantial and persistent wage penalty for higher educated workers entering just after the reform passed compared to their peers entering before.

All these mechanisms build up patterns of structural change in terms of occupational composition. However, the dynamic of occupational changes is puzzling with some results identifying upgrading, while others middle-upgrading or even downgrading. Piccitto (2019) shows that between 1992 and 2015 the Italian labour market experienced a clear upgrade irrespectively of gender or territorial division and the financial crisis of 2012 did not reverse the process, but basically slow it down. On the contrary, Fernández-Macías (2012) observes only mid-upgrading for Italy between 1995-2007. Results from Hurely et al. (2019) are even more in contrasts with Piccitto (2019) showing a clear downgrading pattern since 2007, a finding supported also by Basso (2019) and Aimone Gigio et al. (2021). Furthermore, Hurely et al. (2019) compare the Italian labour structure with other nine European countries. Evidence clearly shows a downgrading with respect the EU-average (at 9 countries) and this trend involves all the Italian regions with only Lombardy having less low-skilled workers compared to the other observed countries. Castellano et al. (2019) observe a downgrading in the employment structure in Italy too. In particular, they find a positive growth of high-skilled workers only at the median of the overall wage distribution. Finally, the European job Monitor (2017) analyses the relationship between changes in the occupational structure and wage inequality. According to the report, Italy is characterised by a mid-level of wage inequality (compared to other European Member State) and low level of occupational wage differentials. Overall, authors find that occupational dynamics does not account for much of the variation in changes of wage inequality, which is mainly explained by within occupation wage changes.

Considering the potential relation between the occupational changes and wage inequality, we follow the contribution by Firpo, Fortin and Lemieux (2009, 2018) to understand and quantify the impact of the structure of the Italian labour market on the wage inequality.

3 Methodology

To understand how the Italian labour market structure affects wage distribution and wage inequality, we rely on the contribution of Firpo, Fortin and Lemieux (2009, 2018), which allows to go beyond the mean both in the estimation of explanatory association and in the decomposition through the standard Oaxaca-Blinder technique (1973; Oaxaca, 1973). Traditionally, the Oaxaca-Blinder method has been applied to the mean with standard linear regression model. Attempts to estimate the coefficient-endowments effects on different statistics, like quantiles, have been performed for example by Machado and Mata (Machado and Mata, 2005).

The latter contribution is based on the conditional quantile regression (CQR) methods introduced by Koenker and Basset (1978) that, differently from the standard OLS, do not permit the unconditional interpretation i.e., the effect of a given explanatory variable X on the population unconditional outcome.

The main reason why CQR does not allow the unconditional interpretation is due to the impossibility to apply the law of iterated expectations. Applying such law to standard OLS leads to $(y|x) = x\beta = E(y) = E(x)\beta$, a property that does not hold for the CQR since indeed, $Q_\tau(y|x) \neq Q_\tau(y)$. In other words, using the conditional quantile regressions we can only interpret the effect of a unit change in a covariate X on the t-th quantile of the conditional outcome distribution. On the contrary, the unconditional quantile regression (UQR) introduced by Firpo, Fortin and Lemieux (2009) allows the researchers to estimate the (marginal) effects of the explanatory variables on the unconditional distribution of y and therefore on distributional statistics like Gini index, quantiles, variance, etc.

The building block of the RIF-OLS is the influence-function. Considering a given distributional statistic v(Fy) – for example the Gini coefficient – computed on the distribution F, then the influence function of v(Fy) represents the effect of an infinitesimal change in the function F at a given point y. Hampel (Hampel, 1974) provides a formal definition of the influence function (IF) as:

$$IF(y;\ v, Fy) = \lim_{\epsilon \to 0} \frac{v\big((1-\epsilon)Fy + \ \epsilon \Delta y\big) - v(Fy)}{\epsilon} \qquad (1)$$

FFL (2009) recentred the function adding back the distributional statistic to the IF:

$$RIF(y; v, Fy) = v(Fy) + IF(y; v, Fy) \qquad (2)$$

and demonstrate how the distributional statistic v(Fy) can be written in terms of expectations and, applying the law of iterated expectations, also in terms of expectations of the conditional RIF:

$$v(Fy) = \int E[RIF(y; v, Fy) \mid X = x] \ * \ dFx\ (x) \qquad (3)$$

According to equation (3) when covariates are present and we are interested in understanding their association on a distributional statistic v(Fy), it is necessary to integrate over the $E[RIF(y; v, Fy) \mid X]$.

To do so, FFL (2009) propose a simple OLS regression, obtaining the RIF-OLS:

$$(Fy) = E[RIF(y; v, Fy)] = E(X\beta) + E(\varepsilon) \qquad (4)$$

where coefficient β can be interpreted unconditionally, in FFL's (2009) terms, as the unconditional partial effect (UPE).

Relying on this approach, we estimate our effects of interest along the entire (unconditional) outcome distribution – log gross wages – getting more informative results compared to the standard CQR.

3.1 RIF-Decomposition

Although RIF-OLS provides a powerful tool to estimate unconditional effects of covariates of interest on a distributional statistic, it is not sufficient to identify gaps between groups when we want to compare gender or two points in time.

To narrow the analysis by decomposing such a difference, it is necessary to combine the RIF-OLS with the standard decomposition technique introduced by Oaxaca-Blinder (Blinder, 1973). As anticipated, this strategy has been implemented to identify the composition and the coefficient effects at the mean through standard OLS estimation. Introducing the RIF-OLS, the Oaxaca-Blinder technique can be also applied to measures beyond the mean, preserving the unconditional interpretation.

Considering for example a distribution function v(Fy), a vector of covariates X and a variable T identifying two different groups – 0 and 1 –, then to estimate the gap between the two groups based on v(Fy), it is possible to take the following difference:

$$\Delta v = v\left(\int F^1_{Y|X}(Y|X) dF^1_X(X)\right) - v\left(\int F^0_{Y|X}(Y|X) dF^0_X(X)\right) \qquad (5)$$

Equation (5) suggests that there are two components that explains the gap between the two groups. The first is due to differences in the characteristics (the distribution of covariates differ among the

groups); the second refers to the different relation between the outcome and the covariates in the two groups.

At this stage, we require a counterfactual to determine the magnitude of each effect. For this purpose, following the standard Oaxaca-Blinder technique and specifying equation (4) for our two groups, we get the counterfactual by applying the coefficient of group 0 to the covariate's distribution of group 1.

FFL (2009) suggest an alternative procedure to define the counterfactual scenario. This approach relies on the identification of a reweighting factor that needs to be applied to $dF_X^0(X)$ to mimic the distribution of group 1, $dF_X^1(X)$. The most straightforward way is to perform a logistic (or probit) regression to estimate the rewighting factor and then estimate the RIF-OLS for the counterfactual applying such factor.[4]

We can now have a full decomposition of the following form:

$$\Delta v = X^1(\beta_1 - \beta_C) + (X^1 - X^C)\beta_C + (X^C - X^0)\beta_0 + X^C(\beta_C - \beta_0) \qquad (6)$$

The first term represents the (pure) coefficient effect while the third addendum is the (pure) endowment effect. The other two terms represent the reweighting and the specification errors, respectively. The reweighting error is a measure of the quality of the reweighting strategy and, as FFL reports, it tends to zero when the sample size increases. The specification error, on the contrary, is a test on the model misspecification as it measures the departure from linearity and, consequently, it is a way to check whether the RIF-OLS are an appropriate tool for the decomposition of endowment and coefficient effects. In summary, we ideally expect both errors to not be statistically different from zero.

4 Data and variables

Using the EU-SILC data (UDB), we estimate what are the main drivers of wage inequality over the decade 2007-2017 and provide separate estimations for 2007, 2011, 2014 and 2017.

The UDB database covers information at the individual and household level, both cross-sectionally and longitudinally, on a wide set of information about labour market conditions, income and socio-demographic characteristics.

In this study, we rely on the cross-sectional part of the database and we concentrate on employees (excluding self-employed individuals) from both private and public sectors aged between 16 and 65 years, for a total sample of 14,367 workers in 2007 and 14,430 in 2017. Employees are classified into occupations according to the ISCO 2-digit classification provided by the EU-SILC (variable PL050 and PL051) and economic sectors, so that it is possible to characterise them according to their position within both the vertical and horizontal division of labour. Using all occupation-sector pairs, we are able to build the job matrix for each year of interest. To deal with the change in both occupation and sector classifications, we convert the NACE rev.2 into the rev 1.1 using the double information included in the 2008 UDB (PL110 and PL111). As for the occupations, we create 9 classes from the 2digit ISCO-88 and ISCO-08. We acknowledge that there might be a potential bias due to changes of the occupational codes at the margins, which may lead to classify an employee in a different class with the two classifications. We end up having a 9x12 occupation-sector matrix.[5]

[4] The RIF-OLS for the counterfactual is the following: $E[RIF(y; v; Fy^C)] = E(X^C\beta_c) + E(\varepsilon)$

[5] We consider the following occupations: legislators & managers, higher professionals, technicians & associate professionals, clerks, service workers, skilled agricultural workers, craft & related trade workers, machine operators and elementary occupations. The economic sectors are agricultural & fishing, industrial, wholesale & retail trade, hotels & restaurants, transport, store & communications, financial, real estate, PA, Education, Health & social, private service

The other two variables related to the labour market structure are working time (full time vs part-time) and the contractual arrangement, i.e., permanent vs temporary. We also include labour experience as an additional covariate.

Finally, we control for the educational attainment defined by the ISCED level, ranging from less or equal than primary to tertiary education and for the macro-area in which the employee is living, North-east, North-west, South & Islands and Centre-Italy.

The outcome variable of interest is the gross annual wage[6] which best proxies living standards as they result from the labour market (Franzini and Raitano, 2019). More precisely, and differently from hourly wages, annual earnings embed both working time and worked weeks which are strongly correlated with lower standards of living.

Gross annual wages are converted into logarithmic scale and adjusted to deal with highly extreme observations, which may bias the computation of inequality indexes like the Gini coefficient. For this purpose, we trim the 1% of both top and bottom distribution. Furthermore, to get rid of inconsistent data, such as when individuals classified as employees report null value for gross income[7], we proceed to impute their annual gross wage by multiplying monthly values by twelve: original and imputed data generate identical distributions and distributional measures (like the Gini coefficient, see Figure A1 in the Appendix). On this final gross annual wage, we apply Eurostat HICP deflator (base year=2015) to get nominal values at constant prices. Finally, all the analyses exclude armed forces employees.

The empirical analysis test different models' specifications: standard OLS, conditional quantile regressions, RIF-OLS over percentiles, Gini coefficient and lastly on the P90/P10 ratio.[8]

All estimations are run separately by gender to avoid any selection bias in a pooled model.

5 Summary statistics

The following section presents several summary statistics to describe the database and the evolution of the employment structure along the main dimensions of the labour market.

During the decade under study (2007-2017), employment increases in three professional groups: Professionals (+5.3 pp), Service Workers (+5.4 pp) and Elementary occupations (+1.3) - Table A1 in Appendix. Conversely, employment in occupations like Crafts and Machine operators decreases substantially, in line with the decrease in employment characterising manufacturing activities from 27% to 23% of total employment. As already highlighted in the introduction, Italy is characterised by an increase in both temporary and part-time workers.

Although the share of female workers increased from 43 to 45 percent, the employment composition by gender is still strongly unbalanced against female workers. As shown in Figure A2 in Appendix, gender differences persist in the distribution across professional groups, confirming harsh gender concentration over the vertical division of labour. Female workers dominate Clerical and Service occupations as well as Professionals (because of the high concentration in the Public sector, mainly Education and Health) while they are strongly under-represented in standard manufacturing

[6] "Employee cash or near cash income gross" (variable py010g). It must be noticed that the variable py010g refers to the previous fiscal year compared to the time of interview. This implies that the observable time-varying characteristics (e.g., contract type or occupation) and employee wages may be mismatched. Considering that such changes are more likely at the bottom of the income distribution – where job discontinuity, precarious conditions and low-value occupations are concentrated – our estimates may underestimate the real effects of time-varying characteristics.

[7] In the original database, there are between 1 and 5 percent of inconsistent cases depending on the year. In terms of occupational breakdown, the highest share of inconsistent cases is reported for "Technicians & associate professionals" and "Service workers".

[8] All the models will be estimated with the EU-SILC individual cross-sectional weights. To take into account the survey structure we use the rotational group as stratum and the individual id as primary sampling unit.

occupations (crafts and machine operators) and to a lesser extent in top ones (Managers). Over time, the share of women has increased in all occupations except for Technical and Associated Professionals and Elementary occupations, which substantially decreases from 56% in 2007 to 47% in 2017. Summary statistics at different points of the wage distribution – Table A3 in Appendix – show that changes in the employment structure are not equally spread across deciles. For instance, the increase in Professionals is concentrated between the median and 9th decile, while the decrease in the share of Machine operators at the aggregate level is reflected in a lower share of the same group within the lower tail of gross wages. More interestingly, our data highlight a process of impoverishment of standard work arrangements since the share of workers belonging to the first decile increased by 5pp for Permanent workers and 10pp for full-timers.

5.1 Distributive Statistics

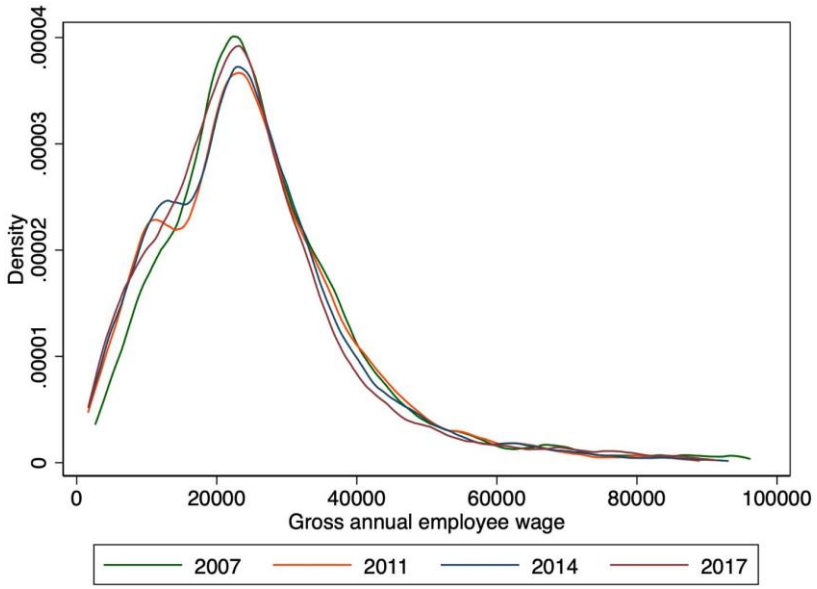
The overall wage distributions are reported in Figure 1 where the effect of the crisis is evident in 2011 and 2014: compared to the pre-crisis period (2007) and the recovery phase (2017), both years are characterised by a higher density at the bottom with the emergence of two "bumps"[9]. In 2017, there is a recovery even though the income levels are lower compared to the pre-crisis period.

Looking at the distribution over time by gender and working time arrangement, we observe the expected results. First, female workers suffer a pay gap in both years when employed full-time, while no major gender gaps emerge for part-time in 2017 compared to 2007. The last evidence may reflect the impoverishment of part-time male workers after the crisis, consistently with the increase in the share of male unvoluntary part time (Eurostat, 2020).

Finally, Figure 3 reports wage distributions according to other covariates. In particular, the left panel contrasts top and bottom professional groups (according to the Isco one digit classification), while the right panel compares permanent and temporary contracts.

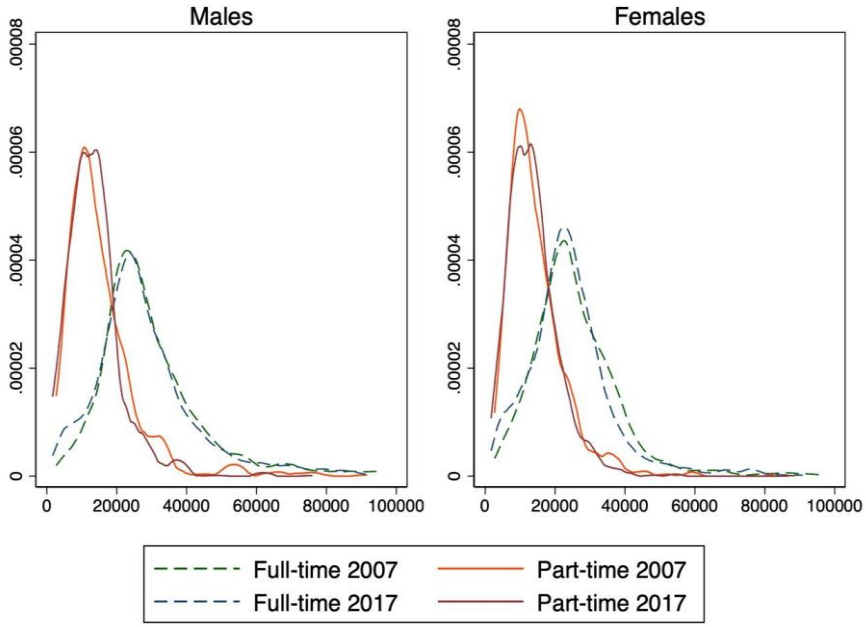
[9] Most likely, these bumps are the results of the "cassa integrazione", the dominant protection provided by the lay-off scheme. Indeed, workers should receive the 80% of the global income they would get if they worked all their standard contract-hours. Therefore, we observe a reduction in the annual gross-wage just before the 20.000 euro, which disappears once the "cassa integrazione" scheme vanished during the Recovery.

Figure 1 Overall Gross annual employee wage



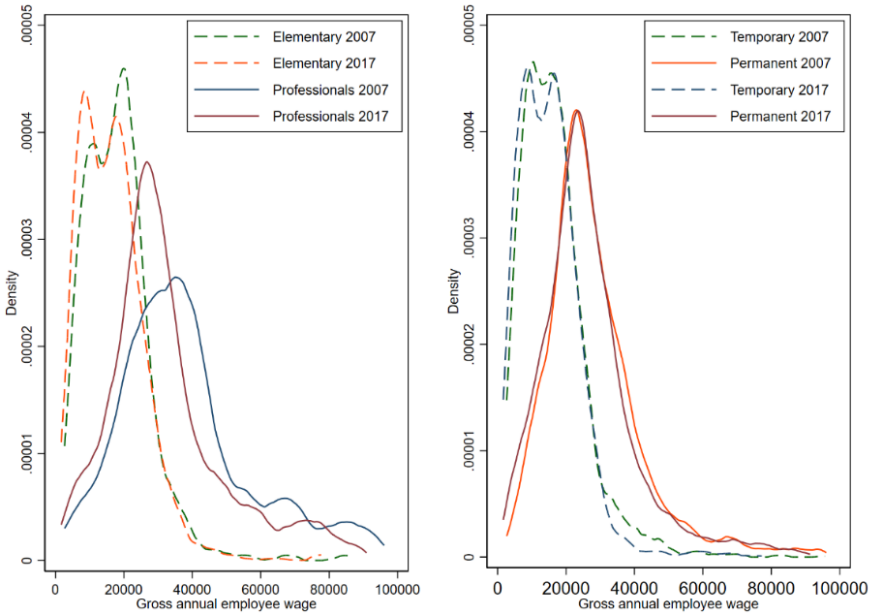
Source: authors' elaboration on EU SILC data

Figure 2 Part-time vs full-time wage distribution by gender



Source: authors' elaboration on EU SILC data

Figure 3 Elementary occupations vs Professionals (left) and permanent vs temporary (right)



Source: authors' elaboration on EU SILC data

Wage performances for top and bottom occupational groups point to the same direction i.e., in 2017, compared to 2007, the associated distribution shows a larger share at lower percentiles and lower density at higher percentiles. However, the magnitude is different and suggests a strong downgrade of elementary occupations with a consequent increase in wage inequality, due to the bottom 10th lagging behind. In line with expectations, temporary jobs are concentrated at the bottom of annual gross wage with a distribution very similar to the one of the elementary occupations. An overall impoverishment also characterises permanent jobs, whose distribution in 2017, compared to 2007, is characterised by higher density at the bottom percentiles.

The distribution of annual gross income, Table A2, highlights that inequality increased at the bottom (P50/P10) and decreased at the top (P90/P50) confirming our previous intuition about a downward trend of the Italian employment structure rather than a polarising effect, as found in the US (Autor and Dorn, 2013). Increase in overall inequality, as resulting from the 90/10 wage ratio, is mainly driven by a surge in inequality at the bottom. More precisely, considering the log-distribution it is possible to directly observe the percentage-change over-time along the wage distribution. In real terms, the bottom 10% loses 23%, while at the top there is a decrease of about 6% (in nominal terms there's a decrease at the bottom of 7% and an increase at the top of around 10%). The Gini coefficient confirms the disequalizing trends, moving from 0.28 in 2007 to 0.30 in 2017.

Different patterns of inequality emerge when we consider two sub-periods, i.e., 2007-2011, characterised by the Great Recession, and the Recovery, 2014-2017. The crisis reduced inequality within top occupational groups and at the very bottom of the Isco ranking. During the so-called recovery phase, inequality increased both at the top as well as for Clerks, Elementary occupations and Machine operators, although with substantial differences in magnitude. This finding does not confirm the polarising argument made in Autor and Dorn (2013) and verified in Firpo et al. (2018), according to which wage inequality is driven by the substitutability between manual routine tasks (mostly characterising manufacturing workers) and new technologies. Other explaining factors should be jointly tested as potential explanation, such as the increase in temporary work and part-time, stemming from labour market (re)structuring after the crisis. At the same time, restructuring phases as the one occurred during the Recovery may also alter the task profile within occupations leading to unexpected patterns.

Figure 4 Gini coefficient by occupation over time

Source: authors' elaboration on EU SILC data

6 Results

This section discusses results from the RIF-OLS method (eq. 4 in Section 3) where the dependent variable, the log wage at three different points of the distribution in two different years (2007 vs 2017), is regressed against a set of both structural and individual characteristics summarised in Table A1. Different estimations by gender are performed in order to account for gender segregation and unobservable factors leading to differences in gender job composition and returns. To check the robustness of the first step, we also implement the RIF-OLS for two different inequality measures, i.e., Gini coefficient and P90/P10 income ratio. For the sake of completeness, we report in the Appendix standard OLS estimates and the CQR outputs for log wage by gender and discuss the main differences with respect to the RIF model in the main text. Finally, the second and last step of the econometric analysis decomposes changes occurring along the wage distribution with the detailed Oaxaca-Blinder decomposition following Firpo et al. (2018).

6.1 RIF-OLS at 10th, 50th and 90th percentiles

Table 1 and Table 2 report estimates from the RIF at 10, 50 and 90th percentile for Female and Male, respectively, in the two points in time (2007 and 2017). Overall, as expected, narrowing the analysis of changes in wages across the distribution highlights the strong heterogeneity in the effect of covariates. Looking into the association of occupation with (log) wage, the positive and significant coefficient of being employed as Legislator or Manager increases along the distribution and also over time for the 90th percentile. Conversely, working into a medium-low occupation (Service workers or

Elementary occupation) has a strong negative correlation at the bottom and to a lesser extent on median wages, where the coefficient is stronger in magnitude in 2017 compared to 2007. While the effect of Legislator and Manager holds also for men - Table 2 -, the negative effects of being employed into medium occupations does not affect the bottom of the distribution but only the medium and top tail.

Moving to sectors, a significant negative association is found for female workers in all sectors apart from Education and Health compared to Wholesale and Retail trade activities (the baseline) at the 10th percentile. The non-significant effect of Health and Education is in line with the literature (Hurley et al., 2019), according to which workers in those two sectors are on average mid or highly paid. It is therefore not surprising that working in the Public administration, Health or Education has a positive effect on wages at the 50th and to a lesser extent the 90th percentile. This effect is stronger in 2017, during the Recovery phase, confirming the stability of wages of public employees compared to those working in the private sector. Finally, as expected, the financial sector provides significantly higher log-wages at the median and more substantially at the 90th percentile: the coefficient is stronger in 2017. Males exhibit similar patterns in the financial sector i.e., high positive returns from the financial sector above all at the 90th, but lower compared to females. An additional difference compared to female employees is in the Public Administration: males have significant positive returns at the bottom and at the median both in 2007 and 2017, while they are penalized in the Education sector and in the Accommodation.

Labour market institutions matter, as expected and in line with the economic literature (Naticchioni et al., 2016; Raitano and Fana, 2019; Rosolia and Torrini, 2016; etc.). Working part-time has a strong negative effect, although it is declining along the entire wage distribution: it holds for both genders, with greater magnitudes for men.

The gender difference is not surprising and coherent with stylised facts on the gender distribution of unvoluntary part-time: men lose more than women, because women have already lost! Indeed, women employment is more concentrated in non-standard working arrangements compared to men, who are now experiencing these new forms of employment that penalize their wages compared to the already low-wages of women.

Moreover, permanent workers enjoy higher wages compared to temporary ones, especially at the bottom of the distribution, regardless of the gender. However, while for women the positive effect weakens at the 50th and 90th percentiles, men with temporary contracts suffer from lower returns even at the bottom. This finding confirms the equalizing effect of standard work arrangements, especially at the bottom of the distribution; in other words, more precarious contracts are inequality enhancing. Finally, education matters as traditionally claimed by the economic literature, although some peculiarities emerge for men in 2017 when – contrary to women – they experience a significant drop in the returns from higher education along the whole income distribution. Specifically, this effect is stronger at the bottom 10, where lower education significantly negatively influences the log-wage. This confirms that men have more to lose from a downgrading occupational structure.

Lastly, considering the macro-areas, both males and females workers living in the South & Islands are penalized compared to those workers living in the North-West. This association is stronger – as reasonable – at the bottom 10th, decreases at the median and vanishes at the 90th. However, in 2017 female workers have a significant gap also at the top of the distribution. Males show a similar pattern.

Table 1 Unconditional quantile regressions at 10, 50 and 90th percentile – Female, 2007 vs 2017

	10th		50th		90th	
	2007	2017	2007	2017	2007	2017
Occupation: ref. Clerks						
Legislators & Managers	0.260**	-0.020	0.112	0.120*	0.631***	0.977***
Professionals	-0.028	-0.096	0.111***	0.136***	0.499***	0.345***
Technicians & Associate Prof.	0.024	-0.183**	0.023	0.055	0.102**	-0.002
Service Workers	-0.114	-0.306***	-0.179***	-0.221***	0.096**	-0.053
Skilled agricultural workers	-0.893	0.453	-0.361***	-0.225	0.069	-0.195*
Craft & related trade workers	-0.091	-0.364**	-0.299***	-0.277***	-0.020	-0.111**
Machine operators	-0.046	-0.055	-0.159***	-0.107	-0.077*	-0.139**
Elementary occupations	-0.448***	-0.504***	-0.272***	-0.285***	0.042	-0.037
Sectors: ref. Wholesale&Retail						
Primary	-0.981***	-0.646*	-0.054	-0.090	0.001	0.066
Mining, Manufacturing, Utilities supply	-0.179**	-0.011	0.018	-0.026	0.135***	0.024
Construction	-0.153	-0.300	-0.036	0.060	0.119	-0.131
Accommodation	-0.561***	-0.148	-0.096*	-0.100*	0.050	-0.030
Transport storage & communication	-0.155	-0.066	0.164**	0.062	0.168*	0.142*
Financial intermediation	-0.141*	-0.090	0.231***	0.202***	0.697***	0.591***
Real estate & business activity	-0.262**	-0.176	-0.065	-0.109***	0.104*	-0.030
Public Adm & social security	-0.172*	0.026	0.197***	0.200***	0.100*	0.042
Education	-0.084	-0.026	0.075*	-0.061	-0.101**	-0.353***
Health	-0.079	-0.030	0.086*	-0.035	0.088*	-0.047
Other soc. services	-0.553***	-0.337**	-0.131***	-0.180***	0.028	-0.061*
Education: ref. Lower Secondary						
isced=1	0.000	0.089	-0.060	-0.032	-0.001	0.010
isced=3	0.148*	0.249**	0.142***	0.068**	0.145***	0.090***
isced=4	0.159*	0.225	0.202***	0.134**	0.148***	0.120
isced=5	0.190**	0.272**	0.252***	0.173***	0.313***	0.319***
WorkingHours: ref. FullTime						
Employed PT	-0.716***	-0.357***	-0.399***	-0.436***	-0.146***	-0.175***
Experience	0.012***	0.014***	0.014***	0.010***	0.015***	0.013***
Contract: ref. Temporary						
Permanent	0.552***	0.618***	0.250***	0.212***	0.067***	0.057***
Macroarea: ref. NorthWest						
South & Islands	-0.336***	-0.308***	-0.071**	-0.126***	-0.002	-0.079**
North-east	-0.039	-0.009	-0.069***	-0.037	-0.045	-0.052
Center	-0.136**	-0.057	-0.083***	-0.028	-0.011	0.012
Constant	8.919***	8.474***	9.610***	9.745***	9.980***	10.110***
R-squared	0.216	0.138	0.397	0.389	0.208	0.194
N	6276.000	6678.000	6276.000	6678.000	6276.000	6678.000

Table 2 Unconditional quantile regressions at 10, 50 and 90th percentile – Male in 2007 vs 2017

	10th		50th		90th	
	2007	2017	2007	2017	2007	2017
Occupation: ref. Clerks						
Legislators & Managers	-0.057	-0.157	0.053	0.100	0.555***	1.077***
Professionals	0.011	0.055	0.169***	0.147***	0.534***	0.667***
Technicians & Associate Prof.	0.028	-0.021	0.122***	0.073***	0.203***	0.228***
Service Workers	-0.166*	-0.069	-0.005	-0.052*	0.027	-0.001
Skilled agricultural workers	-0.136	-0.335	-0.204**	-0.152*	-0.109*	-0.089
Craft & related trade workers	-0.124*	0.036	-0.130***	-0.159***	-0.116**	-0.151***
Machine operators	0.088	0.182	-0.025	-0.078**	-0.120**	-0.155***
Elementary occupations	-0.280**	-0.492**	-0.209***	-0.179***	-0.050	-0.057
Sectors: ref. Wholesale&Retail						
Primary	-0.784***	-0.727**	0.016	-0.002	0.021	0.002
Mining, Manufacturing, Utilities supply	0.187**	-0.075	0.143***	0.159***	0.152***	0.089
Construction	0.039	-0.112	0.017	-0.007	0.054	0.019
Accommodation	0.059	-0.431	-0.081	-0.117***	-0.140**	-0.118*
Transport storage & communication	0.121	-0.017	0.233***	0.120***	0.089	0.037
Financial intermediation	0.120	0.050	0.281***	0.208***	0.718***	0.522***
Real estate & business activity	0.101	-0.093	0.083**	0.013	-0.075	-0.000
Public Adm & social security	0.307***	0.184	0.256***	0.250***	-0.065	-0.075
Education	0.238**	0.028	0.006	-0.072*	-0.434***	-0.672***
Health	0.271***	0.084	0.179***	0.025	0.084	0.015
Other soc. services	0.060	-0.494*	0.072*	-0.101**	-0.022	-0.145*
Education: ref. Lower Secondary						
isced=1	-0.107	-0.760**	-0.121***	-0.039	-0.118***	-0.013
isced=3	0.113*	0.131	0.114***	0.111***	0.181***	0.141***
isced=4	0.056	-0.037	0.113***	0.105	0.160***	0.188
isced=5	0.231***	0.083	0.211***	0.206***	0.642***	0.440***
WorkingHours: ref. FullTime						
Employed PT	-1.476***	-1.238***	-0.220***	-0.263***	-0.037	-0.108***
Experience	0.016***	0.013***	0.013***	0.010***	0.015***	0.014***
Contract: ref. Temporary						
Permanent	0.951***	0.838***	0.180***	0.207***	0.091***	0.084***
Macroarea: ref. NorthWest						
South & Islands	-0.219***	-0.368***	-0.121***	-0.135***	-0.059	-0.105***
North-east	-0.008	0.194*	-0.042*	0.029	-0.031	-0.047
Center	-0.055	-0.077	-0.047**	-0.083***	-0.025	-0.039
Constant	8.425***	8.573***	9.687***	9.704***	10.195***	10.222***
R-squared	0.238	0.159	0.300	0.309	0.190	0.194
N	7786.000	7462.000	7786.000	7462.000	7786.000	7462.000

6.2 RIF-OLS for Gini coefficient

After presenting the effect of labour market structure at different points of the (log) wage distribution, we analyse how and to what extent those covariates directly affect wage inequality: here we discuss estimation outcomes for the RIF-OLS applied to the Gini coefficient (as a robustness check, we use also the P90/P10 ratio, see

Table A7 in Appendix).

Compared to Clerks, an increase in both the share of higher and lower skilled occupations significantly worsens inequality. As expected, for both males and females the effect is stronger as the share of Mangers increases and it strengthens over time, while the one associated to an increase in the share of Elementary occupations is rather stable. More precisely, a 1% increase in the share of males (females) professionals contributes to a 0.46% (0.45%) increase in the Gini coefficient in 2007[10].

According to the expectations and in line with related literature, increasing the employment share of the Educational sector and, to a lesser extent, of the Public administration reduces inequality for both genders. Moreover, such an effect is stronger during the Recovery phase suggesting the inequality enhancing result of the austerity measures adopted by Italian governments in the last decade, such as the freeze in hiring in order to compensate retirements within the public sector ("the turnover block"). The association of labour market institutions, embodied in the dynamics of non-standard work arrangements, with the increase in both the use of part-time and temporary contracts, exists and is persistent over time. In 2007 an increase of 1% in the share of women in part-time leads to a 0.40% increase in the Gini coefficient (0.60% for men). Similarly, an increase of 1% in the share of temporary contracts contributes to an increase in the wage inequality by 0.25% (0.37% for men).

Going back to theoretical explanations, the SBTC (Autor et al., 2003; Katz and Murphy, 1992) predicts that increasing wage inequality at the top and decreasing at the bottom of the distribution are driven by the complementarity/substitutability nexus between technologies (capital) and skills (mostly proxied by educational attainment). More precisely, according to this approach, inequality increases at the top of the wage distribution where more educated workers are more likely to be employed, while it decreases at the bottom. In Goldin and Katz (2008) words, if the demand of skills is racing ahead of supply, then there will be an increase in wage inequality due to skill-biased. On the contrary, if the supply i.e., education is racing ahead of technology, we should expect lower returns to higher education and supply factors determine the occupational changes and wage distribution. Our findings only partially agree with the SBTC. Indeed, as expected, we observe higher Gini coefficient as a consequence of an increase in the share of highly educated workers (irrespective of gender). However, and especially for men, we also observe an increase in inequality due to the lower education, which we have seen being mostly significant at the bottom 10 of the wage distribution. As Basso (2019), we fail to identify the SBTC as the main factor explaining the increase in wage-inequality, which is mostly determined by the changes at the bottom of the income distribution.

[10] 0.46% obtained as: (0.123/0.267)*0.01, where the numerator is the associated coefficient and the denominator the mean RIF for Males in 2007.

Table 3 RIF Gini coefficient by years and gender

	2007		2011		2014		2017	
	Female	Male	Female	Male	Female	Male	Female	Male
Occupation: ref. Clerks								
Legislators & Managers	0.253***	0.184***	0.217***	0.287***	0.333***	0.235***	0.419***	0.240***
Professionals	0.131***	0.123***	0.085***	0.091***	0.121***	0.124***	0.129***	0.099***
Technicians & Associate Prof.	0.016	0.028**	0.019	0.035***	-0.002	0.041***	0.010	0.019
Service Workers	0.074***	0.034***	0.055***	0.027**	0.047***	0.028*	0.055***	-0.003
Skilled agricultural workers	0.140*	0.046	0.012	0.162***	0.005	0.072**	-0.023	0.026
Craft & related trade workers	0.057***	0.019*	0.017	0.038***	0.023	0.014	0.083***	-0.022*
Machine operators	0.020	-0.018*	0.009	0.008	-0.015	-0.023*	0.014	-0.041***
Elementary occupations	0.109***	0.057***	0.112***	0.086***	0.090***	0.054***	0.107***	0.043**
Sectors: ref. Wholesale&Retail								
Primary	0.141***	0.084***	0.127***	0.076***	0.149**	0.088***	0.096***	0.048*
Mining, Manufacturing, Utilities supply	0.040***	0.003	0.039***	-0.015	0.041**	-0.013	0.007	-0.008
Construction	0.045	0.014	0.041	0.016	0.030	0.038*	0.001	0.009
Accommodation	0.075***	-0.010	0.057***	0.055**	0.103***	0.037*	0.039**	0.033
Transport storage & communication	0.050*	-0.010	0.032	-0.008	0.033	-0.010	0.015	-0.021
Financial intermediation	0.126***	0.099***	0.121***	0.097***	0.163***	0.042*	0.158***	0.047
Real estate & business activity	0.069***	-0.024	0.028*	0.013	0.054***	0.011	0.034*	-0.000
Public Adm & social security	0.013	-0.055***	-0.005	-0.053***	-0.021	-0.082***	0.003	-0.059***
Education	-0.042***	-0.106***	-0.089***	-0.106***	-0.111***	-0.110***	-0.110***	-0.144***
Health	0.040*	0.015	0.002	0.019	0.037*	-0.015	0.034*	0.014
Other soc. services	0.091***	-0.011	0.060***	0.032	0.094***	0.032	0.063***	0.015
Education: ref. Lower Sec.								
isced=1	-0.012	0.009	0.017	0.037*	0.032	0.036	0.019	0.065***
isced=3	0.01	0.014**	-0.012	0.016*	-0.002	0.006	-0.017	0.005
isced=4	-0.000	0.009	-0.014	0.027	-0.025	0.000	-0.025	0.008
isced=5	0.051***	0.109***	0.040***	0.045***	0.036**	0.033**	0.024	0.061***
WorkingHours: ref. FullTime								
Employed PT	0.114***	0.160***	0.108***	0.189***	0.099***	0.211***	0.080***	0.143***
Experience	0.001**	-0.000	0.000	-0.001***	0.001	-0.000	0.000	0.000
Contract: ref. Temporary								
Permanent	-0.073***	-0.100***	-0.084***	-0.142***	-0.116***	-0.134***	-0.086***	-0.092***
Macroarea: ref. North West								
South & Islands	0.040***	0.021**	0.048***	0.030***	0.053***	0.035***	0.035***	0.028***
North-east	-0.010	-0.007	-0.012	-0.006	-0.021*	-0.017*	-0.019*	-0.026***
Center	0.005	0.008	0.021*	0.016	0.018	0.007	0.011	0.008
Constant	0.201***	0.297***	0.262***	0.343***	0.271***	0.339***	0.270***	0.332***
R-squared	0.177	0.165	0.198	0.233	0.212	0.216	0.159	0.144
N	6276.000	7786.000	5696.000	6493.000	5776.000	6343.000	6678.000	7462.000
Mean RIF-Gini	0.287	0.267	0.303	0.277	0.306	0.279	0.298	0.29

6.3 RIF-Oaxaca decomposition

The last part of our analysis focuses on the main drivers of change in income inequality by means of the Gini decomposition through which it is possible to distinguish between the endowments-characteristics and unexplained-coefficients effects. For this purpose, we follow the contribution by Firpo et al. (2009, 2018) to estimate Equation (6) that we discussed in the methodological section. Given that the Gini coefficient is a low-dynamic index, the most convenient approach is to evaluate the change over the extreme points of the selected decade, 2007-2017. We estimate our decomposition using the "normalization" approach to avoid the omitted-reference bias which affects the Oaxaca-Blinder decomposition when using categorical variables. However, we present only aggregate results for the main variables, that is summing up all the coefficients of different categories (for example, the occupation effect is the sum of all occupation categories).[11]

Lastly, we use the same variables specified in our model for the reweighting approach. The counterfactual consists in reweighting the characteristics of 2007 with the ones of 2017 (or equivalently, the 2007 characteristics with the 2017 returns).

In Table 4 we report the decomposition for log-wage differences between 90p and 10p, 90p and 50p, 50p and 10p as well as for the Gini coefficient.

Table 4 Oaxaca-Rif decomposition by gender

	Males				Females			
	90-10	50-10	90-50	Gini	90-10	50-10	90-50	Gini
Total Change	0.208***	0.207***	0.001	2.276***	0.072*	0.097***	-0.025	1.111*
Total Explained	0.158***	0.088***	0.069***	2.197***	0.139***	0.050**	0.088***	3.543***
Total Unexplained	0.050	0.119***	-0.068***	0.079	-0.067	0.046	-0.113***	-2.432***
Specification error	0.007	-0.006	0.014	-0.067	0.024	0.013	0.010	0.282
Reweighting error	-0.017	-0.015	-0.003	-0.218	-0.026	-0.012	-0.014	-0.61*
Explained								
Occupation	0.041***	0.020***	0.021***	0.689***	0.060***	0.017*	0.043***	1.551***
Sector	0.008	0.011	-0.003	0.094	0.006	-0.004	0.010**	0.407***
Education	0.021**	-0.003	0.025***	0.579***	0.013	0.003	0.009*	0.576***
Part-time	0.037***	0.032***	0.005***	0.415***	0.020***	0.011***	0.009***	0.401***
Labour experience	-0.001	-0.004	0.003*	-0.007	0.006	0.003	0.003	0.183**
Temporary	0.045***	0.040***	0.005***	0.524***	0.008***	0.005**	0.003***	0.127***
Regions	-0.002*	-0.001*	-0.001	-0.029*	0.002	0.001	0.001	0.016
Unexplained								
Occupation	-0.012	0.013	-0.025	-1.764	-0.023	0.026	-0.114*	-0.215
Sector	0.106	0.079	0.027	-0.349	-0.297**	0.032	-0.093	-3.403*
Education	0.049	0.089	-0.039	0.145	-0.136	0.027	0.021	-1.973
Part-time	-0.022	-0.021	-0.002	0.012	-0.080**	-0.027*	-0.006	-0.535
Labour experience	-0.034	-0.048	0.014	-0.046	-0.114	0.035	0.032	-0.950
Temporary	-0.038	0.027	-0.07	-0.199	0.010	-0.067	0.029	-0.720
Regions	-0.018	0.001	-0.018	-0.278	-0.073	0.018	-0.030	-0.451
Constant	0.036	-0.007	0.043	2.775	0.671**	-0.030	0.062	6.424*

[11] In this case we rely on the same reference base used for the RIF-OLS. This process does not affect our estimates of total difference, total explained and unexplained effects

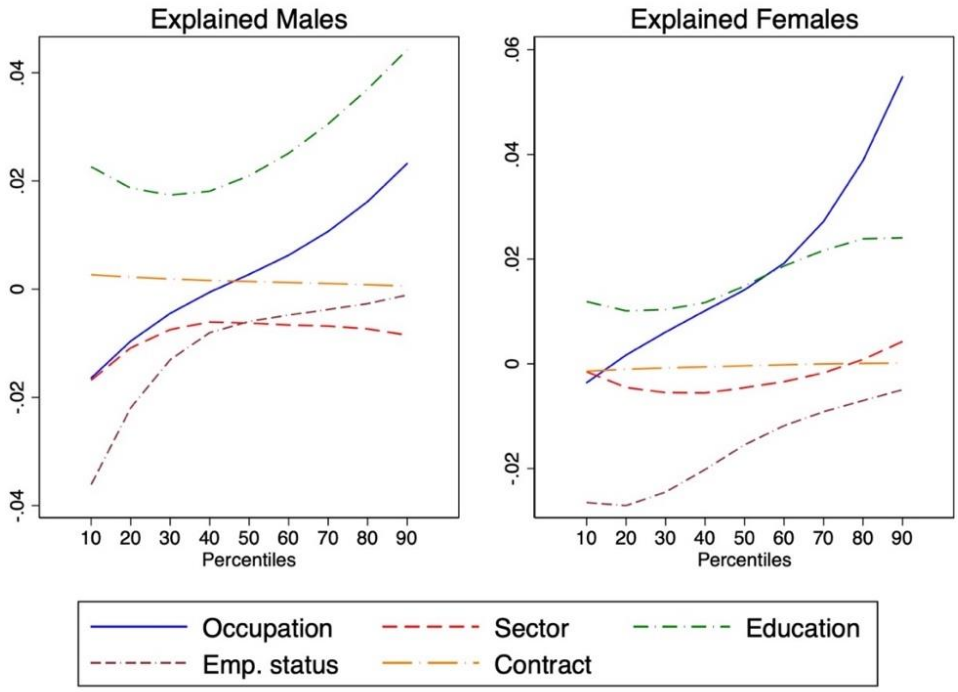
We can confirm that the bottom 10th clearly lags behind both the top 90th and the median, while the distance between the median and top-end of the distribution is irrelevant. As a consequence of the fall in the bottom-end of the distribution, also the Gini coefficient increases by 2.3 points between 2007 and 2017.

The composition effect, i.e., the differences in log-wage due to differences in characteristics, explains most of the change during the decade and specifically for the 90-10 distance (76% for males and 193% for females), while it tends to be about the half in the 50-10 gap.

The decomposition analysis points to changes in the occupational structure and labour market institutions as main factors in explaining changes across percentiles (Figure 5), their absolute difference and the Gini coefficient.

More specifically, for male workers being in a temporary job, working part-time and changes in the occupational structure explain around 22%, 18% and 20%, respectively, of the total log-wage difference between 90th and 10th percentiles. As expected, also education contributes in explaining the wage gap, but to a lesser extent compared to the other variables. However, differently from men, the difference among women is mostly explained by the occupation, and to a less extent by part-time and temporary employment, with non-significant educational effects. This is coherent with the gender structure of occupation, with women employed mostly at the extremes of the occupational distribution.

Figure 5 Detailed explained effects by gender



Source: authors' elaboration on EU SILC data

The 50-10 wage difference for men is mostly determined by contractual arrangement and only to a lesser extent by the type of occupation. The result for women is similar, but the magnitude of occupational characteristics in explaining the gap between the bottom and the median is smaller.

The analysis for the Gini coefficient confirms these results. Changes in the occupational structure account for the highest share in explaining the increase in wage inequality, with a strongest effect for women. The educational and part-time effects are very similar between men and women, whereas

changes in the temporary employment seems to explain most of the males' wage inequality, compared to women. Lastly, the coefficient effects are generally not significant and reported in the bottom part of Table 4.

7 Conclusions

In this paper we do not infer any causal effect, but we investigate the main structural contributions to the wage inequality dynamics in Italy between 2007 and 2017. Starting from some stylized facts concerning the Italian labour market – the sharp increase in the share of temporary contracts, involuntary part-time, working poor and the increase in low-added value occupations – we firstly review the main reform steps directly affecting the labour market. Following these reforms, which are the main ingredients of the neoliberal and European receipts, we discuss how Italy stands according to the current literature about occupational changes i.e., whether the Italian labour market downgraded, upgraded, or polarized.

Although the existing literature is contradicting, we observe a clear wage downgrading over the decade 2007-2017, with the bottom 10% being the more penalized: a wage loss (in real terms) of about 20%, compared to the 6% of the top 90. This wage compression is coherent with the expansion of low-added value occupations – elementary occupations and service workers – at the bottom of the wage distribution. Consequently, in the 2007-2017 decade, we observe an increase in the wage inequality (+2pp in Gini coefficient).

To answer the research question about the determinants of the increase in wage inequality, we followed Firpo, Fortin and Lemieux (2009, 2018) by using the RIF-OLS (unconditional quantile regressions) to verify the effects of our main predictors on different percentiles and on the measure of overall inequality. This exercise reveals that the top-occupations (managers and professionals) have positive monotonic returns on labour incomes for both male and female workers. On the contrary, the expansion of middle-low occupations like elementary workers and service workers has a strong negative association with the log-wages at the bottom 10%. These results imply an inequality enhancing effect. Analysing the contribution of sectoral specialisation, our findings reveal that employment in the Public sector is able to protect both males and females at the median, with non-significant effects at the bottom of the wage distributions. In terms of wage inequality, this means that policies penalizing the public employment – as the turnover block and consequent underemployment in the public sector – tend to widespread the wage distribution and, in turn, increase inequality. We observe the same inequality enhancing effect for education. Indeed, coherently with expectations, tertiary education not only increases the level of wages, but also its dispersion so that both the within and the between effects confirm the higher wage inequality. However, these results are only partially coherent with the SBTC, since – especially for male workers – the inequality at the bottom did not decrease: lower education generates positive effects on the Gini coefficient (and negative returns at the bottom 10th). In other words, the supply-side (of skills) is determinant in the case of Italy, characterized by a low-added value production and a low demand for high-skills, contradicting the main predictions of the SBTC theory.

Our findings also confirm that labour market institutions matter and are the main driver of changes in labour income, especially at the bottom of the distribution. Indeed, in line with the existing literature (Naticchioni et al., 2016; Raitano and Fana, 2019; Rosolia and Torrini, 2016; etc.), both part-time arrangements and temporary contracts have strong depressing effects on log-wages, especially at the bottom of the distribution, thus determining a strong inequality rise. The generalised negative effect on wages induced by non-standard contractual arrangements is not gender neutral. For instance, men lose more compared to women, which also means that the associated reduction in the gender wage gap hides an impoverishment of the labour force, not an increase in living conditions of female workers.

Lastly, results from the Oaxaca-Blinder decomposition reveal two important messages. First, looking at both the Gini coefficient and log-wage differences between different points of the distribution, differences in the characteristics explain most of the increase in wage inequality. Secondly, and more importantly, change in the occupational structure is the main source of log-wage difference between 90th and 10th percentile (as well as for Gini), with a stronger effect for women. As noted by Firpo, Fortin and Lemieux (2018), this result confirms that increasing attention is needed towards the role of occupational tasks and their impact on wage distribution. Moreover, the contractual arrangements, i.e., temporary vs permanent contracts and part-time vs full-time, play a role just as important as determinants of wage inequality, especially for men.

Education explains log-wage differences only in a residual fashion, constrained to men, while it accounts significantly for the increase in the Gini coefficient i.e., a higher share of tertiary educated workers explains well the increase in the wage inequality.

All in all, our results seem to confirm more the “erethic” approach to labour market inequality, seen as the combined result of both occupational changes and more liberalised labour markets.

8 References

Acciari, P., Alvaredo, F., Morelli, S., 2021. The growing concentration of wealth in Italy: Evidence from a new source of data. VoxEU.org. URL https://voxeu.org/article/growing-concentration-wealth-italy (accessed 6.29.21).

Acemoglu, D., Autor, D., 2011. Skills, Tasks and Technologies: Implications for Employment and Earnings, in: Handbook of Labor Economics. Elsevier, pp. 1043–1171.

Atkinson, A.B., 2001. A critique of the Transatlantic consensus on rising income inequality. World Econ. 24.

Autor, D.H., Dorn, D., 2013. The Growth of Low-Skill Service Jobs and the Polarization of the US Labor Market. Am. Econ. Rev. 103, 1553–1597.

Autor, D.H., Katz, L.F., Kearney, M.S., 2008. Trends in U.S. Wage Inequality: Revising the Revisionists. Rev. Econ. Stat. 90, 300–323.

Autor, D.H., Levy, F., Murnane, R.J., 2003. The Skill Content Of Recent Technological Change: An Empirical Exploration. Q. J. Econ. 55.

Basso, G., 2019. The Evolution of the Occupational Structure in Italy in the Last Decade. SSRN Electron. J.

Blinder, A.S., 1973. Wage Discrimination: Reduced Form and Structural Estimates. J. Hum. Resour. 8, 436–455.

Bogliacino, F., 2014. A critical review of the technology-inequality debate. Suma Negocios 5, 124–135.

Brandolini, A., Cipollone, P., Sestito, P., 2001. Earnings Dispersion, Low Pay and Household Poverty in Italy, 1977-1998. Bank Italy Econ. Res. Dep. Temi Discuss. Econ. Work. Pap.

Card, D., 1996. The Effect of Unions on the Structure of Wages: A Longitudinal Analysis. Econometrica 64, 957.

Card, D., DiNardo, J.E., 2002. Skill-Biased Technological Change and Rising Wage Inequality: Some Problems and Puzzles. J. Labor Econ. 20, 733–783.

Castellano, R., Musella, G., Punzo, G., 2019. Wage dynamics in light of the structural changes in the labour market across four more economically developed countries of Europe. Rev. Soc. Econ. 1–39.

Celi, G., Ginzburg, A., Guarascio, D., Simonazzi, A., 2017. Crisis in the European Monetary Union: A Core-Periphery Perspective. Routledge.

Cetrulo, A., Cirillo, V., Guarascio, D., 2019. Weaker jobs, weaker innovation. Exploring the effects of temporary employment on new products. Appl. Econ. 51, 6350–6375.

Dabla-Norris, E., Kochhar, K., Suphaphiphat, N., Ricka, F., Tsounta, E., 2015. Causes and Consequences of Income Inequality: A Global Perspective. Staff Discuss. Notes 15, 1.

DiNardo, J.E., Pischke, J.-S., 1997. The Returns to Computer Use Revisited: Have Pencils Changed the Wage Structure Too? Q. J. Econ. 112, 291–303.

Fana, M., Villani, D., 2021. The Automotive Supply Chain in Europe: An Input- Output Analysis of Value Added and Employment Composition.

Fernández-Macías, E., 2012. Job Polarization in Europe? Changes in the Employment Structure and Job Quality, 1995-2007. Work Occup. 39, 157–182.

Fernández-Macías, E., Hurley, J., Arranz, J.M., 2017. Occupational change and wage inequality, European jobs monitor. Publication Office of the European Union, Luxembourg.

Firpo, S., Fortin, N., Lemieux, T., 2018a. Decomposing Wage Distributions Using Recentered Influence Function Regressions. Econometrics 6, 28.

Firpo, S., Fortin, N., Lemieux, T., 2018b. Decomposing Wage Distributions Using Recentered Influence Function Regressions. Econometrics 6, 28.

Firpo, S., Fortin, N.M., Lemieux, T., 2009. Unconditional Quantile Regressions. Econometrica 77, 953–973.

G. Esping-Andersen, 1990. The three worlds of welfare capitalism. Princeton University Press.

G. Esping-Andersen, M.R., 2000. Why Deregulate Labour Markets?, Why Deregulate Labour Markets? Oxford University Press.

Giorgio Piccitto, 2019. Qualificazione o polarizzazione? Il mutamento della struttura occupazionale in Italia, 1992-2015. Polis 59–88.

Goldin, C., Katz, L.F., 2008. The Race between Education and Technology. Harvard University Press.

Guarascio, D., Dosi, G., 2016. Oltre la “magia del libero mercato”: il ritorno della politica industriale. Quad. Rassegna Sind. 2016, 91–103.

Guarascio, D., Simonazzi, A., 2016. A polarized country in a polarized Europe: an industrial policy for Italy’s renaissance. Econ. E Polit. Ind. 43, 315–322.

Hampel, F.R., 1974. The Influence Curve and its Role in Robust Estimation. J. Am. Stat. Assoc. 69, 383–393.

Hasell, J., Morelli, S., Roser, M., 2019. Recent Trends in Income Inequality, in: Reducing Social Inequalities in Cancer: Evidence and Priorities for Research, IARC Scientific Publication.

Hurley, J., Fernández-Macías, E., Bisello, M., Vacas-Soriano, C., Fana, M., European Foundation for the Improvement of Living and Working Conditions, 2019. Shifts in the employment structure at regional level labour market change.

ILO, 2020. World Employment and Social Outlook - Trends 2020. World Employ. Soc. Outlook 108.

INPS, 2019. XVIII Rapporto annuale.

Katz, L.F., Murphy, K.M., 1992. Changes in Relative Wages, 1963-1987: Supply and Demand Factors. Q. J. Econ. 107, 35–78.

Kleinknecht, A., 2020. The (negative) impact of supply-side labour market reforms on productivity: an overview of the evidence1. Camb. J. Econ. 44, 445–464.

Koenker, R., Bassett, G., 1978. Regression Quantiles. Econometrica 46, 33.

Lemieux, T., 2006. Increasing Residual Wage Inequality: Composition Effects, Noisy Data, or Rising Demand for Skill? Am. Econ. Rev. 96, 461–498.

Lilla, M., Staffolani, S., 2009. The evolution of wage inequality in Italy. Appl. Econ. 41, 1873–1892.

Luciana Aimone Gigio, Camussi, S., Maccarrone, V., 2021. Changes in the employment structure and in job quality in Italy: a national and regional analysis (No. 603), Questioni di Economia e Finanza (Occasional Papers), Questioni di Economia e Finanza (Occasional Papers). Bank of Italy, Economic Research and International Relations Area.

Machado, J.A.F., Mata, J., 2005. Counterfactual decomposition of changes in wage distributions using quantile regression. J. Appl. Econom. 20, 445–465.

Manacorda, M., 2004. Can the Scala Mobile Explain the Fall and Rise of Earnings Inequality in Italy? A Semiparametric Analysis, 1977–1993. J. Labor Econ. 22, 585–613.

Morelli, S., Smeeding, T., Thompson, J., 2015. Chapter 8 - Post-1970 Trends in Within-Country Inequality and Poverty: Rich and Middle-Income Countries, in: Atkinson, A.B., Bourguignon, F. (Eds.), Handbook of Income Distribution, Handbook of Income Distribution. Elsevier, pp. 593–696.

Naticchioni, P., Raitano, M., Vittori, C., 2016. La Meglio Gioventù: earnings gaps across generations and skills in Italy. Econ. Polit. 33, 233–264.

Naticchioni, P., Ricci, A., Rustichelli, E., 2010. Far away from a skill-biased change: falling educational wage premia in Italy. Appl. Econ. 42, 3383–3400.

Naticchioni, P., Ricci, A., Rustichelli, E., 2008. Wage Inequality, Employment Structure and Skill-biased Change in Italy. LABOUR 22, 27–51.

Oaxaca, R., 1973. Male-Female Wage Differentials in Urban Labor Markets. Int. Econ. Rev. 14,

OECD, 2015. In It Together: Why Less Inequality Benefits All

OECD, 1994. The OECD Jobs Study

Piketty, T., Saez, E., 2003. Income Inequality In The United States, 1913-1998. Q. J. Econ. 39.

Piketty, T., Saez, E., Zucman, G., 2018. Distributional National Accounts: Methods and Estimates for the United States*. Q. J. Econ. 133, 553–609.

Raitano, M., Fana, M., 2019. Labour market deregulation and workers' outcomes at the beginning of the career: Evidence from Italy. Struct. Change Econ. Dyn. 51, 301–310.

Franzini, M., and Raitano. "Earnings inequality and workers' skills in Italy." Structural Change and Economic Dynamics 51 (2019): 215-224.

Ricci, A., Cirillo, V., 2019. Produttività, salari e profitti: il ruolo dei contratti a tempo determinato.

Rosolia, A., Torrini, R., 2016. The Generation Gap: A Cohort Analysis of Earnings Levels, Dispersion and Initial Labor Market Conditions in Italy, 1974-2014 (SSRN Scholarly Paper No. ID 2917183). Social Science Research Network, Rochester, NY.

Visser, J., Checchi, D., 2011. Chapter 10: Inequality And The Labour Market: Unions

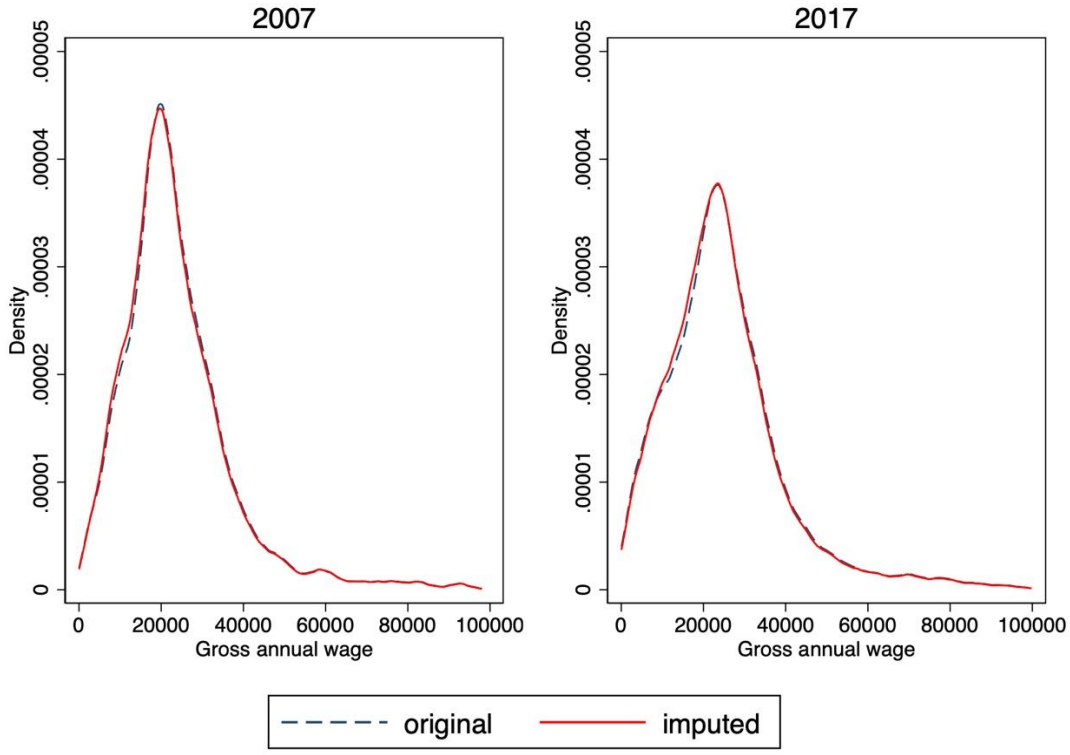
Wright, E.O., Dwyer, R.E., 2003. The patterns of job expansions in the USA: a comparison of the 1960s and 1990s. Socio-Econ. Rev. 1, 289–325.

9 Annexes

Table A 1 employment distribution by main variable over time

	2007	2011	2014	2017
Occupation				
Legislators & Managers	1.8	2.4	1.3	1.4
Professionals	10.2	14.7	15.5	16.5
Technicians & Associate Prof.	23	16.8	16.7	17.6
Clerks	14.9	16.7	16	14.8
Service Workers	11.3	15.5	16.1	16.7
Skilled agricultural workers	1	0.8	0.9	0.9
Craft & related trade workers	15.7	14.3	15.3	13.2
Machine operators	11.6	7.6	6.9	7.1
Elementary occupations	10.5	11.2	11.3	11.8
Total	100	100	100	100
Sector				
Primary	2.6	2.6	2.1	3.1
Mining, Manufacturing, Utilities supply	26.8	24.1	24.1	22.6
Construction	7	6.3	5.8	6.7
Wholesale & Retail	10.9	12.6	11.8	11.6
Accomodation	3.1	4.9	4.7	5.3
Transport storage & communication	5.8	7.7	7.6	7.9
Financial intermediation	3.4	3.7	3.6	3.3
Real estate & business activity	6	7.8	8.5	8.7
Public Adm & social security	8.2	7.8	6.6	6.3
Education	9.7	8.7	8.9	9.4
Health	8.1	8.6	8.9	9.1
Other soc. services	8.5	5.2	7.4	6
Total	100	100	100	100
Contract length				
Part-time	12	15.9	16.1	15
Full-time	88	84.1	83.9	85
Total	100	100	100	100
Contract type				
Temporary	13.3	13.9	14.4	16.6
Permanent	86.7	86.1	85.6	83.4
Total	100	100	100	100
Gender				
Female	43.3	44.7	45.6	45.4
Male	56.7	55.3	54.4	54.6
Total	100	100	100	100

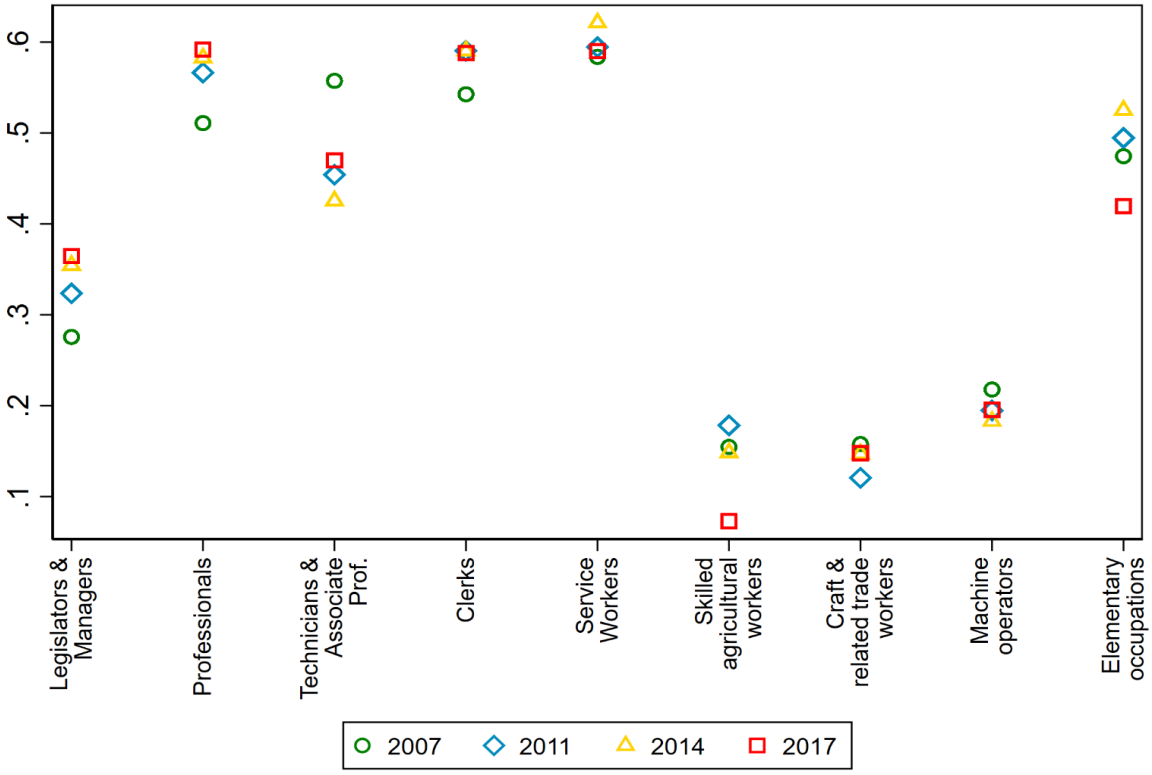
Figure A 1 Original and imputed wage distributions in 2007 and 2017.



Note: the Gini coefficient computed on the original distribution in 2007 is 0.305 and 0.307 with the imputation. In 2017 these values are 0,338 vs 0.335.

Source: authors' elaboration on EU SILC data

Figure A 2 share of female workers across professional groups (Isco08 one digit) over time.



Source: authors' elaboration on EU SILC data

Table A 2 Annual gross income – average within each decile

	p10	p50	p90
2007	7714	22900	38522
2011	6070	22415	38192
2014	5902	22124	37165
2017	5718	21620	36146

Table A 3 Summary statistics (%)

	2007			2011			2014			2017		
decile	*p10*	*p50*	*p90*	*p10*	*p50*	*p90*	*p10*	*p50*	*p90*	*p10*	*p50*	*p90*
Occupation												
Legislators & Managers	0.8	0.9	1.4	0.5	0.7	2.3	0.6	0.3	1.5	1	0.6	0.8
Professionals	4.7	5.0	18.1	6.8	9.6	26	7.6	8.8	27.2	9	9.9	23.5
Technicians & Associate Prof.	14.7	19.7	35.8	7.5	14.8	28.9	8.2	14.1	26.7	10.7	16.5	26.4
Clerks	12	15.8	15.9	10.4	20.1	18.6	10.7	22.8	17.4	9.6	18.5	18.7
Service Workers	20.4	11.8	7.2	27.3	16.4	7.3	27.7	16	7.6	27.6	17.1	10
Skilled agricultural workers	3.1	0.9	0.2	2.2	1.1	0	2.6	1.2	0	1.7	1.2	0.2
Craft & related trade workers	13.9	20.5	8.7	12.3	18.7	8.8	13.5	19.8	10.6	10.8	17.8	8.8
Machine operators	5.8	15.5	10.3	4.5	9.2	6.3	3.6	8.3	7	4	7.8	7.9
Elementary occupations	24.6	10.1	2.4	29.2	9.6	1.8	25.5	8.8	2	25.7	10.4	3.6
Total	100	100	100	100	100	100	100	100	100	100	100	100
Sector												
Primary	10.6	1.8	0.7	9.1	1.5	0.9	6.7	1.3	0.5	7.6	2.2	1.2
Mining, Manufacturing, Utilities supply	16	33	23.5	14.8	24.6	24.6	12.5	25.9	28.1	15.1	24.1	26
Construction	5.7	8.9	2.9	6.7	7.9	2.3	5.2	7.3	2.7	5.7	8.4	3.8
Wholesale & Retail	11.6	13.7	5	16.1	17.2	7.3	11.4	16.5	6.6	11.7	13.2	8
Accomodation	9.7	3.1	0.9	12.3	4	0.9	13.4	4	1.2	12.3	5.2	1.5
Transport storage & communication	2.7	4.6	7.2	3.8	6.7	12	4.2	6.6	10.6	4.5	6.4	11.5
Financial intermediation	1.4	1.7	6	1.2	1.1	6.4	1.3	1.4	6.1	1.9	1.3	5.8
Real estate & business activity	8.2	5.2	4.4	10.2	7.6	5.1	13.6	8.7	5.5	13	7.1	5.9
Public Adm & social security	4.9	5.6	16.2	3.2	7.6	14.2	1.3	7.2	15.6	1.6	6.9	12.3
Education	5.4	10.6	18.3	5.3	9.3	15.2	5.6	8.8	13.6	6.2	9.6	13.3
Health	4.9	7	11.8	5.3	9.1	7.8	6.9	9	6.9	6.3	10.9	8.6
Other soc. services	18.9	4.8	3.3	12.1	3.2	3	17.9	3.1	2.5	14.2	4.7	2.1
Total	100	100	100	100	100	100	100	100	100	100	100	100
Gender												
Female	67.5	42.4	36.7	63.3	45.3	34.8	63	47.1	35.4	61.2	48.4	32.8
Male	32.5	57.6	63.3	36.7	54.7	65.2	37	52.9	64.6	38.8	51.6	67.2
Total	100	100	100	100	100	100	100	100	100	100	100	100
Contract type												
Part-time	49.8	4.9	1.6	47.6	7.6	2.1	48.7	9.7	1.6	39.2	7.6	1.9
Full-time	50.2	95.1	98.4	52.4	92.4	97.9	51.3	91.4	98	60.8	92.4	98.1
Total	100	100	100	100	100	100	100	100	100	100	100	100
Contract length												
Temporary	47.6	9.9	3.6	48.4	119	1.5	47.8	9.7	1.6	42.7	13.9	2.1
Permanent	52.4	90.1	96.4	53.6	89	98.5	52.2	90.3	98.4	57.3	86.1	97.9
Total	100	100	100	100	100	100	100	100	100	100	100	100

Table A4: OLS results by gender and year

	2007		2011		2014		2017	
	Female	Male	Female	Male	Female	Male	Female	Male
Occupation: ref. Clerks								
Legislators & Managers	0.315***	0.193***	0.119	0.431***	0.281***	0.387***	0.383***	0.250**
Professionals	0.192***	0.211***	0.147***	0.236***	0.155***	0.243***	0.172***	0.232***
Technicians & Associate Prof.	0.050**	0.108***	0.079***	0.072**	0.045	0.088***	0.003	0.094***
Service Workers	-0.108***	-0.022	-0.180***	-0.072*	-0.226***	-0.059	-0.187***	-0.035
Skilled agricultural workers	-0.386*	-0.197**	-0.120	-0.521***	-0.242	-0.338***	-0.122	-0.160*
Craft & related trade workers	-0.175***	-0.108***	-0.169***	-0.166***	-0.224***	-0.156***	-0.262***	-0.108***
Machine operators	-0.139***	-0.021	-0.197***	-0.099***	-0.158***	-0.064*	-0.124**	-0.040
Elementary occupations	-0.250***	-0.189***	-0.329***	-0.264***	-0.273***	-0.201***	-0.263***	-0.194***
Sectors: ref. Wholesale&Retail								
Primary	-0.353***	-0.158**	-0.252**	-0.109*	-0.498***	-0.153*	-0.227***	-0.108*
Mining, Manufacturing, Utilities supply	-0.016	0.124***	-0.020	0.092***	-0.041	0.115***	-0.017	0.104***
Construction	-0.050	0.010	-0.055	0.008	-0.155*	-0.011	-0.084	0.000
Accommodation	-0.175***	-0.086	-0.129**	-0.162***	-0.292***	-0.135**	-0.124**	-0.164**
Transport storage & communication	0.045	0.168***	0.041	0.110***	0.011	0.087**	0.034	0.076*
Financial intermediation	0.252***	0.326***	0.245***	0.276***	0.161**	0.301***	0.233***	0.237***
Real estate & business activity	-0.091**	0.001	-0.041	-0.035	-0.165***	-0.044	-0.140***	-0.032
Public Adm & social security	0.073**	0.184***	0.100**	0.126***	0.058	0.157***	0.093**	0.184***
Education	-0.013	-0.023	-0.053	-0.113**	-0.182***	-0.152**	-0.144***	-0.149***
Health	0.060*	0.187***	0.004	0.082	-0.095**	0.024	-0.036	0.077
Other soc. services	-0.224***	0.042	-0.181***	-0.106	-0.342***	-0.158**	-0.217***	-0.162**
Education: ref. Lower sec.								
isced=1	0.005	-0.105***	-0.085*	-0.152***	-0.080	-0.114*	-0.036	-0.175**
isced=3	0.161***	0.123***	0.115***	0.072***	0.102***	0.086***	0.124***	0.120***
isced=4	0.190***	0.100***	0.098**	0.094*	0.184***	0.089*	0.146**	0.116
isced=5	0.268***	0.321***	0.227***	0.190***	0.225***	0.224***	0.226***	0.230***
WorkingHours: ref. FullTime								
Employed PT	-0.453***	-0.441***	-0.474***	-0.528***	-0.418***	-0.562***	-0.393***	-0.446***
Experience	0.014***	0.013***	0.011***	0.013***	0.013***	0.012***	0.013***	0.012***
Contract: ref. Temporary								
Permanent	0.286***	0.327***	0.376***	0.474***	0.396***	0.435***	0.288***	0.319***
Macroarea: ref. North-West								
Sud & Isole	-0.125***	-0.126***	-0.193***	-0.179***	-0.184***	-0.223***	-0.159***	-0.168***
Nord-est	-0.061***	-0.022	-0.028	-0.021	-0.007	-0.029	-0.013	0.026
Centro	-0.072***	-0.028	-0.083***	-0.058**	-0.061**	-0.079***	-0.022	-0.088***
Constant	9.513***	9.536***	9.490***	9.472***	9.476***	9.478***	9.479***	9.531***
R-squared	0.504	0.426	0.500	0.443	0.515	0.453	0.432	0.351
N	6276.000	7786.000	5696.000	6493.000	5776.000	6343.000	6678.000	7462.000

Table A5: Conditional quantile regressions at 10, 50 and 90th percentile – Female in 2007 vs 2017

	10th		50th		90th	
	2007	2017	2007	2017	2007	2017
Occupation: ref. Clerks						
Legislators & Managers	0.131*	0.329***	0.197	0.440***	0.583***	0.686***
Professionals	0.191**	0.035	0.142***	0.148***	0.335***	0.307***
Technicians & Associate Prof.	0.086*	-0.067	0.042**	0.022	0.058***	0.035
Service Workers	-0.110*	-0.261***	-0.108***	-0.141***	-0.068**	-0.169***
Skilled agricultural workers	-0.348	0.291	-0.383	-0.159*	-0.109	-0.290*
Craft & related trade workers	-0.165**	-0.340***	-0.159***	-0.237***	-0.202***	-0.264***
Machine operators	-0.107	-0.173	-0.117***	-0.084	-0.150***	-0.169***
Elementary occupations	-0.251***	-0.278***	-0.250***	-0.265***	-0.193***	-0.243***
Sectors: ref. Wholesale&Retail						
Primary	-0.595***	-0.383	-0.370***	-0.259***	-0.076	-0.149
Mining, Manufacturing, Utilities supply	-0.080	-0.009	-0.016	-0.051	0.064*	0.016
Construction	0.019	-0.123	0.005	-0.030	0.030	0.091**
Accommodation	-0.358***	-0.204*	-0.160***	-0.138***	-0.044	-0.074
Transport storage & communication	-0.047	0.050	0.083**	0.001	0.145*	0.030
Financial intermediation	0.137	0.094	0.328***	0.283***	0.325***	0.227***
Real estate & business activity	-0.177*	-0.179***	-0.090**	-0.130***	0.046	-0.086*
Public Adm & social security	0.103*	0.162***	0.080***	0.008	0.055*	0.064
Education	0.059	0.091	0.041*	-0.133***	-0.121***	-0.320***
Health	0.031	0.028	0.046*	-0.075**	0.092*	-0.081*
Other soc. services	-0.409***	-0.276**	-0.209***	-0.256***	-0.130***	-0.179***
Education: ref. Lower sec.						
isced=1	0.030	-0.038	-0.030	-0.060	-0.012	-0.041
isced=3	0.186***	0.145***	0.137***	0.107***	0.178***	0.088***
isced=4	0.165***	0.213	0.181***	0.163***	0.238***	0.042
isced=5	0.238***	0.294***	0.255***	0.213***	0.318***	0.217***
WorkingHours: ref. FullTime						
Employed PT	-0.561***	-0.420***	-0.491***	-0.438***	-0.331***	-0.369***
Experience	0.018***	0.016***	0.012***	0.011***	0.012***	0.009***
Contract: ref. Temporary						
Permanent	0.487***	0.626***	0.245***	0.249***	0.170***	0.136***
Macroarea: ref. NorthWest						
Sud & Isole	-0.159***	-0.153***	-0.063***	-0.119***	-0.092***	-0.133***
Nord-est	-0.057*	0.040	-0.037**	-0.021	-0.082**	-0.015
Centro	-0.078*	-0.017	-0.043**	-0.021	-0.074**	-0.048**
Constant	8.891***	8.607***	9.597***	9.616***	9.978***	10.137***
Pseudo	0.329	0.244	0.344	0.307	0.279	0.290
R-squared	6276.000	6678.000	6276.000	6678.000	6276.000	6678.000

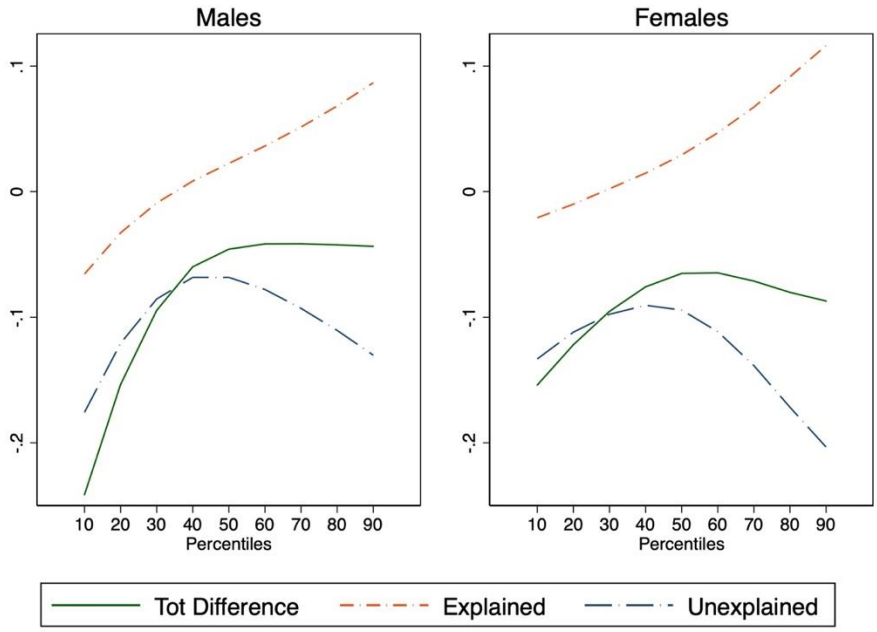
Table A6: Conditional quantile regressions at 10, 50 and 90th percentile – Male in 2007 vs 2017

	10th		50th		90th	
	2007	2017	2007	2017	2007	2017
Occupation: ref. Clerks						
Legislators & Managers	0.047	0.006	0.142***	0.429***	0.478***	0.387***
Professionals	0.086	0.170***	0.230***	0.216***	0.309***	0.316***
Technicians & Associate Prof.	0.029	0.126**	0.093***	0.074***	0.194***	0.146***
Service Workers	-0.082	-0.011	0.006	-0.033	-0.000	-0.057
Skilled agricultural workers	-0.375	-0.219	-0.100	-0.166	-0.188	-0.199**
Craft & related trade workers	-0.129***	-0.033	-0.098***	-0.125***	-0.112***	-0.157***
Machine operators	-0.047	-0.033	-0.018	-0.039	-0.038	-0.116**
Elementary occupations	-0.263***	-0.205***	-0.148***	-0.176***	-0.170***	-0.173***
Sectors: ref. Wholesale&Retail						
Primary	-0.305*	-0.210**	-0.226***	-0.116***	-0.097	-0.113
Mining, Manufacturing, Utilities supply	0.160***	0.094	0.093***	0.082***	0.121***	0.087**
Construction	0.035	-0.084	-0.005	0.017	-0.042	-0.023
Accommodation	-0.021	-0.489***	-0.168***	-0.159***	-0.046	-0.122***
Transport storage & communication	0.201***	0.034	0.139***	0.080***	0.155**	0.021
Financial intermediation	0.368*	0.210**	0.364***	0.272***	0.253***	0.202***
Real estate & business activity	0.004	-0.107	0.010	-0.016	-0.069	0.015
Public Adm & social security	0.279***	0.247***	0.159***	0.153***	0.071*	0.122***
Education	0.142**	0.075	-0.076**	-0.189***	-0.201***	-0.350***
Health	0.225***	0.065	0.129**	-0.003	0.164**	0.149***
Other soc. services	0.058	-0.340*	0.024	-0.158***	0.042	-0.073*
Education: ref. Lower sec.						
isced=1	-0.109*	-0.289**	-0.121***	-0.138**	-0.070	0.007
isced=3	0.097***	0.102***	0.095***	0.115***	0.153***	0.145***
isced=4	0.081*	-0.128	0.113***	0.138***	0.098*	0.127***
isced=5	0.264***	0.123**	0.304***	0.245***	0.431***	0.323***
WorkingHours: ref. FullTime						
Employed PT	-0.693***	-0.629***	-0.477***	-0.467***	-0.309**	-0.367***
Experience	0.014***	0.012***	0.011***	0.010***	0.012***	0.011***
Contract: ref. Temporary						
Permanent	0.550***	0.577***	0.294***	0.266***	0.174***	0.177***
Macroarea: ref. NorthWest						
Sud & Isole	-0.134***	-0.194***	-0.118***	-0.142***	-0.102***	-0.148***
Nord-est	-0.003	0.055*	-0.027*	0.008	-0.017	-0.034
Centro	-0.042	-0.135**	-0.029	-0.073***	-0.006	-0.095***
Constant	8.927***	8.850***	9.646***	9.538***	10.107***	10.147***
Pseudo R-squared	0.285	0.219	0.256	0.235	0.275	0.269
N	7786	7462	7786	7462	7786	7462

Table A7: RIF P90-P10 coefficient by years and gender

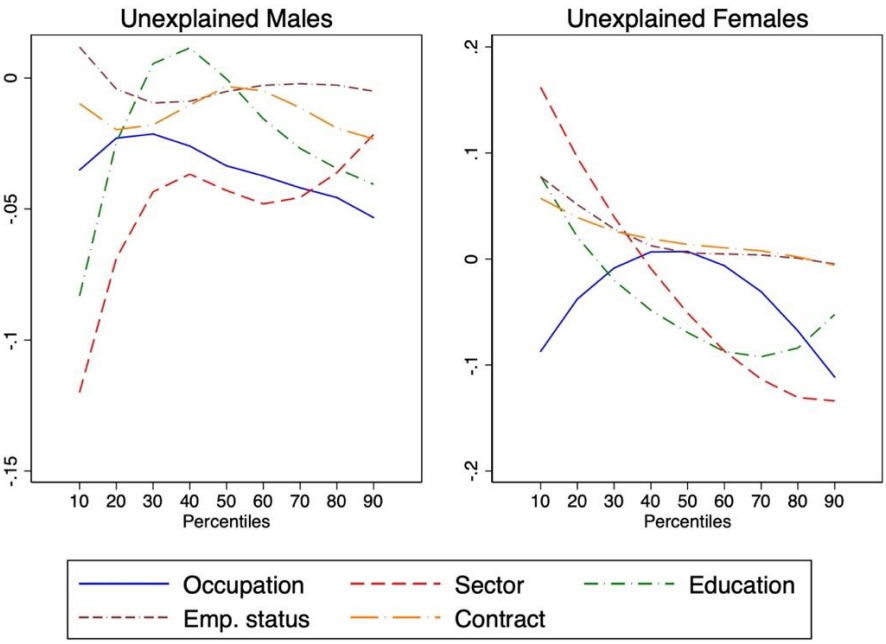
	2007		2011		2014		2017	
	Female	Male	Female	Male	Female	Male	Female	Male
Occupation: ref. Clerks								
Legislators & Managers	1.294	2.103***	4.114***	5.513***	6.240***	4.597***	4.519***	5.177***
Professionals	2.072***	1.795***	1.855***	1.826***	2.151***	2.794***	2.028***	2.561***
Technicians & Associate Prof.	0.288	0.597**	0.467	1.141***	0.493	1.164**	0.884*	1.043**
Service Workers	0.884*	0.664	0.382	0.560	0.031	0.107	1.251**	0.287
Skilled agricultural workers	4.269	0.095	-2.499	5.549**	-2.081	0.451	-3.089	1.047
Craft & related trade workers	0.333	0.031	0.064	0.788	0.150	0.536	1.269	-0.788
Machine operators	-0.096	-0.717***	-0.493	0.029	-0.857	-0.999*	-0.357	-1.420***
Elementary occupations	2.170***	0.792*	2.020***	2.845***	1.415*	0.435	2.287***	1.853**
Sectors: ref. Wholesale&Retail								
Primary	4.396***	2.775***	4.454***	4.033***	6.958**	5.617***	3.450*	3.094***
Mining, Manufacturing, Utilities supply	1.328***	-0.122	0.526	-0.620	0.631	-0.252	0.162	0.691
Construction	1.151	0.050	0.998	0.784	0.359	1.144	0.872	0.553
Accommodation	2.707***	-0.685	1.411	2.528*	3.509***	1.474	0.585	1.338
Transport storage & communication	1.351*	-0.112	1.123	-0.134	0.658	0.366	0.965	0.229
Financial intermediation	3.354***	2.047***	3.302***	2.587***	3.865***	1.323*	3.113***	1.972**
Real estate & business activity	1.580***	-0.608	0.356	-0.259	0.632	0.350	0.720	0.396
Public Adm & social security	1.161**	-1.283***	-0.157	-1.062*	-0.343	-1.828***	0.066	-1.096*
Education	-0.018	-2.313***	-1.984***	-3.037***	-1.878**	-2.687***	-1.474***	-2.937***
Health	0.697*	-0.645	-0.749	0.031	0.460	-0.199	-0.066	-0.294
Other soc. services	2.584***	-0.283	2.055**	1.626	1.719**	2.212	1.365*	1.492
Education: ref. Lower Secondary								
isced=1	-0.003	-0.037	0.244	0.727	1.529	1.607	-0.390	3.170**
isced=3	-0.098	0.232	-0.443	0.545	-0.386	0.231	-0.807*	0.035
isced=4	-0.134	0.356	-0.429	0.504	-0.827	-0.114	-0.551	0.943
isced=5	0.370	1.409***	0.498	0.952	0.180	0.900*	0.120	1.492**
WorkingHours: ref. FullTime								
Employed PT	2.640***	4.960***	1.575***	6.913***	1.436***	7.848***	0.949**	4.804***
Experience	0.007	-0.002	0.005	-0.029	-0.013	0.006	-0.011	0.000
Contract: ref. Temporary								
Permanent	-2.210***	-2.968***	-2.816***	-5.750***	-4.204***	-5.132***	-2.750***	-3.206***
Macroarea: ref. NorthWest								
Sud & Isole	1.498***	0.550**	1.579***	1.145***	2.323***	1.527***	1.143**	1.120**
Nord-est	0.001	-0.077	-0.239	-0.117	-0.439	-0.390	-0.195	-1.018**
Centro	0.564**	0.106	0.400	0.274	0.486	0.053	0.335	0.165
Constant	2.855***	5.293***	5.085***	7.663***	6.313***	6.547***	5.266***	5.135***
R-squared	0.142	0.146	0.106	0.174	0.134	0.183	0.074	0.112
N	6276.000	7786.000	5696.000	6493.000	5776.000	6343.000	6678.000	7462.000

Figure A 3 Total differences, total explained and unexplained of the log-wage decomposition by gender



Source: authors' elaboration on EU SILC data

Figure A 4 Detailed unexplained covariates by gender



Source: authors' elaboration on EU SILC data

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