**Is it the Goldin hypothesis the last chapter to explain the Italian gender pay gap?**

**Sergio Destefanis**
**Fernanda Mazzotta**
**Lavinia Parisi**

**Abstract:** The paper aims to trace some features of the gender pay gap in Italy in the light of Goldin (2014) hypothesis that this gap is crucially linked to firms' incentive to disproportionately reward individuals who work long and particular hours. We apply Oaxaca-Blinder decomposition using data from the Italian component of the European Structure of Earnings Survey (2014). Considering the framework used in Goldin (2014), we analyse the unexplained component of the gender gap taking into account the elasticity of earnings to hours worked in different occupations and five characteristics which reflect the work activities and context. We test whether the unexplained gap reduces when considering the difference in the distribution of men and women across occupation. The underlying hypothesis is that, when the elasticity of earnings with respect to hours worked is greater than one there is a nonlinearity of earnings with respect to time worked thus the gender gap is higher. Nonlinear occupations impose heavy penalties on employees who want fewer hours, more flexible and better substitutes or standardized occupations, women are usually those who prefer these kind of occupations.

## 1. Introduction

While the gap in schooling between men and women has narrowed in the last hundred years, there are still considerable gender gaps in pay and employment levels, as well as in the types of activities that men and women perform in the labour markets of advanced economies (OECD, 2002). The 2018 report on equality between women and men in EU (European Commission, 2019) points out that women in the EU earn on average over 16% less per hour than men. Significant country heterogeneity can be observed among the EU Member States: the gender pay gap varies from 5.2% in Romania to 25.3% in Estonia. Italy has one of the lowest total gaps (5.5%), but is often found to have a quite high unexplained (also called residual) gap (see for instance Boll et al., 2016, on SES 2014 data: 11.9% for Italy vs 9.4% for EU28).

In an important contribution, Goldin (2014) highlights a relatively disregarded reason for explaining the unexplained gender wage gap. This residual gap could largely depend on how firms reward individuals who differ in their desire for workplace flexibility. The latter is defined in terms of number of hours to be worked and also of the particular hours worked (with varying degrees of time pressure, interaction with others, being "on call," providing "face time," being around for customers or group meetings). According to Goldin, firms have an incentive to disproportionately reward individuals who labour long and particular hours. If some workers want the amenity of workplace flexibility, firms may find it convenient to provide it along with a lower wage, also to incentive the others workers. This disproportionate reward produces a nonlinearity (more than proportional relationship) between earnings and hours worked, which in turn brings about a gender pay gap that is not explained by differences in human capital or other characteristics across workers. Indeed, Goldin argues that women usually prefer short and less demanding workhours. Besides, according to her the strongest nonlinearities are found in jobs for which bargaining and competing matter the most, and women also fall back from competition. Follow the Micro-foundations of Compensating Differentials

another part of the wage compensation include how firms reward individuals who differ in their desire for various amenities. These amenities are various aspects of workplace flexibility and workplace flexibility is a complicated, multidimensional concept. The term incorporates the number of hours to be worked and also the particular hours worked, being "on call," providing "face time," being around for clients, group meetings, and the like, These aspects reflect different needs linked to the role of women in the social context or also, for a recent and growing literature, on the role of gender differences in a number of psychological traits (Bertrand, 2011; Croson and Gneezy, 2009; Azmat and Petrongolo, 2014; Niederle, 2015). A robust evidence shows that females are more averse to risk and less willing to compete, have a lower degree of self-confidence, tend to face difficulties in negotiations, suffer more under pressure and from receiving negative feedbacks (Dohmen et al., 2011; Niederle and Vesterlund, 2007; Kamas and Preston, 2012; Shurchkov, 2012; Azmat et al., 2016; Babcock et al., 2017). These psychological differences may be responsible for a significant share of gender gaps in economic outcomes give that women, according their inclinations, may choose type of occupations that meet certain characteristics and they even are willing to forgo a part of the reward in order to ensure certain amenities related to work and that could meet their needs or their preferences. This framework performs well empirically, when applied to US data in Goldin (2014). Yet, applications outside the US are, to the best of our knowledge, thoroughly missing.

In this paper we want to fill this gap, by applying the framework used in Goldin (2014) to Italian data. Italy is an interesting field of research, both because it has (as recalled above) a rather large residual pay gap, and because there exist widely acknowledged differences between the Italian and the US labour market. It is a demanding test for Goldin's framework to be able to explain the residual gender gap in both markets. A basic feature of this empirical analysis (wholly in line with Goldin's contribution) is that we link the residual gender gap with the elasticity of earnings to workhours in different occupations. We aim to test whether, in Italy too, the unexplained component of the gender gap is a function of the elasticity of earnings to workhours in different types of occupation. The underlying hypothesis is that if elasticity of earnings with respect to hours worked is greater than one, employees, typically including women, who want fewer hours and more flexible employment, are penalized and a gender gap emerges.

In order to measure the unexplained component of the gender gap, we follow both Goldin's own procedure, and the well-known Oaxaca-Blinder (O-B) decomposition, thus also providing a methodological extension of the analysis in Goldin (2014). We use a large dataset (the European Structure of Earnings Survey for 2014) that provides accurate and harmonized data on earnings, matching information on individual characteristics of employees (sex, age, occupation, length of service, highest educational level attained, etc.) and of their employer (branch of economic activity, size and location of the enterprise). Moreover in order to control for some relevant qualitative characters of occupations, and to assess whether they are related to the unexplained component of the gender gap, following Goldin (2014) we used the 2014 O*Net online Occupation characteristics, of the U.S Department of Labors Occupational Information Network, in particular five characteristics

which reflect: time pressure, the need for workers to be around at particular times, the flexibility of the occupation with regard to scheduling, the groups and workers the employee must regularly keep in touch with, and the degree to which the worker has close substitutes. We also rely on the 2013 ICP (Italian Sample Survey on Professions) from INAPP for e robustness check.

The rest of the paper has the following structure. In Section 2 we very briefly survey the literature on the gender gap, and provide a more articulate account of Goldin's (2014) framework. Section 3 expounds the empirical procedures and the data. The main results are presented and commented in Section 4. Section 5 provides some robustness checks and Section 6 concludes the paper.

## 2. The gender gap and the Goldin hypothesis

The literature on the determinants of gender pay gaps has provided an extensive set of theories helping to explain the persistence of the phenomenon. Here we are interested in theories that address the residual gender pay gap, that is the pay gap that is not explained by gender differences in human capital or other labour productivity determinants.

Goldin (2014) begins her analysis with the observation that the explained portion of the gender wage gap decreased over time as differences in years of education, and in years of labour market experience between men and women gradually narrowed . As a consequence, the relative importance of the residual gender pay gap increased over time. Among the competing theories for the determination of this residual gap, Goldin singles out the explanations pointing to the role of bargaining ability.[1]Yet these approaches do not explain why the residual gender pay gap tends to increase with age, or why this gap decisively narrows down for women without children. Goldin then undertakes to provide an approach, based on the concepts of compensating differentials and endogenous job design, which is capable of encompassing all these stylized facts.

The key idea is that the residual gender pay gap must be mainly related to how firms reward workers with different propensities for workplace flexibility. The latter concept "… incorporates the number of hours to be worked and also the particular hours worked, being "on call", providing "face time", being around for clients, group meetings, and the like." (Goldin 2014, 1094). Individuals place different values on workplace flexibility, and firms face different costs in providing this amenity. Subsequently, individuals accept lower earnings in exchange for more flexible workplaces. If workers were perfect substitutes one with the other, there would not be a premium in earnings with respect to the number or timing of workhours, and earnings would move linearly with respect to hours. But if workers turn out to be imperfect substitutes for each other, there will be penalties from low or nonmanipulable (from the firm) hours because they produce a loss to the firm. Hence, a nonlinear

[1] Women bargain less fiercely, according to the evidence shown in Babcock and Laschever (2003). A related view is that women are less interested than men to compete in the labour market. Gneezy et al. (2003) and Niederle and Vesterlund (2007) find some evidence in favour of this view, unlike Manning and Saidi (2010).

(more than proportional) relationship arises between earnings and workhours. This simple idea has four important consequences. First, it is women that typically want more workplace flexibility, and a gender gap emerges from the compensating differentials. Secondly, as workplace flexibility is very much linked to the nature of the occupation, the residual gender gap is decisively linked to the existence of a nonlinear relationship between earnings and workhours within each occupation. Third, idiosyncratic temporal demands are generally more important for the highly-educated workers. Hence this approach mainly applies to the higher end of the earnings distribution Finally, Goldin maintains that occupations that have the more pronounced nonlinearities of earnings with respect to workhours are also the occupations for which bargaining and competing matter the most.

Goldin (2014, 1091) states explicitly that although her paper deals with US evidence, her approach should have a broader applicability. Naturally, when bringing this framework to other countries, the different nature of industrial relations must be allowed for. The US, and a number of Anglo-Saxon countries, have been characterized in the last decades by a stark decrease in unionization and union coverage of collective bargaining. On the other hand, in a number of continental European countries, including Italy, wage-setting institutions have also changed, although not so radically (OECD 2004, ch. 3). These countries are now characterized by a multi-level system of bargaining where single employer bargaining has developed alongside multiple employer bargaining. In principle, this hybrid setting should combine the benefits of bargaining centralization and/or co-ordination (internalization of aggregate shocks) with the benefits of greater relative wage flexibility (Dell'Aringa and Pagani 2007). This setting should also leave room for the action of compensating wage differentials, especially in the private sector. Moreover, Goldin's approach avowedly focuses on the higher end of earnings distribution, and unionization and union coverage have traditionally mattered less for this segment of the workforce. It follows that there is at least some promise for the application of Goldin's hypothesis to the Italian labour market, and this is the task to which we now turn.

## 3. The empirical framework

*The data*

Our main dataset is the European Structure of Earnings Survey for 2014 (SES henceforth), which provides data on earnings and individual characteristics of employees (sex, age, occupation, length of service, highest educational level attained, etc.), matched with the individual characteristics of their employer (branch of economic activity, size and location of the enterprise).

We use three different samples from the SES in our empirical analysis. The first sample, labelled as "Fulltime" includes workers 20 to 60+ years old with earnings between the first and the ninth percentile of the earnings distribution, working fulltime (30+ hours) and with a contract of three months or more. The sample defined as "Fulltime, Graduate" includes the individuals in "Fulltime" with at least a university B.A. degree And finally the sample defined as "Fulltime, Not Graduate".

The numbers of observations in each sample are reported in Table 1 also distinguishing between gender and areas. We have 127,061 in "Fulltime" (78% of the overall sample), 47,515 in "Fulltime, Graduate" and 79,546 "Fulltime, Not Graduate".

**Table 1 - Number of observations and percentages for each sample by gender and regions**

| | Fulltime | | Fulltime, Graduate | | Fulltime, Not Graduate | |
|---|---|---|---|---|---|---|
| | **Number** | **Percentage** | **Number** | **Percentage** | **Number** | **Percentage** |
| **By Gender** | | | | | | |
| Female | 52,231 | 41.11 | 21,910 | 46.11 | 30,321 | 38.12 |
| Male | 74,830 | 58.89 | 25,605 | 53.89 | 49,225 | 61.88 |
| **By Region** | | | | | | |
| North | 64,751 | 50.96 | 24,238 | 51.01 | 40513 | 50.93 |
| Centre | 32,008 | 25.19 | 12,661 | 26.65 | 19347 | 24.32 |
| South and Island | 30,302 | 23.85 | 10,616 | 22.34 | 19686 | 24.75 |
| **Total** | 127,061 | 100 | 47,515 | 100 | 79,546 | 100 |

*Source: own calculations on SES, 2014.*

In order to analyse the role of occupations in explaining the gender gap, we decompose our SES samples across ISCO three-digit occupations as reported in Table 2. From the total 111 occupations reported in the original dataset, we select 66 occupations for which the total number of observations, in the third (smallest) sample ("Fulltime, Graduate"), is at least of 25 individuals for each gender. This number of observations is taken as the lower bound for measuring the residual gender gap in each occupational cell.

**Table 2 - Number of observations and percentages across the ISCO three-digit occupations selected in our analysis**

| | Fulltime, Grad. | | Fulltime, Grad., Female | | Fulltime, Not Grad., Female | |
|---|---|---|---|---|---|---|
| | **Number** | **%** | **Number** | **%** | **Number** | **%** |
| 111 Legislators and senior officials | 214 | 0.45 | 88 | 0.4 | 6 | 0.02 |
| 112 Managing directors and chief executives | 388 | 0.82 | 133 | 0.61 | 11 | 0.04 |
| 121 Business services and administration managers | 323 | 0.68 | 73 | 0.33 | 36 | 0.12 |
| 122 Sales, marketing and development managers | 516 | 1.09 | 131 | 0.6 | 45 | 0.15 |
| 132 Manufacturing, mining, construction, and distribution managers | 302 | 0.64 | 37 | 0.17 | 22 | 0.07 |
| 133 Information and communications technology service managers | 231 | 0.49 | 45 | 0.21 | 10 | 0.03 |
| 134 Professional services managers | 762 | 1.6 | 179 | 0.82 | 33 | 0.11 |
| 141 Hotel and restaurant managers | 113 | 0.24 | 33 | 0.15 | 95 | 0.31 |
| 142 Retail and wholesale trade managers | 254 | 0.53 | 72 | 0.33 | 67 | 0.22 |
| 143 Other services managers | 133 | 0.28 | 40 | 0.18 | 60 | 0.20 |
| 211 Physical and earth science professionals | 501 | 1.05 | 219 | 1 | 74 | 0.24 |
| 213 Life science professionals | 159 | 0.33 | 97 | 0.44 | 9 | 0.03 |
| 214 Engineering professionals (excluding electrotechnology) | 1,171 | 2.46 | 247 | 1.13 | 63 | 0.21 |
| 215 Electrotechnology engineers | 466 | 0.98 | 74 | 0.34 | 26 | 0.09 |
| 216 Architects, planners, surveyors and designers | 333 | 0.7 | 156 | 0.71 | 45 | 0.15 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 221 Medical doctors | 306 | 0.64 | 122 | 0.56 | 7 | 0.02 |
| 225 Veterinarians | 140 | 0.29 | 56 | 0.26 | 4 | 0.01 |
| 226 Other health professionals | 1,587 | 3.34 | 714 | 3.26 | 57 | 0.19 |
| 231 University and higher education teachers | 3,456 | 7.27 | 1,356 | 6.19 | 75 | 0.25 |
| 232 Vocational education teachers | 158 | 0.33 | 94 | 0.43 | 78 | 0.26 |
| 233 Secondary education teachers | 2,207 | 4.64 | 1,533 | 7 | 270 | 0.89 |
| 234 Primary school and early childhood teachers | 713 | 1.5 | 643 | 2.93 | 1,156 | 3.81 |
| 235 Other teaching professionals | 225 | 0.47 | 144 | 0.66 | 74 | 0.24 |
| 241 Finance professionals | 651 | 1.37 | 265 | 1.21 | 237 | 0.78 |
| 242 Administration professionals | 2,420 | 5.09 | 1,099 | 5.02 | 678 | 2.24 |
| 243 Sales, marketing and public relations professionals | 1,210 | 2.55 | 493 | 2.25 | 287 | 0.95 |
| 251 Software and applications developers and analysts | 1,384 | 2.91 | 397 | 1.81 | 199 | 0.66 |
| 252 Database and network professionals | 522 | 1.1 | 120 | 0.55 | 112 | 0.37 |
| 261 Legal professionals | 530 | 1.12 | 273 | 1.25 | 50 | 0.16 |
| 263 Social and religious professionals | 444 | 0.93 | 200 | 0.91 | 70 | 0.23 |
| 264 Authors, journalists and linguists | 492 | 1.04 | 226 | 1.03 | 97 | 0.32 |
| 265 Creative and performing artists | 243 | 0.51 | 138 | 0.63 | 168 | 0.55 |
| 311 Physical and engineering science technicians | 911 | 1.92 | 252 | 1.15 | 303 | 1.00 |
| 312 Mining, manufacturing and construction supervisors | 332 | 0.7 | 92 | 0.42 | 130 | 0.43 |
| 313 Process control technicians | 372 | 0.78 | 84 | 0.38 | 192 | 0.63 |
| 314 Life science technicians and related associate professionals | 66 | 0.14 | 25 | 0.11 | 24 | 0.08 |
| 321 Medical and pharmaceutical technicians | 95 | 0.2 | 41 | 0.19 | 35 | 0.12 |
| 322 Nursing and midwifery associate professionals | 1,314 | 2.77 | 957 | 4.37 | 1,240 | 4.09 |
| 325 Other health associate professionals | 1,202 | 2.53 | 689 | 3.14 | 732 | 2.41 |
| 331 Financial and mathematical associate professionals | 3,337 | 7.02 | 1,363 | 6.22 | 1,839 | 6.07 |
| 332 Sales and purchasing agents and brokers | 909 | 1.91 | 369 | 1.68 | 340 | 1.12 |
| 333 Business services agents | 1,002 | 2.11 | 512 | 2.34 | 390 | 1.29 |
| 334 Administrative and specialised secretaries | 1,093 | 2.3 | 589 | 2.69 | 1,037 | 3.42 |
| 342 Sports and fitness workers | 291 | 0.61 | 48 | 0.22 | 67 | 0.22 |
| 351 Information and communications technology operations and user support technicians | 971 | 2.04 | 233 | 1.06 | 245 | 0.81 |
| 352 Telecommunications and broadcasting technicians | 180 | 0.38 | 63 | 0.29 | 101 | 0.33 |
| 411 General office clerks | 4,182 | 8.8 | 2,405 | 10.98 | 4,704 | 15.51 |
| 412 Secretaries (general) | 1,083 | 2.28 | 796 | 3.63 | 2,020 | 6.66 |
| 413 Keyboard operators | 215 | 0.45 | 103 | 0.47 | 303 | 1.00 |
| 421 Tellers, money collectors and related clerks | 1,033 | 2.17 | 447 | 2.04 | 848 | 2.80 |
| 422 Client information workers | 1,086 | 2.29 | 657 | 3 | 1,489 | 4.91 |
| 431 Numerical clerks | 1,646 | 3.46 | 854 | 3.9 | 2,213 | 7.30 |
| 432 Material-recording and transport clerks | 680 | 1.43 | 269 | 1.23 | 925 | 3.05 |
| 441 Other clerical support workers | 608 | 1.28 | 356 | 1.62 | 660 | 2.18 |
| 512 Cooks | 73 | 0.15 | 36 | 0.16 | 302 | 1.00 |
| 513 Waiters and bartenders | 97 | 0.2 | 55 | 0.25 | 518 | 1.71 |
| 522 Shop salespersons | 947 | 1.99 | 571 | 2.61 | 1,932 | 6.37 |
| 523 Cashiers and ticket clerks | 101 | 0.21 | 54 | 0.25 | 177 | 0.58 |
| 524 Other sales workers | 129 | 0.27 | 56 | 0.26 | 154 | 0.51 |
| 532 Personal care workers in health services | 269 | 0.57 | 179 | 0.82 | 942 | 3.11 |
| 541 Protective services workers | 255 | 0.54 | 49 | 0.22 | 150 | 0.49 |
| 742 Electronics and telecommunications installers and repairers | 102 | 0.21 | 27 | 0.12 | 45 | 0.15 |
| 754 Other craft and related workers | 107 | 0.23 | 49 | 0.22 | 482 | 1.59 |
| 815 Textile, fur and leather products machine operators | 65 | 0.14 | 30 | 0.14 | 427 | 1.41 |
| 911 Domestic, hotel and office cleaners and helpers | 115 | 0.24 | 77 | 0.35 | 836 | 2.76 |
| 962 Refuse workers and other elementary workers | 93 | 0.2 | 26 | 0.12 | 298 | 0.98 |
| Total | 47515 | 100 | 21910 | 100 | 30321 | 100.00 |

*Source: own calculations on SES, 2014.*

In order to control for some relevant qualitative characters of occupations (such as time pressure, interaction with others, having working relationship, freedom of decisions), we rely on the 2013 ICP survey from INAPP and the O*Net (2014) survey from the Bureau of Labor Statistics.. These surveys are aimed at detecting the occupational characteristics.

In particular, the Italian Sample Survey on Professions (i.e. ICP survey) 2013 is carried out by National Institute for Public Policies Analysis (Inapp). It records information on workers occupied in around 800 occupations, according to the 5-digit CP2011 classification (the Italian equivalent of the ISCO-08 ILO's classification). The ICP examines occupational characteristics through a questionnaire structured in seven sections (knowledge, skills, attitudes, generalized work activities, values, work styles and working conditions). The survey describes all the professions existing in the Italian labour market and it is based on the US Occupational Information Network (O*Net) run by the Bureau of Labor Statistics.

ICP survey, as well O*Net survey, records occupation according to 5-digit CP2011 classification, thus there are more than twice as many ICP occupations than SES occupations, there we had to match occupations across the two sources. In order to do so, the ICP and O*Net characteristic levels were weighted by the relative number of individuals respectively in the QDL survey (an additional INAPP survey that records number of individuals at 5-digit CP2011 classification) and O*Net survey, to get then, the characteristic values for the SES occupations, for which the residual gender gaps had been computed.

From those surveys we selected 5 indicators reflecting the same occupational characteristics described in Goldin (2014):

1.Time pressure: How often does this job require the worker to meet strict deadlines?

2. Contact with others: How much does this job require the worker to be in contact with others ( face-to-face, by telephone, or otherwise) in order to perform it?

3. Establishing and maintaining interpersonal relationships: Developing constructive and cooperative working relationships with others, and maintaining them over time.

4. Structured versus unstructured work: To what extent is this job structured for the worker, rather than allowing the worker to determine tasks, priorities, and goals?

5. Freedom to make decisions: How much decision making freedom, without supervision,
does the job offer.

Tables 3, 4 and 5 report the occupation characteristics respectively in ICP and O*NET survey. We compare the average of the ICP variables (Tab.3) with the average ONET variable (Tab.4). However, for the empirical strategy, we also use, as Goldin the frequencies (Tab. 5), and in particular individual answering as follows: 1. for time pressure the percentage of individuals that both once a week or more but not every day and every day have to meet strict deadlines; 2. For contact with others the percentage of individuals that have contact with others most of the time and constant contact with others; 3. For establishing and maintaining interpersonal relationships we have only the average; 4.

For structured versus unstructured work, the percentage of individuals that have some and a lot of freedom in determining tasks, priorities, and goals; 5. For freedom to make decisions, the percentage of individuals that have some or a lot of freedom.

With regards to the link between those five characteristics and the gender residual gap we track the following hypothesis:

Hp1: The higher the time pressure means worker have to be around at particular times thus the higher the gender gap;

Hp2: The higher the contact with other, the higher the gender gap;

Hp3: The more working relationships, the more workers and clients the employee must be around thus the higher is the gender gap;

Hp4: The lower the independence in determining task, the job is highly structured to the worker, there would be a lower chance that the worker would have close substitutes, the higher will be the gender gap;

Hp5: The higher the freedom on specific project and tasks and higher discretion, the workers are poorer substitutes for each other the greater is the gender gap.

Each of the these characteristics has been normalized to have a mean of zero and a standard deviation of one, additionally a simple mean of those characteristics has been computed for each of the 65 occupations.

**Table 3 - Normalized average for ICP characteristics, by ISCO three-digit occupation**

| Occupation | Time Pressure | Contact with others | Working relationships | Dependence in detemining tasks | Freedom in making decision | Average |
|---|---|---|---|---|---|---|
| 111 Legislators and senior officials | 1.164 | 1.578 | 2.812 | -1.324 | 0.924 | 1.031 |
| 112 Managing directors and chief executives | 0.831 | 0.591 | 1.408 | -1.553 | 1.467 | 0.549 |
| 121 Business services and administration managers | 1.126 | 0.925 | 0.531 | -1.160 | 0.996 | 0.483 |
| 122 Sales, marketing and development managers | -0.198 | 0.778 | 2.147 | -1.176 | 1.033 | 0.517 |
| 132 Manufacturing, mining, construction, and distribution managers | 0.762 | -0.046 | 0.872 | -1.322 | 1.265 | 0.306 |
| 133 Information and communications technology service managers | 0.675 | 0.425 | 0.710 | -1.082 | 1.033 | 0.352 |
| 134 Professional services managers | 0.411 | 0.171 | 1.447 | -0.796 | 0.635 | 0.374 |
| 141 Hotel and restaurant managers | 0.144 | 0.867 | 0.178 | -1.248 | 1.170 | 0.222 |
| 142 Retail and wholesale trade managers | 0.254 | 0.672 | -0.384 | -1.205 | 1.502 | 0.168 |
| 143 Other services managers | -0.159 | 0.070 | 0.606 | -0.501 | 0.876 | 0.178 |
| 211 Physical and earth science professionals | -0.213 | -0.872 | 0.524 | 0.078 | -0.258 | -0.148 |
| 213 Life science professionals | -0.624 | -0.870 | 0.125 | -0.346 | 0.223 | -0.299 |
| 214 Engineering professionals (excluding electrotechnology) | -0.252 | -0.654 | 0.163 | 0.010 | -0.051 | -0.157 |
| 215 Electrotechnology engineers | -0.839 | -2.366 | -0.572 | 0.049 | 0.255 | -0.694 |
| 216 Architects, planners, surveyors and designers | -1.134 | -0.945 | 0.224 | -0.666 | 0.632 | -0.378 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 221 Medical doctors | 0.704 | 1.229 | -0.128 | -0.302 | 1.026 | 0.506 |
| 225 Veterinarians | 0.172 | 1.450 | -0.102 | -1.118 | 1.555 | 0.391 |
| 226 Other health professionals | 0.575 | 1.004 | -0.100 | -0.568 | 0.866 | 0.356 |
| 231 University and higher education teachers | -0.924 | -0.394 | 0.606 | -0.945 | 0.861 | -0.159 |
| 232 Vocational education teachers | -2.012 | 0.288 | -1.410 | -0.131 | -0.199 | -0.693 |
| 233 Secondary education teachers | -1.294 | 0.671 | -0.121 | -0.098 | -0.150 | -0.199 |
| 234 Primary school and early childhood teachers | -1.586 | 0.973 | 0.757 | -0.580 | 0.195 | -0.048 |
| 235 Other teaching professionals | -2.105 | 0.103 | 0.453 | -0.712 | 0.585 | -0.335 |
| 241 Finance professionals | 1.002 | 0.965 | 0.050 | -0.982 | 0.980 | 0.403 |
| 242 Administration professionals | 0.528 | -0.390 | -0.169 | -0.025 | -0.107 | -0.033 |
| 243 Sales, marketing and public relations professionals | 0.754 | 0.488 | 0.526 | -1.033 | 0.595 | 0.266 |
| 251 Software and applications developers and analysts | -0.187 | -0.691 | 0.163 | -0.169 | 0.416 | -0.094 |
| 252 Database and network professionals | -0.526 | -1.118 | -0.160 | 0.032 | 0.238 | -0.307 |
| 261 Legal professionals | 2.243 | 0.182 | 1.489 | -1.373 | 1.315 | 0.771 |
| 263 Social and religious professionals | -0.368 | 0.415 | 1.151 | -0.985 | 0.702 | 0.183 |
| 264 Authors, journalists and linguists | 1.184 | -0.835 | 0.667 | -0.526 | 0.337 | 0.165 |
| 265 Creative and performing artists | -0.283 | -0.635 | 0.404 | -0.669 | 0.593 | -0.118 |
| 311 Physical and engineering science technicians | -0.227 | -0.783 | -0.247 | 0.140 | 0.037 | -0.216 |
| 312 Mining, manufacturing and construction supervisors | 1.067 | 0.034 | -0.596 | -0.175 | 0.295 | 0.125 |
| 313 Process control technicians | 0.304 | 0.146 | -1.546 | 0.340 | -0.332 | -0.218 |
| 314 Life science technicians and related associate professionals | -0.388 | 0.340 | -0.659 | -0.060 | 0.008 | -0.152 |
| 321 Medical and pharmaceutical technicians | 1.251 | 0.453 | -1.103 | 1.069 | -0.977 | 0.139 |
| 322 Nursing and midwifery associate professionals | 1.159 | 0.083 | 0.082 | 0.473 | -0.949 | 0.170 |
| 325 Other health associate professionals | -0.875 | 0.478 | 0.490 | -0.059 | -0.160 | -0.025 |
| 331 Financial and mathematical associate professionals | 0.857 | 0.544 | 0.219 | 0.118 | -0.193 | 0.309 |
| 332 Sales and purchasing agents and brokers | 0.310 | 1.320 | 1.729 | -0.848 | 0.594 | 0.621 |
| 333 Business services agents | 0.490 | 1.139 | 0.912 | -0.518 | 0.392 | 0.483 |
| 334 Administrative and specialised secretaries | -0.205 | -0.173 | 0.510 | 0.551 | -0.760 | -0.016 |
| 342 Sports and fitness workers | -1.143 | -0.118 | 0.053 | -0.330 | 0.582 | -0.191 |
| 351 Information and communications technology operations and user support technicians | -0.483 | -0.940 | 0.252 | 0.188 | -0.288 | -0.254 |
| 352 Telecommunications and broadcasting technicians | 0.465 | -0.623 | -0.788 | 0.778 | -0.437 | -0.121 |
| 411 General office clerks | 0.848 | 0.011 | 0.331 | 0.569 | -1.412 | 0.070 |
| 412 Secretaries (general) | 0.809 | 0.212 | 1.231 | 0.881 | -1.246 | 0.377 |
| 413 Keyboard operators | 1.103 | 0.567 | -1.298 | 0.421 | -0.436 | 0.071 |
| 421 Tellers, money collectors and related clerks | 1.641 | 1.269 | 0.009 | 1.673 | -1.945 | 0.529 |
| 422 Client information workers | -0.343 | 0.853 | -0.719 | 1.096 | -1.016 | -0.026 |
| 431 Numerical clerks | 0.345 | -0.397 | 0.055 | 0.725 | -0.947 | -0.044 |
| 432 Material-recording and transport clerks | 1.280 | 0.258 | -0.409 | 1.065 | -1.574 | 0.124 |
| 441 Other clerical support workers | 0.062 | -0.924 | -0.524 | 0.678 | -0.956 | -0.333 |
| 512 Cooks | 0.491 | -0.997 | -1.032 | 0.569 | -0.692 | -0.332 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 513 Waiters and bartenders | -0.208 | -0.301 | -1.299 | 1.646 | -1.112 | -0.255 |
| 522 Shop salespersons | -1.153 | 1.190 | -0.263 | -0.149 | 0.810 | 0.087 |
| 523 Cashiers and ticket clerks | -1.621 | -0.122 | -2.381 | 2.558 | -1.805 | -0.674 |
| 524 Other sales workers | -2.084 | 0.560 | -0.753 | 1.467 | -1.174 | -0.397 |
| 532 Personal care workers in health services | -1.000 | 0.791 | -1.084 | 2.080 | -2.328 | -0.308 |
| 541 Protective services workers | 0.248 | 0.580 | -0.097 | 1.133 | -1.041 | 0.165 |
| 742 Electronics and telecommunications installers and repairers | -0.110 | -1.038 | -0.450 | -0.646 | 0.851 | -0.279 |
| 754 Other craft and related workers | 1.443 | -0.032 | 0.641 | -0.752 | 1.554 | 0.571 |
| 815 Textile, fur and leather products machine operators | -0.268 | -3.512 | -2.724 | 1.040 | -0.782 | -1.249 |
| 911 Domestic, hotel and office cleaners and helpers | -2.204 | -3.289 | -1.880 | 2.066 | -1.919 | -1.445 |
| 962 Refuse workers and other elementary workers | -1.685 | -1.606 | -1.527 | 2.640 | -2.156 | -0.867 |

Source: own elaborations on ICP 2013

**Table 4 - Normalized average for O*Net characteristics, by ISCO three-digit occupation**

| | Contact with others | Working relationships | Freedom in making decision | Less structure more discretionality | Time Pressure | Average |
|---|---|---|---|---|---|---|
| 111 Legislators and senior officials | 0.4718 | 1.3553 | 1.2367 | 1.1884 | 0.7549 | 1.0014 |
| 112 Managing directors and chief executives | 0.7340 | 0.7091 | 1.6676 | 1.6938 | 0.8442 | 1.1297 |
| 121 Business services and administration managers | 0.2355 | 1.2733 | 0.5948 | 0.6119 | 0.4449 | 0.6321 |
| 122 Sales, marketing and development managers | 0.0275 | 1.3401 | 0.4572 | 0.8372 | 0.8859 | 0.7096 |
| 132 Manufacturing, mining, construction, and distribution managers | 0.2917 | 0.8528 | 0.1933 | -0.0632 | 0.7263 | 0.4002 |
| 133 Information and communications technology service managers | 0.1322 | 1.8140 | 0.8721 | 1.2481 | 0.5503 | 0.9233 |
| 134 Professional services managers | 0.4922 | 1.3519 | 0.9239 | 0.9439 | 0.1944 | 0.7813 |
| 141 Hotel and restaurant managers | 0.8351 | -0.1877 | 0.1056 | 0.1361 | 0.5725 | 0.2923 |
| 142 Retail and wholesale trade managers | 0.9220 | -0.1524 | 1.8102 | 1.9530 | 0.7179 | 1.0502 |
| 143 Other services managers | 0.3663 | 1.5516 | 0.5780 | 0.3588 | 0.3956 | 0.6500 |
| 211 Physical and earth science professionals | -2.8515 | -1.1289 | 0.3510 | 0.0898 | -1.0138 | -0.9107 |
| 213 Life science professionals | -1.0164 | 0.4528 | 0.6195 | 0.6480 | -1.1249 | -0.0842 |
| 214 Engineering professionals (excluding electrotechnology) | -1.2998 | -0.2120 | -0.1677 | 0.0265 | -0.6212 | -0.4549 |
| 215 Electrotechnology engineers | -1.0601 | -0.9232 | 0.2829 | 0.3348 | -1.0293 | -0.4790 |
| 216 Architects, planners, surveyors and designers | -0.8122 | 0.1825 | -0.2850 | -0.1034 | 0.6135 | -0.0809 |
| 221 Medical doctors | 0.9172 | 0.7501 | 1.7845 | 1.2276 | 0.5379 | 1.0435 |
| 225 Veterinarians | 0.7847 | 0.2222 | 1.1747 | 0.6965 | 0.2988 | 0.6354 |
| 226 Other health professionals | 0.7556 | 0.6168 | 0.8248 | 0.7147 | 0.0584 | 0.5941 |
| 231 University and higher education teachers | -0.2536 | 0.2271 | 1.5735 | 1.5077 | -0.3119 | 0.5486 |
| 232 Vocational education teachers | 0.6893 | 0.2944 | 0.0081 | 0.0543 | -0.6341 | 0.0824 |
| 233 Secondary education teachers | 1.2654 | -0.1211 | -0.1569 | -0.5907 | -0.2880 | 0.0217 |
| 234 Primary school and early childhood teachers | 1.1325 | 0.0453 | 0.5098 | 0.1679 | -0.8358 | 0.2039 |
| 235 Other teaching professionals | 0.3995 | 1.1301 | 0.3330 | -0.0014 | -1.0095 | 0.1703 |
| 241 Finance professionals | -0.7535 | 0.5810 | -0.2733 | 0.5573 | 0.0354 | 0.0294 |
| 242 Administration professionals | -0.2014 | 1.5177 | 0.2941 | 0.3861 | -0.0768 | 0.3840 |
| 243 Sales, marketing and public relations professionals | 0.1180 | 1.4398 | 0.2255 | 0.9552 | 0.5100 | 0.6497 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 251 Software and applications developers and analysts | -2.0548 | -0.9146 | -0.8599 | -0.6365 | -0.0145 | -0.8961 |
| 252 Database and network professionals | 0.2882 | -0.5944 | -0.1957 | 0.1635 | -0.8987 | -0.2474 |
| 261 Legal professionals | 0.1107 | 0.4651 | 1.7225 | 1.1172 | 0.8481 | 0.8527 |
| 263 Social and religious professionals | -0.9228 | 0.7325 | 0.7766 | 0.9752 | -0.2450 | 0.2633 |
| 264 Authors, journalists and linguists | 0.3674 | 0.8567 | 0.3831 | -0.0855 | 1.5813 | 0.6206 |
| 265 Creative and performing artists | -0.8216 | 0.3493 | -0.3776 | -0.3928 | 0.7013 | -0.1083 |
| 311 Physical and engineering science technicians | -1.6322 | -1.1186 | 0.1889 | -0.3651 | -0.0968 | -0.6048 |
| 312 Mining, manufacturing and construction supervisors | 0.2868 | -0.7373 | 0.8656 | 0.4885 | 0.6940 | 0.3195 |
| 313 Process control technicians | -0.5176 | -1.8696 | -0.2124 | -0.2973 | 0.2944 | -0.5205 |
| 314 Life science technicians and related associate professionals | -1.8235 | -0.8300 | -0.7373 | -1.6890 | -0.9011 | -1.1962 |
| 321 Medical and pharmaceutical technicians | 0.2670 | -0.5455 | -0.9985 | -1.1148 | 1.4587 | -0.1866 |
| 322 Nursing and midwifery associate professionals | 1.2027 | 2.0716 | 1.0944 | 0.2097 | 0.0530 | 0.9263 |
| 325 Other health associate professionals | 0.4284 | 0.4355 | -0.4345 | -0.4450 | -0.1646 | -0.0361 |
| 331 Financial and mathematical associate professionals | -0.3807 | 0.2137 | 0.2636 | 0.5646 | 0.4329 | 0.2188 |
| 332 Sales and purchasing agents and brokers | 0.8270 | 1.3822 | 0.7594 | 1.1100 | 0.4399 | 0.9037 |
| 333 Business services agents | 0.6486 | 0.6358 | 0.2799 | 0.6734 | 0.8664 | 0.6208 |
| 334 Administrative and specialised secretaries | 0.4179 | 0.8500 | -0.5976 | 0.4321 | 0.8738 | 0.3953 |
| 342 Sports and fitness workers | 0.8313 | 0.1593 | 0.4809 | -0.7518 | -1.7328 | -0.2026 |
| 351 Information and communications technology operations and user support technicians | -0.0180 | -0.6277 | -0.1151 | 0.4660 | -0.1704 | -0.0930 |
| 352 Telecommunications and broadcasting technicians | -1.5756 | -0.6442 | -0.0359 | -0.3907 | 0.1593 | -0.4974 |
| 411 General office clerks | 0.9685 | 0.2908 | 0.3058 | 1.1911 | 0.5540 | 0.6621 |
| 412 Secretaries (general) | 0.9220 | 0.3158 | -0.1871 | 1.0029 | 0.4944 | 0.5096 |
| 413 Keyboard operators | -1.1113 | -1.1160 | -0.6559 | -0.1004 | -0.2601 | -0.6487 |
| 421 Tellers, money collectors and related clerks | 0.9949 | -1.3282 | -1.7625 | -1.5041 | -0.2267 | -0.7653 |
| 422 Client information workers | 1.1705 | 0.2864 | -1.6324 | -1.0750 | -0.1751 | -0.2851 |
| 431 Numerical clerks | 0.1833 | -0.2601 | -0.6729 | 0.0691 | 0.8183 | 0.0275 |
| 432 Material-recording and transport clerks | 0.6111 | -0.9189 | -0.4093 | -0.2961 | 1.1552 | 0.0284 |
| 441 Other clerical support workers | -0.0297 | -0.2468 | -0.9701 | -0.5854 | 0.2648 | -0.3134 |
| 512 Cooks | -0.9643 | -1.1373 | -1.5534 | -1.2536 | 1.1914 | -0.7434 |
| 513 Waiters and bartenders | 1.4360 | -0.7228 | -1.2925 | -1.1686 | -4.2036 | -1.1903 |
| 522 Shop salespersons | 1.2029 | -0.4718 | 0.8106 | 0.5934 | 0.4177 | 0.5106 |
| 523 Cashiers and ticket clerks | 1.1976 | -1.4163 | -2.8170 | -2.5446 | -3.3849 | -1.7930 |
| 524 Other sales workers | 0.3402 | -0.8239 | -0.7774 | -1.4067 | -1.7441 | -0.8824 |
| 532 Personal care workers in health services | 0.0660 | 0.2925 | -1.6492 | -1.3186 | -1.2258 | -0.7670 |
| 541 Protective services workers | 0.4524 | -0.1530 | 0.0837 | -0.7948 | -0.5679 | -0.1959 |
| 742 Electronics and telecommunications installers and repairers | -0.2775 | -0.5262 | 0.3211 | 0.1435 | 0.3071 | -0.0064 |
| 754 Other craft and related workers | 0.0295 | -1.5264 | -0.0756 | -0.4476 | 1.4528 | -0.1135 |
| 815 Textile, fur and leather products machine operators | -3.1600 | -2.7169 | -3.2900 | -3.2797 | -0.3805 | -2.5654 |
| 911 Domestic, hotel and office cleaners and helpers | -1.2067 | -1.2957 | -0.9438 | -1.2853 | 0.0819 | -0.9299 |
| 962 Refuse workers and other elementary workers | -1.0769 | -1.7779 | -0.6202 | -1.5501 | 0.0564 | -0.9937 |

Source: own elaborations on O*Net survey

**Table 5 - Normalized frequencies for O*Net characteristics, by ISCO three-digit occupation**

| | Contact with others | Working relationships | Freedom in making decision | Less structure more discretionality | Time Pressure | Average |
|---|---|---|---|---|---|---|
| 111 Legislators and senior officials | 0.6453 | 1.3553 | 1.0892 | 0.9970 | 0.8193 | 0.9812 |
| 112 Managing directors and chief executives | 0.8020 | 0.7091 | 1.3639 | 1.1907 | 0.8763 | 0.9884 |
| 121 Business services and administration managers | 0.4823 | 1.2733 | 0.6530 | 0.7679 | 0.4669 | 0.7287 |
| 122 Sales, marketing and development managers | 0.4809 | 1.3401 | 0.5438 | 1.0464 | 1.3112 | 0.9445 |
| 132 Manufacturing, mining, construction, and distribution managers | 0.7009 | 0.8528 | 0.1890 | 0.1241 | 0.7943 | 0.5322 |
| 133 Information and communications technology service managers | 0.9991 | 1.8140 | 1.2905 | 0.5689 | 0.8588 | 1.1063 |
| 134 Professional services managers | 0.7427 | 1.3519 | 0.8542 | 0.8193 | 0.2466 | 0.8029 |
| 141 Hotel and restaurant managers | 0.7939 | -0.1877 | 0.2962 | 0.6544 | -0.1658 | 0.2782 |
| 142 Retail and wholesale trade managers | 1.0076 | -0.1524 | 1.5425 | 1.2395 | 0.7509 | 0.8776 |
| 143 Other services managers | 0.5886 | 1.5516 | 0.4406 | 0.5145 | 0.2663 | 0.6723 |
| 211 Physical and earth science professionals | -3.4701 | -1.1289 | 0.2930 | 0.3211 | -1.7105 | -1.1391 |
| 213 Life science professionals | -0.8888 | 0.4528 | 0.6479 | 0.6557 | -1.7483 | -0.1761 |
| 214 Engineering professionals (excluding electrotechnology) | -1.2775 | -0.2120 | 0.0454 | 0.1680 | -0.7511 | -0.4055 |
| 215 Electrotechnology engineers | -1.3127 | -0.9232 | 0.6880 | 0.4771 | -1.3960 | -0.4934 |
| 216 Architects, planners, surveyors and designers | -1.3367 | 0.1825 | -0.0485 | -0.0736 | 0.7555 | -0.1042 |
| 221 Medical doctors | 0.9356 | 0.7501 | 1.0595 | 0.9701 | 0.4889 | 0.8408 |
| 225 Veterinarians | 0.3970 | 0.2222 | 1.5123 | 0.3314 | 0.1751 | 0.5276 |
| 226 Other health professionals | 0.8856 | 0.6168 | 0.8278 | 0.6700 | 0.0565 | 0.6113 |
| 231 University and higher education teachers | -0.0890 | 0.2271 | 1.2484 | 1.1746 | -0.4362 | 0.4250 |
| 232 Vocational education teachers | 0.6735 | 0.2944 | 0.0461 | -0.0241 | -1.0266 | -0.0073 |
| 233 Secondary education teachers | 0.9224 | -0.1211 | -0.3889 | 0.1181 | -0.7205 | -0.0380 |
| 234 Primary school and early childhood teachers | 0.8210 | 0.0453 | 0.3818 | 0.0248 | -1.0291 | 0.0488 |
| 235 Other teaching professionals | 0.7080 | 1.1301 | 0.6235 | 0.2848 | -0.9434 | 0.3606 |
| 241 Finance professionals | -0.7172 | 0.5810 | -0.1919 | 0.5802 | -0.0928 | 0.0319 |
| 242 Administration professionals | 0.2997 | 1.5177 | 0.7382 | 0.6362 | 0.0504 | 0.6484 |
| 243 Sales, marketing and public relations professionals | 0.0713 | 1.4398 | 0.3188 | 0.9970 | 0.8520 | 0.7358 |
| 251 Software and applications developers and analysts | -2.1860 | -0.9146 | -0.9002 | -0.3879 | -0.1350 | -0.9048 |
| 252 Database and network professionals | -0.0763 | -0.5944 | 0.1837 | 0.5473 | -1.8918 | -0.3663 |
| 261 Legal professionals | 0.1834 | 0.4651 | 1.1346 | 0.6165 | 0.8411 | 0.6481 |
| 263 Social and religious professionals | -1.0301 | 0.7325 | 0.8517 | 0.8674 | -0.3781 | 0.2087 |
| 264 Authors, journalists and linguists | 0.0181 | 0.8567 | 0.3167 | 0.0253 | 1.5725 | 0.5579 |
| 265 Creative and performing artists | -0.7396 | 0.3493 | -0.5897 | -0.6177 | 0.4892 | -0.2217 |
| 311 Physical and engineering science technicians | -1.3862 | -1.1186 | 0.2581 | -0.2406 | -0.1059 | -0.5187 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 312 Mining, manufacturing and construction supervisors | 0.2943 | -0.7373 | 1.1600 | 0.9873 | 1.0794 | 0.5567 |
| 313 Process control technicians | -0.3448 | -1.8696 | -0.1944 | -0.2901 | 0.3962 | -0.4605 |
| 314 Life science technicians and related associate professionals | -1.5837 | -0.8300 | -0.7562 | -1.4195 | -1.2191 | -1.1617 |
| 321 Medical and pharmaceutical technicians | 0.2514 | -0.5455 | -1.0954 | -0.8102 | 1.3142 | -0.1771 |
| 322 Nursing and midwifery associate professionals | 1.1875 | 2.0716 | 1.0767 | 0.8336 | 0.0355 | 1.0410 |
| 325 Other health associate professionals | 0.5573 | 0.4355 | -0.3665 | -0.1927 | -0.2206 | 0.0426 |
| 331 Financial and mathematical associate professionals | -0.3124 | 0.2137 | 0.1773 | 0.3837 | 0.3397 | 0.1604 |
| 332 Sales and purchasing agents and brokers | 0.7205 | 1.3822 | 0.5413 | 0.9056 | 0.4479 | 0.7995 |
| 333 Business services agents | 0.5521 | 0.6358 | 0.4240 | 0.6428 | 0.9016 | 0.6313 |
| 334 Administrative and specialised secretaries | 0.4853 | 0.8500 | -0.3890 | 0.3769 | 0.9806 | 0.4608 |
| 342 Sports and fitness workers | 0.8025 | 0.1593 | 0.4831 | -0.6875 | -1.4432 | -0.1371 |
| 351 Information and communications technology operations and user support technicians | -0.4939 | -0.6277 | -0.2052 | 0.5955 | -0.9400 | -0.3343 |
| 352 Telecommunications and broadcasting technicians | -1.1408 | -0.6442 | 0.2174 | -0.1426 | 0.2957 | -0.2829 |
| 411 General office clerks | 0.7135 | 0.2908 | 0.6894 | 1.3332 | 1.0440 | 0.8142 |
| 412 Secretaries (general) | 0.7529 | 0.3158 | 0.1824 | 1.0165 | 1.0003 | 0.6536 |
| 413 Keyboard operators | -0.8321 | -1.1160 | -1.5035 | 0.7743 | -1.3202 | -0.7995 |
| 421 Tellers, money collectors and related clerks | 0.6188 | -1.3282 | -1.7268 | -1.3442 | 0.0502 | -0.7461 |
| 422 Client information workers | 0.8560 | 0.2864 | -1.9074 | -1.1716 | -0.0390 | -0.3951 |
| 431 Numerical clerks | 0.0882 | -0.2601 | -0.7925 | 0.0987 | 1.2544 | 0.0778 |
| 432 Material-recording and transport clerks | 0.6331 | -0.9189 | -0.5563 | -0.3092 | 1.2785 | 0.0255 |
| 441 Other clerical support workers | -0.2102 | -0.2468 | -0.6716 | -0.5795 | 0.1169 | -0.3182 |
| 512 Cooks | -1.4607 | -1.1373 | -1.6384 | -1.4394 | 0.9834 | -0.9385 |
| 513 Waiters and bartenders | 1.1573 | -0.7228 | -0.8703 | -1.1738 | -2.9762 | -0.9171 |
| 522 Shop salespersons | 1.1631 | -0.4718 | 1.0279 | 0.3236 | 0.6104 | 0.5307 |
| 523 Cashiers and ticket clerks | 1.1132 | -1.4163 | -2.8618 | -2.8694 | -2.5329 | -1.7134 |
| 524 Other sales workers | 0.0978 | -0.8239 | -1.0766 | -1.6848 | -1.1844 | -0.9344 |
| 532 Personal care workers in health services | 0.0673 | 0.2925 | -1.6481 | -1.4416 | -0.9124 | -0.7284 |
| 541 Protective services workers | 0.5214 | -0.1530 | 0.1335 | -0.9003 | -0.5249 | -0.1847 |
| 742 Electronics and telecommunications installers and repairers | -0.2722 | -0.5262 | 0.1384 | -0.2176 | 0.3156 | -0.1124 |
| 754 Other craft and related workers | 0.2863 | -1.5264 | -0.3233 | -0.5549 | 1.5758 | -0.1085 |
| 815 Textile, fur and leather products machine operators | -2.8748 | -2.7169 | -3.2005 | -3.3936 | -0.0181 | -2.4408 |
| 911 Domestic, hotel and office cleaners and helpers | -0.7307 | -1.2957 | -0.9671 | -2.0265 | -0.0919 | -1.0224 |
| 962 Refuse workers and other elementary workers | -1.3119 | -1.7779 | -0.8196 | -1.6670 | 0.2619 | -1.0629 |

Source: own elaborations on O*Net survey

*The methods*

In our empirical analysis, we assess the relevance of the nature of occupations for the residual gender pay gap by (a) applying the main procedures suggested in Goldin (2014) to the Italian data, and (b) by replicating (some of) these exercises with the O-B measure of unexplained gender pay gap (commonly labelled as discrimination) substituted to Goldin's measure of residual gender pay gap.

The first empirical exercise is estimating an equation for log monthly earnings including a dummy for females (Female) and considering the variations of size of its coefficient when occupation dummies are included in the equation. More precisely, we estimate three equations:

$$\mathrm{Ln}(w_i) = \alpha_0 + \alpha_1 \mathrm{Female}_i + \alpha_3 \mathrm{Base}_i + u_i \quad (1)$$

$$\mathrm{Ln}(w_i) = \beta_0 + \beta_1 \mathrm{Female}_i + \beta_3 \mathrm{Base}_i + \beta_4 \mathrm{Ln(Hours)}_i + u_i \quad (2)$$

$$\mathrm{Ln}(w_i) = \eta_0 + \eta_1 \mathrm{Female}_i + \eta_3 \mathrm{Base}_i + \eta_4 \mathrm{Ln(Hours)}_i + \eta_5 \mathrm{Occupation}_i + u_i \quad (3)$$

The dependent variable is always the log of monthly earnings, and all three equations include the Female dummy, whose coefficient is respectively $\alpha_1, \beta_1$ and $\eta_1$, as well as the Base vector, including age class dummies, type of contract (fixed-term versus open-end contract), educational attainment (according ISCED 2011 classification we include the four main groups i.e. G1:basic education no more than Lower secondary; G2 secondary education, G3 tertiary education (up to 4 years) G4 tertiary education (more than 4 years)), tenure (length of service in the enterprise, in years) geographical localization (northern, central, and southern Italy), sector (nace2_2-nace2_10). In eq. 2 we also include the Hours variables (log of monthly workhours, and, if appropriate, a Fulltime dummy). In eq. 3 we also include three-digit Occupation dummies. All three equations are estimated on the "Fulltime", "Fulltime, Graduate" and "Fulltime, Not Graduate" samples. We expect the coefficient of the Female dummy to decrease going from Eq. 1 to Eq. 3. In particular, in line with Goldin's hypothesis, we surmise that this coefficient is sizably affected by the inclusion of the Occupation dummies.

In the above exercise the residual gender gap is measured through the coefficient of the Female dummy. In our opinion, additional knowledge on the explanatory power of Goldin's framework can be gained by relying on the method developed by Oaxaca (1973) and Blinder (1973) to measure the unexplained gender gap. According to this method, Eq. 1 - Eq. 3 (minus of course the Female dummy) are estimated separately for males and females. The total gap between male and female earnings is then decomposed in an explained portion, due to differences in characteristics (the regressors of the equations), and an unexplained (residual) portion, often defined as wage discrimination, due to differences in the coefficients of these regressors. The O-B decomposition is performed for the three subsamples "All", "Fulltime" and "Fulltime, Graduate". in line with Goldin's

hypothesis, we expect the unexplained components to reduce sizably when the Occupation dummies are included in the regression.

In the previous exercise, the role of residual gender gap is taken by the coefficient of the Female dummy. This is not however Goldin's preferred measure of the residual gender gap. To this purpose we estimate for the "Fulltime, Graduate" sample the following two equations for the log of monthly earnings where we include the interaction between the Female and Occupation dummies (Eq. 4) and the interactions between the Female and Occupation dummies and between the log of monthly workhours and the Occupation dummy (Eq. 5):

$$\mathrm{Ln}(w_i) = \gamma_0 + \gamma_1 \mathrm{Female}_i + \gamma_2 \mathrm{Basic}_i + \gamma_3 \mathrm{Ln}(\mathrm{Hours}_i) + \gamma_4 \mathrm{Occupation}_i + \gamma_5 (\mathrm{Female}_i * \mathrm{Occupation}_i) + u_i \quad (4)$$

$$\mathrm{Ln}(w_i) = \delta_0 + \delta_1 \mathrm{Female}_i + \delta_2 \mathrm{Basic}_i + \delta_3 \mathrm{Ln}(\mathrm{Hours}_i) + \delta_4 \mathrm{Occupation}_i + \delta_5 (\mathrm{Female}_i * \mathrm{Occupation}_i) + \delta_6 (\mathrm{Ln}(h_i) * \mathrm{Occupation}_i) + u_i \quad (5)$$

The coefficient of the interaction between the Female and Occupation dummies are interpreted as the penalty of being a woman relative to a man of equal education and age, given workhours and occupation (this is of course the residual gender earnings gap). The coefficient of the interaction between the log of monthly workhours and the Occupation dummy allows on the other hand to measure the elasticity of monthly earnings with respect to monthly workhours within each occupation. In this way we can assess whether a nonlinear relationship exists between earnings and workhours.

We then plot the sum of coefficients $\gamma_1 + \gamma_5$ (the residual gender earnings gap, the vertical axis in the figures) against earnings by occupations (using the log of the male monthly wage) to see whether the residual gender pay gap is an increasing function of wage. Moreover, the sum of coefficients $\gamma_1 + \gamma_5$ is plotted against the sum of coefficients $\delta_3 + \delta_6$ for each occupation. Analysing the relationship between these coefficients gives us the opportunity to test the hypothesis that when the paying structure is not linear (that is the elasticity of earnings to workhours is higher than one), the gender gap increases.

Aa a counterpart to the above exercise, the O-B decomposition is estimated considering Eq. 2 separately for each occupation. In this way we can produce an unexplained gender gap comparable to that obtained with the previous Eq. 4. Once we have obtained these alternative measures of the unexplained gender gap for each occupation, we plot again them these against, the log of the male monthly wage and the elasticity of monthly earnings with respect to monthly workhours. This gives us additional knowledge on the explanatory power of the hypothesis that when the paying structure is not linear (that is the elasticity of earnings to workhours is higher than one), the gender gap increases.

So far, we have considered the relationship between the residual gender gap and the elasticity of earnings with respect to workhours. Clearly, however, an equally important point for the empirical analysis of Goldin's framework relates to the relationship between the elasticity of earnings with respect to workhours and the characteristics of an occupation that prompt firms to impose wage penalties on workers that demand more workplace flexibility (and hence on the relationship between these characteristics and the residual gender gap). These characteristics must include features that:

(a) make it more likely for firm to demand "long and particular" workhours, such as the need to being "on call", providing "face time", being around for clients, group meetings, and the like. In absence of this need, workers imperfect substitutes for each other;

(b) determine the degree of substitutability among workers. Once more, if workers were perfect substitutes for each other, workers imperfect substitutes for each other.

In order to provide measures for these characteristics, Goldin relies on data from O*Net, the US Department of Labor's Occupational Information Network, and selects some questions relating to time pressure, client and worker contacts, working relationships with others, to what extent is a job structured to the worker, freedom to make decisions over job projects. Higher time pressure, more client and worker contacts, more working relationships with others are all features that make it more likely for firm to demand "long and particular" workhours. Jobs highly structured to the worker, and more freedom to make decisions over job projects, make workers poorer substitutes for each other.

Through regression analysis, Goldin finds a significant relationship between her measure of the residual gender gap and an average of these five characteristics, which she obviously takes as further evidence in favour of her hypothesis.

Replication of this part of the analysis on Italian data requires of course that we find a satisfactory source of information for the relevant characteristics of each occupation. Our choice fell on INAPP's survey on profession (henceforth labelled as ICP 2013 from Indagine sulle Competenze delle professioni*)*. Further details on this dataset are provided below in the data section. Yet, it must be immediately pointed out that this survey is an almost perfect correspondence with the O*Net survey. Hence our empirical strategy was to find the questions in ICP that would perfectly correspond to Goldin hypothesis.

**4. The main results**

Table 6 reports the key results for Eqs. 1-3 The different rows represent different samples (as described in Section 3) and different specifications of the model. The gender gap is very high if we consider the "Fulltime Gradaute" sample (it is about -0.2, that is a ratio of female earnings on male earnings of 0.82, meaning that monthly earning of female is 18% lower than the male one). It decreases when we control for workhours worked and, eventually, fulltime, but its starker reduction occurs when we include the occupation dummies reduces. The coefficient on female becomes −0.127.

In other words, it diminishes by 32% (however there remains a 12.7% unexplained gap between male and female earning).

**Table 6 - Estimates for eq-1-eq.3 for three different samples**

| Sample | Coeff. on Female | Other variables included | Std. Err. | $R^2$ |
|---|---|---|---|---|
| Fulltime | -0.170 | Base | 0.002 | 0.3403 |
| Fulltime | -0.166 | Base, Hours | 0.002 | 0.3420 |
| Fulltime | -0.122 | Base, Hours, Occupation | 0.002 | 0.5399 |
| Fulltime, Graduate | -0.199 | Basic | 0.004 | 0.323 |
| Fulltime, Graduate | -0.19 | Base, Hours | 0.004 | 0.333 |
| Fulltime, Graduate | -0.127 | Base, Hours, Occupation | 0.003 | 0.549 |
| Fulltime, No Graduate | -0.140 | Basic | 0.003 | 0.2926 |
| Fulltime, No Graduate | -0.141 | Base, Hours | 0.003 | 0.2926 |
| Fulltime, No Graduate | -0.116 | Base, Hours, Occupation | 0.002 | 0.4675 |

This situation is confirmed also with the O-B decomposition where we find an unexplained gender gap of -0.13.3% for the "Fulltime, Graduate" sample (see Table 5).

**Table 7 - O-B estimated decomposition, for eq-1-eq.3 and for three different samples**

| Sample | Specification | Total | Std. Err. | Unexplained | Std. Err. |
|---|---|---|---|---|---|
| Fulltime | Base | -0.19 | 0.0026 | **-0.169** | 0.0023 |
| Fulltime | Base, hours | -0.19 | 0.0026 | **-0.167** | 0.0023 |
| Fulltime | Base, hours, occupation | -0.19 | 0.0026 | **-0.125** | 0.0022 |
| Fulltime, Graduate | Basic | -0.270 | 0.0045 | **-0.203** | 0.0041 |
| Fulltime, Graduate | Base, hours | -0.270 | 0.0045 | **-0.198** | 0.0041 |
| Fulltime, Graduate | Base, hours, occupation | -0.270 | 0.0045 | **-0.133** | 0.0036 |
| Fulltime, Not Graduate | Base | -0.19 | 0.0028 | **-0.145** | 0.0026 |
| Fulltime, Not Graduate | Base, hours | -0.19 | 0.0028 | **-0.147** | 0.0026 |
| Fulltime, Not Graduate | Base, hours, occupation | -0.19 | 0.0028 | **-0.121** | 0.0027 |

In Figure 1, we plot. for the "Fulltime, Graduate" sample, the residual gender earnings gap (the sum of coefficients $\gamma_1 + \gamma_5$ in Eq. 4) in each occupation, on the logarithm of male monthly earnings. We find negative residual gender gaps for virtually all occupations.

**Figure 1 - Gender Pay Gaps by Occupation: residual gender earnings gap on log male monthly earning for fulltime and graduate workers (2014)**

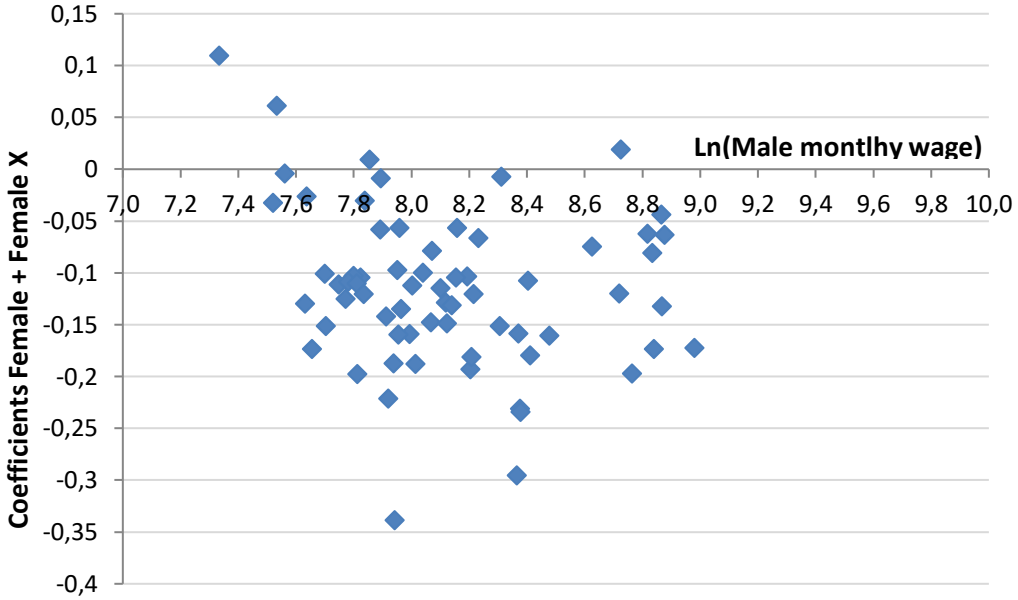
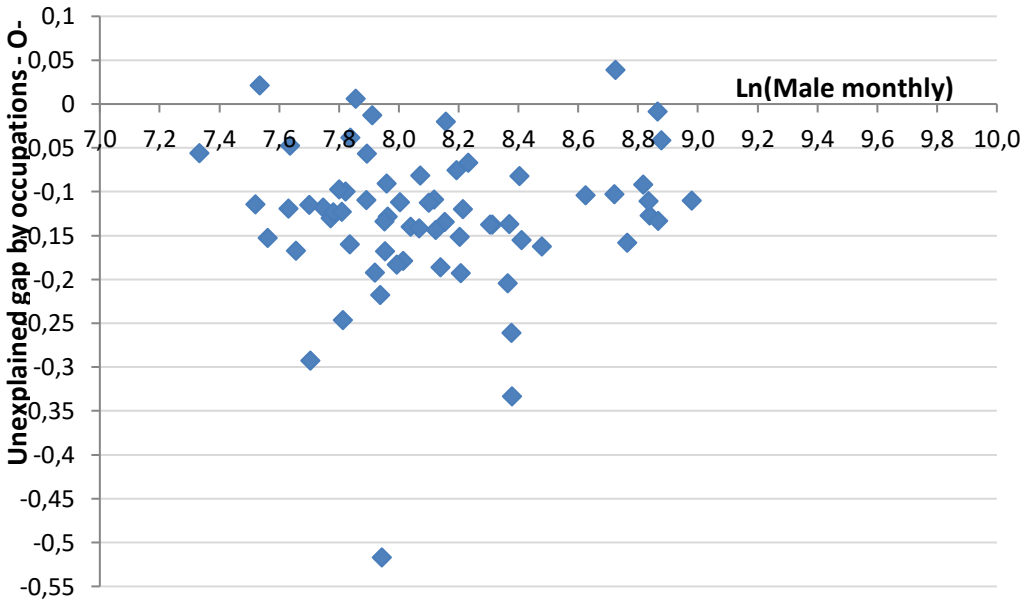



Figure 2 provides very similar results if the sum of coefficients $\gamma_1 + \gamma_6$ in Eq. 4 is substituted with the unexplained gender gap from the O-B decomposition.

**Figure 2 - Unexplained Gender Pay Gaps by Occupation from O-B decomposition on log male monthly earning for fulltime and graduate workers (2014)**




As explained in Section 3, we also consider graphically the relationship between the residual gender earnings gap (on the y-axis) and the elasticity of monthly earnings with respect to monthly hours (on the x-axis). The scatter plot of the mean (adjusted) gender earning gap and the unexplained component of the Oaxaca decomposition for each of the 65 occupations against the elasticity of wages to working hours is presented respectively in Figure 3 and 4.

In Figure 3 we measure the residual gap though the sum of coefficients $\gamma_1 + \gamma_5$ in Eq. 4, and find a clear negative correlation: occupations with higher elasticities have larger (in absolute value) gender gaps. These results are confirmed when the residual gap is obtained with the O-B decomposition (Figure 4).

**Figure 3: Residual gender earnings gap on elasticity of monthly income with respect to monthly hours for each occupation, for fulltime and graduate workers (2014)**

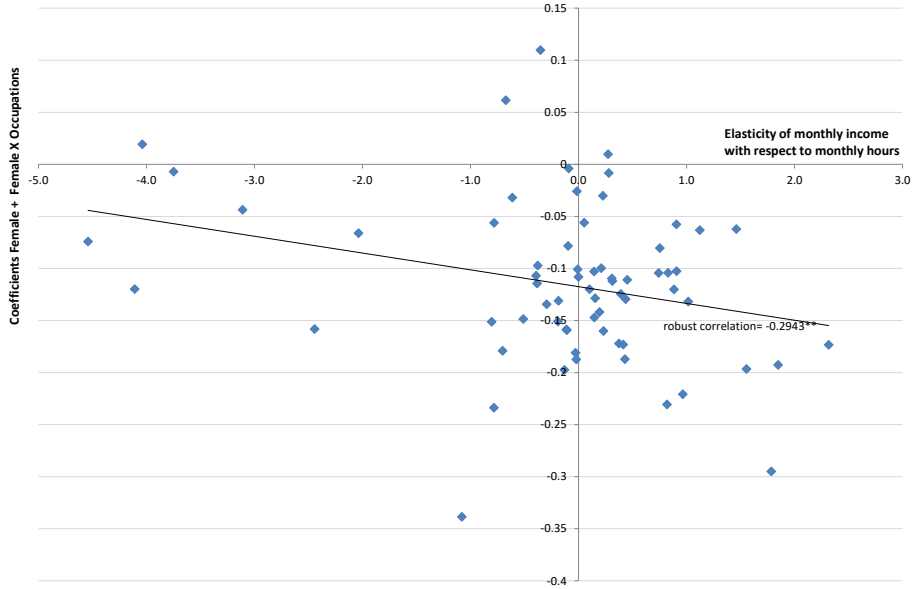
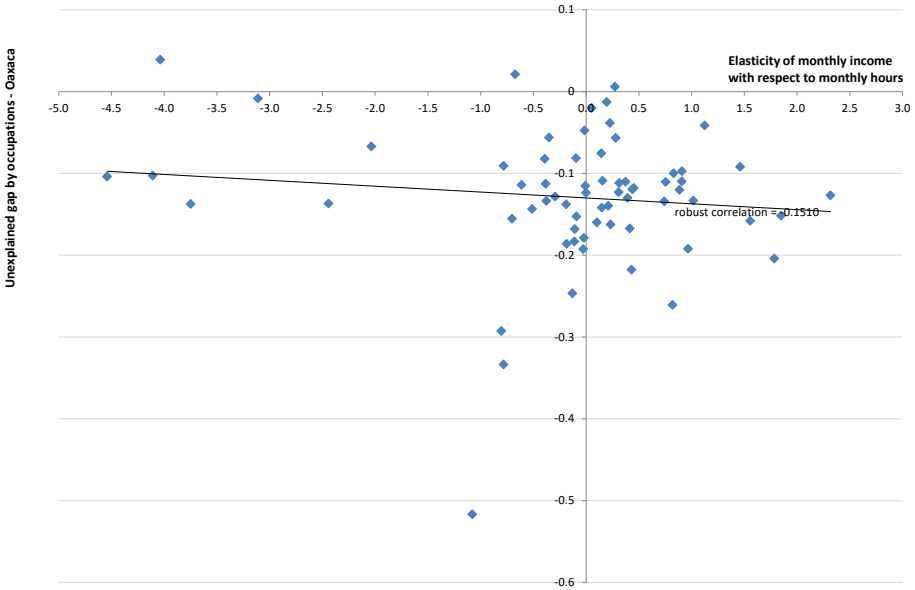



**Figure 4: Unexplained Gender Pay Gaps by Occupation from Oaxaca decomposition on elasticity of monthly income with respect to monthly hours for each occupation, for fulltime and graduate workers (2014)**



The tables below report the robust correlation between the average of the ICP and O*Net characteristics for each of the 66 occupations against the mean (adjusted) gender earning gap and the unexplained component of the Oaxaca decomposition for each occupation among fulltime graduates and full-time non graduates workers. In particular we correlate four different variables (namely: col.1 the residual gender earnings gap in each occupation i.e. the sum of coefficients $\gamma_1 + \gamma_5$ in Eq. 4; col. 2 the Oaxaca unexplained gender gap; col.3 the residual gender earnings gap as resulted in eq.5, i.e. the sum of coefficients $\delta_1 + \delta_5$ in eq. 5 and finally, col. 4 the elasticity of monthly earnings with respect to monthly hours (the sum of coefficients $\delta_3 + \delta_6$ for each occupation.) with the average of the 5 ICP characteristics, the average of the O*Net average characteristics, the frequencies (as described above) of the O*Net characteristics and finally the elasticity of monthly earnings with respect to monthly hours (the sum of coefficients $\delta_3 + \delta_6$ for each occupation.

The relationship is clearly negative and we can see that a part of the residual gender gap may be explained by the O*net characteristics. that are considered here as disadvantages for which women are willing to give up part of their wages to avoid the effort derived by a job with a lot of time pressure, contact with others, working relationships, and lower chance to find close substitutes.

A large part of this relationship is however linked to the non-linearity between wages and hours of work, in fact when the residual is considered controlling for the elasticity of income with respect to hours we do not find any more a correlation between the residual gap and the O*net characteristic.

There is a clear negative association between the residual gender earnings gap and the elasticity of monthly earnings with respect to monthly hours. That is: occupations with higher elasticities have more negative log earnings gender gaps. In other word occupations characterized by nonlinearity in pay (elasticity greater than 1) have much higher unexplained gender gap.

Now we can see also that nonlinearity in pay (elasticity greater than 1) is positive correlated to the O*net characteristic the type of occupation with higher elasticity have also more associated to less pleasant occupations and then confirm that if the time double the earning more than double and then elasticity is higher that 1 when the type of occupation is characterized by labour activities with higher time pressure, higher contact with others or working relationship, unstructured or with great responsibilities and free decision such that to make the occupation less replaceable. Among the 5 O*Net characteristics the one that exhibit the higher correlation are the contact with others(i.e. individuals that have contact with others most of the time and constant contact with others); and establishing and maintaining interpersonal relationships (i.e. the mean across individuals of working relationships) (Table 10)

**Table 8: Percentage bend robust correlation between residual gender earnings gap and the average normalized of 5 occupational characteristics, among fulltime–graduate and fulltime not graduate workers (2014)**

| Occupation Characteristics | Female coeff. by occupations (eq.4) | | Oaxaca Unexplained | | Female coeff. by occupations (eq.5) | | Elasticities by occup. | |
|---|---|---|---|---|---|---|---|---|
| | (1) | | (2) | | (3) | | (4) | |
| **Fulltime, Graduate** | Correlation | T-stat | Correlation | T-stat | Correlation | T-stat | Correlation | T-stat |
| ICP - average | -0.0787 | -0.6319 | 0.0227 | 0.1814 | -0.0511 | -0.4093 | 0.0181 | 0.1447 |
| Onet - average | -0.1880 | -1.5315 | -0.0299 | -0.2393 | -0.1436 | -1.1607 | 0.1716 | 1.3938 |
| Onet – freq. | -0.2227 | -1.8279 * | -0.0389 | -0.3115 | -0.1637 | -1.3273 | 0.2183 | 1.7899 * |
| Elasticities by occupations | -0.2943 | -2.4632 ** | -0.1510 | -1.2218 | -0.2222 | -1.8234 * | | |
| **Fulltime, Not Graduate** | Correlation | T-stat | Correlation | T-stat | Correlation | T-stat | Correlation | T-stat |
| ICP - average | 0.0293 | 0.2343 | -0.0569 | -0.4560 | 0.0455 | 0.3640 | -0.1392 | -1.1247 |
| Onet - average | -0.0365 | -0.2920 | -0.1654 | -1.3413 | -0.0322 | -0.2574 | -0.0013 | -0.0107 |
| Onet – freq. | -0.0611 | -0.4899 | -0.1911 | -1.5573 | -0.0481 | -0.3852 | 0.0469 | 0.3756 |
| Elasticities by occupations | -0.3953 | -3.4424 ** | -0.3285 | -2.7821 ** | -0.3009 | -2.5241 ** | | |

**Figure 5: Residual gender earnings gap on the average of the O*net characteristics frequencies for fulltime and graduate workers (2014)**

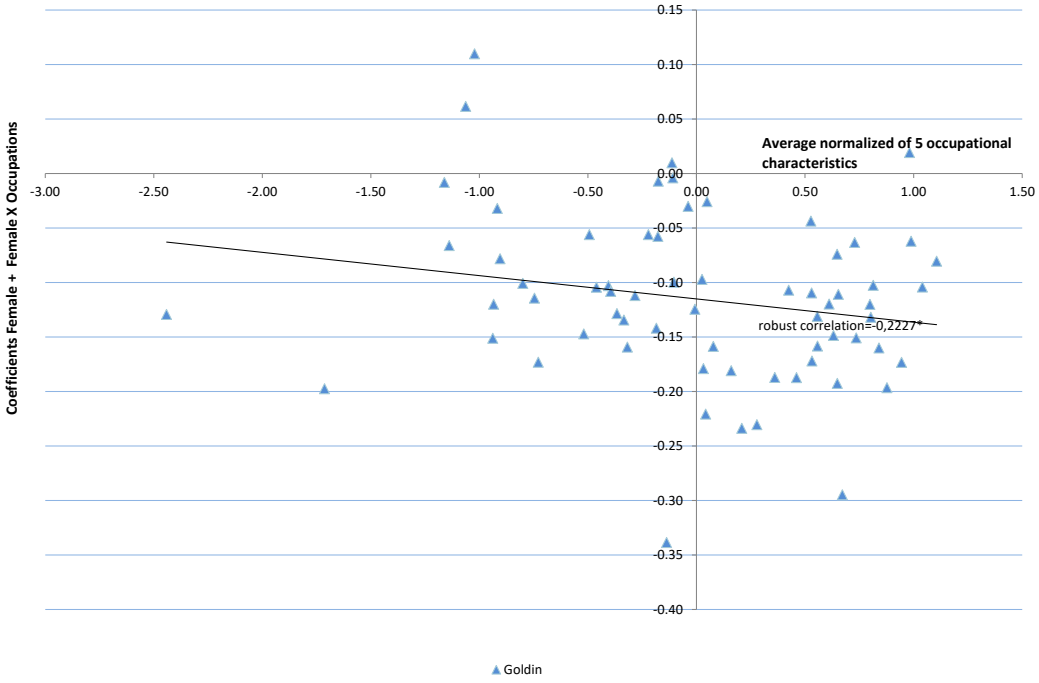


**Table 9: Winsorized robust correlation between residual gender earnings gap and the average normalized of 5 occupational characteristics, among fulltime–graduate and fulltime not graduate workers (2014)**

| Occupation Characteristics | Female coeff. by occupations (eq.4) | | Oaxaca Unexplained | | Female coeff. by occupations (eq.5) | | Elasticities | |
|---|---|---|---|---|---|---|---|---|
| | (1) | | (2) | | (3) | | (4) | |
| **Fulltime, Graduate** | Correlation | T-stat | Correlation | T-stat | Correlation | T-stat | Correlation | T-stat |
| ICP - average | -0.0811 | -0.6506 | 0.0197 | 0.1575 | -0.0364 | -0.2916 | 0.0062 | 0.0496 |
| Onet - average | -0.1859 | -1.5133 | -0.0614 | -0.4922 | -0.1268 | -1.0225 | 0.1231 | 0.9922 |
| Onet – freq. | -0.2396 | -1.9747 * | -0.0876 | -0.7038 | -0.1673 | -1.3576 | 0.1652 | 1.3402 |
| Elasticities by occupations | -0.2658 | -2.2057 ** | -0.1461 | -1.1816 | -0.1918 | -1.5633 | | |
| **Fulltime, Not Graduate** | | | | | | | | |
| ICP - average | -0.0294 | -0.2351 | -0.0942 | -0.7566 | -0.0415 | -0.3320 | -0.1571 | -1.2730 |
| Onet - average | -0.0548 | -0.4389 | -0.2039 | -1.6662 | -0.0704 | -0.5645 | 0.0043 | 0.0340 |
| Onet – freq. | -0.0744 | -0.5966 | -0.2260 | -1.8562 * | -0.0819 | -0.6575 | 0.0395 | 0.3162 |
| Elasticities by occupations | -0.3841 | -3.3281 ** | -0.3074 | -2.5848 ** | -0.2843 | -2.3727 ** | | |

**Figure 6: Unexplained Gender Pay Gaps by Occupation from Oaxaca decomposition on the average of the O*net characteristics frequencies for fulltime and "Not" graduate workers (2014)**

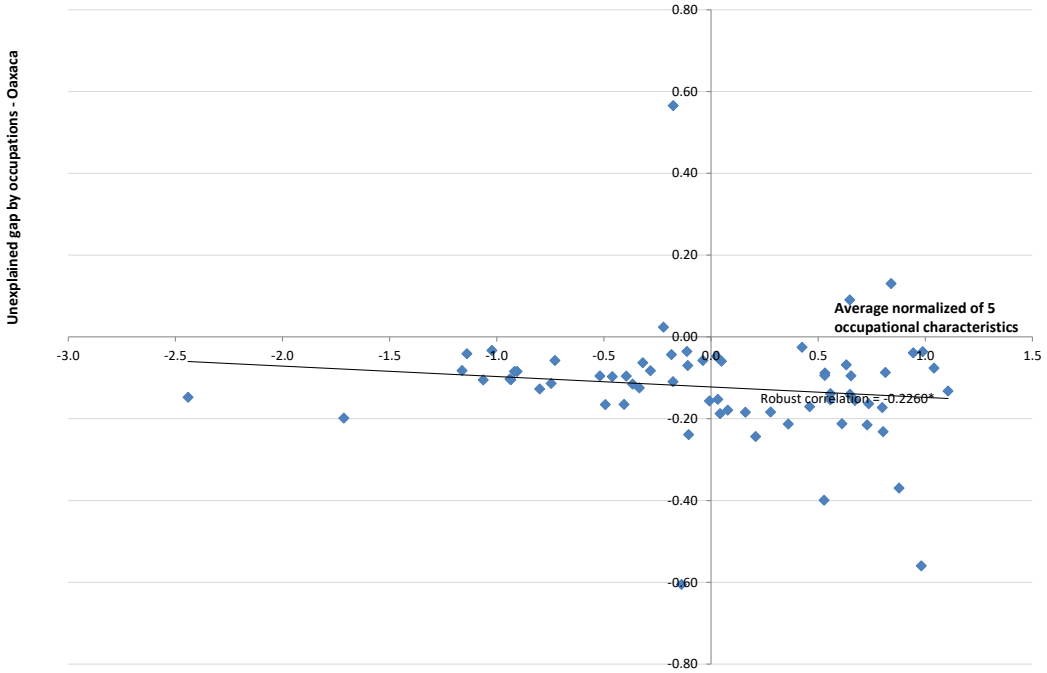


**Table 10: Percentage bend robust correlation between residual gender earnings gap and each of the 5 normalized occupational characteristics, among fulltime–graduate workers (2014)**

| Occupation Characteristics | Female coeff. by occupations (eq.4) | | | Oaxaca Unexplained | | Female coeff. by occupations (eq.5) | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | | | (2) | | (3) | | |
| **Fulltime, Graduate** | Correlation | T-stat | | Correlation | T-stat | Correlation | T-stat | |
| Contact with others (H6) | -0.2084 | -1.7046 | * | -0.1417 | -1.1453 | -0.162 | -1.3133 | |
| Working relationships (G28) | -0.2974 | -2.4922 | ** | -0.0841 | -0.6751 | -0.2525 | -2.0872 | ** |
| Freedom in making decision (H48) | -0.0634 | -0.5086 | | 0.1148 | 0.9246 | -0.046 | -0.3688 | |
| Less structure more discretionality (H52) | -0.1727 | -1.4028 | | 0.0031 | 0.0244 | -0.1646 | -1.3346 | |
| Time pressure (H54) | -0.0359 | -0.2872 | | -0.0431 | -0.3451 | 0.0342 | 0.2734 | |

## 6. Concluding remarks

We have seen that controlling for the standard variables (education, type of contract, tenure, territorial localization) it still remains a residual gender gap. If we look at the coefficient of the dummy female in the earning equation, which show the residual gender gap is always negative in each specifications considered. The same applies when we calculate the unexplained part with more sophisticated technique as O-B and Nopo deconditions. Moreover this residual increases in the firms that give higher earning and in the occupations which require more hard time of work and more time pressure, but the position request more responsibilities. Finally we control for the elasticity of the earning respect the hours worker, then we check for linearity or not of the earning plan used by the firms to rewards different workers depending on whether or not they are willing to work particular and hard hours of work, with greater pressure and greater responsibility but also carrier perspectives and job satisfaction. As said Goldin (2014) the gender gap in pay would be considerably reduced and might vanish altogether if firms did not have an incentive to disproportionately reward individuals who worked long hours and worked particular hours, then reduce the gap if the rewards compensating model is linear respect the more hours worked. More over even if not strongly significant the gap increase also for compensating particular effort which characterize the different type of occupation in particular those occupation with higher contact with others and working relationship, these results could be explained by the fact that a women, either by a choice or for constraint, is willing to forgo a part of the reward if compensated by greater freedom in her life, thanks to an occupation with an higher degree of substitutability.

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