The Gender Pay Gap in Italy: the role of occupations.

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Very Preliminary draft

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 two different decomposition methodologies of the gap: Oaxaca-Blinder and Ñopo using data from the Italian component of the European Structure of Earnings Survey (2002, 2006, 2010, 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. 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 less competitive employment, women are usually those who prefer these kind of occupations.

Introduction

Throughout the past century, women in labour markets have been fostered by the convergence in human capital investment of women relative to men, the women's employment prospects and the women's role in the economy (Goldin 2006). While the gender gap in schooling has become closer, there are remaining gender differences in pay and employment levels, as well as in the types of activities that men and women perform in the labour market (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. Considerable 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 found to have one of a low gender pay gap per hour (5.5% Eurostat 2017). However, the low gender wage gap observed in Italy may be consistent with low female employment rates if selection into

employment is non-random, employed women may have relatively high-wage characteristics, thus low-wage women would not feature in the observed wage distribution. In fact, when considering a synthetic indicator, which includes the average earnings per hour, the number of hours worked per month, and the employment rate, the gender overall earnings gap in Italy rises to 43.7% (39.7% in Europe, Eurostat 2017). The unequal employment of women and men together with one of the lowest gender pay gap in Europe and the traditional family model where men provide greater economic resources while women spend more time managing the household, make Italy an interesting case of study when tracing the evolution of pay discrimination.

In addition, Goldin (2014) points out a further problem that may arise: firms reward individuals who differ in their desire for various amenities that are various aspects of workplace flexibility. Workplace flexibility incorporates the number of hours to be worked and also the particular hours worked. Thus, following the underlying notions of compensating differentials, differences in pay arise because of productivity differences in the workplace, not because of inherent differences in human capital across workers. Some workers want the amenity of flexibility or of lower hours and some firms may find it cheaper to provide. As a consequences in some occupations we have contract less risks, with less responsibilities, less hours, less competitive setting, less time pressure and less interaction with other, thus less payed job.

Thus, consider the framework used in Goldin (2014), the aim of the paper s to analyse the unexplained component of gender gap taking into account the elasticity of hours worked in different occupations. We aim to test whether in Italy the unexplained component reduce when considering individual in different type of occupation. The underline hypothesis is that occupation with more elasticity are affected by more non linearity with respect to time worked, in other words if elasticity of earnings with respect to hours worked is greater than one, individuals who work long hours in these occupations receive a disproportionate
increase in earnings. When earnings are nonlinear with respect to time worked the gender gap is higher. When nonlinearty emerges, occupations impose heavy penalties on employees who want fewer hours and more flexible employment this can result in low remuneration this may cause the shifts to an entirely different occupation or to a different position within an occupational hierarchy or to being out of the labor force altogether. Moreover the greatest nonlinearities has to be found in jobs for which bargaining and competing matter the most. Women are affected from both the problems, they usually prefer fewer hours and more flexible employment and they fall back from competition.

In order to do so, we both follow Goldin methodology that, to the best of our knowledge, is the first time that has been applied to Italy, and also we apply the well-known methodologies to decompose the gender gap that is the Oaxaca-Blinder decomposition and Ñopo decomposition. Both the decompositions distinguish between the explained component of the total gender gap that is the difference due to endowments and the unexplained one that is the difference due to coefficients (i.e. discrimination). The decomposition is performed within occupation to analyse the relationship between the unexplained gap and the elasticity of earnings with respect to hours worked in different occupations.

Following Goldin idea, that what remains to explained the residual gender gap is largely due to how firms reward individuals who differ in their desire for various amenities, we make use of a large dateset (i.e. European Structure of Earnings Survey, 2002, 2006, 2010, 2014) that provides accurate and harmonised data on earnings collecting information on both individual characteristics of employees (sex, age, occupation, length of service, highest educational level attained, etc.) and those of their employer (economic activity, size and location of the enterprise).

1. Theoretical Framework

The literature on the determinants of gender pay gaps has provided an extensive set of theories helping to explain the persistence of the phenomenon. Human capital theory addresses explanations at the individual level: . the impact of motherhood on labour supply lies at the centre of this reasoning. Researchers refer to the wage penalty working mothers receive due to a birth- and childcare-related absence from the labour market. This temporary absence can entail a devaluation of their human capital compared to men of similar age, especially with respect to experience-related knowledge (Becker, 1985). Hence, a pay gap attributable to this channel is simply seen as a reflection of observed productivity differences. Moreover, Becker (1985) and Fuchs (1989) speculate that most of the wage gap not attributable to experience is due to unmeasured differences between men and women in their commitment to parenting. One implication of a stronger commitment by mothers is a higher incidence of part-time jobs among female workers. For several reasons, part-time work is perceived as less efficient than full-time work from an employer's perspective. Dividing the same amount of work among more persons raises internal coordination costs. Moreover, training costs in relation to the actual workload are also higher. As a consequence, part-time workers are paid less than full-time workers with similar experience and education (Kalleberg, 2000). In the opinion of some Human Capital Theorists, another implication of gender roles in parenting could be a lower

wage of mothers, as part of their energy has to be devoted to childcare. Finally, child-related effects also disseminate through potential repercussions on education decisions. Goldin and Polachek (1987) argue that the anticipation of future career interruptions lowers the returns and thus the incentives of young women to invest into education and job-related training. This, in turn, lowers their earnings perspectives even before starting a family. A second strand of theories focuses on the role of social norms and perceptions as explanations for a persistent gender gap. The most visible indicator for the presence of such norms in the workplace is occupational segregation. It describes the observation that women tend to cluster in specific occupations, a phenomenon common to all industrialised countries. These occupations are for the most part characterised by a lower pay than typical jobs for male workers, thereby contributing to a gender differential in earnings (Marini, 1989). The causes are however highly disputed. It is argued that the observed selection into certain occupations stems from differences in worker preferences. According to this view, female workers tend to have particularly strong preferences for jobs characterised by pleasant working conditions and/ or high degrees of time flexibility. These non-pecuniary rewards of working are considered in the wage negotiations, reducing the average payment in these occupations. The part of the wage gap resulting from job selection thus neither represents a sign of market failure nor discrimination.

2. Empirical Framework

A lot of empirical studies have analysed some of the most important standard explanations for the gender wage gap (see for instance Blau and Kahn (2017)). Additional explanations regards the differences in "soft" skills (see Bertrand 2011; Azmat and Petrongolo 2014). With regards to Italy gender pay gap has been explained looking at low labour market participation of women (Olivetti and Petrongolo, 2008); differences in education level (Mussida and Picchio 2014) and differences in the field of study (Piazzalunga, 2018), job mobility (Del Bono and Vuri 2011), selectivity and family responsibility (Cutillo and Centra, 2019) and economic downturn: the gender wage gap increased during the 2008-2012 (Piazzalunga and Di Tommaso, 2018). The economic crisis may affect the gender and sector wage gap through two different channels: structural changes of the labour market and austerity measures (i.e. for Italy law n.78/2010). With regards to the first channel studies have considered the added worker effect: women may enter in the labour market to compensate the job loss of their partners. These women are likely to have low wages (Bettio, 2013). Other have analysed the composition effect: mainly low paid

men lost their job during the crisis and those which remain have higher wage. Finally, we can consider changes in average characteristics (in Italy there is an increase in average age and education of workers after the crisis). With regards to austerity measures, Italy has seen a very tight replacement rate (low turnover), the reform of the pension system (increase of retirement age and reduction of the value) and specially the wage freeze for the public sector.

Finally, Castagnetti-Giorgetti (2019) analyse gender gap between sectors they confirm the substantially higher level of the gender wage gap in the private sector with respect to the public sector. The evidence of a sticky floor effect in the private sector from the cross-section analysis vanishes, while the public sector still shows a glass-ceiling effect. However, both sectors have a significant unexplained gender wage gap whose weight is larger in the public sector throughout the wage distribution.

3. New Perspectives on Gender

Goldin (2014) highlighted a new reason for explaining the gender wage gap. She rely on the fact that in US there has been a decrease in the explained portion of the gender wage gap over time as human capital investments between men and women converged; differences in years of education and in the content of college narrowed; the accumulated labour market experience tightened. As a consequence, the residual portion of the gap rose relative to the explained portion. Some studies claimed that earnings differences for the same position are due to actual discrimination. Others called for women's lower ability to bargain and their lesser desire to compete. With regards to the last one, Goldin (2014) underlines that it is important to explain why different amounts of time out of the labour force and different numbers of hours worked per day or per week have a large effect on the time-adjusted earnings in some occupations but not in others. In fact some positions have a highly nonlinear (convex) pay structure with regard to hours worked and some are almost perfectly linear. According to Goldin (2014) the explanation will rely on labour market equilibrium with compensating differentials and endogenous job design: differences in pay arise because of productivity differences in the workplace, not because of inherent differences in human capital across workers. Some workers want the amenity of flexibility or of lower hours and some firms may find it cheaper to provide. "As women have increased their productivity enhancing characteristics and as they "look" more like men, the human capital part of the wage difference has been squeezed out. What

remains is largely how firms reward individuals who differ in their desire for various amenities. These amenities are various aspects of workplace flexibility. 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. Because these idiosyncratic temporal demands are generally more important for the highly-educated workers, I will emphasize the college educated and occupations at the higher end of the earnings distribution. Jobs for which bargaining and competing matter the most, I will demonstrate, are also positions that have the greatest nonlinearities (meaning convexity) of pay with respect to time worked." (Goldin 2014, p. 1094).. and that "the majority of the current earnings gap comes from within occupation differences in earnings rather than from between occupation differences. What happens within each occupation is far more important than the occupations in which women wind up." (Goldin 2014, p. 1097)..Or in another way what is going on within occupations is far more important to the gender gap in earnings than is the distribution of men and women by occupations.

The framework just outlined can be viewed as the micro-foundations of a compensating differentials model. Individuals place different values on the amenity "temporal flexibility," and firms or sectors face different costs in providing the amenity. The framework gives reasons why there are different costs and how they might change. As a consequences, these individual accept lower wage a front to better jobs in terms of flexibility. Then the workers of a firms are not perfect substitutes and that explain that in some sector show a the greatest nonlinearities (meaning convexity) of pay with respect to time worked.

In Europe the system differently form the US system is a union characterize even if in a number of Anglo-Saxon countries, characterized by fragmented and un-coordinated bargaining, radical changes in the regulation of labour markets and in unionization and coverage of collective bargaining have taken place (OECD 2004: ch. 3). In these countries single-employer bargaining (SEB) is the most common form of bargaining, and the alternative to SEB is multi-employer bargaining (MEB) or, in most cases, no bargaining at all. In some of these countries, such as the UK, New Zealand and, to some extent, also Australia, wage dispersion has been high and increasing in the last decades (OECD 2004: ch. 3).[1] On the other hand, in a number

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of continental European countries, such as Italy, Belgium and Spain, coordination, unionism, coverage of collective bargaining and other wage-setting institutions have not changed in a radical way (OECD 2004: ch. 3). These countries are characterized by a multi-level system of bargaining where SEB has developed alongside MEB. At least in principle, this form of decentralization has been adopted with the idea of combining the benefits of some degree of centralization and/or co-ordination in terms of the internalization of various effects of wage negotiations with the benefits of greater relative-wage flexibility. (Dell'Aringa and Pagani 2007)

This settings may helped us to explain both the gender gap and the public premium. With regards to gender gap, we can assume that when there is this form of decentralization the workers have the power to use their bargaining to stipulated contract more proper to their preferences. This translates for the women in contract less risks, with less responsibilities, less hours, less competitive setting, less time pressure and less interaction with other, as a consequence less payed job. In fact in the private sector we can identify those occupations where is possible the decentralized bargaining and we can compare the differences between men and women at different class of hours supplied to check whether there is a linearity in the link between wage and hours. Thus, for the occupations in which there is more bargaining power, there have to be also more gender gap controlling for the standard characteristic.

4. Data and analysis sample

The sample is drawn by the Italian component of the European Structure of Earnings Survey (SES henceforth) compiled by Eurostat, for the year 2014 (referring to these same years).

We use different samples. The first defines as "All" includes workers 20 to 60+ years old with earnings between the first and the ninth percentile of wage distribution and with no precarious job (defined as jobs with less than 3 mohts contract). The sample defined as "Full-Time" consists of the same individuals as in "All" working full-time (30+ hours). Finally the sample defined as "Fulltime, BA" (i.e. bachelor sample) includes individual as in in Full time sample with at least a college or university bachelor's degree. The numbers of observations in each sample are reported in Table 1 also distinguishing between gender and regions. We have

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162,992for all, 127,061 for full-time (i.e. the 78% of the total sample), 47,515 for BA samples (i.e. the 29% of total sample).

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

	All		Fulltime		Fulltime, Ba	
	Number	**%**	**Number**	**%**	**Number**	**%**
By Gender						
Female	80,255	49.24	52,231	41.11	21,910	46.11
Male	82,737	50.76	74,830	58.89	25,605	53.89
By Region						
North	83,855	51.45	64,751	50.96	24,238	51.01
Centre	40,034	24.56	32,008	25.19	12,661	26.65
South and Island	39,103	23.99	30,302	23.85	10,616	22.34
Total	162,992	100	127,061	100	47,515	100

In order to analyse the role of occupation in explaining the gender gap we consider ISCO 3 digit type of occupation 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 occupational cell, in the third sample (fulltime,Ba), is at least of 25 individuals for each gender, this allows to estimate and decompose the gender gap within occupations.

Table 2: Number of observations and percentages across occupations

	All		Fulltime, Ba		Fulltime, Ba, Female	
	Number	**%**	**Number**	**%**	**Number**	**%**
111 Legislators and senior officials	235	0.14	214	0.45	88	0.4
112 Managing directors and chief executives	440	0.27	388	0.82	133	0.61
121 Business services and administration managers	488	0.3	323	0.68	73	0.33
122 Sales, marketing and development managers	808	0.5	516	1.09	131	0.6
132 Manufacturing, mining, construction, and distribution managers	546	0.33	302	0.64	37	0.17
133 Information and communications technology service managers	371	0.23	231	0.49	45	0.21
134 Professional services managers	1,010	0.62	762	1.6	179	0.82
141 Hotel and restaurant managers	522	0.32	113	0.24	33	0.15
142 Retail and wholesale trade managers	564	0.35	254	0.53	72	0.33
143 Other services managers	381	0.23	133	0.28	40	0.18
211 Physical and earth science professionals	901	0.55	501	1.05	219	1
213 Life science professionals	213	0.13	159	0.33	97	0.44
214 Engineering professionals (excluding electrotechnology)	1,499	0.92	1,171	2.46	247	1.13
215 Electrotechnology engineers	574	0.35	466	0.98	74	0.34
216 Architects, planners, surveyors and designers	498	0.31	333	0.7	156	0.71
221 Medical doctors	363	0.22	306	0.64	122	0.56
225 Veterinarians	148	0.09	140	0.29	56	0.26
226 Other health professionals	1,980	1.21	1,587	3.34	714	3.26
231 University and higher education teachers	3,747	2.3	3,456	7.27	1,356	6.19
232 Vocational education teachers	355	0.22	158	0.33	94	0.43

233 Secondary education teachers	3,712	2.28	2,207	4.64	1,533	7
234 Primary school and early childhood teachers	2,774	1.7	713	1.5	643	2.93
235 Other teaching professionals	493	0.3	225	0.47	144	0.66
241 Finance professionals	1,294	0.79	651	1.37	265	1.21
242 Administration professionals	5,004	3.07	2,420	5.09	1,099	5.02
243 Sales, marketing and public relations professionals	2,278	1.4	1,210	2.55	493	2.25
251 Software and applications developers and analysts	2,493	1.53	1,384	2.91	397	1.81
252 Database and network professionals	1,272	0.78	522	1.1	120	0.55
261 Legal professionals	698	0.43	530	1.12	273	1.25
263 Social and religious professionals	687	0.42	444	0.93	200	0.91
264 Authors, journalists and linguists	987	0.61	492	1.04	226	1.03
265 Creative and performing artists	711	0.44	243	0.51	138	0.63
311 Physical and engineering science technicians	3,934	2.41	911	1.92	252	1.15
312 Mining, manufacturing and construction supervisors	1,577	0.97	332	0.7	92	0.42
313 Process control technicians	3,324	2.04	372	0.78	84	0.38
314 Life science technicians and related associate professionals	196	0.12	66	0.14	25	0.11
321 Medical and pharmaceutical technicians	274	0.17	95	0.2	41	0.19
322 Nursing and midwifery associate professionals	3,367	2.07	1,314	2.77	957	4.37
325 Other health associate professionals	4,143	2.54	1,202	2.53	689	3.14
331 Financial and mathematical associate professionals	9,532	5.85	3,337	7.02	1,363	6.22
332 Sales and purchasing agents and brokers	2,470	1.52	909	1.91	369	1.68
333 Business services agents	2,611	1.6	1,002	2.11	512	2.34
334 Administrative and specialised secretaries	4,573	2.81	1,093	2.3	589	2.69
342	1,053	0.65	291	0.61	48	0.22
351 Information and communications technology operations and user support technicians	2,641	1.62	971	2.04	233	1.06
352 Telecommunications and broadcasting technicians	992	0.61	180	0.38	63	0.29
411 General office clerks	18,586	11.4	4,182	8.8	2,405	10.98
412 Secretaries (general)	6,741	4.14	1,083	2.28	796	3.63
413 Keyboard operators	1,330	0.82	215	0.45	103	0.47
421 Tellers, money collectors and related clerks	3,822	2.34	1,033	2.17	447	2.04
422 Client information workers	6,021	3.69	1,086	2.29	657	3
431 Numerical clerks	8,110	4.98	1,646	3.46	854	3.9
432 Material-recording and transport clerks	5,534	3.4	680	1.43	269	1.23
441 Other clerical support workers	2,723	1.67	608	1.28	356	1.62
512 Cooks	2,022	1.24	73	0.15	36	0.16
513 Waiters and bartenders	2,142	1.31	97	0.2	55	0.25
522 Shop salespersons	7,790	4.78	947	1.99	571	2.61
523 Cashiers and ticket clerks	856	0.53	101	0.21	54	0.25
524 Other sales workers	1,429	0.88	129	0.27	56	0.26
532 Personal care workers in health services	2,406	1.48	269	0.57	179	0.82
541 Protective services workers	2,000	1.23	255	0.54	49	0.22
742 Electronics and telecommunications installers and repairers	922	0.57	102	0.21	27	0.12
754 Other craft and related workers	4,340	2.66	107	0.23	49	0.22
815 Textile, fur and leather products machine operators	1,280	0.79	65	0.14	30	0.14
911 Domestic, hotel and office cleaners and helpers	3,472	2.13	115	0.24	77	0.35
962 Refuse workers and other elementary workers	2,733	1.68	93	0.2	26	0.12
Total	162992	100.04	47515	100	21910	100

In order to perform additional analysis on occupation characteristics, we make use of ISFLO survey on the quality of work in Italy (ISFOL is now INAPP Istituto per l'Analisi delle Politiche Pubbliche). The data collection follows the'European Working Condition Survey (EWCS) conducted by European Foundation for the Improvement of Living and Working Conditions (EUROFAUND) on all European countries. We use the two years available i.e. 2010 and 2015, on about 15.000 workers and 5000 firms.[2]

5. **Methodology**

As we described above, the aim of the paper is to analyse how the gender gap varies by occupations. In fact, the estimated gender gap comes within occupation differences in earnings rather than from between occupation differences. In order to disentangle such difference, we consider the framework used in Goldin (2014), that uses several ways to do so. First, by observing the coefficient on female in a log monthly earnings equations when occupation dummies are added. In this way we analyse how much the gender gap is explained by differences in some characteristics across workers such as: the different number of hours worked whether working fulltime or not and in particular the distribution of men and women across occupations . We, therefore, estimate several log earnings equations, including step by step additional observables variables as follows:

$$\mathrm{Ln}(w_t) = \alpha_0 + \alpha_1 \mathrm{Female}_t + \alpha_3 \mathrm{Basic}_t + u_t \quad (1)$$

$$\mathrm{Ln}(w_t) = \beta_0 + \beta_1 \mathrm{Female}_t + \beta_3 \mathrm{Basic}_t + + \beta_4 \mathrm{Time}_t + u_t \quad (2)$$

$$\mathrm{Ln}(w_t) = \eta_0 + \eta_1 \mathrm{Female}_t + \eta_3 \mathrm{Basic}_t + \eta_4 \mathrm{Time}_t + \eta_5 \mathrm{Occupation}_t + u_t \quad (3)$$

The dependent variable is the log of the monthly wage in each year considered, The main interest in each equation is the female coefficient (α_1, β_1 *and* η_1). In eq.1 *Basic* includes age class dummies, year dummies, type of contract (whether fixed term contract compare to indefinite contract), education, tenure (length of service in the enterprise in year) geographical localization (north south and centre) sector (nace2_2-nace2_10). Gradually we added *Time* variables that includes time worked (log hours per months, and whether full time), and finally *Occupation* dummies (two-digit level) in the most complete specification (eq. 3). The set of the three equations are estimated considering the three sample described in Section 4.

[2] Form the survey we select 11 question on occupation characteristics i.e. q22, q23, q24, d35, d26, d27, d28, d29, d30, d75 d78

We look at the coefficient on female in the regression in order to analyse how much it is affected by the inclusion of *Time and Occupational* dummies. This is a way to look at the differences "between occupation", in term of distribution of men and women across occupations. If our coefficients α_1, β_1 and η_1, after the inclusion of additional coovariates remain negative there is still an unexplained part. This residual could be explained by difference of characteristics "within" the occupation. In order to do so we analyse the non-linearity in earnings with respect the time worked, that is how the firms rewards individual who differ in their desire for various disamenities, We include in our analyses some characteristics of occupations such as working long hours or particular hours, being "on call", providing face time, have more responsibility also of group worked, finally also career perspectives using ISFOL Qualità del Lavoro survey. If one can isolate the features of occupations that have high and low residual differences by gender one can figure out what factors make for more equal pay.

Finally, to further understand the differences "within" occupations, we try to control for the model of compensating wage differential, which introduce heterogeneity among jobs arising from the difficulty of the work to be done. This model allow us to explain why in some types of occupations there is a nonlinear pay with respect to hours worked and why this non-linearity produces an increase in the gender gap.

In fact, according to this framework, certain occupations impose heavy penalties on employees who want fewer hours and more flexible employment this can result in low remuneration, this may cause the shifts to an entirely different occupation or to a different position within an occupational hierarchy or to being out of the labor force altogether. Moreover the greatest nonlinearities has to be found in jobs for which bargaining and competing matter the most. Women are affected from both the problems, they usually prefer fewer hours and more flexible employment and they fall back from competition.

We therefore, estimate two log earnings equations. We make use of eq. 3 adding the interactions between female and occupations (eq.4). The second equation (eq.5) adds to eq. 4 the interaction between log hours worked and occupations as follows:

$$\mathrm{Ln}(w_t) = \gamma_0 + \gamma_1 \mathrm{Female}_t + \gamma_3 \mathrm{Basic}_t + \gamma_4 \mathrm{Time}_t + \gamma_5 \mathrm{Occupation}_t + \gamma_6 (\mathrm{Female}_t * \mathrm{Occupation}_t) + u_t \quad (4)$$

$$\mathrm{Ln}(w_t) = \delta_0 + \delta_1 \mathrm{Female}_t + \delta_3 \mathrm{Basic}_t + \delta_4 \mathrm{Time}_t + \delta_5 \mathrm{Occupation}_t + \delta_6 (\mathrm{LnH}_t * \mathrm{Occupation}_t) + u_t \quad (5)$$

The coefficients of the interaction between female and occupations have to be interpreted as the penalty to being a woman relative to a man of equal education and age, given hours of work for each of the occupations (the residual gender earnings gap). The coefficients of the

interaction between log hours worked and occupations allow to analyse the elasticity of labour supply within occupation and in this way to taking in account for the non-linearity in paying. We then plot the coefficients $\gamma_1 + \gamma_6$ (the residual gender earnings gap, the vertical axis in the figures) against the average of earnings by occupations (using the logarithms of the male wage) for analyse if the gender differences in pay increase or not for high-earning occupation. Moreover the coefficients $\gamma_1 + \gamma_6$ is plotted against the coefficients $\delta_{4\text{hour}} + \delta_6$ (the elasticity of monthly earning with respect the hours worked during the reference month) for each occupation. Analysing the relationship between those coefficients can give us the opportunity to test the hypothesis that when the paying structure is not linear (that is the elasticity is more than 1), the gender gap increase.
Finally, for each occupation we have the mean of hours overtime paid. We use this variable as a measure of the possibility to bargaining long or not long hours of work. Thus we plot the estimated residual gender gap $\gamma_1 + \gamma_6$ against the average of the overtime paid hours within each occupations.

In order to improve the method described above, we also analyse gender discrimination using two different methodologies to decompose the total gender gap. The first one is the method developed by Oaxaca (1973) and Blinder (1973). We estimate the equations described above (eq.1-eq.3).

According to this methodology, the wage equations are estimated separately for the two groups, for example males M and females F (Oaxaca, 1973 and Blinder, 1973). To simplify the notation consider **X** to include all coovariates described above. Thus wage equation become:

$$\text{Logw}_t = \beta\mathbf{X} + \boldsymbol{\varepsilon}$$

The total Gap between male and female wages is due to:

$$\text{Logw}_F - \text{Logw}_M = (\mathbf{X}F - \mathbf{X}M)\,\beta F + \mathbf{X}M(\beta F - \beta M)$$

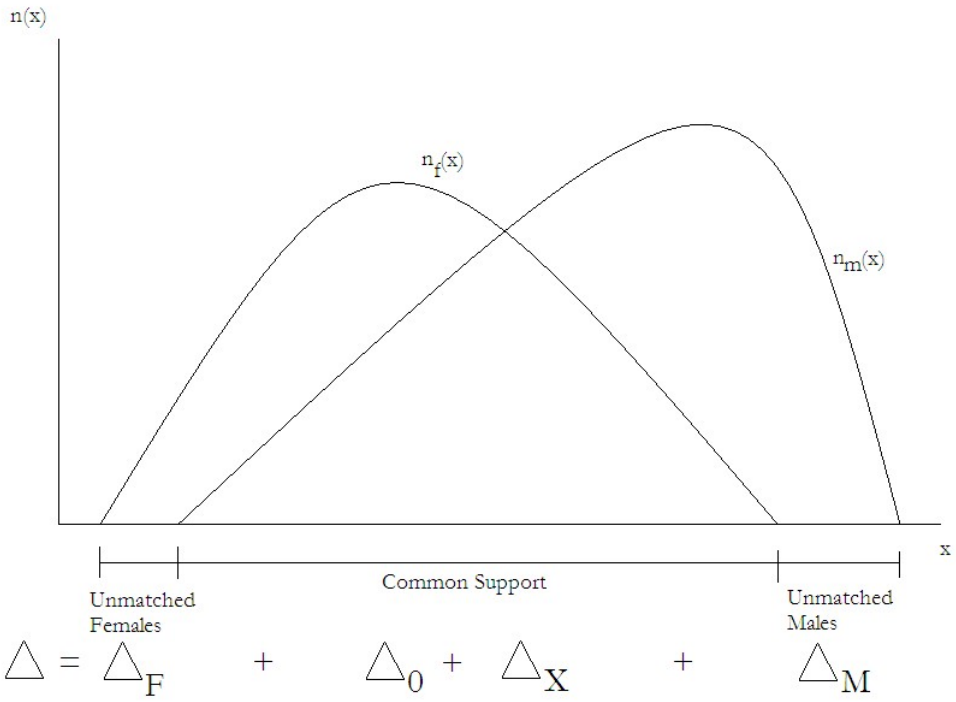
where the explained portion $(\mathbf{X}_F - \mathbf{X}_M)\,\beta_F$ is due to differences in characteristics **X**, while the unexplained (residual and/or discrimination $\mathbf{X}_M(\beta_F - \beta_M)$ is due to differences in coefficient for given **X**. This is a parametric estimates that imply the estimation of a wage equation.

The second method is the one developed by Ñopo (2008) that decomposes the gap in an outcome between two groups using matching. Suppose the two groups are female (F) and

Males (M). Consider $n_F(x)$ and $n_M(x)$ as the distribution of the female and male characteristics. The total gap Δ is decomposed in: $\Delta = \Delta_F + \Delta_X + \Delta_0 + \Delta_M$

where Δ_X and Δ_0 as in Oaxaca are the explained and unexplained component for matched individuals. That is $\Delta_X = (X_F - X_M)\beta_F$ is due to the difference in characteristics X for matched individuals, while $\Delta_0 = X_M(\beta_F - \beta_M)$ is due to the difference in coefficient for given X for matched individuals. Finally, Δ_F is the difference between matched and unmatched female and Δ_M is the difference between matched and unmatched male.

Figure 1: Ñopo decomposition



Both Oaxaca-Blinder and Ñopo decomposition are estimated using the three equation described above (eq.1 and 3) and for the three subsamples All, Fulltime and Bachelor. The aim is to test whether the unexplained components reduce when including additional variable in the regression.

Moreover, both the decompositions are also estimated considering eq.2 for each occupation. In this way we can have econometrically a residual gap comparable to which obtaining with the previous eq. 4 (which include the multiplicative female*occupation). Once we have obtained the unexplained component (i.e. the residual) gender gap for each occupation we plot these unexplained gaps against, as well, the logarithms of the male wage and against the coefficients $\delta_{4hours} + \delta_6$ (the elasticity of monthly earning with respect the hours worked during the

reference month). Again the test allows to analyse whether the nonlinear pay with respect to hours worked is responsible for the majority of the residual differences observed in earnings by gender, and this is true for high-payed occupations.

6. Results

Table 3 reports estimated key coefficients for the log earnings equations (eq.1-3). The different rows represents different sample (as described in Section 4) and different specifications of the model.

The gender gap is very high if we consider the "All" sample (it is about -0.30, that is a ratio of female earnings on male earnings of 0.74, meaning that monthly earning of female is 26% lower than the male one). This gender gap register a very big reduction when we control for the "time" variables (i.e. hours worked and whether full time). Considering the college graduates working full-time sample ("full-time, BA″), the female coefficient, without adding any additional variable, is about -0.19 (that is a ratio of 0.80 meaning that female monthly earning – is 20% lower with respect to male's earning). Considering this last sample, adding log hours variable reduces the coefficient to -0.18 (that is a ratio of 0.82; a difference of -17% between male and female earnings), including all occupations reduces the coefficient on female to -0.12 (that is a difference of -0.12%), thus the coefficient reduce of 32% thanks to the inclusion of occupational dummies, however it remains a difference of 12% of unexplained gap between male and female earnings. This situation is confirmed also by the Oaxaca decomposition where we found a unexplained gender gap of -0.270% for the group of fulltimegraduates(see Table 5). For Ñopo the calculation is only for matched group but we can see that absorbing the effect of all occupations halve the unexplained part, but remain a residual.

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

Sample	Specification	Coefficient on female (unexplained or adjusted)	SE	R^2
All	Basic	-0.2971	0.0022	0.3954
All	Basic,time	-0.145	0.0019	0.5804
All	Basic,time, occupation	-0.1096	0.0017	0.6916
Full time	Basic	-0.1745	0.0022	0.3718
Full time	Basic,time	-0.1697	0.0022	0.375
Full time	Basic,time, occupation	-0.1233	0.0019	0.5489
Full time, BA	Basic	-0.1934	0.0039	0.3444
Full time, BA	Basic,time	-0.1831	0.0039	0.3563
Full time, BA	Basic,time, occupation	-0.124	0.0033	0.5581

Table 4 Oaxaca-Blinder estimated decomposition, for eq-1-eq.3 and for three different samples

Sample	Specifications	Total	Std. Error	Unexplained	Std. Error
All	Basic	-0.326	0.0027	-0.301	0.0023
All	Basic, time	-0.326	0.0027	-0.162	0.0021
All	Basic, time, occupation	-0.326	0.0027	-0.123	0.0019
Full time	Basic	-0.194	0.0026	-0.177	0.0023
Full time	Basic, time	-0.194	0.0026	-0.175	0.0023
Full time	Basic, time, occupation	-0.194	0.0026	-0.128	0.0022
Full time, BA	Basic	-0.270	0.0045	-0.203	0.0041
Full time, BA	Basic, time	-0.270	0.0045	-0.198	0.0041
Full time, BA	Basic, time, occupation	-0.270	0.0045	-0.133	0.0036

Table 5 Nopo estimated decomposition, for eq-1-eq.3 and for three different samples

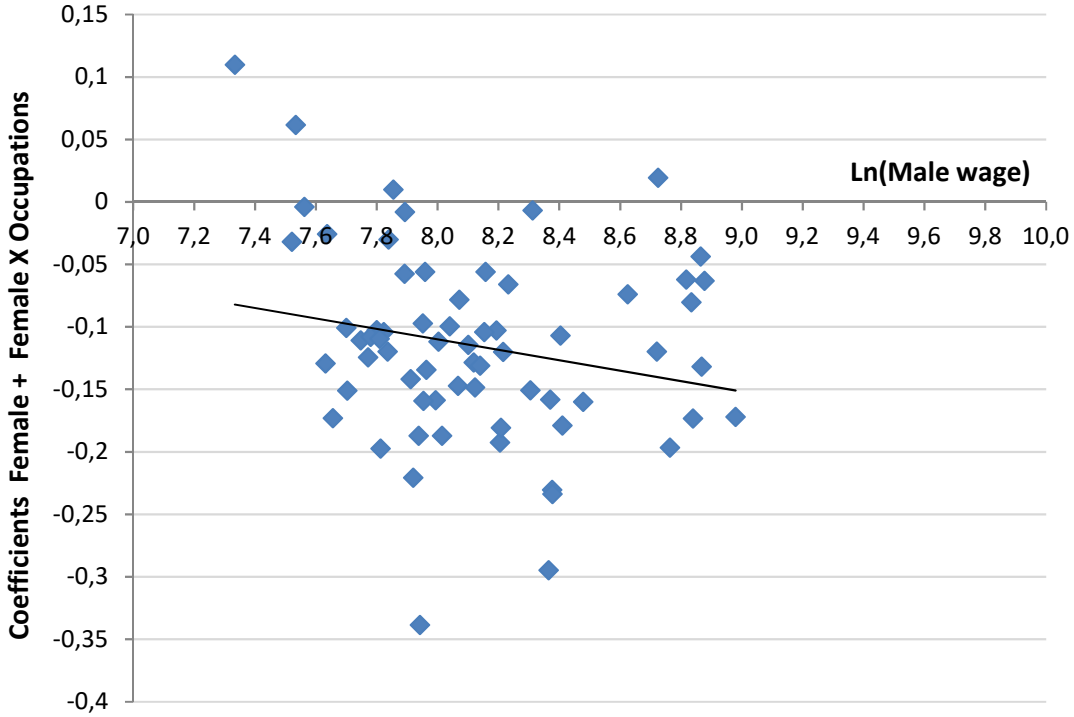
Sample	Specifications	Total	Unexplained
All	Basic	-0.041	-0.034
All	Basic, time	-0.041	-0.018
All	Basic, time, occupation	-0.041	-0.009
Full time	Basic	-0.024	-0.019
Full time	Basic, time	-0.024	-0.019
Full time	Basic, time, occupation	-0.024	-0.009
Full time, BA	Basic	-0.033	-0.022
Full time, BA	Basic, time	-0.033	-0.022
Full time, BA	Basic, time, occupation	-0.033	-0.009

In Figure 1, we plot the Residual Gender earnings gap (the coefficients $\gamma_1 + \gamma_6$ in eq. 4) in each occupation, for fulltime, and graduate workers, on the logarithm of male monthly earnings for all the years considered. We aim to test whether those coefficient are below zero or not.

As Figure 1 shows, for almost all the occupations, the coefficients that show the raw gender gaps in pay adjusted for age, sector of activity, business size, type of contract, education and time worked, are negative. These coefficients can be interpreted as the penalty to being a woman relative to a man of equal age, sector of activity, business size, type of contract, education and time worked k for each of the occupations. That should not come as a surprise since it is a reflection of the lower earnings women receive relative to men in almost all occupations. But despite controlling for age, education, hours

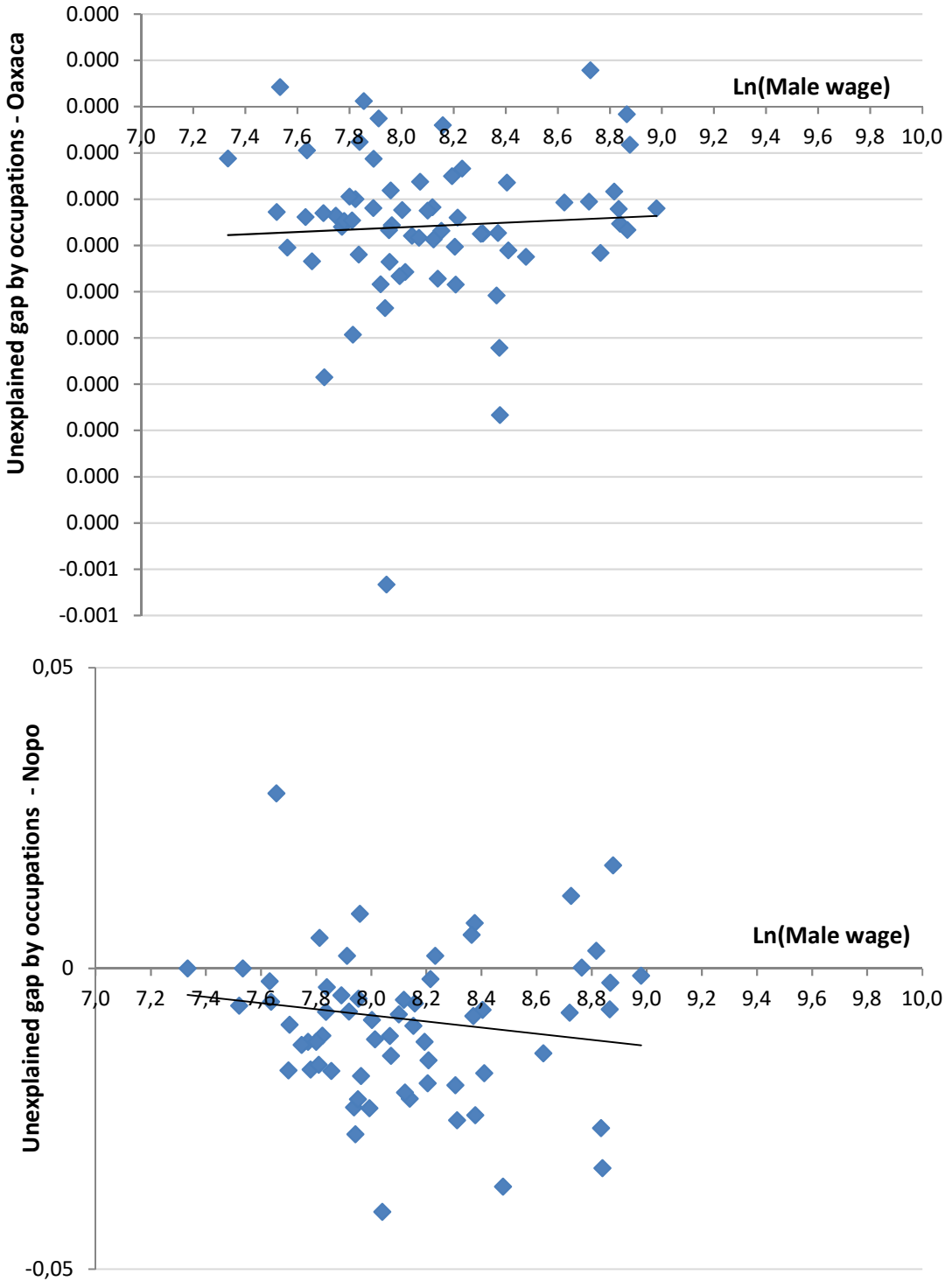
worked, type of contract, tenure and so on, why should the penalty differ so greatly by occupation, even for occupations that are high paying? We have to go deep in the differences in each occupation in terms of compensating wage differences.

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



In order to enhance the analysis we also plot both the Oaxaca and Ñopo unexplained gap in each occupation, for fulltime graduate workers, on the logarithm of male monthly earnings for all the years considered and we got similar results. With Ñopo more occupations have positive values of the unexplained then the gender discrimination gap is not presents.

Figure 2 Unexplained Gender Pay Gaps by Occupation from Oaxaca and Ñopo decomposition on log male monthly earning for fulltime and graduate workers (2014)



To explore the relationship between the residual gender earning gap and occupational features we have used firstly the information of the overtime hours registered in each occupation (showed in figure 3 and 4) and also detailed occupation descriptions from ISFOL survey on

the quality of work. Figure 3 plots the Residual Gender earnings gap (the coefficients $\gamma_1 + \gamma_6$ in eq. 4) in each occupation, for fulltime graduate workers, against the computed average (in log) of overtime hours paid in the reference month for all the year for each occupation. The association is slightly positive meaning that occupations with higher overtime hours have less negative log earnings gender gaps. The overtime hours may be considered as an indicator of the possibility in the firms to bargaining long and more hours, if men are more inclined to bargaining overtime hours the gender gap should increase, we do not find such effect. As we said some workers (as women) prefer the amenity of flexibility or of lower hours thus some firms may find it cheaper to provide them rewarding much less this type pf jobs and much more *individuals who are available to work long hours or worked particular hours.* The results are in line with Oaxaca and Nopo (see Figure 4) .

Figure 3: Residual gender earnings gap on overtime hours average by occupation (2014)

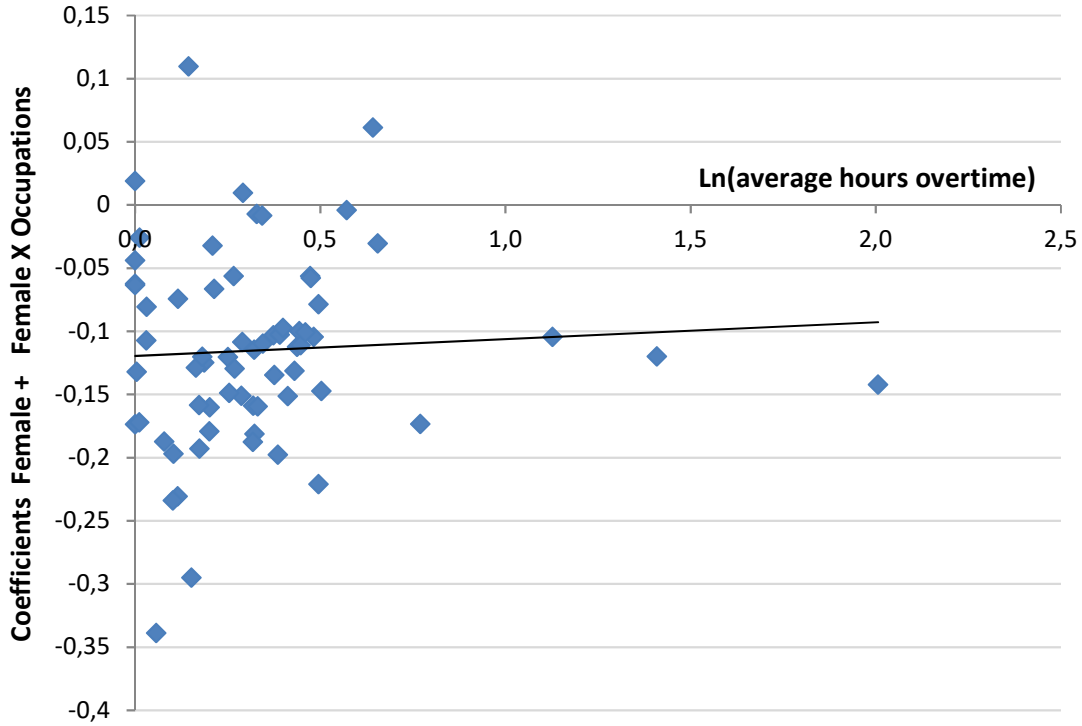
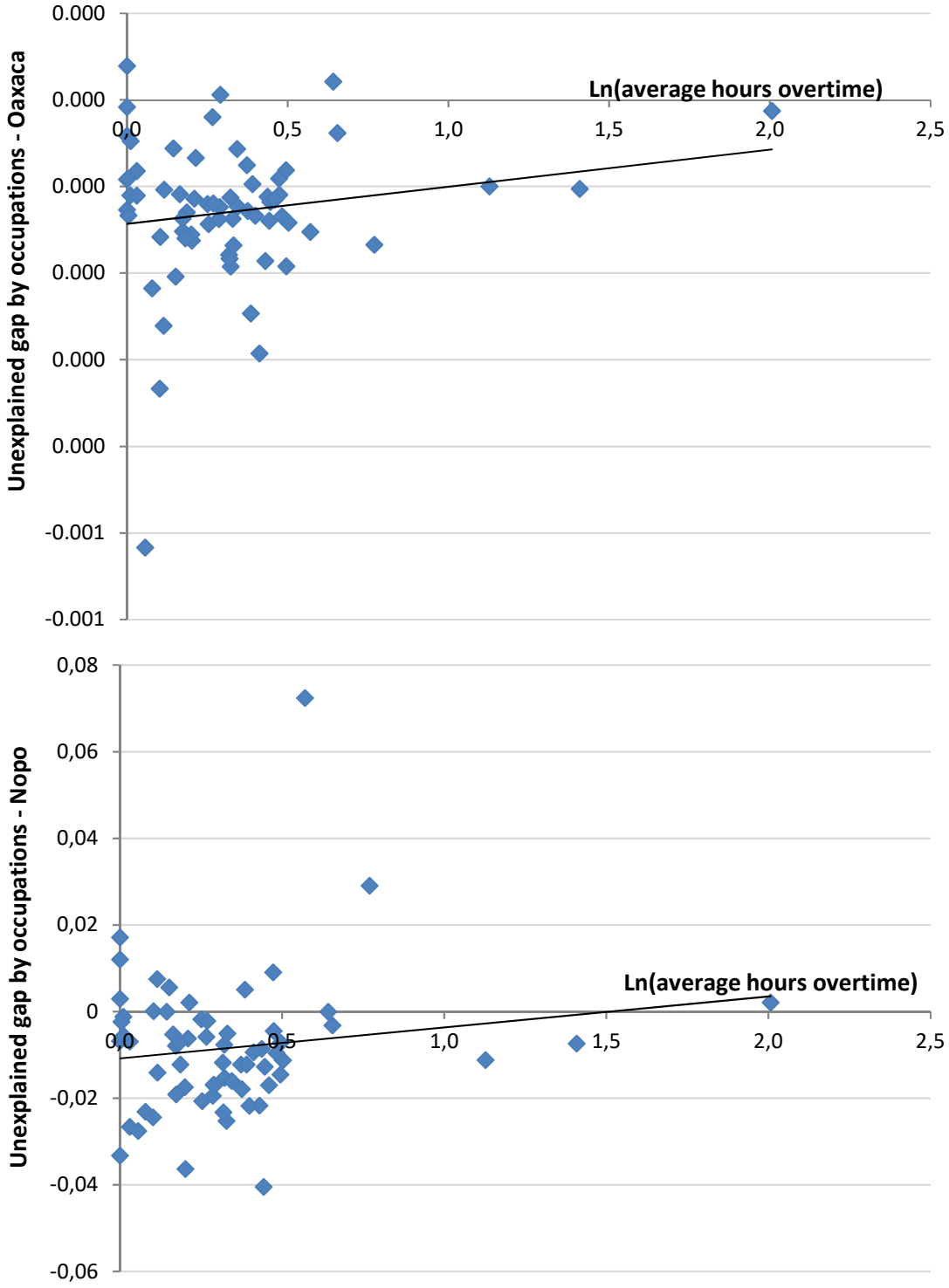


Figure 4: Unexplained Gender Pay Gaps by Occupation from Oaxaca and Ñopo decomposition on overtime hours average by occupation (2014)

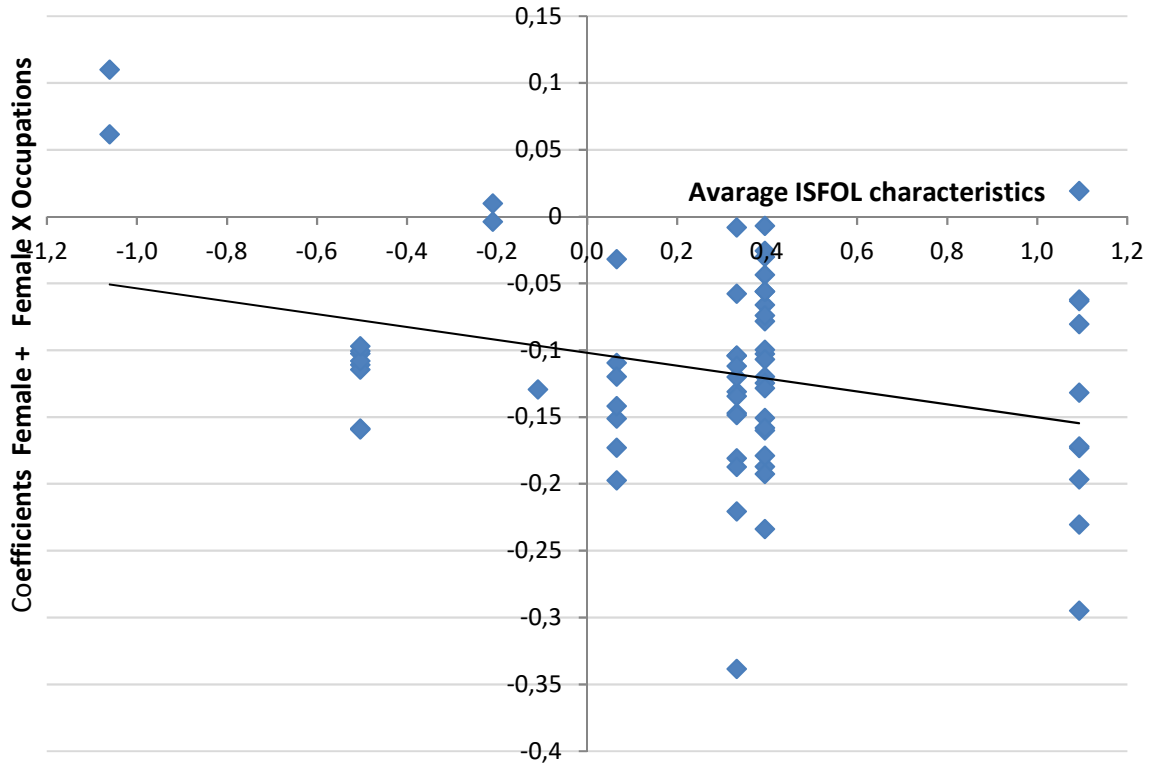


Using the ISFOL data on quality of work, we consider for 8 Type of Occupation (ISCO 1 Digit) eleven variables that reflect some characteristics as follows: flexibility of working hours, working timetable, possibility of making decision, career and motivational aspects.

Each of the these characteristics has been normalized to have a mean of zero and a standard deviation of one. We impute those mean to the 66 occupations considered in the SES data. The scatter plot of the Residual Gender earnings gap (the coefficients $\gamma_1 + \gamma_6$ in eq. 4) in each occupation, against the simple mean of the these characteristics for each of the 39 type of occupations among college graduates (full-time, full - year-round workers) is given in Figure 5. We find results in line with Goldin that shows a negative relation between the residual gender gap and those variables that show occupations with hard work hours and more competitive or occupation with more responsibilities: the gender residual gap became more negative for occupation that requires more hard works in terms of gours, more responsabilities and are more competitive.

Then we have also shown that this characteristics of work settings (Overtime and ISFOL information) are associated with the (adjusted) gender gap in pay such that work environments that require more interactions more hard work, decision power, time pressure, but more competitive and motivational work, for example, are those with larger gender earning gaps.

Figure 5: Residual gender earnings gap on selected ISFOL variables by occupation.



Finally, Another hint at what must be in the last chapter can be gleaned by adding a log hours × occupation interaction into the regression containing the occupation and log hours main effects. The interaction of log hours and occupation allows the relationship between hours and earnings to differ for each occupation. Figure 6 plots the Residual Gender earnings gap (the coefficients $\gamma_1 + \gamma_6$ in eq. 4) in each occupation, against the computed elasticity of monthly income with respect to monthly hours for each occupation for full time college graduates (the coefficient s $\delta_{4\text{hours}} + \delta_6$.in equation 5). There is a clear negative association between the residual gender earnings gap and the elasticity of monthly earnings with respect to monthly hours: occupations with higher elasticities have more negative log earnings gender gaps. The results are confirmed by the unexplained part calculated with Oaxaca and Ñopo technique (Figure 8) .

Figure 6: Residual gender earnings gap on elasticity of monthly income with respect to monthly hours for each occupation, for fulltime and graduate workers (2014)

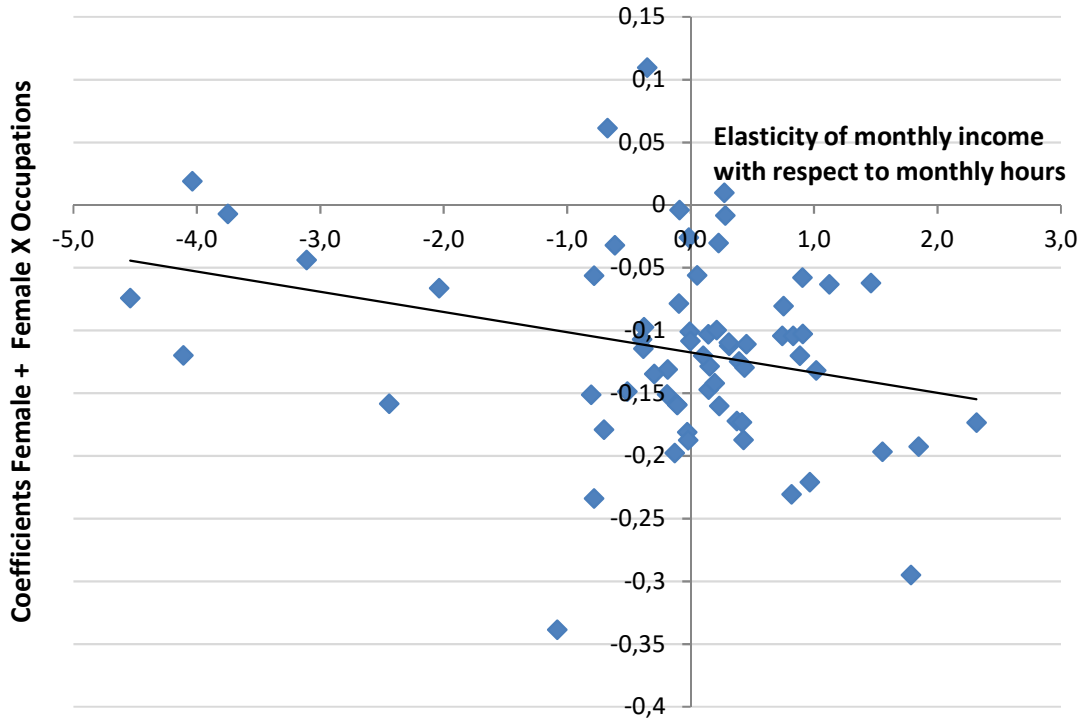
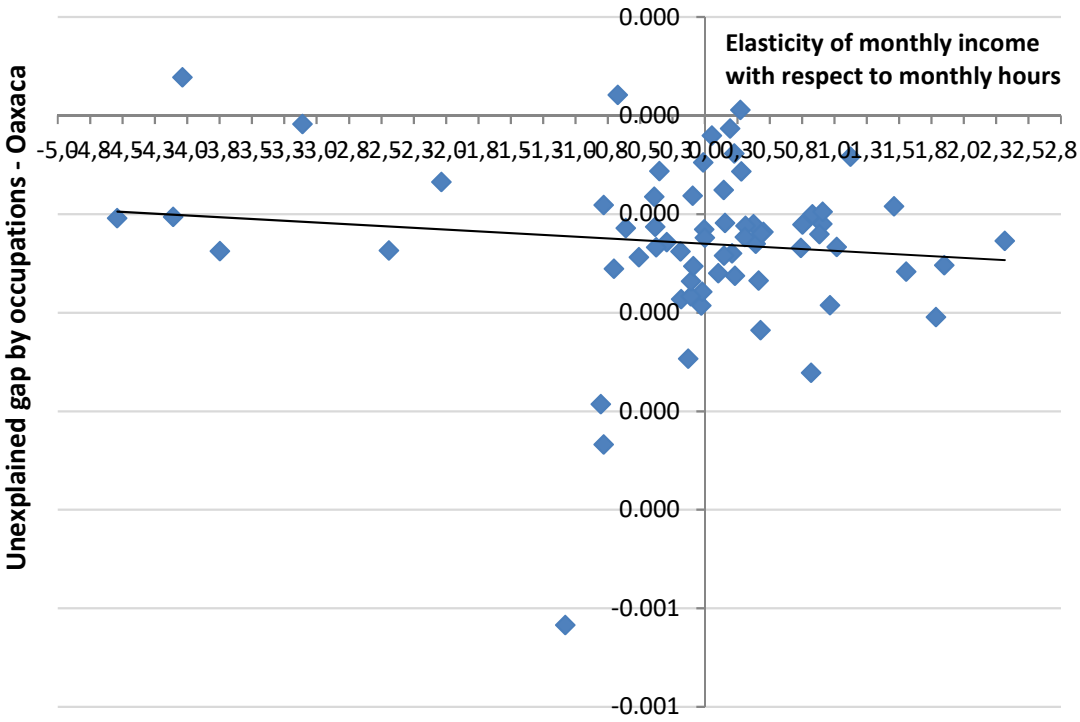
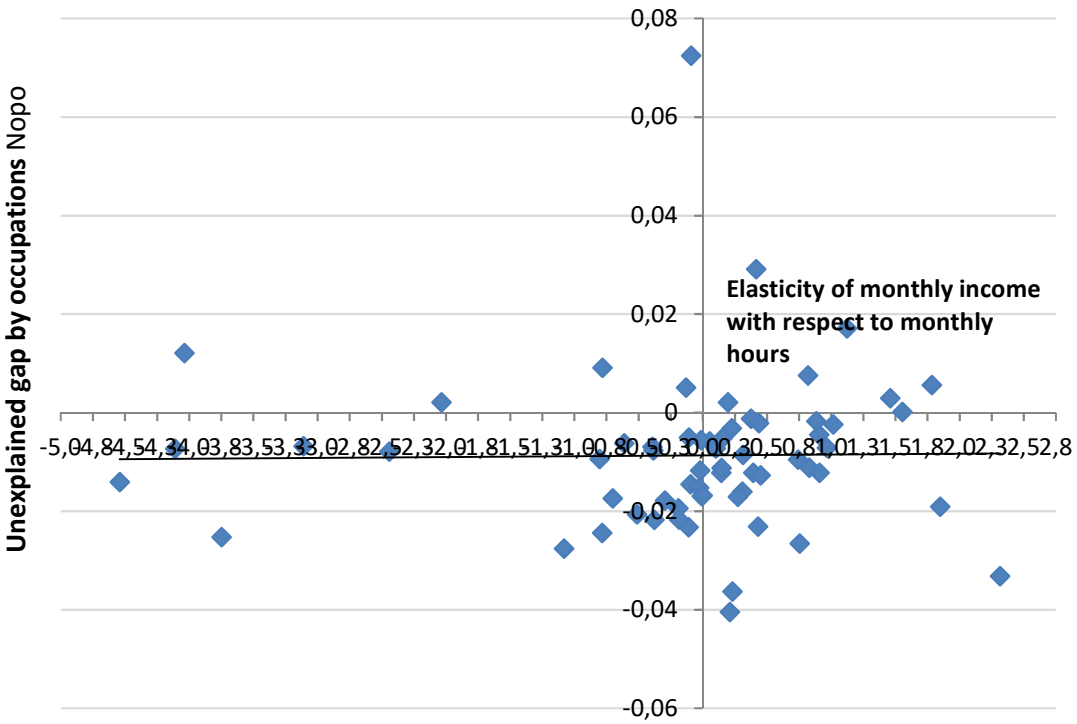


Figure 7: Unexplained Gender Pay Gaps by Occupation from Oaxaca and Ñopo decomposition on elasticity of monthly income with respect to monthly hours for each occupation, for fulltime and graduate workers (2014)





Conclusions

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 Oaxaca-Blinder 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.

Reference

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