Gender Wage Differentials in Italy: A Structural Estimation Approach

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Introduction (1)

- The empirical labour literature has paid particular attention to gender wage differentials; these have been frequently associated with discrimination in labour markets.
- However, identification of discrimination as source of such differentials with standard econometric tools is not a simple task. The problem is that discrimination is only one possible explanation for observed wage differentials among men and women.
- Other components are productivity differentials and different search behaviour of men and women.
- One possibility for analysing these issues is that of using and estimating an equilibrium search model. In this context, all three sources of wage differentials are present as an explanation for wage dispersion.

Introduction (2)

- Estimation of structural behavioural parameters of an equilibrium search model, both with maximum likelihood techniques and matching first moments in the data, guarantees exact identification.
- After estimating structural parameters, it is possible to look at the relationship between productivity and wages paid and estimating the degree of monopsony power for firms.
- Equilibrium conditions can then be used to decompose observed wage differentials due to search frictions, productivity differentials and discrimination.
- However, equilibrium search models assume wage bargaining is decentralised. This can be problematic in some settings in which institutions as minimum wages, EPL and unions can play substantial roles in wage determination, i.e., Italy.

Gender Differentials

- Gender differences are mirrored in behavioural parameters of search models as arrival rates of job offers and job destruction rates.
  - Higher turnover for women implies they invest less in the labour market, increasing the exploitation rate.
  - If firms have monopsony power in setting wages, by compressing the wage distribution, they reduce incentives to search for better jobs, decreasing upward mobility.
  - Finally, women can have some comparative advantage in homework, increasing their productivity and limiting their chances in the labour market.
- Discrimination is modelled as taste discrimination.

Homogeneous Workers and Firms (Burdett and Mortensen, 1998)

- **Workers** are identical and set a reservation wage R that depends on
  - Value of leisure b
  - Arrival rates of job offers λ_0 and λ_1
  - Job destruction rate δ. Define $k_1 = \lambda_1/\delta$ is the *KEY parameter of the model* and represents a measure of the speed at which workers climb the job (and wage) ladder and is also a measure of search frictions in the market.
- **Firms** maximise profits posting a wage in the support of the wage offer F (always lower than p).
  - All firms make the same (positive) profits

$$\pi(w|R,F) = \max_{w}(p-w)l(w|R,F)$$

Problems

- Equilibrium distribution of offered wages

$$F(w) = \left[\frac{(1+k_1)}{k_1}\right]\left[1 - \left(\frac{p-w}{p-R}\right)^{1/2}\right]$$

- Equilibrium distributions $F(w)$ and $G(w)$ have left skewed increasing convex densities with mass concentrated to the right toward the competitive wage.
- The predicted shape of the wage distribution is at odds with the one observed in the data.
- Worker and/or employer heterogeneity are required to fit and explain the (real) observed distribution of earnings.

Heterogeneity in Firms' Productivity (Bontemps et al., 2000)

- Structural relation between $F(w)$ and $G(w)$

$$G(w) = \frac{F(w)}{1 + k_1[1 - F(w)]}.$$

- Firms are heterogeneous with respect to their labour productivity parameter p. Let $\Gamma(p)$ denote the (continuous) distribution of productivity with support $[\underline{p}, \overline{p}]$.
- Firms post wages in the set of profit maximising wages.
- Mapping from the support of the productivity distribution to the support of the wage offer distribution $w = K(p)$.
- Productivity parameter for each firm

$$p = w + \frac{1 + k_1 G(w)}{2k_1 g(w)}.$$

Data and the Likelihood Function

- Use INPS data base from Italian Administrative Archives - National Social Security Institute from 1985 to 1996.
- Current status of workers in the sample in February 1991
- Elapsed and residual duration in the state (employment or unemployment)
- Wage earned or accepted when exiting unemployment
- For employed workers, the next transition to another job or unemployment (or censoring)
- Full-time aged 15–50. Blue and white collars, managers.
- Trim the lowest 1% and highest 99% tail of the overall wage distributions.

The nonparametric estimation procedure

1. Estimate $G(w)$ and $g(w)$ using a nonparametric procedure.
   - Standard Gaussian kernel estimator for the density
   - Empirical cumulative distribution for $G(w)$.
   - Conditional on k_1, consistent estimates of $1 - F$ and f are given by the structural theoretical relationships.
2. Replace estimated $1 - F$ and f in the likelihood function by the preceding expressions, and maximize the likelihood with respect to k_0, k_1, and δ.
3. Estimate p.

Discrimination (Becker, 1971)

- Two types of workers, M and F. There is a proportion θ of the latter and $1-\theta$ of the former. Workers differ by appearance and productivity. Firms maximise utility that depends on profits and preferences over type of workers. There is a fraction γ_d of firms having a disutility d upon hiring a type F worker, while the remaining proportion is unprejudiced firms. Both θ and γ_d are exogenously given.
- Arrival rates are influenced by preferences of employers towards workers' types; a proportional factor $0 \leq k \leq 1$ is added to the model. If $k = 0$, prejudiced firms do not search for F type workers, while if $k = 1$ ($d = 0$ and $\gamma_d = 0$) arrival rates are the same across workers. In general arrival rates differ by k. Exogenous job destruction rates differ by assumption $\delta_F \geq \delta_M$.

Search, Productivity and Discrimination (Bowlus and Eckstein, 2002)

- I solve the following system to estimate δ, λ_0, λ_1, and p to match moments observed in the data. The reservation wage R is assumed to be the lowest wage observed in the sample. The basic system, based on the theoretical model is described below

1. unemployment duration, $u_{dur} = \frac{1}{\lambda_0}$,
2. unemployment rate, $u_{rate} = \frac{\delta}{\delta+\lambda_0}$,
3. proportion from job to unemployment,

$$jtu = \frac{\lambda_1}{(\delta + \lambda_1)\ln(1 + \frac{\lambda_1}{\delta})},$$

4. average wage of cross section earnings distribution,

$$E_{G(w)} = \frac{\lambda_1 p + \delta R}{\lambda_1 + \delta}.$$

Main Results of the Paper

- The arrival rate of offers when when unemployed is ten times higher than the one when employed, both for men and for women. The low level of search while on-the-job negatively affects the speed at which workers climb the job ladder, i.e., the search frictions parameter is equal to 0.5 for men and 0.2 for women.
- The mapping from productivity to wages indicates that for men the relation is highly non linear, with high productivity firms offering proportionally higher wages; while for women, the relationship is almost linear.
- Results indicate different contributions of productivity, search and discrimination to explain wage differentials. For wage offers: 61% for productivity, 28% for search and 11% for discrimination; for earnings: 48%, 24% and 28%.

References

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Table 1: Transition Parameters

MEN	δ	λ_0	λ_1	k_1
All Sample	0.0128	0.0431	0.0064	0.5039
	[0.0127, 0.0128]	[0.0427, 0.0436]	[0.0063, 0.0068]	[0.4925, 0.5218]
Blue Collars	0.0139	0.0421	0.0053	0.383
	[0.0138, 0.0140]	[0.0415, 0.0427]	[0.0051, 0.0055]	[0.3742, 0.3920]
White Collars	0.0109	0.0466	0.0103	0.9472
	[0.0107, 0.0111]	[0.0450, 0.0484]	[0.0097, 0.0108]	[0.8802, 0.9953]
Managers	0.0122	0.0786	0.0655	5.3561
	[0.0115, 0.0132]	[0.0630, 0.1070]	[0.0408, 0.1373]	[3.3168, 10.892]
15-25	0.0251	0.0350	0.0079	0.3154
	[0.0247, 0.0254]	[0.0339, 0.0359]	[0.0073, 0.0085]	[0.2926, 0.3429]
26-40	0.0126	0.0475	0.0060	0.4762
	[0.0124, 0.0128]	[0.0465, 0.0483]	[0.0057, 0.0063]	[0.4525, 0.5114]
41-50	0.0098	0.0709	0.0040	0.4111
	[0.0097, 0.0099]	[0.0677, 0.0737]	[0.0039, 0.0042]	[0.4005, 0.4288]

Time period is month. 5% and 95% percentiles of the bootstrap distribution in square brackets.

WOMEN	δ	λ_0	λ_1	k_1
All Sample	0.0154	0.0398	0.0032	0.2099
	[0.0153, 0.0154]	[0.0378, 0.0405]	[0.0021, 0.0053]	[0.1998, 0.2101]
Blue Collars	0.0158	0.0381	0.0017	0.1133
	[0.0156, 0.0160]	[0.0379, 0.0392]	[0.0012, 0.0021]	[0.1101, 0.1145]
White Collars	0.0151	0.0414	0.0056	0.3749
	[0.0149, 0.0152]	[0.0410, 0.0431]	[0.0053, 0.0059]	[0.3654, 0.3956]
15-25	0.0236	0.0332	0.0032	0.1369
	[0.0233, 0.0240]	[0.0329, 0.0341]	[0.0022, 0.0040]	[0.1298, 0.1403]
26-40	0.0148	0.0465	0.0034	0.2321
	[0.0138, 0.0051]	[0.0455, 0.0475]	[0.0024, 0.0045]	[0.2301, 0.2405]
41-50	0.0095	0.0488	0.0033	0.3466
	[0.0090, 0.0099]	[0.0480, 0.0497]	[0.0027, 0.0040]	[0.3376, 0.3501]

Time period is month. 5% and 95% percentiles of the bootstrap distribution in square brackets.

Table 2: Parameters' Comparison: Non-Parametric and Matching Methods

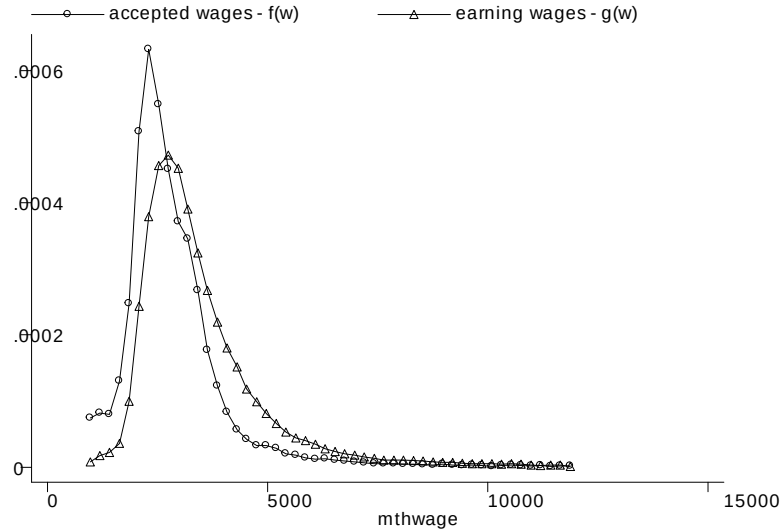
	Non Parametric		Matching Moments	
	Men	Women	Men	Women
	(2)	(3)	(4)	(5)
δ	0.0128	0.0154	0.0078	0.0086
λ_0	0.0431	0.0398	0.0410	0.0393
λ_1	0.0064	0.0032	0.0025	0.0023
p	102,583	87,819	10,691	9,964
k_1	0.5	0.2	0.32	0.26
R	974	835	974	835
u_{dur}	24.37	25.40	24.37	25.40
u_{rate}	0.16	0.18	0.16	0.18
jtu	0.87	0.89	0.87	0.89
$E_{G(w)}$	3386	2760	3386	2760

Table 3: Productivity, Search and Discrimination: Alternative Models

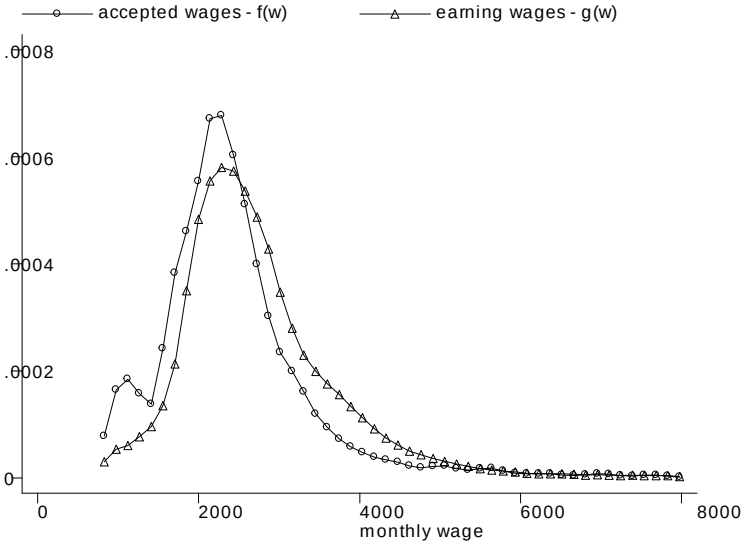
	(1)	(2)	(3)	(4)	(5)	(6)
λ_0	0.04043	0.04043	0.04043	0.04043	0.04103	0.04103
λ_1	0.00247	0.00247	0.00254	0.00254	0.00258	0.00258
δ_M	0.00828	0.00828	0.00770	0.00770	0.00781	0.00781
δ_W	0.00828	0.00828	0.00887	0.00887	0.00864	0.00864
R	835	835	835	835	835	835
P_M	11332	12381	11533	11533	11533	11533
P_W	11332	9444	9726	9446	9446	11533
d	0	0	0	5503	5503	-15478
γ_d	0	0	0	0.1703	0.2703	0.2703
k	1	1	1	1	0.85	0.85

Monetary values are expressed in 000s of Italian Lira.

Figure 1: Kernel Density Estimates of Earnings and Wage Offer Distributions

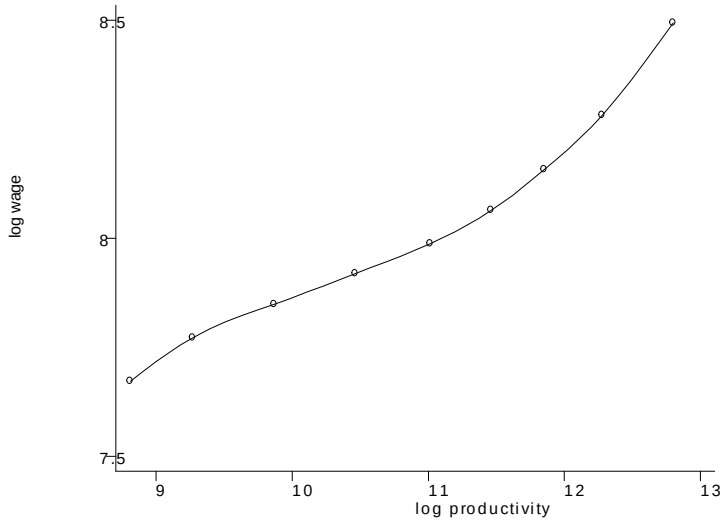


Men

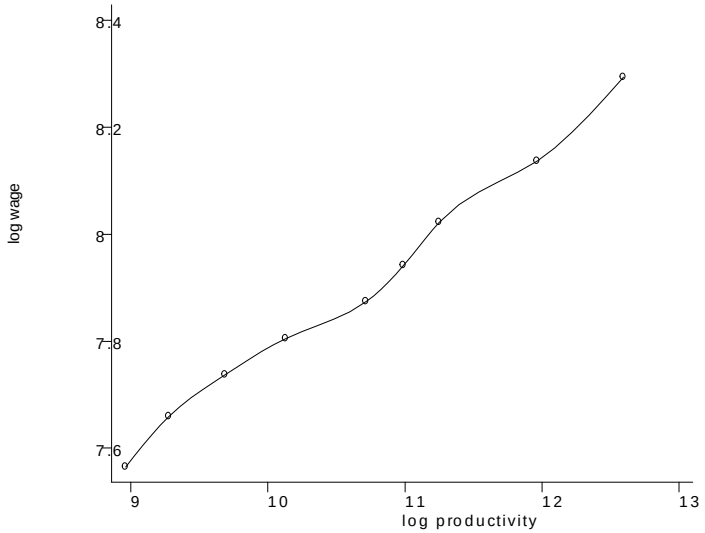


Women

Figure 2: Mapping from Productivity to Wages, Percentiles



Men



Women