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Wage Bargaining and the (Dynamic) Mincer Equation

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Abstract

This paper shows that, if observed earnings are the result of employer-employee wage bargaining, under a set of specific assumptions, the standard static Mincer equation can be thought as a particular case of a dynamic wage equation. Particularly, we argue that the standard static Mincer equation is implicitly based on the hypothesis that the employee has full bargaining power, and provide (further) empirical evidence against this hypothesis.

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1. Introduction

A seminal book by Jacob Mincer (1974) is the starting point of a large body of literature dealing with the estimation of a wage equation where the logarithm of the hourly observed earnings of an individual is explained by his/her schooling years s and by his/her potential labor-market experience z.
As argued by Heckman et al. (2003), the standard Mincerian framework has two main features. First, it provides an explanation why the logarithm of the net potential earnings of an individual at time $t = s + z$, say $\ln npe_t$, can be approximately represented as a function of s and z, where z keeps the post-schooling investment in human capital into account (α is a scalar):

$$\ln npe_t \approx \alpha_0 + \alpha_1 s + \alpha_2 z + \alpha_3 z^2 \qquad (1)$$

Second, it is based on the *assumption* that, at any time $t \geq s$, the observed earnings of an individual, say $\ln w_t$, are equal to the monetary value of the individual net productivity, measured by his/her net potential earnings, i.e.:

$$\ln w_t = \ln npe_t \qquad (2)$$

Replacing (1) into (2) provides the standard static Mincer equation, i.e.:

$$\ln w_t \approx \alpha_0 + \alpha_1 s + \alpha_2 z + \alpha_3 z^2 \qquad (3)$$

This paper does not question expression (1) and focuses on assumption (2). From a theoretical point of view, assumption (2) fits within the perfect-competition framework where the nominal wage equals the monetary value of the marginal labor productivity. However, if one believes that the imperfect-competition framework is a more realistic view of the labor market[1], then *several* arguments can support the statement that assumption (2) is unlikely to hold. This manuscript focuses on *one* of the possible arguments: the existence of wage bargaining at employer-employee level. Additional arguments (asymmetric information, role of unions and efficiency wages) will be briefly discussed in the last Section of this paper.

2. Theory

The standard Mincerian model puts particular emphasis on the supply side: the more an individual invests in his/her human-capital development, the higher his/her wage is. The model that is presented in this Section aims at enhancing the role played by demand factors in determining wages, without diminishing the one played by supply factors. More explicitly, the argument is that schooling and post-schooling investments provide individuals with *net potential* earnings, meaning skills required to earn a given amount of money. However, *observed* earnings are likely to be the result of both employee's skills (supply) and employer's willingness to pay (demand). Since real-life labor

[1] A general reference is the New Keynesian view of the labor market.

markets are characterized by wage bargaining, the possibility of a margin-formation between observed earnings and net potential earnings should not be ruled out a-priori. This implies that observed earnings may not coincide with net potential earnings, although the former generally depend on the latter.
As additional feature, the model keeps into account the stylized fact that observed earnings exhibit path-dependence. To the best of our knowledge, this feature is novel because the existing (micro and macro) evidence on the autoregressive nature of observed earnings[2] has not received attention in Mincerian studies so far.
To anticipate the model's conclusion, current observed earnings are shown to be dependent on both past observed earnings and current net potential earnings.

Let us assume that the logarithm of the observed earnings of an employee arises from a simple, decentralized Nash bargaining between an employee and an employer and that:

- Employee objective function: the employee maximizes his/her observed earnings at time t[3], namely the employee maximizes $U_t^{employee} = \ln w_t$;
- Employer objective function: the employer maximizes the difference between the monetary value of the employee's net productivity at time t and the salary that he/she has to pay to the employee, namely the employer maximizes $U_t^{employer} = \ln npe_t - \ln w_t$;
- Employee outside option: if bargaining fails, the outside option for the employee is the unemployment benefit at time t, i.e. $\tilde{U}_t^{employee} = \ln b_t$;
- Employer outside option: if bargaining fails, the outside option for the employer is $\tilde{U}_t^{employer} = 0$ because the employer neither gets the monetary value of the employee's net productivity nor pays a salary;
- Nash bargaining function: the Nash bargaining function has a Cobb-Douglas specification, i.e. $U_t = (U_t^{employee} - \tilde{U}_t^{employee})^{\rho}(U_t^{employer} - \tilde{U}_t^{employer})^{1-\rho}$.

As usual in the literature, the coefficient $\rho \in [0,1]$ in the Nash bargaining function is interpreted as the bargaining power of the employee, while $1-\rho$ is the bargaining power of the employer.
For sake of simplicity, we further assume that the unemployment benefit at time t is proportional to the salary of the employee at time $t-1$, i.e. $b_t = \lambda w_{t-1}$ where λ is the so-called replacement rate. This assumption is somehow restrictive because the unemployment benefit of an individual at a given point in time usually depends on the whole wage history of the individual, not just the last wage. Using just the last wage makes model calculations easier but less general (see also Section 4). However, in many countries (especially in Europe), the last wage plays an important specific role in determining the level of the unemployment benefit. In addition, since observed wages

[2] See Taylor (1999) for a good survey.

[3] Note that both observed and net potential earnings must be measured in logarithms to be consistent with the Mincerian assumption (2).

are autoregressive in nature, the last wage is likely to incorporate information about the whole wage history of an individual.

Solving the employer-employee bargaining problem provides the following first-order condition:

$$\frac{\rho}{\ln w_t - \ln\lambda - \ln w_{t-1}} = \frac{1-\rho}{\ln npe_t - \ln w_t} \tag{4}$$

which, in turn, gives:

$$\ln w_t = (1-\rho)\ln\lambda + (1-\rho)\ln w_{t-1} + \rho \ln npe_t \tag{5}$$

Hence, if the employee has full bargaining power ($\rho = 1$), then expression (5) becomes expression (2) and the standard Mincerian model holds. Intuitively, only when the employee has full bargaining power, he/she is actually able to earn all his/her net potential earnings. In this case, the employer is indifferent between employing and not employing because $U_t^{employer} = \tilde{U}_t^{employer} = 0$.

On the other hand, if the employee has zero bargaining power ($\rho = 0$), then expression (5) implies $\ln w_t = \ln\lambda + \ln w_{t-1}$ which, in turn, implies $\ln w_t = \ln \lambda w_{t-1} = \ln b_t$. In this case, the employee is indifferent between working and being unemployed because $U_t^{employee} = \tilde{U}_t^{employee}$.

In general, when the bargaining power of the employee is neither null nor full ($0 < \rho < 1$), replacing expression (1) into (5) gives:

$$\ln w_t \approx (1-\rho)\ln\lambda + (1-\rho)\ln w_{t-1} + \rho\left(\alpha_0 + \alpha_1 s + \alpha_2 z + \alpha_3 z^2\right) \tag{6}$$

or alternatively:

$$\ln w_t \approx \beta_0 + \beta_1 \ln w_{t-1} + \beta_2 s + \beta_3 z + \beta_4 z^2 \tag{7}$$

where $\beta_0 = (1-\rho)\ln\lambda + \rho\alpha_0$, $\beta_1 = 1-\rho$, $\beta_2 = \rho\alpha_1$, $\beta_3 = \rho\alpha_2$ and $\beta_4 = \rho\alpha_3$.

Expression (7) is a dynamic version of the Mincer equation. Note that the bargaining power of the employer $1-\rho$ can be estimated, when individual-level *longitudinal* data are available, and the theory underlying (7) can be tested. The main requirement for the theory to be consistent with the data is to find that the coefficient β_1 is significantly different from zero. The next Section provides empirical evidence supporting (7).

3. Evidence

We use both ordinary least squares (OLS) and quantile-regression techniques[4] (QR) to explore 1994-2001 data on Spanish male workers extracted from the European

[4] We present estimates from the 10^{th} to the 90^{th} quantile of the conditional wage distribution, with a step of ten quantiles.

Community Household Panel (ECHP). Sample statistics are in Table I. Table II presents estimates based on model (3), i.e. the static Mincer equation. Table III contains estimates based on model (7), i.e. the dynamic Mincer equation.

The main point of this Section, presented in Table III, is that the employee does not have full bargaining power because the estimated bargaining power of the employer (β_1) is significantly different from zero, both on average (OLS) and along the conditional wage distribution (QR). Therefore, the standard Mincerian assumption (2) is unlikely to hold. This empirical finding, based on Spanish data, is consistent with previous evidence concerning both Portuguese[5] (see Andini, forthcoming) and U.S. data[6] (see Andini, 2007).

It is worth noting that the estimated bargaining power of the employer is higher then one-half, both on average (0.7178) and along the conditional wage distribution. This is consistent with the common belief that, in general, the bargaining power of the employer is higher than the bargaining power of the employee (the implicit bargaining power of the employee is estimated at 0.2822, on average).

Another interesting finding, presented in Figure 1, is that pattern of the estimated bargaining power of the employer, along the conditional earnings distribution, is consistent with earlier results provided by Andini (2007) and Andini (forthcoming). On the one hand, as one would reasonably expect, the bargaining power of the employer is lower at the highest deciles of the conditional wage distribution. On the other hand, minimum-wage regulation, reducing the bargaining power of the employer at the lowest deciles, may explain why the pattern in Figure 1 is a bit inverse-U shaped.

Finally note that, from a theoretical point of view, the static-model return to schooling α_1 is exactly equivalent to the dynamic-model return to schooling $\frac{\beta_2}{1-\beta_1}$ because $\frac{\beta_2}{1-\beta_1} = \frac{\rho\alpha_1}{1-(1-\rho)} = \alpha_1$. The OLS estimation in Table II and III confirms the equivalence prediction[7]. An explanation of why the QR estimates of these two returns may not coincide has been provided by Andini (2007)[8].

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[5] Data on male workers aged between 16 and 65 from the European Community Household Panel, 1994-2001.

[6] Data on male workers aged between 17 and 30 from the National Longitudinal Survey of Youth, 1980-1987.

[7] Andini (forthcoming) argues that both these two returns *should not* be interpreted as returns in terms of observed earnings. They should be interpreted as returns in terms of *net potential* earnings. The return to schooling in terms of *observed* earnings at time t is dependent on labor-market experience z and is given by $\frac{\partial \ln w_t}{\partial s} = \frac{\partial \ln w_{s+z}}{\partial s} = \beta_2\left(1+\beta_1+\beta_1^2+\beta_1^3+...+\beta_1^z\right)$.

[8] The QR estimator is based on stricter assumptions of correct model-specification than the OLS estimator. Therefore, not controlling for lagged observed earnings in the standard static Mincer equation implies that QR estimates are more likely to be seriously biased than OLS estimates.

4. Conclusion

We do not claim for generality. The theoretical model in Section 2 holds under a set of specific assumptions. The main issue is whether these assumptions bring us closer to reality (enhanced role of demand factors in determining wages) or not. In any case, there seems to be substantial empirical evidence supporting the argument that past observed earnings, *together with* accumulated human capital (schooling and post-schooling investments), play an important role in explaining current observed earnings. This finding should open the door to new research effort looking for alternative, and perhaps more general, micro-foundations of a dynamic Mincer equation. Issues related to asymmetric information (for instance, the case where the employer does not observe the net potential earnings of the employee), role of unions (wage bargaining at collective level and insider-outsider considerations) and efficiency wages (the employer cannot observe the employee's effort) are interesting topics for future investigation.

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Table I. Sample statistics

	Obs	Mean	St Dev	Min	Max
Logarithm of hourly wage	15040	6.83	0.53	2.31	9.38
Schooling years	15040	10.54	3.75	2.00	27.00
Potential labor-market experience	15040	17.57	12.41	0.00	55.00
Age	15040	36.10	11.27	16.00	65.00

Table II. Static model

	α_0	α_1	α_2	α_3	R-squared
QR(10)	5.1181	0.0675	0.0459	-0.00070	0.1329
QR(20)	5.2990	0.0694	0.0437	-0.00064	0.1450
QR(30)	5.4009	0.0732	0.0419	-0.00059	0.1572
QR(40)	5.4967	0.0742	0.0415	-0.00058	0.1707
QR(50)	5.5747	0.0759	0.0413	-0.00056	0.1880
QR(60)	5.6401	0.0793	0.0407	-0.00054	0.2096
QR(70)	5.7153	0.0814	0.0406	-0.00052	0.2333
QR(80)	5.8325	0.0829	0.0392	-0.00049	0.2535
QR(90)	5.9925	0.0846	0.0389	-0.00047	0.2674
OLS	5.5407	0.0767	0.0433	-0.00060	0.3502

Table III. Dynamic model

	β_0	β_1	β_2	β_3	β_4	$\frac{\beta_2}{1-\beta_1}$	R-squared
QR(10)	1.0240	0.7663	0.0178	0.0113	-0.00015	0.0761	0.3933
QR(20)	1.1317	0.7729	0.0186	0.0087	-0.00011	0.0819	0.4269
QR(30)	1.2432	0.7734	0.0168	0.0074	-0.00009	0.0741	0.4523
QR(40)	1.2805	0.7769	0.0174	0.0061	-0.00006	0.0779	0.4727
QR(50)	1.3724	0.7753	0.0163	0.0047	-0.00003*	0.0725	0.4904
QR(60)	1.5410	0.7556	0.0182	0.0045	-0.00003*	0.0744	0.5051
QR(70)	1.7095	0.7415	0.0190	0.0027	-0.00000**	0.0735	0.5143
QR(80)	1.9044	0.7196	0.0216	0.0030	-0.00000**	0.0770	0.5160
QR(90)	2.2594	0.6762	0.0274	0.0034	-0.00001**	0.0846	0.5099
OLS	1.6788	0.7187	0.0216	0.0066	-0.00006	0.0767	0.7094

Note that all the estimated coefficients in Table II and Table III are significant at 1% level, apart from those marked with * (significant at 5% level) or ** (not significant).

Figure 1. Bargaining power of the employer