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Further evidence on the wage curve

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In this paper we replicate and extend the wage curve proposed by Blanchflower and Oswald (1990). Our replication only partly confirms their findings. Our extensions relate to gender effects and to a refinement of the unemployment measure. The results show that wage curves for males and females differ. For females unemployment both has a wage effect and a discouraged worker effect.

1. Introduction

Since the mid-eighties a series of papers has been published in which the relation between unemployment and wages is estimated with micro data. Blanchflower and Oswald (1990) provide a brief review of these studies, and conclude that for a number of countries fairly similar estimates of around -0.1 emerge for the unemployment elasticity of pay. In their paper Blanchflower and Oswald (B&O in the sequel) use the efficiency bargaining framework to formulate a model in which unemployment has a depressing effect on the wage rate because it weakens the bargaining power of the employees. The Nash solution of the model gives no theoretical grounds for a specific shape of the wage curve other than that the relation between wages and unemployment is negative. Therefore the exact form of this relation is an empirical issue. B&O estimate – with different data sets – a large number of specifications of the wage curve, and find a well-defined wage curve which becomes horizontal between 9 percent and 15 percent unemployment. This result suggests that only at low levels of unemployment there is a downward pressure on wages.

The results reported by B&O reveal a surprisingly regular pattern, so it is an interesting question whether they have detected a second empirical 'law' with respect to the micro wage equation. [1] This note contributes to settling this question by presenting detailed estimation results of the wage curve in the Netherlands.

We start with a replication of the B&O analysis for three different years (1985, 1986, and 1988). For the replication we use a rather crude measure of the individual unemployment rate, namely the

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[1] The first is the almost universal validity of the Mincerian earnings function.

total unemployment rate in the region in which the individual resides. This crude measure is very comparable to the measures employed by B&O.

Next we extend the analysis in two ways. Firstly, we refine the analysis by using region-cum-occupation-cum-age specific unemployment rates. These refined unemployment rates are probably a better indicator of the relevant labor market conditions which the worker faces than the regional unemployment rates are. We also estimate separate wage curves for males and females.

Secondly, it is argued that unemployment might induce two opposite effects on wages. As argued by B&O unemployment has a negative effect on wages via the weaker bargaining power of employees. But unemployment may also have a positive effect on wages through its effect on labor supply. If unemployment induces a discouraged worker effect, this will decrease labor supply. Given the demand schedule a lower supply will raise wages. So, by the discouraged worker effect unemployment may have a positive effect on wages. We expect the discouraged worker effect to be most relevant for females.

The remainder of this note is divided into four sections. In section 2 we describe the specifications of the estimated wage functions. The data sets and the definition of variables are described in section 3. In section 4 we present and discuss the estimation results. Section 5 contains the main conclusions.

2. Specification of the wage equations

We experimented with several specifications. Analogous to B&O we specified

$$w = \alpha_0 + \alpha_1 U + \alpha_2 U^2 + \beta X, \quad \text{and} \tag{1}$$

$$w = \alpha_0 + \alpha_1 \log U + \alpha_2 (\log U)^3 + \beta X, \tag{2}$$

where w is the wage rate, U is the unemployment rate, X is a vector of job and individual characteristics, and α_i and β are (a vector of) parameters to be estimated. Other specifications that we tried are

$$w = \alpha_0 + \alpha_1 U^{-1} + \beta X, \quad \text{and} \tag{3}$$

$$w = \alpha_0 + \alpha_1 \text{ dummy}(0.1 \leq U < 0.15) + \alpha_2 \text{ dummy}(0.15 \leq U < 0.2) + \alpha_3 \text{ dummy}(U \geq 0.2) + \beta X. \tag{4}$$

As the results obtained with specifications (2) to (4) are very close to the results from specification (1), we only present the latter.

3. Description of data and variables

The data are taken from the labor market surveys of the Organization of Strategic Labour Market Research (OSA). Three waves are available of this survey: 1985, 1986 and 1988. After deleting observations containing missing values, the data sets include 2,261, 2,391 and 2,479 cases, respectively [2].

[2] Details of the sample are available from the authors on request.

The dependent variable is the net weekly pay. As noted in the introduction we will use several distinct unemployment measures. The first is the unemployment rate of the area in which the worker resides. This attaches to each worker one out of 40 possible region specific unemployment rates [3]. This measure is comparable with the measure used by B&O.

Next we define unemployment rates by 'extended region' [4], occupation and age. We estimate separate wage equations for males and females using this region-occupation-age specific unemployment rate.

All regressions include a large number of 'control variables'. The reason is that we want to make sure that the unemployment variables do not catch effects of other (missing) variables. The control variables are: three tax regime dummies, four dummies for the level of education, dummies for gender, marital status, public sector employment, age below 23, job level, number of persons supervised, tenure (squared) and work experience (squared).

4. Estimation results

We start with the results of the replication of the B&O wage curve. Results are in table 1 [5]. These results provide some weak support for the proposed relation. The region specific unemployment rates generate only for 1986 the U-shaped profile. For 1985 and 1988 there is no significant relationship between the wage rate and the unemployment rate. In the next two subsections we will explore some explanations for the fact that our results deviate from the findings reported by B&O.

Gender effects and region-occupation-age specific unemployment rates

One possible explanation that no significant relation between the unemployment rate and wages is found is that our measure for unemployment is too crude: a more refined measure probably gives a more adequate description of the labor market situation with which the worker is confronted. We therefore redefined unemployment rates by region, occupation, age category. We distinguish 46 homogeneous occupational groups, 40 'extended regions', five age categories and two genders. This

Table 1
Dutch wage curves 1985–1988. [a]

	1988	1986	1985
U	1.74	−14.08 *	−6.85
	(0.32)	(2.51)	(1.24)
U^2	−0.06	0.39 *	0.13
	(0.34)	(2.12)	(0.74)
Adj. R^2	0.5190	0.5409	0.5421
N	2479	2391	2261

[a] Absolute t-values in brackets; * significant at 10% level.

[3] The division into 40 regions coincides with the regional division of Employment Offices.

[4] The extended regional unemployment rates differ from the former regional unemployment rates in that these figures relate to the unemployment rates in both the region of residence and the neighboring regions.

[5] In order to save space, we only present the estimates for the unemployment variables. The full estimation results are available from the authors on request.

Table 2
Wage curves, region-occupation-age specific unemployment rates. [a]

	1988		1986		1985	
Males						
U	−6.95	(5.2) **	−4.89	(3.9) **	−3.40	(2.7) **
U^2	0.12	(3.7) **	0.11	(3.8) **	0.05	(1.6) *
Elasticity	−0.086		−0.051		−0.051	
Adj. R^2	0.44		0.42		0.45	
N	1638		1579		1497	
Females						
U	2.70	(1.9) *	5.05	(4.3) **	3.61	(3.0) **
U^2	−0.07	(2.4) **	−0.06	(3.4) **	−0.05	(2.3) **
Adj. R^2	0.32		0.31		0.32	
N	841		812		764	

[a] Absolute t-values in brackets; * significant at 10%, ** significant at 5% level. Elasticity of pay with respect to the unemployment rate at the mean value.

generates 40 * 46 * 5 * 2 (18,400) relevant unemployment rates. We further estimated wage curves for males and females separately.

The estimation results in table 2 show some remarkable differences between males and females. The unemployment–wage relation is U-shaped for males – as expected. However, for females this relation is inverse U-shaped.

Wage and discouraged worker effects

It might be that the estimation results for females in table 2 are a mixture of two opposite effects: a pure wage effect and a discouraged worker effect. First, as argued in the introduction, unemployment has a negative wage effect through the weakened bargaining power of employees. Second, if unemployment has a discouraged worker effect, labour supply will decrease with unemployment. Given the demand for labor, a decrease in labor supply will increase wages. So, via

Table 3
Participation and the wage curve, females. [a]

	1988		1986		1985	
Participation equation						
U	−0.04	(4.5) **	−0.04	(5.1) **	−0.04	(5.0) **
$U^2/1000$	0.56	(3.5) **	0.71	(5.9) **	0.99	(8.8) **
Wage equation						
U	−0.32	(2.3) **	−0.06	(1.5)	−0.19	(1.8) *
$U^2/100$	0.49	(1.6) *	0.13	(2.1) ***	0.71	(5.2) **
Elasticity	−0.17		−0.03		−0.0005	
−Log(L)	−4720.6		−3319.4		−4312.4	
N	2015		1887		1870	

[a] t-values in brackets; * significant at 10%, ** significant at 5%. Elasticity of pay with respect to the unemployment rate at the mean value.

its effect on labor supply, unemployment may have a positive effect on wages as well. The discouraged worker effect will probably be greater for females than for males.

To test this hypothesis we estimate a simultaneous equation system for females consisting of a wage equation (net hourly wages) and a participation equation. As wages are observed only for those who participate this simultaneous equations model is of the sample selection type. The sample selection model is estimated by maximum likelihood. For a description of the likelihood function for this type of model, see Amemiya (1985, pp. 385–386).

The estimation results are in table 3. Both in the participation equation and in the wage equation there is a U-shaped unemployment effect. The unemployment–participation parabole reaches its minimum between 21 and 38% unemployment. So, the probability of participation is declining over most of the relevant unemployment rate interval. This confirms the discouraged worker hypothesis.

Not all coefficients for U and U^2 in the wage equations are significant at the 5%-level: compared to the results in table 2 the reversal of the relationship is, however, remarkable.

5. Conclusion

In this note we have replicated and extended the wage curve proposed by Blanchflower and Oswald (1990). These replications only give a weak confirmation of the B&O findings. Our analysis shows two reasons for this lack of corroboration. Firstly, the local unemployment rate is too crude a proxy of the relevant market opportunities of the worker. Secondly, we find that unemployment has two opposing effects for females: a pure wage effect and a discouraged worker effect. When these facts are taken into account, we find strong support for the U-shaped relationship between wages and unemployment level, both for males and females. For males the elasticity of pay is fairly close to the -0.1 reported by B&O, for females only the figure for 1988 has about this value.

References

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