EVIDENCE OF A WAGE CURVE IN BRITISH COLUMBIA*

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INTRODUCTION

A wage curve shows the effect of unemployment on the level of real wages. First examined in Blanchflower and Oswald (1990), the wage curve is estimated using microeconomic data. The wage curve has a negative slope, but it flattens at higher rates of unemployment. The horizontal part of the wage curve suggests that the neo-classical wage adjustment system, where wages fall to clear the market when there is an excess supply of labour, does not work at high levels of unemployment.

The intuition behind the negative slope of the wage curve is not obvious. At first thought, a positive relationship would be suspected. This is probably due to the simple Keynesian model of unemployment involving fixed nominal wages. In that model, a contractionary shock causes the wages to be fixed above their market clearing level thereby creating unemployment.

Nevertheless, since its introduction in Blanchflower and Oswald (1990), the wage curve seems to have been proven an empirical reality. In Blanchflower and Oswald (1994b), evidence of wage curves from ten different countries is presented. The goal of this paper is to show the existence of a wage curve relationship in the province of British Columbia. Also, some shortcomings of the estimation procedure in this paper will be discussed.

THE ECONOMIC MODEL

The main components necessary to estimate a wage curve is a measure of the level of wages and unemployment rates. In this paper hourly wage rates and industry and occupation unemployment rates for British Columbia will be used. David Card (1995) notes that hourly wage rates are preferred to annual or weekly earnings because hours and wages are highly correlated. If annual earnings are used, it will be unclear whether it is hours or wages that is negatively related to unemployment.

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However, the wages are determined by many other variables besides unemployment. Other variables included in this paper's wage function are: Education level, age, marital status, disability status, gender, and race. The effect of education and age on wages is expected to be positive but diminishing. An individual who is disabled or of a visible minority is expected to have lower wages, while married men are expected to have higher wages. Many other variables such as union membership, work experience, number of children born, mother tongue, country of birth, city size, full-time or part-time worker, and firm size should also be considered in the wage function. Unfortunately, due to restrictions imposed by a lack of computer memory, the number of regressors is limited.

Cross-sectional data for the year 1990 is used in the estimation of the model. Usually repeated cross-sections are used. Blanchflower and Oswald (1994a) point out that using only one cross-section will not allow for fixed effects. Some industries or occupations may have permanently higher unemployment rates. However, the findings in Blanchflower and Oswald (1990) show that similar results can be obtained when using only one or a small number of cross-sections. Blanchflower and Oswald (1990,1994a,1994b) and Blackaby and Hunt (1992), find that the unemployment elasticity of pay is close to -0.1.

THE DATA SET

The majority of the data used in this paper comes from the Labour Market Activity Survey (LMAS) conducted by Statistics Canada for the years 1986-1990. Individuals aged 16-69 residing in one of the ten provinces of Canada were included. Excluded were people on living of Indian reserves, institutionalized individuals, members of the armed forces and residents of the Yukon and N.W.T.. The main purpose of the survey was to provide information involving labour market participation and the characteristics of jobs held throughout the year. The data was collected annually in January by telephone interviews.

The number of individuals surveyed in 1990 was 63,109. For the province of British Columbia, the sample size was 6588. One out of every four individuals in the British Columbian sample were included in the data set for this paper. After leaving out individuals who were self-employed or had incomplete data, 945 observations were left.

Industry and occupation unemployment rate statistics were obtained from the Labour Force Annual Averages (Catalogue 71-220) published by Statistics Canada. Individuals who held more than one job in 1990 usually had a different hourly wage rate and a different occupational and industrial classification in each job. In this case, weighted averages of the hourly wage rate and unemployment rates were calculated. The weights being the number of hours worked at each job divided by the total number of hours.

THE STATISTICAL MODEL

To protect the confidentiality of individuals surveyed, Statistics Canada has reduced the detail of many demographic variables in the LMAS data. Data such as whether the person lived in a metropolitan area has been suppressed, while age and schooling data have been placed into groups. For this reason, the only measured explanatory variables are the unemployment rates. The other variables, education, marital status, age, race, gender and disability status enter as dummy variables on the intercept.

Generally, the hourly wage rate of an individual in a certain industry and occupation is regressed against the corresponding industry and occupation unemployment rate, three age group dummies, one visible minority dummy, six education level dummies, one gender dummy, one disability dummy and a marital status dummy.

A non-linear relationship was expected, but tests were done to determine functional form nevertheless. The simple linear model was compared to a log-linear model using the test suggested by Box and Cox (1964). The log-linear model was found to fit the data better. Secondly, the

log-linear model was tested against a more highly non-linear model with the log of unemployment rates, the log of the unemployment rates squared, and the same dummy variables as regressors. The fits were almost identical so the log-linear model was accepted as a good approximation of the non-linear relationship.

Afterwards, a test for heteroskedasticity was performed. The Breush-Pagan test was carried out, with multiplicative heteroskedasticity being expected. In the artificial regression equation the log of the ordinary least squares residuals were regressed against the industry and occupation unemployment rates in level form, and the full set of dummy variables. The test concluded that heteroskedasticity exists. However, corrected estimates have not been obtained because of the large data set. The ordinary least squares estimates are still consistent, but little attention should be paid to the t-ratios since they are incorrect.

THE RESULTS

Table 1 gives the estimates for the wage curve. While the occupation unemployment elasticity, at -0.1012, is close to the -0.1, the industry unemployment elasticity is positive 0.0673. This positive elasticity may be the result of using only one cross-section and not having industry and occupation dummy variables. David Card (1995) points out that if dummies controlling for industry or occupation specific effects are left out, the elasticity will tend to be small in magnitude or positive. When fixed effects are not controlled for, the effect of permanent and current unemployment rates on the wage level can not be separated. As Harris-Todaro (1970) explains, higher wages are needed to compensate individuals who remain in a industry or region with a permanently higher level of unemployment. Permanent wages and permanent unemployment is positively correlated, while current wages and current unemployment is negatively correlated. If regional dummies are excluded, then the estimated unemployment elasticity will tend to be more positive.

A possible explanation for the negative occupation unemployment elasticity is that the permanent part of the occupation unemployment rate is similar across all occupations. The magnitude of the variations in the overall occupation unemployment rate would then coincide with variations from the long-term average unemployment rate. Another possible explanation is that the occupation unemployment elasticity is just more negative than -0.1.

If the level of wages and the occupational unemployment rates are plotted, the wage curve minimizes at around 10.6 percent unemployment. This suggests that at unemployment rates above 10.6 percent real wages are rigid downward. In our case, the wage curve curls upward as unemployment becomes higher. This is not surprising since at higher rates of unemployment, the permanent component of unemployment may be higher. As explained previously, permanent unemployment will be positively correlated with wages.

The coefficients for the control variables are not surprising. As expected, females, disabled people, and individuals of a visible minority tend to earn a lower wage. The effect of age is also positive but diminishing. The youngest age group (16-19) earn much less than the control group (35-54), while the oldest group (55-69) earn only slightly more than the control group. Individuals with elementary or some secondary schooling have lower wages than high school graduates. On the otherhand, possessing a post-secondary diploma or an university degree will tend to increase wage rates. Interestingly, people with only some post-secondary and trade certificate holders earn lower wages than high school graduates. Perhaps there is a large supply or low demand for individuals with those skill levels.

Table 2 gives the occupation unemployment elasticities, and Table 3 gives the industry unemployment elasticities. Since most of the industry elasticities are positive, interpretation for those results will not be given. Table 2 shows that as expected the wages of females, visible minorities and individuals with only elementary schooling are more responsive to occupation unemployment. On the otherhand, individuals aged 20-34 and 55-69 seem to be less responsive to

unemployment. People in the older age group may prefer early retirement to taking a wage cut, and people in the age group 20-34 may be returning for schooling when unemployment is high. The wages of individuals in the age groups 16-19 and 34-55 are more sensitive to unemployment because they are either already going to school, have a family and can not afford to take time for more education or to young to retire.

CONCLUSION

The wage curve estimated in this paper is consistent with results obtained when only one cross-section and no control variables for fixed effects are used. However, there are some other problems in the estimation procedure that do not involve fixed effects. Firstly, Blanchflower and Oswald (1994a) realize that the level of aggregation is not the same on both sides of the wage equation. Individual data is used for the wages, but more aggregated data is used for unemployment rates. Therefore the t-statistics will have an upward bias. To remedy the problem, Blanchflower and Oswald (1994a) estimate the wage equation using group means. The average wage of all the individuals in a certain industry is found and used as one observation. This technique could not be used in this paper since after aggregation only nine observations would be left.

Secondly, unemployment rates do not reflect the actual labour market situation at high rates of unemployment. They usually underestimate the seriousness of the "oversupply of labour", since people become frustrated and leave the labour force. If the observed unemployment rate is an underestimate of the "true" unemployment rate, then the estimated wage curve will be steeper than it should be.

Table 1. Wage Curve for British Columbia 1990

Explanatory Variables	**Coefficient**	**T-statistic**
Constant	2.7984	24.64
Log industry unemployment	0.0673	1.371
Log occupation unemployment	-0.1012	-2.910
Female	-0.3989	14.62
Education: (0-8)	-0.1069	-1.116
some secondary	-0.1101	-2.712
some post-secondary	-0.1395	-3.343
post-secondary diploma	0.0292	0.6842
university degree	0.1945	4.166
trade certificate	-0.0475	-0.9372
Married	0.1170	3.785
Disabled	-0.0432	-1.019
Visible Minority	-0.1557	2.735
Age: (16-19)	-0.6611	-11.05
(20-34)	-0.1394	-4.618
(55-69)	0.0302	0.6121

Note: 1. Dependent variable is logarithm of hourly wage rate.
2. Number of observations 945.
3. For education levels, high school graduates are the constant.
4. For age groups, (35-54) is the constant.

Table 2. Occupation Unemployment Elasticities

	Coef.	T-stat	N
All workers	-0.1012	-2.910	945
Male	-0.0336	-0.7477	525
Female	-0.2081	-3.989	420
Visible minority	-0.4165	-2.380	52
Not visible minority	-0.0778	-2.185	893
Married	-0.0343	-0.829	619
Single and Others	-0.0228	-3.777	326
Education: (0-8)	-0.6848	-2.011	19
some secondary	-0.2825	-3.710	190
high school grad.	-0.2435	-3.544	245
some post secondary	-0.2134	-2.586	147
post secondary diploma	-0.2246	-2.638	141
university degree	-0.2315	-2.508	119
trade certificate	-0.2091	-1.901	84
Age: (16-19)	-0.2585	-1.727	70
(20-34)	-0.1949	-2.750	370
(35-54)	-0.2317	-4.334	423
(55-69)	-0.1904	-1.184	79

Note: Same dummy variables used as in Table 1, except in the case of Age: (16-19) where no one had a university or trade certificate. Single and others consist of single, widowed, divorced and separated individuals

Table 3. Industry Unemployment Elasticities

	Coef.	T-stat	N
All workers	0.0673	1.371	945
Male	0.0748	1.386	525
Female	-0.0586	-0.581	420
Visible minority	0.2239	1.023	52
Not visible minority	0.0559	1.109	893
Married	-0.0254	-0.439	619
Single and Others	0.2844	-3.255	326
Education: (0-8)	0.2757	0.8034	19
some secondary	-0.1082	-0.7903	190
high school grad.	-0.1205	-0.9654	245
some post secondary	-0.1748	-1.201	147
post secondary diploma	-0.1784	-1.209	141
university degree	-0.1740	-1.081	119
trade certificate	-0.1149	-0.5297	84
Age: (16-19)	0.6783	3.382	70
(20-34)	0.2584	2.225	370
(35-54)	0.1143	1.172	423
(55-69)	0.0887	0.291	79

Note: Same dummy variables used as in Table 1, except in the case of Age: (16-19) where no one had a university or trade certificate.
Single and others consists of single, widowed, separated and divorced individuals.

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