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THE WAGE CURVE: EVIDENCE FROM THE FINNISH METAL INDUSTRY PANEL DATA*

TUOMAS PEKKARINEN

European University Institute, Department of Economics, Via dei Roccettini 9, I-50016 San Domenico di Fiesole, Italy

In this paper we study the wage curve with Finnish metal industry panel data from the period 1991–95. As an unemployment variable we use the unemployment rate of the regional county. The unemployment rate is split into short- and long-term unemployment. The effect of active labour market policies is controlled for by augmenting the wage equation with a variable for subsidised employment schemes. The estimated unemployment elasticity of wages in the Finnish metal industry is somewhat smaller than the elasticities reported by other studies. Long-term unemployment increases wages and subsidised employment schemes decrease them. Their combined effect is zero. The regional fixed effects estimate of the slope of the wage curve is –0.04. The dependent variable is the logarithm of the fixed hourly wage and the unemployment variable is corrected so that the long-term unemployed are removed from the pool of unemployed and the labour force and the workers in subsidised employment schemes are considered as unemployed. Estimations with regional means indicate that common group errors bias the estimates of standard errors significantly.

1. Introduction

The wage curve is an empirical observation originally reported by Blanchflower and Oswald (1990, 1994, and 1995). It describes the relationship between worker's wage and the unemployment rate in a local labour market. The causality is thought to be running from the unemployment rate to the wage rate. The wage curve is estimated using microlevel data and a standard microeconometric wage equation with regional unemployment rate as an additional independent variable. The standard estimation procedure of the wage curve is *brute force* estimation of the following equation:

$$\log w_{irt} = \alpha + \log U_{rt}\beta + X_{irt}\gamma + \lambda_t + e_{irt} \qquad (1)$$

where $i = 1, \ldots, N$ denotes individual, $r = 1, \ldots, R$ denotes region and $t = 1, \ldots, T$ denotes

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time. w_{irt} is the wage rate, U_{rt} is the unemployment rate, X_{irt} is a set of measured characteristics of the individual (such as gender and age), λ_t is the time period effect, and e_{irt} is the residual. The parameter of interest is β.

Original studies by Blanchflower and Oswald used repeated cross-sectional data from 12 different countries containing information on approximately 3.5 million individuals.[1] The results obtained by Blanchflower and Oswald indicate that there exists a *negative* relationship between regional unemployment rate and wages. A worker who is employed in a high unemployment area is expected to be paid a lower wage than a corresponding worker in a region with low unemployment rate. According to Blanchflower and Oswald the wage curve is well approximated by simple log-linear function of the following form:

$$\log w = -0.1 \log U_r + \text{other variables}$$

In other words, the estimated unemployment elasticity of wages – the parameter β in the equation – takes approximately the value –0.1. This relationship can be drawn as a downward sloping convex curve in wage-unemployment -space. Following the example of Blanchflower and Oswald in the literature this curve has been called the wage curve.

This result may be considered as surprising in many respects. First of all, the finding of a negative relationship between regional unemployment and wages seems to contradict the traditional thinking on the wage-unemployment relationship, which is based on the theoretical model of Harris and Todaro (1970). According to this model the correlation between the regional unemployment rate and wages should be *positive* due to compensating wage differentials across regions. At first sight the findings of Blanchflower and Oswald appear to contradict this thinking.[2] Secondly, the wage curve seems to be an international phenomenon: the estimated coefficient of the regional unemployment rate takes approximately same values, –0.1, regardless of the country or the period which the data are from. After the work by Blanchflower and Oswald a number of researchers have performed studies with other data sets and they have all come up with similar results.[3] This similarity of the results is striking given the different labour market institutions in the countries studied.

The discussion on the theoretical interpretation of the wage curve is still under way. According to the original interpretation of Blanchflower and Oswald the wage curve represents an equilibrium relationship and can be seen as an empirical counterpart of the "wage setting locus" in the theoretical models of imperfect labour markets.

In this paper we examine the wage curve with panel data from the Finnish metal industry from years 1991–95. We regress the hourly wages of blue collar metal industry workers on regional county unemployment rates.

The Scandinavian labour markets with their highly unionised wage setting structure provide an interesting test for the generality of the wage curve result.[4] Furthermore, the period under study was fairly exceptional in the Finnish labour market history. During this period unemployment rate rose dramatically and especially the number of long-term unemployed and people enrolled in active labour market policy programmes grew substantially. These develop-

[1] *The countries studied by Blanchflower and Oswald were United States, Great Britain, Canada, South-Korea, Austria, Italy, Netherlands, Switzerland, Norway, Ireland, Australia, and Germany. The largest single regression uses data on over 1.7 million individuals.*

[2] *This is not alltogether clear however. In fact if the wage curve is interpreted as describing the relationship between* current *regional unemployment and wages it may still be the case that the correlation between* expected *regional unemployment rate and wages is positive. Thus the wage curve and Harris and Todaro model are not necessarily contradictory.*

[3] *See for example the studies by Baltagi and Blien (1998), Bratsberg and Turunen (1996), Hoddinot (1996), Janssens and Konings (1998), Pannenberg and Schwarze (1998), Turunen (1998), and Wagner (1994).*

[4] *On the earlier wage curve studies with Scandinavian data sets, see the Norwegian results by Blanchflower and Oswald (1994). A study by Holmlund and Skedinger (1990) is an early example. It provides some evidence on the existence of a wage curve type relationship in the Swedish wood industry. There exist only two examples of Finnish wage curve estimations. Parjanne (1997) studies the issue using cross-sectional data on monthly earnings and Kyyrä (1999) studies the unemployment elasticity of the starting wages of the persons exiting unemployment.*

ments allow us to study whether the long-term unemployment rate or active labour market programmes affect wages differently from normal unemployment. Finally, the fact that we are concentrating on a single industry allows us to benefit from an exceptionally reliable data source that makes it possible to calculate precise measures of hourly wages.

The rest of the paper proceeds as follows. In the following section we provide a brief overview on the wage setting in the Finnish metal industry. This also serves as an introduction to the third section where the data are discussed. We go over the characteristics of the data set and discuss its strengths and weaknesses. In the fourth section the results from panel OLS, individual and regional fixed effects estimations are presented. In the final section the conclusions are discussed.

2. *Wage setting in the Finnish metal industry*

The wage setting in the Finnish labour markets can be seen as a two-stage procedure, where the central employer organisations and trade unions first settle the general guidelines of the wage determination in a national level collective agreement and the actual wages are set at the firm-level.

The collective agreement of the Finnish metal industry covers practically all the workers in the industry.[5] According to the general principles of the collective agreement, wages should be determined by the difficulty of the job, the personal achievement of the worker and by various firm- and individual specific arrangements.

The difficulty of the job specifies a job-specific minimum wage for each worker. This minimum level is called the *occupation-related wage*. The worker is allocated to a *wage group* according to his occupation-related wage. There are three wage groups in the metal industry ranging from the most difficult jobs with highest occupation-related wages in group one to the least difficult ones with lowest occupation-related wages in group three. Worker's individual performance on the job may affect the wage outcome through a *personal bonus* of 2 to 17% on top of the occupation-related wage.[6] Personal bonuses should be normally distributed across workers within each wage group. This is required in order to avoid the tendency of higher bonuses being paid only in the most difficult jobs which tend to attract workers with higher ability.

It is important to notice that according to the collective agreement both the occupation related wage and the personal bonus should be independent of the demand conditions.[7] They are entirely determined by the complexity of the task and the performance of the worker respectively. Occupation related wage and personal bonus form what is called the *basic wage* of the worker. This is the minimum level that the worker can expect to be paid.

The determination of the actual wage outcome takes place at the firm level. It is at this stage when the tightness of the regional labour market is expected to affect wages. The individual firm has considerable scope to choose its wage levels as long as it stays above the minimum wages set by the collective agreement. The firm has two methods of payment available. It can pay either a fixed hourly wage, that we will call here a *fixed rate*, or then pay according to the output produced by the worker. We will call this latter method of payment a *piece rate.*

3. *The data*

The data come from the wage records of the Confederation of Finnish Industry and Employers *(Teollisuus ja työnantajat*, TT). Each year TT conducts a survey among its member em-

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[5] *For an excellent analysis of the wage determination in the Finnish metal industry, see Vartiainen (1993).*

[6] *The translations used here follow Vartiainen (1994).*

[7] *In reality this might not necessarily be the case. For example personal bonus could be affected by demand conditions through efficiency wage effects. However, regressing occupation-related wages and personal bonus' on regional unemployment rates and other control variables does not yield a significant effect for regional unemployment. It thus seems that occupational-related wages and personal bonus' are independent of demand conditions.*

ployers and gathers the information in the wage records. The wage records contain detailed information on the wages and working hours of all the workers who are above 15 years old and are employed in a firm affiliated with TT (in the case of metal industry this means practically all the firms in the metal industry).

We use a sample drawn from the wage records that has been utilized in a number of microeconometric studies on Finnish wage structure, wage drift, and wage discrimination.[8] In the original sampling the year 1990 was chosen as the base year and the 1990 wage records were ordered randomly by firms.[9] Within each firm the workers were ordered according to their mean pay and every 15th worker was then picked for the sample. A longitudinal data set was created from 1990 onwards and backwards all the way to the year 1980 by using the personal codes in the data to identify the workers. The sizes of the yearly samples were determined so that the ratios of the yearly samples were same as those of the original wage records. Furthermore, a supplementary drawing was conducted for each year so that the ratios of new, leaving and remaining workers were same as in the original wage records of the corresponding year. The result was thus an unbalanced panel that is supposed to represent the structure of the Finnish manufacturing sector's working population as well as its dynamics.

We picked the blue collar metal industry workers from this sample. Only blue collar workers were used because hourly wages can be defined only for them. In order to study the wage curve we needed to identify the workers home county. Unfortunately this was possible only for the period 1991–95. The sample sizes for the years 1991, 1992, 1993, 1994, and 1995 were 4498, 4098, 3718, 4094 and 4338 respectively. There are thus a total of 20 746 observations in the panel.

The data on wages and working hours may be considered as exceptionally reliable since the information in the wage records comes usually directly from the firms' wage accounts. On the other hand the information on the individual characteristics is rather scarce. Perhaps the most disturbing feature of the data is the lack of variables for individual's education. It may be argued, however, that the role of education is not so crucial in the wage determination of the blue collar industrial workers.

We were able to identify the exact number of hours worked and wages earned under each wage scheme for each individual worker. Thus fairly precise measures of hourly earnings could be calculated and furthermore we were able to identify separate worker specific hourly wages for each wage scheme. The descriptive statistics of the variables in the data are provided in the appendix.

As we said in the outset, the period under study was rather exceptional in the Finnish unemployment history. The Finnish economy experienced the most dramatic rise of the unemployment in the whole 20th century during this period. The official unemployment rate reported by the Finnish Ministry of Labour reached 20% in 1994. Not only did the unemployment rate rise but also the long-term unemployment rate and the ratio of long-term unemployed to the total number on unemployed persons grew rapidly and converged to the average European numbers. The long-term unemployment rate reached 6% and the ratio of long-term unemployed to the total number of unemployed 30% in 1995.

In order to calculate the regional unemployment rates we had to select an appropriate regional entity that could be thought of as an individual go-to-work area. The original data included the worker's working county. Here we chose to use the regional counties as a proxy for local labour market. There are a total of 88 regional counties in Finland and they are usually seen as typical go-to-work areas. The sample contained observations from 75 regional counties. Unemployment rates were calculated from the county level labour force data provided by the Ministry of Labour. The sample average reached a peak of 19.8% in 1994.

With the data provided by the Ministry of Labour the regional long-term unemployment rates could also be calculated. A person is de-

[8] *See for example Kettunen (1993), Vartia and Kurjenoja (1990), and Vartiainen (1993, 1994, and 1999).*

[9] *For a detailed description of the sampling see Vartiainen (1994).*

fined as long-term unemployed if his or her unemployment spell has lasted for more than 12 months. The regional long-term unemployment rate is thus defined as a ratio of long-term unemployed and the regional labour force. As for active labour market policies, unfortunately the regional data were available only on the subsidised employment schemes (SESs) but not for the various reeducation programmes. As an indicator for the significance of the active labour market policies we calculated the ratios of workers in SESs and the regional labour force.

4. The results

We now move on to present the results obtained from running the regressions of type 1. In each equation we include the logarithm of the individuals occupation related wage to control for the difficulty of the job and workers personal bonus to control for the individual effort. The complete set of controls is specified in the footnotes.

In estimating the elasticity of individual wages with respect to regional unemployment rate, it is important to take into account the possibility of unobservable effects both on regional as well as on individual level. On the regional level certain characteristics of the region that can't be controlled for may affect wages. On the individual level the ability of the worker may affect the final wage outcome as well as some of the independent variables like personal bonus and occupation-related wages. In order to control for these effects we present the results from regional fixed effects and individual fixed effects specifications along with the basic OLS estimates.[10]

We started the analysis by experimenting with different specifications of hourly wages as dependent variables. We found that the total hourly earnings of the workers in the industry were responsive to the changes in the regional unemployment rate. However, this elasticity of hourly wages was completely due to the responsiveness of fixed rates whereas the piece rates were not affected by unemployment. Thus for our purpose the appropriate dependent variable is the logarithm of the fixed rates. In the following we will only focus on the results from equations where we use fixed rates as dependent variable. There were 5 926 different individuals reported earning fixed rates in the sample. Over five years this yields a total of 16 096 observations.

In table 1 we first present the results from equations where we use the official, open regional unemployment rate as the unemployment variable.[11]

Table 1. Wage curve regressions with fixed rates as dependent variable and open regional unemployment rate as independent variable.[12]

Model	OLS	Regional FE	Individual FE
log U_r	–0.0528	–0.0304	–0.021
(t-statistic)	(11.24)	(2.63)	(4.53)
$R^2_{adjusted}$	0.5876	0.5812	0.116
F	1638.84	1618.19	1352.06
N	16 096	16 096	16 096

As can be seen from table 1 the estimated coefficient of the regional unemployment rate is negative and reasonably significant in all the specifications. However the coefficients are typically less negative than –0.1. Regional fixed effects equation in the second column, which is possibly the closest comparison to the original specifications of Blanchflower and Oswald, yields an estimated coefficient of –0.03.

When considering possible explanations for this relatively low unemployment elasticity of hourly wages, we have to look at more detailed definitions of the unemployment rate. Particu-

[10] *The individual random effects specification was tried as well but the Hausmann specification test consistently rejected this specification.*

[11] *To save space only the estimated coefficients of unemployment rates are reported here. The full results are available on request from the author. An example of results on full equations is provided in the appendix.*

[12] *Other control variables include: log (occupation related wage), personal bonus, age and it's square, female dummy, proportion of hours worked on piece rates, newcomer dummy and a set of year dummies. In the OLS regression also a dummy for a sparsely populated area is added. Regional FE refers to the regional fixed effects specification. Individual FE refers to the individual fixed effects specification. F refers to the F-test. N refers to the number of observations.*

larly, given the dramatic rise in the unemployment rates in Finland during the period under study, it is important to control for the effect of the long-term unemployment. If long-term unemployed are not seen as forming part of the efficient supply of labour, we can interpret a rise in the long-term unemployment as a reduction in the labour supply. Thus the coefficient of the long-term unemployment rate should be positive in the wage equation. This could be seen as evidence on what Layard, Nickell and Jackman (1991) call *outsider hysteresis*. The idea behind outsider hysteresis is that a rise in long-term unemployment reduces the search effectiveness of the unemployed and this dampen the downward pressure on wages exerted by unemployment.

Active labour market policies on the other hand provide subsidised employment schemes for the unemployed. There are two possible ways in which these schemes could affect wages. If active labour market programmes are simply interpreted as hidden unemployment, a rise in the proportion of the regional labour force in subsidised employment schemes (SESs) should decrease wages just as ordinary unemployment does. However, if active labour market programmes substantially increase the welfare of the otherwise unemployed participants, a rise in the proportion of the regional labour force in SESs should dampen the downward wage effect of unemployment and thus gain a positive coefficient in a wage equation. This is the interpretation of Calmfors and Forslund (1991) for the role of active labour market policies.

In table 2 we repeat the three regressions using the fixed rates as a dependent variable. The equations in table 2 are thus otherwise identical to the ones in table 1 with the difference that we have replaced the logarithm of the open regional unemployment rate with the logarithms of regional short-term and long-term unemployment rates as well as with the logarithm of the proportion of the regional labour force in the SESs.

Table 2. Wage curve regressions with fixed hourly earnings as dependent variable and logarithms of the regional short-term and long-term unemployment rates and the proportion of regional labour force in SESs as independent variables.[13]

Model	OLS	Regional FE	Individual FE
log $U_r^{short\text{-}term}$	–0.007	–0.0495	–0.0308
(t-statistic)	(0.61)	(2.34)	(3.54)
log $U_r^{long\text{-}term}$	0.0544	0.0171	0.0109
(t-statistic)	(19.54)	(3.54)	(3.46)
log $L_r^{subsidised}/L_r^{total}$	–0.0498	–0.0199	–0.0164
(t-statistic)	(11.97)	(3.11)	(4.47)
$R^2_{adjusted}$	0.6032	0.5933	0.1742
F	1529.87	1405.39	1056.83
N	16 096	16 096	16 096

With respect to short-term unemployment the results in table 2 are somewhat mixed. In OLS regression the short-term unemployment rate does not attain a significant coefficient. However, in the regional and individual fixed effects equations the estimated coefficients are reasonably significant. On the other hand the results on the long-term unemployment and the proportion of the regional labour force in SESs give a coherent message. The estimated coefficient of the long-term unemployment is positive and significant in all the equations. The long-term unemployment thus increases wages. The proportion of the regional labour force in SESs on the contrary has a negative and significant coefficient in all the equations. Active labour market policies thus exert downward pressure on wages. There is also a striking similarity in the absolute values of the estimated coefficients of the long-term unemployment rate and the proportion of the regional labour force in SESs. We cannot reject the hypothesis that the combined effect of long-term unemployment and the proportion of regional labour force in SESs on wages is zero in none of the specifications within reasonable levels of significance. The closest comparison in table 2 to the studies of Blanchflower and Oswald is again the regional fixed effects equation in the second column where the coefficient of the short-term unem-

[13] *Other control variables include: log (occupation related wage), personal bonus, age and it's square, female dummy, proportion of hours worked on piece rates, newcomer dummy and a set of year dummies. In the OLS regression also a dummy for a sparsely populated area is added. Regional FE refers to the regional fixed effects specification. Individual FE refers to the individual fixed effects specification. F refers to the F-test. N refers to the number of observations.*

ployment is –0.05 and the coefficients of the long-term unemployment and the proportion of the regional labour force in SESs are 0.02 and –0.02 respectively and their combined effect is zero.

The results in table 2 seem to indicate that there is evidence on outside hysteresis. In the light of these results a rise in the long-term unemployment is analogous to a decrease in the supply of labour. Furthermore the active labour market policies dampen this effect. These programmes move persons from the pool of unemployed people to subsidised employment schemes that can be interpreted as hidden unemployment. There is no evidence in the results of table 2 to support the claim by Calmfors and Forslund (1991) according to which the active labour market policies increase the welfare of the unemployed and thus dampen the negative effect of the unemployment on wages. A rise in the proportion of regional labour force in SESs exerts downward pressure on wages in addition to the pressure caused by open unemployment.

Based on these conclusions we can calculate a corrected version of the regional unemployment rate. Since long-term unemployed are not a part of the effective labour supply we can remove them from the pool of unemployed as well as from the labour force and since active labour market policies only disguise unemployment we should add the workers in SESs into the pool of unemployed. The corrected regional unemployment rate is thus of the form:

$$U_r^{corrected} = \frac{\text{unemployed + workers in SESs – long-term unemployed}}{\text{labour force – long-term unemployed}}$$

On national level this corrected unemployment was initially higher, 10%, than the open unemployment rate in 1991. After reaching a peak of 18.7% in 1993 it started to decline faster than the open unemployment rate. The same pattern is repeated if we look at the mean of the regional corrected unemployment rates in the sample.

We can now study the effects of this corrected regional unemployment rate on hourly wages. Table 3 presents the results from now familiar equations where we have replaced the unemployment terms in table 2 with the logarithm of the corrected regional unemployment rate.

Table 3. Wage curve regressions with fixed hourly earnings as a dependent variable and logarithm of the corrected regional unemployment rate as independent variable.[14]

Model	OLS	Regional FE	Individual FE
log $U_r^{corrected}$	–0.064	–0.0387	–0.0226
(t-statistic)	(16.77)	(3.22)	(4.9)
$R^2_{adjusted}$	0.5915	0.5853	0.1233
F	1665.49	1618.81	1353.00
N	16 096	16 096	16 096

The results in table 3 give a relatively clear picture. The estimated coefficients of the corrected regional unemployment rate are all negative and significant. A straightforward OLS estimation gives a coefficient of –0.06 which is clearly significant. Controlling for unobservable regional or individual effects reduces the coefficients in absolute terms as well as the t-statistics. The estimated coefficient in regional fixed effects is –0.04. It is significant.

Certain reservations are in place when interpreting these results. One important point, originally brought up by Card (1999) is that the actual "degrees of freedom" in equation (1) are far less than the number of individual wage observations w_{irt} might suggest. This is because the unemployment rate is regional and not individual and the relevant dimension for the estimation of the coefficient of the unemployment rate β is thus the number of regions R times the number of time periods T. In our case this fact should not turn out to be a problem. We have 67–74 regional observations for five years, that yields a total of 351 observations which is comparable with the largest data sets of Blanchflower and Oswald (1994).

[14] *Other control variables include: log (occupation related wage), personal bonus, age and it's square, female dummy, proportion of hours worked on piece rates, newcomer dummy and a set of year dummies. In the OLS regression also a dummy for a sparsely populated area is added. Regional FE refers to the regional fixed effects specification. Individual FE refers to the individual fixed effects specification. F refers to the F-test. N refers to the number of observations.*

Secondly, the fact that the unemployment only varies across regions can cause bias in the estimates of the standard errors of the coefficients of the unemployment rate if the individuals within a region share some common component of variance that is not attributable to either variables in X_{irt} or the regional unemployment rate U_{rt}. These effects are usually called common group error effects (Moulton, 1986). In this case the disturbances e_{irt} will be positively correlated across people within a region and the estimated standard error of the coefficient of the unemployment rate will be downward biased. We tried to control for this bias by following Blanchflower and Oswald (1994), who suggest averaging over individuals in region r at period t. If we assume that there is no correlation in the unobserved determinants of wages across regions, the estimates of the standard errors from averaged equation should be unbiased. The results from these estimations are presented in table 4.

Table 4. Regional cell means wage curve regressions with fixed hourly earnings as a dependent variable and logarithm of the corrected regional unemployment rate as independent variable.[15]

Model	OLS	Regional FE
log $U_r^{corrected}$	–0.041	–0.021
(t-statistic)	(2.47)	(0.44)
$R^2_{adjusted}$	0.6007	0.5061
F	44.87	28.43
N	351	351

As can be seen from table 4 the t-statistics were reduced in both OLS and regional fixed effects specifications and in the latter the coefficient of the regional unemployment rate fail to reach significance. This is seems to indicate that the bias caused by the common group errors is significant in the Finnish case. Thus the significance of the results in the table 3 may be driven by some unobservable common component of variance within regions. However, given the short time period under study the insignificance of the regional fixed effect estimate may be caused by the loss of between region variation in the fixed effects specification.

All in all we can thus conclude that even though we correct for effects of long-term unemployment and active labour market policies the estimated coefficient of the corrected regional unemployment rate remains less negative than the typical wage curve result –0.1. Regional unemployment does still exert some downward pressure on hourly wages. Our candidate for a slope of the Finnish metal industry wage curve is –0.04. However the significance of this estimate may be upward biased by common group errors.

5. The conclusions

The results presented above seem to indicate that regional unemployment does exert some downward pressure on hourly wages in the Finnish metal industry. There seems to be no evidence whatsoever in tables 1–3 to support the compensating differentials argument based on the Harris-Todaro model (1970) that the regional unemployment should increase wages. At worst the estimated coefficient of the regional unemployment rate is insignificant but never positive and significant. Furthermore, this sensitivity of hourly earnings with respect to unemployment is completely due to the elasticity of the fixed rates. Piece rates seem to be completely insensitive to changes in unemployment.

The long-term unemployment increases wages. The estimated coefficient of regional long-term unemployment is positive and significant in all the specifications. This can be interpreted as evidence on outsider hysteresis. Long-term unemployed are thus not a part of effective labour supply. The active labour market policies on the other hand decrease wages. Based on these results we should remove the long-term unemployed from the pool of unemployed and labour force and count the workers enrolled in active labour market programmes as unemployed. This is how we calculated the cor-

[15] *Other control variables include: log (occupation related wage), personal bonus, age, female dummy (over 20% in the region females), proportion of hours worked on piece rates, newcomer dummy (over 20% in the region newcomers) and a set of year dummies. All continuous variables, including the dependent variable, are measured as the mean of all observations in a year/region cell. F refers to the F-test. N refres to the number of observations.*

rected regional unemployment rate applied above.

When we use the correct wage variable and the corrected regional unemployment rate in our estimations the regional fixed effects specification, which is the closest comparison to the specifications used by Blanchflower and Oswald, we find that the slope of the wage curve in the Finnish metal industry is –0.04. However, the estimations with regional cell means suggest that the significance of this estimate may be upward biased by common group errors. An analysis of a longer time period would be required in order to draw definitive conclusion on the significance of the common group errors.

A slope of –0.04 is naturally considerably smaller than the ones obtained in studies with data sets from most of the other countries. Since we have done our best to control for the peculiarity of the period under study by examining the effect of the rise in long-term unemployment and active labour market policies, we cannot explain the low elasticity with period specific reasons. One has to keep in mind however that we are using a very precise measure of hourly wage in this study and it may well be that the reason for the low unemployment elasticity lie in the fact that we have successfully managed to clean away the bias caused by the unemployment elasticity of working hours. As was argued by Card (1995) this had not been done in the original wage curve studies by Blanchflower and Oswald and subsequently many of the studies on the wage curve have had to rely on monthly or annual earnings data. It is of course possible that the reason for the low unemployment elasticity is in the structure of the Finnish labour markets. In the metal industry practically all the workers are members of a central trade union and the collective agreements are binding for all the firms in the industry. Thus it may be that this high level of unionisation creates rigidities in the wage setting mechanism that lower the unemployment elasticity of wages. However, the exact reason behind the low unemployment elasticity of hourly wages in this data set, whether it is the preciseness of the hourly wage measure used here or the high level of unionisation, remains an open issue for further study.

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Appendix

The following table presents the descriptive statistics of the sample.

Variable	N	Mean	Std Dev.	Min	Max
Total hourly earnings[1]	20779	49.17874	8.853886	0	267.375
Occ. –rel. wage	20779	36.57038	4.408865	27.12	48.61
Fixed hourly rate	16096	47.29152	9.000035	19	168.7813
Piece hourly rate	4204	53.8895	17.04524	20	774
Personal bonus[2]	20779	.0940568	.0400088	–.1363044	.4807264
Open regional U	20779	16.09117	5.239317	4.795846	28.88925
Corrected regional U	20779	15.58531	4.899523	5.084277	33.15099
Long-term regional U	20779	3.243259	2.428543	.0624473	8.810723
Short-term regional U	20779	12.84791	3.610794	4.682171	25.53102
Proportion of regional labour force in SES	20779	2.167893	1.157841	.2272586	10.83407
Age	20779	39.33197	9.949009	17	65
Experience	20779	9.213148	4.937773	1	16
Female	20779	.2209442	.4148929	0	1
Newcomer	20779	.1231051	.3285657	0	1
Leaver	20779	.1178594	.3224493	0	1
Hours worked on fixed rate	20779	209.3605	199.2567	0	772
Hours worked on piece rate	20779	51.72294	124.4728	0	640

The following table presents the full results from regressions where the dependent variable is the logarithm of the fixed rate and the unemployment variable is the corrected regional unemployment rate.

Model	OLS		REG. FE		IND. FE	
Independent variable	Coef	(t)	Coef	(t)	Coef	(t)
Log ($U_r^{corrected}$)	–.0636856	(16.769)	–.0387021	(3.218)	–.0226084	(4.895)
Log (occ.-rel. wage)	.8613677	72.124	.8229876	(72.522)	.4844338	(22.585)
Personal bonus	.5042871	(19.437)	.548052	(22.729)	.2743827	(7.729)
Age	.0104405	(14.189)	.0105479	(15.426)	.0417157	(15.443)
Age squared	–.0001115	(12.108)	–.0001158	(13.542)	–.0001999	(7.306)
Sex (Female = 1)	–.0884815	(30.897)	–.0757642	(27.701)		
(Piece rate hours/Hours)	.0717965	(22.768)	.0671084	(21.994)	.0076141	(1.614)
Newcomer	–.0216919	(6.333)	–.021952	(6.890)	–.0211132	(6.748)
Years of experience	.0023035	(9.103)	.0013887	(5.769)		
Population density (sparse)	–.0234243	(11.298)				
Dummy 1992	.0478804	(13.684)	.0362977	(5.483)		
Dummy 1993	.0744499	(18.491)	.0604614	(6.869)		
Dummy 1994	.0790597	(20.269)	.0627637	(7.568)		
Dummy 1995	.0557935	(13.546)	.0494839	(6.397)		
Constant	.5962338	(14.042)	.6665371	(13.893)	.831652	(14.016)
$R^2_{overall, adjusted}$	0.5915		0.5853		0.1220	
N	16 096		16 096		16 096	
F	1665.49		1618.81		1353.00	
F(74, 16008)[3]			42.48			
F(5925, 10163)[4]					6.49	

REG FE = Regional fixed effects, IND FE = Individual fixed effects.

[1] *The wage variables total hourly earnings, fixed hourly rates, and piece hourly rates reported in Finnish markka.*

[2] *Personal bonus defined as the ratio (basic wage – occupation related wage)/occupation related wage.*

[3] *F-test for regional fixed effects. Null: all regional fixed effects are equal.*

[4] *F-test for individual fixed effects. Null: all individual fixed effects are equal.*