



# Department of Economics

ECAP III

## Undergraduate coursework evaluation form

Module code  
 Student's name  
 or ID number  
 Tutor's name

9650831

Coursework item number  
 Coursework item mark

74

Date

**Key:** Your coursework can be evaluated using *some* or *all* of the criteria below. In most cases a grade is returned which shows that the criterion has been met to a standard described as follows

A	<input checked="" type="checkbox"/> excellent	equivalent to a mark of	70 or more
B+	<input type="checkbox"/> good		60-69
B-	<input type="checkbox"/> satisfactory		50-59
C	<input type="checkbox"/> needs attention		40-49
D	<input type="checkbox"/> unsatisfactory		39 or less
NA	<input type="checkbox"/> not applicable		

### Structure

- Is there an introduction? Yes  No 
  - if yes, does it usefully explain the argument? A  B+  B-  C  D  N
- Is the order of the argument clearly explained? A  B+  B-  C  D  N
- Does the coursework avoid significant gaps or omissions? A  B+  B-  C  D  N
- Does the coursework avoid significant irrelevant material? A  B+  B-  C  D  N
- Is there a conclusion? Yes  No 
  - if yes, does it accurately reflect the argument? A  B+  B-  C  D  N
- Is the coursework of appropriate length? Too short  About right  Too long  N

### Analysis

- Is there appropriate use of
  - significant concepts? A  B+  B-  C  D  N
  - analytical models? A  B+  B-  C  D  N
  - quantitative techniques? A  B+  B-  C  D  N
  - graphs and diagrams? A  B+  B-  C  D  N
- Is relevant evidence used to test hypotheses? A  B+  B-  C  D  N
- Are explanations clear and complete? A  B+  B-  C  D  N

### Sources

- Does the coursework demonstrate wide reading? A  B+  B-  C  D  N
- Does the coursework avoid undue reliance on lecture notes? A  B+  B-  C  D  N
- Are arguments, quotes, and facts properly referenced? A  B+  B-  C  D  N
- Are items listed in the bibliography used effectively? A  B+  B-  C  D  N

### Style and presentation

- Does the coursework avoid
  - spelling mistakes? Good  Needs attention
  - mistakes of grammar? Good  Needs attention
  - overlong or unfocused paragraphs? Good  Needs attention
- Is the coursework clearly legible? Good  Needs attention

**Other comments: general evaluation**

Excellent  
 Good  
 Satisfactory  
 Needs attention  
 Unsatisfactory  
 Not applicable

75  
 Will done  
 1580831

**Structure**

70 or more  
 60-69  
 50-59  
 40-49  
 39 or less

**Analysis**

Yes  
 No  
 Too short  
 About right  
 Too long

① how are the dummies selected?

**Sources**

Excellent  
 Good  
 Satisfactory  
 Needs attention  
 Unsatisfactory  
 Not applicable

**Presentation**

Excellent  
 Good  
 Satisfactory  
 Needs attention  
 Unsatisfactory  
 Not applicable

# **ECAPIII Project**

## **An Economic Investigation into the Size and the Determinants of the German Wage Gap**

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*Word Count: 4967*

## 0 Abstract

*In Germany wages are determined in a centralised bargaining process. Unions and employer's associations negotiate wage agreements at industry level that are binding for most companies and can therefore be characterised as minimum wages or minimum conditions. Because these negotiations are rather centralised in Germany the collectively agreed wages fail to take the problems, special situations and interests of a particular company or region into account. Consequently, some firms voluntarily pay a wage in excess of the wage agreed through bargaining, the so-called wage gap. Alternatively, the wage gap might also be forced upon a firm if employees have sufficient bargaining power. The paper aims to analyse what factors influence the magnitude of the wage gap by using regression analysis and assesses which economic theories might help to explain why a wage gap occurs. To find the determinants of the wage gap regression analysis is used and results are compared to the theoretical predictions.*

## 1 Introduction

Wages in Germany are set in a two-stage process. At first, trade unions and employer's associations negotiate wage agreements, predominantly at sector level. The duration of such an agreement is mostly one year and many companies are obliged to apply the regulations of the collective agreements, even if they do not belong to an employer's association.<sup>1</sup> A wage gap defined as the difference between the effectively paid wage and the negotiated wage appears either when the firm regards the collectively agreed wage level as too low and consequently pays a mark-up or if negotiations at firm level force the firm to pay excess wages. The coverage of the negotiated wage in Germany extends to roughly 80 percent of the work force. Modifications of contract terms during the second stage of wage bargaining may only be in favour of the employees. Requests for alterations of the wage contract are formulated by management, individual workers, or their collective organisation. As long as the first-round contracts are in force unions are precluded from engaging in any form of bargaining activity. The most common form of employee representation for this second step of wage bargaining is the representation by works councils, which from a juridical point of view are mandatory in all private firms with five or more employers<sup>2</sup>. However, the council is made up of both employee and firm representatives and has to "act in a spirit of mutual trust"<sup>3</sup>.

Earlier Research on wage setting has very much concentrated on the centralised bargaining process, the first part of any wage setting. For the analyses, extensive use has been made of the wage bargaining model. At an aggregate level, the centralised wage setting was seen as the cornerstone of any governmental wage policy. Recently more emphasis has been put on the second part of the wage process, especially by

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<sup>1</sup> This is the case, because firms are not legally allowed to discriminate in pay between union and non-union workers.

<sup>2</sup> Empirically, only about 30 percent of required firms actually have works councils in place according to Jacobi, O. et al. (1998), p. 21

<sup>3</sup> Meyer, W. (1997), p. 563

assessing the relationship between the two rounds of wage setting. Muysken<sup>4</sup> states that there is considerable scope for wage policy that targets each part of the wage process in turn to achieve an optimal policy outcome. To determine what variables might be useful to target, this paper outlines an empirical analysis of the size and determinants of the wage gap in Germany.

There are a number of reasons that have been put forward to explain why some firms pay premia in excess of the collectively agreed wage level. An outline of the main economic frameworks that might explain the appearance of wage gaps is given in section 2. Section 3 of this paper will present the data taken from an establishment panel performed by the German Institute for Labour Research (IAB), in graphical and tabular fashion and highlight main features and peculiarities of the data. Two regressions using the wage gap as the dependent variable will form the empirical part of this paper (section 4). In section 5 and 6, the limitations to the results are put forward and the results are compared with those from previous studies on this subject. Finally, a short resume of the main findings is presented in section 7.

## 2 Economic Theory

Different economic theories have been put forward that might explain why some firms pay wages above the collectively agreed level. Although there might be some overlaps, it is practical to look at each approach in turn.

### 2.1 The standard supply and demand approach

This model postulates that if there is a shortage of labour in a certain segment of the labour market firms are forced to pay wages above the collectively agreed level to attract personnel. This approach is particularly relevant in economies that are close to their natural employment level. However, it can also be interpreted slightly differently. The perfectly competitive supply and demand approach emphasises the market clearing function of the wage. Sectoral multi-employer contracts fix the wages uniformly for a great number of employers. The agreements do not consider that the economic conditions and prospects may differ across establishments and some enterprises will have difficulties filling their vacancies at the negotiated rates and try to improve their chances by paying a mark-up. This case is an example of partial excess demand and the more enterprises suffer from this partial scarcity of labour, the larger is the wage gap, on average. The above approach was certainly most relevant to Germany during the period of rapid economic growth in the 1960s/70s. In the light of current mass unemployment, labour scarcity might seem surprising. However, excess labour demand does exist for highly qualified, specialised workers. In a survey carried out by the German newspaper *Frankfurter Allgemeine Zeitung*<sup>5</sup>, 35 percent of German firms currently hold vacancies for skilled workers. The impact of the level of skilled workers and the amount of existing vacancies will be used as variables in the regression analysis set out in the forth section of this paper.

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<sup>4</sup> Muysken, J. (1996), p. 126

<sup>5</sup> *Frankfurter Allgemeine Zeitung*, 28 October 1998, p. 4

## **2.2 Wage Bargaining/Rent-Sharing Models**

This approach puts the accent on the relative bargaining power of local unions. If the current business outlook of a company is positive, local unions might succeed in convincing the firm to pay mark-up wages. The wage fixed in the multi-employer contract is taken as given, and the effectively paid wage is negotiated at establishment level. Meyer<sup>6</sup> has pointed out three conditions under which a wage gap will usually appear:

- if the economic conditions and prospects in the individual establishment are better than those at sectoral level,
- if the bargaining power of the local union is relatively greater than that of the sectoral union, or
- if the preferences of local and sectoral bargaining representatives diverge. Insider effects, for instance, may be more important at establishment level. If the sectoral contract wage increases *ceteris paribus*, the range for local bargaining is reduced and the wage gap as well.

For Germany, the bargaining process is slightly different from most other countries and the above points have to be adjusted accordingly. As mentioned before Germany's legal requirements are such that union activity at firm level is prohibited as long as the sectoral agreement is in place. In Germany works councils are usually assumed to take the local union's place. Works councils have the right to negotiate over piece rates and performance-related pay, but not over other forms or components of pay that are usually settled in sectoral contracts. Additionally, the bargaining power of the council is reduced compared to that of local unions, since it is obliged to work in co-operation with the management.

The rent-sharing model of the labour market predicts that changes in profitability are shown to feed through into long-run changes in wages. It is quite possible, however that these changes in profitability translate directly into the wage gap paid by the individual firm.

## **2.3 Efficiency Wage Models**

This model assumes that the wage gap can be used as an instrument in its own right to improve a firm's productivity. Employers voluntarily pay higher wages for several reasons. According to the Shapiro and Stiglitz<sup>7</sup> model of efficiency wage employers are unable to observe the workers' efforts since the monitoring involved is both difficult and costly. To induce them to work harder, a wage mark-up is paid. The model is based on three assumptions:

- Workers prefer not working hard to working hard. This can be expressed by a utility function,

$$U(w,e) = w - e$$

where the utility,  $u$ , is positively related to the wage rate,  $w$ , and negatively to effort,  $e$  (where  $e=0$  when the worker shirks and  $e=1$  when he is working hard)

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<sup>6</sup> Meyer (1997), p. 568

<sup>7</sup> Shapiro and Stiglitz (1984), pp. 433-444



- ‘If an employee is hired for one period, and paid the minimum necessary to induce him or her to turn up for work, i.e.  $b$ , the unemployment benefit, then, whether he or she is monitored or not, it will pay to shirk, i.e. to set  $e=0$ . This is because he or she will get next period from another employer, as long as  $b$  is the minimum wage at which people will turn up for work’<sup>8</sup>. To ensure that a worker will not engage in shirking, the employee must pay a higher wage. If caught shirking (probability  $\pi$  of getting caught whilst shirking), the employee will be made redundant.
- The efficiency wage equation derived from the model is:

$$w = b + e/(\pi U)$$

It implies that the higher the level of employment, the higher the wage the firm has to pay to be sure that the worker does not shirk: “The more workers who are employed, the smaller is the pool of unemployed workers and the larger is the number of workers leaving their jobs, and so the easier it is for unemployed workers to find employment. The wage to deter shirking is therefore an increasing function of employment. At full employment, workers find work instantly, and so there is no cost to being fired and thus no wage that can deter shirking”<sup>9</sup>. Unemployment is described by Shapiro and Stiglitz to act as a *worker disciplining device*.

The shirking model puts significant weight on the size of the unemployment benefit. Germany has one of the most extensive social policy systems in the world and pays high unemployment benefits. Therefore, according to the above theory, to induce the worker to work hard, a higher wage gap must be paid compared to other countries.

A higher wage gap can also be used by the firm to decrease labour turnover, if the higher overall wage increases the worker’s job satisfaction. A high turnover is costly in terms of hiring and firing costs.

A higher wage also attracts better-qualified workers and reduces the problem of adverse selection. While the turnover rate is relatively straightforward to observe, the relevance of adverse selection is very hard to measure in practise.

To assess the relevance of efficiency wage models empirically, variables that might be used include disciplinary dismissals, written reports on worker’s performance, worker satisfaction or training costs. In Germany, high investments in training and relatively low turnover rates would suggest that shirking might be less of a problem than in other countries.

#### **2.4 The Wage Gap as Instrument of Flexibility**

The average German wage gap has decreased from 13.4 percent in 1993 to 11.4 percent in 1997. This might be explained by the surge in unemployment from 7.3 percent to 9.8 percent over the period. However, another explanation is feasible. Mark-up payments might be used by companies as an instrument of wage flexibility to adapt to business cycle fluctuations and to resolve short-term expenditure oscillations. Due to the recession in Germany in 1992/1993 and the increasing international competition some firms might have lowered voluntary mark-ups. It was seen by some firms as the most efficient and painless way to reduce operating costs and was often done in agreement with relevant works councils. Whether the wage gap

<sup>8</sup> Carlin and Soskice (1990), p. 405

<sup>9</sup> Romer (1996), p. 456

will again become larger now that the German economy starts to pick up remains to be seen.

### 3 Data Appreciation

Compared to the abundance of theoretical and empirical research on the supply of labour there is a striking lack of such research on labour demand. Hammermesh<sup>10</sup> pointed out that the lack of data about labour demand is one of the reasons for this. He sees the use of establishment data as a way to implement directly the standard models of firm behaviour and to redress the current imbalance between the immense research on individual workers and the sparse work on companies. The Institute of Employment Research (IAB) Establishment Panel is a suitable data set for a labour demand analysis and will be used to explain why a large number of firms pay higher than agreed wages. For the 1998 panel, a total of 5791 establishments responded to 86 questions covering the firm's employee structure, its annual results, firm policy, public subsidies, the employee's educational background, employee's wages, working hours etc.

For the purpose of this paper, the responses related to wages paid by the firms are the most important. The three questions that follow have been used to collect the data on the size of the wage gap:

1. Is there a collective bargaining agreement at industry and regional level applying to your establishment?
2. If Yes to Q.1: Does your firm pay wages in excess of those established by collective bargaining?
3. If Yes to Q.2: What is the approximate percentage your firm pays in excess of the collectively agreed level?

**Table 1**

	Percentages		
	1996	1997	1998
Establishments	100	100	100
Establishments with collective agreements	56(100)	54(100)	48 (100)
- with wage gap	26.9(48)	24.3(45)	19.7 (41)
- without wage gap	29.1(52)	29.7(55)	28.3 (59)
Average wage gap in %	3.6	3.4	3.3
Average wage gap in % for establishments with collective agreements	5.9	5.6	5.5
Average wage gap in % For establishments with wage gap	12.2	11.4	10.4

*Source: IAB Establishment Panel 1996-1998*

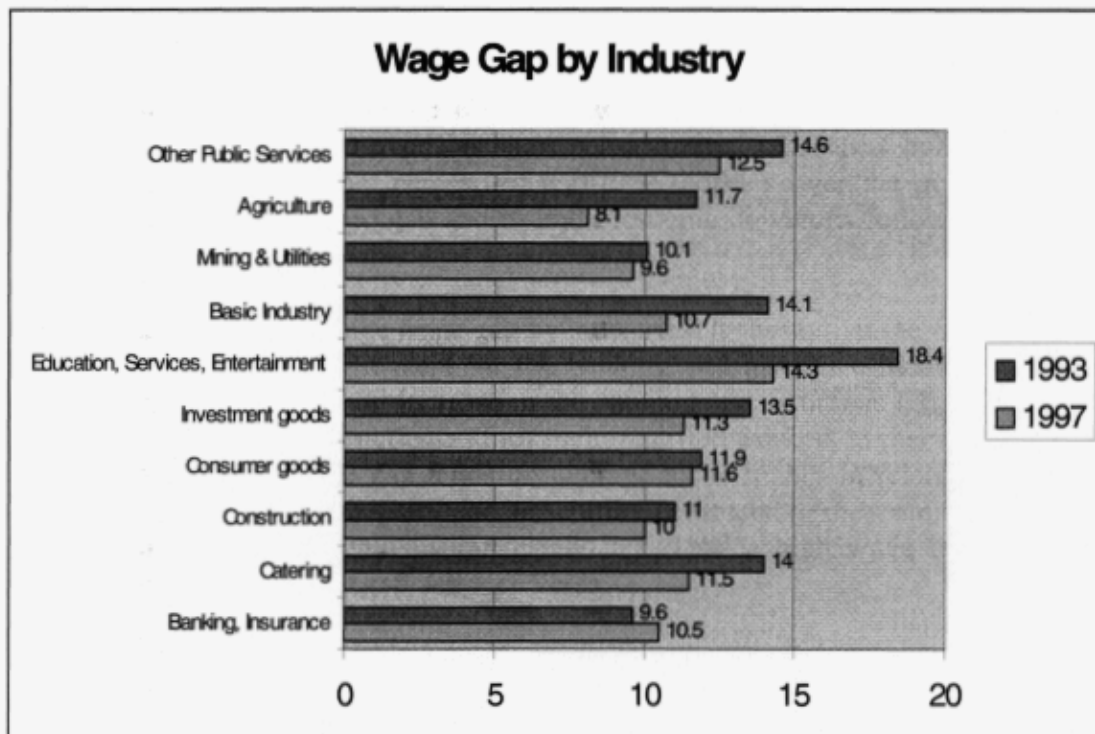
<sup>10</sup> Hammermesh (1991), p. 21



The table 1 above shows the results obtained from these questions for the years 1996-1998. Of the firms that have legally binding collective bargaining agreements, 41 percent stated they paid wages in excess of the agreed level in 1998, down from 48 percent in 1996. One reason for this fall is the persistent high unemployment and firms' labour cost problems. The average wage gap in percent for establishments with a wage gap also decreased over this short period from 12.2 to 10.4 percent. This fall might be explained by the increase of part-time workers over the period having a negative effect on the wage gap and by the economic downturn following the short-lived post-reunification boom.

Figure 1 displays the average wage gap by industries. It shows that the wage gap has decreased in all industries except for the banking and insurance industries over the period 1993-1997. The small increase in the banking and insurance industry might be attributable to the increasing demand for high-qualified workers in this sector over the period. The average wage gap tends on average to be higher in relatively low-paid jobs such as the catering industry and agriculture compared to the 'mining & utilities' industry or the banking and insurance industry. Thus a high wage level generally corresponds to a low wage gap and vice versa.

**Figure 1**



Source: IAB Establishment Panel 1996-1998

The above data proves that the concept of a wage gap is of quantitative importance. Using regression analysis, the next section is concerned with testing to what extent the wage gap can be explained by observable variables and whether these have relevance to the economic frameworks described before.

## **4 Regression Analysis**

### **4.1 What results are expected**

To analyse to what extent different theoretical models can explain the size of the wage gap, two regressions were run, one on the complete 1998 data set of the IAB Establishment Panel (5791 companies responded) and one using a scientific file provided by the IAB (on 211 companies).

In this section I will first set out the results that would be expected given the underlying economic theory. I will then compare these to the results actually obtained from regression analysis

A problem that occurs when regressions are used to test the validity of theories related to wage determination, is that the variables used can be interpreted in different ways depending on what theory is being tested. For example, an important variable for the supply and demand approach is the number of vacancies per employee: the greater the value of this variable, the more pronounced the shortage of labour for the firm and the higher the wage gap should be. But, the labour-turnover version of the efficiency wage theory modifies the firms' strategies to attract labour with the instrument of efficiency wages. This suggests that firms may pay higher wages to reduce staff turnover. In addition, the workers' threat point is regarded as depending on their alternatives to a job within the firm are important for the wage level in efficiency wage models. The efficiency wage theory predicts that firms pay high wages if they face a strong risk of labour mobility. A big proportion of women and part-time employees and a low proportion of skilled workers are characteristics of firms, which do not use the instrument of high wages to recruit employees. Therefore, negative signs for the regression coefficients are expected for the proportion of women and part-time workers, whereas the proportion of skilled workers is expected to be positively correlated to the wage gap variable.

As an alternative to the payment of efficiency wages firms could use the strategy to pay wages increasing with the workers' seniority. Then one would expect that firms offering seniority wages should pay a lower wage gap.

As for the works council variable, a significant positive coefficient might be expected. However, the non-co-operative wage bargaining theory assumes a local union to represent employees at the firm level. However, the fact that German works councils have employee as well as employer representatives alters the outset of the bargaining approach

### **4.2 What results were obtained**

#### **4.2.1 Regression on full sample**

As far as the first regression is concerned, the raw data was not available, because of the legal barrier of data protection in Germany. Instead, the German Employment Research Institute (IAB) provides a service by which programmes can be sent to their offices for processing. The output of the regression is sent back to the enquirer within one week. For the purpose of this paper, a syntax file was created using SPSS and was sent to the IAB in Germany for processing. The format of this file is shown in Appendix 1. For the syntax file to run smoothly, a code book was provided by the

IAB to ensure that the variables used for the program were equal to those of the panel data set. The result of the regression is shown below (please refer to Appendix 2 for further details):

$$\begin{aligned}
 \text{WAGEGAP} = & 6.369 + .0375 \text{ VAC} - .0890 \text{ F07D} - 2.285 \text{ WOMEN} \\
 & \quad (.007) \quad (.165) \quad (.298) \\
 & - 2.050 \text{ PARTTIME} + 2.389 \text{ SKILLED} + \varepsilon \\
 & \quad (.288) \quad (.296)
 \end{aligned}$$

The regression takes the wage gap as the dependent variable and vacancies per 100 employees, a dummy whether or not written reports on the performance of the employees are produced, and the proportion of women, part-time workers and skilled workers as independent variables.

In the regression the *proportion of women and part-time workers* have the effects theoretically expected. The proportion of female and part-time workers is low in firms with a relatively high wage gap. The two variables are highly correlated, because many female workers do actually work part-time. The negative significance of the two variables confirms the predictions of the demand and supply approach. In Germany, there is no excess labour demand for either group. This is different with regard to skilled workers.

The *proportion of skilled workers* is positively related to the wage gap. As predicted by the supply and demand approach, the positive excess demand for skilled workers in Germany leads to a relatively higher wage gap. The significance of the variable can also be explained in terms of the efficiency wage approach. Firms are especially keen to keep their skilled workers and consequently pay them a wage premia to decrease the turnover rate, partly through reducing poaching by other firms.

The *number of vacancies per employee* is significant at 1 percent, indicating that even in times of high unemployment (as currently in Germany), firms have difficulties to find appropriate personnel. It confirms the importance of job-matching to explain unemployment. More generally, the significance of the variable implies that there is partial excess demand at firm level. The coefficient of the variable, however, is quite small. Meyer has previously observed this<sup>11</sup> in a similar study. In his view this relatively small impact on the wage gap elasticity reflect existing inflexibility of the wage gap. He also suggests that this might be due to measurement errors since the indicator is only an imperfect measure of labour scarcity at firm level.

The shirking model of efficiency wages would predict that a firm might reduce shirking by trying to control workers' efforts. Therefore, by producing written reports on workers' efforts firms do not have to pay as high a wage gap to prevent workers from shirking. Unfortunately, the independent variable *written valuation of employee* was insignificant. However, the negative sign of the coefficient shows that the negative relation with the wage gap might exist to some extent.

Although the overall equation was significant, the explanatory power of the regression was rather low, judging by the  $R^2$ . One reason for this might be the variability of the dependent variable with a strong dispersion around the mean (standard deviation of

<sup>11</sup> Meyer (1997), p. 572

6.2% / mean of 3.3%), another the large amount of undefined data points (i.e. zeros) in the data set. Finally, it was not possible to control for outliers due to the unavailability of the original data set.

Therefore, using additional variables, the size of the wage gap was regressed with the help of a scientific file.

#### 4.2 Regression with data from scientific file

The scientific file was created by members of the IAB to serve as a representative sub-sample of the Establishment Panel 1998. The scientific file allows having a closer look at the original data and control for outliers using dummy variables. The variables included in the regression are outlined in Appendix 3 and yielded the following result:

$$\mathbf{F60PROZ = 3.66 + 5.81SKI - 4.69WOM - 2.12PART + 0.28VAC + 7.23EXP}$$

$$(.95) \quad (1.34) \quad (1.04) \quad (.03) \quad (2.01)$$

$$\mathbf{- 1.69WORK - 1.19SENI + 19.53D_{119} + 15.31D_{103} + 15.68D_{122}}$$

$$(.71) \quad (.66) \quad (4.17) \quad (4.14) \quad (4.26)$$

$$\mathbf{+ 14.51D_{63} + 12.39D_{66} + \varepsilon}$$

$$(4.24) \quad (4.13)$$

The regression passes all relevant tests as can be seen in Appendix 3. Its  $R^2$  is considerably higher than that of the first equation.

For the variables *proportion of part-time, women and skilled workers*, as well as for the variable *vacancies per employee* this regression yielded the same results as in the first regression.

In addition, a variable *proportion of exports to total sales* was included. It is significant at the one percent level suggesting that German firms with strong trading links to foreign countries pay a relatively high wage premium. Exports have traditionally featured strongly in the German economy and have been the key force behind German growth in the 1990s.<sup>12</sup> According to the rent-sharing hypothesis some of these profits translate into wage premia. In this respect, the variable profitability was tested to give evidence of rent-sharing but was found to be insignificant.

The works council has a significant negative effect on the wage gap in this sample which confirms the results obtained by Addison et al.<sup>13</sup> They pointed out that the impact of the works council should be subject to further research once large-scale panel data would become available. This has been tried in this paper. Unfortunately, the works council variable was insignificant in the full sample of the first regression which is why it was not included in the first regression analysis.

Another variable that was not included in the first regression is a dummy controlling for the existence of a seniority payment system. The shirking model of efficiency wages predicts that the seniority wage system acts as substitute for a firm's wage mark-up policy. Then, a negative sign of the coefficient of the dummy variable is

<sup>12</sup> This ignores the German Reunification as growth engine.

<sup>13</sup> Addison, J. et al. (1993)

expected. Although the variable is not significant in this model, the negative sign of the dummy gives some evidence for the validity of the shirking model.

## 5 Limitations to Analysis

One limitation of this paper that deserves particular attention is the fact that a number of companies in the data set pay a wage premium, although they have neither free vacancies nor a higher than average level of skilled workers. Other panel data sets that use additional variables are needed to explain the above phenomenon.

The model did not take into account the effect of the size of initially agreed contract on the size of the wage gap. Holmlund and Skedinger (1990)<sup>14</sup> have found that lower contractual wage increases are associated with increases in the wage gap. The data appreciation in Section 3 has shown that the wage gap has been decreasing in the period 1996 to 1998 despite relatively low wage rounds in Germany. Whether this contradicts the findings of Holmlund and Skedinger or whether the expected increase in the wage gap is outweighed by the general economic conditions that have pushed the wage gap down is unclear. A time series analysis to determine the exact reasons has not been performed yet because of lack of data (data on the wage gap is only available since 1993 and for the post-war period up to 1962). However, restraining wages is still effective from a policy point of view. Incomes policy aimed at restraining the growth of negotiated rates apparently are not neutralised by offsetting movements in wage drift<sup>15</sup>.

Other variables that could have been included had they been available are the turnover rate, a variable controlling for the existence of a company pension plan, workers self-perceived work efforts or a dummy for profitability.

## 6 Previous Work

An interesting analysis on the size and determinants of the wage gap was done by Meyer<sup>16</sup>, using data on the German manufacturing industry. In his data set, firms that are covered by collective agreements pay a considerably higher wage gap than the regression in section 4 predicted. Given that his data set is from 1989 and 1991 respectively, part of the higher level of the wage gap can be explained in terms of the worsened economic and labour market situation. In his survey, workers were asked directly whether a mark-up would influence their efforts at work. The findings showed that this variable was indeed highly significant. More generally, Meyer found that the efficiency approach and the market approach were captured by his regression, whereas his indicators of the bargaining power of the employees were insignificant.

A lot of research in the field of wage determination has focused on the experiences of the Scandinavian countries. Since wage bargaining is highly centralised in Scandinavian countries, there is an increased probability that the settled wage does not suit every individual firm. Therefore, the occurrence of a wage gap resulting from ex post local agreements is very likely.

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<sup>14</sup> Holmlund, B. and Skedinger, P. (1990) "Wage Bargaining and Wage Drift: Evidence from the Swedish Wood Industry", p. 383 in Cahnfors, L. (ed.) *Wage Formation and Macroeconomic Policy in the Nordic Countries*

<sup>15</sup> The terms wage drift and wage gap are used synonymously throughout this paper.

<sup>16</sup> Meyer (1997), pp. 561-577



During the 1980s studies on the Nordic labour market focussed on the centralised part of the wage setting. Holden<sup>17</sup> was one of the first to study the importance of the second part by studying the size and determinants of the wage drift in Norway. He has found the wage gap to be negatively related to the size of inventories, and positively to the vacancy rate and the level of the gross product. The size of the inventory is one of the main assumptions of the non-co-operative bargaining model where the firm's bargaining power depends on the relative size of its inventory.

A study by Tyrväinen<sup>18</sup> took a slightly different approach to analysing wage drift using data from Finland. He modelled the wage gap as an instrument to compensate for expectational errors in the centralised wage setting and finds the same inverse relationship between the wage level and the wage drift as Holmlund and Skedinger. His finding that the wage gap and the number of vacancies are positively related is in accordance with the results of this paper.

## **7 Conclusion**

The existence of wage gap is a highly significant real world phenomenon. There are two fundamental reasons why it occurs. First, a wage gap might be paid voluntarily by firms to prevent workers from shirking, improve their productivity and reduce turnover rates. On the other hand, employees might impose a wage gap upon the firm, if the latter possess sufficient bargaining power. The latter can be regarded as less important in the German case, since the works councils' bargaining power is significantly reduced by its role as intermediary between firm and workers.

The existence of a wage gap can then be interpreted as an instrument of adjustment of individual firms to the centrally negotiated wage setting. In this respect it supports the standard supply and demand approach of the labour market. Support for the efficiency wage model was limited and the variable written reports on workers' efforts was found to be insignificant. Equally, the wage bargaining model was rejected with the works council variable in fact being negatively significant. However, the findings do not provide conclusive evidence that the demand and supply is the best model to capture the wage gap. The significance of vacancies within a firm used for the demand and supply model can also be seen as evidence supporting the efficiency wage model and the seniority variable is equally related to that model. Future research in this field might use the IAB Establishment Panel<sup>19</sup> to perform a time-series analysis to gain further insights into the size and determinants of the wage gap.

The wage gap might have an important policy implication. The existence of a wage gap helps to offset the inflexibility created through the centralised bargaining process and therefore has a beneficial effect on resource allocation. Policies aiming at increasing the flexibility of wage setting in Germany should have a positive impact on the labour market.



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## APPENDIX 1

**This Syntax File was sent to the IAB who ran this regression using the data from the Establishment Panel Data 1998.**

/Syntax File ID0948273

```
COMPUTE exports = f15c + f15d .
EXECUTE .
COMPUTE parttime = (f46tz + f46bef) / f45ges .
EXECUTE .
COMPUTE skilled = (f45fach+f45qual)/f45ges .
EXECUTE .
COMPUTE women = f45ges_f / f45ges .
EXECUTE .
IF (f51 = 2) vac = Value(f51) = 1 .
IF f51 = 1 vac = f52ages .
EXECUTE .
IF (f67=1) work = VALUE(f67)=1 .
IF (f67=2) work = VALUE(f67)=0 .
EXECUTE .
REGRESSION
  /DESCRIPTIVES MEAN STDDEV N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT f60proz
  /METHOD=ENTER vac f07d women parttime skilled .
```

## APPENDIX 2

### Variable Definitions:

F60PROZ	Size of the wage gap
VAC	Number of vacancies per 100 employees
F07D	Dummy that takes value 1 if written valuation of the worker's efforts are produced in the company
WOMEN	Proportion of women in the work force
PARTTIME	Proportion of part-time workers in the work force
SKILLED	Proportion of skilled workers in the work force

### **Regression**

#### **Variables Entered/Removed<sup>b</sup>**

Model	Variables Entered	Variables Removed	Method
1	VAC, F07D written employee valuation, WOMEN, PARTTIME, SKILLED		Enter

- a. All requested variables entered.  
b. Dependent Variable: F60PROZ

#### **Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.217	.251	.243	6.06

- a. Predictors: (Constant), VAC, F07D written employee appreciation, WOMEN, PARTTIME, SKILLED

#### **ANOVA<sup>b</sup>**

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	10538.955	5	2107.791	387.223	.000 <sup>a</sup>
1	Residual	31488.913	5785	5.443200		
	Total	41987.868	5790			

- A. Predictors: (Constant), VAC, F07D written employee appreciation, WOMEN, PARTTIME, SKILLED  
b. Dependent Variable: F60PROZ

### Descriptive Statistics

	N	Mean	St. Deviation
F60PROZ	5791	3.31	6.21
VAC	5791	2.0962	11.597
F07D Written work appreciation	5791	.49	.3070
WOMEN	5791	.4282	.3044
PARTTIME	5791	.2428	.3178
SKILLED	5791	.6802	.2758

### Coefficients<sup>a</sup>

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.369	.249		1.617	.107
	VAC	.03748	0.007	.070	5.427	.000
	F07D written employee appreciation	-.08900	.165	-.007	-.540	.590
	WOMEN	-2.285	.298	-.112	-7.666	.000
	PARTTIME	-2.050	.288	-.105	-7.125	.000
	SKILLED	2.389	.296	.106	8.083	.000

a. Dependent Variable: F60PROZ

### APPENDIX 3

List of Variables:

- Wage Gap (F60PROZ)
- Proportion of skilled workers (SKILLED)
- Proportion of women (WOMEN)
- Proportion of part-time workers (PARTTIME)
- Number of Vacancies per 100 Employees (VACPEREM)
- Proportion of Exports of Total Sales (EXPORTS)
- Dummy for existence of Works Council (WORKSCOU)
- Dummy for existence of Seniority payments in the firm (SENIOR)
- 5 control dummies for outliers (residual of above 2.5)

EQ( 1) Modelling F60PROZ by OLS (using ScientificFile.xls)  
The present sample is: 1 to 211

Variable	Coefficient	Std.Error	t-value	t-prob	PartR <sup>2</sup>
Constant	3.6593	0.85345	4.288	0.0000	0.0850
SKILLED	5.8056	0.95443	6.083	0.0000	0.1574
WOMEN	-4.6906	1.3394	-3.502	0.0006	0.0583
EXPORTS	7.2343	2.0137	3.593	0.0004	0.0612
PARTTIME	-2.1155	1.0360	-2.042	0.0425	0.0206
VACPEREM	0.28289	0.028511	9.922	0.0000	0.3321
WORKSCOU	-1.6937	0.71258	-2.377	0.0184	0.0277
SENIOR	1.1872	0.65650	1.808	0.0721	0.0162
Dummy103	15.313	4.1424	3.697	0.0003	0.0646
Dummy119	19.527	4.1656	4.688	0.0000	0.0999
Dummy122	15.676	4.2625	3.678	0.0003	0.0639
Dummy63	14.509	4.2390	3.423	0.0008	0.0559
Dummy66	12.391	4.1326	2.998	0.0031	0.0434

R<sup>2</sup> = 0.435196 F(12,198) = 34.3 [0.0000] \sigma = 4.06849 DW = 1.94

RSS = 3277.424904 for 13 variables and 211 observations

AR 1- 2 F( 2,196) = 1.3648 [0.2578]  
 ARCH 1 F( 1,196) = 0.010333 [0.9191]  
 Normality Chi<sup>2</sup>(2) = 4.9924 [0.0824]  
 Xi<sup>2</sup> F(17,180) = 1.5116 [0.0947]  
 Xi\*Xj F(38,159) = 0.98963 [0.4953]  
 RESET F( 1,197) = 0.12425 [0.7248]

**Descriptive Statistics**

Variable	N	Mean	Standard Deviation
WAGEGAP	211	3.5355	6.9318
SKILLED	211	.60461	0.32012
WOMEN	211	.41543	0.32295
PARTTIME	211	.27147	0.29654
VACPEREM	211	2.6393	10.673
WORKSCOU	211	0.26066	0.44004
SENIOR	211	.30332	0.46078
EXPORTS	211	0.091765	0.14867