FOUR PAPERS ON WAGE FORMATION IN A UNIONIZED ECONOMY

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Abstract

This thesis consists of four papers on wage formation in Sweden. In the first paper two models of wage and employment determination are estimated using data from the Swedish Construction sector: the efficient bargaining model and the monopoly union model. The main objective of the paper is to examine whether the models provide a theory consistent description of firm technology and union utility. The results lead to the conclusion that the monopoly union model describes a well defined firm technology and union objective function. The estimates of the efficient bargaining model imply that we will end up at the only attainable solution on the labour demand curve, although this point seems to be a less accurate description of the data compared to the estimated monopoly model. In the second paper a general sequential bargaining model is estimated in order to test its special cases. In particular, the labour demand model and the model of efficient bargaining can be tested against the general model by the use of a likelihood ratio test. The main conclusion is that the labour demand model cannot be rejected, while the efficient bargaining model can be rejected in out of two cases.

The effects of labour market education on wages and employment are studied in the third paper. A monopoly union model on structural form is used to infer the effects of two hypotheses regarding labour market education. The first is an incentive effect on the part of workers and the second is a quality enhancing effect. Using data from the Swedish Pulp industry, we find that the incentive effect decreases the reservation utility of workers. There is also some support for the hypothesis that labour market education increases the quality of workers.

The final paper in the thesis estimates a monopoly union model with insiders. The basic model is augmented with a membership rule that nests a number of possible definitions of the incumbent labour force. The model is estimated with sectorial data from the Swedish economy. Hysteresis cannot be rejected. Using the membership rule as a testing device, we are able to reject membership hysteresis in five out of seven cases. Finally, a simultaneous equations model is estimated using data from the Construction sector and the Pulp industry of the Swedish economy. An insider hypothesis cannot be rejected in the case of the Pulp industry.

Keywords: Wage formation, employment determination, efficient bargaining, monopoly union, sequential bargaining, labour market education, membership hysteresis.

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Finally, the remaining errors are my sole responsibility.

Umeå, November 1992

Magnus Wikström
The thesis consists of this summary and the following four papers


1 Introduction

The present thesis deals with wage and employment determination in the Swedish economy. In particular, it consists of four empirical studies on the microeconomics of trade unions and bargaining in the labour market.

Circumstantial evidence suggests that a bargaining framework is an appropriate starting point when dealing with wage formation in Sweden. First, both parties involved in wage determination are highly organized. The degree of unionization is, by international standards, very high. In 1987 some 83 percent of the labour force were attached to unions. The number of trade union members has, moreover, increased steadily during the post-war period. On the employers side, cartel formations is a key characteristic. Second, consecutive bargains have been struck at a highly aggregate level during the whole of the post-war period. In particular, wage bargaining has been conducted at three different levels of the economy: at the national, industry, and firm levels respectively. Up to 1983, national agreements were common, involving the major union and employer confederations. After 1983, however, industry wide bargains have been the rule. In addition, wage drift is an important feature at the firm level. Thus, two seemingly important ingredients in wage and employment determination in Sweden are collective action by workers and the presence of explicit bargaining between trade unions and employer confederations.

A unifying theme in this thesis is the recognition of trade unions in wage formation. This tradition, of course, has its roots in the theory of imperfect competition. Prior to the second world war, the problems of imperfect competition were largely limited to markets other than the labour market. In 1944, John Dunlop argued that formal models of trade unions were vital to analytical economics. He
also suggested a basic specification of trade union objectives.\textsuperscript{1} Many authors, therefore, regard John Dunlop as the main forerunner to modern trade union theory.\textsuperscript{2} Almost fifty years later, the economics of trade unions and union—employer bargaining is a major field within labour economics. During the last two decades, many theoretical issues have been settled, and empirical applications are now growing at a fast rate.

There are three basic aims of the thesis. The first is to address the problem of testing whether wage—employment bargains are efficient and whether trade unions have a substantial degree of market power in the Swedish labour market. This issue is dealt with in the first two papers in the thesis. In paper [I] two popular models of wage and employment determination are estimated: the monopoly union model and the efficient bargaining model. In paper [II] a general sequential bargaining model is used to test, formally, the labour demand model and the model of efficient bargaining.

The second aim of the thesis is to examine the causes and implications of labour market education on wages and employment. Paper [III] addresses this problem. Two possible routes by which wages and employment can be affected by labour market education are exploited, and these ideas are applied to Swedish time series data.

The final aim is to assess the impact of certain groups of workers in wage formation. In particular, the distinction between insiders and outsiders in the labour market is addressed. In paper [IV] a monopoly union model of insiders is estimated, and a membership rule is applied to the data.

\textsuperscript{1} Pencavel (1991), p 55.
\textsuperscript{2} See, however, Bagge (1917).
We now continue with a summary of papers [I]—[IV], highlighting at the same time some aspects of contemporary work within the field.

2 A Summary of the Papers

2.1 Monopoly Union versus Efficient Bargaining: Wage and Employment Determination in the Swedish Construction Sector (Paper [I])

One important issue, that has drawn much attention within the field of labour economics during the last 10 years or so, is the question of whether wage and employment outcomes are a result of efficient union—employer bargains. In the efficient bargaining model, the union and the employer negotiate over wages as well as employment with a resulting contract efficiency. However, there are alternative bargaining models where efficiency is not implied. One such model is the labour demand or right—to—manage model. The right—to—manage model emphasizes that employment decisions are made unanimously by employers.

There are arguments in favour of each of these models. Starting with the efficient bargaining model, it can be argued that generally, by moving from a contract on the labour demand curve to a point on the contract curve (an efficient contract), both parties can be made better off. This means that contracts on the labour demand curve are Pareto dominated by efficient contracts. On the other hand, advocates of the labour demand model argue that, even though efficient bargains may be feasible, employers have an incentive not to follow the efficient

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3 The standard reference is Mc Donald & Solow (1981). Pencavel (1992, chapter 4) contains a comprehensive review of efficient bargaining and the testing of efficiency of contracts.

4 See, e.g., Nickell (1982).
bargaining contract if they have the formal right to manage employment decisions. This calls for a set of rules and a penalty system to be defined in order to prevent cheating on the part of the employers. However, such arrangements are not observed in reality. From society's viewpoint, the appropriate bargaining model is by no means self-evident. Both of these models generally imply that labour is inefficiently allocated from the society's point of view. The labour demand model largely implies underemployment, whereas the efficient bargaining model may produce underemployment as well as overemployment. On comparison, the underemployment argument is, under standard assumptions, stronger in the labour demand model. However, the present discussion suggests that the appropriate bargaining framework is a highly empirical question.

Empirical contributions in this field include Brown & Aschenfelter (1986), MaCurdy & Pencavel (1986), Svejnar (1986) and others. Typically, the empirical work uses data from the U.S., Canada and U.K., and it is probably fair to say that the existing evidence is inconclusive. However, Skedinger (1991) tests two models of bargaining in the labour market using time series data from the Swedish Wood Manufacturing industry: the efficient bargaining model and the labour demand model. Skedinger's estimations suggest that the efficient bargaining model provides a better explanation of employment determination in the Swedish Wood Manufacturing industry.

A commonly applied methodology, when it comes to testing whether bargaining outcomes are efficient or if they are constrained to lie on the labour demand curve, is to test for the presence of union related variables in structural forms of

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5 For a different result, see Manning (1992). He discusses bargaining models where firms invest in capacity before negotiating over wages. In such an environment he can derive the result that employment is higher in the labour demand model than in the efficient bargaining model.

employment equations. Most often, the impact of the reservation wage is tested. If the union related variables are found to be statistically significant, the labour demand model is rejected in favour of the efficient bargaining model. However, the two models are non-nested, meaning that neither of the models is contained as a special case of the other. This means that the test for the exclusion of union related variables is not without problems.\footnote{This point is developed further in Pencavel (1992), pp. 108–111. See also Hendricks & Kahn (1991) for the testing of efficient bargaining versus labour demand models under the presence of efficiency wages. Maintaining efficiency wages when testing leads to other predictions compared with when efficiency wages are absent.}

Having noted this, the question arises as to whether there is any other way in which a comparison of these two models can be made. One way of accomplishing this task is to estimate a fully parameterized structural model as in Svejnar (1986). He uses an efficient bargaining model in order to explain, among other things, the impact of exogenous variables affecting the bargaining power of trade unions. The model is estimated as a two equation system using a maximum likelihood estimator. Although he does not aim at discriminating between efficient bargains and bargains that are on the labour demand curve, he finds evidence that the resulting contract curve is vertical.\footnote{A vertical contract curve implies an efficient allocation of resources from the society's point of view (strong efficiency) because the resulting equilibrium employment is always at the same level as in the competitive equilibrium.}

Paper \cite{1} builds on Svejnar (1986) in the sense that we use a model on structural form. Our focus is on the efficient bargaining model and the monopoly union model. Because of the difficulties with testing these alternatives against each other, our main idea is to invoke fully specified theoretical models on the data in order to check whether the estimates of these models are consistent with
their theoretical assumptions. For example, whether the second order conditions for union utility maximization and profit maximization of firms are fulfilled. The data are industry aggregate data from the Swedish Construction sector over the period 1960–1988. Both models are specified using a Cobb–Douglas form of technology and union preferences. An assumption used (and tested) is the competitiveness of the industry. One advantage with using this structural model is that union bargaining power can be estimated. Moreover, it is possible to identify bargaining power as a constant term.\(^\text{10}\)

In a first set of estimates, union bargaining power is modelled as being time-independent. The results indicate that the monopoly union model provides theoretically consistent estimates of union preferences and technology. The efficient bargaining model is, however, associated with some problems. First, the output elasticity of material inputs is found to be negative. Second, union bargaining power constantly goes toward zero, and would probably be less than zero if it were not constrained by a non-negativity restriction. On, these grounds, therefore, we reject the model of efficient bargaining. In a second set of estimates, bargaining power in the efficient bargaining model is assumed to depend on two exogenous variables: the aggregate unemployment rate among union members and a dummy reflecting (hopefully) the decentralization of the bargaining system from the aggregate level to the industry level. This model works better than the "time-independent" model. However, the output elasticity of labour is low.

Finally, a model simulation, based on the monopoly union model, is conducted.

\(^{10}\) The possibility to identify union bargaining power depends on the assumptions made in the paper concerning union utility and technology. In particular, our model yields a recursive system of equations, where employment does not enter the wage equation. The fact that we do not include any parameter that is (log)constant in the wage equation makes identification possible.
The simulation concerns an alteration of the tax system where income taxes are lowered and payroll taxes increased by the same amount. It is found that a change in the tax system towards higher payroll taxes and lower income taxes may have a considerable impact on employment.

2.2 Efficient Bargaining, Right-To-Manage or Otherwise: Empirical Tests in a Model of Sequential Bargaining (Paper [II])

The main problem and also the main challenge associated with the question posed in the first paper is the difficulty to actually discriminate between competing hypotheses of union–employer bargains. The second paper relies on a theoretical article by Manning (1987), where a general bargaining model is constructed. The underlying idea in Manning's paper is that negotiations over wages and employment can be split up in a two-stage (sequential) bargaining process. In the first stage, wages are determined and in the second stage employment. This two-stage procedure produces outcomes that lie either on the contract curve, or on the demand curve, or somewhere else. To be more precise about the third alternative, consider Figure 1.
The figure attempts to explain, schematically, the possible wage–employment outcomes associated with the general model. In the figure, \( L | \theta = 0 \) denotes the labour demand curve, where \( \theta \) is the union's weight in employment determination. \( 1 - \theta \) represents the employer's weight. On the other hand, \( L | \theta = 1 \) is a case where the union fully controls employment decisions. In this case, the union ensures that employment is such that profits are zero. The corresponding cases for wage bargaining are depicted as \( w | \gamma = 0 \) and \( w | \gamma = 1 \), where \( \gamma \) reflects the union's impact in wage determination. Now, attainable solutions in the labour demand model are given by the line AB. Solutions on the contract curve, and hence consistent with efficient bargaining, are given by BC. However, the general model produces a solution somewhere within the area given by ABDC. It is clear, therefore, that the general model nests both the labour demand model and the efficient bargaining model as special cases.
Although neat, the general bargaining model needs to be firmly anchored in reality. The Swedish bargaining process is generally split up into two distinct parts. Contractual wages are agreed upon at a high level of aggregation (industry or national). Then, given contractual wages, wage drift occurs at a lower level. It is likely that bargains over employment never occur at the aggregate level. At least, they are never observed at that level. Instead, if bargaining over employment is conducted, it is expected to take place at a lower level. If conducted at different levels, it may very well be the case that bargaining powers differ, and the general bargaining model is, therefore, motivated as an approximation to the actual bargaining process.

There are not many applications of the general bargaining model. Alogoskoufis & Manning (1991) use aggregate data from the U.K. in order to test the labour demand model and the efficient bargaining model against the general model. Their test is based on a reparameterization of the reduced form for wages and employment. Testing for the exclusion of union related variables and variables explaining bargaining power they reject both the efficient bargaining model and the labour demand model. Using a latent variables technique, Paci et al. (1991) estimate union bargaining power for a large number of industries using British microdata. Their findings support the conclusions of Alogoskoufis and Manning (1991).

The adopted approach comes close to that of paper [1]. A similar theoretical structure is employed and estimates of the sequential bargaining model and its special cases are obtained using data for the Swedish Construction sector. The only main difference compared with paper [1], when it comes to the variables

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11 In the paper, we abstract from wage drift.
12 There are other arguments for the sequential bargaining model as well. See Manning (1987).
Summary

used, is the reservation utility. Interest is focused on unemployment benefit compensation instead of an alternative wage.

As in paper [1], union bargaining power is estimated indirectly using a set of exogenous variables. The unemployment rate and the vacancy–unemployment rate are used as exogenous variables. The estimates of the general model imply that the second order conditions for maximization are fulfilled in both stages of the bargaining. Therefore, the estimated models are consistent with the theoretical model.

The bargaining power in employment determination is roughly equally divided between the union and firms in the specification where unemployment is used as a proxy. Although it is associated with quite large prediction errors, overmanning can not be rejected with these data. The union's weight in wage determination is close to zero, so the resulting equilibrium wage level is found to be close to the competitive.

In order to test the different models of interest, we develop a formal testing procedure by the use of a likelihood ratio test. The alternative models are estimated with the theoretical restrictions imposed. Thereafter, a comparison is made using the devised test. The efficient bargaining model can be rejected in one out of two cases, whereas the labour demand model cannot be rejected. A second comparison is then made in order to test the nested hypotheses within the labour demand model, in particular the monopoly model and the competitive hypothesis. This test reveals that the monopoly model is always rejected.

Overmanning or featherbedding are popular names for the case when wages are held above the marginal revenue product of labour.
and the competitive hypothesis is rejected in one out of two cases. However, the output elasticity of labour is small, which forces down the labour demand elasticity close to one. Therefore, the results should be treated with some caution.

2.3 Labour Market Education, Wages and Employment: A Test of Two Explanations (Paper [III])

The third paper of the thesis concerns the effects of labour market education on wage and employment determination. Recently, a large number of empirical studies have been conducted in Sweden, which aimed at study the wage effects of labour market policy programmes, in particular labour market training and relief work. Most of these studies find that labour market policy programmes have remarkably strong effects on wages. For an exposé over the results, see, for instance, Forslund (1992).

There are several possible routes by which wages (and employment) can be affected by manpower training. One classical view in this respect is that labour market training (and perhaps also relief works) maintain or increase the human capital of those who participate in training compared with those in open unemployment. Another is simply that active manpower training decreases mismatch in the labour market and speeds up the rate of structural change. Lately, a third possibility has been put forward. This idea exploits the outside opportu-

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14 The conclusions drawn from the estimation of the structural model are not contradicted when using Alogoskoufis and Manning's testing procedure. This test reveals that neither the labour demand nor the efficient bargaining model can be rejected. Such a result is consistent with a competitive hypothesis.
Summary

nities faced by workers. Shifts in outside opportunities, e.g., an increase in the number of persons in labour market programmes, will cause the reservation wage to change. A theoretical result in this context is that wage demands increase with the conditional probability of ending up in labour market training, as long as labour market training is considered a favourable alternative to that of open unemployment.

However, given profit maximization by firms, it is also possible to say something about the employment effects of labour market training. Shifts in outside opportunities will, under standard assumptions, have opposite sign effects on employment compared with those on wages. So, it is worthwhile discussing the employment effects of labour market policy changes as well as wage effects. In particular, it is interesting to test the joint hypothesis of increasing wages and decreasing employment as a result of a policy change. This is one of the two aims of paper [III].

As mentioned above, the supply effect, working through outside opportunities, is not the only possible explanation of a positive correlation between labour market education and wages. A second aim of the paper is, therefore, to model and estimate an effect originating from the demand side of the labour market. The effect we have in mind is a quality enhancing effect on the part of workers who participate in labour market education. We also allow for unemployment to affect the average quality of workers, thus capturing the idea that unemployment has a negative effect on human-capital.

The paper utilizes time-series data from the Swedish Pulp industry over the period 1960-1988. The structural model developed is a standard monopoly union

model. The estimates reveals an interesting pattern. Generally, the estimated model satisfy the theoretical restrictions. Most of the parameters introduced entail anticipated and significant estimates. When it comes to labour market education, the estimates of the demand effect indicate that labour market training increases the average productivity of workers and hence wages and employment. Moreover, the parameter associated with this effect is significant in most specifications. The unemployment effect introduced in the same manner usually has the opposite sign, implying that unemployment decreases the average quality of workers. However, in some of the specifications this effect is small and insignificant. Since the different specifications used differ only slightly, we conclude that this effect is not robust.

The effect introduced through the supply side of the market cause labour market education to depress wages and increase employment. The estimates reveals that there is always a significant difference between the worker's valuation of labour market education and unemployment. This result is contrary to earlier findings using Swedish time-series data, where wages are found to increase as a result of labour market education. Our result indicates that unemployed workers are better off being left in open unemployment than being in labour market education. The cause for this result is, of course, speculative. One has to address, explicitly, workers attitudes towards labour market education. In our particular data set, the effect is partly caused by a strong positive correlation between employment and the number of persons in labour market education. Therefore, the problem should be studied using other data before any far reaching conclusions can be drawn. However, the results concerning the supply effect are, at least to some extent, confirmed by two other studies using panel data sets; see Edin et al. (1992) and Forslund (1992).
2.4 Employment and Membership Hysteresis in Sweden: An Application Based on Time Series Data (Paper [IV])

An important problem in the Western economies is the high and persistent level of unemployment. One cause closely related to the wage determination problem is the potential existence of insiders in the labour market. Insiders are, as opposed to outsiders, thought of as those who have influence in wage and employment negotiations. The reason why they can exercise this power is because they are, in one way or another, incumbent workers protected from being fired. They can, for instance, be protected by legislation or by skill. Outsiders, on the other hand, are those who have little or no power in wage and employment determination. They are either unemployed or workers with little job—security.\textsuperscript{16}

The fact that insiders have market power, makes them, if they choose to use it, able to alter the wage structure to their advantage. In particular, they can discriminate against outsiders by pushing up wages and thereby worsen outsiders' employment prospects. In an extreme case, they can set the wage so that all insiders are retained and no outsider is employed.

This theory yields some predictions that constitute testable hypotheses. One such prediction is the hypothesis that shocks to employment (and unemployment) will tend to persist, and that employment will only slowly adjusts to its "natural" level. The extreme case of persistence is referred to as hysteresis, and corresponds to a situation where shocks to employment have permanent effects. In order to highlight insider effects, the most common line of empirical research uses, in one way or another, the prediction of persistence as the basis for empiri- 

\textsuperscript{16} Lindbeck & Snower (1988) develop the ideas underlying the Insider—Outsider theory. See also Ball (1990) for a recent criticism of the Insider—Outsider theory.
Another approach uses the foundations of the theory, for instance by comparing hiring or firing costs among different economies.\footnote{There is a growing empirical literature on this particular topic. See e.g. Alogoskoufis & Manning (1988), Blanchard & Summers (1986), Blanchflower et al. (1990) and Nickell & Wadhwani (1990).}

The Swedish experience up to date is somewhat mixed. A majority of studies reject the insider hypothesis in the Swedish labour market. Holmlund & Zetterberg (1991) estimate wage equations with lagged employment as an explanatory variable using a panel of industry data. They find no significant insider effects in the Swedish industry. Nor can Calmfors & Forslund (1990) and Wikström (1991), applying similar tests using time-series data, establish any significant insider effects. However, Alogoskoufis & Manning (1988) and Forslund (1991) find some support for the hypothesis.

In order to address the problem of persistence empirically, insiders have to be defined. Since the number of insiders is unobservable, it is common to define insiders as those employed in the previous period. However, there are no a priori reasons why insiders should correspond exactly to lagged employment. In paper \cite{IV}, this particular assumption is relaxed. Following Lindbeck & Snower (1988, chapter 9) an entry–exit function is defined. This function allows for a number of possible definitions of the incumbent workforce. Given this membership rule, a simple trade union model is constructed. The model is set in a static framework, where workers decide over wages subject to a constraint that the expected number of employed coincides with the number of insiders.\footnote{See Bentolila & Bertola (1990) and Bertola (1990).} The basic model is then augmented with the entry–exit function. A likelihood ratio test

\footnote{More general models where uncertainty is explicitly considered in the decision making process can be found. See, e.g., Gottfries & Horn (1987). See also Leslie (1992) who discusses insider models and implicit contracting models in one context.}
and a t-test can be used to sort out the "acceptable" insider hypotheses from those that are unlikely to have been generated by such behaviour. In particular, membership hysteresis is a testable hypothesis within this framework.

The empirical analysis uses time-series data from seven sectors within the Swedish economy. First, the employment series are tested for a unit-root (hysteresis) using a simple Dickey-Fuller test. Hysteresis cannot be rejected. However, when the membership rule is used, five out of the seven series can be rejected as inconsistent with the model outlined. In two cases the insider model cannot be rejected: the Transport sector (SNI 7) and Banking (SNI 8).

In addition, we also estimate a model of insider behaviour using a simultaneous equations approach. The advantage with this model is that it is possible to control for other hypotheses generating persistence in employment. This model is applied to two data sets: the Construction sector and the Pulp industry of the Swedish economy. In the latter case a significant insider effect is found, whereas in the case of the Construction sector no such effect can be found. This set of estimations suggest that there are sectorial differences with respect to insider effects.
References


