

# Why do Employees Voluntarily Participate in Centralised Wage Bargaining?

*An Investigation of the Scandinavian Model using an Evolutionary Game Theoretic Approach*

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## Preface

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## Summary

This thesis investigates the behaviour of employees captured by centralised wage-negotiations. It is empirically shown that centralised institutions are correlated with compressed wages, which in turn accumulates several types of conflicts. A centralised unions' association face similar conflicts of interest as within a plant union. The employees of different skills and crafts have distinct demands towards the employer, representing their importance for the final product. Within this bargaining, no person or group can raise specific demands without creating some sort of externality onto the other employees.

Compressed wages lead to higher wages for the least productive employees and lower wages for the most productive employees. This in turn makes the employers demanding the latter better off, as the wage bill becomes lower with compressed wages. With centralisation a potential conflict arises within the employers' confederation; between the skilled labour employers and the low-skilled labour employers, demanding the distribution of productivity among the labour.

By letting the wages in a society be based on norms, I implement the described conflicts into a game-theoretic approach, similar to the Battle of the Sexes. In a game between a more than average productive employee and an employer demanding this specific labour, both players need to coordinate on a wage-contract. As the employee receives a lower wage with a centralised wage-contract, the employee would prefer if they coordinated on a decentralised contract. However, the employer has opposite preferences. He/she has a lower wage-bill in the centralised case and prefers on coordinating on a centralised wage-contract. If they cannot coordinate, they receive nothing. One may argue that the productive employee carries an opportunity cost. This cost is similar to what he/she would have made in a decentralised system, with negligible compression of wages. The game is played many times. The probability of the other player playing a specific contract is based on information the players gather through previously played stage-games, games with other players, word-of-mouth or other sources of information. By using this information both players calculate their best response strategy. If all employers are expected to play the strategy of centralised wage-contract, the employee's best response strategy becomes to coordinate. When the players are expected to coordinate on this specific contract, and the expectations become self-enforcing, the strategy becomes a convention. This suggests that the most productive employees

voluntarily participate in the centralised wage-bargaining, due to their best-response strategy.

If the opportunity-cost change, the expectations of the players change. This could be caused by movements in the economic environment, such as economic depression, booms, high level of industrial conflict etc. This may modify the players' best responses and the system may flip towards a decentralised wage-contract bargaining. Considering individuals being able to make random behavioural mistakes, some players will play non-best-responses. This theory suggests that only a few players not able to coordinate on the expected strategy may switch expectations from one convention to the other. An increase in the opportunity cost associated will impose enhanced pressure on the "satisfied" groups. In the centralised system, this implies the high-technological employers and the least productive employees. The convention becomes more accessible and tolerates fewer non-best responses. These non-best responses can be either stochastic or intentional. When the model is stochastic, the convention flips by the satisfied players playing "wrong". This may seem unlikely. When the satisfied groups are able to coordinate, the system can only change through intentional non-best responses by the most dissatisfied groups.

Equipped with this theory and the historical background of the Nordic countries, this thesis provides an explanation of the implementation of the centralised system in these countries. Further, this thesis discusses forthcoming difficulties in sustaining these institutions. First is the role of migration. Because of free trade-agreements of services within Europe, migrants are faced with fewer problems of moving across the borders. This may alter the contextual best responses by either the most productive employees or the least productive employers. Second is a change of equality preferences within the unions' association. When unions accelerate their sense of actuarial fairness the system may be altered through intentional collective actions. However, by using theory of collective action, I find that the centralised system may persist, rather than imposing a conventional flip of best-response play. This is because the preference shock may not lead to collective action, but rather alter the distribution of power among the unions participating in the unions' association.

It has been argued by labour economists that the Nordic or Scandinavian model has been evolutionary rather than coerced politically. This thesis adds weight to the argument using models of evolutionary change through game-theory.

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## Table of Contents

<b>1. INTRODUCTION</b> .....	<b>1</b>
<b>2. LITERATURE REVIEW</b> .....	<b>3</b>
2.1 UNION OBJECTIVE IN ECONOMIC THEORY.....	3
2.2 POTENTIAL CONFLICTS WITHIN THE UNION AND THEIR EFFECT ON THE WAGE-DISTRIBUTION. ....	4
2.2.1 Dimensions of Collective Agreements.....	4
2.2.2 A model of union behaviour.....	6
2.3 MACROECONOMIC PERFORMANCE AND BARGAINING COORDINATION.....	8
2.3.1 Union Behaviour with Endogenous Prices.....	8
2.3.2 Level of coordination on union behaviour.....	10
2.3.3 Macroeconomic Performance and the Hump-Curve.....	11
2.4 LABOUR PRODUCTIVITY AND WAGE COMPRESSION.....	13
2.4.1 The wage equalizing effect.....	13
2.4.2 Employer participation and the role of technology.....	16
2.4.3 Creative Destruction by Wage Compression.....	17
2.5 SUM OF LITERATURE REVIEW- A HISTORICAL CONTEXT OF THE NORDIC COUNTRIES.....	18
<b>3. OTHER REGARDING PREFERENCES- INEQUALITY AVERSION</b> .....	<b>22</b>
3.1 INEQUALITY AVERSION AMONG UNIONS- NORMS OF FAIRNESS?.....	23
<b>4. WAGE-BARGAINING MODELLED AS A NORM-BASED COORDINATION GAME</b>	<b>25</b>
4.1 THE SETUP: BATTLE OF THE SEXES.....	25
4.2 HOW TO MODEL BARGAINING SITUATION BASED ON NORMS?.....	26
4.2.1 Description of a Nash-Demand game in the generalised wage-setting.....	27

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<b>5.</b>	<b>THE MODEL .....</b>	<b>29</b>
5.1	THE CONTRACT GAME IN A GENERALISED BARGAINING SITUATION .....	29
5.1.1	Expected payoffs of the players .....	30
5.2	STOCHASTIC PLAY INTRODUCED- LIMIT OF MEMORY .....	33
5.2.1	Reduced resistance.....	35
<b>6.</b>	<b>DISCUSSIONS.....</b>	<b>38</b>
6.1	IMPLEMENTATION OF CENTRALISED SYSTEM IN THE NORDIC COUNTRIES (I) .....	38
6.2	IMPACT OF LABOUR MIGRATION .....	39
6.3	SUMMARY AND CONCLUSION .....	41
<b>7.</b>	<b>INTENTIONAL NONBEST-RESPONSES .....</b>	<b>43</b>
7.1	MODIFIED REDUCED RESISTANCES .....	43
7.2	HOW WILL THE PLAYERS BE SELECTED FOR ACTIONS TOWARDS NON-BEST RESPONSES?.....	45
7.3	THE COLLECTIVE ACTION PROBLEM .....	46
7.3.1	The free-rider problem- no-one participates in the collective action .....	47
7.3.2	Benefits and costs of collective action .....	48
7.3.3	A model of Collective Action .....	50
<b>8.</b>	<b>DISCUSSIONS.....</b>	<b>53</b>
8.1	IMPLEMENTATION OF CENTRALISED SYSTEM IN THE NORDIC COUNTRIES (II).....	53
8.2	PERSISTENCE OF THE CENTRALISED SYSTEM .....	54
8.3	REVERSIBLE DECENTRALISATION .....	54
<b>9.</b>	<b>CONCLUDING REMARKS.....</b>	<b>57</b>
	<b>REFERENCES.....</b>	<b>58</b>

# 1. Introduction

Few theorists have investigated if and why the most productive labour voluntarily participates in centralised wage negotiations. An explanation often assumed is that employees in societies with centralised institutions have altruistic traits, are strongly inequality averse or have other egalitarian preferences. This thesis treats this subject as individual choices in a game theoretic approach.

There are a variety of systems of collective bargaining with a varying degree of centralisation. It has been widely agreed by labour economists that centralised wage negotiations compress wage-distribution in a society (Barth and Moene, 2008, Flanagan, 1999, Cahuc and Zylberberg for summary, 2004). That is, less productive employees tend to receive higher wages than their marginal product of labour. Conversely, at the other side of the productivity distribution, the most productive employees obtain less than their marginal product of labour.

Compressed wages clearly magnifies conflicts between the most productive employees and the least productive. However, equally important are the conflicts arising on the employers' side of the negotiations. A high-technology company demanding productive and educated employees will possibly benefit from compressed wages, as their wage-cost becomes less than the marginal product of labour. Conversely, the low-technology companies face higher wages. These conflicts are described further in chapter 2 which provides a survey of the literature on economic theory of collective bargaining.

The unions' associations in the Nordic countries have bargained wages according to solidarity preferences utilising the slogan *equal pay for equal work*. This can be assumed to be some sort of inequality aversion within the centralised unions' association. This will be further explained in chapter 3.

By converging the bargaining situation into a  $2 \times 2$  *Battle of the Sexes* game representing a range of possible wage-contracts, it is possible to explain employees participating in centralised wage-negotiations as a best-response strategy. This is possible by letting wage setting be based on norms. By the theory provided by P. Young (1996, 1998a, 1998b) on conventions and stochastic stable equilibria, *playing centralised* by the productive

employees and employers respectively becomes a convention. Chapter 4 introduces the basic setup using game theory and introduction of social norms, while chapter 5 provides the model used to analyse the problem.

However, as the system may persist due to coordination between employers benefitting from the system, Chapter 7 provides models of intentional play by the productive employees. The purpose of this is to investigate the opportunities a productive employee has to alter the system in a preferable way.

Chapters 6 and 8 discuss how the models presented may be able to analyse how the institutions affect the participants' behaviour. Further they provide some obstacles the centralised institutions face in an increasingly globalised environment. As information technology advances and free-trade agreements are imposed, the best-response play of the players may be altered. Rather than coercion, this thesis emphasizes the willingness of the players to act in certain ways for institutional change. This change can eventually be explained as being evolutionary. Chapter 9 gives some concluding remarks in this respect.



## 2. Literature review

This section describes the different conflicts of interest that arise in collective agreements. From the presentation of economic literature, it is the aim of this section to explain how the separate outcomes will act upon the workers' wages and employers' profits.

The first section describes the union objective function, and how multiple preferences may alter the wage-bargaining. The second section will depict different dimensions of collective agreements and evaluate the potential conflicts of interest within the union(s) and employers, respectively. The third section presents discussions on macroeconomic performance in the dimensions of wage-bargaining and introduces the hump curve. The fourth section discusses the particular conflicts between employees and employers in terms of labour productivity and the role of technology.

### 2.1 Union Objective in Economic Theory

In the simplified Right to Manage- model presented in Cahuc and Zylberberg (2004, chapter 7) the bargaining is situated between a single union and a single employer. The objective of the unions is to maximise the wages of their members and they are given some power in the negotiation, which can be regarded as the union's discount rate. That is, the more impatient the union is towards the employer, denoted by a higher discount rate, the weaker it makes their bargaining strength. The employer is given some monopoly power and demand labour to maximise profits. After implementing the objectives of the different parties in a Nash-bargaining setup, two critical issues need to be raised. First, the agreement of the wages is not pareto-efficient. For a given profit of the firm, the union utility could have increased by lowering the wages, and hereby increasing employment. However, since the union objective is to maximise wage according to their bargaining power, they will not reach such an efficient agreement. Second, a stronger union implies larger wages of members, however, it also implies fewer labourers employed. This is a reasonable prediction since the firm maximises profits such that the marginal revenue equals the marginal costs. Equation (2.1) depicts the Nash-bargaining setup.  $(U_1, \Pi_1)$  express the utility outcome of the union and profits of the firm subsequent to an agreement,  $(u_0, \pi_0)$  is the fall back position if the

negotiation fails.  $\Omega$  is the bargaining power of the union.  $r_i$  denotes the discount rate of the different parties.

$$(2.1) \quad w = [U_1 - u_0]^\Omega [\Pi_1 - \pi_0]^{1-\Omega}$$

$$\Omega = \frac{r_\Pi}{r_u + r_\Pi}$$

Efficiency is easily addressed if the objective function of the union is altered such that they maximise utility over both wages and employment. For a given profit-maximising firm with a given demand-for-labour curve, the union bargains over both wage and employment so that the firm are indifferent between the two outcomes. In doing so, the labour union moderate wages weighted against employment. Other than wage and employment, union preferences might be on a society level; political power, stability, megalomania, or collective coverage of agreements made with the employer. However, it may also be on more personal and individual arrangements; company car, kindergarten accessibility, or health-and pension insurance. The importance of these preferences will affect the wage-level agreed upon by the parties.

## 2.2 Potential conflicts within the union and their effect on the wage-distribution.

### 2.2.1 Dimensions of Collective Agreements

Across the world, several different systems of wage negotiations have evolved and persisted. In some countries workers have organised rather strong unions with many members and in other countries union members are almost no-existent. Equally important is the collective coverage of the unions' agreements with a company or employer confederation. *Union density* equals the proportion of wage-earners who are unionised and *collective coverage* is proportion of wage earners who are covered by collective agreements (Cahuc and Zylberberg, 2004). These two measures can be implemented into a *degree of centralisation* of wage negotiations. Along with employment laws, this may help explain the differences of bargaining institutions across countries. Moene et al. (1993) describes two different

dimensions of wage-bargaining, depicted in Table 2.1. The first dimension depicts the level of the negotiations; plant, industry or nation. The second dimension is whether workers of different positions bargain jointly or separately.

Levels of wage-setting	Each Type bargains	
	separately	All Types bargain jointly
Plant	Complete decentralisation (i)	Company unions (ii)
Industry	Craft Unions (iii)	Industrial Unions (iv)
Nation	Complete Centralisation (v)	

*Table 2.1* equivalent to Moene, Wallerstein and Hoel (1993) Table 11.2

- (i) Complete decentralisation: the company and the employee negotiate the wage independently. Without considering the consequences of others employed, an employee may raise wage-demands towards the employer. If she succeeds, the overall cost to the employer is increased. For the employer to be indifferent ex post, other employees may suffer from cut-backs. There are no collective coverage and the employees need to unionise to participate in collective negotiations.
- (ii) Company union: the workers of a company unionise and announce wage demands towards the company. There exists a conflict of interest in the hierarchy of the company. The conflict arises from the power and skills among the employed. An employee or a group of employees cannot raise wage-demands without considering the total employment. The members of the union need to sort out how big a share the different employees of respective skills and value shall receive after a negotiation.
- (iii) Craft unions: the workers of a craft are represented by a single union which bargains the wage towards the many employers demanding this specific craft. The craft union does not have any incentive to moderate wages as they only care about their members. In other words, craft unions experience little internal conflict of interest, because it is the preference of all members to raise wages. If a

society relies on a system where all crafts are unionised separately, it is reasonable to predict a wage and price spiral.

- (iv) Industry unions: the workers in an industry unionise and the union represents the industry as a whole. Similar to craft unions, the workers in the industry have a certain power towards the employer(s). However, since the union is comprised by different crafts, an internal conflict within the unions may exist in developing the different demands.
- (v) The complete centralised system of wage-negotiation involves all the different workers in the different industries represented by a union confederation. In this system there are two stages of conflict. First, the workers across crafts, industries, skills and productivity need to resolve the internal arguments of pay-differentials within the union association. Second is the actual conflict with the employers. The complete centralisation system is found basically in the Nordic countries today.

In case (v), both the union density and the collective coverage are great. One may reason that this is the only possible centralised institutional system, however, in many countries the bargaining within a specific industry or plant may act as guidelines for local bargaining in other sectors. In this sense, the union density may be small, while the collective coverage is substantial. This will also be a form of centralised institutions. How to classify the bargaining system has long been discussed in labour economic literature (Cahuc and Zylberberg, 2004, Flanagan, 1999, Blanchard and Wolfers, 2000).

### **2.2.2 A model of union behaviour**

The following paragraph follows Moene et al. (1993) in describing the economic mechanisms and union behaviour of the different systems. The model is based on the Right to Manage model described in equation (2.1). Union objectives are to maximise utility of real wages and level of employment. The latter is determined by the employer. The unions are considered to have monopoly power over the negotiation ( $\Omega = 1$ ). For a single union the utility is given by

$$(2.2) \quad u = u(w, L(w))$$

$$(2.3) \quad FOC: \frac{\partial u}{\partial w} + \frac{\partial u}{\partial L} \frac{\partial L}{\partial w} = 0$$

The utility is increasing in both arguments,  $u_w > 0, u_L > 0$ . The employment is believed to be a decreasing function of the wage,  $\frac{\partial L}{\partial w} < 0$ . To capture the two dimensions portrayed above, Moene et al (1993) extends the model to include more than one single union. The employees with different skills announce wage-demands presented to the employer. However, a potential wage increase in one union may generate externalities on another, either positive or negative. The sign of these externalities are subject to whether the workers are what Moene et al terms *substitutes* in production or *complements* in production.

With complements in production Moene et al (1993) refer to a situation where wage increase in one union would decrease the demand for labour in another. The presence of one type of job will increase the productivity of the other, when both are needed for the final product. Substitutes in production are referred to when the different employees within the same craft or with similar skills are represented by different unions. If one union potentially demands higher wages, the company could easily lay off all members of this union and hire employees with membership in a competing union.

When unions coordinate towards more centralisation, they internalise these externalities created by the wage demands of different workers or crafts. This internalisation demonstrates the conflicts of interest within a company union, an industry union or a national centralised system, as described in Table 2.1. Thus, if wages was set to maximise some sort of collective welfare function, the optimal collective choice is given by

$$(2.4) \quad \max_{w_1 \dots w_k} \sum_{i=1}^k u(w_i, L(w_i)) \quad \text{s.t.} \quad L_i = L_i(w_1, \dots, w_i, \dots, w_k)$$

$$(2.5) \quad FOC: \frac{\partial u_i}{\partial w_i} + \frac{\partial u_i}{\partial L_i} \frac{\partial L_i}{\partial w_i} + \sum_{i \neq j}^k \frac{\partial u_j}{\partial L_j} \frac{\partial L_j}{\partial w_i} = 0,$$

The first order condition describes a similar situation as in equation (2.3). However, the last term expresses the internalisation of a wage demand on other labourers. If a wage increase raises employment in other unions they are said to be substitutes in production,  $\frac{\partial L_j}{\partial w_i} > 0$ . If

the wage increase lowers employment in other companies' unions', the members are complements in production,  $\frac{\partial L_j}{\partial w_i} < 0$ .

Equations (2.2) to (2.5) explain differences between a decentralised company union case, a craft or industry union system and a fully centralised one. If unions are substitutes in production they will gain benefits of coordination from company unions to industry unions, as they will be able to raise wage demands. The reason is that the industry unions' association does not have to worry about competition from other unions. In other words, the power of a potential strike is more credible and will affect all employers. Moene et al call this a *vertical coordination* from plant to industrial unions (see Table 2.1). In contrast, when the union members are complements in production a wage increase by one union will have a negative impact on the others. By internalising this externality, no members or unions can demand a greater wage without solving the conflict with the other members/unions. This reflects a vertical shift in Table 2.1 from industrial unions to national coordination. It can also explain a *horizontal coordination* shift from complete decentralisation to plant unions or craft unions to industry unions. In this respect, a plant union will face similar conflicts of interest as the aggregate national level will.

## 2.3 Macroeconomic Performance and Bargaining Coordination

### 2.3.1 Union Behaviour with Endogenous Prices

By extending the model above to include endogenous prices, the new union objective is to maximise the real wage of its members. In other words, if the union can increase wages, but not increase the overall prices reflected in the consumer price index, its members will have increased utility. The objective function is given by

$$(2.6) \quad u = u\left(\frac{w}{p^c}, L\left(\frac{w}{p}\right)\right)$$

$w$  represents bargained wage,  $p^c$  the consumer price index, and  $p$  represents the price of the product the firm produces respectively. The consumer price index is implicit depending on

both prices of the product price  $p$ , and prices on all other goods  $p^*$ . Because wages in a company may provide externalities on other companies, the prices are again implicit functions of the wages in the respective company  $w$ , and the wage of other companies  $w^*$ . This is summarised in equations (2.7).

$$(2.7) \quad \begin{aligned} p^c &= p^c(p, p^*) \\ p &= p(w, w^*) \\ p^* &= p^*(w, w^*) \end{aligned}$$

By differentiating equation (2.6) with respect to  $w$ , having in mind (2.7), the FOC gives information on how much a wage increase will impact the product-price of a respective product and the impact on the consumer-price index. If the union's wage-increase, in one company or sector, exercises a raise of the product-price in a manner that the relative wage is not affected, the layoffs will be marginal. If the weight of the product-price on the consumer-price index is small, the relative wage of the workers has increased substantially against consumption.

$$(2.8) \quad FOC : \frac{\partial u}{\partial w} = u_1 + hu_2 L' \left( \frac{w}{p} \right) = 0,$$

$h$  represents to what degree a wage increase will affect the product-price, the price of other companies and subsequently the consumer-price index. Notice, if  $h = 1$ , equation (2.8) becomes similar to equation (2.3). The union has to moderate wage-demands in order to maintain employment level. However, if  $h < 1$ , the union may increase utility by raising wages, since the impact on the level of employment is smaller than the benchmark case of equation (2.3).

In order to investigate the macroeconomic performance on employment, equation (2.8) needs further attention.  $h$  is given by equation (2.9) and (2.10).

$$(2.9) \quad h = \frac{1 - \eta}{1 - (\theta\eta + (1 - \theta)\eta^*)}$$

$$(2.10) \quad \eta = \frac{\partial p}{\partial w} \frac{w}{p} \quad \theta = \frac{\partial p^c}{\partial p} \frac{p}{p^c}$$

$$\eta^* = \frac{\partial p^*}{\partial w} \frac{w}{p^*} < \eta \quad (1 - \theta) = \frac{\partial p^c}{\partial p^*} \frac{p^*}{p^c}$$

The elasticity  $\eta$  measures how much the price of the product will increase subsequent of a wage increase in the respective company, while  $\eta^*$  says how much prices of the other products increase after the wage increase.  $\theta$  measures the effect of a price increase on the consumer price index.

Consider a union with high  $\eta$  and low  $\eta^*$ . From (2.9) and (2.10), this union may increase wages drastically. The high  $\eta$  tells that the company “bakes” the increased wages into the price of the product, while the low  $\eta^*$  makes sure the increased wages will not affect other prices. Accompanied with a small  $\theta$ , the union has managed to increase *real* wages and utility of members. From equation (2.8) and (2.9) this is shown by a small  $h$ . The behaviour of the union depends on the negative impact of increased wages on employment.

### 2.3.2 Level of coordination on union behaviour

If negotiations are set at plant level, the firms are considered strictly as price takers. This implies that  $\theta = 0$ . That is, the product-price does not affect the consumer price index. Thus, the unions observe prices as independent of its own wage, hence  $\eta = \eta^* = 0$ . Implementing these into (2.9) one gets  $h=1$ . By this reasoning, in the decentralised system, no union will aggressively raise wages if level of employment of their members is undertaken.

At the other extreme, in the national system, the prices set by the employer confederation equals the consumer price index. Thus, when  $p=p^c$ ,  $\theta = 1$  it follows that  $h=1$ . The internalisation of externalities within the confederation forces the unions to moderate wages to keep employment at a steady level. Similar conflicts arise in the national system as within a specific plant union.

At the intermediate level of coordination, craft- or industrial unions will have lesser incentive to moderate wage demands. This is explained in the following way; picture that all workers within a particular craft have organised a craft union. Depending on the importance and utilisation of the craft, the wages set by the union will have some positive impact on the



product-prices. The craft may operate within many industries or only within a particular industry. Anyway, if the product-prices of a single industry increase, this will have an impact both directly and indirectly on the consumer price index. Hence, a wage increase for an entire craft results in  $\eta > \eta^* > 0$  and  $\theta \in (0,1)$ . Similar reasoning can be used for industrial unions; however, they may face some internal conflict between crafts before announcing wage demands. Though, the larger the  $\eta$  and the smaller the  $\theta$ , the more militant the union may behave due to decreased  $h$ . In other words, the union is able to transport the added cost of increased wages onto “everybody else” through the consumer price index.

### 2.3.3 Macroeconomic Performance and the Hump-Curve

If all workers were either organised in craft- or industrial unions, comparing the latter system with the two above, depicts a wage- and price-spiral. The relationship between degree of coordination and unemployment performance has been thoroughly researched in economic literature (Summarised in Cahuc and Zylberberg, 2004, Flanagan, 1999) Calmfors and Drifill (1988, quoted in Cahuc and Zylberberg, 2004) describes a hump-shaped relation between the degree of centralisation of bargaining and the unemployment rate ( $u$ ).

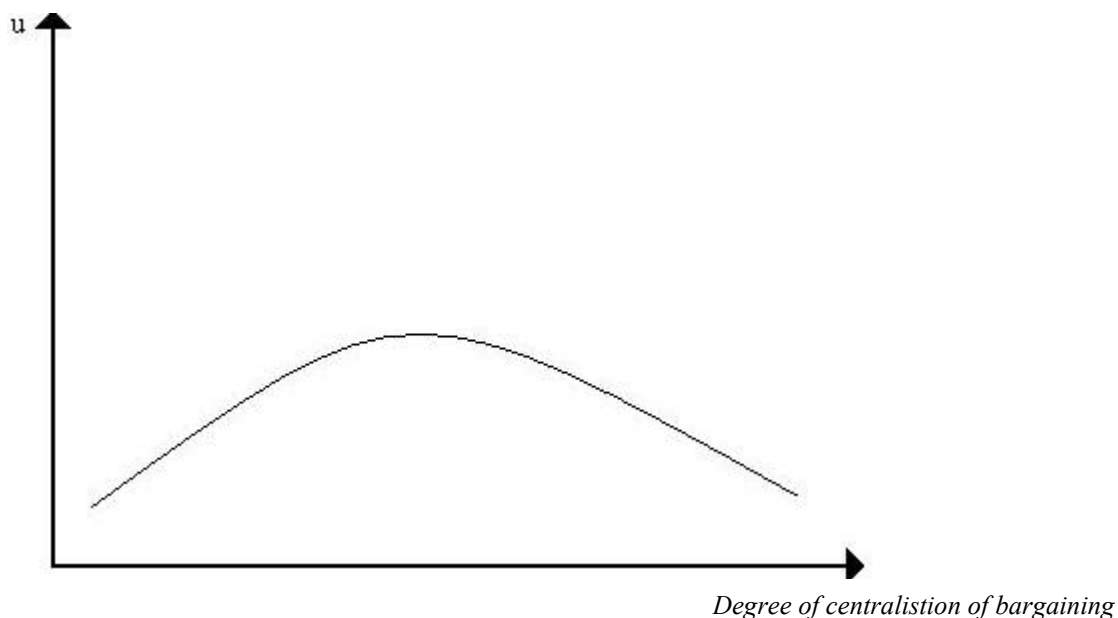


Figure 2.1 Source Cahuc and Zylberberg (2004)

Flanagan (1999) outlines two attacks against this hump-shaped hypothesis of macroeconomic performance. The first objection of the argument regards the assumptions of a closed economy and complete bargaining coverage. Flanagan (1999) argues: “To the

extent that foreign goods are substitutes, it will become difficult for domestic firms to pass on pay increases to the consumers, (...) [And] industry-wide bargaining units to pass on wage into prices. The higher risk of employment loss in the face of international competition should also mitigate union wage demands.” The second objection is the argument of the relationship between the *level* of collective bargaining and macroeconomic performance. The flexibility does not rely on bargaining coordination as a *centralised institution*, but rather on the degree of coverage of the outcome. An example of a high degree of coverage is the spring-offensive (Shunto) in Japan, where company level bargaining in some representative companies act as guidelines for other bargaining units. Flanagan summarises the empirical work made in the 1990s, predicting that any relationship between bargaining structure and macroeconomic outcome is contingent on the particular economic or political environment of a country and the technical relationship between different groups of unionised employees.

Conversely of Flanagan’s critique of centralisation and openness, the Nordic countries have a relatively high degree of centralisation and are both open and specialised economies. However, the relationship between centralised bargaining and specific features of the “Scandinavian” welfare state may act complimentary with the wage-system. These features include: generous and universal unemployment benefits, health- and pension insurance and child support and the unions’ effort to implementing “equal pay for equal work” together with a full employment policy. Calmfors (1982, quoted in Flanagan) describes the governments (usually left-of-centre) behaviour when employment falls below a specific target. To offset the employment disturbances, the government appeals to labour constituencies by increasing public employment. Flanagan (1999) argues that the active role of the government in accommodation policies lowers the elasticity of demand facing a centralised union, inducing a higher real wage in equilibrium. The specific features of the Scandinavian countries may therefore result in the opposite of the rationale described above, that centralisation creates lower real wages. However, the public employment is guarded by the centralised wage-negotiation. This may make it easier for the government to raise public employment in the first place. The equality preference within the central unions’ association will compress the wages respectively. The mean wage-earner will face a higher real wage, while the top wage-earner will make a lower real wage.

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## 2.4 Labour Productivity and Wage compression

### 2.4.1 The wage equalising effect

An article by Barth and Moene (2008) provides empirical findings of both *an equality magnifying effect* and *a wage equalising effect*. The first mechanism: “runs from the wage distribution to the determination of welfare state policies: More wage equality leads the majority of voters to support a more generous welfare state. The other mechanism runs from welfare state policies to wage determination: More generous welfare benefits reduce wage inequality by strengthening weak groups in the labour market.” The latter argument is even stronger with a higher level of coordination in wage-negotiations. Barth and Moene (2008) argue: “A drop in the coordination, (...) from full coordination to full decentralisation, increases wage inequality by 12 percent.” This, they claim, will give negative feedback for welfare generosity which again decreases wage inequality through *the equality multiplier*. This expresses two important features. First, there is a direct positive relationship between wage-coordination and compression of wages. In other words, when wages are bargained between a union confederation and an employers association, the *least productive* employees tend to get increased wages, while the *most productive* employees tend to get decreased wages. Second, wages will indirectly be further compressed through welfare generosity in a multiplier. These features are not compatible with standard economic theory of incentives as the workers are not paid in line with their marginal productivity of labour. This raises the question if the most productive labourers would freely join the wage coordination, as this would lower their wages.

The model by Barth and Moene (2008) illustrates the argument of wage-compression between productive labour and less productive labour. They regard the wage-coordination process in two stages. The first stage is the negotiation between the unions’ association and the employer confederation. The model used is a Nash-bargaining similar to the one presented in equation (2.1). The fall-back positions ( $u_0$  and  $\pi_0$  in (2.1)) are regarded as the outcomes of wages and profits in a decentralised system, times a loss of value due to labour disputes in case of breakdown. This is a measure of  $\delta < 1$ . The next stage is the internal negotiations within the unions’ association. In a decentralised system all unions have equal strength towards the employer, however, in the union-union negotiation a concern is raised

for equal treatment,  $r \in (0,1)$  in addition to rewards according to labour productivity,  $p$ . If  $w(p)$  represents some wage received in a decentralised system depending on the individual's productivity, let  $W(p)$  be the wage obtained in a centralised system.

$$(2.11) \quad W(p) = w(p) + (1 - \delta)r\alpha[\hat{p} - p],$$

In equation (2.11),  $\alpha$  is the bargaining power of the unions' confederation in the first stage (equivalent to  $\Omega$  in equation (2.1)), and  $\hat{p}$  is average labour productivity. Depending on the concern for equal treatment in the internal conflict, equation (2.11) implies that an individual with lower labour productivity than the average worker will benefit from higher wages in the centralised system. However, a more productive worker will pick up a *cost* in the centralised system, induced by lower wage. This can be regarded as an opportunity cost carried by an above average productive employee in a centralised wage-bargaining system.

Barth and Moene (2008) found a significant relationship between wage-coordination and compression of wages. Table 2.2 depicts wage inequality in the OECD countries represented by the ninth deciles of wage earners divided by first deciles. Table 2.3 shows the wage distribution between the top wage-earners divided by the median wage-earners.

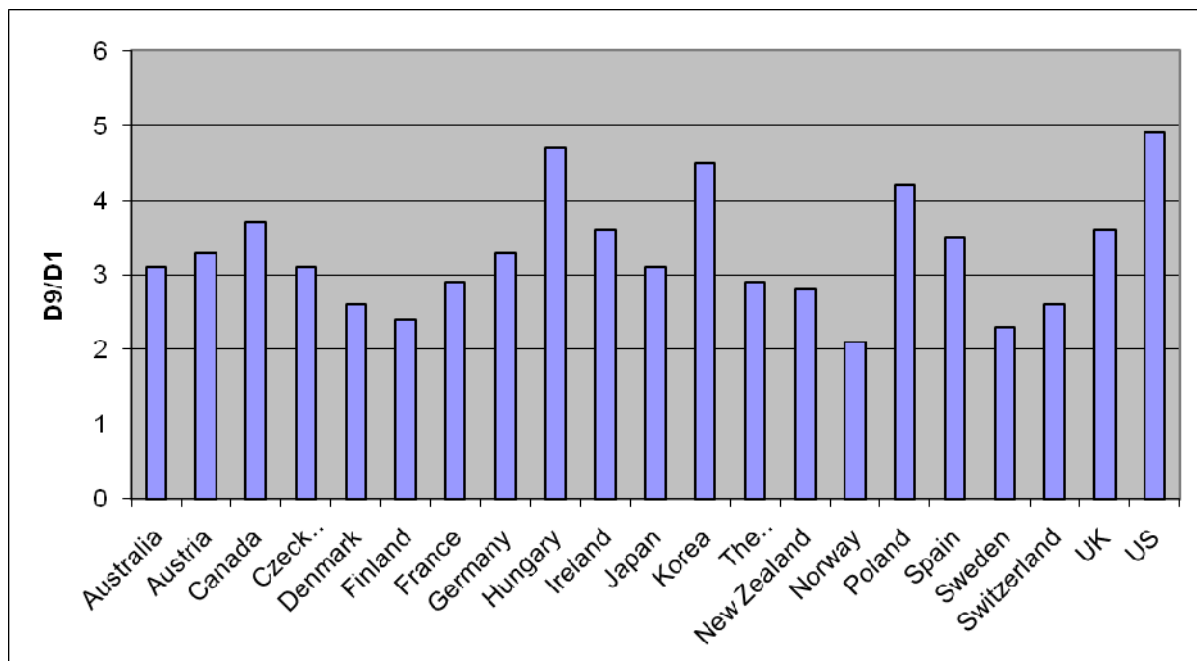


Table 2.2

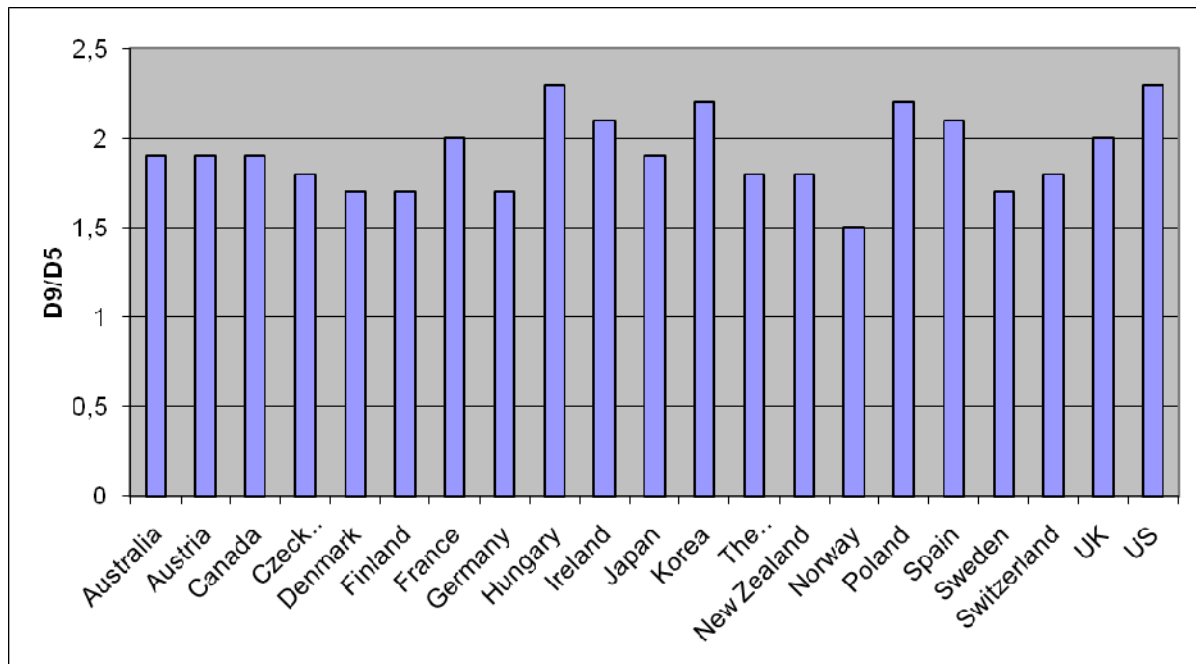


Table 2.3 Source OECD Earnings Database

In Norway the highest wage-earners make 2.21 times more than the ten percent with the lowest wages and in Denmark 2.64 times more. The difference in wage equality towards the Anglo-American countries is striking. In US the highest wage-earners make 4.86 times more the lowest wage-earners and in UK they make 3.62 times more. The continental European countries are somewhat in-between with France and the Netherlands with 2.91 and Germany at 3.26. The wages earned by the ninth deciles divided by the median wage are much lower in countries with higher degree of centralised wage bargaining. In the Nordic countries, along with Germany, the highest wage earners make 1.5 to 1.7 times more than the subsequent median wage earner. In the Anglo-American countries and in continental Europe the difference is much greater.

Equation (2.11) describes an important characteristic often used by critics of union presence. Progressively lower wages to productivity will give less incentive for people to gain productivity by education or other kinds of experience. Further, the employers will not be able to raise wages in order to attract the most productive labourers, since they too are bound by the wage-negotiation. So far this thesis has focused mainly on the employees and their preferences measured through union utility. However, the employers' bargaining preferences may be as important as the workers'.

### 2.4.2 Employer participation and the role of technology

Arguably, in a country with high degree of centralisation, the various employers experience similar internal conflicts within the employers' confederation as unions within the unions' association. Employers of different production, craft utilisation, industry and technology will have a range of demands towards each other and against the unions.

The process involves another important feature to be discussed. Are the employers forced into the system of centralised wage bargaining, or do they participate voluntarily? It is fairly reasonable to believe that employers of the most productive labourers actually benefit from the progressive wage-restraint carried by their employees respectively. In other words, high-technology industries or companies, which demand a significant share of the most productive workers in the distribution of productivity, will achieve lower wage-costs in the centralised system. A potential conflict within the confederation is between low-productivity companies and high-productivity companies.

Rueda and Pontusson (2000) describes that from the demand side, "labour economists typically argue that growth of wage inequality in the US, and elsewhere, reflects technological changes, which have rendered more educated workers more valuable to employers than less educated workers." Further, they explain with regard to the supply side, "(...) the compression of wage differentials prior to the 1970s coincided with rapid growth of university enrolments, that is, with an increase in the relative supply of educated labour. As the growth of university enrolments decelerated, the supply of better-educated labour subsequently failed to keep up with demand, giving rise to sharply increasing returns to education." Hence, as technology advances, more employers demands skilled labour to cope with new technology. In a centralised system these employers may then benefit from the compression of wages. Swenson (1991a) suggests that "centralised unions and the Left exercise institutionalised power in advanced industrial societies not against or in any way at the expense of employers." This is also the reasoning in an article by Moene and Wallerstein from 2006 called "Social Democracy as a Development Strategy". They explain that in the development of the Nordic countries the government, or *The Social Democrats*, saw the primary obstacle to modernisation as strong local unions whose wage premiums restricted the expansion of the most productive sectors. "By reducing profits in low-productivity firms and increasing profits in high-productivity firms, labour and capital would be induced (or

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coerced) to move from low productive to highly productive activities, increasing aggregate efficiency as well as improving equality” (Agell and Lommerud 1993, quoted in Moene and Wallerstein 2006; Moene and Wallerstein 1997).

### **2.4.3 Creative Destruction by Wage Compression**

In a model developed by Moene and Wallerstein (1997) coordinated wages and decreased competition for productive employees results in a faster rate of creative destruction. In other words, a fully decentralised wage setting “subsidises” low-productive companies by unskilled and poor labourers. In the centralised system these companies will carry an extra cost equivalent as introducing a tax on these companies. In contrast, the more productive employers receive a “tax-relief” inducing more investments in new technology. The above description is similar to that of Jones (1987, quoted in Cahuc and Zylberberg, 2004) and the impact of minimum wages. Jones distinguishes between “good jobs” which require people who can handle complex tasks, and “bad jobs”, in which they don’t. As Cahuc and Zylberberg (2004) reason: “The workers with the good jobs, whose effort at work can only be observed imperfectly, receive an efficiency wage, while the ones with a bad job are paid at a lower rate, equal to their reservation wage. When a minimum wage lying somewhere between (...) it reduces the efficiency wage and increases the number of good jobs opened up. In some circumstances, the increase in the number of good jobs even exceeds the decline in the number of bad ones.” In the Nordic countries with centralised bargaining, there is no “minimum wage” introduced by politicians, rather the different parties of the wage negotiations discuss lower bounds and “predicts that, at company level, the employees are given increments” (Stokke and Seip, 2003). Thus, Rueda and Pontusson (2000) describe that a supply shock of unskilled labour due to immigrants and the massive increase in women’s participation in the labour force pressed the wage for unskilled labour down. This raised inequality in most OECD countries; except in countries where union-negotiated wage contracts were extended to non-union workers.

The role of technology and the strength of the different employers in a potential employer-employer negotiation may therefore be highly important when creating of a centralised wage system. If the employers of less productive employees are strong, and there are many, easy substitutable, unskilled workers in the workforce; the employers of high-technological firms may come out short in a potential internal bargaining. In an open economy, with plentiful

access to unskilled and non-unionised labour, this situation would seem reasonable. However, the presence of centralised systems is in fact found in small and open economies in the north of Europe. Furthermore, coordinated wage may reduce incentives for workers to invest in education; however, it may also create more jobs demanding better skilled employees. Thus, if education is expensive, one would demand higher wage as compensation. The next section summarises the theory discussed so far with a historical view from the Nordic countries.

## 2.5 Sum of Literature Review- A Historical Context of the Nordic countries

In the 1920s and the early 1930s, Norway and Sweden experienced a substantial degree of unemployment, which “was due to the highest level of industrial conflict in the world” (Moene and Wallerstein, 2006). The costs of these conflicts were extremely expensive for both employees and employers. As Moene and Wallerstein (2006) further reports:

“In Norway the number of working days lost in strikes and lockouts in one year- 1931- were three times larger than the total number of working days lost in industrial conflict over the twenty-five year period 1945-70. (...) Employers were equally militant in defending their interests [as workers’ unions]. More working days were lost in lockouts than in strikes.”

One would easily argue that these circumstances pushed the parties of the conflicts to seek for new arrangements in order to raise both long-term profits and wages. It has been argued by Peter Swenson that, driven by the Great Depression, the rationale for centralisation developed as a consensus among the unions. Swenson (1991a) writes:

“During the depression employers in traded goods were forced to reduce prices to maintain production, and unions like the metalworkers accommodated them by accepting wage reductions. Their ability to do so was limited by the fact that the metalworkers’ militancy could not be contained long if pay differentials across sectors were not reduced and kept under control. (...) It could not maintain long-term restraint, however, if wages in home-market sectors were not somehow indirectly subjected to the same discipline.”



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The arguments used by Swenson coincide with the theory of Moene et al (1993). Competition forced the export-sector to reduce prices, and subsequently wages. To prevent their members from relative poverty it was necessary that all other sectors showed restraint in their wage-demands to keep prices low. Their biggest obstacle was the union in construction and buildings. They were protected from international competition and their militancy was immense. Swenson (1991a) attempts to highlight the militant role of the employers in fostering union centralisation and argues that Scandinavian employers used multisectoral “sympathy” and “offensive” lockouts to promote the centralisation of union authority and industrial relations.

“Employers in *SAF* (employers’ confederation in Sweden) threatened a sweeping economy-wide lockout in response to strikes in the building trades begun in 1933. (...) As a consequence of pressure from Social Democrats, Agrarians, SAF and LO (Labour Unions’ Association) finally prevailed on the construction union to call off the strikes. The confederation stepped in again with even less hesitation in 1937 with a “brutal public rebuke” of two of its own construction unions that had called strikes.”

Flanagan (1999) argues that centralisation was contingent on the political and economic environment and stressed the government role in maintaining low levels of unemployment. The history of the Scandinavian countries demonstrates not only an active government in macroeconomic policies, but also a direct responsibility for the creation of the system in itself. This suggests that the government, when left-of-centre, may feel greater consciousness for the system and the level of employment. The relationship remains close to this day, and LO in Norway are the biggest contributor of funds to the Labour party ([www.partifinanisering.no](http://www.partifinanisering.no), 2007).

Flanagan (1999) describes the shortages to the hump-shape of centralisation on aggregate employment. In particular, he criticise the models of complements in production and substitutes of production and degree of the openness of economic activity. However, Swenson (1991a) explains that openness is one of the key features of the process of centralisation in the Scandinavian countries.

“For employers in small economies dependent on or vulnerable to international trade, problems with regulating pay across home-market and traded-goods sectors were probably more acute than they were elsewhere. In large countries employers in traded

goods had larger home markets and were therefore better insulated from international discipline. They would have been better able to raise prices along with wages to keep up with the construction industry.

Further Swenson claims that employers could coordinate punitive actions towards domestic competitors, which is not possible for their counterparts in small and open economies. Swenson argues that openness was merely the employers' bottleneck, rather than the substitution between employees. However, he describes the compression of wages with differences between Denmark and Sweden. In Sweden the skilled and unskilled metalworkers pushed successfully towards interoccupational levelling. In Denmark, the skilled metalworkers supported employers' effort to maintain differentials. Swenson claims the Danish Social Democrats intervened against the unskilled general labourers' union, but was allied with the skilled workers' union. This can be seen as a sort of coercion to bring labour from less productive technology towards more productive technology. The unskilled craftsmen in construction and metal were a militant but weak union, and the skilled workers wanted more control over the outcome of wages. Thus the outcome was somewhat similar, but with different histories. This clearly depicts the conflicts of interests both within the workers' unions and in an employer-employer relationship. However, as in Denmark it may seem somewhat strange that the skilled labourers wanted more centralisation. Did they know they would be less paid than in a decentralised system? Obviously, potential strikes by the unskilled could damage their own jobs, so their militancy needed to be weakened. A most important feature was the employers' pressure on centralisation in order to keep the unskilled worker unions in control, especially within the building sector. Axel Hadenius (quoted in Swenson 1991a) writes that as early as in 1907, Danish, Swedish and Norwegian employers met in Copenhagen to discuss cooperation. He claims that one of the few substantive resolutions they made regarding wage policies was to keep earnings in the building trades roughly in line with earnings in other industries. The benefit of centralisation has clearly been witnessed by employers in the Scandinavian countries. However, Moene and Wallerstein (2006) verify that employers in highly productive industries lost ability to attract workers with offers of higher pay. They write:

“The government, unions and employers responded to the problem with an array of active labour market policies that subsidised the movement of workers from one industry to another with training programs and grants to cover moving expenses. To

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keep highly productive employers from undermining the policy of wage restraint by offering workers generous benefits (which were harder than wages to monitor at central level), the Swedish employers' confederation lobbied the government to nationalise the provision of health care and pensions (Swenson, 2002)."

### 3. Other Regarding Preferences- Inequality Aversion

So far this thesis has examined economic theory of wage-bargaining and discussed the effect of centralised bargaining on employee wages and employer profits. This chapter will explore a quite different, but important, subject. The models investigated in the previous chapter could have been interpreted differently, along with most economic theory, relaxing the assumption of the rational, economic man. In this thesis' main model of chapter 5, the bargaining theory introduced in chapter 2 is crucial. However, the model also needs to be equipped with the theory of other regarding preferences.

Economic theory has treated individuals to be entirely self-interested. However, experiments using the ultimatum game (UG) "has been conducted throughout the world with student populations and has generated robust violations of the *canonical model*" (Heinrich et al., 2001). In the sequential UG a proposer offers a share of a given endowment to the receiver. The receiver will then accept or reject. If accepted, both get their agreed shares. If rejected, they both receive nothing. The rational self-interested proposer is expected to propose marginally nothing to the receiver. The receiver will rationally accept this offer as a best response strategy. There exists a Nash Equilibrium where the proposer gets the whole pot, while the receiver gets nothing.

Results of the experiments show that two violations of the canonical model appear. First, the receivers often reject offers below a certain level. Second, the proposers offer a substantial amount to the receiver. If the latter anticipates the rejection-level, to propose marginally above this level is an act of rational income maximisation. However, the behaviour of the proposer may be one of inequality aversion or altruism. Inequality aversion suggests that people "are willing to give up some material payoff to move in the direction of more equitable outcomes" (Fehr and Schmidt, 1999); while altruists get a higher utility of giving (see Nyborg and Rege, 2001, for discussions on altruism). The receivers' violation can be considered to be reciprocal in addition to inequality averse. The receiver is willing to take on a loss in punishing the proposer for not sharing what she ought to perceive as a fair share. This thesis will only discuss inequality aversion in the importance it has for sense of equality, measured by  $r$  in equation (2.11).

Fehr and Schmidt (1999) developed a simple utility-function able to explain the observed results. They “model fairness as self-centred inequality aversion. (...) Self-centred if people do not care per se about inequality that exists among other people but are only interested in the fairness of their own material payoff relative to the payoff of others” (Fehr and Schmidt, 1999).

$$(3.1) \quad U_i = w - \lambda_1 \max(w^* - w, 0) - \lambda_2 \max(w - w^*, 0)$$

$w^*$  represent the payoff to the other players, or individuals, and  $w$  is the payoff to individual  $i$ . The person is self-centred and receive increased utility in material payoff, however, experience a disutility in the relative payoff to the other. If either  $w^*$  is greater or less than  $w$  the individual’s utility is decreased. The  $\lambda$ -parameters explain the impact of relative payoff on the utility. “The assumption  $\lambda_1 > \lambda_2$  captures the idea that a player suffers more from inequality that is to his disadvantage” (Fehr and Schmidt, 1999). This, they claim, is backed by empirical evidence.

### 3.1 Inequality Aversion among Unions- Norms of Fairness?

The theory of inequality aversion can be implemented into the model of union behaviour as described in section 2.2. Moene et al (1993) assume that the unions have monopoly power and can decide wages, while the company determines the employment from the demand-for-labour curve. The union objective function, given by (3.2) is somewhat similar to equation (2.2).

$$(3.2) \quad u = u(w, L(w), z(w, w^*))$$

$z$  is some variable depending on wages elsewhere in the economy, among unions, or within an industry,  $w^*$ , as well as wages in the plant,  $w$ . Moene et al (1993) explains: “Suppose, for whatever reason, that union members care about how much they are paid relative to other workers in addition to the standard concerns with wage levels and employment security.

Then  $z$  can be written  $z = \frac{w}{w^*}$  with  $\frac{\partial u}{\partial z} > 0$ . (...) If all unions try to increase their wage

relative to the others, none will change position. Wages will increase, however, and

unemployment will rise. (...) Centralised wage-setting reduces wages inhibiting the fruitless struggle of each group to raise its wage more than the others” (Moene et al, 1993).

Even though centralised bargaining may moderate wage-struggle, the utility function of the union presented by Moene et al. does not provide any solidarity between the unions.

However, implementing inequality function (3.1) into  $z$  in (3.2),

$z(w, w^*) = -\lambda_1 \max(w^* - w, 0) - \lambda_2 \max(w - w^*, 0)$  the relative wage of the union directly concerns both disutility of less wage and solidarity towards other unions’ wages.

There are two important matters from this section to be further discussed before introducing the theory of this thesis. First; the solidarity between unions within centralised bargaining creates more equal and compressed wage distribution. In the wage-equation presented in section 2.4 by Barth and Moene (2008) the measure of preferences for equality,  $r \in (0,1)$  is a function of the inequality aversion in a specific union. In addition, Barth and Moene (2008) discuss  $r$  as increasing in levels of coordination of wage-bargaining. This, they claim, may be due to increased pressure on equal treatment as representatives must publicly defend the relative wages they have negotiated. Second, fairness norms are important for wage-setting in centralised wage-bargaining. Chapters 4 to 8 will treat both these matters more closely in trying to explain the centralised system as a norm-based model in a game-theoretic approach.

## 4. Wage-bargaining modelled as a norm-based coordination game

The model of chapter 5 presumes that the reader understands the specific theoretic approach. Chapter 4 provides the basic setup of the game theory used, and gives a presentation of social norms and discusses how norms can be applied in the particular model.

### 4.1 The setup: Battle of the Sexes

Consider a 2X2 normal-form game between two players. The players are named player e and player E, and both have two strategies to play  $\{C, D\}$ . The payoffs to each strategy are given in Figure 4.1.

Battle of the sexes			
		Player E	
		Strategy C	Strategy D
Player			
e	Strategy C	$W, \Pi$	$0, 0$
	Strategy D	$0, 0$	$w, \pi$

Figure 4.1

The name “Battle of the Sexes” may be somewhat misleading, but stems from a scenario where a couple simultaneously decides on going to the cinema or the opera. Both of the lovers would like to meet up at the same place, otherwise they won’t bother to enter the venue, and their payoffs are both zero. However, if they manage to coordinate, they have different preferences. One of the players would like to go to the cinema, while the other would like to go the opera. The payoffs in Figure 4.1 suggests that, for example, player e would prefer a coordination on strategy D rather than on strategy C, i.e.  $0 < W < w$ . However, player E prefers the opposite coordination with payoffs given by  $0 < \pi < \Pi$ . The two pure Nash-equilibria of this game are strategies  $\{C, C\}$  or  $\{D, D\}$ .

By letting both players put probabilities on what strategy the other player will choose, the players may select a mix between the two strategies. Consider  $e$  putting probability  $p$  on  $E$  choosing  $\{C\}$  and  $1-p$  on  $E$  choosing  $\{D\}$ . Then player  $e$ 's expected payoff by playing  $\{C\}$  is  $p * W + (1 - p) * 0$ , and the expected payoffs of playing  $\{D\}$  will be  $p * 0 + (1 - p) * w$ . For  $e$  to be indifferent between the two strategies  $p$  must equal:

$$(4.1) \quad p = \frac{w}{w + W}$$

Similar results for player  $E$  letting  $q$  being the probability of  $e$  playing  $\{C\}$  and  $1-q$  that  $e$  chooses  $\{D\}$ . The mixed strategy Nash-equilibrium is  $\left( p = \frac{w}{w + W}, q = \frac{\pi}{\pi + \Pi} \right)$ .

If one of the players believes that the other will choose a strategy with a larger probability than what is given by the mixed equilibrium, then best response will be to select strategies accordingly. This implementation will be discussed further in the thesis.

## 4.2 How to model bargaining situation based on norms?

This section does not look further into the form of the bargaining, rather that there is a range of possible optimal contracts between the two parties, and that they have to agree on one of these contracts. The contracts specify the terms and the payoffs to each party. "Here convention plays a key role by providing focal points that help the parties resolve the indeterminacy of the bargaining situation" (Young, 1998). In this sense, the share an employee will receive in a given period depends largely on the share other employees in similar firms will receive in the same period ( $w^*$ ). Young (1996, 1998a, 1998b) provides examples from the bargaining situation between landlord and tenant in sharecropping contracts. It is in this manner this section will treat more general wage-bargaining.

Recall the two stage approach of bargaining introduced by Barth and Moene (2008) in section 2.4. Then consider the distribution of wages agreed in the first two stages will hold as pinpoints, for a third stage of negotiating; an internal wage-negotiation between the employer and the one employed, or yet to be employed. When both parties sign a binding contract, specifying the wage, the terms of the contract will last for one period, usually a



year. After one period the terms of the contract will be re-negotiated, and so forth. If the parties of the negotiation use the focal points given by the centralised bargainers as conventions, may we then describe an employee that voluntarily sticks to the coordinated wage as adhering to social norms? Elster (1989, pp. 102) defines a social norm as a norm that must be shared by other people and partly sustained by their approval and disapproval. Obviously, it is difficult to address whether approval or disapproval would be given to a person in favour of centralised bargaining or not, otherwise in a society carrying a high degree of inequality-aversion. However, Elster (1989, pp 102-103) depicts a social norm of fair division of surplus between capital and labour in a wage-bargaining situation: “Employers will appeal to this norm when the firm does badly, workers when it does well. There is a norm of equal pay for equal work. Workers will appeal to this norm when they earn less than workers in similar firms, but not when they earn more.”

The crucial interpretation is that both employers and employees have expectations about what the other will demand. Schelling (1960, quoted in Young, 1998a) interprets these expectations, or *contextual cues*, as *focal points*, “of which cannot be defined a priori; they depend on the coordination problem at hand and the culture in which the players are embedded” (quoted in Young, 1996). Following the framework of Bowles (2007, ch.12) and Young (1996, 1998a, 1998b), the wage-bargaining situation described will take the form of a contract game, similar to a Nash demand-game and a modified version of The Battle of the Sexes given in Figure 4.1.

#### **4.2.1 Description of a Nash-Demand game in the generalised wage-setting**

Every period a number of employees and a number of employers get to re-negotiate the wage in a one-shot game, expressed as a match. Each population consists of  $k$  individuals. The process evolves in discrete time intervals  $t = 1, 2, 3, \dots$ . In a match, each person in each matched group names a contract – the proposed terms of their relationship. If both name the same contract  $i$ , they enter into this contract in period  $t + 1$ , and receive the expected payoffs  $w_i, \pi_i$  respectively. “If they name different contracts (i.e. they cannot agree on the terms) they are unattached for the period and their payoffs are zero” (Young, 1998a). “The individuals are represented as bearers of strategies they have adopted, while the distribution of strategies

among them varies” (Bowles, 2007). The players use this distribution of strategies “to predict the likelihood that his current partner will make various demands” (Young 1998a).

From past experience, job-interviews and by word of mouth etc. both players have partial information about the other player. The payoffs depend on who is playing. This suggests that the most productive employee may demand a slightly higher share than the least productive employee. Since the employer has gathered some information about the other player, and formed some expectations about what the employee will demand, the employer will demand a share that is slightly lower from the productive employee and a slightly higher share from the unproductive. However, both the employer and the employee, both productive and unproductive, have gathered some information about what other players, similar to them, receive in surrounding demand-games. This suggests then that when playing this one-shot game, both players have enough information to form some expectations about what they will receive of the share of the surplus, and will reach Nash equilibrium.

Further, I consider the conflict of interest between highly productive employers and employees and their payoffs respectively. In this manner I reasonably assume that if these parties cannot overcome the obstacles in the agreement of a contract, and overthrow the centralised presumed wage-distributions, the conflict between highly and less productive employers (employees) will reach new heights. In this scenario there is no room for the employers’ confederation (union association), and it will be destructed. One may argue that the centralised bargaining will be attacked from “above”. This may happen if the most productive employees are largely dissatisfied. However, the same argument could have been used if the less productive employers were largely dissatisfied, and could not come to an agreement with the least productive employees. However, in the Nordic countries, the least productive employees are guarded by a high unemployment benefit, which makes this scenario less likely. Another feature of the unskilled labour, which makes them less convenient to use in this setting, is that unskilled and low-paid labour is more substitutable, so their bargaining position is more immediate. That is, they have a lower discount rate in the wage-bargaining. However, in case of breakdown in either of the contracts-settings, there is reason to believe that the new institutional system would move towards decentralised wage negotiations. This can be either partial coordination bargaining, i.e. industry- or craft wage-bargaining, or full decentralisation.

## 5. The Model

### 5.1 The contract game in a generalised bargaining situation

The contract game depicted in Figure 5.1 is to be interpreted as follows: Contract C is regarded as a benchmark contract of a *Centralised* wage system, while contract D is the alternative of what the employees would have earned in a *Decentralised* system. If they cannot agree the employee will leave the job, while the employer will be left with a vacant position. That is, if they cannot match their strategies, both receive a payoff of zero. While the employee demands a contract with wages reflecting marginal labour productivity  $\{D\}$ , the employer is only willing to pay the employee according to the centralised wage  $\{C\}$ .

Payoffs in the contract game		
	Employer offer contract C ( $E_C$ )	Employer offer contract D ( $E_D$ )
Employee offer contract C ( $e_C$ )	$W(p), \Pi(p)$	0, 0
Employee offer contract D ( $e_D$ )	0, 0	$w(p), \pi(p)$

Figure 5.1

Figure 5.1 is similar to Figure 4.1, and differs only in that the payoffs are functions of productivity.  $W(p)$  and  $w(p)$  are taken from the bargaining model of Barth and Moene (2008) (see section 2.4), where  $W(p)$  is the wage to an employee participating in the centralised system, while  $w(p)$  is the wage obtained in a decentralised system, or if the centralised negotiations breaks down.  $\Pi(p)$  and  $\pi(p)$  represents payoffs to the employer with same interpretation as  $W(p)$  and  $w(p)$ .

From Section 2.4  $W(p)$  is given by

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$$(5.1) \quad W(p) = w(p) + r\omega(1 - \delta)(\hat{p} - p),$$

$\hat{p}$  represents average productivity in the society.  $r$  is the fairness of equality regarded by the unions' confederation and  $\omega$  is their bargaining power.

Equation (5.1) explains that an employee with above average productivity will receive a lower wage than in a decentralised system and, conversely, a lower than average productive employee will benefit from centralised wage. Profit-functions are similar to that of Barth and Moene (2008) given by

$$(5.2) \quad \begin{aligned} \Pi(p) &= p - W(p) \\ \pi(p) &= p - w(p) \end{aligned}$$

Combining (5.1) and (5.2) gives  $\Pi(p) = p - w(p) - r\omega(1 - \delta)(\hat{p} - p)$

$$(5.3) \quad \Pi(p) = \pi(p) + r\omega(1 - \delta)(p - \hat{p})$$

Figure 5.1 depicts the same conflicts as described in section (2.3). The top left corner shows that employers demanding highly productive employees would prefer the centralised wage-bargaining, while employers in need of less productive employees would be better off in the decentralised setting. However, the workers have opposite preferences. The productive employees would earn more in a decentralised system, while the less than average productive employee benefits from the centralisation of wage-negotiations.

Throughout the thesis I will assume that negotiations are based on productivity  $p$  of the individuals. That being if wage is bargained collectively, the bargainers will consist of individuals with equal productivity. Homogenous union members are obviously a great simplification as most trade unions consist of members with differing productivity. I am aware of this, but relaxing this assumption would cause difficulties in explaining the basic arguments that follows.

### 5.1.1 Expected payoffs of the players

Following Bowles (2007), let  $\alpha$  be the number of employees that played strategy {C} in previous period, and  $\beta$  the number of employers that played {C}.  $\alpha$  and  $\beta$  are regarded as probabilities that the opposite player in a contract-setting will play {C}. Bowles and Naidu

(2008) describe a process of the players being able to revise their strategy. Each time they are matched, agents play the strategy that they played last with probability  $1-v$  or revise their strategy with probability  $v$ . If they revise and do not alter the strategy, they play the best response to last periods' distribution of strategies. In the following presentation, the level of  $\delta$  is excluded without altering the basic argument.

$$(5.4) \quad \text{Expected payoffs for employee: } \begin{aligned} e_C &= \beta W(p) \\ e_D &= (1-\beta)w(p) \end{aligned}$$

$$(5.5) \quad \text{Expected payoffs for employers: } \begin{aligned} E_C &= \alpha \Pi(p) \\ E_D &= (1-\alpha)\pi(p) \end{aligned}$$

The best response for each player would be to play the strategy that would maximise the expected profit. Thus the chosen strategy would be a function of how many people played the different strategies in the previous period. If there are no random shocks in terms of idiosyncratic play,  $\{C, C\}$ , or  $\{D, D\}$  would easily become stable conventions, depending on the initial state. Young (1996) defines a *convention* as a pattern of behaviour that is customary, expected and self-enforcing.

Regard the levels  $\alpha^*$ ,  $\beta^*$  as the numbers of individuals that have to play non-best response for the other party to switch their best-response play respectively. These measures are similar to that of  $p$  and  $q$  in equations (4.1) and (4.2).

$$(5.6) \quad \begin{aligned} \Delta e = e_C - e_D = 0 &\Rightarrow \beta W(p) - (1-\beta)w(p) = 0 \\ \Delta E = E_C - E_D = 0 &\Rightarrow \alpha \Pi(p) - (1-\alpha)\pi(p) = 0 \\ \alpha^* &= \frac{\pi(p)}{\pi(p) + \Pi(p)} \quad \beta^* = \frac{w(p)}{w(p) + W(p)} \end{aligned}$$

The values of  $\alpha^*$  and  $\beta^*$  now depends on what kind of players that are matched. Since the employer and employee have partial information about the other party, it is reasonable to assume that productive employees are being matched with productive employers and vice versa. However, as the distribution of payoffs differs, the preferences of the parties will also differ. In a match between the productive employer and the productive employee the preferences are:  $W(p) < w(p)$ ,  $\Pi(p) > \pi(p)$ , then  $\alpha^* < \frac{1}{2}$  and  $\beta^* > \frac{1}{2}$ . The probabilities

$\alpha^*$ ,  $\beta^*$  define the best reply-functions of each player. Hence, if  $\alpha > \alpha^*$ , best-reply for the employers is to play strategy {C}. If  $\beta > \beta^*$  it will be best-reply for the employees to play strategy {C}. See Figure 5.2

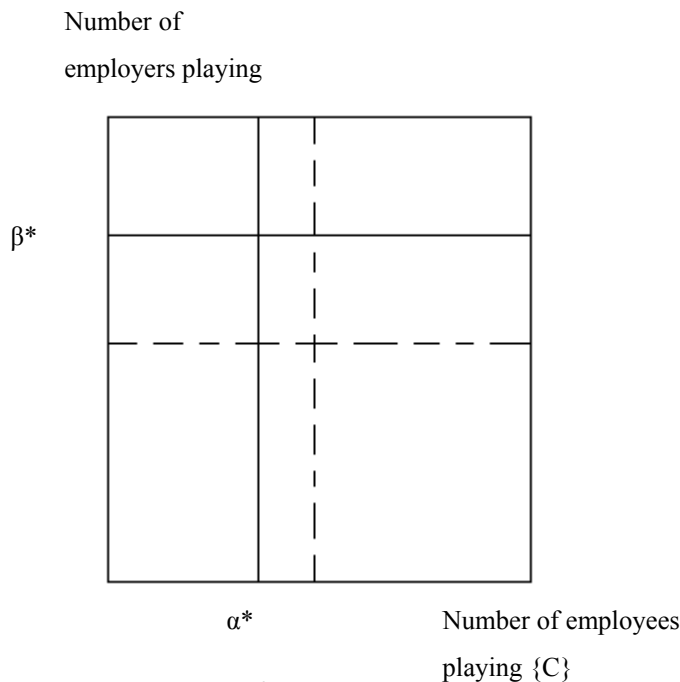


Figure 5.2

Now assume that the players can play idiosyncratic non-best for some reason, whether stochastic or intentional. Bowles (2007) explains that if a convention requires a large amount of idiosyncratic play to dislodge, while requiring little idiosyncratic play to access, it is a *robust* convention. Consider that the initial state is the benchmark state {C,C}.  $w(p)$  depicts the opportunity cost of what the productive employee *would have* received as a share of the surplus in a decentralised wage negotiation. The larger the opportunity cost, the larger  $\beta^*$  will become. Thus, if for any reason some of the employers play non-best responses, the number of such responses needed to switch convention to decentralised,  $(1 - \beta^*)$  will decrease. In other words, the {D} convention of decentralisation becomes more *accessible*. Bowles (2007) defines *accessible* as a convention that “does not require much bunching of nonbest-response play to displace the population state into the basin of attraction of the robust convention”. In Figure 5.2, as the unstable and mixed equilibrium moves in the north-east direction, the space that attracts people to play the stable, pure equilibrium {D} advances. This suggests that as  $w(p)$  increase relative to  $W(p)$ , for the employers to stay in

the preferred state, at least as many, or more, players must play conventional as in the previous round.

If  $\pi(p)$  describes how much the employer must redistribute to the employee in a decentralised wage negotiation, then  $\Pi(p)$  becomes relative savings of the employers in the benchmark case. Thus, the smaller  $\pi(p)$  gets relative to  $\Pi(p)$ , the smaller  $\alpha^*$  will become. This implies that the centralised convention  $\{C, C\}$  will be more *persistent*, because it will now require a larger bunch of idiosyncratic play by the employees to tip the employers best-response play.

This is shown by taking the derivative of equations (5.1) and (5.3) with respect to productivity  $p$ . Keeping the average productivity constant and excluding the dispute factor, the derivatives becomes

$$(5.7) \quad \begin{aligned} W'(p) &= w'(p) - r\omega \\ \Pi'(p) &= \pi'(p) + r\omega \end{aligned}$$

Equations (5.7) show that an increase in individual productivity will increase the relative difference in wages between a decentralised wage  $w(p)$ , and a centralised wage  $W(p)$ . However, the opposite will happen between the relative profits in a centralised and a decentralised system. This implies that an individual increase in productivity will alter  $\alpha^*$  and  $\beta^*$ .

## 5.2 Stochastic Play Introduced- Limit of Memory

So far the memory of the players has been considered to be all of the matches in the previous round. In other words, all the employees and all the employers to be matched in this period have information about contracts by the similar firms and workers, by either word-of-mouth or other sources. For example, they know  $(\alpha, \beta)$ , the degrees where both employers and employees agreed on a binding contract of the centralised bargaining benchmark. In that case, if these degrees were larger than the tipping frequencies,  $(\alpha^*, \beta^*)$  both the employees and the employers would expect this customary behaviour and the contract would be self-enforcing, hence a convention. This implies that both parties may have heard of some

matches where the players played differently, i.e. could not agree on the terms, or agreed on a decentralised contract. This number was, however, considered so small that the players expected this behaviour as rather unlikely.

However, it is reasonable to think of a situation where the employer carries greater uncertainty as to what the employee expects. Should the employer demand the equal share as “usual”, or does the other party have information that inclines him to demand a higher share? Because it is impossible to know “all” the other matches made in the previous period, Young (1996, 1998a, 1998b) assumes players with a finite set of memory  $m$ . In this case the players may have different information, and may create different expectations to base their best responses. The memory  $m$  will consist of what information they have gathered in previous rounds. Young (1996) assumes that the players may have limited recollection of their memory in developing their best response functions. He argues that a convenient way to model the acquiring of information is to suppose that the agent draws a random sample from the last  $m$  encounters. The sample size  $s$  reflects the agent’s informational network and is an inherent property of the agent, not a result of an optimal search. Young calls this *best reply to recent sample evidence*. For instance, if  $m = 15$  and  $s = 5$ , an employer has heard about 15 matches in the previous rounds similar to her company. She then only uses five random matches in forming her expectations. If three of these five consisted of employees playing strategy  $\{D\}$ , she may regard her best-response to be strategy  $\{D\}$ , depending on the payoffs. However, these three cases may have been the only three in the memory-set of 15. This particular match may again reach a different employee with  $m = 10$  and  $s = 3$ . Based on this he will develop his best response function etc.

With this reasoning, a few matches that went wrong may alter the conventions completely, and the strategies may diffuse in a population in considerably short time. With stochastic shocks, may a convention be regarded as a stable equilibrium? It will all depend on the probability of a person making a “mistake” in the game. In the above example, for the employer to switch best-response play, it needed three mistakes in previous rounds. If the probability of playing wrong is  $\epsilon$ , and three independent individuals make this decision, the probability of tipping the employer from a specific best response to the other will be  $\epsilon^3$ . As Young (1996) states: “if two societies start off under similar initial conditions, there is a positive probability that at any given future time they will be operating different conventions. Such a process is said to be *path dependent*.” Further we introduce a simplified



model of the contract selection theorem described in Young (1998a), as explained in the  $2 \times 2$  case in Bowles (2007), where  $m = s = 1$ .

### 5.2.1 Reduced resistance

The two pure equilibria are both likely to occur as conventions in a society. However, at which convention will the society spend most of time? Bowles (2007) assumes that the convention is *stochastically stable* if it is the most likely to occur, as the probability of “mistakes” decreases. To determine the most probable path from one convention to the other, Young (1998a) defines the term *reduced resistance*, given by equation (5.8).

$$(5.8) \quad r_{ij} = \frac{a_i}{a_i + a_j} \wedge \frac{b_i}{b_i + b_j}$$

$\wedge$  refers to minimum of the equations, so,  $r_{ij}$  is defined as the minimal number needed, in a population adhering to the convention  $i$  that idiosyncratically switch to strategy  $j$ , for inducing their best responding partners to switch theirs. Equation (5.8) rewritten becomes:

$$(5.9) \quad \begin{aligned} r_{DC} &= \min(\alpha^*, \beta^*) \\ r_{CD} &= \min((1 - \alpha^*), (1 - \beta^*)) \end{aligned}$$

Because a convention may switch in two ways, either by the employees or employers playing idiosyncratic, the reduced resistances tells us in which way the most likely path of conventions will take. Hence,  $r_{DC}$  shows how many players have to switch to induce from the decentralised {D} convention to the centralised {C} convention. Since  $\alpha^*, \beta^*$  are the tipping frequencies, at least as many players as these numbers will have to play idiosyncratic. The same holds for  $r_{CD}$  in the other direction.

Since  $W(p) < w(p), \Pi(p) > \pi(p)$ , and  $\alpha^* < \frac{1}{2}$  and  $\beta^* > \frac{1}{2}$ , then

$$(5.10) \quad \begin{aligned} r_{DC} &= \alpha^* & r_{DC} &= \frac{\pi(p)}{\pi(p) + \Pi(p)} \\ r_{CD} &= 1 - \beta^* & \text{or} & \\ r_{CD} & & r_{CD} &= 1 - \frac{w(p)}{w(p) + W(p)} = \frac{W(p)}{w(p) + W(p)} \end{aligned}$$

Equations (5.10) show that moving from convention {D} to convention {C} at least  $\alpha > \alpha^*$  of idiosyncratic play by the *employees* is required; while in the other direction  $1 - \beta > 1 - \beta^*$  of idiosyncratic play by the *employers* is required. For a centralised wage-system to be a stochastically stable convention, the number of idiosyncratic decisions needed to switch from convention {C} to convention {D} must be larger than the number needed to switch the other way. In other words, convention {C} must be persistent and convention {D} must be more accessible than {C}. That is:

$$\begin{aligned}
 & r_{CD} > r_{DC} \\
 & 1 - \beta^* > \alpha^* \\
 (5.11) \quad & \frac{W(p)}{w(p) + W(p)} > \frac{\pi(p)}{\pi(p) + \Pi(p)} \\
 & W(p)\Pi(p) > w(p)\pi(p)
 \end{aligned}$$

Equation (5.11) says that the total payoff in the equal convention must be bigger than the total payoffs in the unequal convention, for {C} to be stochastically stable. This suggests that the conventions chosen in a path are always pareto-superior to the others.

The above discussion implies that the employers in a centralised bargaining will “save” more than the potential loss for the employee. However, it is crucial that both know, at least to some extent, that it is in fact possible to switch; i.e. they know the different payoffs  $w(p)$ ,  $W(p)$ ,  $\pi(p)$  and  $\Pi(p)$ . One may argue that these measures are to some extent describing the race of technology vs. labour productivity. Following the reasoning presented in section 2.4.2 as new technology emerges and proliferates, the employers need skilled labour and the demand for such labour will be greater than the supply. The result is more negotiation power for most productive employees, thus, demanding a larger piece of the pie. A common justification for this is that more productive people have usually invested more in education and experience, needing more pay as a result. However, as more people get educated, supply will equal demand for productive labour and the labour share for the productive employees will decrease. This can be thought of as an increase in average productivity in equations (5.1) and (5.3). Here, we assume that the productive employer will save profits, hence, that the society experiences floating technology-peaks, and a rather rigid labour-

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education. The movements of the payoffs according to technology-shifts may explain why the different contracts came to be in the first place.

## 6. Discussions

### 6.1 Implementation of centralised system in the Nordic countries (i)

Swenson's (1991a) explanation that the centralised model of wage-negotiations rose from the economic depression in the Nordic countries, as described in section 2.5, is popular among labour economists. Because of low demand for different products, especially in the export sector, the employees had to moderate their wage demands for the company to survive in a difficult environment. For the workers to tolerate a wage-moderation, the unions' bargained with other unions providing incentive to moderate their wages. In other words, the bargaining power of productive employees was diminished. This can be interpreted as a relative decrease in  $w(p)$ . The opportunity cost carried by productive employees in a centralised system became relatively small, altering the best-response functions in line with equation (5.11). (5.11) explains that this reduction resulted in a larger  $(1-\beta^*)$ , eventually larger than  $\alpha^*$ , and the best-response institution switched to a centralised wage bargaining system. However, this requires that the relative profits were not altered at a similar degree.

Introducing the labour disputes factor  $\delta$  gives another explanation. Consider the game depicted in Figure 5.1. Modify the payoffs of coordination on strategies  $\{D, D\}$  from  $(w(p), \pi(p))$  to the fall-back positions used by Barth and Moene (2008), given by  $(\delta w(p), \delta \pi(p))$ .  $\delta < 1$  represents a loss due to potential disputes in case of a breakdown in negotiations. Equation (6.1) shows that the level of  $\delta$  may be important in determining the most efficient contract, hence, making the centralised system more stochastically stable.

$$(6.1) \quad \frac{W(p)}{\delta w(p) + W(p)} > \frac{\delta \pi(p)}{\delta \pi(p) + \Pi(p)}$$

$$W(p)\Pi(p) > \delta^2 w(p)\pi(p)$$

Equations 5.1 and 5.3 show that more labour disputes, a smaller  $\delta$ , result in greater  $W(p)$  and  $\Pi(p)$ , while the alternative contract of the decentralised system becomes smaller. Moene and

Wallerstein (2006) described that the Nordic countries experienced the highest level of industrial conflict in the world in the years after the depression. This would be represented by a very small  $\delta$ . In other words, the breakdown of negotiations in the years after the economic recession made the convention of centralised wage-bargaining more efficient and the players were induced to switch best-responses.

## 6.2 Impact of labour migration

The recent development of free trade and services between countries, to include free labour movement, may diminish obstacles for productive employees to search for jobs outside the countries' borders. By introducing a simple modification to the expected payoffs of the different players, we can show that increased migration may add pressure on the stable centralised convention. First, assume that the wage obtained in a decentralised system,  $w(p)$ , measures the opportunity cost carried by a productive employee in a centralised system. Further, assume this wage to be equal to the wage that equally productive employees in nearby countries with decentralised systems make. Let  $m \in (0,1)$  measure the obstacles facing the migrant. That is, the higher the level of  $m$ , the easier is it to access jobs in foreign countries, i.e. fewer formal and informal problems like languages and culture barriers etc. Let the expected payoffs of the above average employees become

$$(6.2) \quad \begin{aligned} e_D &= (1-m)(1-\beta)w(p) + mw(p) \\ e_C &= \beta W(p) \end{aligned}$$

With no migration, setting  $m = 0$ , equation (6.2) becomes similar to (5.4). The easier it is to access jobs in a foreign country, the higher the expected payoffs will be for a productive employee. That is, if  $m=1$ , the productive employee is guaranteed a wage  $w(p)$  taking on work in foreign borders. (5.6) can then be re-written to

$$(6.3) \quad \begin{aligned} \beta^* &= \frac{w(p)(1+m)}{W(p) + (1+m)w(p)} \\ \beta_m^* &= \frac{w(p)W(p)}{(W(p) + (1+m)w(p))^2} > 0 \end{aligned}$$

Equation (6.3) implies increased pressure on employers, that is, for the convention in preferable centralised wage-bargaining, fewer non-best responses are tolerated by the employers. Remember, at least as many as  $\beta$  of the employers need to play the conventional benchmark of centralisation. In Figure 5.2, this is shown by a vertical shift in the  $\beta^*$ .

Letting the employer differentiate between foreign employees and domestic employees, the company can offer a higher, competitive wage to foreigners equal to  $w(p)$ . It is reasonable to think that the employer would only hire foreign employees if they had better skills and higher productivity. With two candidates for the job, one foreign and one domestic with similar skills, the employer would choose the domestic if this employee is guarded by the convention of centralised wages.

However, on the other side of the productivity distribution, migrant workers with low skills will put immense pressure on the less productive employees. It has been assumed that these workers benefit from the centralised wages, earning more than their marginal productivity. With increased supply of low skilled workers, it should be intimidating for the employers to hire this labour for lower wages than the centralised benchmark. Similar to equations (6.2) and (6.3) the expected payoffs and tipping frequency become

$$(6.4) \quad \begin{aligned} E_c &= \alpha \Pi(p) \\ E_D &= (1-m)(1-\alpha)\pi(p) + m\pi(p) \end{aligned}$$

$$(6.5) \quad \alpha^* = \frac{\pi(p)(1+m)}{\Pi(p) + (1+m)\pi(p)}$$

The payoffs of the game in this setting are totally opposite, so that the employers prefer decentralised wage-setting. The switch of convention is now induced by lower productive employees playing non-best responses, that is, the higher  $\alpha^*$ , fewer idiosyncratic play by these employees would induce all the low-productive employers to play decentralised. If labourers are fully mobile and able to work wherever there is demand,  $m = 1$ , then no employers would offer higher wages than the decentralised wage for the less skilled workers.

Note that in both these settings, the switch of systems is induced by the players that will lose from the consequences of the switch. However, if the benefits are as great as assumed, it is perhaps more plausible that coordination exists between the players, and that they will stick

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to the preferred norm. This coordination can consist of plain cooperation and threat of sanctions put on deviators and lobbying against eventual threats. An example of the latter can be the effort made by the Labour Unions' Confederation in Norway against so-called "social dumping".

### 6.3 Summary and conclusion

So far I have tried to explain that the major reason why the most productive employees voluntarily participate and accept the wages set by a centralised bargaining is their best response strategy. I claim this to be the most important reason, rather than that societies with centralised wage scheme possess a population with a high degree of *other regarding preferences*. This is shown by considering the wages based on expectations and social norms. Presented as an evolutionary change of conventions a society may develop different institutions. The crucial understanding is the payoffs of the different parties involved, as they alter the tipping frequencies.

Can the Nordic model be used as a development model for developing countries today? I have shown that the implementation in the Nordic countries may have been the most efficient path. Here, the willingness of the parties is important. There may have been underlying circumstances that triggered the Nordic societies to implement such a system. Without further discussions, due to limited space, I agree with Moene and Wallerstein that the compression of wages will benefit the employers of the productive sectors, moving labour and capital in the direction of more creative destruction. As the economic environment changes, the societies may switch conventions if this is more efficient. Increased information of international wages may increase the assumed opportunity costs carried by the productive employees. In addition, migration plays an important part. The easier it is to move to another country with higher wages, the greater the pressure on the centralised system. Many developing countries suffer from brain-flow, that is, the educated and most productive employees move across the borders, often to industrial countries, in search of higher wages. The employers of technology industries have little incentive to emphasise centralised bargaining schemes. The importance of attracting the most productive employees to avoid brain-flow is probably a much stronger incentive. Hence, a coercion of this system could induce more trouble for developing countries.

The model presented suggests that a switch of conventions in the Nordic countries come from random “mistakes” made by the employers of productive technologies. This may happen if productive employees’ opportunity costs are increased. Due to skill biased technology change found in more decentralised countries, opportunity costs become greater. The pressure on employers making less idiosyncratic play becomes severe. The employers would eventually lose from a potential switch. Therefore one may reasonably argue that the employers could somehow coordinate their actions, within an employers’ confederation, or impose punitive actions on employers deviating from the conventional play. If the employers do manage to coordinate, the model predicts that the conventions will never flip. The only possible way for this to happen is that the productive employees intentionally play non-best. To investigate the productive employees’ possibility of inducing this switch, more models need to be presented. The next chapter will try to explain how productive employees may dislodge the conventional play of employers; intentionally and by using collective action. It shows that even if the Nordic countries implemented the centralised system to increase efficiency, the system may persist if the most satisfied party is able to coordinate play.



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## 7. Intentional nonbest-responses

The long-term relationships between employers in the Scandinavian countries described in section 2.5, implies a thorough coordination among employers. Regarding the outcome of the employers' negotiations as given, whatever their play is, one can reasonably argue that no employer will play non-best by chance. In other words, if the employers have decided to always play the benchmark convention, for the employees to alter a convention, a substantial amount of idiosyncratic non-best response play is needed.

In the model of intentional non-best responses, developed by Bowles and Naidu (2008), the dynamic institutional transitions are induced only by the idiosyncratic play of those who will benefit if a transaction will occur. In *Microeconomics* (2007), Bowles describes two important features of the players that need to be reconsidered. First, if productive employees succeeded in altering the convention towards a decentralised system, they will understand the impact this has on the least productive employees. In other words, an alternation of the system by more than the tipping-frequency of non-best responses are triggered by the productive employees' understanding of actuarial fairness being more important than solidarity. Second, the reduced resistances introduced in equation (5.8) to (5.10) needs to be modified so that the only possible way of transiting conventions is by those who will gain. The next paragraph will treat this subject as in Bowles and Naidu (2008). The model describes how difficult it is for the productive employees if they are: i) non-organised with no communication of collective action with each other; or ii) organised in different industry unions, with obstacles of raising wage-demands due to conflicts of interests within the union, presented in section 2.2 to 2.4; or iii) organised as craft unions with no communication of collective action between the craft unions.

### 7.1 Modified Reduced Resistances

There are two important extensions to the previous model. First, the actions taken are now only from the productive employees that gain from a switch to decentralisation (on the other side of the productivity distribution, the employers would induce the switch). Second, the number of players, that is, the number of total employees and employers are important to

induce a switch. So far the model has treated matches to be random, drawn from two populations of equal size. When idiosyncratic play is intentional and not stochastic, the amount of non-best responses by the displeased group are largely influenced by the size of this group. It will be shown that if productive employees are organised by craft unions the number of subpopulations in the contract-setting will diminish, and the likelihood of switching conventions become much greater.

Consider the contract setting between productive employees and employers. Let the total number of players be  $N$ . The total number of employers is  $(1-\gamma)N$ , while the total number of employees are  $\gamma N$ . The new modified reduced resistances, similar to (5.9) become:

$$(7.1) \quad R_{DC} = (1-\gamma)N\beta^*$$

$$R_{CD} = \gamma N(1-\alpha^*)$$

The new modified resistances show that equal to, or more than the tipping-frequency of employers need to play centralised to induce a switch of the employees' best response; or the number of employees needed to play decentralised for the employers to alter their best response. (7.1) can be normalised by  $N$  without losing generality. The resistances refer to fractions of the two groups, rather than the actual number.

$$(7.2) \quad R_{DC} = (1-\gamma) \frac{w(p)}{W(p) + w(p)}$$

$$R_{CD} = \gamma \frac{\Pi(p)}{\Pi(p) + \pi(p)}$$

The reduced resistances refer to the number of players needed to play idiosyncratically for the other group of players to switch their best responses. Equation (7.2) show an important feature, namely, that the more employees relative to the employers, the larger will  $R_{CD}$  become and subsequently more difficult to induce a transition towards a better outcome. In a scenario where most of the productive employees were organised in different craft unions, they would all be counted as voices of the unions' demands. This implies fewer negotiators, only the representatives of the unions, and a relatively small  $\gamma$ . However, if they were either non-organised or organised in an industry union, since they cannot cooperate, this would imply a large  $\gamma$ .

## 7.2 How will the players be selected for actions towards non-best responses?

Consider  $\gamma$  to represent the share of employees in the contract setting by craft unions' representatives. One has to regard the representatives to speak for every member, raising wage demands on the belief that all the members support them. Let  $\varepsilon$  be the probability that the craft union is drawn, that means, all members will play non-best response. The probability,  $\mu_i$  of a transition in any given period is then given by equation (7.3).

$$(7.3) \quad \mu_{CD} = \sum_{j \geq R_{CD}N} \binom{\gamma N}{j} \varepsilon^j (1 - \varepsilon)^{[\gamma N - j]}$$

$$\mu_{DC} = \sum_{j \geq R_{DC}N} \binom{(1 - \gamma)N}{j} \varepsilon^j (1 - \varepsilon)^{[(1 - \gamma)N - j]}$$

The first equation of (7.3) has to be interpreted as follows: To induce employers to switch their best response to a decentralised system, at least  $j$  craft unions need to break contracts with the employers. The probability of  $j$  unions in a given period taking action is given by  $\varepsilon^j$ . The term within the brackets shows the different combinations of how  $j$  unions can be sorted. Then after calculating the probability of  $j$  unions occurring, redo the calculations with  $j+1$  unions. The sum of all these calculations will show the overall probability of inducing a transition to a decentralised system. The latter of the equations in (7.3) show the other direction for a transition from a decentralised towards a centralised system from actions by the productive employers.

It is clear from equations (7.1) to (7.3) that the larger the population size of the employees and employers respectively, the less likely the groups are to induce a switch of convention in the preferred way. In the scenario described above, it is reasonable to believe that the number of employers and craft unions are somewhat equally shared; however, if this scenario is relaxed and the employees are either non-organised or organised in industry unions,  $\gamma$  will represent individuals rather than crafts. In the latter scenario, one should regard  $\gamma$  to be substantially larger. Remember that  $(1 - \alpha^*) > 1/2$ ; a large  $\gamma$  and a large  $j \geq R_{01}N$  bring about severe difficulties for productive employees to switch conventions by non-best responses.

One might easily apply this model to a different situation. Imagine a society with a decentralised wage system. Here, the more dissatisfied groups are the less productive employees and the employers demanding productive labour. If unionisation is rare, the employees' obstacles to alter conventions become so great that the persistence of the conventions is long-lasting. This would be even stronger when including migration into the equation. First, immigrants usually fill the jobs requiring little skills. Second, immigrants are rarely unionised. A flow of unskilled labour makes the less productive employers benefit more from the decentralised system, and at the same time increasing  $\gamma$ . Here, the relative strength of employers towards each other is important.

### 7.3 The collective action problem

This chapter investigates the possibility of coordination between employees to alter a present convention towards a more preferred one, utilising collective action. The actual action can be strike, a silent clause, or any other behaviour that capture a non-best response by the employees.

The theory can be used to describe a range of social phenomena, such as why people participate in revolutions and revolt, voting in a democratic election, and organising of trade unions as a voice towards employers. This thesis treats the collective action problem of members in a specific trade union coordinating their actions towards the employers.

Consider the model of the non-best response in the previous section. Regard the number of involved subgroups,  $\gamma$ , as different trade unions consisting of members of the upper half of the productivity distribution. If a certain share of the trade unions demands decentralisation, the model predicts that the conventions will flip employers' best responses. How a specific trade union decides on non-best response is considered by the collective action problem. If the share of the members that participates in the collective action reaches a certain level, the trade union will represent their claim towards the employers and the centralised unions' association.

The next section is a brief description of the theory of collective action. The second section depicts a simplistic model suitable to describe the behaviour of the members of a trade union in pursuit of a decentralised wage-bargaining system.

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### 7.3.1 The free-rider problem- no-one participates in the collective action

What is important for people to be able to organize in coordinated behaviour towards other groups? When, and maybe equally important, why, do people participate in collective action? The collective action problem occurs when two or more people need to coordinate on an action that is not a shared best response for the players. As an example, consider “the tragedy of the fishers” introduced by Hardin (1968, quoted in Gibbons, 1992). Can the fishers coordinate on behaviour that is pareto- superior to the strategy that wipes out the fish from the lake? In a book called “The Logic of Collective Action” from 1965, Olson (quoted in Miller, 1992) a situation where no-one would participate in collective action is described. “Olson considers only self-regarding individuals lacking any social or community bond. Given the assumption of isolated, self-interested economic persons, Olson asks what conditions are necessary for such persons to act collectively (Miller, 1992).”

The situation can be described as a public goods game, similar to an n-person prisoner’s dilemma game. An act by a single individual provides everyone with a public benefit and at the same time induces a cost of acting to the particular individual. In the case of the fishers, fishing less would impose a positive marginal good for oneself and everyone else and the specific fisherman would receive the cost of less income. “Because an individual has a negligible impact on large-scale collective actions, and because the benefits obtained in such actions are public and cannot be withheld from those who do not participate, Olson argues, the rational individual will not participate in collective action. The strategically rationally individual will be a free-rider” (Miller, 1992).

Figure 7.1 depicts the utilities of people participating in collective actions as a function of the share of co-operators. The figure illustrates a simple case, where each co-operator brings equal benefit to the public, that is marginal benefits and costs are constant. The upper curve is utility of free-riders. The dotted line shows the average benefit to all members-cooperators and non-co-operators.

Payoffs

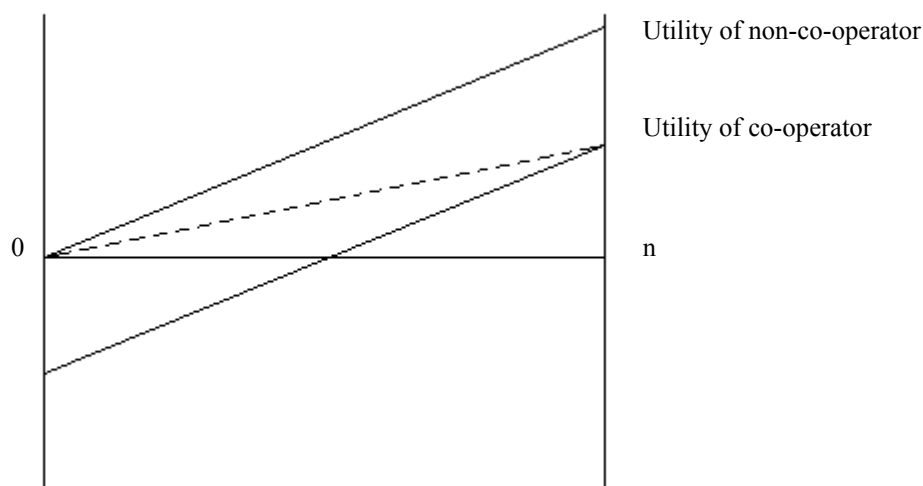


Figure 7.1 (taken from Schelling, 1973, quoted in Elster 1985)

In this scenario the free-rider will reap all the benefits imposed by the ones acting for public good, without paying the cost. Similar to a two-player prisoner's dilemma, the best response of everyone is not to coordinate, so the Nash equilibrium is that everyone fink, hence, no-one participates in the collective action. Obviously, this theory has obviously been criticized for lack of social realism. People do vote in elections, they do start revolutions and they do strike if terms of wage-contracts are largely dissatisfying.

### 7.3.2 Benefits and costs of collective action

Recently Norwegian newspapers have reported conflicts within the Norwegian police department. In the aftermath of a wage-fight between the police and the officials, or wage-regulators, the media portrays a silent clause within the police force (Dagsavisen April 17<sup>th</sup>, 2009, Aftenposten April 17<sup>th</sup>, 2009). The officers refuse to work any overtime in addition to a suspiciously large share of sickness leave within the force. However, the ones that do voluntarily work overtime "are being bullied by colleagues (Dagsavisen 17.april, 2009)". The bullying are reported as post-its representing "yellow cards", e-mails containing explicit warnings of unpleasant working-community and some officers claim they are being called "Judas". The social sanctions towards the ones crossing the picket line can be labelled as costs towards the ones not participating in the silent clause. The over-time workers are subjected as disloyal to the collective action and are being punished for their free-riding.

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However, it may be other reasons than free-riding that prevents some officers to participate. Still, they are being treated as free-riders by their colleagues.

The actions of not working overtime impose a cost of lesser earnings, and since this is reported in the news, the public may feel disgust by how police-officers act towards their mates. This again can be labelled a social cost on the ones taking part in the “strike”. They may even feel guilt, shame or other internal, negative emotions towards the actions taken, both the punishing of colleagues and the actions of silent clause itself. However, there are also benefits associated to the action. There is a direct gain of “winning” the fight and reaching a better agreement, the more people participating; the greater the average utility.

However, there exists possibly a positive utility in the *process of agency*. This may be the feeling of belonging to something important, bonding with others, and perhaps the satisfaction of contributing. Elisabeth Wood argues that such affective benefits received through participation, together with moral, are described as the most relevant explanation of the reason why civilian supporters chose to contribute in insurgency towards the government in El Salvador. She terms this “pleasure of agency” (Bowles, 2007).

Elster (1985) describes implications for morality as a motivation for cooperation. He explains that if an individual asks the question, “But what if everyone did that?” the relevance of *duty* to collective action is captured. Further he argues that another *interpersonal magic* is that a person would be willing to represent her group, as the group would represent her. Another feature of preferences is *altruism*. An altruist is an individual that receives pleasure from other people’s pleasure. The altruist may act for a public good even with no obligation. In a review of collective action theory and experiments, Elinor Ostrom (2000), argues that players of a population are of different types and use norms in different ways. The types she addresses are: *purely rational agents*, *reciprocal types*, *willing punishers*, *conditional co-operators* (punish if others do) and *free-riders*. Elster (1985 pp. 152) assumes that individuals in a population have “varying degrees of altruism, as well as selfish agents, as well as moral agents etc” and describes the snowball effect when “each new cooperator brings successively larger increases in the average benefit.” If some unconditional, highly altruistic and moral agents set off a collective action, less motivated people may join in when the share of cooperators becomes larger. Finally, even the selfish may benefit from joining. This need not be sequential, as rational individuals anticipate and

estimate other people's actions, while full information agents can act separately towards non-best response.

### 7.3.3 A model of Collective Action

To capture all the costs associated to strikers and non-strikers within a group, Bowles (2007) develops a simple model where the group as a whole imposes a cost of non-conformism. Consider a specific trade union consisting of individuals with job-positions according to their productivity  $p$ . If the union acts militantly towards the employer, they are exposed to a cost,  $c$ . In other words, if the convention is to conform to the centralised wage-system,  $c$  exhibits a cost of non-conformism. To incorporate the free-rider problem, total non-conformist costs are dependent on the number of strikers,  $s$ . That is, the more strikers, the less are the costs of striking. (Conversely, the more strikers the larger are the costs associated with non-conformist non-strikers.)

The affective subjective costs and benefits, not related to share of strikers are measured by a parameter,  $\mu$ . This parameter shows the emotional costs of striking, not by breaking the norm, but rather other internal feelings, such as conscience, immorality and altruism towards the less productive employees.  $\mu$  also includes the net positive benefits or pleasure of agency subject of moral, duty and group-oriented altruism.

Consider the union-members being able to anticipate and estimate the number of strikers within the group and, hence, their net costs and benefits. "Successful collective action often requires the ability to wait- to delay rather than to seize on any occasion to act" (Elster, 1985). All members receive  $w(p)$  in subsequent periods if the strike is successful, and if the strike is not successful they continue to receive the centralised wage of  $W(p)$ . "Thus, the relevant comparison is between the single-period net benefits to striking and abstaining" (Bowles 2007).

$$U_s = \mu(w(p) - W(p)) - (1 - s)c$$

(7.4)

$$U_n = W(p) - sc$$

The top equation of (7.4) shows the positive direct benefits of a successful strike less the non-conformist cost decreasing in the total number of strikers. The bottom equation of (7.4)



shows the single-period utility of the non-striker. The costs of the non-striker increase in the numbers of strikers captured by social sanctions to avoid the free-rider problem. Figure 7.2 shows the payoffs as functions of strikers, similar to Figure 7.1.

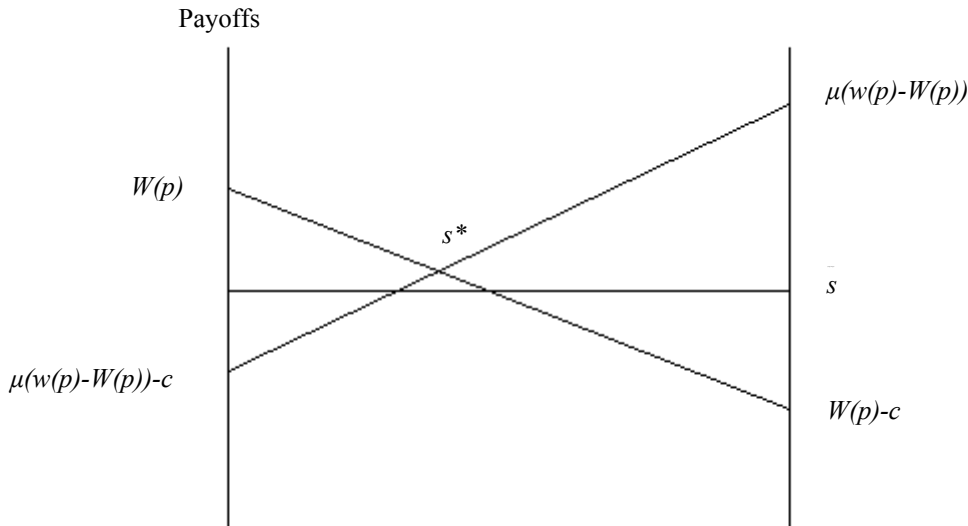


Figure 7.2 From Bowles (2007, pp. 428)

The number  $s^*$  reflects the tipping frequency. If one believes that the share of participators is greater than this number, the best response for the individual is to strike. For simplicity, if a member of the trade union believes that the probability that other group-members strike is 0.5, then if  $s^* < 1/2$  all members would strike.  $s^*$  is given by equation (7.5).

$$(7.5) \quad s^* = \frac{1}{2} - \frac{\mu(w(p) - W(p)) - W(p)}{2c}$$

It is straightforward to see that if  $\mu(w(p) - W(p)) > W(p)$ , then  $s^*$  will be less than 1/2. That is, the direct benefits of striking exceed the payoffs accompanied by the centralised bargaining system. In other words, a potential strike depends on the opportunity cost carried by the productive employees, and the pleasure of agency-parameter  $\mu$ . As an example, consider the net affective costs and benefits to equal zero, that is, no-one bothers to strike even if the potential decentralised wage is vastly greater than the centralised. In this case  $s^*$  will be between 1/2 and 1. Now, consider  $\mu=1$ , equation (7.5) shows that the potential wage of a decentralised system need to be twice as high as the wage currently received in centralised wage-bargaining for  $s^*$  to be less than one half.

Elster (1985) describes altruism as an important factor to set collective action in motion. In the trade-union model, two kinds of altruisms are apparent. Since the individual knows the consequences of her actions, an act towards a more differentiated society implies that the striking individual has a notion of actuarial fairness. In other words, the union member knows that other people may become worse off as a consequence of her action. This can be termed as low degree of between-group altruism. In contrast, a strong level of within-group altruism would induce people to participate in the collective action. In equation (7.5), these two types of altruism would be reflected in  $\mu$ .

Similar arguments hold for societal inequality-aversion reflected in the centralised bargaining measure of equality,  $r$ . Reasonably, one may argue that social sanctions from other unions, media and other potential punishers are greater the larger  $r$  is, which implies that  $c$  is an increasing function of  $r$ . Differentiating equation (7.5) with respect to  $r$  then gives two opposing effects on  $s^*$ . First, a greater  $r$  implies a larger gap between decentralised wage and the centralised, resulting in greater direct benefits of successful striking. This has a negative impact on  $s^*$ . However, larger  $r$  induces a greater  $c$ , which decelerates the process.

Consider the opposite process of lower  $r$  in the centralised bargaining system. That is, the specific unions are given more bargaining power in the productivity they represent. The effect would be that the centralised wage of the most productive employees would approach the decentralised. This implies that  $s^*$  advance. Hence, a decentralisation of the system may be triggered within the centralised system, in that unions' association provides different unions with power with reference to actuarial fairness to productivity. This raises two implications. First, if decentralisation of the system is done within this notion, then strikes can be made extinct. Second, if decentralisation is a function of  $r$  within this model, then may the decentralisation be reversible? That is, if the surrounding circumstances, economic and business cycles, international environment etc alter the domestic economic situation, the centralised bargainers exercise power favouring egalitarian preferences, which in turn will compress wages. Stokke and Seip (2003) argue that increased differentiation of wages, individual and geographical, within the Nordic countries is basically because "labour unions actively contribute to decentralised wage". They assume that the reason for this is the "change in sense of justice". Since membership of unions is unaltered, this may seem as a plausible explanation.

## 8. Discussions

### 8.1 Implementation of centralised system in the Nordic countries (ii)

Similar to the stochastic case described in equations (5.11), if  $R_{CD} > R_{DC}$ , then most of the time will be spent on the centralised convention. In other words, it requires more idiosyncratic play by the employees towards a decentralised wage-system, than it does by employers towards a centralised wage-system. Notice, that if  $\gamma = 1/2$ , then the modified reduced resistances will be similar to the stochastic case of equations (5.11). This suggests that there exist a  $\gamma^*$  so that if  $\gamma > \gamma^*$ , then a centralised system will be the convention, that is  $R_{CD} > R_{DC}$ . In other words, most employees are expected to play centralised, if the number of employees (or craft unions) is greater than  $\gamma^*$ .  $\gamma^*$  is found by setting  $R_{CD} = R_{DC}$ .

$$(8.1) \quad \gamma(1 - \alpha^*) = (1 - \gamma)\beta^*$$

$$\gamma^*(p) = \frac{\beta^*(p)}{1 - \alpha^*(p) + \beta^*(p)}$$

By implementing the payoffs in  $\alpha^*$  and  $\beta^*$  into equation (8.1) the equation becomes

$$(8.2) \quad \gamma^*(p) = \frac{\delta w(p)\Pi(p) + \delta^2 w(p)\pi(p)}{2\delta w(p)\Pi(p) + \delta^2 w(p)\pi(p) + W(p)\Pi(p)}$$

Letting  $\delta = 0$  implies  $\gamma^* = 0$ . Equation (8.2) shows that when labour disputes are high very few idiosyncratic plays are needed from the *employers*. That is, as  $(1 - \gamma^*)$  becomes less than  $(1 - \gamma)$ ,  $R_{DC}$  becomes smaller than  $R_{CD}$ . In the Nordic countries, the employers were well organised according to Peter Swenson (1991a and 1991b). After the depression, the Nordic countries experienced a substantial degree of labour disputes, and according to Moene and Wallerstein (2006), there were more lockouts by employers, than strikes by employees.

## 8.2 Persistence of the centralised system

In the years after the great depression and up to this day, technology has been rapidly advancing. In trying to capture the increased benefits for the employers demanding highly skilled workers, consider an increase in productivity  $p$ , holding average productivity constant. This is a somewhat simplistic assumption; however, it shows the effect of higher demand for productivity relative to lower productivity. By taking the derivative of  $\gamma^*$  with respect to productivity gives

$$(8.3) \quad \gamma^{*'}(p) = \frac{-\beta^{*'}(p)\alpha(p) + \beta^*(p)\alpha^{*'}(p)}{(1 - \alpha^*(p) + \beta^*(p))^2} < 0$$

The sign of the derivative come from  $\alpha^{*'}(p) < 0, \beta^{*'}(p) > 0$ , for the circumstance of productive employees and employers respectively. Equation (8.3) has to be interpreted as follows. As the demand for skilled labour increases, the employers benefits increase, which implies that the payoff matrix is altered such that it requires more employees to play idiosyncratic in the same period to induce a change of best-response functions of employers. In other words, as  $\alpha^*$  decrease with increased productivity of the employees,  $(1 - \alpha^*)$  increase. That is, the share of employees needed to play {D} to alter the convention. Thus, even though the centralised system may have been implemented for efficiency reasons, it may persist because the employees cannot act cooperatively. As technology advances, and labour skills lags after, the system persists as  $\gamma^*$  decrease with benefits of the productive employers. It is worth to notice that education in the Nordic countries are free of charge for everyone, in addition to generous welfare mechanisms towards students in the aim that everyone has opportunity to attend university. If education was costly, there is reason to believe that scholars would demand higher wages and be more militant towards employers. However, militancy requires that the different productive crafts are somewhat separately organised.

## 8.3 Reversible Decentralisation

Stokke and Seip (2003) present a process of decentralisation in the Nordic countries in recent decades. This decentralisation has been greatest in Sweden. Swenson (1991b) describes a trade union- influenced decentralisation in Sweden in the 1980s. Swenson argues

that this was due to internationally induced inflation. The exporting sector, guided by the trade union “Metall”, was dissatisfied by the increased wage-level of the public sector and the additional inflation this brought upon the domestic economy. Letting the participants ( $\gamma$ ) in equation (7.3) be weighted on the power of different unions, the presence of striking in only a single and powerful union increase probability of switch instantly. Thus, a collective action within the big unions may induce a switch of conventions according to equations (7.3) and (7.5). This argument is used by Nito (Norwegian Engineering- and Technology organization) in Norway. In a Fafo-report in 2006 by Seip on request by Nito, Seip writes: “An important factor to achieve independency [from centralised agreements] is to become “invincible”, to avoid being measured, weighted and compared with other groups. (...)If big groups manage to keep their wage-progress outside the equation [centralised system], the task becomes difficult.”

In a Fafo-report by Stokke and Seip (2003), the authors argue that the current decentralisation of institutions the Nordic countries is basically powered by the trade-unions of more productive employees, for example Metall and Nito. However, they describe a process of both decentralisation and centralisation at the same time. The central level has greater control over setting the scope of agreements and giving warranties, while the distribution of wages is set at a local bargaining between employee and employer. They write: “The decentralisation is not being described as impossible to reverse. If wage-drift becomes out of control, the central level can impose a stricter direction. The development of wages is based on cycles, as in trends, claim participants of the Swedish tariff-agreements.”

That *trend* of the wage-progress is assumed to be the driving force behind the decentralisation can be thought of variations of  $r$  from equations (5.1), (5.3). This implies that the unions representing the employees in current trend have a lesser degree of equality preferences. As  $r$  becomes smaller, the centralised wage becomes closer to the decentralised. This suggests that there is no need to alter conventions, as the payoffs grow to be similar. Within this reasoning, the different unions borrow the power, in according to their productivity, by the centralised bargainers. However, if anything happens to the economic environment, this power can be retaken and wages will again be distributed more egalitarian. How plausible this argument is, will not be discussed further. However, the report of Stokke and Seip (2003) finally concludes that locally negotiated wage is related to less worker struggle. This finding is consistent with equation (7.5). The lower  $r$  induces  $s^*$  to advance

and decreases the likelihood of collective action. Instead of strike, the productive employees have been able to decrease the egalitarian distribution of wages by imposing local bargaining, which means that power in the negotiation is taken from the centralised agreements into the productivity of the employee respectively.

## 9. Concluding Remarks

The game-theoretic approach used in this thesis is based on a few simplistic assumptions. Due to these assumptions, the reader should interpret the discussions in a general manner. It is important to highlight the assumption that employees with a similar productivity negotiate the wage-contract with a specific employer. The employer will for obvious reasons have no credible source of information of the specific productivity and will face adverse selection problems. However, through the matching process of hiring labour into a vacant position, the employer and the employee gather information about the other player through, often several, job interviews, reference-checks, CV etc. The main point will not be excluded, regarding that an exact match between a high-technological employer and a low-productive, uneducated, worker will not take place.

This thesis concludes that the most productive labour do participate in the centralised wage-bargaining voluntarily. This seems as a reasonable conclusion, considering the individual as adapting to the surrounding environment. The respective employee may feel: if there are no other jobs providing higher pay for my productivity or education, then I will have to stick with this.

The thesis describes some dissatisfaction by unions consisting of members of typical highly productive crafts. These unions have the opportunity to alter the system by supporting their members' non-best play. In the Nordic countries, the behaviour of such has resulted in decentralisation of the system. However, the potential collective action and worker struggle has been unravelled by the compromise of local bargaining in addition to the centralised.

This thesis supports the logic that the compressed wages leads to a higher rate of creative destruction and can be used as a growth model. As technology advances, this feature is even stronger; however, this alters the opportunity costs, and hence enhances pressures of a potential flip of conventions. Since the behaviour of both employers and employees are subject of the surrounding environment, to raise the idea of compressed wages in current developing countries will probably not be supported by best responses of employers, due to the problem of brain-flow.

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