



Gradual collective wage bargaining[☆]



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ABSTRACT

This paper presents an alternative implementation of firm-level collective wage bargaining, where bargaining proceeds as a finite sequence of sessions between a firm and a union of variable size. We investigate the impact of such a 'gradual' union on the wage-employment contract in an economy with concave production. In a static framework, the resulting equilibrium is equivalent to the efficient bargaining outcome. In a dynamic framework with search frictions, we demonstrate that gradual collective wage bargaining coincides with all-or-nothing bargaining when bargaining takes place in fictitious time before production.

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1. Introduction

The general assumption in canonical collective bargaining models is that all employed union members return to the external labor market permanently when negotiations fail.¹ In many real-world labor markets characterized by search frictions, such immediate termination may not be an accurate assumption because it entails, e.g., search costs of finding a new job, search costs of replacing the workforce and opportunity costs of forgone production. Therefore, it is unlikely that neither the union seriously contemplates leaving the firm permanently, nor the firm credibly considers dismissing its entire workforce.²

This paper presents an alternative implementation of decentralized collective wage bargaining, replacing the usual 'all-or-nothing' union by our proposed 'gradual' union. Essentially, in a discrete labor

setting, the latter implies that the union bargains on behalf of N workers and if negotiations break down, the marginal worker leaves the firm and the union rebargains on behalf of the remaining $N - 1$ workers, and so forth. In terms of interpretation, any time before production, the firm may fire an employee, or alternatively, an employee might grow frustrated and exit the firm after which bargaining resumes. Such a collective bargaining environment is particularly relevant in an 'at-will firm' where wage offers are unenforceable and renegotiations are frequent. We refer to Hogan (2001) for a rationalization of the presence of a union in an incomplete contracting environment.

We investigate the impact of a gradual union on the equilibrium wage-employment contract in both a static and dynamic framework of firm-level collective wage bargaining in an economy with concave production. In a static framework, the resulting equilibrium is equivalent to the equilibrium under efficient bargaining (EB), which assumes an all-or-nothing union (McDonald and Solow, 1981). In a dynamic framework where the firm cannot instantaneously replace workers after a breakdown of the wage bargaining, firm-level employment is no longer efficient. We demonstrate that gradual collective wage bargaining still coincides with all-or-nothing bargaining when bargaining takes place in fictitious time before production.

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¹ For the ongoing relevance of union wage bargaining, especially for European countries, we refer to Booth (2014).

² Bauer and Lingens (2013) provide a rare example of Ronald Reagan's dismissal of air traffic controllers in 1981, arguably a political rather than an economic act.

Table 1
Characteristics of different bargaining arrangements.

	Efficient bargaining (EB)	Intra-firm individual bargaining (SZ)	Gradual collective bargaining
Solution concept	Generalized Nash	Generalized Nash	Generalized Nash
Bargaining parties	Union-firm	Worker-firm	Union-firm
Bargaining scope	Wages and employment	Wages	Wages
Disagreement action	All workers leave the firm	One worker leaves the firm	One worker leaves the firm
Nature of contract	Binding	Non-binding	Non-binding

Our article relates to two strands of literature. First, our static analysis reexamines the work of [Stole and Zwiebel \(SZ\) \(1996a,b\)](#) on intra-firm individual bargaining under non-binding contracts, based on the notion that contracts cannot commit the firm and its employees to wages and employment. The employment-at-will assumption, together with employee hold-up power, yields inefficiencies in hiring decisions. In equilibrium, the SZ firm overhires relative to the neoclassical (NC) firm to such an extent that bargained wages are driven down to the reservation wage.³ Our implementation of gradual collective wage bargaining allows to investigate how equilibrium wages and profits of SZ's at-will firm alter when bargaining takes place collectively rather than individually. Similar to all-or-nothing collective wage bargaining, gradual collective wage bargaining removes the wage externality by hindering firms from instantaneous renegotiations with individual workers. [Table 1](#) summarizes various characteristics of the different bargaining arrangements that are compared in our static analysis.

Second, we introduce a gradual union into the rent-sharing literature analyzing the interaction of search frictions and distortions caused by collective wage bargaining in a dynamic setting. We build on the work of [Bauer and Liggins \(BL\) \(2013\)](#) who investigate this interaction under the assumption of an all-or-nothing union in a large-firm random search model. In case the firm cannot immediately replace its workforce, two competing effects emerge: a strategic overhiring effect as in the SZ environment and a countervailing wage rise effect typical of unionized bargaining. BL demonstrate that the latter effect is more important and firm-level and aggregate employment are inefficiently low when the number of firms is held constant. We complement the analysis of BL by showing the equivalence between gradual and all-or-nothing bargaining when bargaining takes place in fictitious time before production starts. The fact that also under gradual bargaining all employees may exit off the equilibrium path in the current period explains this equivalence result. We conclude that inefficiencies in hiring decisions that arise in an economy characterized by search frictions and collective wage bargaining are not driven by the particular implementation of firm-level all-or-nothing collective bargaining.

The plan of the article is as follows. In [Section 2](#), we introduce the gradual union in a static SZ framework. [Section 3](#) extends the analysis to a dynamic large-firm search and bargaining environment. [Section 4](#) concludes.

2. Gradual collective wage bargaining without search frictions

In [Section 2.1](#), we present our gradual collective wage bargaining model in a static SZ framework with discrete labor and without externalities arising from job search. In [Section 2.2](#), we derive the equilibrium wage-employment contract and demonstrate its

equivalence with the equilibrium wage-employment contract under efficient bargaining.

2.1. Bargaining environment

Consider a fixed-size union of $\mathcal{N} \in \mathbb{N}$ members. A subset of N union members (the employees) work in the firm. We assume that the union is sufficiently large to cover labor demand ($N \leq \mathcal{N}$). We endogenize the choice of N later on. We denote $w(N)$ the employee's wage in a firm with N employees. The reservation wage is \underline{w} . The firm utilizes a single-asset, strictly increasing and strictly concave production function $F(N) : \mathbb{N} \rightarrow \mathbb{R}_+$. We assume that $F(j) \geq j\underline{w}$ for $j \in \{1, \dots, N\}$. Furthermore, $F(0) = 0$. Denote Δ the first-difference operator, e.g. $\Delta F(N) = F(N) - F(N - 1)$. The firm's profit function equals $\Pi(N) = F(N) - Nw(N)$. The neoclassical firm's profit function is denoted by $\Pi^{NC}(N) = F(N) - N\underline{w}$. Both the firm and workers are risk-neutral.

In the at-will firm, wage offers are unenforceable. Any time before production starts, the firm may fire an employee, or alternatively, an employee may quit the firm. Employees are irreplaceable. An employee who returns to the external labor market can never re-enter the firm and stays a union member earning the reservation wage.

Union preferences are represented by a utilitarian objective function. The union's payoff when there are N employees equals:

$$Nw(N) + (\mathcal{N} - N)\underline{w}. \quad (1)$$

The union's payoff when there are $N - 1$ employees equals:

$$(N - 1)w(N - 1) + (\mathcal{N} - N + 1)\underline{w}. \quad (2)$$

Hence, the gradual union's net gain from reaching a bargaining agreement equals:

$$Nw(N) - (N - 1)w(N - 1) - \underline{w}. \quad (3)$$

The firm's net gain from reaching a bargaining agreement equals:

$$\Pi(N) - \Pi(N - 1). \quad (4)$$

Following the collective bargaining literature, we assume that conventional generalized Nash bargaining is the appropriate solution concept. The bargaining scope is negotiation over wages alone. The firm chooses the employment level that maximizes profits. The bargained wage follows from maximizing the Nash product Ω :

$$\Omega = [Nw(N) - (N - 1)w(N - 1) - \underline{w}]^\phi [\Pi(N) - \Pi(N - 1)]^{1-\phi} \quad (5)$$

where $\phi \in [0, 1]$ denotes the workers' bargaining power.

For the sake of expositional clarity, we present an extensive-form bargaining game which unique subgame perfect equilibrium corresponds with the equilibrium wage-employment contract that follows from our static model.

³ [Stole and Zwiebel \(1996a\)](#) propose an extensive-form bargaining game and claim that the profiles of wages and profits in the subgame perfect equilibrium coincide with the Shapley values. [Brügemann et al. \(2015\)](#) show that this claim is incorrect. They propose an alternative extensive-form bargaining game, the Rolodex game, in which the profiles of wages and profits in the subgame perfect equilibrium do coincide with the Shapley values. They also demonstrate that overhiring is larger when wages are set according to the SZ game than according to the Rolodex game.

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