Raising Rivals' Fixed (Labor) Costs: The Deutsche Post Case*

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Abstract

In this paper we analyze the bargaining problem of an incumbent firm and a union when the collectively agreed upon wage becomes the minimum wage in the entire industry. Our main application is the Deutsche Post case which nicely highlights the raising rivals' costs incentives which labor laws provide that make collective agreements generally binding. In contrast to previous works on raising rivals' (wage) cost strategies we analyze the case where labor costs are mainly fixed operating costs. In those settings generally binding (minimum) wages become an extremely effective tool to deter market entry of rivals which may be even more efficient. Besides the well-known duplication costs of competition, overall productive efficiency may deteriorate under extension regulations.

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1 Introduction

In this paper we analyze the bargaining problem of an incumbent firm and a union when a collectively agreed upon wage contract becomes the minimum wage in the entire industry. This is typically the case in Germany, where collective wage agreements between a union and an employers' association can be make compulsory even for independent employers through so-called extension rules.

Our main application is the Deutsche Post case which nicely highlights the parties' incentives and the consequences of labor laws which make collective agreements generally binding. In contrast to previous works on raising rivals' (wage) cost strategies we analyze the case where labor costs are mainly fixed operating costs. We assume that the employees of the incumbent firm are represented by union, while none of the workers of the entrant firm is organized. In those settings generally binding (minimum) wages become an extremely effective tool to deter even a more efficient rival from entering the industry.

Our paper is related to Williamson (1968) who showed that an incumbent firm may accept high wage rates if this also raises rivals' costs (see also Haucap, Pauly, Wey, 2001). Precisely, Williamson (1968) analyzed the so-called Pennington case and he argued that an industrywide wage contract which increases the cost of relative labor-intense firms to a larger extent than the costs of relative capital-intensive firms, can be used to force labor intensive firms to withdraw from the market. In contrast to Williamson's paper we show that generally binding wages may also force more efficient competitors to stay out of the market. When wages impact on marginal cost (as assumed in Williamson and Haucap, Pauly, and Wey, 2001) a rival with a higher labor productivity cannot profitably harmed through a generally binding wage contract.

Our paper is also related to Rogerson (1988) who shows that under symmetric cost conditions a dominant firm has incentives to raise fixed entry cost. However, in Rogerson (1988) the level of fixed entry costs is exogenously given, while in our analysis the fixed labor of operating a mail delivery network are the outcome of negotiations between the union and the incumbent operator.

2 The Model

We assume an incumbent firm $i = 1$ and an entrant firm $i = 2$. We think of the firms as postal network operators which offer mail delivery services. The incumbent firm operates a delivery network by employing a fixed volume of mailmen services, $\eta_1 > 0$, which guarantees a certain (regulated) mail service quality (e.g., maximum delivery transit times). Hence, the incumbent's labor costs of operating its mail delivery network are fixed costs which are independent of the overall mail volume. For a given wage rate w_1, the incumbent's total labor costs are then given by $\eta_1 w_1$. In addition, the incumbent's (non-labor) marginal costs of mail delivery service are given by $c_1 = c \geq 0$.

With regard to the entrant firm's costs we also assume that labor costs for operating its own delivery network constitute fixed costs with $\eta_2 w_2$.[1] The entrant has (non-labor) marginal costs of $c_2 = c + \Delta$, where Δ stands for the relative cost efficiency of the entrant firm. The relative cost efficiency of the entrant increases with lower values of Δ. We suppose that the entrant firm's mail delivery network is more efficient when compared with the incumbent firm's delivery technology, so that $\eta_1 \geq \eta_2$ holds (we measure the relative network efficiency of the entrant by the ratio $\eta_2/\eta_1 \leq 1$, where a lower value indicates a higher efficiency level).

We assume a linear inverse demand for mail services $p(X) = a - X$, with $a > c$, where $X := x_1 + x_2$ stands for the sum of mail services offered by the incumbent, x_1, and the entrant firm, x_2. Firms set mail service capacities x_i (e.g., sorting capacity), while the offered mail service is perceived as homogenous by consumers.[2] In the following it is useful to define $\alpha := a - c$.

All workers of the incumbent firm are represented by a union which maximizes the wage bill $L = w_1 \eta_1$ of its members. We suppose that all workers in the sector have the same reservation wage $\rho \geq 0$ (which is typically determined by unemployment benefits). We assume collective wage bargaining between the incumbent firm and the union. The union's disagreement point

[1] We focus on competition between delivery network operators. By that we abstract from the issues of access regulation which may counter competitors' incentives to set-up own delivery networks (as, e.g., in Britain where relatively low access prices prevail). See Armstrong (2008) for a model of optimal access prices in postal service markets.

[2] Because of the linearity of our model we can also reinterpret Δ as measuring vertical product differentiation (see Häckner, 2000).

is then given by $\rho\eta_1$. We apply the wellknown Nash bargaining solution to solve for the wage settlement (Nash, 1950).

Workers of the entrant firm are assumed to be not organized in a union. Hence, in the absence of an extension rule, the entrant is able to hire workers at their reservation wage ρ.

We consider the following two stage game: In the first stage, the incumbent firm and the union bargain about the wage rate. In the second stage, the incumbent and the entrant simultaneously determine their capacities (i.e., compete à la Cournot).

We distinguish two labor market regimes depending on whether or not an extension rule is in place. If no extension rule exists, then the entrant firm pays the reservation wage to its employees while the incumbent bargains with the union about the wage rate, $\widehat{w}_1$, which only applies to its own employees. In contrast, if an extension rule is in place, then the entrant firm must pay the (minimum) wage, $\overline{w}$, which is determined jointly by the union and the incumbent firm.

At this point some more general remarks are helpful to specify a meaningful parameter range for our linear model. Let us denote the net revenue of firm $i = 1, 2$ by $R_i = [p(X) - c_i]\, x_i$. Suppose an interior Nash-Cournot equilibrium (x_1^*, x_2^*) exists with

$$x_i^* = \arg\max_{x_i} \; R_i(x_i, x_j^*), \text{ for } i = 1, 2,\ i \neq j.$$

As products are homogenous, differences in firms' equilibrium quantities only depend on Δ and are independent of the wage rate. Quite generally, in a Cournot duopoly model increasing the relative cost efficiency of one firm (say, of the entrant with $i = 2$) leads to a relative increase of the firm's equilibrium output; i.e., $\partial x_1^*/\partial\Delta > 0$ and $\partial x_2^*/\partial\Delta < 0$ holds, with $x_1^* = x_2^*$ at $\Delta = 0$.[3] We specify that $x_2^*(\Delta) > 0$ and $x_1^*(\Delta) > 0$ for all admissible Δ, so that the range of Δ is restricted to an interval which guarantees strictly positive output levels for both firms.

Denote now the optimal net revenue of firm i under duopoly by $R_i^D := [p(x_1^* + x_2^*) - c_i]\, x_i^*$ (where the superscript "D" stands for the duopoly outcome in the product market). As we assumed constant marginal costs, we obtain $dR_1^D/d\Delta > 0$ and $dR_2^D/d\Delta < 0$, with $R_1^D = R_2^D$ if $\Delta = 0$.

[3] See Vives (1999) for a general treatment of the Cournot oligopoly model and the conditions which ensure "intuitive" comparative statics.

Our approach implies that the wage rate only affects firms' profit levels but not optimal quantity choices. We assume that workers' reservation wage is sufficiently low such that $R_2^D - \eta_2\rho > 0$ holds. For all admissible Δ, this assumption ensures that the entrant firm always finds it profitable to enter the market whenever it pays the reservation wage to its employees operating the mail delivery network. Similarly, we assume that $R_1^D - \eta_1\rho > 0$ holds for all admissible Δ, so that the incumbent operates with a strictly positive profit if it pays the reservation wage under duopoly. This assumption also ensures that the joint surplus of the union-incumbent relationship is strictly positive implying, in turn, a negotiated wage strictly larger than workers' reservation wage.

Given that an extension rule exists, the entrant firm must pay the generally binding wage rate, $\overline{w}$, which is the outcome of bilateral bargaining between the union and the incumbent firm. Clearly, as long as the entrant's net revenue R_2^D is not smaller than its fixed labor costs, $\overline{w}\eta_2$, the entrant will enter the market. We denote the limit wage, where $R_2^D = w\eta_2$ holds, by $\widetilde{w}$. Note that $d\widetilde{w}/d\Delta < 0$ which says that the limit wage increases as the entrant's cost efficiency increases.

If $\overline{w} \geq \widetilde{w}$ then the entrant does not enter the market and the incumbent realizes the monopoly net revenue $R_1^M := R_1(x_1^M)$ with $x_1^M = \arg\max_{x_1} [p(x_1) - c_1]\, x_1$ (where the superscript "M" stands for the monopoly outcome in the product market). Note that R_1^M is independent of both Δ and $\overline{w}$. We now invoke the assumption that $R_1^M > \widetilde{w}\eta_1 \equiv (\eta_1/\eta_2)R_2^D$ which guarantees the existence of a limit wage $\widetilde{w}$ which leaves the incumbent with a strictly positive payoff at the limit wage; i.e., $R_1^M - \widetilde{w}\eta_1 > 0$. This assumption guarantees scope for entry deterrence as, otherwise, the incumbent would always be better off under the duopoly outcome.

We, therefore, formulate the following assumption which we maintain throughout the entire analysis.

Assumption 1. *We invoke the following parameter restrictions.*

i) $\Delta \in (-\alpha, \frac{\alpha}{2})$ *which ensures that both firms' equilibrium quantities are strictly positive, whenever the entrant firm enters the market.*

ii) $\rho < \widetilde{w} = \frac{1}{\eta_2}\left(\frac{\alpha-2\Delta}{3}\right)^2$ *which ensures that the entrant firm enters the market whenever it pays the reservation wage to its employees.*

iii) $\frac{\eta_1}{\eta_2} < \left(\frac{\alpha}{2}\right)^2 \Big/ \left(\frac{\alpha-2\Delta}{3}\right)^2$ *which guarantees that the incumbent's profit is strictly positive at*

the limit wage, $\widetilde{w}$.

Part *iii)* of Assumption 1 mirrors the fact that entry deterrence is in principle possible as the incumbent realizes monopoly net revenues at the limit wage which are larger than the wage bill at the limit wage. This constellation is guaranteed by imposing an upper limit on the relative network efficiency of the entrant. However, the share the incumbent may get from the realized monopoly revenues may be quite small when the limit wage becomes large.

3 Equilibrium Analysis

We first analyze the equilibrium when no extension is in place. Then we turn to the case where an extension rule makes the wage agreement between the incumbent and the union generally binding for all firms in the industry. Finally, we compare the results under both labor market regimes.

Bargaining without extension rule. We first analyze the equilibrium when no extension rule is in place. The profit functions of the incumbent and the entrant are given by

$$\pi_1 = (\alpha - X)x_1 - w_1\eta_1 \text{ and } \pi_2 = (\alpha - \Delta - X)x_2 - w_2\eta_2,$$

respectively, from which we obtain the first-order conditions

$$\alpha - 2x_1 - x_2 = 0 \text{ and } \alpha - \Delta - 2x_2 - x_1 = 0,$$

and hence, the optimal quantities

$$x_1^* = \frac{\alpha + \Delta}{3} \text{ and } x_2^* = \frac{\alpha - 2\Delta}{3}.$$

Hence, $R_1^D = \left(\frac{\alpha+\Delta}{3}\right)^2$ and $R_2^D = \left(\frac{\alpha-2\Delta}{3}\right)^2$. In the absence of an extension rule, the entrant pays the reservation wage ρ to its workers. Hence, the entrant firm's equilibrium profit becomes

$$\widehat{\pi}_2^D = R_2^D - \rho\eta_2. \tag{1}$$

We now turn to the first stage of the game, where the union bargains with the incumbent firm about the wage rate w_1. We apply the Nash bargaining solution which requires that the joint surplus $R_1^D = \left(\frac{\alpha+\Delta}{3}\right)^2$ is shared equally relative to the union's disagreement point $\rho\eta_1$ (the incumbent's disagreement point is zero). Hence, the equilibrium wage bill, $\widehat{w}_1\eta_1$, must fulfill

$$R_1^D - \widehat{w}_1\eta_1 = \widehat{w}_1\eta_1 - \rho\eta_1. \tag{2}$$

The following proposition follows immediately from solving Equation (2) for the wage rate, $\widehat{w}_1$, the incumbent's profit and the union's wage bill.

Proposition 1. *Suppose that no extension rule exists. Then the entrant firm always enters the market, pays its employees the reservation wage and realizes the profit level* $\widehat{\pi}_2^D = R_2^D - \rho\eta_2$. *In equilibrium the union and the incumbent settle on the wage rate*

$$\widehat{w}_1 = \frac{1}{2}\frac{1}{\eta_1}\left[R_1^D + \rho\eta_1\right]$$

which implies a profit level of

$$\widehat{\pi}_1^D = \frac{1}{2}\left[R_1^D - \rho\eta_1\right], \tag{3}$$

for the incumbent, while the union's wage bill is

$$\widehat{L} = \frac{1}{2}\left[R_1^D + \rho\eta_1\right].$$

By Assumption 1, the entrant firm enters the market with a strictly positive quantity and receives strictly positive profits. Comparing both firms' profit levels (1) and (3), we observe that the entrant typically realizes a larger profit level than the incumbent. To see this, suppose that both firms are equally cost efficient (i.e., $\Delta = 0$). Then comparison of (1) and (3) yields that $\widehat{\pi}_2^D > \widehat{\pi}_1^D \Leftrightarrow \rho\eta_2 < (1/2)(R_1^D + \rho\eta_1)$, where the latter inequality holds always as we assumed $\eta_1 \geq \eta_2$ and $R_1^D > \rho\eta_1$. Hence, the incumbent's profit can only be larger than the entrant's profit if the entrant's cost efficient is sufficiently small (i.e., Δ positive and sufficiently large).

We next turn to the analysis of the labor market regime with an extension rule which makes the wage agreement between the union and the incumbent generally binding for all firms in the industry.

Bargaining with extension rule. In the case of an extension rule, the outcome of the negotiations between the union and the incumbent firm determine the minimum wage rate, $\overline{w}$, which is binding for all firms in the industry. With an extension rule in place, firms' optimal strategies in the second stage remain unaffected as long as the entrant firm finds it optimal to enter the market. This is the case as long as $\pi_2 = R_2^D - \overline{w}\eta_2 > 0$ holds. However, if the agreed upon wage rate does not fall short of the limit wage, $\overline{w} \geq \widetilde{w}$, then the incumbent sets the monopoly output level, $x_1^M = \alpha/2$ and realizes the monopoly net revenues $R_1^M = (\alpha/2)^2$ in the product market. Depending on the generally binding wage rate, $\overline{w}$, the incumbent firm's profit

function is then given by

$$\pi_1(\overline{w}) = \begin{cases} R_1^M - \overline{w}\eta_1 = (\alpha/2)^2 - \overline{w}\eta_1 & \text{for } \overline{w} \geq \widetilde{w} \\ R_1^D - \overline{w}\eta_1 = [(\alpha+\Delta)/3]^2 - \overline{w}\eta_1 & \text{for } \overline{w} < \widetilde{w}. \end{cases}$$

Let us assume for a moment that bargaining only occurs over a certain wage rate. We can then state the bargaining frontier $\Lambda(\pi_1)$ which gives the maximum payoff of the union for a given profit level of the incumbent firm when the parties bargain over "certain wage rates" as

$$\Lambda(\pi_1) = \begin{cases} R_1^M - \pi_1 & \text{for } 0 \leq \pi_1 \leq R_1^M - \widetilde{w}\eta_1 \\ R_1^D - \pi_1 & \text{for } R_1^M - \widetilde{w}\eta_1 < \pi_1 \leq R_1^D - \rho\eta_1. \end{cases} \tag{4}$$

We, therefore, obtain a non-convex bargaining problem if

$$R_1^D - \rho\eta_1 > R_1^M - \widetilde{w}\eta_1 \tag{5}$$

holds. Condition (5) requires that the joint surplus under duopoly net of the wage bill at the reservation wage is strictly larger than the joint surplus under monopoly net of the wage bill at the limit wage. In those instances, the incumbent would be able to realize a larger payoff under duopoly than under monopoly if it had all the bargaining power.

If, to the contrary, Condition (5) does not hold, then the bargaining frontier is described by $L(\pi_1) = R_1^M - \pi_1$ for $0 \leq \pi_1 \leq R_1^M - \widetilde{w}\eta_1$. In the latter case, we obtain a convex bargaining problem. In the former case, however, we have to allow for lotteries to "convexify" the bargaining frontier. We do this by allowing for bargaining over a lottery $l = (\widetilde{w}, \rho; p, 1-p)$ which chooses the limit wage, $\widetilde{w}$, with probability $p \in [0,1]$ and the reservation wage, ρ, with counter probability $1-p$. We assume that the union and the incumbent are risk-neutral.[4]

[4]By allowing for bargaining over lotteries and assuming von Neumann-Morgenstern expected utilities, our model fulfills the axioms of the Nash bargaining solution in expected terms. One may question whether bargaining over lotteries and the requirement to implement the ex post outcome of the lottery is a convincing image of real world wage bargaining. However, bargaining solutions which abstain from using lotteries are also problematic. For instance, Conley and Wilkie (1996) propose an extended Nash bargaining solution for nonconvex but comprehensible bargaining problems. Their approach is not applicable to our problem as the smallest comprehensible set of the bargaining frontier (4) has a jumb at the limit wage $\widetilde{w}$. Moreover, Conley and Wilkie's proposed solution is not necessarily strictly Pareto-efficient (see Hougaard and Tvede, 2010, for a solution which requires strict Pareto-efficiency but lacks a noncoorporative implementation).

We can now describe the convexified bargaining frontier by

$$L(\pi_1) = \begin{cases} R_1^M - \pi_1 & \text{for } 0 \leq \pi_1 \leq R_1^M - \widetilde{w}\eta_1 \\ [p\widetilde{w} + (1-p)\rho]\,\eta_1 & \text{for } R_1^M - \widetilde{w}\eta_1 < \pi_1 \leq R_1^D - \rho\eta_1, \end{cases} \tag{6}$$

where the lottery fulfills

$$[p\widetilde{w} + (1-p)\rho]\,\eta_1 = \widetilde{w}\eta_1 - \frac{\widetilde{w}\eta_1 - \rho\eta_1}{(R_1^D - \rho\eta_1) - (R_1^M - \eta_1\widetilde{w})} \cdot \left[\pi_1 - (R_1^M - \eta_1\widetilde{w})\right].$$

Applying the Nash bargaining solution to the convexified bargaining frontier (6) and noting the union's disagreement payoff, $\rho\eta_1$, we obtain the following proposition which summarizes the equilibrium outcome under an extension rule.

Proposition 2. *Suppose that an extension rule exists. If $R_1^D - \rho\eta_1 \leq R_1^M - \widetilde{w}\eta_1$, then entry is deterred for sure and the Nash bargaining solution yields the generally binding wage rate*

$$\overline{w} = \begin{cases} \frac{1}{2}\frac{1}{\eta_1}(R_1^M + \rho\eta_1) & \text{for } R_1^M - \widetilde{w}\eta_1 \geq \widetilde{w}\eta_1 - \rho\eta_1 \\ \widetilde{w} & \text{for } R_1^M - \widetilde{w}\eta_1 \leq \widetilde{w}\eta_1 - \rho\eta_1. \end{cases}$$

If $R_1^D - \rho\eta_1 < R_1^M - \widetilde{w}\eta_1$, then the (expected) wage rate is given by

$$\overline{w} = \begin{cases} \frac{1}{2}\frac{1}{\eta_1}(R_1^M + \rho\eta_1) & \text{for } R_1^M - \widetilde{w}\eta_1 \geq \widetilde{w}\eta_1 - \rho\eta_1 \\ [p^*\widetilde{w} + (1-p^*)\rho] & \text{for } R_1^M - \widetilde{w}\eta_1 \leq \widetilde{w}\eta_1 - \rho\eta_1, \end{cases}$$

with $p^* = \left[1 + \frac{(\widetilde{w}\eta_1 - \rho\eta_1) - (R_1^M - \widetilde{w}\eta_1)}{R_1^D - \rho\eta_1}\right]^{-1}$.

The first part of Proposition 2 follows directly from applying the split-the-surplus rule and taking notice of the corner solution. The second part of Proposition 2 follows from applying the split-the-surplus rule to the convexified problem. In particular, whenever the Nash solution requires to use a lottery, then the lottery must guarantee that the net joint surplus is shared equally which gives the condition

$$[p^*\widetilde{w} + (1-p^*)\rho]\,\eta_1 - \rho\eta_1 = p^*(R_1^M - \widetilde{w}\eta_1) + (1-p^*)(R_1^D - \rho\eta_1) \tag{7}$$

from which we obtain p^* as stated in Proposition 2.

We are now in a position to analyze how the parameters of our model affect the likelihood of a monopoly outcome where the union and the incumbent agree on a minimum wage which deters entry. We focus on the case where the bargaining frontier is represented by (6) such that

$R_1^D - \rho\eta_1 < R_1^M - \widetilde{w}\eta_1$ holds. From Proposition 1 we observe that deterrence for sure depends on the condition $R_1^M - \widetilde{w}\eta_1 > \widetilde{w}\eta_1 - \rho\eta_1$ being fulfilled. We can rewrite that condition as follows

$$f := (\widetilde{w}\eta_1 - \rho\eta_1) - R_1^M + \widetilde{w}\eta_1 = \frac{2\eta_1}{\eta_2}\left(\frac{\alpha - 2\Delta}{3}\right)^2 - \rho\eta_1 - \left(\frac{\alpha}{2}\right)^2 < 0.$$

Differentiation of $f(\cdot)$ gives $\partial f/\partial\eta_1 > 0$, $\partial f/\partial\eta_2 < 0$ and $\partial f/\partial\Delta < 0$.

We can also examine the probability p^* which we can rewrite as $p^* = (1 + f/g)^{-1}$ with

$$g := R_1^D - \rho\eta_1 = \left(\frac{\alpha + \Delta}{2}\right)^2 - \rho\eta_1.$$

Differentiation of $g(\cdot)$ yields $\partial g/\partial\Delta > 0$ and $\partial g/\partial\eta_1 < 0$. It is now straightforward to establish the following corollary.

Corollary 1. *Deterrence of the entrant for sure becomes more likely and the probability of a limit wage increases, whenever the relative network efficiency of the entrant increases (i.e., η_2/η_1 decreases) or the relative cost efficiency of the entrant decreases (i.e, Δ increases).*

Clearly, a bargaining outcome with $\overline{w} \geq \widetilde{w}$ becomes more likely for higher values of the entrants marginal costs (Δ) and larger values of the ratio η_2/η_1. Inspection of the probability p^* which solves the split-the-surplus condition (7) in expected terms, shows that p^* (i.e., the probability of choosing $\widetilde{w}$) increases as well when entry deterrence of sure becomes more likely. Interestingly, an increasing value of Δ and a decreasing value of η_1 which both shift the extremal point $R_1^D - \rho\eta_1$ of the bargaining set outward induce the bargaining parties to settle on a higher probability of choosing $\widetilde{w}$ under the lottery solution.

We now ask whether entry deterrence can occur for sure even when the entrant is more efficient. Let us assume for a moment that both firms have the same network efficiency (i.e., $\eta_1 = \eta_2$). To simplify, let us also assume that workers' reservation wage takes the value of zero. Entry deterrence then occurs for sure if

$$2\left(\frac{\alpha - 2\Delta}{3}\right)^2 - \left(\frac{\alpha}{2}\right)^2 \leq 0 \text{ or } \Delta \geq \frac{\alpha}{2}(4 - 3\sqrt{2}) < 0.$$

Hence, for all $\Delta \in [\frac{\alpha}{2}(4 - 3\sqrt{2}), 0)$ wage bargaining under an extension rule induces deterrence of a more cost efficient rival. Let us now assume that both firms have the same cost efficiency (i.e., $\Delta = 0$) but may differ in their network efficiencies (η_1, η_2). Again, setting the reservation wage to zero, we then obtain the following condition for entry deterrence for sure:

$$\frac{2\eta_1}{\eta_2}\left(\frac{\alpha}{3}\right)^2 - \left(\frac{\alpha}{2}\right)^2 \leq 0 \text{ or } \frac{\eta_1}{\eta_2} \leq \frac{9}{8}.$$

Hence, with an extension rule existing, an incumbent can deter a rival operator with a more efficient delivery network if $\frac{\eta_1}{\eta_2} \in (1, \frac{9}{8}]$ holds. We summarize those results in the following corollary.

Corollary 2. *Suppose $\rho = 0$. If $\eta_2/\eta_1 = 1$, then a more cost efficient entrant is deterred from entry for sure for all $\Delta \in [\frac{\alpha}{2}(4 - 3\sqrt{2}), 0)$. If $\Delta = 0$, then an entrant with a more efficient network is deterred from entry for sure for all $\frac{\eta_1}{\eta_2} \in (1, \frac{9}{8}]$. Moreover, when the parties use a lottery to share their expected joint surplus, then deterrence of a more efficient entrant always occurs with some strictly positive probability.*

Comparison of labor market regimes. Comparing the wage rate agreed upon when no extension rule is in place with the case where an extension rule obliges the entrant to pay the minimum wage, we arrive at the following result.

Corollary 3. *The (expected) wage rate under a regime with an extension rule is strictly larger when compared with a regime where no such rule exists. Moreover, the union's (expected) wage bill and the incumbent's (expected) profit are both strictly larger under an extension rule.*

Corollary 3 shows that the usually assumed conflict of interest between a firm and its union may be absent in the presence of market entry, whenever the deterrence instrument is a minimum wage. In contrast to deterrence models where the deterrence instrument (as, e.g., sunk costs in Dewatripont, 1987) differs from the rent-sharing instrument, a minimum wage which combines both functions in a single instrument largely resolves the tradeoff between the firm's interest to deter entry while trying to pocket as much as possible of the monopoly rents.

We conclude the analysis of our model with some remarks on overall productive efficiency as measured by mail unit costs. We compare the labor market regime without an extension rule with the labor market regime with an extension rule. We focus on the case in which the agreed upon wage rate in the latter regime is given by $\overline{w} = \frac{1}{2}\frac{1}{\eta_1}(R_1^M + \rho\eta_1)$, so that entry is deterred for sure. Unit mail cost when no extension rule is in place is given by

$$\frac{cx_1^* + (c + \Delta)x_2^* + \eta_1\widehat{w}_1 + \eta_2\rho}{x_1^* + x_2^*}. \tag{8}$$

With an extension rule place, unit mail costs are equal to

$$\frac{cx_1^M + \eta_1\overline{w}}{x_1^M}. \tag{9}$$

Inspection of both expression reveals the basic tradeoff of an extension rule in terms of unit mail costs. As is well-known duplication of fixed costs under duopoly tends to make a monopoly outcome more attractive. However, a monopoly outcome under an extension rule has two main drawbacks: first, it reduces overall volume ($x_1^*+x_2^* > x_1^M$) and second, it increases wage demands by the union of the incumbent firm ($\overline{w} > \widehat{w}_1 > \rho$). Both effects tend to make the duopoly outcome more desirable, even in an industry exhibiting features of a natural monopoly.

To show that overall mail unit cost can be smaller under duopoly in the absence of an extension rule, let us shortly analyze the case of $\Delta = 0$, so that $x_1^* = x_2^*$. Using expressions (8) and (9) we obtain the condition

$$\rho\left(\eta_2 - \frac{1}{6}\eta_1\right) < \frac{\alpha^2}{9}$$

which assures that mail unit costs are smaller under duopoly when compared with a labor market in which an extension rule allows the union and the incumbent to settle on an entry blockading minimum wage. Clearly, such an outcome is more likely the higher the network efficiency of the entrant, but becomes less likely when workers' reservation wage increases.

4 The German Collective Bargaining System

In this section we shortly describe the legal foundations of the German system of collective bargaining. We describe the traditional procedure of declaring wage contracts generally binding by means of extension regulation ("Allgemeinverbindlicherklärung"). We, finally, describe most recent minimum wage legislation (the Posted Workers Act) which has significantly increased the scope for making wage contracts generally binding.

The legal basis of collective bargaining. In Germany wage bargaining occurs mainly at the sectorial level between an industry union and an employer association representing most of the firms in the industry.[5] Those collective negotiations usually result in standard wages and

[5] Labor market and labor law differ substantially between countries (see, e.g., Nickell, 1997, OECD, 1997, or Blau and Kahn, 1999, for cross-country comparisons). A salient dimension that differentiates national labor markets is the degree of wage setting centralization (Calmfors and Drffill, 1988, and Wallerstein 1999). From this angle Germany's collective wage bargaining system is somehow positioned in the middle between a fully decentralized system (with collective bargaining at the firm level) and a fully centralized system (with collective bargaining at the national level).

labor contracts which cover almost all firms and workers in the industry. This so-called area tariff system ("Flächentarifsystem") still dominates the German labor market. As has been argued by Haucap et al. (2006, 2007) the stability of the area tariff system in Germany is mainly externally supported by various labor market regulations which systematically protect collective bargaining system against deviant behavior and outside competition.

One core institution of the German system of collective bargaining is the so-called tariff autonomy ("Tarifautonomie"), which empowers unions, employers and employer associations to form coalitions and to bargain collectively.[6] The principle of tariff autonomy protects the "social partners" to strike collective agreements on their own and, with that, prevented outright minimum wage setting through state intervention.

The legal nature of the collective bargaining process is specified in the law concerning tariff agreements ("Tarifvertragsgesetz"; in short: TVG). According to the TVG only the tariff parties (unions, firms, and employer associations) can conclude collective labor contracts. Most unions (as the united services union - "Vereinigte Dienstleistungsgewerkschaft", in short Verdi) are organized within the German confederation of trade unions ("Deutscher Gewerkschaftsbund", in short DGB). While there is no doubt that all unions which are members of the DGB have the right to conclude tariff agreement, this is typically not the case for outsider unions.[7] In fact, as summarized in Haucap et al. (2006, pp. 365ff.) legal practice and the legal literature have arranged extremely restrictive conditions which have to be fulfilled so that a worker association should be regarded as eligible to conclude collective agreements (see also Wiedemann and Stumpf, 1977, pp. 357ff.).[8]

[6] The legal grounds for the tariff autonomy can be found in Article 9 Paragraph 3 of the German Constitution ("Grundgesetz") and the law concerning tariff agreements ("Tarifvertragsgesetz").

[7] The case of the Christliche Gewerkschaft Metall (CGM) which is a member of the Christliche Gewerkschaftsbund (CGB) is instructive in this regard. Ever since its appearance, the dominant union Industriegewerkschaft Metall (IGM) (which is member of the DGB) has continuously tried to challenge to right of the CGM to strike collective agreements (see Haucap et al. 2006).

[8] An exceptionally restrictive condition is the so-called mightiness ("social power") requirement which unfolds a vicious circle which ulimately counters attempts to form a new union which competes with an already established union. According to the Federal Labor Court an indication for the existence of social power comes from the fact whether the union already concluded collective agreements. Quite obviously, the incumbent union meets this requirement but a new union can hardly refer to collective contracting in the past.

The TVG states that in general only members of the bargaining parties are actually bound to obey the regulations of the tariff contract. In practice, though, a firm which is member of an employer association pays the tariff wage to all of its employees (see Haucap et al, 2006, p. 363, for the economic reasons).

Traditional extension rule. While there are many stabilizers of the area tariff system, as stabilizer of last resort is provided by the possibility to make collective bargaining contracts compulsory for all unorganized employers (and hence, all unorganized workers) within an industry by an extension rule. Specifically, paragraph 5 of TVG provides the bargaining parties with such a device, the so-called "Allgemeinverbindlicherklärung" (in short: AVE). The first prerequisite to declare an employment contract to be generally binding is the existence of a collective bargaining agreement in accordance with TVG; i.e., a collective contract between a union and an employer association at the industry level. Secondly, at least 50 per cent of employees in the tariff area for which an AVE is initiated have to be employed in firms of countract-bound employers and the AVE must be "in the public interest". However, an additional social-emergence clause waives the requirements that the public interest is served and that at least 50 per cent of the employees of the tariff area concerned have to be employed by countract-bound firms.

The implementation of the AVE is regulated in the TVG. Initially, one of the bargaining parties must apply for an AVE at the Ministry of Labor. Unorganized employees and employers concerned, as well as employer associations, unions and the Ministry of Labor of the state affected by the AVE are given the right to express their opinion. Afterwards a public hearing of a council consisting of three representatives of umbrella organizations of unions and employers respectively ("Tarifausschuss") is initiated. The council then decides with the majority of votes whether or not to recommend the use of an AVE to the Ministry of Labor. Though the Ministry of Labor is not bound by the council's recommendation, it nevertheless has proved to affect the ministry's final decision. Once an AVE has been put into force, it remains effective until the collective bargaining contract expires or the Ministry of Labor puts the AVE out of force.

Posted Workers Act. The Posted Workers Act ("Arbeitnehmer-Entsendegesetz", in short: AEntG) came into force in 1996 and has been revised several times later on (the latest version dates back to April 20th 2009). Its original objective was to ensure binding labor standards for workers employed by businesses of foreign origin (with a focus on construction workers).

Yet, right from the beginning it was clear that the act could also be used to force all employers (including nonorganized domestic firms) in a certain sector to adhere to the same working standards and, in particular, minimum wages. In fact, as of today the Act's main purpose has become to enforce minimum wages in several service sectors.

The Posted Workers Act reduced significantly the bar for the German Ministry of Labor to implement minimum wages when compared with the traditional extension rule according to the TVG. First, it allows to declare a collective wage contract generally binding even if less than 50 per cent of the employees of the tariff area concerned have are employed by countract-bound firms.[9] Second, until 2009 the Act did not require a public hearing of a council consisting of the involved umbrella organizations.[10] Finally, the Ministry of Labor can declare a wage contract generally binding by legal decree ("Rechtsverordnung") without having to go through complicated procedure as required under the TVG (under the TVG the Labor Ministry of a Land can block an AVE in which case the Federal Ministry of Labor must ask the Federal Government for permission).

The Act does not apply automatically to all service sectors. Instead, the Act explicitly states the sectors which can apply for a minimum wage ruling. Initially, the Act only mentioned the construction industry. By the end of 2007 (shortly before full liberalization) postal services and, most recently, several other sectors have been added (as, e.g., commercial cleaning and waste management).

[9] In the latest version of the Posted Workers Act a representativeness requirement was introduced which applies to those industry where competing collective labor contracts exist. The collective agreement which is more "representative" in terms of the number of workers employed by contract-bound employers and in terms of the number of union members affected by the tariff agreement.

[10] In its latest version of 2009, the Posted Workers Act was supplemented by a paragraph which requires the Ministry of Labor to ask the involved bargaining parties as well as the parties of competing collective agreements (if applicable) for their statements.

5 The Deutsche Post Case

In Germany, the transition period towards full liberalization started on January 1st, 1998 with the implementation of the first EU Directive (97/67/EC) on postal service markets.[11] Initially, it was planned to liberalize the postal service market fully on January 1st, 2003. However, prior to that date, Germany's federal government decided to renew Deutsche Post's monopoly for letter services for five more years. At the latest, around 2006/2007 it became clear that the then ruling Federal government was committed to liberalize the postal service market fully on January 1st, 2008.

With full liberalization of the postal market in prospect, labor unions (in particular, the United Services Union Verdi) and left wing parties called for the introduction of minimum wage legislation in the postal service sector. It was claimed that wage dumping at the expense of postal workers should be prevented this way.[12]

Prior to liberalization, Deutsche Post AG (DPAG) had significantly restructured operations; e.g., through outsourcing of post offices and transport services, while letter the mail delivery network has been kept inhouse. At that time, virtually all operators who entered the not reserved area provided end-to-end services, many of them at a local or regional level, competing with DPAG via alliances. Until full liberalization in 2008, the reserved area included letters up to 50 grams (with some exceptions for large senders). Competition that emerged prior to 2008 was mainly in the area of value-added services as little requirements had to be fulfilled to operate outside the reserved area (Dieke and Wojtek 2008).

Deutsche Post claimed, that the disadvantage of historically relatively high wages due to the former legal status of its employees as civil servants led to the necessity of a minimum wage in order to ensure a level playing field and to prevent competition based only on lower wages.[13]

In August 2007, the Federal government (consisting of a grand coalition) reached an agree-

[11] In the EU, the stepwise liberalization process of the market for postal services is governed by three EU Directives; namely, Directive 97/67/EC, Directive 2002/39/EC, and Directive 2008/06/EC, where the latter one requires the member states to abolish any remaining reserved areas by 2010.

[12] The release of a study (commissioned by Verdi) on the allegedly precarious employment conditions at the postal service competitors triggered an intense debate about this issue (Input Consulting 2006).

[13] Interestingly, aspects of employment conditions have also been integrated into the Third Postal Directive which allows to implement minimum requirements in the authorization conditions.

ment to support the introduction of minimum wages in the postal sector. The exact details, however, were left open until the end of 2007. Given the political support for minimum wages, a series of strategic moves by the involved parties followed quickly.

On August 28th, 2007 the Postal Employer Association (Arbeitgeberverband Postdienste, in short AGV Postdenste) was established. It was obvious that the AGV Postdienste was clearly dominated by the Deutsche Post and its subsidiaries.[14] At that time the competitors proclaimed that the establishment of AGV Postdienste was a strategic move to implement excessive minimum wages in order to drive them out of the market after full liberalization.

On September 4th, 2007 the newly founded AGV Postdienste and Verdi reached a collective wage agreement which was intended to serve as the reference contract for minimum wages in the postal service sector. Accordingly, the contract was filed to the Federal Ministry of Labor to set generally binding. The tariff contract stipulated a minimum wage per hour of € 8.00 and € 8.40 in East Germany and West Germany, respectively. The minimum wage for mail delivery was set at € 9.00 and € 9.80 in East Germany and West Germany, respectively. These minimum wages should become effective on January 1st, 2009.

To investigate the actual working conditions in the postal industry, from summer to autumn 2007 the Federal Network Agency ("Bundesnetzagentur") conducted a survey about working conditions of licensed postal service operators. Table 1 provides an overview over the results concerning the wages.

Table 1: Industry wages before the introduction of the minimum wage (BNetzA 2008))

	Deutsche	Competitors		
	Post AG	West	East	Average
Sorters	11.34	8.10	6.11	7.68
Drivers	11.99	8.08	6.23	7.73
Delivery postmen	12.13	7.71	6.18	7.28
Administrative staff	16.01	11.24	9.23	10.97
Average	13.04	8.23	6.38	7.79

[14] At court hearings in 2009, the most important competitors claimed that they never had the opportunity to join the association or to take part in the negotiations.

Focusing on wages per hour for delivery postmen, Table 1 clearly shows that the tariff agreement between AGV Postdienste and Verdi stipulates a minimum wage which exceeds the average wage rate paid by competitors by at least 20-30 per cent.

Needless to say, the competitors immediately complained heavily about the high wage levels and the procedure how the tariffs have been agreed upon. Another issues was the coverage of the tariff agreement. Initially, it was planned that the tariff agreement should hold for all firms delivering letters no matter of the firms' core business (as, e.g., newspaper delivery). By November 29th, 2007 the original wage contracted was revised such that it only applied to firms with letter delivery as being their core business (letter services instead of postal services).

The most contentious issue, of course, was the relatively high wage floor. The main competitors responded on September 18th, 2007 with the establishment of a new employer association "Arbeitgeberverband Neue Brief- und Zustelldienste" (in short: AGV Neue BuZ) which immediately claimed, a minimum wage would be reasonable and acceptable if it was between € 6.00 € and € 7.50 €. Minimum wages above would "not be meant to be a minimum wage but to extend the postal monopoly".

In the mean time, a new union for new letter and delivery services (Gewerkschaft Neue Brief- und Zustelldienste, in short: GNBZ) was founded which concluded a wage contract with the new employer association AGV Neue BuZ which stipulated a general minimum per hour of 6.50 € and 7.50 € for East Germany and West Germany, respectively. That contract was also filed to the Ministry of Labour to serve as an alternative proposal for a mandatory minimum wage.

Market surveys conducted by the Federal Network Agency revealed that the introduction of a minimum wage by means of the extension rule of the TVG would be problematic, as the wage contract between AGV Postdienste and Verdi hardly represented at least 50 per cent of the employees in postal/letter delivery services that had to be employed in firms of countract-bound employers according to the TVG.

Hence, a minimum wage would depend of a revision of the Posted Workers Act by adding letter delivery services to the sectors eligible for an extension ruling. On December 20th, 2007 the so revised Act was passed by the Upper House ("Bundesrat"). On December 28th, 2007 a government decree was issued, declaring wage agreement between Verdi and AGV Postdienste generally binding for all mail service providers. The decree became effective on January 1st,

2008 and was set to expire on April 31st, 2010.

The AftermathXXXXX to be rewritten

6 Conclusion

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