Entrepreneurship in A Unionised Economy*

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Abstract

This paper shows that labor market institutions are important for the formation of new entreprises and market entry. The effects of different labor market institutions on wage determination, entrepreneurship and firm size are analysed both analytically and illustrated numerically. Models where labor unions are strong in the wage setting are compared to the case of more competitive labor markets. The main result is that union power reduces entrepreneurship in the sense of new entry and results in a decline of the optimal size of enterprises, measured in terms of their hired labor.

Keywords: entrepreneurship, occupational choice, unions, labor market organizations

JEL Classification: J23, J24, J51, M13

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1 Introduction

There is abundance of empirical observations indicating that the rate of entrepreneurship differs substantially among OECD countries.[1]It is another empirical fact that the labor market institutions have taken radically different forms in different economies. In Europe, unions have traditionally adopted a significant role in wage determination while in the anglo-american world, wages are determined mainly through bargaining at the level of single firms without nationwide or industry-wide coordination between representatives of unions and employers. While it has been suggested that enterprise formation may be less active in a unionized economy than in competitive labor markets, such a relationship has so far eluded a theoretical analysis.[2] Our paper provides such an analysis. Unlike the earlier literature on entrepreneurship which has focused on personal properties of entrepreneurs like ability (Lucas (1978) and Kanbur (1979)) or risk aversion (Kihlström and Laffont (1979) and Newman (1995)), our paper has a rather different focus. In developing a general equilibrium model of a one-sector economy, consisting of labor and goods markets, we will normalize the entrepreneurial ability across individuals. Instead, our model can be viewed an extension to that by Kihlstrom and Laffont (1979) in that we cope with various labor market institutions. In particular, we compare the incentives to market entry under a labor market organization with strong unions to the nature of incentives to enter under competitively organized labor markets.

The analysis of labor markets in a unionized economy has been useful in introduction of many key institutional structures like the union power or strategic wage negotiation between unions and employers.[3] The usefulness of such a paradigm is highlighted by the fact that it has facilitated a departure from the assumption of competitive labor markets. In Europe in particular, such an approach can be thought to be "realistic". The caveat, however, is that the inherited analysis has a particular limitation: it has taken the size of the enterprise sector or industry as exogenous without paying attention to the fact that market entry and exit are a key part of business dynamics and that new enterprises can be thought to emerge only if the future prospects

[1]For documented empirical evidence, see Lindh and Ohlsson (1997) and Ilmakunnas, Kanniainen, Lammi (1998). Most typically, entrepreneurship is measued as the share of those working on their own account relative to the total labor force.

[2]Cf. Ilmakunnas, Kanniainen and Lammi (1999).

[3]See for instance Booth (1994) and Farber (1986).

are lucrative enough. The current paper therefore asks: what mechanism do the presence of labor unions create when analyzing entry of new enterprises?

Unions tend to have an important role in wage determination. Hence, any rational potential enterprise has to be forward-looking anticipating the forthcoming labor market conditions in which it is bound to operate in the *post*-entry stage. The issue is interesting not least because the mechanisms become quite complicated. By pushing up the wage rate, union actions tend to enhance incentives for individuals to abstain from entrepreneurship and instead entering the labor market. But on the other hand, high wages tend to decrease the probability of finding a job, thereby having a counter effect, i.e. pushing people to self-employment. Moreover, high wages tend to reduce the optimal operative size of a firm. Moreover and given the market size, the optimal size may be adversely affected by the number of enterprises. Our analysis confirms the intuition that the stronger the union power is, the smaller is the equilibrium entry of new enterprises. Moreover, it confirms that the size of each firm, measured in terms of labor employed, is decreasing in the union power. Intuitively, these results follow from that wages play a double role in the model. First, the wage rate represents the opportunity cost in the occupational choice for any potential entrepreneur. Second, high wages reduce the optimal amount of hired labor within each firm.

The paper is organized as follows. In section 2, we introduce a model of a firm under market uncertainty, union preferences, and the occupational choice of individuals. In section 3, we analyze different labor market institutions and introduce a general model for wage bargaining with a firm's right to manage its labor force *ex post.* The case with strong union power (the so called monopoly union) is analyzed as a special case as is the case of competitive labor market. Section 4 introduces the results of numerical simulations. Section 5 concludes the paper.

2 The Model

The economy consists of N risk-averse individuals who qualify for becoming entrepreneurs or workers in the economy. They are all identical, having the same preferences represented by von Neumann-Morgenstern utility functions and they have the same innate abilities. The individuals face the same occupational choice, i.e. choice of their economic roles, between entering as entrepreneurs or becoming employed by those who choose entrepreneurship.

All enterprises will be run exactly by one individual whose work effort is a necessary input. There are n such individuals while the number of those who become (employed or unemployed) workers will be $N - n$.

The interaction in the labor market can take a variety of forms, depending on the role of unions. Their role in wage negotiation may be central. The employers are assumed to preserve the right to adjust the labor force *ex post*, given the wage level, and subject to negligible firing cost. Employers are also assumed to be organized as a federation. Both parties are assumed to be rationally forward looking in that they anticipate the future course of events when committing themselves into their strategy.

We develop a general equilibrium model of a one-sector economy consisting of labor and goods markets. Our model is an extension to the seminal paper by Kihlstrom and Laffont (1979) in that we develop the analysis to cope with various labor market institutions. We also address the implications of the nature of goods markets, while they focused on competitive labor and goods markets. In the main text, we however, take the task of analyzing the union effects in the competitive case, while we discuss the complications arising from the non-competitive product market in an Appendix. Thus we write competitive market price as

$$p = \widetilde{\alpha} \tag{1}$$

Variable $\widetilde{\alpha} > 0$ is stochastic reflecting the underlying uncertainty in the product market. Its realization characterizes the market size. Variable $\widetilde{\alpha}$ has binary support, $\widetilde{\alpha} \in (\underline{\alpha}, \overline{\alpha})$ with probabilities $\lambda, 1 - \lambda$. There are no network externalities.

After committing themselves to the entry cost, say $k > 0$, the entrepreneurs have access to the same production technology of the constant elasticity variety

$$f(l) = l^{\gamma}, \gamma < 1 \tag{2}$$

where l is the number of workers in a firm, each working one working hour $(h = 1)$. If it were the case that $\gamma = 1$, we would have the case of constant returns which is uninteresting for the purpose of the research task of the current paper since it would imply that the total output would be produced by a single large firm only.

The union operating in the economy is assumed to be engaged in wage bargaining with the objective of maximizing the utility of its employed and unemployed members. Income of an employed member is the wage rate, w, and the income of unemployed, b, is exogenous satisfying $b \leq w$ and is independent of the current variables. One interpretation of b is that in line with the existing labor market literature it is regarded as an exogenous unemployment compensation.

Utility of a member is of the constant elasticity type. Therefore, we introduce the following utility measure as an *ex post* utility of the union in terms of a utilitarian variety

$$U = nlw^{\rho} + (N - n - nl)b^{\rho}. \tag{3}$$

Note that this formulation qualifies the standard model in the literature in the sense that in (3), n captures the number of entrepreneurs, later referred also as a rate of entrepreneurship. It is implicitly and without loss of generality assumed that all workers belong to the union.

The market for entrepreneurship is assumed to be open only once. However, one can also give the interpretation that once the labor contracts have been reached, those who become unemployment have the option for self-employment outside the labor market. Then the outside income b can alternatively be viewed as return on self-employment.

In the product market, each firm is assumed to behave competitively after entry, taking the market price p as exogenous. After realization of price uncertainty, the profit of each firm is given by

$$\pi = pl^{\gamma} - wl \tag{4}$$

where $p =$ the realized price.

An entrepreneur faces the risk of not being able to recoup the sunk cost k, uninsured by the risk markets.This risk is non-diversified. The ex-post project value may thus be negative. Labor faces employment risk but is better protected in the light of social insurance in the form of unemployment compensation. Risk-averse individuals make their occupational choice in the light of the above prospects. In equilibrium, their expected utility from the entrepreneurial income (π) has to match with that from being employed by any firm in the economy, adjusted for the sunk cost of entry. We highlight that by becoming an entrepreneur, an individual loses her option of having access to wage income. The entry cost, k, thus plays on important role in the choice of market entry but in the union decision making its role is apparently eternal. We raise this issue when considering the impact of the entry cost on contract wage.

The realization of the market price and the outcome of labor market negotiation will dictate the optimal size of each firm, i.e. how much labor each firm will eventually hire. In line with the labor market literature, workers face the chance of either being employed or becoming unemployed. Assuming that the employed and unemployed workers are chosen randomly with "probabilities" $nl/(N-n)$ and $(N-n-nl)/(N-n)$, we will now introduce the key *ex ante* indifference condition (*participation constraint)* of any potential entrepreneur. It states that the expected utility of the income from entrepreneurship has to be sufficient to match with the expected utility of income earned as an employee (or unemployed), $E[\pi] = E[U]$, in other words,

$$E(\pi - k)^{\rho} = E[\frac{nl}{N-n}w^{\rho} + \frac{N-n-nl}{N-n}b^{\rho}]. \tag{5}$$

This condition determines the equilibrium entry, n, subject to labor market institutions.

To further clarify the model, it is useful to state the timing of the three-stage model more precisely;

Timing:

0———————————1————————2———>t

entry uncertainty resolved wage negotiations labor demand

At time $t = 0$, n individuals enter as entrepreneurs as a result of their occupational choice, committing themselves to an entry cost, $k > 0$. This entry cost is assumed to be sunk. After entry, market uncertainty is resolved and the firms and the union know the value of α. At time $t = 1$, the wage rate w is negotiated between the union and the federation of the employers. At time $t = 2$, the enterprises choose their labor input (firm size), l, in the light of their right to manage.

3 The Analysis of Labor Market Institutions and Entrepreneurship

3.1 Entry under Competitive Labor Markets

It is helpful to consider first as the benchmark the case of competitive labor market i.e. where unions do not exist. We think of entry into a competitive market under price uncertainty a case where entry is irreversible but where employment decisions can be made after resolution of price uncertainty. The labor union literature has not introduced market uncertainty, though is has incorporated the problem of unemployment. Under competitive labor market, there is no role for unemployment compensation because there will be by definition be no unemployment. Market wage will adjust to the market price to provide full employment.

Entry, n, is determined by the indifference condition

$$EU[\pi - k] = EU[w].$$

Assuming that the utility is of constant exponential variety, this condition reads as

$$E(pl^{\gamma} - wl - k)^{\rho} = E(w)^{\rho}, \rho < 1.$$

After irreversible entry, price uncertainty is resolved and competitive wage determined. Each firm is price taking in all markets and chooses its size, i.e.the labor demand by the marginal productivity condition,

$$l_C = (\frac{w_C}{\alpha\gamma})^{\phi}. \tag{6}$$

In the labor market the supply of labor has to match the demand in the aggregate. In the rest of the paper we normalize $N = 1$, and thus in equilibrium there will be (1- n) workers each supplying one unit of labor and n

enterprises will demand labor according to (6). Labor market equilibrium thus requires

$$(1-n) = nl = n(\frac{w_C}{\alpha\gamma})^{\phi} \tag{7}$$

From this condition, one can solve for the equilibrium wage as a function of entry and market price

$$w(n,p) = \alpha\gamma[\frac{1-n}{n}]^{\frac{1}{\phi}} \tag{8}$$

with the *ex post* impact $\partial w/\partial n > 0$. Moreover, the size of each enterprise is related in a simple way to market entry, $l = (1-n)/n$ with $\partial l/\partial n < 0$.

Lemma 1 *In competitive labor market, equilibrium wage is positively related to market entry. Moreover, the size of each enterprise measured in terms of hired labor is determined as* $l = \frac{1-n}{n}$.

In the competitive labor market there is full job security: the size of the firm is independent of the state of market demand but the wage will absorb part of the price risk. Irreversible entry is *ex ante*, however, risky for an entrepreneur whose income is the residual hs has to be sufficient to compensate for the cost of entry, k. It is helpful to solve for the equilibrium entry first in the absence of entry cost, $k = 0$.

Having the results of Lemma 1 at hand, it is easy to show

Proposition 2 *Under competitive labor market and in the absence of entry cost, market entry is fully determined by the degree of returns to scale, n=1-*γ.

Proof. Inserting the solutions for w and l into the indifference condition gives the result.

Two important visions arise from the above results. First, in competitive labor markets with costless entry, there is no risk premium for an entrepreneur in that he and his labor share risks on an equal basis. Second, the incentive for market entry is inversely related to the degree of diminishing returns to scale in that under slowly decreasing returns, there is less room for intramarginal profits sugegsting that there are fewer enterprises but with a larger scale.

When entry requires costly *ex ante* commitment, $k > 0$, such a cost is avoided by labor and has to be compensated for a risk-averse entrepreneurs. Since the right-hand side of (..) $E(w)^{\rho} = E[p\gamma]^{\rho}(\frac{1-n}{n})^{(\gamma-1)\rho}$ is independent of k,one must have from the left-hand side, $\partial E(pl^{\gamma} - wl - k)^{\rho}/\partial k = \partial E[p(1 - \gamma)(\frac{1-n}{n})^{\gamma} - k]^{\rho}/\partial k = 0$,which is possible only if $\partial n/\partial k < 0$. Entry cost thus makes $n < 1-\gamma$; entering firms require a risk premium over the wage income which is less risky:

Lemma 3 *Entry cost generates a positive risk premium for entering enterprises.*

It is not possible to solve analytically for entry n when $k > 0$ because of the non-linearitiezs involved. In the subsequent section, we illustrate our results by a numerical analysis and compare them to the case of unionized labor market. . Such an analysis is welcome in that it was not possible to solve for the equilibrium entry explicitly in a unionised economy.

3.2 Wage Bargaining: The Right-to-Manage Model

We start our analysis by first formulating the general case where the union and the federation of the employers share the bargaining power. That is, n individuals choose to become entrepreneurs; $N-n$ choose their occupation as a worker. The model is solved by backward induction.

We denote the union's bargaining power as $\theta < 1$ and the firm's bargaining power as (1-θ), respectively. The threat point of the union is taken to be the situation where all $N-n$ workers are unemployed, being eligible to unemployment benefit b. The threat point of a firm in turn is assumed to be zero production and thus zero profit.[4]

At the final stage, and as a result of profit maximization of price-taking firms, the demand for labor by each firm after resolution of price uncertainty and wage negotiation reads as

$$l = (\frac{w}{p\gamma})^{\phi} \tag{9}$$

where $\phi = \frac{1}{\gamma-1} < 0$ and where p is either $\underline{\alpha}$ or $\overline{\alpha}$. Due to diminishing returns, firms have access to intramarginal profits. It is convenient to solve the profit function as $\pi = l(w)w(\frac{1}{\gamma} - 1) > 0$ where, one should remember, $\partial l/\partial w < 0$. To determine the wage rate at the preceding stage, we formulate the bargaining between the union and employers as a Nash bargaining problem:

$$\max_{w} \Gamma = [nl(w^{\rho} - b^{\rho}) + (N-n)b^{\rho} - (N-n)b^{\rho}]^{\theta}[n\pi]^{1-\theta} \tag{10}$$

$s.t.$

$$l \in \arg\max \pi = pl^{\gamma} - wl$$

[4] Analogously to the literarure on labor unions, these assumptions are introduced if only to simplify the algebra.

Entry n is bygone when the wage negotiation takes place. Therefore, the maximization problem in (10) is equivalent to

$$\max_w \Gamma = u^\theta \pi^{1-\theta} \quad \text{s.t.} \quad l \in \arg\max \ \pi = pl^\gamma - wl, \tag{11}$$

where $u = nl(w^\rho - b^\rho)$. Notice that when entering the market, a potential entrepreneur is interested in his or her expected utility of profit, as manifested in the indifference condition (5). Because the diminishing marginal utility of consumption has been acknowledged in the indifference condition at the initial stage, $t = 1$, it is the level of profit in the *post-entry* stage at t=2 on which the entrepreneurs are concerned when participating in the wage negotiation.

The solution to the bargaining problem is determined by the following first-order condition[5]

$$\theta u^{\theta-1} u_w \pi^{1-\theta} + u^\theta (1-\theta)\pi^{-\theta}\pi_w = 0. \tag{12}$$

With positive intramarginal profits ($\pi > 0$), this condition can alternatively be stated as the weighted average of the elasticities of utility and profit with respect to wage:

$$u^\theta \pi^{1-\theta}[\theta \frac{u_w}{u} + (1-\theta)\frac{\pi_w}{\pi}] = 0. \tag{13}$$

In solving for the resulting wage rate, we will make use of the fact that with intramarginal profits ($\pi > 0$), this condition can hold only when the expression within the square brackets is equal to zero. Notice that the firm's labor demand is the firm's optimal choice, and thus due to envelope theorem $\pi_w = -l$. Substituting into (13) one obtains

$$\theta \frac{[n\frac{\partial l}{\partial w}(w^\rho - b^\rho) + nl\rho w^{\rho-1}]}{[nl(w^\rho - b^\rho)]} = (1-\theta)(\frac{l}{\pi}) \tag{14}$$

[5] We assume that the second-order condition holds.

Because $l = (\frac{w}{\alpha\gamma})^{\phi}$ and $\frac{\partial l}{\partial w} = \phi(\frac{w}{\alpha\gamma})^{\phi-1}\frac{1}{\alpha\gamma}$ from above, and eliminating π, we obtain after somewhat involved manipulation the condition

$$w^{\rho}[w(\theta-1)+\theta(\rho+\phi)] = b^{\rho}[w(\theta-1)+\theta\phi] \tag{15}$$

Condition (15) determines the outcome of Nash bargaining, the wage rate, say $w_N(\theta, b, \rho, \gamma)$. We can immediately report a helpful result

Lemma 4 *In a bargaining model, the number of firms, n, does not influence the outcome of bargaining.*

That the number of firms, n, does not influence the outcome of bargaining, is somewhat surprising but can be viewed to reflect the Bellman's principle of optimality in a model where bygones are bygones.In the next section, we report numerical simulation results on the contract wage under centralized bargaining.

In the initial stage, where entering firms have to anticipate both the future price development and the union behavior after entry, their *ex ante* indifference (equilibrium) condition (5) requires

$$E(\pi_N - k)^{\rho} = \lambda[\frac{n\underline{l}}{N-n}w_N^{\rho} + \frac{N-n-n\underline{l}}{N-n}b^{\rho}] +$$

$$(1-\lambda)[\frac{n\bar{l}}{N-n}w_N^{\rho} + \frac{N-n-n\bar{l}}{N-n}b^{\rho}]. \tag{16}$$

Evaluating both sides of (16), we rewrite it as:

$$\begin{aligned} & \lambda[\pi(w_N,\theta)-k]^{\rho} + (1-\lambda)[\pi(w_N,\theta)-k]^{\rho} \\ = \ & (w_N^{\rho}-b^{\rho})\frac{n}{N-n}[\lambda\underline{l} + (1-\lambda)\bar{l}] + b^{\rho}. \end{aligned} \tag{17}$$

where $\underline{l}= l(\underline{\alpha})$ and $\bar{l} = l(\overline{\alpha})$ are the state-dependent employment decisions. Having inserted the solution for w_N, the above condition states the equilibrium entry of new entrepreneurs, n_N. Given n_N,one can finally also express the equilibrium size of firm, l_N, in terms of θ, the bargaining power.

Although we have introduced a number of simplifying parameterization in our model, the indifference condition above remains highly non-linear in n_N, the rate of entrepreneurship. Therefore, no closed-form solution is available in the general case. However, we can produce clear-cut analytic results and illustrate them numerically.

The main interest lies with the question how labor market institutions affect the entry and enterprise formation, i.e. whether $\partial n/\partial\theta \lesseqgtr 0$. The fact that the union has bargaining power over market forces suggests that wages tend to be pushed up, leading to less jobs available and unemployment. Apparently, the union incentives are affected not only by their bargaining power (arising, say from membership), but also by the access of union members to unemployment compensation, which does not have any role in the competitive model. We explore this intuition below where we also examine in which way centralized labor markets interact with enterprise formation.

In order to analyze this problem, we proceed in two steps. We first find out how the bargaining power affects the bargaining wage *ex post*. Then we analyze how the wage rate affects the market entry *ex ante*. We first prove:

Lemma 5 *The contract wage is increasing in the union bargaining power,* $dw(\theta)/d\theta > 0$.

Proof. Inspecting the first-order condition (15) (and assuming that second order condition is satisfied) one finds that sign$\{\frac{dw(\theta)}{d\theta}\}$=sign$\{\frac{\partial^2\Gamma}{\partial w\partial\theta}\}$= $w^\rho(w+\rho-1) - b^\rho(w-1) > 0$, since $w > b$ and $\rho > 0$. In other words, an increase in the union's bargaining power increases the bargaining wage. ■

Next, we analyze the second link in the process. We use the the indifference condition (17) to examine under which conditions it holds that $dn/dw \lesseqgtr 0$. Notice that condition (17) states an equality between two value functions, one for each agent as a potential employer and one for each agent as a potential employee. Under price-taking firms and unions, the left-hand side is independent of the number of entering enterprises. Totally differentiating (17) one obtains

$$\frac{dn_N}{dw_N} = \frac{E_w[\pi_N] - E_w[U_N]}{E_n[U_N]} \tag{18}$$

We next evaluate the sign of (18). The marginal entrepreneur understands that an increase in the wage cost reduces expected profit,

$$E_w[\pi_N] = -\lambda \underline{l}\rho(\underline{\pi} - k)^{\rho-1} - (1-\lambda)\bar{l}\rho(\overline{\pi} - k)^{\rho-1} < 0. \qquad (19)$$

In above we have used the fact that due to envelope theorem $d\pi/dw = -l$. Increased number of enterprises is beneficial to workers, since the probability of obtaining the job both in the good state and in the bad state is higher:

$$E_n[U_N] = [\lambda \underline{l} + (1-\lambda)\bar{l}]\frac{N}{(N-n)^2}(w_N^\rho - b^\rho) > 0. \qquad (20)$$

It remains to analyze the impact of higher wage on the expected utility of an employed worker,

$$\begin{aligned} E_w[U_N] \;\; = \;\; & \frac{n}{N-n}\lambda[\frac{\partial \underline{l}}{\partial w}(w_N^\rho - b^\rho) + \underline{l}\rho w_N^{\rho-1}] + \qquad (21) \\ & \frac{n}{N-n}(1-\lambda)[\frac{\partial \bar{l}}{\partial w}(w_N^\rho - b^\rho) + \bar{l}\rho w_N^{\rho-1}]. \end{aligned}$$

The second terms within both square brackets are positive. I.e. for any given rate of entry and any given size of an enterprise, higher wage raises the utility of each employee. The first terms, however, are negative because higher wage is expected to lead to a smaller size of enterprises. From a potential entrepreneur's point of view, the production cost is higher. However, this effect is partly diluted to the extent that the enterprises can adjust their labor force *ex post* in the spirit of the right-to-manage: an increase in the wage cost also reduces the optimal size of each firm. This effect then actually tends to increase the equilibrium entry.

. Therefore, there are two offsetting mechanism affecting the worker's utility. Thus, it is helpful to state

Lemma 6 *A necessary condition for the bargaining wage to create an entry barrier in firm formation is that its marginal impact on the expected profit of each enterprise at entry equilibrium exceeds its impact on an employee's expected utility at the equilibrium.*

If the possibility to meet higher wage cost by scaling down the optimal production unit is significant, the impact on entry remains less clear. Smaller unit size may be associated with more elastic supply of new enterprises. It is not, however, likely that such an affect could actually turn the numerator of (21) positive. Is is expected that the impact of higher wage depends on the unemployment compensation scheme and on the returns on scale. We next show that this intuition is valid. Evaluating the effect on the optimal size of an enterprise in (21) above one finds

$$\frac{\partial l}{\partial w} = \frac{1}{\gamma - 1}(p\gamma)^{1-\gamma} w^{-\frac{2-\gamma}{1-\gamma}} = (\frac{1}{\gamma - 1})(\frac{l}{w}). \tag{22}$$

Though it always holds $\frac{\partial l}{\partial w} < 0$ because $\gamma < 1$, one notices that when there are many small firms in the economy, i.e. when $\gamma \to 0$, $\frac{\partial l}{\partial w} \to 0$, too, i.e. $\lim_{\gamma \to 0} \partial l / \partial w = 0$. This observation gives a hint of the sign of $E_w[U_N]$. From (**??**), one finds that in the bad state (the same argument applies in the good state)

$$\frac{\partial \underline{l}}{\partial w}(w_N^\rho - b^\rho) + \underline{l}\rho w_N^{\rho-1} = (\frac{\underline{l}}{w})[\rho w_N^\rho + (\frac{1}{\gamma - 1})(w^\rho - b^\rho)] \tag{23}$$

Now $(\frac{l}{w}) > 0$ always. The expression in the square brackets is positive provided that

$$b/w_N > [1 - \rho(1-\gamma)]^{1/\rho}.$$

This cannot hold if $\gamma \to 1$. It will, however hold, if $\gamma \to 0$ and if the unemployment compensation is sufficiently large relative to the wage rate. Both qualifications make intuitive sense. Thus,

Lemma 7 *For sufficiently generous unemployment compensation, there exists* $\gamma*$ *such that* $\gamma \leq \gamma* \Rightarrow E_w[U] > 0$ *for all* w*. Alternatively, given* γ*, there exists* $b*$ *such that* $b \geq b* \Rightarrow E_w[U] > 0$ *for all* w*.*

Stated verbally, sufficiently diminishing returns to labor input is sufficient (but not necessary) to make $\frac{dn}{dw} < 0$.

Given Lemmas 1,2,3, we can report

Proposition 8 *Sufficiently diminishing returns to labor input associated with sufficiently generous unemployment compensation make union power to create an entry barrier and to reduce the equilibrium entrepreneurship of an economy.*

3.3 The Case of Strong Union: Monopoly Union as Wage Setter

We now turn to analyze the extreme case of a strong union which does not need to negotiate about the wage; instead it is able to impose it unilaterally as a market monopolist. At time $t = 1$, the union thus sets the wage rate w, and given the wage, price-taking firms decide on the amount of labor they will hire at time $t = 2$. The union chooses w so as to maximize its objective function anticipating (rationally) the labor choice by the enterprises. The union's problem can be simply obtained by inserting $\theta = 1$ in (15). It turns out that the first-order condition of the monopoly union when solved for the wage rate reads as:

$$w_M = b(\frac{\phi}{\rho + \phi})^{\frac{1}{\rho}}. \tag{24}$$

Then we show

Lemma 9 *A monopoly union will always have an incentive to push the wage rate above the outside option of the employee, $w_M > b$.*

Proof. The result follows from $\gamma < 1 \Longrightarrow (\gamma - 1)\rho < 0 \Longrightarrow \frac{1}{(\gamma-1)\rho+1} > 1 \Longrightarrow (\frac{1}{(\gamma-1)\rho+1})^{1/\rho} > 1.$■

The effect of the wage rate (w_M) on determination of new entry under monopoly union can be stated in a somewhat more explicit form:

Proposition 10 *Under monopoly union the increased wage rate unambiguously reduces the equilibrium rate of entrepreneurship.*

Proof:

$$\frac{dn}{dw_M} = \frac{-\lambda \underline{l}\rho(\underline{\pi} - k)^{\rho-1} - (1-\lambda)\bar{l}\rho(\overline{\pi} - k)^{\rho-1} < 0.}{[\lambda \underline{l} + (1-\lambda)\overline{l}]\frac{N}{(N-n)^2}(w_M^\rho - b^\rho)} < 0. \tag{25}$$

This follows from the observation that the monopoly union will definitively choose $\partial E[U]/\partial w = 0$ in (18).QED

In light of this result, the detrimental effect of monopoly union on market entry is beyond any doubt.

To provide some additional intutition, it is useful to contrast the bargaining model (or the union models as an extreme) to the competitive case. The fundamental difference is that while in the competitive case markets stabilize employment, it is the contract wage which is stabilized in the union model.

The second fundamental implication is then the emergency of unemployment risk both in the good state and in the bad state to the union members. The social risk pooling arrangements, however, tend to mitigate this impact. There is an interesting implication for the optimal size of enterprises. Given that high union power reduces formation of new enterprises, there is more scope for the existing enterprises to grow when times are good. This implication will be verified in our simulation results below.

4 Simulation Results & Discussion

In the absence of all closed-form solutions for the equilibrium number of entrepreneurs (n) and firm size (l), we produce numerical simulations in the general bargaining case and we report sensitivity analysis of those simulations. We adopt the following parameter assumptions: $N = 1$, $\gamma = \rho = 0.5, b = 0.980$.

4.1 Simulation Results

Table 1. The Relationship between Bargaining Power (θ), Wage Rate (w), Firm Size (l) and Rate of Entrepreneurship (n)

$(k = 0.05, \Delta\alpha = 1, b = 0.980, \lambda = 0.5)$

θ	$w(\alpha = 2)$	$l(\alpha = 2)$	$w(\alpha = 3)$	$l(\alpha = 3)$	n
0.7	1.492	0.449	1.492	1.011	0.04
0.6	1.421	0.495	1.421	1.114	0.171
0.5	1.354	0.545	1.354	1.227	0.280
0.4	1.287	0.604	1.287	1.358	0.383
0.3	1.219	0.673	1.219	1.514	0.488
0.2	1.148	0.759	1.148	1.707	0.605
0.1	1.070	0.873	1.070	1.965	0.757

Table 2. The Relationship between Bargaining Power (θ), Unemployment Benefit (b), Wage Rate (w), Firm Size (l) and Rate of Entrepreneurship (n) *under increased uncertainty*

$(k = 0.05, \Delta\alpha = 1.5, b = 0.098, \lambda = 0.5)$

θ	$w(\alpha = 1.75)$	$l(\alpha = 1.75)$	$w(\alpha = 3.25)$	$l(\alpha = 3.25)$	n
0.7	1.492	0.344	1.492	1.187	0.033
0.6	1.421	0.379	1.421	1.308	0.158
0.5	1.354	0.418	1.354	1.440	0.265
0.4	1.287	0.462	1.287	1.594	0.368
0.3	1.219	0.515	1.219	1.778	0.473
0.2	1.148	0.581	1.148	2.003	0.592
0.1	1.070	0.669	1.070	2.306	0.747

4.2 Discussion of the Results

(i) **Equilibrium wage**

As expected, the equilibrium wage is increasing in the union's bargaining power. When the union's bargaining power is reducing, the wage rate decreases as well. The bargained wage is independent of the entry cost k. In line with the earlier results in the literature (Oswald (1985)), the wage rate is not affected by the product market uncertainty.

(ii) **Size of the firm**

First, the average size of an enterprise (measured by the labor force l) is heavily dependent on the labor market institutions.[6] In the case of monopoly union, the size of an enterprise is the smallest. In the bargaining model, the average firm size is bigger and is increasing in the bargaining power of firms, (1-θ). High entry cost (k) implies bigger firm size, and this effect is very robust. When the product market is booming, the firm size increases .

(iii) **Entry of New Enterprises & Entrepreneurship**

We are now able to analyze the effects of labor markets on entry of new firms. First, and not surprisingly perhaps, the rate of entrepreneurship is largest when the labor market is organized more competitively. The stronger is the union power in labor markets, the smaller is the number of enterprises (recall also that then the firm size is small as was shown above). Unsurprisingly again, higher k means less entrepreneurs.

(iv) **Effects of Increased Uncertainty**

In table 2 we considered a case where the market uncertainty in terms of $\Delta\alpha$ is higher, but where the expected value of market uncertainty remains the same. this is due to our assumption that $\lambda = 0.5$ i.e. we consider the case of mean preserving spread. In this case we can see that higher uncertainty does not have any effect on wages as was expected, but has on expected effect on wages. Most interestingly we observe that the higher the market uncertainty is the lower is the equilibrium rate of entrepreneurship, n. In other words, when the market uncertainty increases people prefer a worker's status.

[6]It has been rerported by Kanniainen (1998) that the employment of small enterprises is smaller in Finland than in other EU-countries.

5 Concluding Remarks

Our model has considered the determination of entrepreneurship in the light of two market imperfections. The first arises from union power which has been shown *ex ante* to reduce market entry. The second arises from entry barriers, modelled as a cost of entering the market as an entrepreneur. In the light of our results, these two mechanisms reinforce each other. It would be a challenging task for empirical work to disentangle which of the two mechanisms is relatively more important. There is, however, sufficient cross-country variation at least in the measures of union power to make such a research agenda both feasible and fruitful. Enterprise formation and entry also has to do with the nature of market demand. The model of the current paper has been formalized in terms of given, though unpredictable market prices. To the extent that market demand is price-elastic, there may be an additional barrier to entry arising from consumer preferences. We therefore extend our model in the Appendix to cope with the case of elastic market demand. This analysis provides an extension to our basic model in the main text.

Another extension but subject of future work is to introduce market uncertainty and its implication for market entry and exits in a dynamic context where enterprises have different cost structures and efficiency.

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Appendix

Appendix. Union effects with elastic market demand

Demand reads as

$$p = \widetilde{\alpha} Q^{-\epsilon}, \epsilon \geq 0 \tag{26}$$

The equilibrium market price is determined by the product market equilibrium

$$\begin{aligned} nl^{\gamma} &= Q \\ &\Rightarrow p = \alpha (nl^{\gamma})^{-\epsilon} \end{aligned} \tag{27}$$

where α is the realization of $\widetilde{\alpha}$. As a result of profit maximization of a price-taking firm, the demand for labor by each firm reads after resolution of price uncertainty and wage negotiation as

$$l = (\frac{wn^{\varepsilon}}{\alpha\gamma})^{\phi} \tag{28}$$

$$l = (\frac{w}{p\gamma})^{\phi} \tag{29}$$

where $\phi = \frac{1}{\gamma(1-\epsilon)-1} < 0$ and where α is either $\underline{\alpha}$ or $\overline{\alpha}$. To determine the wage rate, we introduce the Nash bargaining problem as follows:

$$\begin{aligned} & \max_{w} \Gamma = [nl(w^{\rho} - b^{\rho}) + (N-n)b^{\rho} - (N-n)b^{\rho}]^{\theta}[n\pi]^{1-\theta} \quad (30) \\ s.t.\ \ l \ \in \ & \arg\max \ \pi = pl^{\gamma} - wl \end{aligned}$$

Contract wage now solves

$$u^{\theta}\pi^{1-\theta}[\theta\frac{u_w}{u} + (1-\theta)\frac{\pi_w}{\pi}] = 0. \tag{31}$$

The firm's labor demand is the firm's optimal choice, and thus due to envelope theorem $\pi_w = -l$. Substituting $\pi_w = -l$ into (14) one obtains

$$\theta \frac{[n\frac{\partial l}{\partial w}(w^\rho - b^\rho) + nl\rho w^{\rho-1}]}{[nl(w^\rho - b^\rho)]} = (1-\theta)(\frac{l}{\pi}) \tag{32}$$

Because $l = (\frac{wn^\varepsilon}{\alpha\gamma})^\phi$ and $\frac{\partial l}{\partial w} = \phi(\frac{wn^\varepsilon}{\alpha\gamma})^{\phi-1}\frac{n^\epsilon}{\alpha\gamma}$ from above, and eliminating π, we obtain after some quite involved manipulation the following condition. When $\epsilon > 0$, the left-hand side depends of the number of enterprises. Totally differentiating,

$$\frac{dn}{dw} = \frac{E_w[\pi] - E_w[U]}{E_n[U] - E_n[\pi]}.$$

A marginal entrepreneur undestands that an increase in the wage cost reduces the expected profit,

$$E_w[\pi] = -\lambda \underline{l}\rho(\underline{\pi} - k)^{\rho-1} - (1-\lambda)\bar{l}\rho(\bar{\pi} - k)^{\rho-1} < 0.$$

for any given n but that there will also be an adjustment in n to be coordinated by markets.