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ENTREPRENEURSHIP IN A UNIONISED ECONOMY

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Abstract

This paper shows that labor market institutions are important for the formation of new enterprises. The effects of labor market institutions on entrepreneurship, wage determination, and firm size are analysed analytically and illustrated numerically. The main result is that an increase in union power reduces the equilibrium rate of entrepreneurship and reduces the average size of enterprises.

Keywords: Entrepreneurship, labor market institutions, occupational choice, unions

JEL Classification: J23, J24, J51, M13

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1 Introduction

Current discussions on entrepreneurship have been mostly related to the rise and expansion of the "new economy". However, the determinants of entrepreneurship have attracted much less interest in the economic profession. This is surprising in the light of the fact that most of the economic value added is produced by enterprises. Economic textbooks are silent about entrepreneurs, having replaced them by the neoclassical production function. This paper analyzes the formation of enterprises in a unionized economy. In particular, we address the allocation of individuals to entrepreneurial activities and entry to labor markets. The main argument is that labor market institutions interact with enterprise formation through wage formation.

The recent revolution in information economics has provided a substantial increment in our understanding of the complicated mechanisms inside enterprises.[1] However, the Knightian entrepreneur is still largely without the analysis it deserves.[2] Previous studies have mainly been empirical. They have established many important findings, for example that profits may not fully capture the reasons why some people become entrepreneurs (for recent analyses, see Hamilton (2000), Holtz-Eakin, Rosen and Weathers (2000), Gentry and Hubbard (2000)).[3] Some studies have also pointed to the potential role of liquidity and financial constraints arising from informational asymmetries (cf. Evans and Jovanovic (1989), Holtz-Eakin, Joulfaian and Rosen (1994a, 1994b), Blanchflower and Oswald (1997), Lindh and Ohlsson

[1] For a thorough and enlightening survey, we refer to Holmström and Tirole (1989).

[2] This omission is not easy to understand as the early literature on occupational choice provides many of the required tools, cf. Lucas (1978), Kanbur (1979), Kihlström and Laffont (1979) and Newman (1995).

[3] For an earlier survey, see deWitt (1993).

(1996), Ilmakunnas and Topi (1999)).[4] The literature on industrial organization has shown us that existing firms may undertake strategic pre-emptive actions in order to create entry barriers. There may be regulatory barriers, too. Institutions also tend to adapt to new situations. For instance, increased wage costs may lead to enterprise creation by contracting out some of the activities. The boundaries of enterprises tend thus to be endogenous. High efficiency wages may also be an entry barrier, as attracting high-quality labor may require relatively high costs. It has also been suggested that unemployment may push some people toward establishing their own enterprises.

Determination of entrepreneurship is subject to a number of further mechanisms, including the quality of the ideas, the quality of entrepreneurs, their willingness to provide effort, not to mention their preference for independence. Country-specific determinants are not less important. There is indeed abundance of empirical evidence which indicates that the rate of entrepreneurship differs substantially among OECD countries.[5] One of the findings of the cross-country study by Ilmakunnas and Kanniainen (2000) was that labor market mechanisms tend to interact with enterprise formation.[6]

[4] Geroski (1995) finds that the failure rate among newly-established enterprises is substantial. This finding may be viewed as providing some support for the Boadway et.al (1998) result that financial contracts may allow for the excessively high entry of untested ideas.

[5] See Figure 1 with data on 19 OECD economies. As entrepreneurship is hard to measure, we follow the convention of depicting the figures on self-employment, the share of those working on their own account relative to the total labor force, as a proxy. For documented empirical evidence, see also Lindh and Ohlsson (1997) and Ilmakunnas and Kanniainen (2000).

[6] Their main claim was that the welfare state insures the entrepreneurial and labor risks differently, reducing incentives for enterprise formation. For an analysis of old-age income risks, cf. Wagener (2000).

It is an empirical fact that labor market institutions have taken radically different forms in different economies. In Europe, unions have traditionally adopted a significant role not only in wage determination but more broadly.

For empirical support as to the possibility that enterprise formation may be less active in a strongly unionized economy we refer to Figure 2. It illustrates the relationship between the rate of entrepreneurship and the union density in 19 OECD countries. The current paper therefore sets up such a research agenda, asking how labor market institutions (unions) influence the formation of new enterprises. As far as we know, this question has so far eluded theoretical analysis.

Unlike the earlier literature on entrepreneurship which has focused on the personal characteristics of entrepreneurs (starting with the seminal papers by Lucas (1978) and Kanbur (1979)) or their risk aversion (as in Kihlström and Laffont (1979) and Newman (1995)), our paper has a rather different focus. In developing our model, we normalize the entrepreneurial ability across individuals. We examine the incentives for enterprise formation when wage determination is influenced by labor unions. Any rational potential entrepreneur then has to be forward-looking, anticipating the forthcoming strategic bargaining position which dictates its profit creation capacity in the *post*-entry stage. There are indeed new and unexplored implications. By pushing up the wage rate, unions tend to enhance incentives for individuals to abstain from entrepreneurship and enter the labor market instead. On the other hand, high wages tend to decrease the probability of finding a job, creating a counter effect, i.e., pushing people to entrepreneurship. Our analysis shows that the negative effect always dominates.

The earlier analyses of labor markets in a unionized economy have been

useful in introducing the strategic bargaining between unions and employers.[7] One of the implications of our analysis, however, is that such an approach is subject to a particular limitation of having taken the production sector or industry as exogenous. It has overlooked market entry as the mechanism which shapes the business dynamics and labor demand. New enterprises can come into existence only if the future prospects are lucrative enough.

As it is not possible to derive a closed-form solution for the equilibrium rate of entrepreneurship we illustrate our results numerically. We also consider the effects of increased entry cost and increased uncertainty on the rate of entrepreneurship. Most interestingly, we observe that a mean-preserving spread in market uncertainty reduces the equilibrium rate of entrepreneurship.

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 introduce labor market institutions. As a benchmark case we first analyze competitive labor markets in which unions do not exist. Then we formulate a general model for wage bargaining with a firm's right to manage its labor force *ex post*. In section 4, we analyze the occupational choice and equilibrium rate of entrepreneurship in a unionized economy. In section 5 we illustrate our model by producing numerical simulations. Section 6 concludes the paper.

2 The Model

The economy is assumed to consist of risk-averse individuals who qualify to become entrepreneurs or workers. They are all identical, having the same

[7] See for instance Oswald (1985), Farber (1986) and Booth (1995).

preferences represented by the von Neumann-Morgenstern utility function and 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 just 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 is $1 - n$.

The interaction in the labor market can take a variety of forms, depending on the role of unions. 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, anticipating their future interaction when committing themselves to their strategy.

We develop a model of a one-sector economy consisting of labor and goods markets. The product market is competitive. The realization of the market price is $p = \underline{p}$ with probability λ and $p = \overline{p}$ with probability $1 - \lambda$, $\underline{p} < \overline{p}$.[8] After committing themselves to the entry cost, $k > 0$, assumed to be sunk, entrepreneurs have access to the same production technology of the constant elasticity variety

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

where l is the number of workers in a firm.[9] Entry cost has to do with risk

[8] It is appropriate to simplify the demand side and assume perfectly elastic market demand when focusing on the supply side, i.e., formation of new enterprises.

[9] The case of constant returns ($\gamma = 1$) 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.

sharing in the model. After realization of price uncertainty, the profit of each firm is given by

$$\pi = pl^{\gamma} - wl \tag{2}$$

where $p = \{\underline{p}, \overline{p}\}$, the price realized.

The union is assumed to be engaged in wage bargaining with the objective of maximizing the expected utility of its members. All workers belong to the union. The income of an employed member is the wage rate, w, and the income of the 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.

The utility of a member is of the constant elasticity type. The *ex post* utility of the union, conditional on observed price, is introduced in the form of a utilitarian variety[10]

$$U = nlU(w) + (1 - n - nl)U(b) \tag{3}$$

$$= nlw^{\rho} + (1 - n - nl)b^{\rho}, \quad \rho < 1.$$

[10] We note that the current approach does not capture all the roles of unions. Recently, Agell (2000) has contrasted the unions as rent seekers and providers of social insurance. In the current approach, their role as an insurance institution has been taken to be limited, as the social insurance is assumed to be provided by the government. In contrast, a potential interpretation is that the need for publicly provided insurance may be strengthened by rent-seeking behavior or unions. This would be analogous to those arguments which explain the increasing size of the public sector as arising from increased risks as economies have become more open.

This formulation only marginally qualifies the standard model in the literature in the sense that in (3), n captures the (endogenous) number of entrepreneurs, later also referred to as the rate of entrepreneurship.

The market for entrepreneurship is assumed to be open only once. However, one can also interpret this to mean that once the labor contracts have been settled, those who become unemployed have the option of self-employment outside the labor market. The outside income b can then alternatively be viewed as income from self-employment.

An entrepreneur faces the risk of not being able to recoup the sunk cost k, uninsured by the risk markets. This risk is thus non-diversifiable. The ex-post project value may thus be negative for an entrepreneur. Labor in turn faces employment risk. It is, however, protected by social insurance in the form of unemployment compensation. Risk-averse individuals are then allocated in the light of these prospects. By becoming an entrepreneur, an individual loses her option of having access to wage income, which thus represents an opportunity cost for a potential entrepreneur.

To focus on the effects of union behavior on the market entry of non-existing firms, it is appropriate to work with a particular view of a union, fully appropriating its power *ex post*, after the market price has been observed. A model with more periods would also allow for wage bargaining between the union and the surviving and established firms in conditions with unknown future prices. There would thus be an important difference between new and existing firms, as the unions could share some of the risks of the latter through wage contracts while they cannot share the risks with the former to the same extent. The union could induce greater market entry by committing itself to more limited rent-seeking ex post. Such a commitment does not, however, seem credible from the point of view of a non-existing enterprise. To

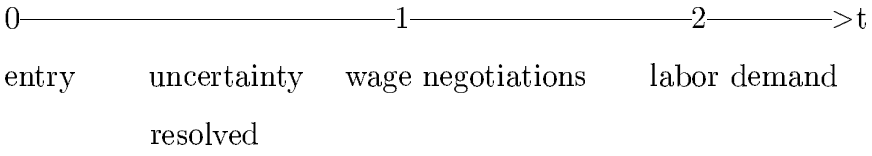
the extent that unemployment compensation is financed by union members, our formulation neglects a mechanism that may somewhat control for wage bargaining.

The realization of the market price and the outcome of wage bargaining will dictate the optimal size of each firm, i.e. how much labor each will eventually hire. In line with the labor market literature, workers face the chance of either being employed or becoming unemployed. The employed and unemployed workers are chosen randomly with probabilities $nl/(1-n)$ and $(1-n-nl)/(1-n)$. The *ex ante* indifference condition (*participation constraint)* of any potential entrepreneur can now be introduced. This states that the expected utility of the entrepreneurial income, prior to price observation and adjusted for the sunk cost of entry, has to be sufficient to compensate for the expected utility of income earned as an employee, $E_pU(\pi - k) = E_p[U]$, in other words,

$$E_p(\pi - k)^\rho = E_p[\frac{nl}{1-n}w^\rho + \frac{1-n-nl}{1-n}b^\rho]. \tag{4}$$

It is this condition which determines the equilibrium entry, n. To further clarify the model, it is useful to state the timing of our three-stage model.

Timing:



At time $t = 0$, n individuals make their occupational choice, and entrepreneurs commit themselves to an entry cost, $k > 0$. After entry, market uncertainty is resolved and the firms and the union observe the value of p.

At time $t = 1$, the wage rate w is negotiated between the union and the federation of 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 the case of competitive labor market, i.e., where unions do not exist, as a benchmark. We think of entry into a competitive market under price uncertainty as the case where entry is irreversible but where employment decisions can be made after resolution of price uncertainty. Under a competitive labor market, there is no role for unemployment compensation because there will, by definition, be no unemployment. Market wages will adjust to provide full employment.

Entry, n, is determined by the indifference condition $E_p U[\pi - k] = E_p U[w]$. Assuming that the utility is of constant exponential variety, this condition reads as

$$E_p(pl^\gamma - wl - k)^\rho = E_p(w)^\rho. \tag{5}$$

After irreversible entry, price uncertainty is resolved and a competitive wage determined. Each firm is price-taking in both markets and chooses its size, i.e. the labor demanded according to the marginal productivity condition $l_C = (\frac{w_C}{p\gamma})^\phi$, where $\phi = \frac{1}{\gamma - 1} < 0$ and where p is either $\underline{p}$ or $\overline{p}$. In the labor market, the supply of labor has to match the demand in the aggregate.

The labor market equilibrium thus requires

$$1 - n = nl_C = n(\frac{w_C}{p\gamma})^{\phi}. \tag{6}$$

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

$$w_C(n, p) = p\gamma[\frac{1-n}{n}]^{\frac{1}{\phi}} \tag{7}$$

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

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

It is a fundamental property of a competitive labor market that there is full job security: the size of the firm is independent of the state of market demand, but the wage will absorb a substantial part of the price risk. However, irreversible entry is risky *ex ante* for an entrepreneur whose income is the residual. In the expected value sense, it has to be sufficient to compensate for the cost of entry, k. It is illuminating to solve first for the equilibrium entry in the absence of entry cost, $k = 0$. Having the results of Lemma 1 at hand, it is easy to show

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

Proof. Inserting the solutions for w_C and l_C into the indifference condition (5) gives the result. ■

Two important visions arise from this. First, in competitive labor markets with costless entry, there is no risk premium for an entrepreneur; she and her labor share the income risk on an equal basis. Second, the incentive for market entry is inversely related to the degree of diminishing returns to scale. Under slowly decreasing returns, there is less room for inframarginal profits, suggesting that there are fewer enterprises but that they all operate on a larger scale.

When entry requires costly *ex ante* commitment, $k > 0$, such a cost is avoided by labor and has to be compensated to a risk-averse entrepreneur. To see this, notice that the right-hand side of $E_p(w)^\rho = E_p[p\gamma]^\rho(\frac{1-n}{n})^{(\gamma-1)\rho}$ is independent of k. Thus one must have $\partial E_p(pl^\gamma - wl - k)^\rho/\partial k = \partial E_p[p(1-\gamma)(\frac{1-n}{n})^\gamma - k]^\rho/\partial k = 0$, from the left-hand side, which is possible only if $\partial n/\partial k < 0$. Entry cost thus makes $n < 1-\gamma$. In order to have an incentive to enter, a firm requires a risk premium over the less risky wage income.

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

Proof. The result follows from reduced enterprise formation being reflected in a lower wage rate, since from equation (7) we see that $-(\partial w_C/\partial n) < 0$. Consequently the expected profits of a potential entrepreneur go up, generating a positive risk premium. ■

3.2 Wage Bargaining: The Right to Manage Model

In the case of a unionized economy, we first assume that the union and the federation of employers share the bargaining power. The union's bargaining power is $\theta < 1$ and the firms' bargaining power is (1-θ), respectively. The fall-back value of the union is taken to be that determined where all $1-n$

workers are unemployed, being eligible to unemployment benefit b.[11] The fall-back value of a firm, in turn, is assumed to be zero production and thus zero profit.

The model is solved by backward induction. In the final stage, the size of each firm - after resolution of price uncertainty and wage negotiation - reads as above, $l = (\frac{w}{p\gamma})^{\phi}$. Due to diminishing returns, firms have access to inframarginal profits. It is convenient to rewrite the profit function as $\pi(w) = l(w)w(\frac{1}{\gamma} - 1) > 0$ where, one should remember, $\partial l/\partial w < 0$. The wage rate is assumed to be determined in the previous stage through Nash bargaining. Recall that on entering the market, a potential entrepreneur is interested in his or her expected utility of profit (entrepreneurial income) as manifested in the indifference condition, equation (4). It is this indifference condition in the initial stage at which the diminishing marginal utility of consumption plays its role. However, it is the actual profit level in the *post-entry* stage which the entrepreneurs are concerned with when participating in the wage negotiation. Thus, the bargaining can be modeled as

$$\max_{w_N} \Gamma = [nl(w_N^{\rho} - b^{\rho}) + (1-n)b^{\rho} - (1-n)b^{\rho}]^{\theta}[n\pi]^{1-\theta} \tag{8}$$

subject to $l \in \arg\max \pi = pl^{\gamma} - w_N l$. Entry n is bygone and irreversible when the wage bargaining takes place. The maximization problem in (8) is thus equivalent to

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

[11] We follow the existing labor market literature on modelling static bargaining.We note, however, that the formulation abstracts from the dynamic change in the relative bargaining power. Unions may be strong when a strike is young but weak when the strike has lasted longer.

where we have denoted $u = nl(w_N^\rho - b^\rho)$. With positive inframarginal profits ($\pi > 0$), the first-order condition is given by the weighted average of the elasticities of the workers' utility and the firms' profit with respect to the bargaining wage:[12]

$$u^\theta \pi^{1-\theta}[\theta(\frac{u_w}{u}) + (1-\theta)(\frac{\pi_w}{\pi})] = 0. \tag{9}$$

In solving for the resulting wage rate, we will make use of the fact that with inframarginal profits ($\pi > 0$), this condition can hold only when the expression within the square brackets is equal to zero. Notice also that the firm's labor demand is the firm's optimal choice, and thus, because of the envelope theorem $\pi_w = -l$. Substituting in (9) we obtain

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

Because $l = (\frac{w_N}{\alpha\gamma})^\phi$ and $\frac{\partial l}{\partial w_N} = \phi(\frac{w_N}{\alpha\gamma})^{\phi-1}\frac{1}{\alpha\gamma}$, and eliminating π, we obtain after some manipulation

$$w_N = b\left[\frac{\gamma + \theta(1-\gamma)}{\gamma + \theta(1-\gamma-\rho+\rho\gamma)}\right]^{\frac{1}{\rho}}. \tag{10}$$

Condition (10) determines the outcome of Nash bargaining, the wage rate $w_N(b, \theta, \rho, \gamma)$. We can immediately see that the two standard results of the labor union literature apply here. In the extreme case where the union's bargaining power is zero, the wage agreed on equals the exogenous unemployment compensation, $w_N(\theta = 0) = b$. The other extreme case is where a union is strong in the sense that it does not need to negotiate about the wage

[12] We assume that the second-order condition holds, i.e. that Γ is concave.

but is able to impose it unilaterally as a market monopolist. The monopoly union, of course, chooses w_N so as to maximize its objective function anticipating (rationally) the labor choice by the enterprises. The monopoly union's wage policy can be obtained by inserting $\theta = 1$ in equation (10). Then $w_N(\theta = 1) = b\left[\frac{1}{1+\rho(\gamma-1)}\right]^{\frac{1}{\rho}}$. The term in square brackets, $\frac{1}{1+\rho(\gamma-1)} > 1$, since $\gamma < 1$ and thus $w_N(\theta = 1) > b$.

For our purposes the following observation relating the strength of the union to the bargained wage rate is even more interesting:

Lemma 4 *The negotiated wage rate is increasing in the union's bargaining power.*

Proof. By taking the derivative, we have $\frac{\partial w_N}{\partial \theta} = -\frac{(-1+\gamma)\gamma\rho}{(\gamma+\theta-\gamma\theta+(-1+\gamma)\theta\rho)^2} > 0$ for all parameter values. ■

We also obtain the following result:

Lemma 5 *In a bargaining model, the number of firms in the market, 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 results from our focus on the steady state equilibrium.

4 Formation of Enterprises in a Unionized Economy

Now we can turn to examine how the strength of the union is reflected in the formation of new enterprises in a unionized economy. This can be analyzed by examining whether $\partial n/\partial\theta \lesseqgtr 0$. When the bargaining power of

the union increases, its role in wage setting becomes stronger. As this is reflected in wages, it shapes the incentives of the individuals when making their occupational choices.

The fact that the union has bargaining power suggests that wages tend to be pushed up, leading to less jobs available and to unemployment. Naturally, the union incentives are affected not only by their bargaining power, but also by the access of union members to unemployment compensation. To examine the effects of labor market institutions on entrepreneurship we have to go back to the initial stage of our three-stage model. The *ex ante* indifference condition (4) requires

$$E_p(\pi_N - k)^\rho = \lambda[\frac{n\underline{l}}{1-n}w_N^\rho + \frac{1-n-n\underline{l}}{1-n}b^\rho] + \tag{11}$$

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

Evaluating both sides, we can rewrite this as:

$$\lambda[\pi(w_N,\theta) - k]^\rho + (1-\lambda)[\pi(w_N,\theta) - k]^\rho \tag{12}$$

$$= (w_N^\rho - b^\rho)\frac{n}{1-n}[\lambda\underline{l} + (1-\lambda)\overline{l}] + b^\rho.$$

where $\underline{l} = l(\underline{p})$ and $\overline{l} = l(\overline{p})$ are the state-dependent employment levels. We now substitute the wage rate from equation (10). The above condition then states the equilibrium entry of new entrepreneurs, n_N, as a function of parameters only, and in principle one should be able to solve for n_N. However,

although we have introduced a number of simplifications, the indifference condition remains 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 which we will illustrate numerically.

We proceed in two steps. We already know that $\partial w_N/\partial\theta > 0$, i.e. that the bargaining power of the union positively affects the wage rate *ex post*. Now we analyze how the wage rate affects the market entry *ex ante*, the second link in the process. We use the indifference condition (12) to examine the effect of the bargaining wage, dn/dw_N.

We first notice that the equilibrium condition (12) states an equality between two value functions, one for an individual as a potential entrepreneur and one for an individual as a potential employee. Since the firms and unions are price-takers, the left-hand side is independent of the number of entering enterprises. Totally differentiating (12) we obtain

$$\frac{dn_N}{dw_N} = \frac{E_w[\pi_N] - E_w[U_N]}{E_n[U_N]}. \tag{13}$$

We hasten to claim:

Proposition 6 *An increased bargaining wage rate unambiguously leads to reduced enterprise formation.*

Proof. To evaluate the sign of (13), note first that the marginal entrepreneur understands that an increase in the wage cost reduces expected profit,

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

Here we have made use of the envelope theorem, giving $d\pi/dw = -l$. An increased number of enterprises is beneficial to workers, since the probability

of obtaining a job both in the good and bad states is higher:

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

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

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

There are two offsetting mechanisms affecting the worker's utility. The second terms within both square brackets are positive: for any given rate of entry and any given size of enterprise, a higher wage raises the utility of each employee. The first terms are negative because a higher wage is expected to lead to a smaller enterprise size. It is, however, the positive effect which must dominate, making $E_w[U_N] \geq 0$. To see this, it is helpful to consider first the case of a monopoly union with $\theta = 1$. By its first-order condition, it certainly holds that $E_w[U_N] = 0$, since the monopoly union has chosen the wage unilaterally to maximize its expected utility. Then, by the logic of the model, any union with a lower bargaining power, $\theta < 1$, has to face a *lower* wage, $w_N < w_M$, where M refers to the monopoly union. The implication is that for such a union it must hold that $E_w[U_N] > 0$. This completes the proof. ■

Our analysis has produced definitive results on the relationship between the formation of enterprises and union power. As the relationships remain non-linear, no closed-form solutions are available. In the absence of such solutions for the equilibrium rate of entrepreneurship (n), it is useful to produce numerical simulations to illustrate the results.

5 Simulation Results

In this section, we examine and illustrate numerically three effects present in our theoretical model. First, we illustrate how the bargaining power of the union affects the equilibrium rate of entrepreneurship in a unionized economy. Second, we demonstrate how incresed price uncertainty affects occupational choices and thus the entry for entrepreneurship. Finally, we illustrate the effects of increased entry cost on the formation of new enterprises.

In order to produce numerical simulations we adopt the following parameter assumptions: $\gamma = 0.7, \rho = 0.5$. To examine the effects of increased union power we proceed as follows. First we calculate the bargaining wage rate defined by equation (10). Then we solve the labor demand (the size of each firm) in both the good and bad states of nature. Then we plug these into the indifference condition, equation (12), and solve the equilbrium rate of entrepreneurship. It was necessary to find combinations of other parameters which satisfy the requirement $0 \leq n \leq 1$. We chose $\underline{p} = .100, \overline{p} = .157, b = 0.047, k = 0.027$. We then examine the effects of the change in the bargaining power of the union by allowing it to vary, thus reflecting the strength of the union. The results of are reported in Table 1.

Table 1. The Relationship between Bargaining Power (θ), Wage Rate (w), Firm Size (l) and Rate of Entrepreneurship (n) under Price Uncertainty ($\gamma = 0.7, \rho = 0.5, \Delta p = 0.057, b = 0.047, k = 0.027$).

θ	$w(p = 0.1)$	$l(p = 0.1)$	$w(p = 0.157)$	$l(p = 0.157)$	n
1	0.065	1.280	0.065	5.759	0.084
0.9	0.063	1.421	0.063	6.390	0.169
0.8	0.062	1.499	0.062	6.740	0.208
0.7	0.060	1.672	0.060	7.519	0.280
0.6	0.058	1.872	0.058	8.418	0.350
0.5	0.057	1.983	0.057	8.921	0.385
0.4	0.055	2.234	0.055	10.049	0.459
0.3	0.053	2.528	0.053	11.369	0.543
0.2	0.051	2.874	0.051	12.925	0.647
0.1	0.049	3.283	0.049	14.769	0.786

From the results above we can indeed see that the union stabilizes the wage rate; it is independent of the state of the economy. Potential entrepreneurs anticipate the events and make the occupational choice accordingly. Consider first the weak union, $\theta = 0.1$, where the bargaining wage 0.049 settles down only marginally above the exogenous unemployment compensation, $b = 0.047$. Since employment within each firm varies from the bad state to the good, individuals in the unionized economy are vulnerable to unemployment risk. Letting the bargaining power now increase, we see that the wage rate increases monotonically. As a consequence, both the size of enterprises and the rate of entrepreneurship decrease systematically. Simulation results therefore illustrate the predictions of the theoretical model. The equilibrium rate of entrepreneurship is the lowest when the union has a monopoly in wage setting.

We next study the impact of increased price uncertainty on market entry. In Table 2, we report the case where the market uncertainty in terms of the price range Δp is higher, but where the expected market price remains the same. This is reflected in our assumption that $\lambda = 0.5$ and we thus consider the case of mean preserving spread. In the unionized economy, increased uncertainty leaves the union wage unchanged (because it is negotiated after resolution of uncertainty). However, the volatility of firm size (labor demand) increases; the size of enterprise becomes smaller in the bad state and larger in the good state when compared to the case of lower price uncertainty. Most interestingly, we observe that the higher the market uncertainty is, the lower the equilibrium rate of entrepreneurship, n, is. In other words, when the market uncertainty increases, individuals prefer a worker's status, which is safer because of the insurance provided via the unemployment benefit. Not less interestingly, this effect becomes stronger when the union's bargaining power increases.

Table 2. The Relationship between Bargaining Power (θ), Unemployment Benefit (b), Wage Rate (w), Firm Size (l) and Rate of Entrepreneurship (n) *under Increased Price Uncertainty.*($\Delta p = 0.067$).

θ	$w(p = 0.095)$	$l(p = 0.095)$	$w(p = 0.162)$	$l(p = 0.162)$	n
1	0.065	1.079	0.065	6.392	0.035
0.9	0.063	1.197	0.063	7.094	0.137
0.8	0.062	1.263	0.062	7.483	0.180
0.7	0.060	1.409	0.060	8.347	0.258
0.6	0.058	1.578	0.058	9.346	0.331
0.5	0.057	1.672	0.057	9.904	0.368
0.4	0.055	1.883	0.055	11.159	0.443
0.3	0.053	2.130	0.053	12.622	0.529
0.2	0.051	2.422	0.051	14.349	0.634
0.1	0.049	2.767	0.049	16.396	0.778

Next we examine the effects of increased entry cost on the equilibrium rate of entrepreneurship, the results being reported below in Table 3. Comparing with Table 1, we observe unsurprisingly that increased entry cost results in a lower rate of entrepreneurship. The wage rate, however, is independent of the entry cost k, and since the wage rate is unaffected the firm size does not change either. The results follows from the entry cost being sunk and hence disregarded when wages are negotiated in a unionized economy. Therefore, it is only the rate of entrepreneurship which adjusts.

Table 3. The Relationship between Bargaining Power (θ), Wage Rate (w), Firm Size (l) and Rate of Entrepreneurship (n) *under Increased Entry Cost.* ($\Delta p = 0.057, k = 0.028$)

θ	$w(p = 0.1)$	$l(p = 0.1)$	$w(p = 0.157)$	$l(p = 0.157)$	n
1	0.065	1.280	0.065	5.759	0.062
0.9	0.063	1.421	0.063	6.390	0.153
0.8	0.062	1.499	0.062	6.740	0.194
0.7	0.060	1.672	0.060	7.519	0.269
0.6	0.058	1.872	0.058	8.418	0.341
0.5	0.057	1.983	0.057	8.921	0.378
0.4	0.055	2.234	0.055	10.049	0.453
0.3	0.053	2.528	0.053	11.369	0.539
0.2	0.051	2.874	0.051	12.925	0.643
0.1	0.049	3.283	0.049	14.769	0.784

6 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. Our results show that 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 behavior. It would also be desirable to extend the analyses presented here in such a way that it would capture non-competitive product markets. Another extension, but a subject of future work, is to introduce the possibility of market exit as well.

References

[1] Agell, J. 2000: On The Determinants of Labor Market Institutions: Rent-Sharing vs. Social Insurance. A paper presented at the CESifo Summer Institute on European Economic Policy in Venice July 21-22, 2000.

[2] Blanchflower, D.G. and A.J. Oswald 1998: What Makes an Entrepreneur?, *Journal of Labor Economics 16. 26-60.*

[3] Boadway, R. et al 1998: Entrepreneurship, Asymmetric Information, and Unemployment, *International Tax and Public Finance 5.* 307 - 327.

[4] Booth, A. 1995: *The Economics of The Trade Union.* Cambridge University Press.

[5] Evans, D. and B. Jovanovic 1989: An Estimated Model of Entrepreneurial Choice under Liquidity Constraints, *Journal of Political Economy, 97*, 808-827.

[6] Farber, H. S. 1986: The Analysis of Union Behavior, in Handbook of Labor Economics, vol II, (eds) Ashenfelter, O. and R. Layard. North-Holland.

[7] Holmstrom, B.R. and J. Tirole, "The Theory of the Firm", Handbook of Industrial Organization, Vol.I, ed.by R.Schmalensee amd R.D.Willig, Elsevier Science Publishers B.V.: Amsterdam, 1989.

[8] Gentry, W. and G. Hubbard 2000: Tax Policy and Entrpreneurial Entry, *American Economic Review 90. 283-287. Papers and Proceedings.*

[9] Geroski, P. 1995: What do we know about entry?, *International Journal of Industrial Organization 13*, 421-440.

[10] Hamilton, B. 2000: Does Entrpreneurship Pay? An Empirical Analysis of the Returns to Self-Employment, *Journal of Political Economy 108.* 604-631.

[11] Holtz-Eakin, D., D. Joulfaian and H.S. Rosen 1994a: Sticking It Out: Entrepreneurial Survival and Liquidity Constraints, *Journal of Political Economy, 102*, 53-75.

[12] Holtz-Eakin, D., D. Joulfaian and H.S. Rosen 1994b: Entrepreneurial decisions and liquidity contraints, *Rand Journal of Economics 25,* 334-347.

[13] Holtz-Eakin, D., D. Joulfaian and H.S. Rosen 2000: Horatio Alger Meets the Mobility Tables, *NBER Working Paper No. W7619.*

[14] Ilmakunnas, P. and V. Kanniainen 2000: "Entrepreneurship, Economic Risks, and Risk-Insurance in the Welfare State: Results with OECD data 1978-93", a paper presented at the CESifo Summer Institute on European Economic Policy in Venice July 21-22, 2000.

[15] Ilmakunnas, P. and J. Topi 1999: Microeconomic and macroeconomic influences on entry and exit of firms, *Review of Industrial Organization 15,* 283-301.

[16] Kanbur, S. M.1979: Of Risk Taking and The Personal Distribution of Income, *Journal of Political Economy 87.* 767 - 797.

[17] Kihlström, R. and Laffont, J.J. 1978: A General Equilibrium Theory of Firm Formation Based on Risk Aversions, *Journal of Political Economy 87.* 719 - 748.

[18] Lindh, T. and H. Ohlsson 1996: Self-Employment and Windfall Gains: Evidence from the Swedish Lottery, *Economic Journal 106*, November, 1515-1526.

[19] Lindh, T. and H.Olsson 1997, *Egenföretagande och manna från himlen,* Finansdepartementet Ds 1997:71 (in Swedish).

[20] Lucas, R. Jr. 1978: On The Size Distribution of Business Firms, *Bell Journal of Economics 9.* 508 - 523.

[21] Newman, A. 1995: Risk-Bearing and "Knightian" Entrepreneurship, *mimeo. Columbia University,* New York.

[22] Oswald, A.1985: The Economic Theory of Trade Unions: An Introductory Survey, *Scandinavian Journal of Economics 87. 160 - 193.*

[23] Wagener, A., Entrepreneurship and Social Security, a paper presented at the 56^{th}Congress of the IIPF, Seville, Spain, 28-31, August 2000.

[24] Witt, G. de 1993: Models of self-employment in a competitive market, *Journal of Economic Surveys, 7,* 367-397.

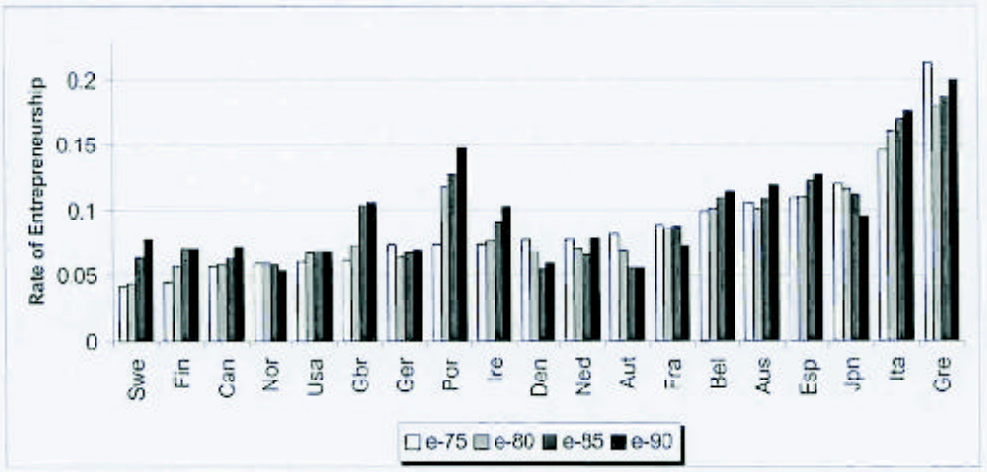


Figure 1: Development of entrepreneurship in OECD countries.

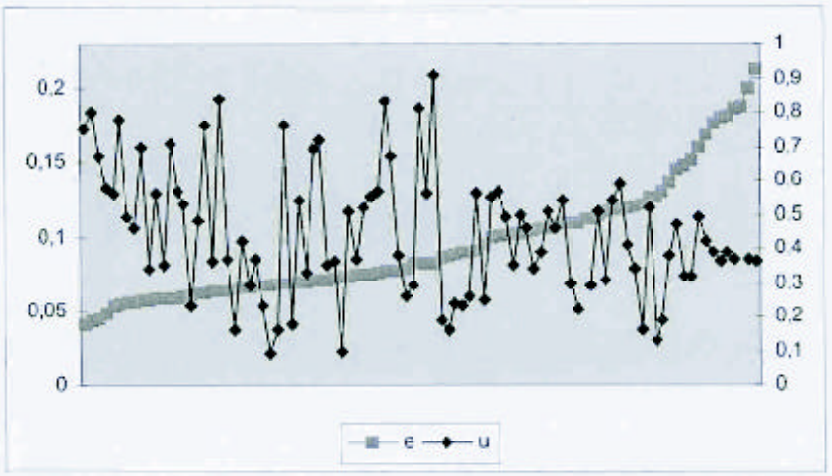


Figure 2: Rate of entrepreneurship (e) and union density (u) in 19 OECD countries. Construction: observations in entrepreneuship in increasing order, with union density rates correspondingly.