Union Power, Entrepreneurial Risk and Entrepreneurship*

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Abstract

The paper shows how union power raises the risk of entrepreneurial income, thereby discouraging entrepreneurship and reducing the capacity of enterprises to employ. Moreover, union power magnifies the effects of demand shocks both on entrepreneurship and enterprise size. The results are worked out in the right-to-manage model with endogenously determined entrepreneurship under price risks.

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1 Introduction

In terms of their ability to create jobs and economic growth, many continental European economies have been disappointing for a fair amount of time. It is often suggested that the most useful way to approach this issue is to recognize that it is entrepreneurship that is the key engine in economic progress. Indeed, it is the entrepreneurs' effort and risk-taking that create

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most of a nation's value-added, provide jobs and generate income, offering a source of revenue to enable the government to carry out its social tasks. Enterprise formation arises from the occupational choice of individuals at the beginning of (or during) their active working life. But it is a risky choice. In industrialized economies, only a relatively low although a diverse share of people becomes entrepreneurs.[1] As entrepreneurship results from a risky occupational choice, it cannot be understood without the due consideration of risk-taking.[2] While the welfare state provides social risk insurance for workers in the form of unemployment compensation and other labour protection measures, insurance against business failure is out of the question in a market economy, and for good reasons.[3] Entrepreneurial risks cannot be socialized as this would lead to the moral hazard while labour protection measures serve a well-defined social purpose. Individuals especially with industry-specific human capital need protection in conditions in which markets do not provide such insurance.[4]

While acknowledged, entrepreneurial risks have been, however, poorly related in the literature to economic institutions. In particular, it has been too silent on the effects of labor market institutions on entrepreneurial risks. The current paper shows that union power exacerbates the downside risk faced by those enterprises who employ labor, thus discouraging entrepreneurship

[1] Empirical data (OECD Labor Force Statistics) show that the rate of entrepreneurship (when measured in terms of entrepreneurs and those working on their own account as the proportion of the total labor force), varies greatly between different economies. For example, in 1990, Norway (5.4%), Austria (5.6%) and Denmark (5.9%) were examples of countries with a below-average rate of entrepreneurship, while Belgium (11.4%), Ireland (10.2%), the UK (10.6%) and Australia (11.9%) were examples of countries with a much higher rate. Most central European countries fell between these two levels while the Mediterranean countries typically have higher rates of entrepreneurship resulting from their high rate of self-employment. For an evaluation of the empirical studies, see Parker (2004).

[2] The view of entrepreneurs as primary risk-takers is deeply rooted in the Knightian tradition (Knight (1921)). The well-known complementary Schumpeterian view (cf. Schumpeter (1942)) depicts entrepreneurs as innovators, the heroes of economic progress.

[3] Such risks show up in the unpredictability of entrepreneurial earnings representing the residual claim, in risky capital income, and in bankruptcy rates. The data reported by Eurostat (see Enterprises in Europe, Fourth Report (1996)) suggest that the failure rate of new firms in the European Union is substantial in the early years of business. After the first year, 20% of new firms close down, 35% have disappeared within the first three years, and after five years, only 50% remain in the market, see also Geroski (1995).

[4] As showed by Booth (1996), an efficient outcome can be obtained even in conditions in which incumbent workers and firms are bargaining over wages and the redundancy pay simultaneously. However, private contracts cannot undo policy-determined labor market regulation measures as the insurance elements created by those regulations raise the union bargaining power (Kanniainen and Vesala (2005)).

and reducing the capacity to employ.

After ignoring it for a long period, the economic profession reintroduced entrepreneurial risk-bearing into the theory of the firm in the late 1970s. The economic underpinnings were analyzed in a few pioneering papers, including Lucas (1978), Kanbur (1979, 1981), Kihlstrom and Laffont (1979), and more recently Newman (1995), Fölster and Trofimov (1997), Blanchflower and Oswald (1998) and Boadway et al. (1998).[5] Lucas (1978) introduced the notion of ability differences to explain enterprise size distribution and growth in his work on Gibrat's law. Kihlstrom and Laffont (1979) on the other hand, suggested that less risk-averse agents would become entrepreneurs, and moreover that the lower the rate of risk aversion, the bigger the size of the firm. According to Kanbur (1979), entrepreneurs are self-selected without knowledge of their ability, while Boadway et al. (1998) suggest that differences in ability (to sell the product) give rise to different success probabilities. Empirical research caught up in the late 1980s, utilizing both longitudinal, time-series and cross-sectional data.[6] It is a frequently reported empirical regularity that also finance and liquidity matter in the formation of new enterprises.[7] The rise (and subsequent fall) in venture capital finance in backing start-up firms in the 1990's led to a substantial increase in studies on issues related to entrepreneurship. It also became understood that informational asymmetries tend to facilitate the entry of low-quality projects, implicitly subsidized by high-quality projects (De Meza and Webb (1999)).

Entrepreneurship hinges upon a number of further mechanisms, including the quality of ideas and of entrepreneurs, and their willingness to provide effort, not to mention their preference for independence. Country-specific structural or cultural determinants may not be less important.[8] Previous studies have also established that the profit motive may not fully capture the reasons why some people become entrepreneurs.[9] It has also been suggested that existing firms may undertake strategic pre-emptive actions in order to create entry barriers and block competition. Institutions also tend to adapt

[5] The literature on self-employment up to the early 1990s is reviewed in de Wit (1993b).

[6] For a representative sample, see Blau (1987), Evans and Leighton (1989), Evans and Jovanovic (1989), Holtz-Eakin, Joulfaian and Rosen (1994a, 1994b), Van Praag and Van Ophem (1995), Lindh and Ohlsson (1996), Lindh and Ohlsson (1998), Blanchflower (2000) and Johansson (2000).

[7] Evans and Jovanovic (1989), Black, De Meza and Jeffreys (1993), De Wit (1993a), Holtz-Eakin, Joulfaian and Rosen (1994a,1994b), Blanchflower and Oswald (1997), Lindh and Ohlsson (1996), and Ilmakunnas and Topi (1999).

[8] For documented empirical evidence, see also Lindh and Ohlsson (1997) and Ilmakunnas and Kanniainen (2001).

[9] Hamilton (2000), Holtz-Eakin, Rosen and Weathers (2000), Gentry and Hubbard (2000).

to new situations.[10] Moreover, unemployment may push some people toward establishing their own enterprises and furthermore many start-ups are initiated as spin-offs from existing firms. The development of entrepreneurship may thereby be a state-dependent cumulative process.

With its focus on the interaction between union power and the downside risk of entrepreneurs, our work differs from previous papers. Risks in our model are aggregate and economy-wide, hence correlated. We thus focus on the market risks arising from business cycles. It has been recognized in the literature of industrial organization that diminishing returns determine the limits of industries and firm size. We show that the union power interacts with such a link. We also show that union power magnifies the distortions caused by price uncertainty on entrepreneurship and the optimal enterprise size. These mechanisms have typically been neglected in policy debate. Our research task appears particularly relevant in the European context with strong labor unions.

Empirical finding available so far provide support for our results. Using OECD country data in 1978-93, Ilmakunnas and Kanniainen (2001) indeed found a negative relationship between entrepreneurship and union density. In Kanniainen and Vesala (2005) which used extended OECD data set for 1978-98, the union effect was measured by several variables. They all obtained negative coefficients as predicted by the model.

The paper is organized as follows. We introduce a model of a firm under market uncertainty, labour unions, and the occupational choice of individuals in Section 2. In Section 3, we first analyze labor markets where unions do not exist to find out the technology effects. Then we formulate a model of wage bargaining. Section 4 considers the effects of union power on the downside risk of enterprises. We examine the effects on the rate of entrepreneurship in a unionized economy in Section 5. In Section 6, we report our simulations. Section 7 concludes the paper.

2 The Model

Occupational choice Essentially, our argumentation is based on merging two well-known models, an occupational choice model and a union model. We show that these two models provide tools for analyzing entrepreneurial risks. The economy is assumed to consist of identical risk-averse individuals with mass one and with utility function of the exponential variety, $U(x) = x^{\rho}, 0 < \rho < 1$. At the outset, the individuals face an occupational choice between

[10] For instance, enterprises may be created by the contracting out some activities. The boundaries of enterprises thus tend to be endogenous.

entrepreneurship (n) or joining the labour force, employed or unemployed ($1-n$). Each enterprise will be run just by one individual. The entrepreneur is the necessary input in hiring the labour and organizing the production; the output without him is zero.

Price risk and entry cost The economy has just one production sector subject to, say international competition. Producers are price-takers and face price risk. The market price obtains the value $p = p^L$ with probability λ and the value $p = p^H$ with probability $1-\lambda$, $p^L < p^H$.[11] Entrepreneurs' income is residual. At entry, a start-up entrepreneur commits to an entry cost, $k > 0$, which is sunk. It can be viewed as the cost of developing the business idea, or carrying out the necessary investments in human capital. It could also arise in the form of an asset risk, i.e. from the allocation of private assets to risky productive use. It could be an R&D cost, the cost of organizing production etc. In the low price state, entrepreneurs face the risk of being unable to recoup this cost, which is uninsured by private risk markets or social insurance. The risk is non-diversifiable. Labour faces unemployment risk but is protected by unemployment compensation.[12] As start-up entrepreneurs are subject to a strictly positive sunk cost, their risk adjusted expected return has to compensate for the failure risk.[13] By downside risk we mean the entrepreneurial income relative to the cost of market entry should a bad state (recession) materialize.

Technology After commitment to an entry cost, each entrepreneur has access to production technology

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

where l is the number of workers, a measure of an enterprise size. After resolution of price uncertainty, the state-dependent profit of an enterprise is

$$\pi^i = p^i (l^i)^\gamma - w^i l^i, \quad , i = L, H. \tag{2}$$

[11] Basically, we assume perfectly elastic market demand as we focus on the supply side, i.e. formation of enterprises.

[12] Given outside credit finance, contracts tend to impose substantial liability on start-up entrepreneurs, or given outside equity to entitle them to a fraction of residual claims. Entrepreneurs' invested wealth is thus subject to default risk while non-entrepreneurial agents face no such risk. For a failing entrepreneur, there is also a psychological cost in terms of the social stigma.

[13] Fonseca, Lopez-Garcia and Pissarides (2001) have obtained a result that higher start-up costs discourage entrepreneurship. Their search theoretical model, however, has a different set-up as they abstract from risk-aversion.

Labour union The union has an objective of maximizing the expected utility of its members.[14] The income of an employed member is the wage, w. The income of the unemployed, b, is exogenous, satisfying $b \leq w$. One interpretation of b is that it is an 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

$$W = nlw^{\rho} + (1 - n - nl)b^{\rho}, \quad 0 < \rho < 1. \tag{3}$$

Our formulation differs from the standard union model in that the number of entrepreneurs is endogenous in (3). The market for entrepreneurship is open only once for the reasons of the sunk cost.[15]

The market price and the outcome of wage bargaining will dictate the employment capacity of each firm. Workers face the risk of becoming unemployed. The employed and unemployed workers are assumed to be chosen randomly with probabilities $nl/(1-n)$ and $(1-n-nl)/(1-n)$.

Entry The expected utility of the entrepreneurial income adjusted for the sunk cost of entry has to be sufficient to compensate for the expected utility of foregone income earned as an employee. It holds for the marginal entrepreneur

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

determining the equilibrium rate of entrepreneurship (entry), n.

The timing of our model is as follows. At time $t = 0$, individuals make their occupational choice. Entrepreneurs commit to an entry cost, $k > 0$. After entry, price is observed and is public information. At time $t = 1$, the wage rate w is negotiated. At time $t = 2$, the entrepreneurs choose their labour input (firm size), l.

[14] Petrakis and Vlassis (2000) have shown that if the union's power is sufficiently high, universal right-to-manage bargaining emerges in equilibrium. Agell (2002) has introduced a model, arguing with heterogenous labour, institutionalized wage compression operates as a welfare-enhancing device, providing social insurance, albeit at a cost of unemployment for those who hold the bad jobs. He focused on labour income risk, abstracting from business risk, which, however, ougth to be the cause of the employment risk of workers. Moreover, his model abstracted from aggregate risks, overstating a union's ability to provide an insurance for its members. We abstract from unions as an insurance device. In the current approach with aggregate risks, its potential role as an insurance device is limited, as the social insurance is provided by the government. Aidt and Sena (2005) have considered rent creation and extraction by unions.

[15] One can interpret this to mean that once the labor contracts have been settled, those who become unemployed have the option of self-employment outside the labour market. The outside income b can then be alternatively viewed as income from self-employment.

3 The Analysis of labour Market Institutions and Entrepreneurship

3.1 Entry under Competitive Labour Markets

It is illuminating to consider first the case of competitive labour markets. We do this for two reasons. First, we want to show the effects of technology on entry and on the size of start-up enterprises. Second, we want to explore the role of the sunk cost in terms of risk premium. As the logic of a competitive labour market is fully different from the bargaining model with a union, the reader should bear in mind that the latter model cannot be obtained as a limiting case in the union model (i.e. making the union bargaining power approach zero).

The market wage adjusts to provide full employment. There is thus no role for unemployment compensation. Of course, such an economic structure raises rather tricky welfare issues. Risk-averse workers are willing to pay for an insurance against income risk. Risk averse entrepreneurs may not have the ability to provide it. Moreover, when labour is homogenous, a tax on labour income could not be used to provide an insurance device among workers.[16] Such thoughts point to the complexity of normative issues.

Here, we restrict ourselves to positive analysis. The competitive world is here not introduced to provide a normative yardstick in terms of a welfare analysis but to provide results related to technology and risk-aversion. The union effects will then below be interlinked with the technology and risk-related mechanisms.

After entry, each entrepreneur is a price-taker in product and labour markets and chooses its employment according to the marginal productivity condition $l_C^i = (\frac{w_C}{p^i\gamma})^\phi$, where $\phi = \frac{1}{\gamma-1} < 0$ and where $i = L, H$. Labour supply has to match its demand in the aggregate. Equilibrium thus requires $1 - n = nl_C = n(\frac{w_C^i}{p^i\gamma})^\phi$. The equilibrium wage is then found as a function of entry, n, and market price

$$w_C^i(n, p^i) = p^i\gamma[\frac{1-n}{n}]^{\frac{1}{\phi}}. \tag{5}$$

with $\partial w_C^i/\partial p^i > 0, \partial w_C^i/\partial n > 0$. Thus, in the competitive case, the equilibrium wage is positively related to the number of enterprises. Moreover, the optimal size of each enterprise is related in a simple way to market entry,

$$l_C = (1-n)/n \tag{6}$$

[16] We note, however, that in case of large-scale corporations with diversified ownership, labour contracts could be adjusted for an insurance premium.

with $\partial l_C/\partial n < 0$. Enterprise size is thus unaffected by the realized price. As it is the property of a competitive labour market that there is full job security, the wage absorbs a substantial part of the price risk.

To capture the role paid by the technology, we solve first for the equilibrium entry in the absence of entry cost, $k = 0$.

Lemma 1 *Under a competitive labour market and with zero entry cost, the rate of entrepreneurship and the optimal enterprise size are fully determined by technology, i.e. the degree of returns to scale,* $n_C = 1-\gamma, l_C = \gamma/(1-\gamma)$.

Proof. The indifference condition of a marginal start-up entrepreneur is $E_pU[\pi - k] = E_pU[w]$,or $E_p(pl^\gamma - wl - k)^\rho = E_p(w)^\rho$. Inserting the solutions for w_C and l_C and $k = 0$ into this condition gives $n_C = 1-\gamma$. Insert $n = 1-\gamma$ in (6) to obtain $l_C = \gamma/(1-\gamma)$. ■

Several conclusions are at hand. First, 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. Second, in competitive labour markets with costless entry, there is no risk premium for an entrepreneur who shares the income risk with hired labor on an equal basis. Third, the state dependent wage rate is determined both by the technology and the realized price, $w_C^i(p^i, \gamma) = p^i\gamma[\frac{\gamma}{1-\gamma}]^{\gamma-1}$.[17]

Suppose in stead not that entry requires costly *ex ante* commitment, $k > 0$. Such a cost is avoided by those who enter labour force. To examine, 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 reduces the number of enterprises, $n < 1-\gamma$. In order to have an incentive to enter, an entrepreneur requires a premium over the less risky wage income.

Lemma 2 *Entry cost generates a risk premium for start-up enterprises, reducing equilibrium entry.*

Proof. The result follows from the lower wage rate since from equation (5) we see that $-(\partial w_C/\partial n) < 0$, generating a positive risk premium.

We note that entry cost also reduces the equilibrium wage in the labour market. ■

[17] We notice that the link between the equilibrium rate of entrepreneurship and technology is also explicit in the seminal paper by Kanbur (1979). Interestingly, our result is independent of the degree of risk aversion.

3.2 Wage Bargaining

With unionized wage setting, the technological and risk-related effects on entrepreneurship will be distorted. We consider the well-known right-to-manage model.[18] We note, however, that the traditional labour union models have been subject to a particular limitation as they take the industry size as given. They have overlooked the fact that forward-looking market entry, shaping the business dynamics, is not immune to the wage bargaining process ex post.

Let the union's bargaining power be $\theta < 1$; the bargaining power of entrepreneurs is then $1-\theta$. The fall-back value of the union is taken to be utility when all $1-n$ workers are unemployed. The fall-back value of a firm, in turn, is assumed to be zero production and thus zero profit. That is, we follow the standard assumptions in the labour union models.

The model is solved by backward induction. In the final stage, the size of each enterprise is $l^i = (\frac{w}{p^i\gamma})^{\phi}$. 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 determined in the previous stage. A word on the entrepreneurial objectives is in order. In the start-up stage, a potential entrepreneur is interested in the expected utility of profit, cf. (4). However, it is the actual profit in the *post-entry* stage which becomes relevant in the wage negotiation. Thus, the bargaining is modeled as

$$\max_{w_N} \Gamma = [nl(w_N^{\rho} - b^{\rho})]^{\theta}[n\pi]^{1-\theta} \tag{7}$$

subject to $l^i \in \arg\max \pi = p^i(l^i)^{\gamma} - w_N l^i$. Denote $u = nl(w_N^{\rho} - b^{\rho})$. The maximization problem in (7) is equivalent to $\max_{w_N} \Gamma = u^{\theta}\pi^{1-\theta}$. 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:[19]

$$u^{\theta}\pi^{1-\theta}[\theta(\frac{u_w}{u}) + (1-\theta)(\frac{\pi_w}{\pi})] = 0. \tag{8}$$

In solving for the wage rate, we will make use of the fact that with inframarginal profits, this condition holds only when the expression within the square brackets is equal to zero. Notice also that the firm's labour demand is the firm's optimal choice, and thus, by the envelope theorem $\pi_w = -l$.

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

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

Substituting in (8),

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

Since $l^i = (\frac{w_N}{p^i\gamma})^\phi$ and $\frac{\partial l^i}{\partial w_N} = \phi(\frac{w_N}{p^i\gamma})^{\phi-1}\frac{1}{p^i\gamma}$, and eliminating π, we obtain after some manipulation the wage rate

$$w_N = b\left[\frac{\gamma+\theta(1-\gamma)}{\gamma+\theta(1-\gamma-\rho+\rho\gamma)}\right]^{\frac{1}{\rho}}. \tag{9}$$

Notice that in the union model, the wage rate w_N does not depend on the realized price. This should be contrasted to the wage rate in the competitive case from above, (5).

We see here two standard results of the labour union literature. In the extreme case with the union's bargaining power approaching zero, the wage agreed upon equals the exogenous unemployment compensation, $w_N(\theta = 0) = b$. The other extreme case arises if the union is able impose the wage unilaterally. By inserting $\theta = 1$ in (9), $w_N(\theta = 1) = b\left[\frac{1}{1+\rho(\gamma-1)}\right]^{\frac{1}{\rho}}$. The term in square brackets, $\frac{1}{1+\rho(\gamma-1)} > 1$, since $\gamma < 1$ and thus $w_N(\theta = 1) > b$. By differentiating (9) with respect to θ, we obtain $\frac{\partial w_N}{\partial\theta} = -\frac{(-1+\gamma)\gamma\rho}{(\gamma+\theta-\gamma\theta+(-1+\gamma)\theta\rho)^2} > 0$ for all parameter values. Thus, the negotiated wage rate is increasing in the union's bargaining power. This is a standard result. After substituting in w_N, the labour demand is given by

$$l^i = \left[\frac{b}{p^i\gamma}\left(\frac{\gamma+\theta(1-\gamma)}{\gamma+\theta(1-\gamma-\rho+\rho\gamma)}\right)^{\frac{1}{\rho}}\right]^{\frac{1}{\gamma-1}}.$$

In contrast to the competitive labour market model, the labour demand is state-dependent. Moreover, the number of firms in the market, n, does not influence the outcome of bargaining nor the labour demand.

As to the profit of an enterprise, $\pi^i = p^i(l^i)^\gamma - w_N l^i$, entrepreneurial risk is now shared less by labor, as the wage rate is independent of the realized price. This suggests that union power raises the entrepreneurial risk.

4 Union Power Enhances Entrepreneurial Risk

To consider the impact of union power on entrepreneurial risk, we evaluate the state-dependent profits

$$\pi^i = (p^i\left[\frac{b}{p^i\gamma}z^{\frac{1}{\rho}}\right] - bz^{\frac{1}{\rho}})\left[\frac{b}{p^i\gamma}z^{\frac{1}{\rho}}\right]^\phi, \quad i = H, L$$

where for brevity,

$$z = \frac{\gamma + \theta(1-\gamma)}{\gamma + \theta(1-\gamma) - \theta\rho(1-\gamma)}.$$

The profit rate is stochastic as the price is subject to risk. Though the negotiated wage is not adjusted for the realized price, the entrepreneurs can adjust their employment ex post. This provides, however, at best a partial insurance for entrepreneurs, making workers share some of the business risk. The union understands the mechanisms but it also understands that the social insurance protects its labour, when unemployed. Taken all into account, we show that union power enhances entrepreneurial risk.

Proposition 3 *The greater is the union power in wage setting, the greater is the risk that the entrepreneur is unable to recover its initial investment.*

Proof. The expected profit is given by $E[\pi] = \lambda\pi^L + (1-\lambda)\pi^H$. Consider an increase in θ. Using the envelop theorem, we can disregard the employment and the output effects of price increases. Then, as $\partial z/\partial\theta > 0$, we have

$$\partial\pi^i/\partial\theta = -l\partial w/\partial\theta < 0, \quad i = L, H.$$

Therefore, $\partial E[\pi]/\partial\theta < 0$ and, with given $k > 0$, the greater is the chance that the entrepreneur is unable to recover its initial investment as $\pi^L - k$ may turn negative. ■

What this proposition suggests is that in a unionized economy, the entrepreneurial risk is amplified by the union power. As the initial investment k is sunk, there is a downside risk of having $\pi^L < k$. The greater is θ, the greater is the entrepreneurial loss $\pi^L - k$ in case where the bad state is realized.

The implication that union power makes entrepreneurial income more risky, though obvious, has not been recognized by the existing literature. We illustrate this outcome numerically and graphically below.

To make the numbers compatible with the simulations in Section 6, we introduce the following parametrization: $\gamma = 0.7, \rho = 0.5, b = 0.047$. We let the prices be $p^L = 0.100$, $p^H = 0.157$ in recession and boom respectively. We calculate the realized profits in the two states and produce figures for the expected profits. We report the findings as follows:

Table 1. The Relationship between Union Power (θ), Prizes (p^L, p^H), Realized Profits in Recession (π^L) and in Boom (π^H) and the Expected Profit ($E[\pi]$) in Unionized Economy.

θ	p^L	p^H	π^L	π^H	$E[\pi]$
$\theta = 1$	0.1	0.157	0.036	0.160	0.098
$\theta = 0.9$	0.1	0.157	0.038	0.170	0.104
$\theta = 0.8$	0.1	0.157	0.040	0.181	0.111
$\theta = 0.7$	0.1	0.157	0.043	0.193	0.118
$\theta = 0.6$	0.1	0.157	0.046	0.207	0.127
$\theta = 0.5$	0.1	0.157	0.050	0.222	0.135
$\theta = 0.4$	0.1	0.157	0.053	0.240	0.147
$\theta = 0.3$	0.1	0.157	0.058	0.260	0.159
$\theta = 0.2$	0.1	0.157	0.063	0.283	0.173
$\theta = 0.1$	0.1	0.157	0.069	0.310	0.190

In Figure 1 (next page), we illustrate the impact of union power on the profit of an entrepreneur in the two states, net of the sunk cost k. Such an illustration is helpful to gain understanding also about the employment effects of union power. With increasing union power, profit in each state is reduced, so is the expected profit of each new venture. Particularly critical for an enterprise is the effect on downside risk, $\pi^L - k$. Using $k = 0.045$ in Figure 1, we illustrate how the profit net of the sunk cost turns negative when the union power increases. With increasing union power, also the upside potential in terms of high good risk is reduced and it does not compensate for the threat of loss in the bad state. With a potential loss in the bad state and reduced upside potential in the good state, fewer enterprises are created as we show in the next section both theoretically and numerically.

5 Entrepreneurship in a Unionized Economy

We concluded above that union power makes start-up enterprises more risky. We now turn to examine how this is reflected in the rate of entrepreneurship and the optimal size of enterprises. This can be analyzed by examining $\partial n/\partial\theta$.

The fact that the union has bargaining power suggests that wages tend to exceed the competitive ones, leading to fewer jobs available. Naturally, the union incentives are affected not only by its bargaining power but also by the access of union members to unemployment compensation. In the initial stage of our model, the *ex ante* indifference condition of an entrepreneur (4) requires

$$E_p(\pi_N - k)^\rho = \lambda[\frac{nl^L}{1-n}w_N^\rho + \frac{1-n-nl^L}{1-n}b^\rho] +$$

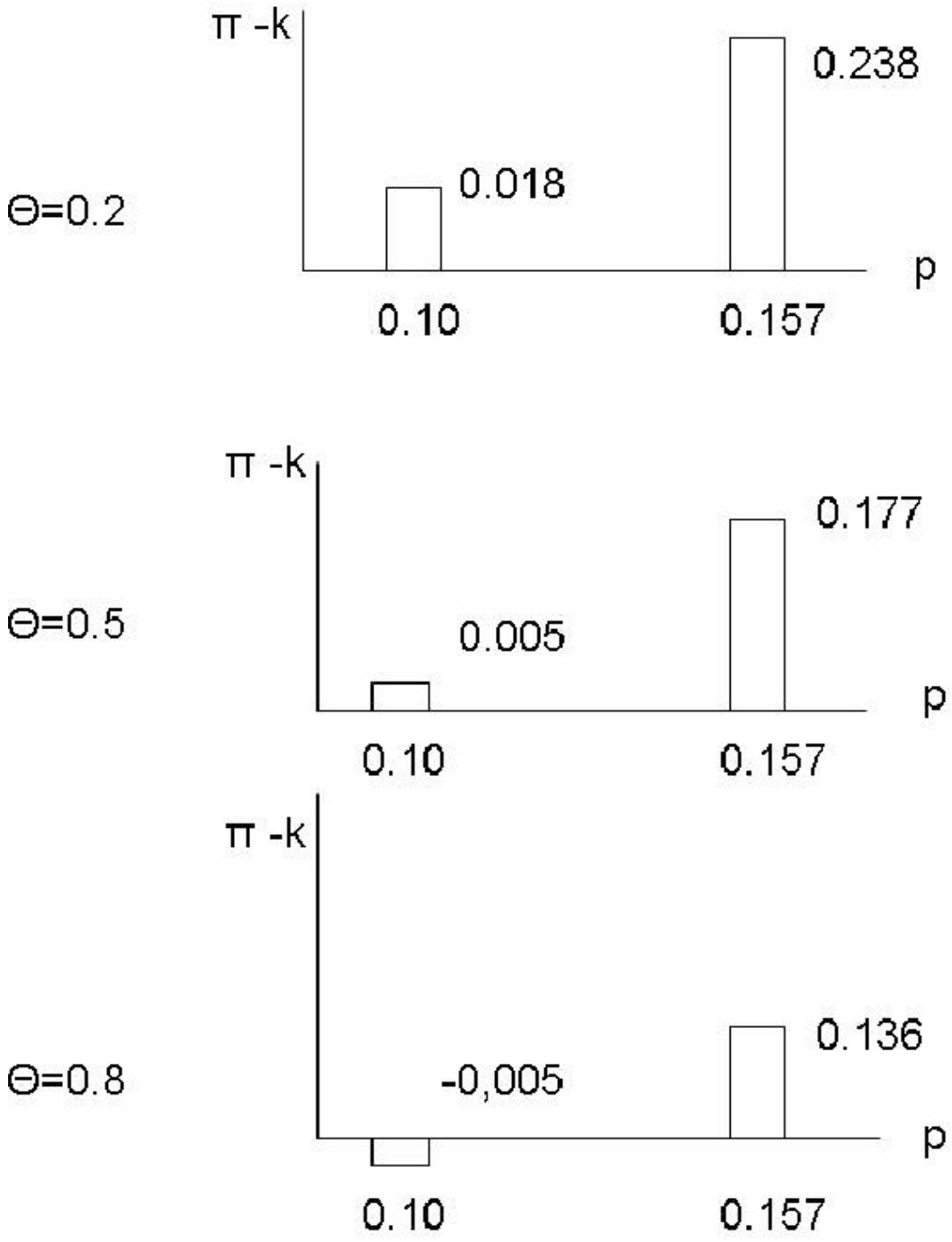

Figure 1: Union Power Increases the Downside Risk of an Entrepreneur.

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

Evaluating both sides, we rewrite

$$\begin{aligned} & \lambda[\pi(w_N,\theta)-k]^\rho + (1-\lambda)[\pi(w_N,\theta)-k]^\rho \qquad (10) \\ = \quad & (w_N^\rho - b^\rho)\frac{n}{1-n}[\lambda l^L + (1-\lambda)l^H] + b^\rho. \end{aligned}$$

where $l^L = l(p^L)$ and $l^H = l(p^H)$ are the state-dependent employments. We now substitute the wage rate from equation (9). The above condition then states the equilibrium rate of entrepreneurs, n_N, as a function of exogenous parameters only. In principle, one should be able to solve it for n_N. However, the indifference condition is non-linear in n_N. Therefore, no closed-form solution is available. Yet, we are able to produce a clear-cut analytic result.

We proceed in two steps. We already know that $\partial w_N/\partial\theta > 0$. Now it is sufficient to analyze how the wage rate affects the market entry, the second link in the process. We use the indifference condition (10) to examine dn/dw_N. The condition (10) 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 enterprises. Totally differentiating (10),

$$\frac{dn_N}{dw_N} = \frac{E_w[\pi_N] - E_w[U_N]}{E_n[U_N]}. \qquad (11)$$

We can now state

Proposition 4 *An increase in the bargained wage rate leads to reduced enterprise formation.*

Proof. To evaluate the sign of (11), note first that an increase in the wage cost reduces the expected profit of the marginal entrepreneur

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

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:

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

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

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

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 leads to a smaller firm size. It is, however, the positive effect which must dominate, making $E_w[U_N] \geq 0$. To see this, it is helpful first to consider 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. ■

What is the intuition for the result? In an unionized economy, any potential entrepreneur is assumed to be forward-looking, anticipating the strategic bargaining position in the post-entry stage. By pushing up the wage rate, the union tends to enhance incentives for individuals to abstain from entrepreneurship and enter the labour market instead. The mechanism arises from increased risk faced by an entrepreneur given reduced risk sharing with labor. On the other hand, higher wages tend to decrease the probability of finding a job, thereby having a counter effect, i.e. pushing people to entrepreneurship. Our proposition 4 proves that it is the negative effect which dominates at the outset when the union power is increased.

6 Illustrations: Simulation results

We adopt the following parameterization: $\gamma = 0.7, \rho = 0.5$ and we proceed as follows. First we calculate the bargaining wage rate defined by equation (9). Then we solve for the labor demand in both the good and bad states. Then we plug these into the indifference condition, equation (10), and solve for the entrepreneurship. It is necessary to find the appropriate combinations of other parameters which satisfy the requirement $0 \leq n \leq 1$. We choose $p^L = .100, p^H = .157, b = 0.047$. We also choose a fairly low value for k, $k = 0.027$, to show the negative impact of θ on enterprise formation even

though the expected profit of each firm is positive. The results of are reported in Table 2.

Table 2. The Relationship between Union Power (θ), Wage Rate (w), Firm Size (l), Rate of Entrepreneurship (n) under Price Uncertainty ($\gamma = 0.7, \rho = 0.5, \Delta p = 0.057, b = 0.047, k = 0.027$).

θ	$w(p^L = 0.1)$	$l(p^L = 0.1)$	$w(p^H = 0.157)$	$l(p^H = 0.157)$	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 Table 2 we can indeed see that in the bargaining model, the union stabilizes the wage rate across business cycles. In the case of a weak union, say $\theta = 0.1$, the bargaining wage 0.049 settles down only marginally above the 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 be greater, we see that the wage rate increases monotonically. As a consequence, both the optimal enterprise size and the rate of entrepreneurship are reduced. The figures on the effects of union power on entrepreneurial risk are rising with increased union power. The equilibrium rate of entrepreneurship is reduced down to the lowest figure when the union has monopoly in wage setting. As far as we know, such conclusions have not been discussed in the literature so far.

We next study the impact of increased price risk on market entry in the sense of mean preserving spread. In Table 3, we report the case where the price range Δp is increased, but where the expected market price has remained the same. This can be accomplished by introducing $\lambda = 0.5$. Increased uncertainty leaves the union wage unchanged (because it is negotiated after resolution of uncertainty). However, the realized distribution of firm size (labour demand) conditional on the realized price increases; the size of enterprise becomes smaller in the bad state and larger in the good state when compared with the case of lower price uncertainty. Most interestingly, we observe that the greater the price uncertainty is, the lower is the equilibrium

rate of entrepreneurship, n. In other words, when the market uncertainty increases, individuals prefer a worker's status. It is safer because of the insurance provided by the unemployment benefit, while the entrepreneurial risks are uninsured. Not less interestingly, the distortive effect on entrepreneurship is positively related to union power. Therefore, when labour markets move from low union power to greater union power, enterprise formation become more vulnerable to demand shocks.

Table 3. 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	$w(p^L = 0.095)$	$l(p^L = 0.095)$	$w(p^H = 0.162)$	$l(p^H = 0.162)$	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

7 Final Remarks

Our model has considered entrepreneurship under various labour market institutions. The union effects on entrepreneurship, wage determination, and the optimal firm size have been analyzed in an occupational choice model. In the benchmark case with competitive labour markets, entrepreneurship is determined by the underlying technology. The entry cost generates a risk premium on entrepreneurship. With union power in wage bargaining, our result is that the entrepreneurial risk is increased, the equilibrium rate of entrepreneurship is reduced and so is the average size of enterprises. The robustness of the results could be examined by extending the model in various directions. For example, having heterogenous entrepreneurial abilities would extend the model in the direction of firm-specific risks. We conjecture, however, that as long as a union's strategy results in wages exceeding the competitive ones, the results obtained in our study will hold. Note, however, that we have abstained from any normative statements. Yet, as the European disease is often related to the way its labour markets operate, we believe that our results provide some insights on this debate.

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