

Institutions, Occupational Choice and Development - the Role of Property Rights Protection and Entrepreneurship

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1 introduction

In a world where entrepreneurs are the leading force in the economy sufficient protection of property rights by a legal system is vital. Not the possible loss of property to theft is what threatens economic development - entrepreneurs can deter criminality by providing jobs, it is the loss of entrepreneurial talent to rent-seeking activity. This paper provides some discussion illustrated by a model in which agents' occupational choice responds to the institutional environment.

A special role in the economic development of nations has been attributed to the Schumpeterian entrepreneur. Perpetual growth can only be achieved through unceasing invention of new processes and products. The endogenous growth literature pioneered by Aghion/Howitt (1992) and Romer (1990) reserves a prominent role for entrepreneurship by allowing for monopoly rents which a researcher seeks through innovative activity; thereby he inadvertently fosters growth.

Entrepreneurs fulfill many tasks in the economy on their search for profits. They will not only adopt the most profitable products and methods and thereby increase productivity, they also allocate worker skills accord-

ing to the workers' comparative advantages. Not everyone can become an entrepreneur, only some have the innate talent for performing these tasks.

Precisely because of his entrepreneurial talent though a potential entrepreneur can also become a destructive force for the economy. Ultimately individuals seek to enhance their personal lot. In the case of the entrepreneur this means he will seek out any enterprise deemed profitable, including organized crime and corruption if this is not sanctioned. As noted by Baumol (1990) it is "the set of rules not the supply of entrepreneurs nor his objectives that change". This implies a prominent role for institutions which as institutionalists say ".. are the rules of the game,.. the humanly devised constraints that shape human interaction. .. they structure incentives in human exchange, whether political, social, or economic" (North 1990). And as North and Thomas (1973) assert "the factors we have listed (innovation, economies of scale, education, capital accumulation etc.) are not causes of growth; they *are* growth". What causes development though are not the rules, it is human action and ingenuity. If markets were "perfect" people's selfish strife for riches would lead to the best outcomes for all. But markets fail to achieve socially efficient outcomes and therefore we need institutions to set the rules of the game.¹

The model presented in this paper focuses on the effect of institutions, a legal system enforcing the protection of property, on occupational choices of agents endowed with entrepreneurial talent. The entrepreneur is necessary in this economy to find projects, convert them into firms and match skilled workers to a firm. But this might not be the only way to make profits. The relative strength of the legal system compared to the power of a rent-seeking organization supplying private protection of property determines the value of rent seeking which might attract entrepreneurs away from entrepreneurship. This has dire consequences for the economy since entrepreneurs determine if productive projects are realized and workers' ability demanded. A weak legal system not only attracts more criminals, workers who's pay-off from theft is higher than that of skilled labor but worst of all it deflects entrepreneurs from fulfilling their socially desired role. An entrepreneur could prevent all crime by realizing productive possibilities and getting workers "off the street" but weak institutions create rents that make entrepreneurship the less

¹A market is not an institution. Markets form naturally in the absence of any intervention. Market economies do have an institutional framework in place, as a remedy for market failures. (and other objectives)

desired occupation. The fall in entrepreneurship is what makes the economy strictly worse off under private protection. In the extreme case that private protection is powerful enough to prevent all crime and the legal system is non-existent there will be no production at all.

But fortunately the legal system does not have to be extremely powerful to prevent this from happening. It turns out that fairly moderate levels of protection of property are sufficient to make entrepreneurship more attractive to potential entrepreneurs than rent-seeking.

There are two strands of related literature. First there are the models of anarchic games of aggression and defense in the conflict literature provided by Jack Hirshleifer (1991, 1995, 2001) and also Grossman and Kim (1995). In these models two parties fight for resources. Agents have to decide how much of their endowment to invest in defence, predation or production. Hirshleifer discusses the "paradox of power" when the weak fight harder (1991) and conditions for the breakdown of anarchy which he describes as a spontaneous order into, he conjectures, either chaos or coordination (1995). Grossman and Kim discuss the possibility of a non-aggressive equilibrium where investment in defense is high enough to prevent all aggression. Dixit (2004 ch. 5)² considers furthermore the interaction of self-defense and "private protection" in a partial equilibrium model (following Anderson and Bandiera 2002) where protectors and producers are distinct groups of agents. There is an externality in private protection since protectors will only protect the rich and deflect criminals on low value property. This implies that a welfare maximizing state might have an incentive to reduce the proportion of protected property. In comparison to self defence though private protection is welfare enhancing.

There exists some theoretical literature on occupational choice and development [Murphy, Shleifer, Vishny (1991), Acemoglu (1995), Acemoglu, Verdier (1998), Banerjee and Newman (1993)].

Murphy et al. construct a model in which an alternative redistributive job option for talented agents (entrepreneurs) harms productive activity and growth. The most talented person determines the economy's growth rate but he is attracted into rent-seeking if returns increase more with talent than in production. Increasing returns to rent-seeking can have institutional

²In his 2004 book "lawlessness and economics" Dixit provides a conceptual framework of "alternative institutions" that support economic activity in the absence of government enforced laws for contract enforcement and property rights.

reasons but in their model why the rent-seeking opportunity arises is not explicitly modeled. Acemoglu considers the role institutional features play in the allocation of entrepreneurial talent in his 1998 paper with Verdier. The lack of proper contractual laws reduces the profitability of a relationship between a supplier and producer due to moral hazard. This creates rents that can be earned by corrupt bureaucrats who are able to verify outcomes.

Banerjee and Newman's model focuses on the interplay between the distribution of wealth, credit market imperfections and occupational choice.

In the following model exogenous institutions provide property rights protection for entrepreneurs. It is presented in the next section followed by a discussion of empirical observation in the literature in section 3. Concluding remarks close the paper.

2 the model

2.1 agents and technology

The economy is populated by a unit mass of potential entrepreneurs. These agents are endowed with entrepreneurial talent and thus have the potential to become entrepreneurs, but they need not take up entrepreneurship as their profession. Entrepreneurial talent enables them to find and implement a productive project but also to pursue organized rent-seeking. For tractability I assume that entrepreneurs are homogenous.

There is also a unit mass of workers. These agents do not have any entrepreneurial talent but they have the ability to become a skilled worker. It makes sense that not everyone has entrepreneurial talent. Even the high skilled researcher need not have the vision for what will become a successful new product. Innovations have to be screened and adopted by someone with entrepreneurial talent. To harvest the potential of its worker's ability the economy must have agents with entrepreneurial talent. In this model workers have the choice between becoming skilled and working in production or remaining unskilled and becoming criminal. Here becoming skilled simply means that workers use their ability in their occupation. The worker's decision will be determined by employment possibilities created through entrepreneurship.

Workers are heterogenous and their individual ability is the realization of a random variable "a" which is drawn from the economy's ability distribution

$H(a)$ on support $[\underline{a}, \infty)$. By the law of large numbers $H(a)$ gives the proportion of workers with ability below a . For concreteness I assume the distribution of worker ability to be Pareto:

$$a \sim H(a) = 1 - \left(\frac{a}{\underline{a}}\right)^{-\gamma_a}$$

$$\gamma_a > 3, \underline{a} > 0$$

The lowest ability in the population is given by \underline{a} . The shape parameter γ_a determines the heterogeneity of the population. Larger γ_a means less mass in the right tail and a smaller expected value as more workers have ability closer to the minimum ability \underline{a} .

The state of development of the economy gives rise to a distribution of potential projects' quality. Project quality here is synonymous with productivity in production. Let the distribution of potential projects also follow a Pareto distribution:

$$x \sim F(x) = 1 - \left(\frac{x}{\underline{x}}\right)^{-\gamma_x}$$

$$\gamma_x > 3, \underline{x} > 0$$

The interpretation of the parameters is similar to the one of the ability distribution. The parameter restrictions guarantee the existence of the first three moments. I will also assume that shape of the ability and quality distributions is not too different, in particular I assume $\frac{1}{2} \leq \frac{\gamma_x}{\gamma_a} \leq 2$. This will make sure that profits are always positive and therefore rule out uninteresting equilibria³ but not change the implications.

The entrepreneur is invaluable for the economy. Only entrepreneurs have the talent to evaluate potential projects and implement them as a firm. The qualities realized by entrepreneurs determine the realized productivity distribution of the economy. I model the process of project formation analogous to a simple search. An entrepreneur can employ his talent to draw from this distribution and assess the quality of his draw, he will only implement a project that meets a minimum quality requirement. Search costs can be interpreted as the effort an entrepreneur has to expend to improve his future firm. What will be the structure of production in the economy? Due to

³starting off from a point with negative profits means the economy will get stuck with zero entrepreneurs, no matter what

the law of large numbers the realized distribution will be the distribution of project qualities conditional on the quality requirement denoted by x^* :

$$F(x | x \geq x^*) = 1 - \left(\frac{x}{x^*}\right)^{-\gamma_x} \quad (1)$$

The production technology of the firm is summarized by the following production function:

$$y(x) = xa^\alpha \quad (2)$$

with $\alpha < 0.5$

Where "a" is the level of skill of the firm's worker. The entrepreneur hires a single skilled worker whom he will choose to match the quality of his firm. Since all inputs are complementary, positive assortative matching will result as in Kremer (1993) and Becker (1973).

2.2 institutional setting

The protection of property rights is arguably one of the most important functions of an institutional framework. Here I will focus on this function. Institutions are given by a legal system whose effectiveness is determined exogenously. As stated above workers either become a production worker or support themselves through robbery. Criminals attack a firm and steal the entrepreneur's profit. I assume the probability of a successful theft depends positively on the proportion of criminals to firms and negatively on the strength of law enforcement. In particular the probability of theft is given by:

$$p^L = \frac{\frac{C}{N^E}}{\frac{C}{N^E} + L} \quad (3)$$

Where L (≥ 1) denotes a measure of the strength of the legal system and C and N^E are the mass of criminals and entrepreneurs respectively. This is a simple form of a "contest success function" which has been discussed and used in the context of conflict by Jack Hirshleifer (1989, 1990, 1995) and subsequently employed by others [Grossman/Kim (1995), Anderson/Bandiera (2003), Dixit (2003)]. L encompasses the quality of the written law and of its enforcement. At $L=1$ there is no law enforcement and the probability only depends on the numbers of criminals for every entrepreneur.

I also allow for an alternative protection structure. Suppose agents can organize and provide protection of property. They will not have the tradition and force of a written law behind them but through use of brute force and a reputation for toughness, they are also able prevent crime. Analogously the probability of theft under private protection is given by:

$$p^R = \frac{\frac{C}{N^E}}{\frac{C}{N^E} + P} \quad (4)$$

Where P denotes the rent-seekers' power. I assume this power is achieved by private protectors collectively and a single agent acting alone will not be able protect a firm any more effectively than the entrepreneur. Private protection is offered by entrepreneurs acting like a monopoly of protection not unlike the state but instead of providing it costlessly (since its production free) it collects monopoly rents.

2.3 timing

Agents are risk-neutral and maximize income. They live for one period, a generation. The timing of their actions is as follows: first potential entrepreneurs maximize earnings by comparing the expected value of entrepreneurship to the expected profit from rent seeking and choosing the more profitable occupation. Observing the entrepreneur's choice workers solve their decision problem. Then entrepreneurs search for a project, pay a protection fee to rent-seekers if applicable, implement the project by hiring a worker and produce. Workers who are not working in production attempt to steal from entrepreneurs. Rent-seekers enforce private protection.

2.4 rent-seeking

A rent-seeker sets the price for protection, R , to maximize his profits. The product he sells, protection, is an indivisible good, either the entrepreneur agrees to purchase protection or he doesn't, in particular an entrepreneur buys protection until the price is equal to the gain from protection, that is as long as $R \leq (p^L - p^R)\pi(x)$ where $\pi(x)$ is the entrepreneur's profit when his firm is of quality x . Since the rent-seeker has entrepreneurial talent and can therefore evaluate a firm's quality he can price discriminate and charge a price dependent on firm quality. Thus he charges:

$$R(x) = (p^L - p^R)\pi(x) \quad (5)$$

The profit of each single rent-seeker is total rents accruing to the rent-seeking organization divided by the number of rent-seekers.

2.5 an entrepreneur's problem

2.5.1 second stage matching and production

The project quality obtained in stage one defines the quality of a firm by determining the productivity of the production function (2). Given his choice of x^* , determined below, and the draw of quality accepted, the entrepreneur chooses a worker to maximize profits. This standard problem leads to a first order condition relating the marginal cost of ability to its marginal benefit:

$$\begin{aligned} \max_a \pi(x, a) &= xa^\alpha - w(a) \\ \text{foc} &: \frac{dw}{da} = \alpha xa^{\alpha-1} \end{aligned}$$

an entrepreneur will pay more for per ability increment the higher the quality of his firm. In equilibrium each firm will be matched with a worker in accordance with its quality. Since there are no labor market frictions the optimal assignment, positive assortative matching, will be the stable outcome of entrepreneurs picking their most desired worker by making him the a wage offer no other entrepreneur is willing to top. The assignment function is determined by the demand for workers. I define the mass of firms with productivity smaller than x by:

$$G(x) \equiv N^E F(x | x^* \geq x)$$

where N^E denotes the mass of entrepreneurs and thus the mass of firms. Positive assortative matching implies that if the supply of workers exceeds demand, $N^E < 1$, the lowest ability workers, a mass of $1 - N^E$ workers, will be unemployed. The assignment function assigning a worker to each firm is determined by:

$$H(\lambda(x)) - (1 - N^E) = G(x)$$

where $\lambda(x) = a$ denotes the assignment function. The explicit solution for the distributions I have assumed is:

$$\lambda(x) = \underline{a} (N^E)^{-\frac{1}{\gamma a}} \left(\frac{x}{x^*} \right)^{\frac{\gamma x}{\gamma a}} \quad (6)$$

The ability of the worker hired is increasing in firm quality as implied by positive matching. For higher minimum quality x^* an entrepreneur will accept only higher quality projects thus a given worker will be matched with a better firm. The assignment also depends on parameters of the distribution functions and the number of firms. A smaller number of firms implies that each quality is matched with a higher ability worker, this effect is reduced the smaller the expected value of a . The flip side is that a worker is matched with a relatively lower firm quality. The lowest ability worker hired is:

$$\lambda(x^*) = \underline{a} (N^E)^{-\frac{1}{\gamma_a}} \equiv \tilde{a} \quad (7)$$

The wage schedule can be derived by substituting the assignment function into the entrepreneur's first order condition and solving the differential equation in "a". The initial condition is given by the outside option c , which is the wage offer the lowest quality firm makes the lowest ability worker. Using (7) I arrive at the following wage schedule:

$$w(a) = \frac{\alpha}{\alpha + \frac{\gamma_a}{\gamma_x}} (x^* N^{E \frac{1}{\gamma_x}} \left(\frac{a}{\underline{a}}\right)^{\frac{\gamma_a}{\gamma_x}}) a^\alpha + \left[c - \frac{\alpha}{\alpha + \frac{\gamma_a}{\gamma_x}} x^* \underline{a}^\alpha N^{E - \frac{\alpha}{\gamma_a}} \right] \quad (8)$$

Wages are a fraction of output plus a constant. Wages are an increasing function of worker ability. Solving for profits, we see that they are also a fraction of output but less a constant:

$$\pi(x) = \left(1 - \frac{\alpha}{\alpha + \frac{\gamma_a}{\gamma_x}}\right) \underline{a}^\alpha N^{E - \frac{\alpha}{\gamma_a}} x^* \left(\frac{x}{x^*}\right)^{\frac{\gamma_x}{\gamma_a} \alpha + 1} - \left[c - \frac{\alpha}{\alpha + \frac{\gamma_a}{\gamma_x}} \underline{a}^\alpha N^{E - \frac{\alpha}{\gamma_a}} x^* \right] \quad (9a)$$

Entrepreneurs receive a larger share of output but they have to pay an extra fixed component which considers the worker's outside option. Profits are an increasing function of firm quality. They decreasing in N^E since more entrepreneurs result in fiercer competition for high ability workers. The profit at x^* is given by:

$$\pi(x^*) = \underline{a}^\alpha (N^E)^{-\frac{\alpha}{\gamma_a}} x^* - c \quad (9b)$$

Aggregating the individual production functions I derive an expression for the economy's Output:

$$\begin{aligned} Y &= \int_{x^*}^{\infty} y(x) dG(x) \\ &= \frac{\gamma_x}{\gamma_x - \frac{\gamma_a}{\gamma_x} \alpha - 1} \underline{a}^\alpha N^{E^{1 - \frac{\alpha}{\gamma_a}}} x^* \end{aligned} \quad (10)$$

Output is a linear function of x^* . The higher the cut-off entrepreneurs choose in the first stage the higher aggregate output. Furthermore Output is increasing in the mass of entrepreneurs which will also affect the cut-off in equilibrium. Output also increases with the minimum ability of workers.

2.5.2 first stage search for project quality

A potential entrepreneur who has decided to look for a project and be productive takes draws from the economy's productivity distribution. The value of search for a project is the maximum of the profit he would make if he founded his firm with the project quality at hand and the continuation value of search for a better project.

$$V(x) = \max \{ (1 - p^L)\pi(x); \kappa \}$$

$$\text{with } \kappa = \int_{\underline{x}}^{\infty} V(x') dF(x') - s$$

For each new draw the entrepreneur has to expend effort s . The value takes into account that the entrepreneur is either robbed with probability p^L and will not receive any profit or is robbed with probability p^R and pays $R(x)$ for private protection. The solution of the entrepreneur's first stage problem is a cut-off rule; it yields a value of search equal to:

$$V(x) = \begin{cases} (1 - p^L)\pi(x^*) = \kappa & \text{if } x \leq x^* \\ (1 - p^L)\pi(x) & \text{if } x \geq x^* \end{cases}$$

Note that the cut-off x^* is unique since profits are increasing in x while the continuation value is constant. The cut-off quality is given by the following condition:

$$(1 - p^L) \int_{x^*}^{\infty} [\pi(x') - \pi(x^*)] dF(x') = s \quad (11a)$$

The entrepreneur equalizes cost and benefit of continuing to improve the quality of his project. The LHS gives the benefit, the expected gain in profit conditional on the cut-off but each new draw costs s . The cut-off is decreasing in search costs and the probability of theft while it is increasing in expected profits.

Solving explicitly using 9a,9b and 3:

$$x^* = \left(\gamma_x - \frac{\gamma_x}{\gamma_a} \alpha - 1\right)^{-\frac{1}{\gamma_x-1}} s^{-\frac{1}{\gamma_x-1}} \left(\frac{LN^E \frac{\gamma_a - \alpha}{\gamma_a}}{C + LN^E}\right)^{\frac{1}{\gamma_x-1}} \cdot \underline{x}^{\frac{\gamma_x}{\gamma_x-1}} \underline{a}^{\frac{\alpha}{\gamma_x-1}} \quad (11b)$$

The optimal cut-off is increasing in the minimum ability of workers, as well as the minimum potential productivity. There are two effects of N^E . More entrepreneurs increase the competition for workers but also reduces the probability of theft for every individual. The latter dominates if L is not too large,⁴ since then the impact of more entrepreneurs on the probability of theft becomes negligible. Furthermore the entrepreneur sets a lower cut-off in response to more criminals and weaker law enforcement.

2.6 occupational choice

2.6.1 potential entrepreneurs' options

A potential entrepreneur will compare the expected return from entrepreneurship and rent-seeking. Let V_L^E denote the expected return to entrepreneurship if protection from criminals is given by the legal system alone. And let V_R^E denote the return when he purchases private protection. Both values are equal to expected profits of the firm minus expected total search costs:

$$V_i^E = (1 - p^L)E_i(\pi(x)|x \geq x^*) - \frac{1}{1 - G(x^*)}s; \quad i = L, R$$

When $p^L < p^R$ there is no scope for private protection and the entrepreneur expects to lose his profit with probability p^L . The value of entrepreneurship is given by V_L^E . When $p^R < p^L$ he will buy protection if it is offered by rent-seekers at the price given by (5). Notice that he still loses a proportion p^L of his profit; the rent-seeker appropriates the surplus. These values differ though in expected firm profits as will be seen below

The value of rent-seeking is given by total rents collected from the entrepreneurs divided by the number of rent-seekers:

$$V^R = \frac{1}{NR} \int_{x^*}^{\infty} R(x) dG(x) \quad (12)$$

⁴ $L < \frac{\gamma_a}{\alpha}$

Potential entrepreneurs could also choose to be idle, they would do so if both values were negative. When $L > P$ the value of rent-seeking is negative but given the assumptions made on the parameters α, γ_a and γ_x the value of entrepreneurship is positive for all numbers of entrepreneurs.

2.6.2 workers' options

A worker who becomes skilled can earn a wage dependent on his ability, if he gets hired by a firm. The value of working is simply his wage given by (8). But a worker can also decide to remain unskilled and steal to make a living. The value of crime depends on the probability of successful theft and the expected value of the entrepreneur's profit.

$$V_i^C = p^i E_i(\pi(x) | x \geq x^*); \quad i = L, R \quad (13)$$

2.6.3 Equilibrium

The economy is in equilibrium when all agents have chosen their occupation given the other agents' choice of occupation and the strength of the legal system.

Equilibrium conditions:

1. (a) $V^E = V^R$; potential entrepreneurs are indifferent between entrepreneurship and rent-seeking *or*
 - (b) $V^E > V^R$ and $N^E = 1$; all potential entrepreneurs are entrepreneurs and do not wish to become rent-seekers *or*
 - (c) $V^E < V^R$ and $N^E = 0$; all potential entrepreneurs are rent-seekers and do not wish to become entrepreneurs.
2. $V^C = c$; the marginal worker is indifferent between working and stealing

Since $V^C \geq 0$ and the subsistence wage is implicitly set at zero, unemployed workers will always become criminal and $C = 1 - N^E$. The entrepreneurs will pay wages according to the wage schedule (8). It is optimal for entrepreneurs to bid up wages such that the marginal worker accepts employment. Solving condition 2. for the wage of the lowest type hired results in the following expressions:

$$c_i = \frac{1 - N^E}{2 + (i - 2)N^E} \zeta \underline{a}^\alpha N^{E - \frac{\alpha}{\gamma_a}} x^*; \quad i = L, R$$

where $\zeta = (1 - \frac{\alpha}{\alpha + \frac{\gamma_x}{\gamma_a}}) \frac{\frac{\gamma_x}{\gamma_a}}{\gamma_x - \frac{\gamma_x}{\gamma_a} \alpha - 1} + \frac{\alpha}{\alpha + \frac{\gamma_x}{\gamma_a}} > 1$

Substituting for c_i , protection fees (5), profits (9b) and the equilibrium cut-off (11a) I can now obtain explicit solutions for the values of rent-seeking and entrepreneurship as a function of the number of entrepreneurs, the strength of the legal system L and the strength of the rent-seeking organization P. Explicit functions for the value of entrepreneurship and rent-seeking are:

$$V^R = \frac{(P - L)}{((L - 1)N^E + 1)((P - 1)N^E + 1)} \left(1 - \frac{1 - N^E}{2 + (P - 2)N^E}\right) \zeta \underline{a}^\alpha N^{E - 2 - \frac{\alpha}{\gamma_a}} x^* \quad (14)$$

$$V_i^E = \frac{L}{((L - 1)N^E + 1)} \left(1 - \zeta \frac{1 - N^E}{2 + (i - 2)N^E}\right) \underline{a}^\alpha N^{E - 1 - \frac{\alpha}{\gamma_a}} x^* \quad (15)$$

Both are increasing in the number of entrepreneurs and the relationship is highly non-linear. The value of rent-seeking is falling in L and increasing in P. A relatively bad legal system and a strong rent-seeking system increase the price a rent-seeker can charge for protection. The value of entrepreneurship is rising with L. Under protection by law, a better legal system lowers the probability of theft, while under protection by rent-seekers it lowers the price of protection. The value of entrepreneurship is increasing in the power of rent-seekers and the value of entrepreneurship under private protection is always larger than the one without protection as long as $P > L$. That is because rent-seekers reduce the probability of successful theft and thereby they lower the return to crime. A lower return to crime on the other hand is reflected in a lower outside option for workers and the entrepreneur can afford to lower wages without driving workers into criminality. I will analyze the equilibria that arise under different values for L and P below.

Before I will clarify which of the two expressions V_i^E will be the value of entrepreneurship in equilibrium. It turns out that $V^E = V_R^E$. In fact the value of entrepreneurship in equilibrium is given by:

$$V^E = \begin{cases} V_L^E & \text{for } N^E = 1 \\ V_R^E & \text{for } N^E < 1 \end{cases} \quad (16a)$$

But notice that $V_R^E = V_L^E$ for $N^E = 1$ because there is no theft in this case. When $N^E < 1$ there must be rent-seekers present because no equilibrium will

arise where $N^E < 1$ and $N^R = 0$; since $V_L^E \geq 0$ all potential entrepreneurs that are currently idle would prefer to be in production. Therefore if $N^E < 1$ protection must be offered and the entrepreneur will achieve V_R^E .

equilibria under anarchy: $L=1$ What happens to occupational choice when the legal system provides no protection for the entrepreneur? As long as the power of rent-seekers is not too large the social optimum can be achieved. That is there is a stable equilibrium where all potential entrepreneurs become entrepreneurs. Once P crosses a threshold level P^* this equilibrium can no longer be sustained.

Equilibria under anarchy:

1. for $P \leq \frac{\zeta}{\zeta-1} \equiv P^* : N^E = 1$, there is no rent-seeking in equilibrium
2. for $P > P^* : N^E \in [0, 1)$, there is a non-zero proportion of rent-seekers

Figure 1 displays examples for illustration.⁵ For $P \leq 1$ the value of rent-seeking is less than or equal to zero; all potential entrepreneurs thus choose production and we have an equilibrium with $V^E > V^R$ and $N^E = 1$. When P is larger, the value of rent-seeking shifts upward and becomes steeper. Until P^* though it remains below the value of entrepreneurship. Consider the example with $P=3$ and $L=1$ ⁶. If there were any number of rent-seekers, agents would prefer entrepreneurship and thus the only stable equilibrium is where all potential entrepreneurs are in production. At P^* the value of rent-seeking and entrepreneurship are equal for $N^E=1$. A rent-seeking system that is more powerful than P^* can offer potential entrepreneurs higher expected profits than production for some measure of entrepreneurs and we will have rent-seekers in equilibrium. Observe the situation in the right graph, less than half of the potential entrepreneurs choose entrepreneurship in equilibrium. This equilibrium is stable. For a proportion of entrepreneurs smaller than the equilibrium number the value of entrepreneurship is larger than the value of rent-seeking and agents would want to deviate to entrepreneurship. Analogously for a proportion larger than the equilibrium one agents would prefer

⁵(for some reason the legend and lines won't come out right) the value of entrepreneurship is the dashed line when rent-seekers are present. the value of entrepreneurship is the solid line. the value of entrepreneurship under a legal system alone is the dotted line - I only include it for illustration, it is not relevant unless $N=1$ as discussed in the text

⁶ $\alpha = 0.4$ and $\gamma = 6$

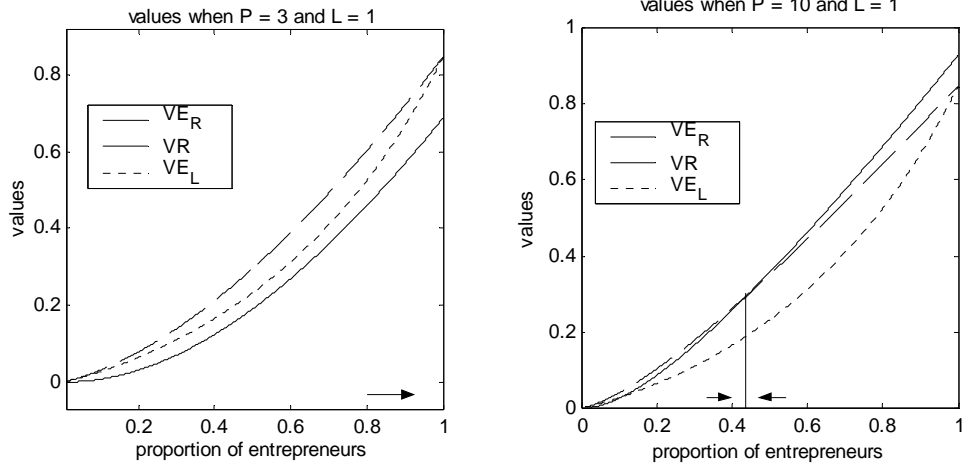


Figure 1: Equilibria under anarchy

rent-seeking. There exists a $P > P^*$ such that the value of rent-seeking will be above the one for entrepreneurship for all $N^E > 0$ and all larger values of P . Then there will be no entrepreneurs in equilibrium. Note that agents would be better off at $N^E = 1$ but this cannot be an equilibrium in this case because the value of rent-seeking is above the value for entrepreneurship.

equilibria under a legal system $L > 1$ A legal system can prevent rent-seeking in equilibrium if it is strong enough.

equilibria under a legal system

1. for $L > \zeta \equiv L^* : N^E = 1 \forall P$, there is no rent-seeking
2. for $L < L^*$ and $P \leq P^{**}(L) : N^E = 1$, there is no rent-seeking
3. for $L < L^*$ and $P > P^{**}(L) : N^E \in [0, 1)$, there will be some rent-seeking

Thus when the legal system provides a level of L that is larger than L^* (> 1) there will never be any rent-seekers in equilibrium no matter how large their power. This is illustrated in Figure 2. For $L < L^*$ rent-seeking can arise in equilibrium when P is large enough as in the case of anarchy. At $L = L^*$ the

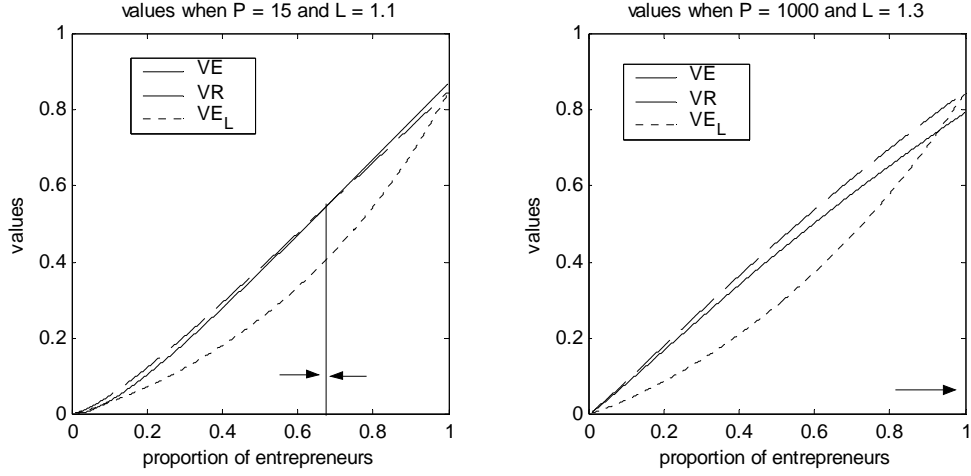


Figure 2: Equilibria under law enforcement

functions V^R and V^E are equal at $P \rightarrow \infty$. For $L > L^*$ the value of rent-seeking will never be above the value of entrepreneurship.

The value of L^* is decreasing in γ_x . Which implies that the higher the expected value of potential productivity $E(x) = \frac{a\gamma_x}{\gamma_x-1}$ the better the legal system has to be to prevent rent-seeking. This is due to the fact that the value of rent-seeking is increasing with expected profits more than the value of entrepreneurship. An implication of this is that the higher the level of development of the economy the more important is a functioning legal system.

2.7 welfare

Aggregate welfare is maximized when total output is maximized.

$$Y = \left[\hat{\gamma} s^{-\frac{1}{\gamma_x-1}} (\underline{a}^\alpha \underline{x})^{\frac{\gamma_x}{\gamma_x-1}} \right] \left(\frac{LN^E}{1 + (L-1)N^E} \right)^{\frac{1}{\gamma_x-1}} N^{E^{1-\frac{\alpha}{\gamma_a} \frac{\gamma_x}{\gamma_x-1}}} \quad (17)$$

$$\text{where } \hat{\gamma} = \zeta \left(\gamma_x - \frac{\gamma_x}{\gamma_a} \alpha - 1 \right)^{-\frac{1}{\gamma_x-1}}$$

Output is a function of the number of entrepreneurs, the strength of law enforcement and the number of criminals, search costs and parameters of the distributions functions. In particular it is an increasing function of N^E and a decreasing function of p^L . At the social optimum, when $N^E = 1$,

the expression for output reduces to the term in square brackets. Note that output is a function of the "minimum potential output": $\underline{a}^{\alpha}\underline{x}$. The economy's maximum potential can only be realized when all potential entrepreneurs take up entrepreneurship.

It is clear that private protection is no alternative for a legal system since all the benefit from more protection is appropriated by rent-seekers. For the level of Y only the strength of the legal system is relevant. Aggregate output is reduced under a weak legal system due to the smaller number of entrepreneurs .

It is apparent from the equilibrium analysis that it is sufficient to give entrepreneurs only a moderate advantage over criminals; L need not be huge to prevent rent-seeking *and* crime.

3 some empirical observations and implications

The model implies that under no or weak law enforcement profit opportunities for private protection arise and the economy can end up in a rent-seeking equilibrium. This need not happen, only if the power of protectors is large enough. Prominent collaborations of this hypothesis are historical developments in southern Italy and recent events in Russia.

Diego Gambetta (1993) describes the origins and business practises of the Sicilian Mafia. He cites evidence that the timing of the emergence of the mafia as a private protection industry coincided with the introduction of wide-spread property rights with the abolition of feudalism in the nineteenth century. (pg 80, 97) By the unification of Italy (1860-1) he says the foundations of this industry were already firmly in place. The Mafia thus emerged at a time when property became available but there was no institutional framework in place to protect it. Furthermore the Italian state once in charge was not "significantly weaker ... than any other liberal state of the period. ..." but "natives (of the south) had developed their own special toughness."and therefore the rent-seeking equilibrium was able to persist. Puzzling is the fact that apparently there is still a significant Mafia presence in Italy. No one would put forth the hypothesis that there is next to no rule of law in Italy today. What has to be considered though the effective strength of the legal system,e.g. how laws are enforced. The periodic execution of promi-

ment judges on behalf of the Mafia in the past points to an overlap of, and struggle between the Mafia and the State. In this situation the law might not be applicable to entrepreneurs that aren't clients of private protection.

There is tentative empirical evidence that the presence of the Mafia affects economic outcomes. Peri (2004) finds that organized crime, measured by initial murder rates, is strongly negatively correlated with economic performance (employment and income growth) controlling for other economic and geographic variables.

The Russian experience is described by sociologist Vadim Volkov in his appropriately titled book "violent entrepreneurs" (2002). After the collapse of communism Russia seemed to collapse into a venue for organized crime. Here the emergence of a "Mafia" also started with the introduction of property rights and the lack of rule of law to enforce them. And “.. It was private entrepreneurs of violence who claimed to maintain order and exercise justice" (pg xii). In this case private protectors saw their opportunity with the introduction of markets and established their power through violence.

Many developing countries are leading the negative lists of measures for "rule of law" (for example Kaufman 2003). Some just emerged from decades of civil war or experienced "regimes change" by the US. The model indicates that the void created by a missing legal system will be a profit opportunity for potential entrepreneurs who should be leading productive activities. Low income countries that are notoriously inefficiently governed might have rent-seeking structures in place that provide entrepreneurs with better rewards than productive activity and thereby hinder economic development. Paternalistic "governance" structures or systems of enforcement by local strongmen might be the manifestation of a rent-seeking organization.

4 concluding remarks

The paper presented a model in which entrepreneurs are necessary for production possibilities to be realized. Furthermore workers will waste their ability and become criminal if there are no payoffs from skilled labor. The strength of the legal system determines the success of theft. If laws are not enforced and private protection is sufficiently powerful the rents earned by providing protection to entrepreneurs will exceed those for entrepreneurship and potential entrepreneurs will become rent-seekers. Moderate levels of law

enforcement though can prevent the occurrence of rent-seeking in equilibrium. These levels increase with the state of development of the economy.

A benevolent government providing the legal system should certainly be able to achieve enough protection. Government bureaucrats though might have their own agenda. In fact a government might be an extensive structure with enough power to enforce but also to abuse. Bureaucracy might thus attract prospective rent-seekers who have the power to enforce laws selectively - for those entrepreneurs who pay. Even if the bureaucracy is enforcing the law it might erect other hurdles to entrepreneurship through regulation and taxation. In this case the level of law enforcement necessary to prevent rent-seeking will certainly rise.

Another interpretation of the framework could be that of an inefficient state provided legal system that forces citizens to make use of lawyers to get protection under the law. The legal profession would attract some entrepreneurial talent ⁷ that harvests those rents created by the legal system.

The model ignores the political economy of governance and the interactions of the two systems of protection. Furthermore the strength of both systems is exogenous. They could be interrelated. A strong legal system might prevent the rent-seekers' power from becoming too large because part of the strength of private protection is that it can use illegal force to achieve security, this ability will be limited with strong law enforcement.

The very interesting question of what it is that determines the rise of an efficient state versus a rent-seeking bureaucracy/organization can only be answered in a dynamic context. Both the power of rent-seeking and the effectiveness of the legal system involve reputation. I would assume though that a strong legal framework will take longer to establish than a strong organization of private protection which can make use of excessive and illegal force. This could imply that an economy that starts out with a weak system might get stuck in lawlessness and low levels of entrepreneurship.

There is enormous scope for empirical investigation.

⁷Murphy et al. (1991) provide some albeit shaky evidence that lawyers reduce growth

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