

Cordes, Christian; Richerson, Peter J.; McElreath, Richard; Strimling, Pontus

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The Role of Cooperation and Cultural Evolution**

by

**Christian Cordes, Peter J. Richerson
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please contact: evopapers@econ.mpg.de

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Max Planck Institute of Economics
Evolutionary Economics Group
Kahlaische Str. 10
07745 Jena, Germany
Fax: ++49-3641-686868

A Naturalistic Approach to the Theory of the Firm: The Role of Cooperation and Cultural Evolution

Christian Cordes, Peter J. Richerson, Richard McElreath, and Pontus Strimling^{*}

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Abstract

One reason why firms exist, this paper argues, is because they are suitable organizations within which cooperative production systems based on human social predispositions can evolve. In addition, we show how an entrepreneur – given these predispositions – can shape human behavior within a firm. To illustrate these processes, we will present a model that depicts how the biased transmission of cultural contents via social learning processes within the firm influence employees' behavior and the performance of the firm. These biases can be traced back to evolved social predispositions. Humans lived in tribal scale social systems based on significant amounts of intra- and even intergroup cooperation for tens if not a few hundred thousand years before the first complex societies arose. Firms rest upon the social psychology originally evolved for tribal life. We also relate our conclusions to empirical evidence on the performance and size of different kinds of organizations. Modern organizations have functions rather different from ancient tribes, leading to friction between our social predispositions and organization goals. Firms that manage to reduce this friction will tend to function better.

Keywords: Theory of the Firm – Cultural Evolution – Entrepreneurship – Firm Performance – Cooperation

JEL Codes: L25, D21, M13, M14, C61

^{*} Cordes and Richerson: University of California at Davis, Department of Environmental Science and Policy, One Shields Ave, CA 95616 Davis, USA (e-mail: cccordes@ucdavis.edu and pjricherson@ucdavis.edu); McElreath and Strimling: University of California at Davis, Department of Anthropology, One Shields Ave, CA 95616 Davis, USA (e-mail: mcelreath@ucdavis.edu and pontus.strimling@mdh.se). Cordes acknowledges generous support from the Max Planck Institute of Economics, Jena, Germany.

Many people exhibit loyalties to organizations that appear disproportionate to the material rewards they receive from these organizations. Employees often make decisions in terms of their expected effects on the firm's profitability and identify with organization goals without considering their own economic self-interest. In most firms and organizations, employees cooperatively contribute much more to their organization's or firm's overall goal achievement than the minimum that could be extracted from them by supervisory enforcement of the not fully specifiable terms of the employment contract.¹ So, why are they often motivated to work vigorously for the organization's welfare? Every organization faces the problem of the commons: benefits that are jointly gained and shared by all – among non-contributors and contributors – and the resulting temptation of free-riding (Simon 1991). Why is there anything besides free-riding? And why do employees identify with organizational goals at all? Do organizations depend entirely on motivating agents through their selfish interests in order to operate successfully? And, connected to these puzzles, why is the organizational form of the multi-person firm preferred to ordinary market transactions?

To provide some answers to these questions, this paper identifies empirically testable postulates about what motivates people in organizations and firms and about how the transmission of cultural contents via processes of social learning influences their behavior in this respect. As will be shown, cultural transmission is biased; people tend to acquire some cultural variants rather than others.² Moreover, this process of cultural transmission is influenced and constrained by humans' evolved psychology that shapes what we learn, how we think, and whom we imitate. This approach offers a new perspective to the debate on why firms exist (Coase 1937; Alchian and Demsetz 1972; Williamson 2002): firms, we argue, are organizations within which a cooperative regime based on evolved social predispositions can be established. Moreover, firms are culturally variable and evolve new cultural forms as time passes. This evolution is partly driven by entrepreneurs and other business leaders in entrepreneurial roles (Penrose 1959; Langlois 1998), partly by the decisions made by rank-and-file members, partly by the firm's competitive success or failure (Alchian 1950), and partly by cultural evolution in the larger society within which firms are embedded. This paper's intention is to contribute to an understanding of the processes by which corporate cultures evolve. The theory of gene-culture coevolution will serve as the central tool in this analysis (Boyd and Richerson 1980, 1985; Richerson and Boyd 2005; see also Nelson and Winter 1982 and Bowles 2004). It shows the connection between humans' innate psychological predispositions and the organizations in which humans are embedded.

Another link between evolved cognitive capacities – giving rise to bounded rationality – and the theory of the firm is provided by the concept of “cognitive leadership” (Witt 1998, 2005). This theory shows how a business conception motivates and coordinates firm members and how an entrepreneur can foster cooperation while holding down opportunism.³ Thereby, it emphasizes the crucial cognitive input of entrepreneurs and other business leaders in organizing production and trade. Central to this approach is the implementation of a business conception as a socially-shaped cognitive frame within the firm that directs the scarce resource of “human attention”. We will draw on this concept to scrutinize the outstanding role of an entrepreneur or business leader in the socialization process of employees.

An answer to motivational questions derived only from the employment contract, which is bound to have enforcement problems (Williamson 2002), does not explain how employees are

¹ As Williamson (2002) has argued, all complex, future-related contracts are unavoidably incomplete.

² A cultural variant is defined as an idea, skill, belief, attitude, or value that is acquired by social learning and that determines an individual's behavior.

³ Which is the dominant theme of transaction cost based explanations of the “nature of the firm” (see Coase 1937; Williamson 1985).

induced to work more than minimally, and, what is more, perhaps even with initiative and enthusiasm (see Simon 1991). An approach that exclusively focuses on individual maximizing behavior of parties cannot explain why employees should tend to maximize the firm's profits when making the decisions that are delegated to them. This paper argues that humans certainly have selfish interests. This trait we share with every organism. However, humans have a marked inclination toward cooperation within groups. Arguments based on natural selection processes are often invoked – explicitly or implicitly – to derive selfish characteristics of the agents (see Bergstrom 2002). Gene-culture coevolutionary theory, in contrast, shows how non-selfish, cooperative human traits evolved: the social predispositions (Henrich 2004).

A Behavioral Theory of the Firm (Cyert and March 1992) was an early approach to an economic theory of organizations with an explicit grounding in behavioral reality. The work done within the tradition of the “Carnegie School” provided important support for the notion that some aspects of human behavior within organizations are based on simple rules (March and Simon 1958; Simon 1978; Winter 1971; Nelson and Winter 1982). While this behaviorist position concentrated on forms of simple rule-governed behavior, such as satisficing behavior, problem triggered search activity, standardized decision rules, rules of thumb, mark-up pricing, and organizational routines, this paper's approach focuses on more complex rules and biases that take effect in the transmission of cultural contents between agents in general. Furthermore, we explicitly derive these rules and biases from humans' evolutionary past and show the direct links between evolutionary theory and the study of organizational behavior. A starting point common to both avenues is the recognition of the boundedness of rationality. Imitating or learning from others is one of the most important means by which humans finesse the bounds of rationality (Boyd and Richerson 1993). Weakly rational decision-making applied to choices among cultural traditions simulates organic evolution but substantially speeds up the process. By studying the nature of human psychology and the cultural traditions it supports, both approaches provide some “micro-foundations” of organizational or firm behavior.

Notwithstanding these behavioral approaches, transaction cost oriented concepts dominate the research agenda in the theory of the firm. According to transaction cost theory, the organizational form of the firm – rather than market transactions – is chosen in order to minimize transaction costs, hold-up, and post-contractual hazard as well as to internalize scale economies (see, as a point of origin, Coase 1937, 1992; Williamson 1975, 2002). The prevailing view of why firms exist has been that they serve to keep in check the transaction costs arising from the self-interested motivations of individuals. It is only via monitoring combined with employment contracts that appeal to an agent's self-interest that shirking may be mitigated. Recent theoretical and empirical work shows how monitoring and enforcement schemes designed to motivate supposedly selfish rational actors can “crowd out” intrinsically motivated desirable behavior (Frey and Jegen 2001). We argue that what successful firms do better than markets – besides economizing on transaction costs – is to establish a cooperative regime among its employees that “crowds in” desirable behavior based on humans' unique evolved group-regarding social predispositions. The paper tackles the task of understanding how entrepreneurs and other business leaders can actively shape human behavior within a firm, given these predispositions, and how this affects firm performance and size – a cognitive dimension that is usually neglected in both transaction cost economics and the theory of the firm more generally (Witt 2005). A transaction cost based analysis, it is argued, is an insufficient vehicle with which to examine such organizational capabilities and challenges.

The paper proceeds as follows. Section I introduces the social predispositions hypothesis that is based on a process of cultural group selection. A cognitive model of the role of the

entrepreneur is also sketched. Next, Section II develops a model of intra-firm cultural transmission. Recursion equations account for processes of social learning that increase the frequency of some cultural variants while decreasing that of others and depict a firm's growth process. Potential implications of the insights gained before for the theory of the firm are the subject matter of Section III. Especially the challenges and possibilities for the entrepreneur in establishing a certain corporate culture within the firm are in this section's focus. Section IV concludes the paper.

I. The social predispositions hypothesis and the role of the entrepreneur

The central tenet of evolutionary theory is that behavior of organisms should maximize genetic fitness. Furthermore, as a corollary of this principle, natural selection leads to cooperation among large numbers of individuals only if they are genetically closely related. With the exception of humans, this result seems consistent with the available data (Wilson 1975).

In human organizations, cooperation – including non-relatives – readily emerges spontaneously in small- and medium-sized groups. Cooperation seems to be a kind of first choice for human actors.⁴ This disposition is rare in nature if not uniquely human. The question is then, what are the origins of this inclination toward cooperation? In order to understand this phenomenon, we require a theory that explains why humans, but not other organisms, are capable of large scale cooperation among non-relatives. Boyd and Richerson (1982, 2002) and Richerson and Boyd (2005) propose that the disposition for cooperation has evolved: by a process of cultural group selection. Humans are also unique in the degree to which they depend upon socially transmitted information (culture) to create complex adaptations (Tomasello 1996). While genetic variation between human groups is very hard to maintain due to intergroup migration, cultural variation between groups can resist the destruction of intergroup variation.⁵ Cultural variation can more easily respond to group selection because of mechanisms peculiar to culture that maintain variation even when migration rates are appreciable. One of these mechanisms in cultural transmission is the well-studied conformist bias (see, for an overview, Aronson et al. 2002, ch. 8; Kameda and Diasuke 2002; Henrich 2004; Richerson and Boyd 2005, p. 120ff). If social learners use a conformist bias, they will discriminate against traits that are rare in their local population. A fairly modest conformist bias will maintain intergroup variation in the face of fairly high intergroup migration rates.

Conformist transmission belongs to the class of frequency-dependent biases and has been a simple heuristic that improves the chance of acquiring the locally favored cultural variant (Boyd and Richerson 1985, p. 216ff, 1989). Especially if the environment changes slowly and the information available to an individual is poor, a strong reliance on social learning evolves that favors a strong conformist tendency. In general, frequency-dependent bias will occur if the probability that social learners acquire a variant depends nonlinearly on the frequency of the variant among the set of models. The boundedness of human rationality in the face of a complex world induces individuals often to adopt culturally transmitted behaviors without independent evaluation of their outcomes (Richerson and Boyd 2001). The constrained psychological resources are a fundamental part of cultural evolution.

⁴ See the abundant evidence from game theory and experimental economics (e.g., Bolton and Ockenfels 2000; Güth and van Damme 1998; Fehr and Gächter 2000; Fehr and Schmidt 1999; Rubin 1982).

⁵ The first aspect is the central problem of any genetic explanation of group selection.

This bias uses the commonness or rarity of a cultural variant as a basis for choice. Due to the conformist bias, agents pick the cultural variant that is used by most of the models in a population (see also Henrich and Boyd 1998). Other cultural processes, like symbolic markers of group identity, also tend to limit the flow of ideas from group to group (McElreath et al. 2003). The patterns of group formation and group competition in small-scale societies satisfy the requirements of cultural group selection models (Soltis et al. 1995).

The ancestors of modern humans became highly cultural in the Middle Pleistocene, perhaps 250,000 years ago (McBrearty and Brooks 2000). If cultural group selection became an appreciable evolutionary force about that time, it would have set in motion a process of gene-culture coevolution.⁶ The prevalent level of cooperation based upon the prevailing social transmitted institutions in a group would exert selection on innate human social dispositions. We imagine a long period of repeated gene-culture coevolutionary cycles in which primitive social institutions became established in populations, and in turn exerted a coevolutionary response. Over many generations this coevolutionary dynamic generated a social psychology that facilitated cooperation. This coevolutionary dynamic makes genes as susceptible to cultural influences as *vice versa*. Moreover, the selective mechanisms involved in this process can favor quite different behaviors from those favored by selection on genes alone. As a result, any gene that contributed to pro-social behavior or anti-social conduct would have been undergone selection by coevolution. Culturally evolved social environments favored an innate psychology that is suited to such environments, for example, a psychology aiming at gaining social rewards and avoiding social sanctions.⁷ In this way, cultural institutions set up a moral community – the tribe for a want of a better word.⁸ The complex societies of the sort we live in only began to evolve about 5,000 years ago, too little time for much, if any, evolution of the innate aspects of our social psychology. Hence, complex societies are based upon the cultural evolution of institutions that use our tribal social predispositions as their raw material. Thus, the organizations of which complex societies are composed, such as business firms, in many ways resemble ancestral tribes (Richerson and Boyd 1999). The business firm is an interesting type of organization since in competitive economies they are free to succeed or fail. The idea that success or failure depends importantly upon corporate cultures has been a staple of the economics and business management literature (Denison 1996; Deal and Kennedy 1982; Kotter and Heskett 1992). The evolution of business organizations and tribes should have a lot in common.

Cultural group selection meets a fundamental evolutionary principle: costly group-beneficial behavior cannot evolve unless the benefits of this behavior flow non-randomly to individuals who carry the genes that give rise to the behavior. Moreover, the evolution of moralistic strategies has been guided by cultural group selection for cooperative traits and represents another crucial mechanism in creating cultural differences between groups: the coevolutionary process between genes and culture is maintained by a system of moral rules that sanction bad behavior and reward good behavior. “Good” genes get rewarded and “bad” genes penalized by cultural transmitted norms, not by group selection acting directly on the genes. Nevertheless, in the end, the innate elements of human social psychology act much as

⁶ To enable this process to start, a group-beneficial variant must become common in an initial subpopulation only once. Then, the conformist effect will favor its further increase by group selection.

⁷ Evidence from neuroscience, for example, shows that cooperation leads to the activation of brain regions involved in the release of dopamine and in pleasure behavior thus reinforcing cooperation (Rilling et al. 2002). Cultural rules that are affectively evaluated in a positive way may be transmitted preferentially.

⁸ The political economies of simple societies vary a lot and the traditional but polysemous term “tribe” sweeps a lot of important anthropology under the rug. For a discussion of the nomenclature problem see Richerson et al. 2003. For an account of the evolution of relative large, cooperative, egalitarian hunter-gatherer societies from smaller, less cooperative dominance structured ape societies see Boehm (1999).

if they had been subject to group selection. The theory of punishment (see, e.g., Fehr and Gächter 2002) describes how the evolved willingness to punish non-conformists – even at a cost to oneself – renders a potentially powerful tool in homogenizing social groups and group competition.⁹ Groups with prosocial moralistic norms for cooperation had a considerable advantage over other, competing groups (Richerson and Boyd 2005, p. 214ff; Henrich 2004). Cultural group selection not only favors the evolution of prosocial predispositions, but also the harder element of altruistic punishment of individuals who violate cultural norms. Successful social organizations are based on humans' propensity toward cooperation reinforced by altruistic punishment, rewards, moral suasion, and social role models, often codified in culturally transmitted norms and rules. Organizations have to cope with the problem that there is always a not-insignificant selfish minority that has to be coerced to cooperate. Some sort of policing system must exist to counteract this threat (Richerson and Boyd 2001; Fehr and Gächter 2000; Ostrom 1990). Monitoring, rewarding, and punishment systems are necessary to prevent an increase of selfish behavioral strategies and a collapse of cooperation. These systems function best when they crowd in good behavior in those tempted to defect without crowding out cooperation on the part of those inclined to cooperate even without direct material incentives.

As has been argued above, coevolutionary selection on genes has favored a psychology that causes people to conform to the majority behavior – the conformist bias. Hence, human choice between different kinds of behavior is boundedly rational: repertoires of behavior are mostly formed by imitating others.¹⁰ This can lead to adaptive but also myopic choice among the cultural variants observed. Besides the conformist bias, there are other biases taking effect in cultural transmission: the evolved inclination toward group-beneficial or cooperative cultural contents is another case in point. In this context, biases can consist of an innate component and a cultural component acquired in an earlier episode of social learning (Richerson and Boyd 2005, p. 66). In general, cultural transmission biases are forces that arise because people's psychology makes them more likely to adopt some cultural contents rather than others, thereby changing the frequency of the different types of cultural variants in the population.¹¹ Within the scope of this paper's argument, we will focus on four cultural evolutionary forces that bias transmission and that are a result of the coevolutionary dynamics described above: the model-based bias, the conformity bias, and two direct biases, one favoring cooperation, the other selfish or opportunistic behavior. Three of them will be introduced in more detail in the next section where we develop a model of intra-firm cultural transmission.

In order to model the evolution of corporate culture, a deeper understanding of the role of the entrepreneur or business leader is necessary. The theory of cognitive leadership offers such an understanding and has been formulated by Witt (1998, 2000). According to Witt, the development of firm organizations is constrained by regularities in human cognition and restrictions on humans' information processing capacities; he also accounts for the boundedness of human rationality. Humans' evolved cognitive apparatus faces constraints that entail a selective processing of sensory information on the basis of discriminative attention processes. Cognitive cues are employed to discriminate among information and are themselves organized into more complex systems called cognitive frames which guide

⁹ Moralistic punishment is a more plausible mechanism for the maintenance of large scale cooperation than reciprocity.

¹⁰ Rational choice is a weak process relative to cultural transmission in the construction of behavioral repertoires (for a similar argument see Eshel et al. 1998).

¹¹ The forces of biased transmission acting on cultural variation are much stronger than those that shape genetic variation; they work on shorter timescales and are driven by psychological processes, not demographic events.

classificatory and interpretative mental activities (Anderson 2000, ch. 3 and 5). Incoming information is screened for cognitive cues which trigger associations with patterns already existent in memory. Starting from a set of innate cues that comprise cultural biases, associative chains, enabled by the innate capability of associative learning, create more and more complex sets of frames. By introducing a “business conception” as a cognitive frame, an entrepreneur can take advantage of these cognitive dispositions: such a conception can furnish the employees with a shared cognitive framework that is directing the limited resource of “human attention” (see also Simon 1978). Cultural variants compete for this scarce cognitive resource of the social learner and for control of behavior (Richerson and Boyd 2005, p. 73). If employees adopt the entrepreneurial business conception as their own cognitive frame for their firm-related activities, a firm’s organization can attain a higher degree of cognitive coherence among its members, which affects the interpretation of information, the coordination of dispersed knowledge, and individual endeavor, as well as the motivation to contribute to a common goal instead of private interests (Witt 2005).¹² A business conception building on humans’ social predispositions including their inclination toward group-beneficial and cooperative behavior can be considered to be especially attractive as a shared cognitive frame and plays an important role in coining a business culture.

In the formation of these shared cognitive frames, cultural transmission based on social learning plays a crucial role. This is because the change of these frames hinges on processes of intense social interaction. Cognitive commonalities emerge from, for example, communication and observational learning from social models of behavior. For the entrepreneur to set up a “business conception” as a shared cognitive frame it is necessary to exert some “cognitive leadership” and serve as a role model (Witt 2000). By doing so, an entrepreneur relies on another cultural bias: the model-based bias that will be introduced in the next section. This bias includes a predisposition to imitate successful or prestigious individuals. In this context, the chances of succeeding in implementing cognitive leadership and shared cognitive frames on a face-to-face basis improve the smaller the group of employees; the more frequent and intense communication is, the more similarities can emerge in the interpretative frames. The frequency of face-to-face interactions declines, however, as the size of the firm organization grows. Cognitive coherence becomes a problem: the entrepreneur’s capacity to exert cognitive leadership becomes insufficient – her own cognitive resources are limited – and cognitive coherence is no longer spontaneously achieved. The straining of the entrepreneur’s capacity to influence the social learning processes may result in a loss of the mutually contingent and motivational attitudes. Competing cultural contents, for example, the direct bias favoring opportunistic behavior (see the next section), can spread individualistic frames and change corporate culture to the detriment of the organization.¹³

II. A model of intra-firm cultural transmission

A fundamental assumption of the approach developed here is that the positive theory of the individual firm can profit from an evolutionary approach. A firm is a potentially immortal population of mortal individuals (not to mention other forms of turnover). To understand how corporate cultures evolve, we need to account for the processes that increase the frequency of

¹² Of course, the adoption of a business conception as a cognitive frame also depends on the quality and appeal of the business conception.

¹³ Henrich and Gil-White (2001) make a distinction between power and prestige, arguing that prestige exists because people freely grant it to those that they believe are a source of good ideas to borrow. Most accounts of leadership, including business leadership, emphasize power, the ability of a power-holder to influence others’ behavior by rewards and punishments. Interestingly the small-scale societies under which our social predispositions evolved tolerated very little exercise of power but relied heavily upon prestige.

some cultural variants and reduce that of others. A complex concatenation of such processes will constantly play upon any organization's culture. The preceding section described a set of concepts and hypotheses that structure the view on this process and its key mechanisms. In this section, we illustrate how such considerations are translated into formal mathematical models. We model three basic processes, the impact of entrepreneur/leaders upon firm culture, the impact of individual learning by ordinary employees, and a firm's growth process.

To model the transmission of a dichotomous cultural trait we begin by labeling the variants, say c and o , where c represents the variant "cooperative behavior" and o the variant "opportunistic behavior". These variants could, however, be any pair of alternative culturally transmitted behaviors one of which makes a positive contribution to the profits of a firm and the other a negative impact. The state of the group is determined by the frequency of employees with the variant c , labeled p . Now, the task is to find a recursion equation in discrete time that allows us to predict the frequency of p in the next stage of the transmission process given its frequency in the present stage. Transmission takes place from the entrepreneur or business leader to the employees and from employees to agents entering the firm in the course of firm growth. The model comprises processes that change the frequency of the two cultural variants. These cultural evolutionary forces are derived from the social predispositions hypothesis presented above, i.e., the biases in cultural transmission presented in the following are the result of interacting genetic and cultural evolutionary processes.¹⁴

The leading role of the entrepreneur: a model-based bias

The choice of a cultural trait can be based on the observable attributes of the individuals who exhibit the trait (Richerson and Boyd 2005, p. 69; Harrington 1999). Selection favored social learners who have been able to evaluate potential models and copy the most successful among them, thereby saving the costs of individual learning (see also Rogers 1983; Henrich and Gil-White 2001; Labov 2001). Hence, such a model-based bias includes a predisposition to imitate successful or prestigious individuals. In general, such an indirect bias results if social learners use the value of a second character that characterizes a model (e.g. prestige) to determine the attractiveness of that individual as a model for the primary character (e.g. a business conception and cooperative behavior). This method of evaluating different cultural variants is likely to be much less costly than directly evaluating these variants (Boyd and Richerson 1985, p. 135). An entrepreneur may take advantage of this human characteristic by providing a prestigious role model for social learning processes that is embedded in the business conception, for example, by demonstrating cooperative attitudes as a worth-while. We will refer to variations in the ability to use her prestige to influence other employees as the charisma of entrepreneurs and other leaders.

In organizations, the entrepreneur is just one source of information. Other members also influence the agenda of communication and introduce rival cognitive frames and social models (see Witt 2005; Salancik and Pfeffer 1978). We assume that an agent entering the firm is influenced by the entrepreneur and n peers she is interacting with. To depict the importances of the models in different social roles in the cultural transmission process, we assign different weights, A_E and A_p , to the models. A large value of A_E means that the employee is disproportionately likely to acquire the cultural variant of the entrepreneur. nA_p

¹⁴ Each of these biases of cultural transmission arises from the attempts of social learners to evaluate the adaptiveness of the different cultural variants they are exposed to in a setting in which information is incomplete or costly to acquire (Boyd and Richerson 1985). This does not imply that all biases are necessarily adaptive, especially in contemporary societies.

reflects the weight of an employee's fellow employees, whereby $A_E + nA_p = 1$. As we argued in the preceding section, the entrepreneur's influence as a role model in implementing shared cognitive frames is decreasing with a growing group size. Therefore, her weight A_E is assumed to be dependent on the group size n . The total, i.e., firm size adjusted actual weight of the entrepreneur or leader is given by

$$(1) \quad A_E = \frac{\alpha_E}{\alpha_E + n\alpha_p},$$

where α_E is the basic weight (raw prestige or charisma) of the entrepreneur and α_p the basic weight of any given peer employee. Hence, the relation $\frac{\alpha_E}{\alpha_p}$ represents the

entrepreneur's charismatic potential (see Langlois 1998) relative to the other group members. Entrepreneurs or business leaders differ in their ability to exert cognitive leadership depending on their personal characteristics and social skills (Witt 2005). Given this expression, the entrepreneur's influence is diluted as group size n increases.

Moreover, given the entrepreneur or business leader's influence, the weight of a member of the peer group is given by

$$(2) \quad A_p = \frac{\alpha_p}{\alpha_E + n\alpha_p},$$

where α_p is the basic weight of the i th worker and $\alpha_p = \alpha_1 = \alpha_2 = \dots = \alpha_n$. The n peers' cumulative influence on the social learning process is growing with an increasing group size and a dwindling role of the entrepreneur. Moreover, the weights of the entrepreneur and the peers are normalized by the denominator so that A_i gives the weight of the i th model relative to the other models encountered by the individual in question.

To characterize the evolution of the group, the model must allow us to predict the changes in the frequency of cultural variants in the course of time. To do this, we derive a recursion that determines p in the next time step, given the value of p in this period. This is done by specifying the probability that a particular set of role models makes an individual to acquire the cultural variant c . Firm employees (n in total) may be cooperative (c) or opportunistic (o). We assume that the entrepreneur is always cooperative. In order to account for the effects of new personnel joining the firm from outside, we suppose that in each time step a cohort of n employees retires and is replaced by n new employees who are socialized by all n old employees, plus the entrepreneur. In addition, we assume that the n new employees are initially naïve.¹⁵ New employees encounter members of their peer group at random. With these assumptions, the cultural transmission table showing the probability of agents acquiring trait c or o given a particular set of models (Entrepreneur/Leader, n Peers) that have different total weights (A_E , A_p) and group size n – also determining the changing values of A_E and A_p – yields:

¹⁵ Cognitive frames, for example, emerge in a complex, unconscious, spontaneous process under the influence of information processed earlier, not least socially contingent experience (Anderson 2000, ch. 3). However, we assume here that all new employees show neutral behavior when they join the firm.

Table 1 The probability of agents acquiring trait c or o given a particular set of models (Entrepreneur/Leader, Peers) that have different total weights (A_E , A_P).

| Cultural Variant of | | Probability That an Agent of the New Cohort Acquires | |
|---------------------|-------------|--|----------|
| Entrepreneur/Leader | n Peers | c | o |
| c | $c...c$ | $A_E + nA_P$ | 0 |
| c | $c...c,o$ | $A_E + (n-1)A_P$ | A_P |
| c | $c...c,o,o$ | $A_E + (n-2)A_P$ | $2A_P$ |
| \vdots | \vdots | \vdots | \vdots |
| c | $o...o$ | A_E | nA_P |

The variable p measures the frequency of the c type in an infinite meta population of firms of size n . That is, for illustrative simplicity we are here modeling only the deterministic effect of evolutionary processes. In any given firm, stochastic effects will be important. However, in an infinite population of firms with particular characteristics p will perfectly describe the average frequency of the cooperative variant and $(1-p)$ the opportunistic variant. Therefore, the average pairing probability of role models in the transmission table will have $A_E + pnA_P$ probability of transmitting c to each new member of a cohort and probability $(1-p)nA_P$ of transmitting the cultural variant o . So, in an infinite population of firms of size n , the partial recursion for the socialization phase with the frequency of c after transmission, p' , given that it was p before transmission is expressed by

$$(3) \quad p' = A_E + pnA_P.$$

The preference for cooperation and the opportunistic component: two competing direct biases

Individuals are more likely to adopt some cultural variants based on their content (Boyd and Richerson 1985, p. 135; Richerson and Boyd 2005, p. 69). Such a content-based or direct bias can result from the calculation of costs and benefits associated with alternative variants or from cognitive structures that cause people to preferentially adopt some cultural variants rather than others.¹⁶ This procedure is likely to entail some kind of experimentation on the part of the agent.¹⁷ In general, a cultural transmission rule is characterized by direct bias if one cultural variant is more attractive than others. A directly biased transmission creates a force that increases the frequency of the culturally transmitted variant that is favored by the bias. A relatively weak direct bias can have important effects on the frequency of different cultural variants in a population.

We assume two direct learning biases here that reflect the existence of conflicting human goals: first, an employee may recognize the discrepancy between her personal effort for the

¹⁶ This process can be unconscious. See for an example of such a bias Cordes (2005).

¹⁷ As long as this experimentation is not too expensive, it is plausible that directly biased transmission might evolve, as is indicated by abundant empirical evidence (e.g., Lumsden and Wilson 1981, p. 38ff; Rogers 1983, p. 217f; Labov 1994). However, when it is difficult or costly to evaluate the consequences of the cultural variants available in the population directly, then frequency-dependent or model-based bias may be more advantageous.

firm's interests and her direct benefits accruing from it. Hence, she may lower her efforts, i.e., increasing the relative importance of her individual interests. We call this the opportunistic bias μ_{co} favoring the cultural variant o (Boyd and Richerson, 1980). Second, as has been argued in Section I, humans have an inclination toward cooperation. We label this propensity the cooperation bias μ_{oc} favoring cultural variant c . We suppose that each c employee has a μ_{co} chance of learning to be opportunistic and each o employee a μ_{oc} chance of learning to become c . Hence, the partial recursion for the individual learning phase is

$$(4) \quad p'' = p' - p'\mu_{co} + (1 - p')\mu_{oc},$$

where p'' indicates the frequency of c after one complete “generation”. We assume that $\mu_{co} > \mu_{oc}$. The evolutionarily interesting case is when the opportunistic cultural variant is preferred to the cooperative one. If the opposite inequality holds, then the cooperative tendencies of individuals would be sufficient to maintain group cooperation without any form of moral leadership. Since even the simplest human societies seem to require some form of prestige based leadership, and multi-person firms virtually always have leadership roles (small partnerships may be exceptions), this assumption makes empirical sense.

The complete recursion

The complete recursion for p , obtained by substituting (3) into (4) is expressed as

$$(5) \quad p'' = A_E + pnA_P - (A_E + pnA_P)\mu_{co} + (1 - (A_E + pnA_P))\mu_{oc}$$

and models the change of p in the group over one socialization and learning step. By setting the parameters of the system, we can analyze its long run behavior by conceptually iterating equation (5) recursively for many generations. For the purpose of simplification, we assume a positive value for μ_{co} while setting $\mu_{oc} = 0$ in the following. Therefore, we obtain

$$(5a) \quad p'' = A_E + pnA_P - (A_E + pnA_P)\mu_{co}.$$

We now calculate the equilibrium frequency of the cultural variant c in the population. At equilibrium the population does not change so $p'' - p = 0$. We subtract p from both sides of (5a). One can determine the equilibrium of the set of coupled recursions implied by (5a) by solving for \hat{p} denoting the equilibrium frequency of the cooperative cultural variant c :

$$(6) \quad \hat{p} = \frac{1 - \mu_{co}}{1 + \mu_{co} \left(n \frac{\alpha_P}{\alpha_E} \right)}.$$

The derivative of \hat{p} with respect to n , $\frac{\partial \hat{p}}{\partial n}$, is negative for all n , i.e., given a certain charismatic potential of the entrepreneur, the level of cooperation within a firm is decreasing with firm size. Consistent with this, the derivative of \hat{p} with respect to α_E , $\frac{\partial \hat{p}}{\partial \alpha_E}$, is positive

for all n , i.e., the larger an entrepreneur's charismatic potential, the higher the level of cooperation in the group for fixed n .

The firm's growth process

Next, we want to couple the dynamics of level of cooperation in firms to the size of firms. Firms will grow so long as adding new employees is profitable on average. We assume the following recursion for the firm's growth process:

$$(7) \quad n' = pn(1 + r_c) + n(1 - p)(1 - r_o).$$

Our reasoning behind that relation is that each employee contributes to the firm's profit, r_c , or loss, r_o , where $r_{c/o}$ is measured in units of a standard employee wage. Thus, $np(1 + r_c)$ represents the number of cooperative employees times the unit resources needed to pay their wage plus the profit they make. To support one employee necessitates the generation of one unit of revenue, while r_c is the profit resulting from their cooperative behavior that allows new employees to be hired. Similarly, $n(1 - p)(1 - r_o)$ is the aggregate loss of a firm's income due to opportunistic employees.

We now have two coupled recursions, one describing the development of p in time (8) and another one for the changing frequency of n (9):

$$(8) \quad \Delta p = A_E + pnA_p - (A_E + pnA_p)\mu_{co} - p \quad (p'' - p = \Delta p)$$

$$(9) \quad \Delta n = pn(1 + r_c) + n(1 - p)(1 - r_o) - n \quad (n' - n = \Delta n).$$

For the immediately following calculations, we assume a symmetrical profit/loss case so that $r_c = r_o = r$. We will later again differentiate between these two parameters. Next, we calculate the equilibria for our model. Δp becomes zero if

$$(10) \quad \hat{p} = \frac{1 - \mu_{co}}{1 + n\mu_{co} \frac{\alpha_p}{\alpha_E}}.$$

Δn becomes zero if $\hat{n} = 0$ or – substituting (10) into (9) – if

$$(11) \quad \hat{n} = \frac{1 - 2\mu_{co}}{\mu_{co} \frac{\alpha_p}{\alpha_E}}.$$

In addition, by combining $\hat{n} = 0$ and (10) we yield $\hat{p} = 1 - \mu_{co}$. Substituting (11) into (10) gives us $\hat{p} = \frac{1}{2}$. As is shown in the appendix, the equilibrium at $\hat{p} = \frac{1}{2}$ and $\hat{n} = \frac{1 - 2\mu_{co}}{\mu_{co} \frac{\alpha_p}{\alpha_E}}$ is

stable and has some interesting properties: if a firm of a certain size starts with a level of cooperation below $p = 0.5$, the number of group members will decrease. This process continues until p reaches 0.5. At that moment, n stabilizes at a certain level given by \hat{n} . On

the other hand, as long as $p > 0.5$, the firm grows, until the decreasing influence of the entrepreneur or business leader causes p to fall to 0.5. In both cases, the firm size that is finally reached is crucially influenced by μ_{co} . A high value of μ_{co} shortens the firm's growth process when $p > 0.5$ and accelerates its decline when $p < 0.5$ and *vice versa*.

The level of cooperation and firm size

Additional insights concerning firm size and the level of cooperation can be gained by dropping the requirement that r_c and r_o are equal. The more general expression for \hat{p} in terms of the profit variables is

$$(12) \quad \hat{p} = \frac{r_o}{r_c + r_o}.$$

According to this expression, the level of cooperation within a firm depends on the relation given by (12). The corresponding value of \hat{n} is given by

$$(13) \quad \hat{n} = \frac{(r_c - \mu_{co}(r_c + r_o))\alpha_E}{r_o\mu_{co}\alpha_P}.$$

As is indicated by the derivatives of (13) with respect to r_c , the profit cooperative employees yield, and r_o , the loss incurred by opportunistic behavior (see appendix), \hat{n} is always growing in r_c and decreasing in r_o . The opposite holds for \hat{p} (equation 12). This has interesting implications for the relationship between $r_{c/o}$, the level of cooperation, and group size: if r_c is large relative to r_o , the firms' numbers of employees are large and the frequency of cooperative agents is low. On the other hand, if r_o is relatively large, the firm's sizes are small and the level of cooperation is high. The next section will discuss some potential theoretical implications of these findings.

III. Implications for the theory of the firm

It is possible to derive some insights concerning a firm's growth process and equilibrium size from the model developed in the preceding section. Equation (6) – denoting the equilibrium frequency of the cooperative cultural variant c – shows that, given a certain charismatic potential of the entrepreneur or business leader, the level of cooperation is decreasing with firm size. Or, to put it differently, the business conception that has to be conveyed to the employees via intense communication processes loses its power to motivate agents to contribute cooperatively to a common goal instead of private interests. This is due to the dilution effect decreasing the entrepreneur or leader's weight A_E in socialization. Therefore, depending on the entrepreneur's charismatic potential, firms have different growth potentials – a cognitive constraint to firm development. Starting from an initially high level of cooperation, group size can increase for a longer period of time before p reaches its equilibrium value and firm growth comes to a halt, as is expressed by equations (10) and (11). At this point, organizational innovations, such as the creation of middle management to help the entrepreneur or leader spread her vision, are required if the business is to continue to expand.

Proposition 1: An entrepreneur's capability to convey a business conception to a firm's employees is subject to cognitive constraints. As a result, in the course of a firm's growth process, the level of cooperation is decreasing. Contingent on the entrepreneur's charismatic potential, firms have different growth potentials in this stage of their existence.

Another implication derived from these equilibrium values of \hat{n} and \hat{p} in the case of a growing firm concerns the potential failure of entrepreneurs due to a decline in their charisma with age or their replacement by a leader with less charisma. A drop in the leader's charisma will support a level of cooperation insufficient to pay wages and make a positive profit at the size of the old equilibrium and the firm's size will inevitably decrease, albeit slowly if the rate of conversion from cooperative to opportunistic behavior (μ_{co}) on the part of ordinary employees is low.¹⁸ Although the frequency of the cooperative cultural variant is increasing in the course of a shrinking group size, the firm is trapped at a low level of personnel absent the arrival of a highly charismatic leader. This level crucially depends on the value of μ_{co} , the direct learning bias favoring the opportunistic variant. Since employment contracts often make shrinkage of employment costly, a firm that is out of equilibrium may shrink too slowly to avoid bankruptcy or a prolonged troubled decline as repeated efforts to find new leadership that can stabilize the company fail. Venture capitalists and consulting firms call these stagnating firms the "living dead" (Kenney and von Burg 1999). In a dynamic world, firm cultures can be rendered obsolete by the rise of better business concepts elsewhere in an industry or by external shocks to the whole industry. The conservatism of ordinary employees and the difficulty of finding new leaders with outstanding charisma perhaps contribute to industries, like airlines and auto manufacturers, where a fair proportion of old living dead firms coexist with younger growing firms for a prolonged time. The larger a firm the rarer the leadership talent needed to stabilize it and the more inertia is present in the form of older employees socializing new hires with obsolete cognitive frames.

Proposition 2: If an entrepreneur's charismatic potential is insufficient to sustain firm growth, the firm's stagnating final size mainly depends on the relative strength of the learning bias favoring the opportunistic cultural variant.

As has been shown by equations (12) and (13), if the costs of opportunistic behavior are high, i.e., r_o is large, then firm size stays small. Collectively shaped cognitive frames enable a high degree of cooperativeness within these small, intensely communicating groups. The entrepreneur or leader can easily maintain a high level of cooperation in these smaller organizations by exerting cognitive leadership. Moreover, this is a determinant of firm size very different from transaction cost based explanations for the argument does not rely on a comparison of market versus firm internal interactions. Especially in firms consisting of highly independent, specialized employees with a great level of self-motivated responsibility-taking, opportunistic behavior would be harmful. Professional partnerships where a single partner's scandalous behavior has the potential to seriously damage the firm's reputation might exemplify this. This argument may provide an explanation for why expert firms are often small or why, for example, consultant firms have a structure that is explicitly based on small groups. On the other hand, if the costs of opportunistic behavior are low and the gains from cooperation are high, relatively few cooperative employees can support a large firm. Firms earning monopolistic profits might exemplify this case. The employees' tasks would

¹⁸ The conformity bias mentioned in section I can amplify the increase or decrease of the level of cooperation above or below $p = 0.5$. At this point, this effect is not explicitly considered in the model.

most probably be of a nature that prevents great losses from shirking behavior, maybe due to easily observable effort and results of performance. In this case, a moderate monitoring regime may be sufficient to keep opportunism in check. Still, a higher starting level of cooperation and thereby induced gains from cooperation – induced by a charismatic entrepreneur – enables a firm to finally reach a bigger size.

Proposition 3: If the costs of opportunistic behavior are high, firm size stays small, thereby facilitating a higher level of cooperation within the group. If these costs are low, relatively few cooperative employees can support a large firm.

A central challenge for an entrepreneur in running an enterprise is to cope with the fact that humans evolved a social psychology that consists of an element of cooperative dispositions and a selfish element (see Richerson and Boyd 1999). People are imperfect but effective contingent cooperators. Humans' social psychology induces evolutionary biases toward cultural systems of morality and convention that prepare the stage for sophisticated systems of cooperation such as businesses. The cultural transmission of social norms can amplify humans' social predispositions. However, humans' vices as well as virtues can act to bias the evolution of culture (also bad habits may attract imitators). So, an entrepreneur's task is partly to bias the biases that shape an organizations cultural evolution. Our model has shown some potential dynamics caused by cultural evolutionary forces taking effect in a firm context that facilitate or prevent the establishment of a cooperative regime. Insights into human nature and cultural evolution can clarify how a business leader may influence the social institutions of firms and how it is feasible to create as much cooperation and as little conflict as is possible given the complex social proclivities of employees.

For instance, an entrepreneur who is promoting a business conception that explicitly emphasizes the selfish purpose of the firm, for example, one that is solely focusing on profits, may also – in his prominent role as a social model (implying a great value of A_E) – foster the concept of selfishness within the firm or group.¹⁹ People tend to look for justifications for selfish behavior (see Salancik and Pfeffer 1978) – a selfish business conception may provide one. Or, to put it differently, the firm's engagement in social or environmental responsibility can assign a higher general value to cooperative and altruistic behaviors and the underlying cultural variants, thereby promoting their transmission within the organization. This could, for example, lead to a higher value of the learned component of the parameter μ_{oc} – the direct bias of cooperation that was zero in our model above. According to this argument, it can be profitable for a firm to invest in social or environmental projects due to their indirect effect on the spreading of cooperative cultural variants among its own employees and the positive effects on firm performance connected to this.²⁰

Proposition 4: In her prominent role as a social model, an entrepreneur's general behavior influences the evaluation and subsequent dissemination of cultural variants with the firm.

If firms are more than simple nodes in a network of market transactions, new questions and phenomena arise for the theory of the firm (Simon 1991). A prominent topic within this strand of thinking has been a theoretical puzzle: the fact that the two coordination forms, firms and markets, operate in parallel (for an overview of this literature see Rathe and Witt 2001). For the entrepreneurial pursuit of visions of business opportunities, the choice between

¹⁹ We have not considered the problem of leadership succession here but it is easy to see how a gifted entrepreneur or leader could build up a large firm and then be replaced by a leader with lesser charisma, leading to a decline in the size of the firm.

²⁰ Dowell et al. (2000) have shown that firms adopting a stringent environmental standard have much higher market values than firms defaulting to less stringent standards.

firms and markets is a core element (Witt 2005). Firms enhance the opportunity for entrepreneurs and other visionary business leaders to inculcate their cognitive frame in employees compared to dealing with market buyers and sellers at arms length. As regards the question of the relative efficiency of markets and organizations, we argue that an important element of the advantages of organizations such as firms is that they offer a more powerful setting to implement a regime of cooperation than market transactions could do. In a market, anonymous and arms length transactions give entrepreneurs and cooperative employees no opportunity to socialize new employees.

Hence, a crucial feature of the firm is its ability to induce productive traits like cooperation among its employees based on the processes of cultural transmission and evolution. Establishing such a regime is an independent argument for why an entrepreneur creates a firm organization for carrying out her business vision, instead of exclusively relying on the division of labor via anonymous market transactions. Firms are able to improve on their efficiency and profitability by tapping humans' social predispositions in order to elicit more perfect cooperative behavior.²¹ In effect, firms are one modern version of the ancient tribes that honed our social psychology. Therefore, a crucial aspect of what makes organizations work as well or as badly as they do is whether they are able to establish a cooperative regime or not.

A meta-analysis of studies of the relationship between corporate social performance – including cooperation and a shared “vision” as crucial components – and corporate financial performance conducted by Orlitzky et al. (2003) has found sound empirical evidence that suggests that corporate virtue in form of social performance is likely to increase a firm's profits. Corporate social performance and financial performance are positively related across a wide variety of industry and study contexts. A firm with a good social performance can built up managerial and entrepreneurial competencies, such as preventive efforts that necessitate significant employee involvement and goodwill, which in turn improve financial outcomes. These firms may also attract better employees, i.e., there would be a high proportion of cooperative agents in the firm's recruitment pool.²² Hence, organizational effectiveness encompasses both financial and social performance. Obviously, market forces do not penalize firms that are high in corporate social performance (see also Denison 1984; Hansen and Wernerfelt 1989; Baron and Hannan 2002). Therefore, the predisposition-based motivational mechanisms presented in this paper hint at possibilities for enhancing productivity and efficiency within a firm.

Within groups up to the limits of our tribal social predispositions, congenial people find it easy and natural to function prosocially. Leaders easily create cooperation and group identities in this context by introducing shared cognitive frames, symbols, and rituals that function as prosocial motivators and that can induce feelings of trust, respect, and reciprocity. When the group becomes too big, the social predispositions stop working for the group as a whole.²³ Firms may react to this development by establishing a formalized regime of a detailed, hierarchical instructing and monitoring of the employees' actions (Witt 2005). This would replace the culture of cooperation, delegation, and informal coordination that prevailed before and that encouraged initiative and creativity. Transaction cost based approaches focus

²¹ Successful social organizations occur when the prosocial aspects of the social predispositions are tapped successfully and when the organization is capable of working around their limitations.

²² Firms that value their social responsibilities attract cooperatively inclined people. That would modify the model's assumption that all the new members joining the organization behave neutrally.

²³ These thoughts are also important in the context of make-or-buy decisions and the determination of the boundaries between firms and markets: if a firm's growth process is about to reach a critical threshold, there may be an incentive to buy inputs rather than to make them oneself in order to not endanger the prevailing cooperative regime by an increasing group size.

on such monitoring and control of people to prevent opportunistic behavior (Williamson 2002). However, instead of reducing the latter kind of behavior, monitoring and control threatens peoples' personal sense of autonomy, decreases their intrinsic motivation, and crowds out voluntary cooperation (Ghoshal and Moran 1996). Enzle and Anderson (1993) have shown that intrinsic motivation is higher under noncontrolling and no-surveillance conditions. Cooperative employees resent tight monitoring as an implication that they are opportunistic agents.²⁴ Hence, room for self-determined action is necessary to elicit a high level of initiative, cooperation, creativity, and problem solving engagement as well as intrinsic work motivation in general (see also Baron and Hannan 2002; Frey and Jegen 2001).²⁵

Alternatively to a monitoring regime, an intra-organizational subdivision of entrepreneurship can be implemented to counteract the dilution effect in growing groups that lowers A_E , the business leader's influence in the socialization of employees. Entrepreneurially talented individuals would be assigned to subdivisions of the growing firm to exert entrepreneurial cognitive leadership in smaller groups there. This would imply the introduction of new lines of authority without disrupting the face-to-face legitimacy of sub-leaders, i.e., proximal cognitive leadership (Witt 2005). Now, however, some higher level leader has to coordinate the emerging group of entrepreneurial peers on an overarching business conception. Both regimes mentioned here are likely to have different cognitive underpinnings and organizational cultures but they do not necessarily differ in short-run efficiency and profitability. A regime of divided entrepreneurship should be more conducive to maintain employees' highly motivated cooperation and creative problem solving behavior and to be more profitable in the long run. Such interdependency between the growing of an organization and human cognitive dispositions offers some interesting insights into the development of firms. For example, investors often find that large firms composed of well functioning subsidiaries are worth more when they are broken up and made independent. Conglomerates often do not outlive the extraordinary entrepreneurs and investment fads that create them.

Most contributions in the literature on the theory of the firm assume more or less rational, self-interested, and autonomous individuals (Foss 2000). However, given these assumptions, it is not evident how the surplus of a firm can be secured if there are unforeseen contingencies, costs for information, measurement, and enforcement, or if specific investments have to be made (Rathe and Witt 2001). Obviously, employees are motivated by organizational goals combined with organizational identification, material rewards, and supervision. Profit and material incentives are not the only enforcers of organizational efficiency. Simon (1991) has stated that organizations would be far less effective systems than they actually are if monetary incentives were the principal means of motivation. Indeed, comparative studies have found that it is difficult to identify systematic differences in productivity, efficiency, and staff performance between profit-making, nonprofit, and publicly-controlled organizations (e.g., Weisbrod 1988, 1989). What is more, Demsetz and Villalonga (2001) could not identify statistically significant differences in profits between corporations that were managed by owners and those with diffuse stock ownership. Our explanatory approach based on a set of evolved social predispositions favoring cooperation and group-beneficial traits accounts for the motivational underpinnings of human behavior in

²⁴ However, even in a cooperative regime a minimum of monitoring and sanctioning is necessary due to a significant minority of people that plays selfish strategy.

²⁵ Innate dispositions toward cooperation and group loyalty may increase the individual effort devoted to information updating and creativity beyond that favored by individual advantage alone. Rational, selfish thinking will tend to produce less individual learning than would be optimal from the point of view of the firm or organization due to the altruistic effects of social learning and public good problems.

these different contexts. It is then possible to explain why, for example, profit-making, nonprofit, and public organizations can all operate well. In all these organizations, given certain structures – such as group sizes – and cultural transmission processes, a cooperative regime can potentially be implemented, given that these organizations can tap a human social psychology adapted to conduct business in tribal scale social systems.

IV. Conclusions

Evidence from evolutionary and cognitive science suggests that humans have an evolved psychology that shapes what we learn, perceive, and what we think (Richerson and Boyd 2005, p. 4). These cognitive dispositions influence the kinds of cultural variants that spread and persist. What is more, these findings can render assumptions on organizational behavior more concrete, substantiate them, and can contribute to a theory of organizations. This paper has shown that humans have predispositions toward cooperation and group-beneficial behaviors that have resulted from a process of gene-culture coevolution (Boyd and Richerson 1982). A firm is a suitable organizational form in which a cooperative regime based on these social predispositions can be established. Moreover, a model of cultural transmission has been proposed that can be considered as a step toward an applied science of cultural evolution in an organizational context. The approach can be generalized to indicate conditions under which a cooperative regime can be maintained in organizations in the course of an evolutionary process. Moreover, it can serve to identify the critical periods of firm development.

We have no quarrel with the transaction costs argument. However, a behavioral approach to organizations that solely rests on transaction costs, routines, or opportunism ignores fundamental components of human predispositions and abilities. Humans are much more cooperative than rational choice theory would predict. Furthermore, a cooperative regime can generate benefits to the firm which are not feasible via market contracting and thus provides motives other than, for example, transaction cost advantages for choosing the organizational form of the firm. Moreover, our prosocial predispositions act as biases in the process of cultural evolution. Norms and institutions are built up by cultural evolution within organizations, supporting a more cooperative regime than can be sustained by individual level processes acting alone. Therefore, when setting up a multi-person firm, it may not be transaction cost arguments that motivate this action, but rather reasons related to the cognitive and cultural evolutionary dimensions. And in this respect, the entrepreneur provides a crucial cognitive input for the establishment of a cooperative regime within the firm. Consequently, differences in incentive and transaction costs are not the only reasons why there are different forms of economic organization. If this paper's argument is right, we are no longer compelled to accept the traditional view that universal opportunism is the only stable behavioral equilibrium within the context of the firm.

Appendix

- Proving the stability of the equilibrium at $\left\{ \hat{p} = \frac{1}{2}, \hat{n} = \frac{1-2\mu_{co}}{\mu_{co} \frac{\alpha_p}{\alpha_E}} \right\}$: equation (A1) describes the

rate of change of the deviation from equilibrium, $\tilde{p} = p - \hat{p}$ and $\tilde{n} = n - \hat{n}$, near equilibrium, linearizes both recursions around equilibrium, and contains the matrix of the partial derivatives of equations (8) and (9) with respect to p and n

$$(A1) \quad \begin{pmatrix} \Delta p \\ \Delta n \end{pmatrix} = \begin{pmatrix} 1-2\mu_{co} & \frac{r(2-4\mu_{co})}{\mu_{co} \frac{\alpha_p}{\alpha_E}} \\ \mu_{co}^2 \frac{\alpha_p}{\alpha_E} & 1 \end{pmatrix} \times \begin{pmatrix} \tilde{p} \\ \tilde{n} \end{pmatrix}.$$

To determine the stability of the equilibrium, we calculate the eigenvalues of the matrix above. The equilibrium is stable if the largest eigenvalue is < 1 . In this case, both eigenvalues are complex, but the real portion of simplifies to

$$(A2) \quad 1 - \mu_{co},$$

which is always < 1 . Thus, the equilibrium is stable.

- The derivatives of \hat{n} (equation (13)) and \hat{p} (equation (12)) with respect to r_c and r_o are:

$$(A3) \quad \frac{\partial \hat{n}}{\partial r_c} = \frac{(1-\mu_{co})\alpha_E}{r_o \mu_{co} \alpha_p} > 0$$

$$(A4) \quad \frac{\partial \hat{n}}{\partial r_o} = -\frac{(1-\mu_{co})\alpha_E r_c}{r_o^2 \mu_{co} \alpha_p} < 0$$

$$(A5) \quad \frac{\partial \hat{p}}{\partial r_c} = -\frac{r_o}{(r_c + r_o)^2} < 0$$

$$(A6) \quad \frac{\partial \hat{p}}{\partial r_o} = \frac{r_c}{(r_c + r_o)^2} > 0.$$

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