信念与能力
——家族企业创立时领导地位的决定因素

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Belief and Ability: The Determinant of Leadership in Setup of Family Firm

摘要：本文探索了在成员偏好于和同伴协调付出努力，并对产出拥有不同期望的团队（类似初创时的家族企业）中领导地位与乐观预期的作用。首先，本文表明领导地位有利于团队生产，然后说明选择高生产率的领导人未必最优。如果团队成员生产率相同，那么更加乐观的领导人增加团队的产出。较少服从态度的成员会内生成为领导人。因此，顺从程度和乐观信念是领导地位的决定因素。在动态环境中，本文说明领导地位可以以追随者自信心的丧失为代价而加以巩固。
关键词：服从态度，领导职位，团队生产，乐观预期

Abstract

This paper explores the role of leadership and optimism in team, where agents have the preference to match effort with peers and different beliefs about outcome (Like the setup of family firm). We first show that leadership benefits the team, then establish that high productivity leader is not necessarily optimal; if productivity being equal, the highly optimistic leader increases the output of the team; less conformism agent will take leader position endogenously. Thus conformism and optimism are determinants of leadership. In dynamic circumstance, we demonstrate that the leader's position could be consolidated at the loss of self-confidence among the followers.
Keyword: conformism, leadership, team production, optimism
Journal of Economic Literature: D23, L22, M21,

1 Introduction

When a group starts new business, which organizational form does best to them? Should they make decision through voting and choose effort in production simultaneously? Or select one of them to be a leader to determine what and how to produce, indeed be the manager (leader, entrepreneur, employer……)? This issue goes at least as far back as debate on which government form the ancient Persia should adopt, democracy, empire, or oligopoly, among Darius Ⅰ and his company, documented in Herodotos' *History*. Standard Economics theory usually ignores the role of leadership, and interprets this manager from the view of property right, as the one who has residual claimant status, so he just delegates control or ownership (Alchian and Demestz, 1972). The agent whose control increases the productivity of group more than the productivity decrease due to the loss of control of others, saying, the one who have more human capital, higher productivity, or will make more relation-specific investment, takes the role as manager (Grossman and Hart, 1986; Hart, 1995). This theory restricts the attention to the agents' motivation to achieve material income through effort and avoid risk, and typically predicts that the more incentives offered by principal, the more effort provided by agent. However, recently both theoretical and experimental studies throw doubts to this conventional wise. For example, sometimes low-powered incentives take advantage in team work (Che and Yoo, 2001), economic incentive in long-run generates counterproductive effect (Behabou and Tirole, 2003), insufficient rewards produce negative effect on performance (Gneezy and Rustichini, 2000). These studies reveal that in the presence of contractual incompleteness and coordination, other tools such as communication between manager and employee (Brandts and Cooper, 2005), non-differential wage to maintain morale (Fang and Moscarini, 2005), attempts to build loyal among employee (Fehr and Falk, 2002), deliberate use of trust and threat to punishment (Fehr and List, 2002), reciprocity (Gachter and Falk, 2000) are among the efficient alternatives other than material incentive to improve performance.

In this paper, based on the work of Huck and Rey (2005), we present a model on the choice of leadership in team under the presence of conformism preference, uncertain outcomes and different priors. We show that in the absence of free-rider problem, different attitude to risk, moral hazard and property rights, a manager who dictates production decision under uncertainty still benefits the team. Given opposite prior beliefs among group members, degree of conformism, productivity and the degree of optimism jointly determine the leadership.

Our model is driven by the assumption of conformism preference, a kind of interdependence preference. Specially, group members dislike the differentials in effort. Recent various empirical and experimental studies document the tendency to match effort of their peers, for instance, Gachter and Rennen (2003) observes that leader's effort influence effort choice of all the other members, Ichino and Maggi (2000), Falk and Ichino (2003) and Bandiera et al (2005) present clear evidence of peer effects in work place. However, the underlying reason of conformism remains a highly argued issue. There is variety of explanations for conformism in many other fields, especially in financial market, concern on status (Bernheim, 1994), signaling (Banerjee, 1992; Bikhchandani et al, 1992), sanction on deviation (Akerlof, 1980) are just few among them[1]. Here we take the assumption of conformity preference as Jones (1984) suggests, without in-depth

[1] Gould and Winter (2005) recently show that maximization agent and technological properties of team production function is enough to generates peer effect, without resort to any psychological consideration such as social pressure, social norm and shame

exploration of the underlying reason.

But we think that conformity preference is a plausible assumption at least in the context of small group of friends or closed kinships[2], where the members tend to reduce the behavior differential among them. Therefore, the story of our model is more likely a story of the setup of family- run firms or small firms. When household or closed friends prepare to start a business, the members should make many decisions on which project to undertake, how to produce, and so on, and they may have very different even conflict opinions. However, once the final decisions are made, this conflict is terminated, and the members all put their beliefs aside, conform to other's action and contribute effort. They devote to their joint business rather than quit[3].

Some previous studies on peer interaction in team suggest that the presence of lower ability agent benefits the team production (Battaglini, Benabou and Tirole, 2005, Huck and Rey, 2005). These studies are explicitly or implicitly constructed on the basis of "leading by example" mechanics (Hermalin, 1998), a relatively less ability agent will enhance the confidence of high ability one, and encourage him to make more effort to team, while the less ability one also will take more responsibility and work more. We show that this "example" effect is largely offset by the different beliefs on project risk, thus low ability agent become leader does not necessary induce the high ability one to contribute more. Moreover, we define efficient productivity as the product of perception and real productivity, and display that this term makes sense in optimal leadership choice. Normally high efficient productivity and low degree of conformism agent become the leader increases the output most.

Another related research line is the role of confidence and optimism in workplace. In auction theory, the optimistic expectation gives rise to "winner's curse"[4]. Quiggin (1992) shows that in risk environment as land development, optimistic expectation leads to undeserved consequence as over-exploitation and land degradation. Similar negative consequence of overconfidence is also addressed in finance[5]. However, recent studies in labor economics and firm give rise to the value of overconfidence. Overconfidence enhances the motivation to conquer challenges, improves the morale to run team production more efficiently (Benabou and Tirole, 2002, 2003; Compte and Postlewaite, 2004; Fang and Moscarini, 2005). Overconfidence manager is more beneficial to the firm than the rational manager, and the overconfidence agent is more likely to be selected as manager in firms (Goel and Thakor, 2000; Bernardo and Welch, 2001; Gervais et al, 2003; Hackbarth, 2003). Finally, optimistic bias in beliefs increases the anticipated utility, and may outweigh the cost of loss due to worsen decision making (Brunnermeier and Parker, 2005). In our model, however, since the confidence addresses the precision of estimates about outcome, and there are different beliefs about the outcome among members, it impairs the cooperation and reduces the output. Our model also shows that shattering others' confidence about their own estimates significantly reins the leader's power, and indeed improves the return to the team provided that the leader has more precise estimate than other members.

The remainder of this paper is organized as the follows: section 2 describes the economy

[2] Hart (1995) mentions that managers of family-run firm perhaps have motivation other than profit to maintain the unsuccessful firm. Thus, it seems reasonable to consider the initial members of small firm have other preferences, conformism preference, among the interdependence preferences, is a easy-to-dealt assumption.

[3] Using the data in Dartmouth College, where the room-mate is arranged randomly, Marmaros and Sacerdote (2006) examine the formation of friendship. It is noteworthy that geographic proximities and race are more important determinants than common interests. Thus, different opinions may not be great barrier to social interactions, and closed friends do not necessarily share the same beliefs.

[4] For the detailed discussion of winner's curse, see Milgrom (1989)

[5] Odean (1999) provided a recent empirical account on the relative performance of overconfidence investors.

environment, specifies the component of my model. Section 3 presents a numerical example, shows that in the context of opposite beliefs about outcomes, the effect of "learning by example" mechanics in deterministic environment changes considerably, and investigate the inside production decision of this team. Section 4 is devoted to analysis in more general situation and demonstrates the choice of leader under the tradeoff between confidence about estimate precision and productivity. Section 5 is conclusion.

2 Preliminaries on Economy

Production

Consider two agents i=A, B, who form a firm to carry out a project on a market-specific goods production, which means that the output could only sold on a specific market. They cannot quit this firm during period t. We restrict that at the beginning of every period t each agent chooses and promises to provide the nonnegative effort x^i, and this effort is the only input in production. Besides, they could perfectly observe other's choice and the actual action, so they would provide the effort they choose. We also assume that the output y is linear in efforts as follows:

$$y = 2\sum_{i=1}^{2} k^i x^i \qquad (1)$$

Where k^i is the productivity of agent i, and it's constant over time.

The output could only be sold on the market at the same period, and no storage technology is available. We assume that individual cannot consume the product of their efforts but sold on the market. Therefore, these two agents only care the realized return from production and sale of output, rather than the output itself. Their share in the realized earning at the end of every period t is α^i, and $\alpha^A + \alpha^B = 1$.

Project and expectation

An important distinction from previous studies on team and leadership is our model explicitly introduces the project risk. An important feature in modern market economy is the presence of uncertainty, and the entrepreneur partly arises from the need to cope with risk.

We assume that there are two projects n=1, 2. Each period there is an exogenous market shock γ^n ($n = 1, 2$) on the two projects, which only affect the sale of the output and consequently the realized earning. Let

$$Y^n = \gamma^n y \qquad (2)$$

Where Y^n is the realized earning. For the sake of simplicity, we let the shocks have only two possible value, as $\overline{\gamma^n} = 1$ to denote *success* and $\underline{\gamma^n} = 0$ to denote *lost*, $\Pr(\overline{\gamma^n}) + \Pr(\underline{\gamma^n}) = 1$. At the beginning of each period, before the resolution of uncertainty, the agents make collective

decision on which project to undertake, then they produce and sell output on this market.

A crucial assumption in our model is that these two agents have different prior beliefs on γ^n. We assume that each agent set up π_n^i, his estimate about the probability of success on project n, at the beginning of period t, and they could only be convinced by the result, namely the realized outcome in the end of this period, hence they insist their beliefs in the rest of this period. Therefore, agent i's expected project outcome is π_n^i. In other words, this assumption could be interpreted as two individuals have different degree of confidence in the same proposition, in the same context, this is exactly the "personalistic" view of probability (Savage, 1972). Naturally this biased estimate is associated with overconfidence and optimistic[6], which are of importance for leadership in firm. Fang and Moscarini (2005) interpret worker's confidence about their own ability as "morale", which benefit aggregate productivity, but here we are concerned with agent's confidence about their estimate about the firm, rather than about himself. Thus the confidence sometimes may produce collapse in coordination.

Naturally, this specification on prior beliefs leads to the collective choice problem. If the agents both have same prior beliefs, or loosely, just have consensus on which project have more prospect than the other one, i. e., $\pi_n^i > \pi_m^i, \forall i = 1,2, n \neq m$. Then this firm will undertake project n. However, if they have different beliefs, $\pi_n^i > \pi_m^i$ while $\pi_m^j > \pi_n^j$, and $i \neq j, m \neq n$, then the collective choice problem makes a difference, some procedure are required to coordinate their beliefs and make the final decision. We are interested in the latter case.

Preference

In our model, we assume that the utility of agents is time additive, and the utility in each period t depends on the share of firm return, the effort, and the difference between his effort and the effort of his peer, and it increase in the first term and decrease in the latter two terms. The last term capture the sprit of "conformism". Moreover, for simplicity, we assume that the cost of exerting effort and the efforts difference are of quadric form, while the utility with respect to earning is linear[7]. Specially, let

$$E[u^i] = \alpha^i \pi_n^i y - \frac{(x^i)^2}{2} - \frac{b_i (x^i - x^j)^2}{2}, \quad i \neq j \qquad (3)$$

Where b_i >0, measure the agent i's degree of conformism. The first term $\alpha^i \pi_n^i y$ is the expected return to individual member, the product of return share and project return. It worth noting that this term is belief-dependent. Finally, the object of agent is to maximize the expected utility on that period, $E[u^i]$. The assumption of risk neutral permits us to ignore the various

[6] Gervais et al (2003) distinguished overconfidence from optimistic, here estimated outcome could be considered as the combination of these two factors.

[7] Recently the social preference, which implies that agent derives utility from other's material payoffs, receives more and more attention. See Sobel (2005) for the last development on this topic.

issues related to risk attitude, for example, the consideration about insurance.

Standard theories just take the first two terms, utility of return and disutility of effort into account. However, in the term of intrinsic and extrinsic motivation, we can explain the material return as extrinsic incentives and the conformism effect as intrinsic motivation[8]. We assume that this utility function is common information for these two agents.

Timing and Strategies

Finally we will make the production decision process specific. The timing of this game and the strategies of the players in each period t are described in 5 stages:

Stage 1: Return Allocation- At first, these two agents will decide the return share schedule, α^i. There are several possible mechanisms on the allocation, for instance, bargain according to the relative power or status, allocation according to their productivity, allocation according to there efforts. Lifelong experiences show that return allocation plays a relative minor role in the start up of a small firm, especially family-run firm where the conformism is more likely to appear. Thus in our model we pay little attention to this stage, and assume directly the Nash equilibrium bargaining solution appears, that is, agent receives the equal share[9].

Stage 2: Project Decision- These two agents should decide which project to undertake, according to some collective decision procedure. Specially, in this paper we address two procedures, random choice and dictatorship, respectively. The first implies that they agree to flip an honest coin to determine the project[10], the latter implies that the decision is made by one of them.

Stage 3: Efforts Choice- Once the project decision and return share is determined, these two agents choose the optimal efforts x^i provided in production. Here we also focus on two possible efforts choice procedures, one is that they choose the efforts simultaneously, and the other is they decide the efforts sequentially, one agent moves first, the other observes the action of first mover and choose the effort in second place. These structures are adaptation of classical Cournot and Stackleberg dual-oligopoly games.

Stage 4: Production- We have ruled out the possibility that these agents behave inconsistent with their promise in stage 2, hence the output is exactly the production function with respect to the x^i.

Stage 5: Return realized- Only when the output are sold on market, the market shock is observed by both of the two members. Then the return is allocated according to the original schedule. In this stage, both agents update their confidence according to the realized value of γ^n, which is used to make the collective decision on next period $t+1$. It's worth noting that here we

[8] Kreps (1997) argues that many intrinsic motivations may be at least partly the worker's response to fuzzy extrinsic motivators. In his commentary, peer pressure, a possible source of conformism, is still an extrinsic motivation. However, we do not take up this point here.

[9] In competitive labor market the worker could only receive a fixed amount, the reservation wage, and the employer takes all residuals. However, in this context there is no difference in internal organization between family-run firm and other firms, and conformism preferences is difficult to display. Therefore, we won't highlight fixed payment schedule.

[10] It somewhat analogues to stochastic ownership, see Hart (1995).

don't consider the asymmetric information on project shock, i. e., only one agent, namely the entrepreneur, could observe the value of γ^n, and the other one, namely worker, could learn this real value by the signal the entrepreneur supply. This framework is indeed another type of asymmetric information case between principal and agents, where the principal have more information. Behabou and Tirole (2003) have used this theoretical framework to study the interaction between intrinsic and extrinsic motivation.

3. A simple example

In this section we construct a simple example to show the impact of different prior beliefs and effort choice procedure on the output at period t.

We let $\alpha^A = \alpha^B = \frac{1}{2}$, $\pi_1^A = \pi_2^B = 1$, and $\pi_2^A = \pi_1^B = 0$. These specific parameters imply that each agent extremely *optimistic* on one project but extremely *pessimistic* on the other one, intuitively, they have sufficiently extreme opposite expectation but same degree of confidence of their beliefs. Because they are both extremely overconfidence, the Bayesian update of self-confidence has no job. Thus here we address the outcome in one period. Besides, we assume that the γ^n takes the value of one or zero with equal real probabilities, $\Pr(\gamma^1 = 1) = \Pr(\gamma^2 = 1) = \frac{1}{2}$.

3.1 Simultaneous choice on efforts

Now suppose that these agents choose the efforts simultaneously after the aimed project is determined. For simplicity, we suppose that the project decision result is to undertake project 1, and the agent A is optimistic on this project. Then,

$$E[u^A] = \frac{1}{2}y - \frac{(x^A)^2}{2} - \frac{b_A(x^A - x^B)^2}{2} \quad (4.1)$$

$$E[u^B] = -\frac{(x^B)^2}{2} - \frac{b_B(x^B - x^A)^2}{2} \quad (4.2)$$

The agent B's utility is strictly negative, since he has extremely pessimistic expectation on that the market shock. Taking first-order condition we can derive agent i's best-reaction function as:

$$x^A = \frac{k^A + b_A x^B}{1 + b_A} \quad (5.1)$$

$$x^B = \frac{b_B x^A}{1 + b_B} \quad (5.2)$$

We see that the above functions are asymmetric, and it's only the conformism that motives the agent B to choose positive efforts and cooperate with agent A. Therefore, here conformism plays significant role in coordination in firm. The presence of conformism, together with the assumption

that agents cannot quit the firm, makes the efforts become strategic complements, i. e., the effort chosen by one agent is influenced by the effort chosen by the other. Solving these two equations we have the equilibrium efforts and output as:

$$x_{SIM}^{A} = \frac{(1+b_B)k^A}{1+b_A+b_B}, \quad x_{SIM}^{B} = \frac{b_B k^A}{1+b_A+b_B} = x_{SIM}^{A} - \frac{k^A}{1+b_A+b_B},$$

$$y^{SIM} = 2\frac{(1+b_B)k^A + b_B k^B}{1+b_A+b_B}k^A \quad (6)$$

The expression of x_{SIM}^{B} demonstrate the impact of opposite expectations. The effort of pessimist is strictly lower than the optimist, and only associated with his degree of conformism, thus only conformism inspires him to work.

To find the effect of productivity and degree of conformism on effort chosen and output, we differentiate the equilibrium efforts and output with respect to these parameters to get:

$$\frac{dx_{SIM}^{A}}{dk^1} > \frac{dx_{SIM}^{B}}{dk^1} > 0$$

$$\frac{dx_{SIM}^{A}}{db_B} = \frac{b_B k^A}{(1+b_A+b_B)^2}, \quad \frac{dx_{SIM}^{B}}{db_B} = \frac{(1+b_A)k^A}{(1+b_A+b_B)^2}$$

$$\frac{dy^{SIM}}{dk^A} = 2\frac{2(1+b_B)k^A + b_B k^B}{1+b_A+b_B} > \frac{dy^{SIM}}{dk^B} = 2\frac{b_B k^B}{1+b_A+b_B}$$

$$\frac{dy^{SIM}}{db_B} = 2k^A \frac{k^A b_B + k^B(1+b_A)}{(1+b_A+b_B)^2}$$

In words, the rise in the optimist's productivity increases both agents' efforts, while increase the optimist's effort more. Both agents' efforts are increasing in the pessimist's conformism and decreasing in the optimist's conformism. The effects on output are in the same sign.

The mechanic behind is: In order to reduce differences in efforts, agents adjust their effort choice towards the efforts of the peer. In effect, the pessimist's effort is entirely motivated by conformism, and the optimist takes potential leading position on effort adjustment[11]. Therefore, if the pessimist is also high conformism, he increases his effort, which implicitly increases the optimist's effort. However, if the optimist increase his conformism and adjust the effort to the pessimist, he will reduce the effort and affect the effort of pessimist negatively. Since the optimist is more willing to provide effort on the project he is confidence on, and the increasing in his productivity increases the expected return, motivates him to take more effort, which also stirs the pessimist to increase his effort to follow. But, since the pessimist has no passion on this work, his productivity has no direct impact on optimist, then the increase in his productivity only increases his contribution to output, but no chain effect on the effort of optimist happens.

A natural question arises: how to determine which project to undertake? According to the

[11] In the view of Aghion and Tirole (1997), this optimist gains real authority, namely "the effective control over decision".

above analysis, if the real probabilities of success in the two projects are the same, the project undertaken is the one the high productivity agent preferred. Because the high productivity agent is optimistic about the project, he is likely to work more, which consequently induce the pessimist to increase his effort. Here we have shown that leader advantage in favor of the high productivity agent.

Another possible project decision procedure is flipping an honest coin, let the head to represent project 1 and the tail to represent project 2. It seems like a fair procedure, however, if the real probabilities of success are the same and agent A has higher productivity than agent B, then the expected return from project 2 is strictly less than that from project 1. The reason is simple, albeit the result of collective decision is project 2, the high productivity agent A still is pessimistic about the project 2, then he is passive on work and reduce his effort. Since agent A is high productivity, the rise in agent B's effort cannot offset the loss in agent A's effort. Therefore, this procedure is dominated by choosing project by the high productivity agent. Thus we get the following result.

Result 1: In simultaneous effort decision case, the high productivity agent makes project decision alone increases the output.

Finally, suppose that the real probability of success in project 1 is lower than project 2, even in extreme case that agent A's prediction is totally wrong, that is $\Pr(\gamma^1 = 1) = 0$. It seems that they should choose project 2, since it's an entire waste on project 1 regardless the efforts provided. A possibility is that the low productivity agent has more accurate forecast and dictates on decision making. However, it's noted that in assumption we rule out the possibility that the agents change their prediction during this period, so the high productivity agent A still will make effort decision according to his initial belief, thus reduce his effort. Under this condition, though the low productivity agent cannot persuade the high productivity agent, he still could choose the project 2, force the high productivity agent to join the production and provide effort. In this case, the productivity of high productivity but bad forecast ability agent has no direct impact on the low productivity but good forecast ability agent, and consequently less impact on the output. Obviously, this dictatorship benefits to each agent *ex post*. Indeed this dictatorship is a kind of entrepreneur, which comes from the accuracy of project forecast.

3.2 Sequential choice on effort

Now we turn to an alternative effort decision procedure. Let us assume that these two agents choose their effort sequentially. That is, the second agent decides the effort to provide only after the effort chosen by the first one is observed. To ease notation, still let agent A, the optimist, as the first mover and agent B, the pessimist, as the second mover. This problem here is similar to standard Stackelberg Game. Solving by backwards induction, it's obvious that agent B choose his effort as $x^B = \frac{b_B x^A}{1+b_B}$. Because agent A anticipate this reaction, he maximizes

$$E[u^A] = (k^A x^A + k^B \frac{b_B x^A}{1+b_B}) - \frac{(x^A)^2}{2} - \frac{b_A (x^A - \frac{b_B x^A}{1+b_B})^2}{2} \qquad (7)$$

First order condition shows:

$$x_{SEQ}^{A} = \frac{(1+b_B)k^A + b_B k^B}{(1+b_B)^2 + b_A}(1+b_B) = x_{SEQ}^{B} + \frac{(1+b_B)k^A + b_B k^B}{(1+b_B)^2 + b_A} \quad (8.1)$$

$$x_{SEQ}^{B} = \frac{(1+b_B)k^A + b_B k^B}{(1+b_B)^2 + b_A} b_B \quad (8.2)$$

$$y^{SEQ} = 2(k^A x_{SEQ}^{A} + k^B x_{SEQ}^{B}) = \frac{2[k^A(1+b_B) + b_B k^B]^2}{(1+b_B)^2 + b_A} \quad (8.3)$$

Applying simple comparative static analysis, it's revealed that everything else being equal, the higher the leader's productivity, the more the output gained. Thus it's always better for the firm if the high productivity agent move first.

Relative to the simultaneous decision case, here the optimist sets example at first and anticipates that the pessimist will learn his example. Both agents' effort is greater than that under simultaneous case. The optimist takes the effort of pessimist into account, and this consideration finally appears in the effort decision of pessimistic agent. Therefore, there are the "pure conformism effect" and the "commitment effect" (Huck and Rey, 2005). The former one is due to the attempt to match the effort of optimist by pessimist, and the latter one implies that because of the reaction function of pessimist is somehow "committed", then taking this into consideration, the first optimistic mover increases his effort, consequently motivates the followed pessimist increases effort as well. Therefore, in addition to pure conformism effect, commitment effect increases aggregate efforts.

In other hand, if the pessimist B is the leader. The optimist A move second, hence his reaction function is $x^A = \frac{k^A + b_A x^B}{1+b_A}$. The leading pessimist anticipates this reaction, and maximizes:

$$E[u^B] = -\frac{(x^B)^2}{2} - \frac{b_B(x^B - \frac{k^A + b_A x^B}{1+b_A})^2}{2}$$

Again taking the first order condition, we have:

$$x_{SEQ}^{A}{}' = \frac{(1+b_A)k^A + b_B k^A}{(1+b_A)^2 + b_B} = x_{SEQ}^{B}{}' + \frac{(1+b_A)k^A}{(1+b_A)^2 + b_B} \quad (9.1)$$

$$x_{SEQ}^{B}{}' = \frac{b_B k^A}{(1+b_A)^2 + b_B} \quad (9.2)$$

Compared with the case of optimist moving first, both agents reduce their effort. The intuition is simple: The consideration of the optimist's action doesn't affect pessimist's expected return, so it's only the motivation to minimize effort difference that induces him to work. However, since he anticipates that his effort decision would affect agent A, it's in his favor to take action that reduces the effort of the optimist. Meanwhile, the reaction function of optimist as a commitment forces him to attempt to match the observed effort of pessimist, and in consequence reduce his effort.

Therefore, while pure conformism effect still increases the effort, here the commitment effect has negative effect on aggregate effort. Finally, we have the following results.

Result 2: Given project decision, the optimistic agent take the leadership in effort decision on production increases the output.

Because the effort of the optimist is strictly larger than that of the pessimist, thus, higher productivity optimist increases the output more than higher productivity pessimist. Consider the relatively more output under optimist leader, again, the Result 1 in previous subsection sustains. Adapting Hamilton and Slutsky's (1990) analytical framework on the endogenous emergence of leadership in Stackelberg game and applying backward induction, in a deterministic version of team production Huck and Rey (2005) reveal that if at least on agent is a conformist, then sequential effort decision dominates simultaneous effort decision, and leader-follower structure emerges endogenously. Here since the pessimist could not quit the team, similar endogenous timing always gives rise to sequential decision procedure.

Therefore, we have examined the efficiency of effort decision procedure, given the project decision. We found that sequential effort decision maximizes output. However, this optimality coincides only with the optimist leader. Then, by and large, we could isolate the effort decision from project decision, and conclude that the efficient production procedure requires the optimistic agent to move first in effort decision. We shows that in uncertainty environment, the higher is the degree of conformism of the follower, the more output produced, thus relatively less conformism leader increases the output. Besides, integrating result 2 with result 1, in this example we show that given the equal degree of confidence among agents and real probability of success between projects, to maximize one period output, the high productivity agent should be selected to choose project and move first in production. Thus, this agent takes two roles, determining the direction, as a CEO in a firm, and encouraging the followers with his example, as a leader in a team.

4. General Situation

We have investigated the role of productivity in leader selection, and demonstrated that high productivity agent takes leadership increases the output. However, in the presence of different degree of estimates, the previous results may alter. In this section we stress the interaction between productivity and expectation. Specifically, these beliefs of these two agents are not too extreme, thus there is tradeoff of expectation and productivity in leader selection. Besides, we also consider the probable impact of different degree of conformism on leadership selection.

Because the optimal effort decision procedure is sequential choice with optimistic one move first, below we always emphasis this procedure, and we denote the leader as L, and the follower as F. Still, we assume the return is allocated equally between them. Again with first order condition in this decision procedure, we get the optimal effort contribution when project j is undertaken:

$$x^L = \frac{(1+b_F)^2 \pi_j^L k^L + k^F (b_F + \pi_j^F b_L)(1+b_F) + b_L b_F \pi_j^F k^F}{(1+b_F)^2 + b_L (1+b_F)^2 - b_L b_F^2} \qquad (10.1)$$

$$x^F = \frac{\pi_i^F k^F + b_F x^L}{1+b_F} \qquad (10.2)$$

$$y = 2(k^F x^F + k^L x^L) \qquad (10.3)$$

Here the follower's effort is kindled by two motivations, one is the expected return from project success, and the other is the motivation to match the effort with the leader. Thus he increases his effort relative to the entirely pessimistic expectation situation. Again, the pure conformism and commitment effect are presented. The leader takes the strictly positive expectation on success of follower into consideration, and increases his effort as well. Thereby, not too extreme expectation increases the output significantly. In subsequent sections we discuss impacts of various parameters on effort exert and output, and explore the resulted optimal leadership choice.

4.1 The Importance of Productivity

Previous studies and everyday experience documents that the leader in team exerts high effort as a first mover (Hermalin, 1998; Gächter and Renner, 2004; Huck and Rey, 2005), however, we show that this intuition is not necessarily the truth. Specially, we show that who exert higher effort depends the difference in $\pi_j^i k^i$, which we define as *efficient productivity*.

Since k^i is the marginal productivity of agent i, and π_j^i is the estimates which has direct effect on the production decision, the product term $\pi_j^i k^i$ could be seen as the *efficient productivity* of agent i on project j. The intuition behind is the high productivity agent probably is pessimistic on the prospect, so he put in less effort in this project, and the real marginal output of his effort is probably less than the relative low productivity but highly optimistic one. Therefore, optimistic attitude and productivity are somewhat substitutes in production, and what matters are the products of expectation and productivity. In subsequent section we will show that the difference between efficient productivity is usually a crucial condition suffice for alternative place in effort and leadership selection. Here we have the following proposition:

Proposition 1: Which member exert more effort in production depends on the difference on efficient productivity, $\pi_j^F k^F - \pi_j^L k^L$. *If* $\pi_j^F k^F - \pi_j^L k^L < \frac{b_F k^F}{1+b_F}$, *the leader offers more effort; if* $\pi_j^F k^F - \pi_j^L k^L = \frac{b_F k^F}{1+b_F}$, *the leader and follower exert equal effort; if* $\pi_j^F k^F - \pi_j^L k^L > \frac{b_F k^F}{1+b_F}$, *the follower puts in more effort.*

Proof: just compare (10.1) and (10.2), the results is obvious.

We find that if the inequality condition $\pi_j^F k^F - \pi_j^L k^L > \frac{b_F k^F}{1+b_F}$ holds, the case that the follower may provide more effort than the leader arises. And the right term $\frac{b_F k^F}{1+b_F}$ could be interpreted as the marginal productivity contributed by conformism preference. Therefore, this condition implies that if the efficiency productivity of follower is sufficiently larger than that of leader, which is larger than the productivity increased by conformism, the follower will put in

more effort than the leader. Because the return allocation is equally, the leader takes the advantage of leadership without any more effort provision. Therefore, when a lower productivity or relatively pessimistic agent become the leader, he could just make the project decision in favor of the other's expectation[12] and build up "leading by example" mechanism, then he could convince the follower to exert more effort, and he could gain more utility than the other.

As to the output of this firm, obviously, to maximize the production, it's required that more effort provider has higher productivity. However, in this general situation it's not clear which agent will put in more effort. Combining the above analysis with the conclusion in section 3, there could be two possible leader selections on one project, high productivity agent is not necessarily selected as leader. One is the high productivity and optimistic agent chooses project, and exerts more effort. As previously analyzed, he is CEO and leader. The other is the low ability and pessimistic agent choose project and make effort decision in first place, but the high efficient productivity agent become the follower and provide more effort, which correspondent to familiar story of old and conservative father with able and ambitious son in real life. These two choices are equal in output.

Furthermore, using the continuity argument, other thing being equal, we conjecture that there are some states that productivity has ignorable effect on output. We show that if $\pi_j^F k^F - \pi_j^L k^L = \frac{b_F k^F}{1+b_F}$, the two agents provide equal effort, regardless the leader and follower. Actually, in this context, the productivity of leader is irrelevant to the maximal output. This implies that if the difference in efficient productivity between follower and leader is sufficient large, whether the leader or the follower has higher productivity doesn't have any impact on output. However, the role of CEO, who decides the project choice, may still be relevant, since it's probably more difficult to request this condition holds in either project.

4.2 The Role of Conformism

Another interesting topic is the role of degree of conformism, which is the distinction from standard economics assumption. Here we investigate the sequential effort decision in the presence of nonconformist.

We make extreme assumption that agent B is not conformist, i. e. $b_B = 0$. Then we studies whether this variant affects the leader position. First, we assume that agent A is leader and agent B is follower. Again, using first order condition we have:

$$x^B = \pi_j^B k^B, \quad x^A = \frac{\pi_j^A k^A + b_A \pi_j^B k^B}{1+b_A} \qquad (11)$$

Here the only motivation for nonconformist is the expectation of return, and the commitment effect disappears in the effort of the leader.

In the view of evolutionary theory, we could explore the role of conformism, namely, if agent A is chosen as leader exogenous, whether his conformism is optimal reaction to selfish follower? We compare the performance of conformism leader with the nonconformist leader. Again, we find

[12] Actually, this condition requires the coincident that the leader's estimation of project is sufficient lower than that of the follower, but still higher than his estimation of the other project. In words, the leader is pessimistic on both projects, but he is obligated to make decision.

that the efficiency of conformism relies on the difference in efficient productivity. If $\pi_j^B k^B > \pi_j^A k^A$, then the existence of conformism increases the leader's effort, as well as the output. To understand this point, we consider a team with high ability worker and low ability leader, where the position is exogenous imposed. The conformism preference could be seen as a form of leader's devotement, which motivates him to work hard and partly mitigates ability difference. Another result of the condition $\pi_j^B k^B > \pi_j^A k^A$ is the follower agent B will provide more effort than the leader agent A, though the leader is a conformist. Thus, conformism alone could not offset the impact of difference in efficient productivity on effort exert.

However, we could show that this structure is not optimal. If the two agents could negotiate for leader position, the conformism agent A will prefer to become the follower. To clarify this argument, we show that in the context of non-conformism leader, the effort exerted are:

$$x^B{}' = \pi_j^B k^B + \frac{b_A}{1+b_A} k^A, \quad x^A{}' = \frac{\pi_j^A k^A + b_A \pi_j^B k^B}{1+b_A} + \frac{b_A^2 k^A}{(1+b_A)^2} \qquad (12)$$

Obviously, if the nonconformist is the leader and the conformist is the follower, they both exert more effort. In the effort of nonconformist agent B, the pure conformism effect is replaced by commitment effect, which increases the effort of leader. The conformism follower takes this increase into account and consequently increases the effort. Thus, consistent with everyday experience and previous studies, we show that independent agent take leader place increases the team output more than the conformist leader. Meanwhile, the conformism agent benefits from this leader-follower arrangement. We get the following proposition:

Proposition 2: If one agent prone to conformism and the other is self-interest, then the agent who only cares his return is the leader who maximizes output.

Again, we examine the efficient productivity, from (12) it's easy to show that $x^B{}' > x^A{}'$ if and only if $\pi_j^B k^B - \pi_j^A k^A > -\frac{b_A k^A}{1+b_A}$. Therefore, if the efficient productivity of the agent who has standard preference is not sufficient smaller than the conformist, it is always better for the team if this independent agent become leader, and actually he will put in more efforts.

4.3 The Effect of Expectation

So far we have investigated the role of productivity and conformism in leader selection. It is shown that *efficient productivity* determines the optimal leader selection and the effort provision. Because we defined efficient productivity as the product of expectation and productivity, we could study the role of belief on leadership arrangement.

Though efficient productivity is determinant, expectation and productivity are not completely substitutes. In general $\frac{\partial x^i}{\partial \pi^i}$ is not equal to $\frac{\partial x^i}{\partial k^i}$, thus we should isolate belief and investigate its impact on output and leader choice.

Proposition 3: If the level of conformism and productivity are equal between leader and

follower, the team benefits more from optimistic leader.

Proof: Differentiate (10. 3) with respect to π^L and π^F, we have:

$$\frac{\partial y}{\partial \pi^L} = 2(k^L \frac{\partial x^L}{\partial \pi^L} + k^F \frac{b_F}{1+b_F} \frac{\partial x^L}{\partial \pi^L}) \qquad (13.1)$$

$$\frac{\partial y}{\partial \pi^F} = 2(k^L \frac{\partial x^L}{\partial \pi^F} + k^F (\frac{k^F}{1+b_F} + \frac{b_F}{1+b_F} \frac{\partial x^L}{\partial \pi^F})) \qquad (13.2)$$

ceretus paribus, i. e., $b_L = b_F = b, k^L = k^F = k$, , (10.1) together with (10.2) imply that $\frac{\partial x^L}{\partial \pi^L} < \frac{\partial x^L}{\partial \pi^F}$ if and only if $b > \frac{1+\sqrt{5}}{2} > 1$. But this condition implies that both agents are so strong conformism that in utility they place more weight on minimize effort differential than on physical return, an extremely unrealistic situation. Thus it's reasonable to ignore this case and conclude $\frac{\partial x^L}{\partial \pi^L} > \frac{\partial x^L}{\partial \pi^F}$ holds. Simple calculation demonstrates that under this condition $\frac{\partial y}{\partial \pi^L} > \frac{\partial y}{\partial \pi^F}$.

The above inequality sheds light into the affect of belief on output, the leader's expectation has larger impact on output. Given the project choice, the more optimistic agent takes leader place increases output more than the less optimistic one. In other word, given project choice, overoptimistic attitude is a competitive edge in the competition for leadership, which is consistent with many evidences that unrealistic optimistic is common trait among business executives. Camerer and Lovallo (1999) Goel and Thakor (2000), Heifetz and Spiegel (2000), Manove (2000), Bernardo and Welch (2001), Gervais et al (2003) demonstrate that in business world unrealistic optimistic entrepreneur usually more successful than the realistic counterpart, or even drive the realistic one out of business.

4. 4 Confidence Management

Recently confidence management in workplace receives large and growing attentions in economics literatures (Benabou and Tirole, 2002, 2003; Compte and Postlewaite, 2004, Fang and Moscarini, 2005). In this paper belief could be seen as the combination of confidence and estimate, thus our model is able to be applied to learn the role of confidence.

In section 3 we present that under opposite beliefs but same confidence on a project, the high productivity agent should decide the project and take the leader position in work. Intuitively, even a minimal amplification in the other agent's estimates on the chosen project increases the output, through the increase in his effort and consequent increase in the leader's effort. This view is also supported by the analysis in above subsections.

However, by and large, it's still a static framework, and we haven't explore the source and revision of π_n^i. A common modeling strategy is restricting the agents revise their beliefs

according to Bayes' law. However, because of the absence of incomplete information, in our setting this approach is not applicable. Furthermore, to implement the belief update process in our model, we need some additional conditions. Here we present an informal discussion on the influence of expectation, the combination of confidence and estimates.

To emphasis the role of confidence, we assume that estimate of probability of success is fixed for both agent, and confidence varies alone. Moreover, the confidence consists of self-confidence and confidence on the other. If agent has high self-confidence, his belief is inclined to his own forecast, but if he trusts other more than himself, he prefers to believe other's choice. Thus, the confidence in belief is the maximum among self-confidence and confidence on the other.

A promising line of study is to assume that only one agent, normally the leader, have access to information about project outcome that is inaccessible for the follower. This assumption captures an important feature in modern firm that the manager knows more about the market outcome than the workers. Thus what the manager should do is how to signaling the follower about the market outcome, if needed.

Suppose initially the follower has opposite belief to leader, which imply that he has more confidence on himself than on the leader. If the manager finds that he chooses the correct project, he will signal follower the result to reinforce his position, to show his correct estimates, and to enhance the follower's confidence on leader, consequently the expectation on the project chosen. Alternatively, if the leader find his choice is wrong, but he believe it's just a occasion and finally this choice will be verified right, he will attempt to hid the truth to the follower to avoid to hurt his confidence on leader's choice. Therefore, to achieve the above process, the leader should have some tools to manipulate information to follower.

To model the above induction, first we consider wage and reward scheme. The assumption of pre-determined return share should be replaced by the institutional restriction that the leader (manager) has the right to determine the shares. Consider an example, if the leader chooses project j in period t, since he believes that this project has large probability of success, and the follower, on the other hand, prefer to another project. Therefore, in fact current leader and the follower are potential competitors for future leader position, if the project lost, the complained follower will challenge the leader for manager position. If unfortunately on this period there is an undesirable shock on this project j, and the project lose, if the leader still believe in good prospect on this project, he will insist project j in period $t+1$. However, he also faces the potential threat from the follower, so in order to persuade the follower that the project is profitable, he will disguise that the project is success and give some compensation to the follower[13]. Because the follower is assumed to only learn the market outcome through the material payoffs, he will believe that the project is success in this period, increase the confidence on leader and update the estimated probability of success upward in next period. This increase in expectation increases the efficient productivity, consequently the output next period. This cheat strategy do effect as long as the leader spends his last penny or the leader lose self-confidence. If the leader's expectation is correct and he has enough wealth[14], this information-hidden strategy is feasible and probably optimal. This conclusion is applicable to any situation where the follower estimates less

[13] Here the leader's share is less than the follower. Hermalin (1998) shows that in a small team (the members is fewer than 6), because it's necessary for the leader to signal his information to motivate workers, he will receive less share than the workers.

[14] More restrictively, his discount factor is not too small.

probability of success than leader.

In the view of modern psychology, estimates is cognitive, while confidence is emotional, the complex interaction of these two sometimes results in dysfunctional outcomes. Here this dysfunctional outcome is the subjective distorted probability of success, rather than rational beliefs in standard economics[15]. If the real probability of success is equal among projects and other thing about agents are equal, a natural result our model displays is more confidence agent, who has higher π_n^i and higher efficient productivity, should take leader position and decide the direction of firm. This arrangement is strictly superior to any other allocation.

Besides, even if we relax the assumption about real probability, the above arrangement may be still optimal. For instance, consider $\Pr(\gamma^1 = 1)$ is a little less than $\Pr(\gamma^2 = 1)$, but only low efficient productivity agent B prefers project 2[16]. On the other hand, overconfidence agent A is optimistic on project 1 but pessimistic on project 2. If the efficient productivity of agent B is not sufficient high, the output of project 1, even the *ex post* return from project 1, will exceed that of project 2, and it's optimal to let agent A become the leader. Here we observe the tradeoff between estimates accuracy and overoptimistic. Indeed the probability of success of project 2 is higher than project 1, but how to verify it? Without further information, aggressive agent A will always choose project 1, and agent B even has no chance to put his belief into action to persuade agent A. This case demonstrates a type of "rational expectation", aggressive agent's belief is self-fulfilled in real world.

Is overconfidence leader always good for the firm? Not necessary, notice that in section 3 we show that extreme wrong belief together with overconfidence of the leader, i.e. $\Pr(\gamma^1 = 1) = 0$, leads to entire waste of effort. Though agent A has high efficient productivity, but since he is overconfidence on a wrong road, the team suffers from significantly worsen decision making. However, under other not-so-extreme situation, efficient productivity and probability of success are somewhat substitutes, and there is balance between the benefit of modest confidence and cost of bad market decision.

Similarly, albeit employer's high self-confidence may enhance the efficient productivity, sometimes the confidence-reduction strategy is optimal. Consider the following situation: suppose the confidence on the leader and self-confidence is negative correlated--------a story about how to command arrogant follower in real life. Let agent B is the arrogant guy who has incorrect beliefs on project 2, and pessimistic on project 2, which have higher $\Pr(\overline{\gamma})$, and leader agent A has sufficiently large efficient productivity and have more realistic beliefs on both project. It's in the interest of the leader, in effect also of the firm, to adopt confidence-reduction strategy, rather than confidence-enhancement strategy, to undermine the follower's self-confidence and increase his trust on the leader. "battle for dominance" exists in this example: a high self-confidence reduces effort or induces wrong type of efforts. (Benabou and Tirole, 2003). Thus, manager obtains trust to induce the efforts to the correct direction, at the expense of loss of self-confidence among

[15] Brunnermeier and Parker (2005) provide a model in which agents have incorrect but optimistic expectation. They find these utility-biased beliefs increase happiness.

[16] In the term of confidence we used above, we say that he lacks self-confidence, thereby he is somewhat more likely a pessimistic realist on both project.

members, and any strategy increases the trust for manager increases cooperation efficiency. The leader who earns enough confidence from others has the characteristic of *charisma*, in terms of Max Weber. On this respect, a manager has greater access to information unavailable, and he uses variety of means, such as rewards, word-of-mouth communication, to spread information to workers and build up authority.

Hence, so far a leader in an independent production team takes at least three tasks: determine the direction of team, move first in effort exert to coordinate actions, and determine the return share among team members. These tasks make him as a entrepreneur![17]

5 Concluded Remark

In this paper we have examined the determinant of leadership, in the circumstance of conformism preference and different perceptions of market outcome. Particularly, we illustrate the roles of productivity, degree of conformism and degree of optimism. The results are summarized in the following table.

Table 1. Qualities of Leader

Factor	Condition
Productivity	Not necessary high, depends on the difference in *efficient productivity*.
Degree of conformism	Low
Degree of optimism	Strong

We define efficient productivity as the product of expectation and productivity, and show this term is critical resource in production. Strong degree of optimism gives rise to leadership, since it is also a crucial component in effort provision. In terms of *access* in Rajan and Zingales (1998), here leadership in organization comes from the greater access to optimistic attitude and high efficient productivity.

Conformism is the central drive force of our model, this assumption permits the possibility of coordination in the absence of any material return. This mechanism is documented as a key result in Gachter and Renner's study（2003）, namely that the agents exhibit tendency to reduce the effort differential. However, coordination mechanism doesn't rely on conformism assumption, even the most common production function is able to reflect effort complimentary among agents[18]. If nobody is extremely pessimistic on one project, namely, perceives the probability of success as zero, it's reasonable to believe the model without conformism assumption is able to generate some similar quantitative results about the role of optimism.

By and large, our model ignores the issue of share in effort exert, and pays most attention to symmetric information and static case. However, in real world these play important roles in leadership formation. Greater access to market information provides the advantage to entrepreneur to manage worker's perception, and the rights to allocate return is just one mean among many. Further studies will spend more currency on the dynamic process of belief revision and the uses of variety of incentive scheme.

[17] This leader has no ownership or residual control. An opportunistic incentive that the leader appropriate all output for himself arises. But, we have reminded the readers that our model is more likely to analogue to circumstance of family-run firm, where is reasonable to consider this problem as trivial. Besides, Potters et al (2004) report experimental results that most leaders forego the temptation to appropriate all the team output and show installing leader substantially improve the team performance.

[18] For example, see Akerlof and Yellen (1990).

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