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Standards of Behavior and Time Generate Tacit Cooperation in a Hierarchical Relationship

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ABSTRACT. – This paper provides a game theoritic rationale for the use of standards of behavior in hierarchies. It proves that the common knowledge of such standards in a long term relationship generates tacit cooperation as long as the time horizon is far enough and that intermediary observations are feasible. Though mathematically similar to the well known reputation effect it is argued that the observed result is more robust with respect to the players incentive to view their relationship through such a formalization.

Coopération implicite dans une hiérarchie avec des standards de comportement

RÉSUMÉ. – On montre l'utilité de standards de comportement au sein des hiérarchies, à l'aide d'un modèle de théorie des jeux. Lorsque de tels standards sont communément connus par les parties engagées dans une relation de long terme, une coopération tacite se met en place, ceci, en dépit de l'impossibilité d'un engagement contractuel sur le comportement futur du principal ou de l'agent.

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1 Introduction

In many situations in which a hierarchical relationship occurs for the achievement of some project it is good practice for the supervisor to define intermediary steps. These intermediary steps provide an opportunity to check that everything goes as expected, cash payments are indeed made, well defined parts of the projects are achieved, and so on. In some sense one could say that a reference path has been agreed upon. Furthermore, the tacit agreement is that, if intermediary steps are fine, then the project will go on as expected but no definite commitment is made *a priori.*

Indeed the use of standards of behavior plays a key role to facilitate coordination within companies in which hierarchical relationship is the rule. The literature on administrative management gives many illustrations of such practices in terms of standard costs, output objectives, ROI, ... To an outsider it is always a surprise that these references are most of the time self-enforced in spite of the uncertainties and of the moral hazard opportunities which there may be. The traditional interpretation is one of bounded rationality and satisficing behavior (CYERT and MARCH [1963]).

This paper provides another interpretation for the use of standards of behavior. It shows that in a game theoritic context, reference and time stabilize behavior and eliminate opportunistic deviations. Under some minimal rationality conditions, an agent will accept to support extra costs to maintain the path on the reference because of the tacit agreement to go on. Once properly understood, this game theoretic rationale can be used in a normative fashion that significantly enlarges the usual applications of standards in management.

Indeed the specific context which suggested this paper develops one such application. Consider a capital investment project. The usual approach is to analyze it as a global package, including possible contingencies, and accept it if its discounted expected cash-flow is positive. The "reference method" relies on the implementation of a control procedure in which the value which is supposed to be created by the project is periodically reassessed (for a detailed presentation *see* KERVERN and PONSSARD [1990] as well as PONSSARD and TANGUY [1991] for discussion of a case study which triggered the development of this method). But, as opposed to traditional updating, the idea is to maintain the initial agreed upon value as a commitment as long as possible. The existence of this commitment greatly facilitates coordination and adjustments within the firm, say between the headquarters and the operational divisions. Furthermore it focalizes the attention on the elaboration of a stable reference that is, on a set of assumptions which should be immune to contingencies that can and should be taken care of as part of operational management. As a pratical tool this approach reminds of "target ROI" or "target price" approaches (*see* for instance KAPLAN and ATKINSON [1989], for a discussion of these tools). Yet this approach has several distinct features such as shared understanding of the basic underlying physical flows of the project, the existence of crucial coordination dates between parallel decision processes, etc... so that the global target is actually decomposed into more elementary ones the coherence of which has to be maintained. The construction of such a reference is quite a heavy organizational task. The actual course of action will inevitably generate many deviations from this reference, most of them are natural and do not endanger the overall economy of the project while others may eventually lead to its complete reformulation. The existence of a common reference facilitates this decentralized inference process so as to maintain coordination along the project life cycle. It should be noted that this coordination procedure operates under a control by exception mechanism, the setting of a set of possibly incompatible constraints being more important than the identification and the maximization of an objective function.

The corresponding situation will be modelled as a game between a supervisor and an agent which expertise relative to the project may a priori be high or low. Of course, once the project has started, the agent will know his own expertise and if it is low he may decide to compensate it by a larger effort. It will be supposed that the project can be decomposed into smaller ones and that for each small project a standard is observable by both parties. When this standard is observed it is assumed that the overall project is going on schedule from the point of view of the supervisor. Yet the achievement of the standard may be costly in the short run for the agent.

In such a situation it will be proved that a policy in which the supervisor agrees to let the project go on as long as the intermediary steps are met and accordingly the agent eventually incurs intermediary costs generate an equilibrium path as long as the time horizon is far enough. As the time horizon becomes shorter the probability of a collapse of the tacit coordination increases and a complete reformulation of the project becomes more and more likely.

From a theoretical angle the underlying model may be considered as a straighforward application of the theory of games with incomplete information and in particular of the well known reputation effect (*see* Kreps and Wilson [1982], Milgrom and Roberts [1982]). But the interpretation of the model is somewhat different. Most game theorists consider that the players actually face the game as it is described either by its game tree or by its normal form. Here these representations are only a joint model of a "real situation" and it is agreed upon that in many ways this model is an unrealistic representation of reality. Then it becomes crucial to explain why the players would agree that this simplication is useful and what usage it serves. The idea of the paper is that model building should be considered as a joint learning exercice the role of which is to elicit standards of behavior for actual action. In the context of this paper one will have to discuss why it may be meaningful for the players to decompose a large project into smaller ones, under what conditions is tacit agreement to go on enough to bring up tacit coordination, whether or not the uncertainty on the expertise of the agent can be detrimental to the relationship... In fact, it will be argued that the role of standards is far more robust with respect to these questions than the reputation effect is.

This paper is organized as follows. Section 2 defines the model. Typically the underlying situation is characterized as an investment project that on the average should be beneficial to both parties. Yet if the agent is not the perfect expert he may sometimes be unlucky so that to meet the required standards he would have to carry on an effort which could only be worthwile if the project goes on. Since both parties know this, it means that the project can be initiated only if the time horizon is long enough. In fact it will be proved that this is the only sequential equilibrium of that game. The corresponding results are detailed and proved in section 3. It should be noted that this game of incomplete information deals with two long players that is, both players stay in the game for its whole duration. This feature explains why the computations are somewhat more complicated than in most similar games in which the uninformed player is a different one at each stage (in particular the folk-theorem results derived by FUDENBERG and LEVINE [1989] do not apply here). Section 4 provides a discussion of the similarities and differences between this approach and the reputation effect.

2 The Model

Consider the extensive game depicted figure 1

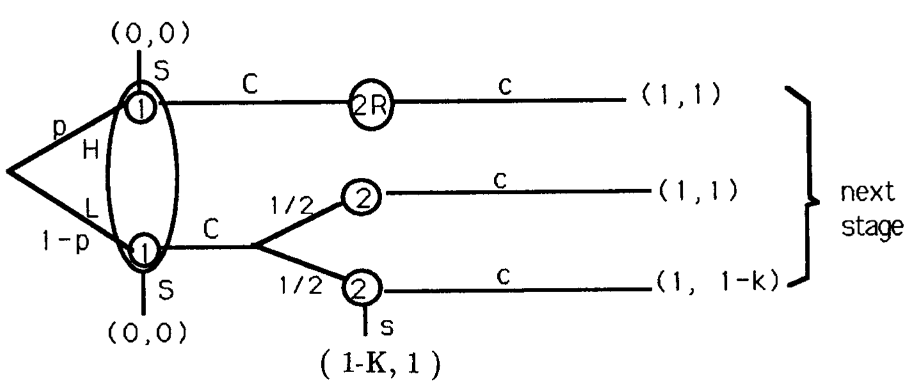

FIGURE 1

The Basic Reference Model.

This game is to be interpreted as follows:

(i) Player 1 and Player 2 may jointly operate an on going project for N stages.

(ii) Player 1 provides the money and Player 2 provides the expertise.

(iii) There is a probability p that Player 2 be the perfect expert for the project in which case he is indeed Player 2 R (R for reference Player), but there is a probability $1-p$ that he only be an imperfect expert.

(iv) If he is an imperfect expert, at each stage he may either be lucky (with probability 1/2), in which case everything goes as if he were the perfect expert, or he may be unlucky (with probability 1/2), in which case he may decide to stop the project (s) rather than to continue (c), the selection of s is an opportunistic move but it is revealing whereas the selection of c is costly and not revealing.

(v) The stage payoffs are such that: the project is worthwhile if everything goes fine (1, 1), an unlucky imperfect expert would rather stop ($k>0$), if Player 1 were sure to face an imperfect expert he would not initiate the project ($K>2$).

(vi) Observe that this game involves two types of chance moves. The first chance move on H and L occurs only at the beginning of the game whereas the second one occurs as many times as the number of stages to be played (without loss of generality one could change the probability distribution on the second chance move and adjust the payoffs accordingly).

To get further insight about this game consider the special case $p=0$, no repetition and take the expectation over the second chance move (*see* figure 2).

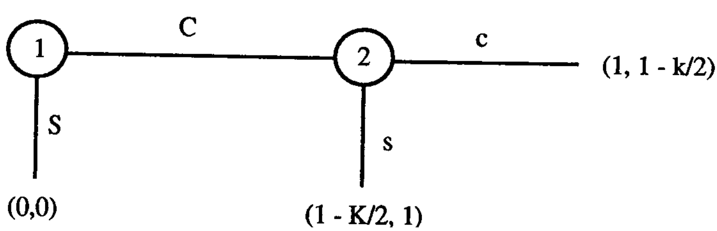

FIGURE 2

The Game for $p=0$

It is now apparent that if $K>2$ and $0<k<2$ then the unique Nash equilibrium of this game is (S, s) whereas the payoffs associated with (C, c) strictly dominate (0, 0). If the Players could commit themselves to (C, c) then this would be preferable to a non cooperative play. This is the well-known centipede game of Rosenthal.

Let us come back to the original situation. The fact that they cannot commit themselves may come from the non observability of the move c and from the fact that to write a contingent contract may be too complicated. Then the players are left with the possibility of defining a "proxy" as a standard of behavior. In this case it may mean to achieve an outcome of 1 for player 1. It is now common knowledge that not to satisfy this standard will interrupt the game because in that case it is also common knowledge that the outcome of 1 will not be achieved in the last period, and in fact in no future periods at all. In a sense, the model of the game is part of the accepted standard.

3 The Results

Denote by $\Gamma(k, p, \mathrm{N})$ the game described in section 2 in which K, k and p are parameters ($\mathrm{K}>2$, $0<k<2$, $0\leqslant p\leqslant 1$) and N stands for the length of the game that is, the maximal potential number of repetitions for the sequences of move (C, c).

A strategy for Player 1 can be associated with the sequence of probabilities $\lambda_n (0\leqslant\lambda_n\leqslant 1)$ of playing C whenever there are at most n remaining stages ($1\leqslant n\leqslant \mathrm{N}$). Similarly, a strategy for Player 2 can be associated with a sequence of probabilities $\mu_n (0\leqslant\mu_n\leqslant 1)$ of playing c.

Observe that by strict dominance it must be that Player 2's equilibrium strategy satisfies $\mu_1=0$. At the last stage, Player 2 never continues. As for Player 1, straightforward calculation shows that if $p\geqslant p_1$ he should select $\mathrm{C}(\lambda_1=1)$ and if $p\leqslant p_1$ he should select $\mathrm{S}(\lambda_1=0)$. The point of indifference p_1 is such that

$$0=p_1+(1-p_1)(1/2+(1-\mathrm{K})/2)$$

or

$$p_1=(\mathrm{K}-2)/\mathrm{K}$$

with belongs to [0, 1] since $\mathrm{K}>2$.

The idea is to prove that when this game is repeated then it only has one sequential equilibrium. Let us first describe the nature of this equilibrium qualitatively.

If p is close to 1, say between p_1 and 1, then it certainly pays for Player 1 to cooperate at the last stage. In a two stage game and if p is between p_1 and 1, it may be worthwile for Player 2 to cooperate. This comes from the fact that Player 2 knows that Player 1 will cooperate at the last stage. Thus it is possible for Player 2 to calculate the return of an investment that is, to accept the eventual extra cost of the current period in order to achieve an outcome of 1 for Player 1, given the benefits of going on one more period. Suppose this is positive. Now, can it be that Player 2 pays this extra cost for sure for p close but smaller to p_1? The answer is clearly no since otherwise the revised probability would not change, it would remain less than p_1 and Player 1 would not cooperate at the last period. Now could it be that Player 2 never pays this extra cost? Again the answer is no since otherwise, for p close enough to p_1, the revised probability would make a jump above p_1 and Player 1 would now cooperate for sure, and this would induce Player 2 to pay the extra-cost for sure. This logical contradiction can only be solved through the introduction of randomized strategies. The consequence of this randomization is that for a two stage game Player 1 is prepared to cooperate as long as p is between p_2 and 1 with $p_2 < p_1$. And so on.

The corresponding steps of this Bayesian idea are now detailed.

LEMMA 1 (Existence of a strictly dominating for Player 2):
In the game $\Gamma(K, k, p, N)$ it is a strictly dominating strategy for Player 2 to always stop ($\mu_n = 0$ for all n, $1 \leqslant n \leqslant N$) as long as

$$k > 2(1 - (1/2)^{N-1})$$

Proof: If Player 2 stops, the game ends immediately and his payoff is 1. Suppose he is given an opportunity to play then to continue will first generate a stage payoff worth $1-k$. The most that he can expect from the remaining $N-1$ stages is $1 + 1/2 + 1/4 ... + 1/2^{N-2}$, given that he is sure to stop at the remaining stages. Comparing the two payoffs gives the desired result. □

Denote by N_0 the smallest integer for which ($k < 2(1 - (1/2)^{N_0 - 1})$. Recall that $0 < k < 2$ so that N_0 exists).

LEMMA 2 (Last stages):
For $N < N_0$ the only equilibria are the following.
For Player 1 if $p \geqslant p_1$ then $\lambda_n = 1$ for all n, if $p \leqslant p_1$ then $\lambda_n = 0$ for all n.
For Player 2, $\mu_n = 0$ for all n.
Except for $p = p_1$, the equilibrium is unique.

Proof: Since Player 2 has a strictly dominating strategy it is enough to compute Player 1's best response. If Player 1 decides to continue, his conditional payoffs at each stage are independent of the stage. They are 1 and $1 - K/2$ for $p = 1$ and $p = 0$ respectively. The expectation over p is zero for $p = (K-2)/K$, his best response stragegy follows. □

LEMMA 3 (Initialization of the reference effect):
If $N = N_0$ and $p > p_1$ then $\mu_N = 1$.

Proof: Lemma 2 implies that whatever Player 2's initial move, Player 1 will continue for sure for the remaining $N-1$ stages. This is so because whatever Player 2's initial move, the conditional probability given the observation of c is bounded from below by p (only Player 2 has the option to play s, Player 2 R does not have this option). Then, and this is the key of the argument, strict dominance now implies that Player 2 selects c as an initial move in the game $\Gamma(K, k, p, N_0)$. □

From now on it is supposed that $N > N_0$.

Let us give a sketch of the proof of the main theorem that will be made formally in the next pages.

As the proof is by induction, we shall suppose that on can build a sequential equilibrium for the $N-1$ last stages. At the $N-1$ stage, if p is superior to p_{N-1}, then player 1 continues (*i.e.* plays C). Let us define p'_N such that the posterior probability on H is p_{N-1} given a prior of p'_N and the assumption that Player 2 plays $\mu=0$ (he stops).

One must notice, given a prior p and denoting $p_c(\mu)$ the conditional probability if c is observed given μ, that the lower μ is the higher $p_c(\mu)$ becomes after observing Player 2 continuing. That is to say that as soon as p is inferior to p'_N the revised probability $p_c(\mu)$ is always inferior to p_{N-1}. One must also notice that, whatever the value of μ, $p_c(\mu)$ is always superior or equal to the prior p.

Let us draw some implications of these facts. If the theorem is true for $N-1$ then:

– if $p<p'_N$ then Player 1 plays S, (because Player 2 plays s knowing that Player 1 shall play S at the next stage),

– if $p>p_{N-1}$, then Player 1 plays C (because Player 2 plays c knowing that Player 1 shall play C at the next stage),

– for $p'_N<p<p_{N-1}$, Player 2 plays a randomized equilibrium.

This defines $p_N=(K-1)p_{N-1}/K$ such that:

– if $p>p_N$ Player 1 plays C,

– if $p<p_N$ Player 1 plays S.

In the following, we shall adopt the following notations.

$p_{N_0}=(K-2)/K$,

for $N>N_0$, $p_N=((K-1)p_{N-1}/K$,

$p'_N=p_{N-1}/(2-p_{N-1})$.

THEOREM 4 (Reference effect):

The sequential equilibrium of the game $\Gamma(K, k, p, N)$ is unique (except for $p=p_N$) and can be fully characterized as follows.

For Player 1:

(i) $p<p_N$ then $\lambda_n=0$ for all n;

(ii) if for some $m\geqslant N_0$, $p_m\leqslant p\leqslant p_{m-1}$ then:

$\lambda_n=1$ for all n such that $m\leqslant n\leqslant N$

$\lambda_n=k/(1+k)$ for all n such that $N_0<n<m$

$\lambda_{N_0}=k/(2-(1/2)^{N_0-1})$ for $n=N_0$.

$\lambda_n=1$ for all n such that $1\leqslant n\leqslant N_0-1$;

(iii) if $p_{N_0}\leqslant p\leqslant 1$, then $\lambda_n=1$ for all n.

For Player 2:

(i) if $p\leqslant p_N$ Player 2 expects Player 1 to select S with probability 1, in case he observes C, his strategy is degenerated but to select μ_n such that $p_c(\mu_n)=p_{n-1}$ for all $n \geqslant N_0$ and $\mu_n=0$ for all n such that $1 \leqslant n < N_0$ give consistent beliefs;

(ii) if for some $m \geqslant N_0$, $p_m \leqslant p \leqslant p_{m-1}$ then:

$\mu_n = 1$ for all n such that $m < n \leqslant N$,

μ_n is such that $p_c(\mu_n)=p_{n-1}$ for all n such that $N_0 \leqslant n \leqslant m$,

$\mu_n=0$ for all n such that $1 \leqslant n < N_0$;

(iii) if $p_{N_0} \leqslant p \leqslant 1$, then $\mu_n = 1$ for $N_0 \leqslant n \leqslant N$ and $\mu_n = 0$ for $1 \leqslant n < N_0$.

The theorem is proved by induction. Observe that it trivially holds for all $n \leqslant N_0$ because of Lemma 2 and 3. Suppose it is true for $N-1$ then we first characterize the subset of p, $0 \leqslant p \leqslant 1$ such that a pure sequential equilibrium may exist, second we characterize the subset of p, $0 \leqslant p \leqslant 1$ such that a randomized equilibrium may exist. In each case we prove uniqueness, the proof of the theorem will follow.

Lemma 5 (Pure sequential equilibria):
Consider the game $\Gamma(K, k, p, N)$ and assume the theorem holds for $N-1$ then pure equilibria at the first stage exist if and only if $p < p'_N$ or $p \geqslant p_{N-1}$.

Proof: If $p < p'_N$, it has been seen that whatever μ_N Player 1's beliefs given the observation of c are such that $p_c(\mu_N) < p_{N-1}$. This means that in $\Gamma(K, k, p_c, N-1)$ Player 1 equilibrium strategy is always to stop: $\lambda_{N-1}=0$. Consequently Player 2 has no incentive to induce Player 1 to initiate the game and Player 1 equilibrium strategy can only be $\lambda_N=0$. Observe however that this does not imply that μ_N can be anything, in particular it cannot be that $\mu_N=1$ otherwise a contradiction would arise, Player 1 would initiate the game and then stop. This explains why μ_N has to be small enough so that $p_c(\mu_N)$ is smaller or equal to p_{N-1}, yet close enough to p_{N-1}.

If $p > p_{N-1}$, since $p_c(\mu_N) \geqslant p$, it is known that Player 1 will continue for sure at the next stage so by continuing Player 2 increases his total expected payoff by $(1-k/2)$ which is strictly positive. Player 2 should play c so that Player 1 should play C and this is the only way of playing.

Suppose now that $p'_N < p < p_{N-1}$ then, by construction $p_c(\mu_N=0) > p_{N-1}$. If $\mu_N=0$, Player 1 should continue at stage $N-1$ but then Player 2 should have played $\mu_N=1$. Suppose $\mu_N=1$ then $p_c(\mu_N=1)=p<p_{N-1}$ and it is now known that Player 1 should definitely stop at the next stage so that Player 2 best response is now $\mu_N=0$. No pure strategy equilibria can exist for such values of p. □

As a consequence of lemma 4 it follows that for $p'_N < p < p_{N-1}$ one can only have randomized equilibria with $0 < \lambda_{N-1} < 1$ and $0 < \mu_N < 1$. It is now a simple matter to show that such a randomized equilibrium is unique except at the value of p for which Player 1 will be precisely indifferent between S and C, and this value is exactly p_N.

Lemma 6: (Randomized sequential equilibria):

Consider the game $\Gamma(K, k, p, N)$. Assume the theorem holds for $N-1$, then, the randomized equilibrium at the first stage is unique (except at $p=p_N$) and occurs only when $p_N \leqslant p \leqslant p_{N-1}$. It is such that:

(i) $\lambda_N = 1$,

(ii) $p_c(\mu_N) = p_{N-1}$,

(iii) $\lambda_{N-1} = k/(k+1)$, if $N > N_0$.

(iv) $\lambda_{N-1} = k/(2-(1/2)^{N_0-1})$, if $N = N_0$.

Moreover for $p'_N \leqslant p \leqslant p_N$.

(i) $\lambda_N = 0$,

(ii) $p_c(\mu_N) = p_{N-1}$ is a consistent belief.

Proof: For Player 2 to randomize it must be that he is indifferent between a payoff of 1 and an expected payoff such that

$$1-k+(1-\lambda_{N-1}).0+\lambda_{N-1}[1+\lambda_{N-2}(1+\ldots+\lambda_{N_0}(2-(1/2)^{N_0-1})].$$

This is so because as long as Player 2 will be randomizing his stage payoff is one whereas it is $(2-(1/2)^{N_0-1})$ for the last stages. This proves that $\lambda_{N-1}[1+\lambda_{N-2}(1+\ldots+\lambda_{N_0}(2-(1/2)^{N_0-1}))]=k$ and so $\lambda_{N-1}(1+k)=k$, and finally $\lambda_{N-1}=k/(1+k)$ except for $N=N_0$ for which $\lambda_{N-1}=k/(2-(1/2)^{N_0-1})$.

Note that Player 1's probability of continuing remains exactly the same as the last stages come closer. Observe however that as soon as only the last stages are left (if they are), Player 1 will continue for sure whereas Player 2 will stop for sure if he is unlucky.

Now if Player 1 randomizes at stage $N-1$ it must be that $p_c(\mu_N)=p_{N-1}$ since this is the only point where Player 1 is indifferent. Given this condition let us compute Player 1's expectation at stage N. Observe that his conditional expectation at stage $N-1$ is zero.

If he stops he gets 0.

If he continues he gets

$$p.1+(1-p)(1/2+1/2(\mu_N+(1-\mu_N)(1-K))+0$$

that is

$$p+(1-p)(1-K/2+\mu_N K/2).$$

But $p_c(\mu_N)=p_{N-1}$ implies $\mu_N=2p(1-p_{N-1})/(1-p)p_{N-1}-1$ so that the value of p for which Player 1 is indifferent between stopping and continuing is precisely such that

$$p+(1-p)(1-K/2+p(1-p_{N-1})/(1-p)p_{N-1}-K/2)=0$$

or

$$p=(K-1)p_{N-1}/K=p_N.$$

Note that for $p=p_N$ we have through simple calculus $\mu_N=1-2/K(1-p_N)$, which proves that μ_N increases with N since p_N decreases with N. On the contrary, as already noted, λ_N is constant. □

Proof of the theorem 4: Since we used only necessary conditions to construct sequential equilibria and since the construction leads to a unique solution (except for $p=p_N$), this gives the desired result. □

4 Similarities and Differences with the Reputation Effect

It is first worthwhile to show that the game Γ(K, k, p, N) may have non sequential equilibria.

Consider figure 3 which gives the normal form of the game Γ(5, 1/2, 1/2, 2). Only undominated strategies for Player 2 are kept. Observe that $p_1=3/5$ and $p_2=12/25$ so that theorem 1 says that at the first stage Player 1 should play C, then Player 2 should randomize. At the second and last stage Player 1 randomizes whereas Player 2 always select s. The corresponding normal form equilibria is (1/2, 1/2, 0) for Player 1 and (1/3, 2/3) for Player 2.

	c	s
CC	(3/4,15/8)	(-1/8,7/4)
CS	(1,7/8)	(-1/4,1)
S	(0,0)	(0,0)

FIGURE 3

The Multiplicity of Equilibria in the Normal Form.

This normal form game has another equilibrium namely (0, 0, 1) and (0, 1). The fact that this equilibrium is not sequential can be interpreted as a time inconsistency in Player 1's reasoning. Start with statement 1 that Player 1 plays S because he expects Player 2 to play s whatsoever. This implies that had he payed C and observed c he would almost be sure to face a good guy so that he should again play C. This is self contradictory since it leads Player 2 to deviate and play c.

As a comparison with the reputation effect it has long been observed that in the Kreps and Wilson entry model there are several sequential equilibria and indeed the rationale to eliminate some of them and keep the good one is at the origin of much work on Nash refinements. This work reinforces the role of common knowledge not only on the game structure but also on the solution concept itself and this indirectly justifies our interpretation. In what way the players share any incentive to structure their relationship according to some basic rules embedded in a formal model becomes a major question for the analyst.

In this respect it is interesting to depict the impact of the reference effect through the graphs of Player 1's average expected payoff as a function of p and N (cf. figure 4). Observe that the reference outcome 1 is achieved almost everywhere as the number of stages goes to infinity. Consequently the value of information for Player 1 (v_1) is always negative. (This notion is defined as discussed in LÉVINE and PONSSARD [1977]). This is evidently true for Player 2 as well.

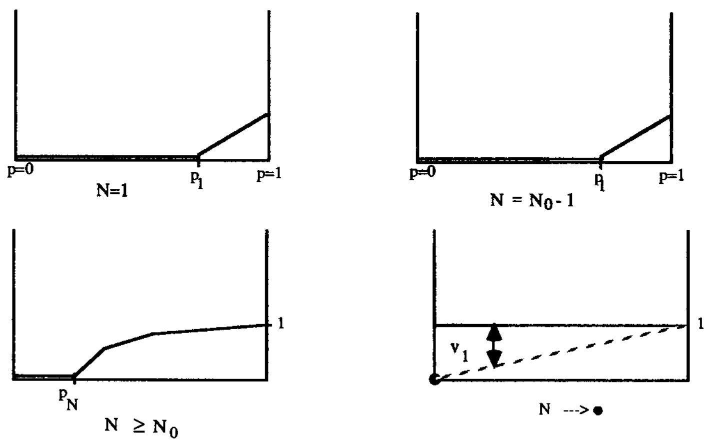

FIGURE 4

The Graphs of Player 1's Average Expected Payoff.

As for the equilibrium path it can be summarized as consisting of three parts: tacit cooperation for sure in the early stages, then tacit cooperation only with some probability (constant for Player 1, decreasing for Player 2), finally defection for sure for Player 2 and continuation as long as possible for Player 1. In the second part of the equilibrium path the net gains for continuing the relationship is clearly zero since the players are randomizing, yet the players exactly manipulate their strategies to generate a positive outcome in the early stages. In a loose way one could say that they agree to correlate their strategies over time and this certainly justifies the idea that the actual path embeds some joint rationality aspects as opposed to a pure individualistic interpretation of Nash solutions.

This feature of the model is particularly convincing in this case since it is in both players' own interest to do so that is, to accept the model as a reference. The corresponding graphs for the Kreps and Wilson's model show that the players have conflicting interests with respect to the value of information.

Similarily it can easily be seen that in this model the players have a similar incentive in reshaping a one shot model into an N shot model in which the payoffs are equally divided by N, whereas ordinarily this is not true in the reputation model.

Such differences explain why interpretations such as "entrants reason to forecast future actions on the basis of past behavior which in turns gives the established firm reason to prey to build a reputation" (MILGROM and ROBERTS [1982, p. 303]) would not apply here. One would prefer one such as "it is much better to incur an intermediate loss as long as compliance to the agreed upon standard will keep the project going on and generate future profit streams that overcompensate this loss, given that the project is already going on and that the others are reasoning in a similar fashion and that every body knows that". This latter interpretation is more in line with the idea of convention as defined by LEWIS [1969] whereas in the former one the idea of reputation could in fact be associated with "bluff" and that "bluff" should sometimes be "called", otherwise "La mariée est trop belle".

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