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WHY ARE INSTITUTIONAL TRANSITIONS SO DIFFICULT ?

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SOMMAIRE

I - <u>The evolution of institutions in long-run dynamics: a neglected area</u>

All through the '60s and '70s, economic theory has made definite advances in the understanding of pure market economies. In the Arrow-Debreu framework, all the necessary conditions for the existence of an equilibrium have been worked out. Nevertheless, if information is asymmetric, returns to scale are increasing and transactions decentralized and sequential, or if some contingent future markets are missing, then the equilibrium may no longer be unique or stable, and it may not even exist. In all these circumstances--very close to what is observed in existing economies--how do economic agents behave?

This problem is especially crucial when the agents play not only against Nature but between themselves: the kind of uncertainty they are facing does not derive from purely stochastic elements but from the complex interaction of the strategic behavior of others. In this context, standard maximization of expected utility or of profit does not help very much: so many configurations of other agents have to be contemplated that the rationality principle reaches its limit. Either it will exhaust itself in an endless search for an optimal strategy in response to other optimal behavior, or it will call for a <u>Common Knowledge</u> principle, which in fact is equivalent to a total transparency of the whole economic system for each agent.

This is where the need arises for <u>coordinating mechanisms</u>, whether obtained from laws, jurisprudence, private contracts,collective agreements or tacit rules. In the following part of this paper, we shall refer to all of these arrangements as either "conventions" or "institutions." Nevertheless "conventions" insists upon the more basic and abstract feature of coordination, "institutions" refers to the explicit and organic content needed in order to implement and enforce such conventions.

From a methodological point of view, these concepts provide a link between purely individualistic approaches and so-called holism. On one hand, in the absence of any institution, the maximization principle would be unable to deliver acceptable and realistic behavior on the part of individual economic agents. On the other hand, it would be useless and unrealistic to assume that collective rules totally determine individual strategy, especially in market economies and democratic societies, which are built upon the strength of individuals. Therefore, elaborating a theory of institutions might be an elegant way of overcoming both the sterility of an extreme version of methodological individualism and the mechanicism of a totally functionalist explanation in which the relative autonomy of each agent vanishes.

This paper takes a very preliminary step in that direction. It aims at presenting the contours, significance and power of institutions as a core component of any economic analysis, and still more of any social science investigation. Social relationships do shape the system of values, the visions and the aims of each agent and they even provide coordinating signals. Economic behavior is embedded in a whole social system, and no such thing as pure economic behavior exists. But new problems then emerge.

First, a general definition of "convention" has to be elaborated and confronted with other partial conceptions (part II). But if they are basically evolutionarily stable, how can they change through purely individual actions? Both theoretical models and some historical processes, such as the $5-a-day policy of Henry Ford, do confirm a strong structural stability ofconventions (part III). But nevertheless, counter-examples exist too. We will show, with the help of a very simple model, that selecting participants can indeed be an efficient technique for implementing a new coordinating mechanism and challenging an existing social norm. We will conclude by illustrating these points with a look at the surprising success of Japanese transplants in the United States (part IV). But of course, these are very provisional views to be investigated by much more detailed research.

II - Conventions as evolutionarily stable strategies

Since David Lewis, Thomas Schelling and Andrew Schotter's seminal works, a lot of attention has been devoted to what these authors called problems of coordination. This notion can be best understood by using the theory of noncooperative games. In this framework, a "pure coordination game" is defined by the following payoff matrix :

Player 1		Player 2: A	Player 2: B
	A	1 (top) / 1 (bottom)	0 (top) / 0 (bottom)
	B	1 (top) / 0 (bottom)	1 (top) / 1 (bottom)

GAME J0

In a game of pure coordination like the game J0, there is no conflict of interest: both players' preferences are perfectlyconvergent. They both prefer the outcomes (A,A) or (B,B), in which the utility derived by each is 1, to the situations (A,B) or (B,A). The players are indifferent to the intrinsic content of A or B: all that matters to any player is that he coordinate his behavior with that of his partner. Nevertheless, in spite of this convergence of preferences, the coordination between the participants is not trivial because two solutions are possible: either (A,A) or (B,B). Deductive reasoning is here of no help to these players. It leads to an infinite regress without being able to discriminate between the two Nash equilibria. Coordination problems cannot be solved exclusively on the basis of individual rationality, as economists normally understand it. This point has been thoroughly discussed by Schelling. He shows that the agents must draw on some common experience, historical or cultural, in order to escape the infinite regress of expectations. In the context of such common experiences, certain solutions will stand out in virtue of what Schelling calls "some intrinsic magnetism": "the intrinsic magnetism of particular outcomes, especially those that enjoy prominence, uniqueness, simplicity or precedent, or some rationale that makes them qualitatively differentiable from the continuum of possible alternatives" (Schelling [1960], 70). The capacity, shared by all the members of a given community, to recognize these specificities enables them to solve coordination problems. This capacity is something distinct from what economists define as rationality because it takes into account the existence of some past experience, of some common sense shared by my partner and myself. We will call it "situated rationality" in order to underline the role played by the contextual elements. Situated rationality succeeds in achieving coordination because it relies on something shared by the players.

A. Schotter, following D. Lewis, proposes to define a convention as a "regularity in behavior which is agreed to by all members of a society and which specifies behavior in the specific recurrent situation (defined by the game GO)" (Schotter [1981], 9). The fact that this standard of behavior is common knowledge makes it possible to resolve the coordination problem. A convention is a social arrangement which allows people to cooperate with each other. Once the convention is established, no agent has any incentive to deviate from it. The convention is self-sustaining: each agent will choose to follow it provided he expects his opponent to follow it.

One of the essential aspects of conventions is this self-enforcing quality. When one considers the case of a game with n players, rather than only two players, that means that, if there exists a small number of agents who do not conform to the convention, they will obtain a lesser utility than what they would have obtained by following the convention. This situation is a consequence of the fact that, in the coordination games, the utility obtained through the choice of a strategy [A] is an increasing function of the number of individuals having already chosen [A]. This characteristic is essential. It is found in many diverse situations: the choice of techniques (W. Arthur [1988] et P. David [1985]), threshold behavior (M. Granovetter [1978]), the theory of social custom (G. Akerlof [1980]) and "the economics of conformism" (S. Jones [1984]). These examples highlight the important role played by the pressure to conform, whether through its direct economic consequences, for instance the "increasing returns of adoption", or through purely social effects such as reputation or the feeling of belonging to a group. Our reflections here are meant to show how these <u>conformity effects</u> are closely bound up with economic dynamics. Contemporary analyses of the economic impact of interindividual comparisons (D. Kahneman, J. Knetsch et J. Thaler [1986]) and of the notion of equity (B. Reynaud [1991], L. Summers [1988]) point in the same direction. In the same spirit, H. Leibenstein [1982] emphasizes the role played by peer group pressures in the formation of an effort convention within a firm. He adds:
effort convention need not depend only on the peer group standard. It is also possible that some type of work ethic, orthe Japanese consensus system, creates conventions which are superior to some or all possible peer group standards. Thus there may exist a wide range of alternative latent solutions" (Leibenstein [1982], 95).

In many, but not all models, conformity effects lead to the emergence of a group consensus around one strategy, and therefore to the constitution of a "standard of behavior", to use von Neumann and Morgenstern's term. Conformity effects are then the basis for the creation of a convention as defined above. To analyze this process, it is useful to draw, as R. Sugden does, on the concepts proposed by J. Maynard Smith, especially on the notion of an "evolutionarily stable strategy" (ESS).

Let us consider a large population from which pairs of individuals are repeatedly drawn at random to play a particular two-person game which we will suppose to be symmetrical. We define E(I,J) as the expected utility derived by any player from a game in which he plays strategy I and his opponent plays strategy J. If p(t) is the frequency of I strategists at time t in the population and (1-p(t)) the frequency of J strategists, then an individual playing I will obtain the utility U(I,t), given by the following formula:

[1] $$U(I,t) = p(t)E(I,I) + [1-p(t)]E(I,J)$$

In the same way, one obtains:

[2] $$U(J,t) = p(t)E(J,I) + [1-p(t)]E(J,J)$$

We will posit the existence of a learning process such that p(t) increases if U(I,t) is greater than U(J,t), which can be formulated in the following way:

[3] $$p(t+1) - p(t) = G[U(I,t)-U(J,t)]$$

where G is a non-decreasing function, such that $G(x)>0$ if $x>0$.

An ESS is a strategy such that, if all members of a population adopt it, then no mutant strategy can invade the population. For I to be such a stable strategy, it must have the property that, if almost all members of the population adopt I, then the utility of these members is greater than that of any possible mutant; otherwise the mutant could invade the population and I would not be stable. Therefore I must be such that, for all p very close to 1, U(I) > U(J). One must therefore have, for all J different from I:

either [4.1 $E(I,I) > E(J,I)$

or [4.2] $E(I,I) = E(J,I)$ and $E(I,J) > E(J,J)$

These conditions were given by Maynard Smith and Price (1973). Following Sugden, one may extend the definition proposed by Lewis and define a convention as any ESS in a game that has two or more ESS's: "The idea is that a convention is one of two or more rules of behaviors, any one of which, once established, would be self-enforcing."

Consider the symmetrical game defined by the following payoff matrix:

Player 2

Player 1		A	B
	A	UA UA	0 0
	B	1 0	UB UB

GAME J1

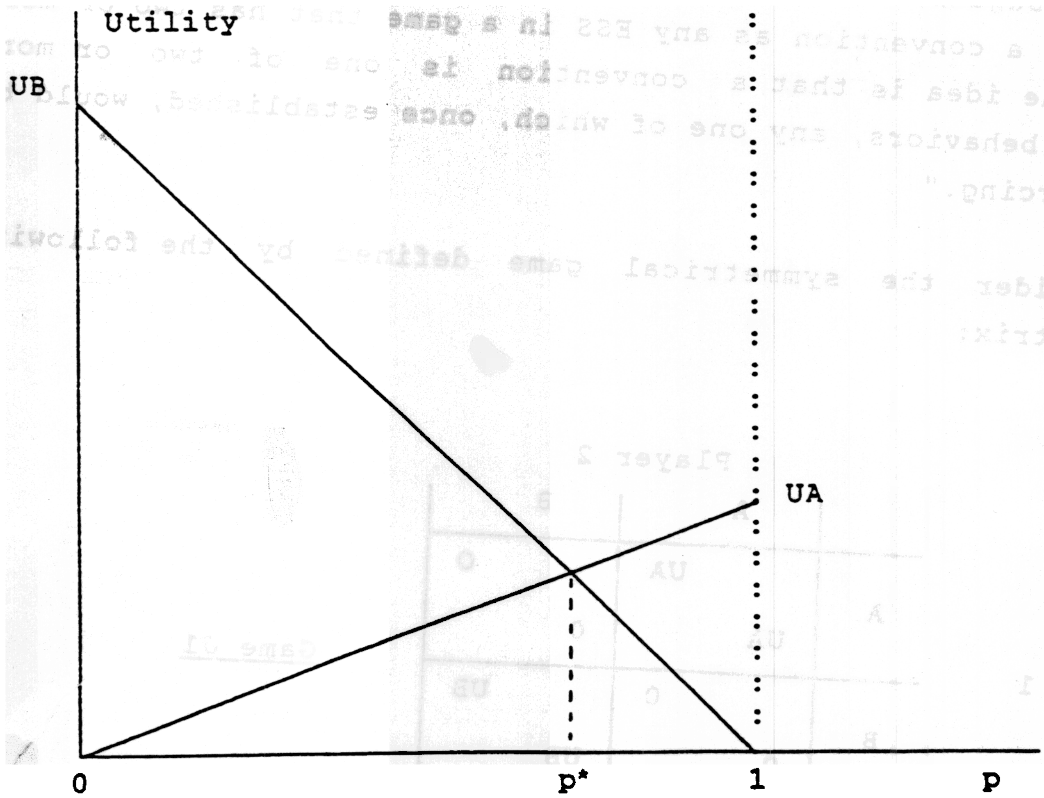
with $0 < UA < UB$.

It follows immediately from the condition [4.1] that [A] and [B] are both EES's. Then [A] is an ESS even if UA is less than UB. That means that it is possible for the system to get stuck in a situation that is Pareto-inefficient. If p is the proportion of A strategists in the population, we can write:

[5] $U(A,p) = p.UA$

[6] $U(B,p) = (1-p).UB$

The utilities U(A) and U(B) may be represented by means of the following graph:



There exists one and only one value of p, p*, such that U(A,p*) equals U(B,p*):

[7] $p^* = UB/(UA + UB)$

For $p > p^*$. U(A,p) is greater than U(B,p) even if UA is less than UB, because of the insufficiency of the number of agents having chosen [B] . If the convention [A] prevails, a proportion 1-p* of individuals would have to change their behaviors simultaneously in order for the system to converge on the convention [B]. The greater UB is, the smaller this proportion 1-p* is (equation [7]).

III - A paradox: how can such an evolutionarily stable convention change?

III.1 The first-order conditions against institutional change

This leads us to a rather pessimistic vision of the capacity of societies for self-transformation, even when competitive relations predominate. Why should a society change once it satisfies first-order conditions and thereby finds itself in a local optimum? In such a situation there does not exist a mutant strategy permitting a modification of the convention [A]. The extreme interdependence of the different strategies gives rise to exceedingly powerful pressures to conform, so powerful that they bring about an overall rigidity of the system. If there is no pressure to modify the prevailing convention, that is because the very existence of the externalities makes it impossible for any agents, taken individually or in small groups, to appropriate for themselves the benefits that would be produced by a shift to the superior convention [B]. Everything takes place as if the convention that people created took on a life of its own andopposed the community's desire for change. This pessimism is shared by Arrow, who writes: "It may be really true that social agreements ultimately serve as obstacles to the achievement of desired values, even values desired by all or by many. The problem is that agreements are typically harder to change than individual decisions... What may be the hardest of all to change are unconscious agreements, agreements whose very purpose is lost to our minds (Arrow [1974], 28)."

III.2 A strong confirmation: Henry Ford's $5-a-day policy reconsidered

The foregoing analysis has been fairly abstract. It is time to flesh out the argument and consider an exemplary case study: the initiative by Henry Ford to stop paying "the market wage" but to implement profit sharing, a wage-earner career plan and a series of labor-management devices in order to promote workers' commitment, higher achievement and less turn-over. The complex process generated by the $5-a-day proposal on January 4, 1914 is quite enlightening for the present analysis. (A previous paper by the authors detailed this episode, Boyer et Orléan [1991]).

First, this suggested wage convention did not represent a minor alteration of the prevailing one and could not be derived from a marginal and progressive shift of "the optimum wage convention" brought about by the actions of individual and rational agents in a stationary world. It was instead a major, or even radical, innovation: the financial newspapers clearly considered that this was a crazy and dangereous proposal which broke the rules and would lead to bankruptcy. Imagine paying wages almost twice the market rate and proposing to institutionalize what was previously considered to be a purely market relation.

Second, the benefits from such a social innovation could not be privately appropriated by Henry Ford. Of course the implementation of his plan produced a sharp drop in thepreviously enormous turn-over rate, but the wage increases were much higher than the savings generated by the decline in training costs due to a more permanent work force. This has been shown by D. Raff [1988]. In other words, this wage formula was not the equivalent of buying or inventing a more efficient machine, getting a higher return and thereby stimulating imitation and hence diffusion to other firms. Nobody imitated Henry Ford. Consequently, there emerges a compatibility problem: in the absence of joint implementation throughout the American economy, will not the innovation be abandoned?

This is indeed what finally happened, after much trial and error. First, the major changes induced by the outbreak of the First World War exacerbated the obstacles encountered, and obliged Henry Ford to amend his initial plan very significantly. Later when the 1929 depression came, the car manufacturer decided quite boldly to fight it by raising his workers' wages. Of course, unable to propel the American economy out of mass unemployment, he was obliged to set back his wages to more standard, i.e. market, values.

The American historical record suggests that Henry Ford's strategy totally failed at the individual level to impel this change in work intensity and wage rates. In addition, at the social level, new collective actors such as the United Auto Workers and business associations struggled to reach transitory compromises within the framework of collective bargaining. The Federal government and the various States came under pressure to pass new laws or to adapt existing legislation so as to protect workers and/or to organize labor market functioning (minimum wage legislation, for example).

The outcome was that these institutions channelled the various behaviors in such a way as to create a form of mimetic adjustment to an emerging new pattern. A Pareto-superior state then emerged, providing more profit to firms, higher wages and quasi-full employment to workers. But the irony is that the related institutions were a far cry from Henry Ford's original project: adversarial instead of paternalistic, sector- or economy-wide and not limited to each firm, collectively negotiated instead of being presented as a gift, and with indexing of wages to productivity rather than profit-sharing.

To sum up: in order to overcome their coordination failures, the firms and wage earners struggled and finally compromised over specific institutions. In turn these institutions gave rise to genuine and largely unintended coordination mechanisms, far different from those envisioned by Henry Ford.

III.3 What kind of device could overcome these obstacles?

Theoretical analysis as well as some historical examples suggest a large variety of mechanisms for coordinating radical changes in conventions.

i) A general collapse which indirectly destroys the existing structure of conventions. For example, the two World Wars turned out to be social laboratories for the emergence of new conventions and norms. Two cases must be distinguished. First case: UA stays strictly positive but falls precipitously. In such conditions the value p* comes very close to 1 such that, even if [A] remains an ESS, a very small group of mutants, 1-p*, is able, by adopting the strategy [B], to invade the population. Second case: UA becomes negative or null, [A] ceases to be an ESS and the system converges on unanimity around the strategy [B].

ii) External invasion: when a new group P' that has adopted the convention [B] suddenly enters into competition with the existing population P and its convention [A]. If, in the global population, P+P', the proportion of the newcomers P' having chosen [B] comes to exceed 1-p*. The individuals who have adopted [A] will convert to [B]. This possibility is all the more plausible in that UB is greater than UA and, consequently, that, following equation [7], p* is close to 1.

iii) Translation. This phenomenon is based on the existence of a certain compatibility between [A] and [B], in other words acertain capacity to translate the new convention into the terms of the old. An example of such a situation is what P. David calls "gateway technology." Formally this is expressed by the fact that E(B,A) is no longer null. Let E(A,B) equal 0 and E(B,A) equal UBA. The game thus obtained is then defined by the following payoff matrix:

Player 2

Player 1		A	B
	A	UA UA	UBA 0
	B	0 UBA	UB UB

GAME J2

with $0 < UA < UB$ and $UBA < UA$

Following [4.1], [A] remains an ESS. We can write:

$$U(A,p) = pUA$$
$$U(B,p) = pUBA + (1-p)UB$$

It follows that:

$$p^* = \frac{UB}{UA - UBA + UB}$$

One finds that, as UBA tends to UA, p* tends to 1. The more the convention [B] is compatible with the old one, that is to say the smaller is UA-UBA, the smaller is the minimal proportion ofindividuals, 1-p*, needing to choose [B] for the system to converge on [B].

iv) Collective agreement. As a result of collective deliberation, the community as a whole may recognize the superiority of [B] over [A] and provoke a coordinated change in all behaviors.

v) "Tinkering" (bricolage) : piecing new arrangements together from old ones.

IV. Internalizing the benefits: an example of successful transition strategies

IV.1 A model

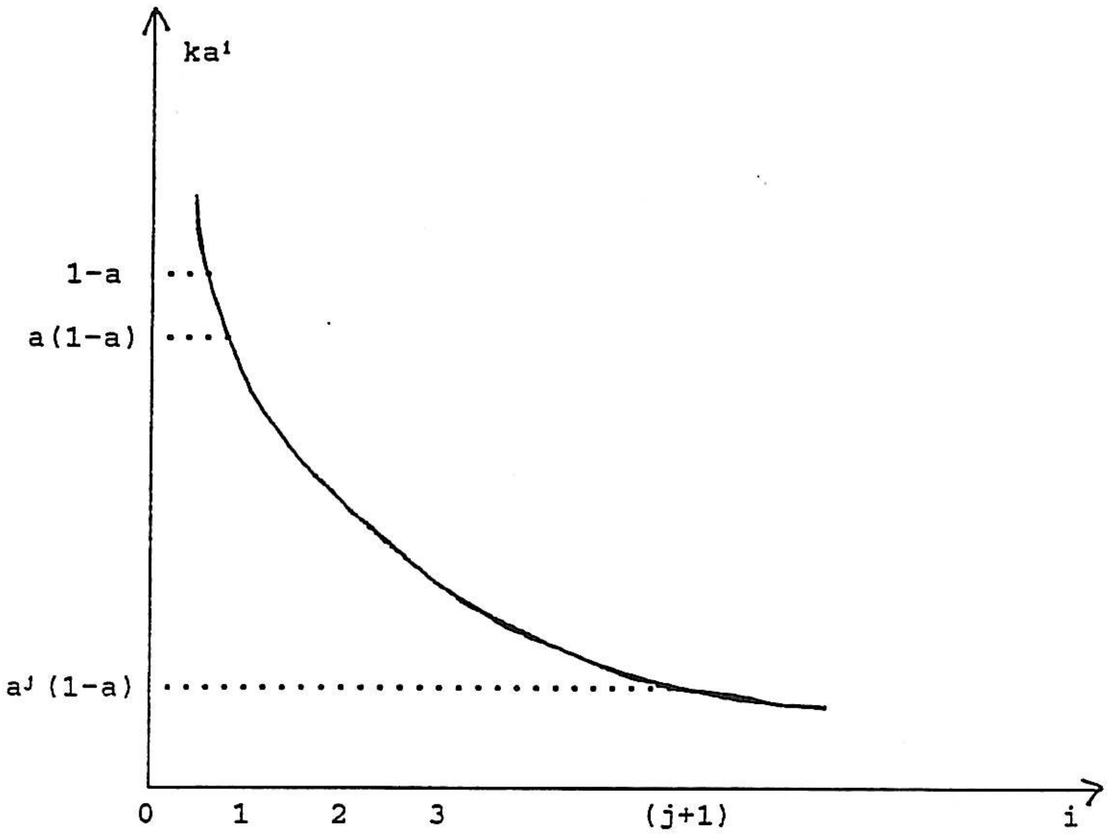
The negative results yielded from the ESS concept are all the more troubling in that there exist, historically, counter-examples testifying to the possibility of an endogeneous diffusion of a superior convention. It appears that the main obstacle to diffusion, in the formalism presented above, lies in the fact that the individuals having chosen the superior convention [B] find themselves indifferently confronting the whole of population [A]. It is this indifferentiation of relations which blocks the diffusion of [B]. In numerous historical examples, however, social mechanisms are observed which tend to restrict the range of interactions. That is what we are going to study now. In contrast to the foregoing analyses, we shall suppose that matching between agents does not take place uniformly throughout the space but respects a certain localization of interactions. More precisely, we will assume that the agents are distributed over the one-dimensional lattice of integers, Z, as it is shown by the following figure:

```
      __ * ___ * ___ * ___ * ___ * ___ ... ___ * ___ * ___ * _
i =            ...   -1     0     1    ...    t-1     t    t+1
```

In order to describe the pattern of interactions, let us consider the case of the agent i=0. It will be supposed that the probability of his interacting with another agent i, for i_1, is equal to ka^i with $0 < a < 1$ and $k = (1-a)/a$ so that:

$$\sum_{i>1} ka^i = 1.$$

For a equal to 0, the distribution $\{ka^i\}$ is then identical to the distribution (1, 0, 0, 0, ...). For $0 < a < 1$, the distribution is represented by the following figure:



The interactions of $i=0$ with the negative i's are formalized by the symmetrial distribution ka^{-i}. One may then calculate T(a), the average distance of interaction:

$$T(a) = \frac{1}{2} \sum_{i \neq 0} k a^{|i|} |i| = \frac{1}{1-a}$$

T(a) is an increasing function. For a equals 0, T(a) equals 1: the agent $i=0$ only interacts with his immediate neighbors to the right and to the left. When a tends to 1, T(a) tends to infinity. The limit case $a=1$ can then be considered as a goodapproximation of the preceding situation (part II) where the interactions were indifferentiated. So the parameter a measures the intensity of the localization effects. These effects are maximal for a=0. When a approaches 1, one approaches a quasi-uniform distribution.

We will assume that the pattern of interactions is translation invariant: a is independent of i so that all agents i react in the same manner to their environment. Let us assume that the game played by these agents is the one described by the payoff matrix J1 (page 6). In order to calculate the utility of any agent i, we first consider the utility U+(i) produced by the interactions of i with the i's who are to his right, and U-(i), the utility produced by the i's who are to his left. If we note j's choice X(j), with a value either A or B, the righthand utility is equal to:

$$U+(i) = \sum_{j>i} ka^{j-i} E(X(i),X(j))$$

where E(X(i),X(j)) is given by the matrix J1, namely:

E(A,A) = UA; E(B,B) = UB; E(A,B) = E(B,A) = 0.

We calculate the lefthand utility U-(i) in the same way:

$$U-(i) = \sum_{j<i} ka^{i-j}E(X(i),X(j))$$

The total utility U(i) is then equal to $\dfrac{U+(i)+U-(i)}{2}$.

Consider now the following spatial distribution where an isolated group of B strategists is surroundered by a population exclusively composed of A strategists:

```
    — A —— A —— A —— B —— B —— ... —— B —— A —— A —
i =   ......      -1     0     1   ....    t-1    t    t+1
```

Let us calculate the utility of the agent i=0. According to the figure, he has chosen [B]. His lefthand utility U-(0) is therefore null. His righthand utility U+(0) depends on the number t of agents having chosen [B]. Let us suppose that t $\geq$ 2. This gives us:

$$U+(0) = \sum_{i>t}^{t-1} ka^i\ UB = UB(1\text{-}at\text{-}1) \text{ for } t \geq 2$$

Therefore $U(0) = U+(0)/2$

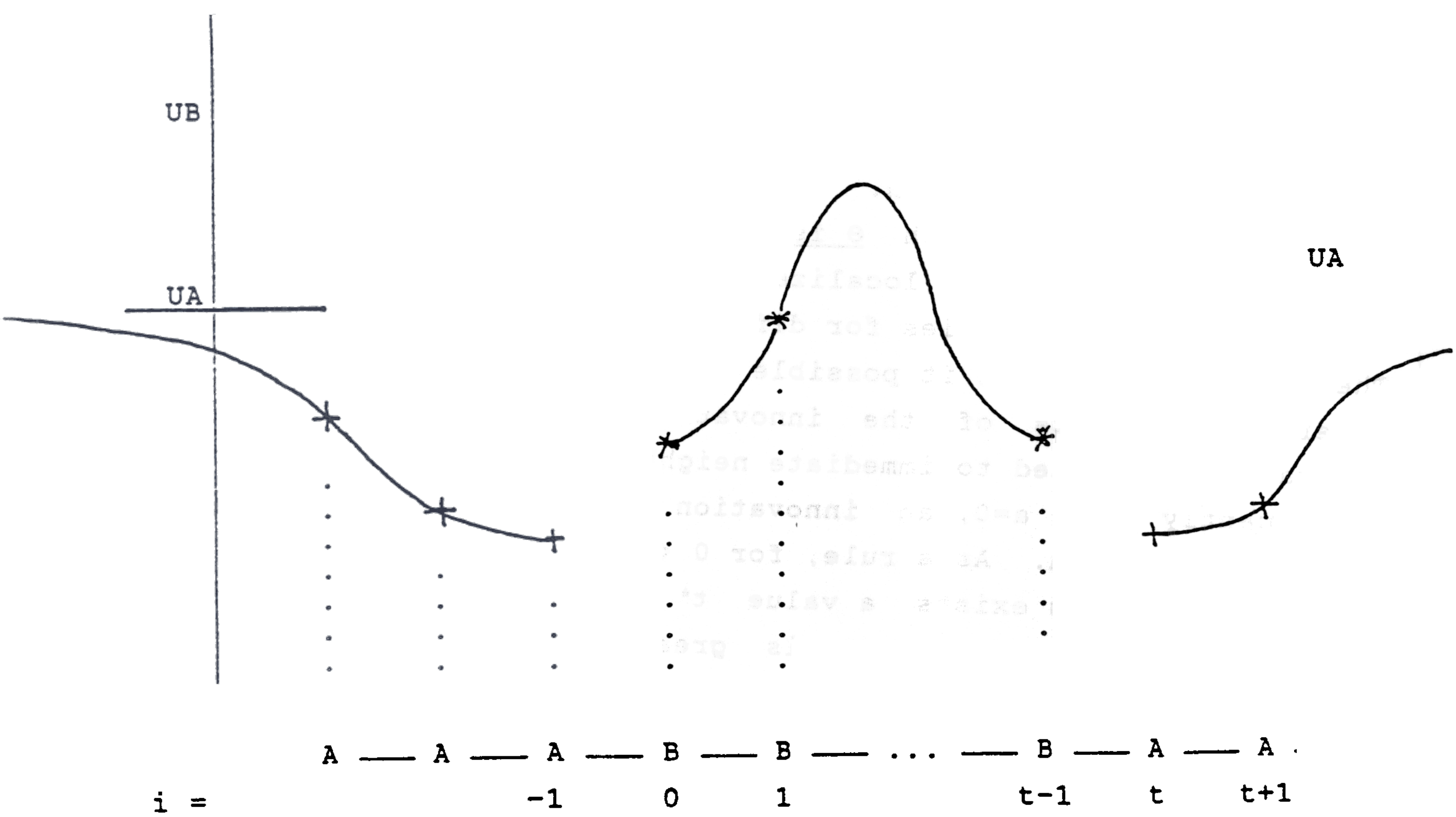
Now let us calculate the utility of the agent i=-1. His lefthand utility has the value UA since there is nothing but [A] to the left of i=-1. His righthand utility is given by the formula:

$U+(-1) = \sum_{i \geq t} UAka^i = U(A)a^t$, with $t \geq 2$.

This then gives us:

$$U(-1) = \frac{1}{2} UA\ (1+a^t)$$

We clearly have U(-1) = U(t) and U(0) = U(t-1). It can also be shown that the utility has the following form :



We will suppose, in accordance with intuition, that there is diffusion of the innovation [B] as soon as U(0) = U(t-1) isgreater than U(-1) = U(t). In other words, it is the agents on the border between the space of the [A]'s and the space of the [B]'s who are determinant. For the sake of convenience, let us denote as $\Theta(a,t)$ the double of the difference between U(0) et U(-1).

$$\Theta(t,a) \quad UB(1-a^{t-1}) - UA(1+a^{t})$$

$$= UB - UA - a^{t-1}(UB+aUA) \qquad t \geq 2$$

First, Θ is an increasing function in t. That means that the bigger the group having adopted [B], the greater the relative utility of the agents in that group and the greater the possibilities of diffusion. Second, we obtain the fundamental result according to which Θ is a decreasing function in a. The smaller a is, the more localized are the interactions and the greater the possibilities for diffusion of the innovating group. The localization makes it possible to internalize in part the beneficial effects of the innovation. For a=0, that is for interactions limited to immediate neighbors, is equal to UB-UA. Consequently, for a=0, an innovation [B] will be diffused if UB is greater than UA . As a rule, for $0 < a < 1$, it can be shown that there always exists a value t* = t*(a), such that, if the size of the innovating group is greater than t*, then Θ is positive. So, a superior convention is able to invade a population if this new convention can implement social filters in order to localize the benefits generated by the interactions.

t* is a strictly increasing function of a which tends to infinity as a tends to 1. Here we come up once more with the previous result, namely that when there is indifferentiation of relations, the innovation [B] cannot be diffused. For a=1, the function Θ is equal to -2UA, always negative. It will be understood that it is in the interest of an establishedconvention to impose a strong universality constraint on its potential competitors. Conversely, it is in the interest of a new convention to localize its effects and invade progressively the whole space.

Let us confront our theoretical framework with some historical "stylized facts" and consider now a very contemporary issue: what happens when conflicting conventions confront one another in the same territory, when local conventions face invasion by foreign innovations?

IV.2 The surprising success of Japanese transplants in UK and US

No better case can be found in order to scrutinize some of the basic conditions for an endogenous change in work organization, management style and wage system. In the early eighties, many observers were led to believe that the Japanese transplants would not succeed outside their homeland, since the Japanese model seemed too closely tied to a specific and idiosyncratic system of values, customs and tacit norms. They forecast that the Japanese model would lose a lot of its competitive edge. In the United Kingdom, balkanized and adversarial craft unions would impede any improvement in the overall efficiency of the factories taken over by Honda, Toyota or Nissan. In the United States, the UAW strategy as well as the highly individualistic values and the money grubbers and short-run financial views of Wall Street would wipe out most of the potential productivity increases deriving from the implementation of the Japanes management style.

Now, in 1991, many detailed studies and even general surveys provide a much more balanced view of the exportability and resilience of the set of conventions behind the surprising success of these transplants. Not only have many, if not all the components of the genuine "Toyotist" model been implemented, butglobally the market share of Japanese transplants (for example in the US car industry) has significantly increased, so drastically that now some expect that the American branch of Toyota will overtake the Ford Motor Company by the end of the decade. Futhermore, the success of the Japanese firms has put pressure on American institutions, especially in industrial relations and labor regulations: some analysts have noticed a "Nipponization" of the American legislation. Consequently the economic challenge from Japanese transplants has progressively altered some basic features of the American economy, and, in a second stage, has triggered an adjustment, or in some cases, a new direction, in institutions, laws and the ideal management style. A slow and still embryonic structural change is underway and has to be explained.

The diffusion model presented in IV.1 offers some hints which seem to fit rather well the stylized facts about the distinctive features of Japanese transplants with respect to other firms, both homegrown American companies and the branches of European multinationals.

Primarily, the managers multiply signals about their intent to implement a cooperative strategy with the white and blue collar workers: no absolute barriers between the bosses, the controllers and regular workers; promotion of an apparently egalitarian approach; homogeneous representation of workers; efforts to convince everybody that employers and employees are playing a positive and increasing sum game and not a prisoners' dilemma, as it is usually felt to be by both sides in North America, the UK, Italy or France.

The birth and growth of most transplants follow a definite pattern. The first workers hired are carefully selected according to their motivation and aptitude to be incorporated into nascent firms. For core managers, controllers and technicians, very intense training is offered, frequently associated with a stay and a working position within one of the parent factories in Japan. Clearly the aim is to engineer thediffusion of the initial cooperative attitude. A careful selection of the incumbent workers--itself made possible by the high unemployment rate, and the choice of greenfield areas in Britain, or by preventing the organization of unions in the United States--makes quite sure that the initial cooperation will not be destroyed by insiders motivated by the opportunistic search for a free lunch. The Economist (February 23, 1991) states that "Japanese firms do not blend into their surroundings... Handling and recruiting people is a task at which the Japanese are famously different from their American and British counterparts." In reference to the model, this means that social filters have to make the transplants a semi-closed entity: only the required characteristics may be admitted within in order to promote a high probability a of being surrounded by cooperatively oriented workers. Below the threshold $a > a^*$, the internal cooperative norm would be destroyed by its contact with abrasive individualistic society-wide values.

But, finally, the transplants' challenge to the American style of manufacturing has to be explained. The second major result from the model can now be brought into play: the internalization of the related competitive edge allows the Japanese firms to enjoy faster growth. Extra workers are hired, or new factories opened, thus extending the size of the population, t. Again, if the initial advantage is large enough and not eroded, but, on the contrary, increased, then the limit size t* is obtained, and the new convention is bound ultimately to replace the old one. It would be a silent but powerful process of "Nipponization" of the British and American economies.

Just for the sake of completeness and in order to prevent any feeling on the part of the reader that the authors are succumbing to a Japanomania, let us mention some limiting or inhibiting factors that militate against such a smooth transition. First, the complete efficiency of the model supposes that the American subcontractors are willing to accept strong interaction with or even interference from the Japanesetransplants. Can they learn and accept the Japanese style sufficiently quickly not to stop the cumulative process? Second, some production processes (for instance that of engines) have large fixed costs, which call for a minimum market size. If that size is not attained, the whole process could possibly collapse, or at least grind to a halt. Finally, at a more societal level, can American businessmen, workers and politicians accept such an alteration of their styles, values and institutions? Given the subtle chemistry of the complex set of norms, the answer is not clear... and will not be given here.

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