

# WHY ARE INSTITUTIONS THE 'CARRIERS OF HISTORY': PATH DEPENDENCE AND THE EVOLUTION OF CONVENTIONS, ORGANIZATIONS AND INSTITUTIONS

PAUL A. DAVID<sup>1</sup>

Three main analytical insights into the conditions that give rise to path dependence in economic phenomena generally can be applied to answer the question why history matters so vitally to the form and functioning of human organizations and institutions, a question which the 'new institutional economics' has not explicitly addressed. The first has to do with the role of historical experience in forming mutually consistent expectations that permit coordination of individual agents' behaviours without centralized direction. The second is concerned with the resemblance between highly durable capital assets and the information channels and codes required by multiperson organizations in order for the latter to function with minimal viable efficiency. The third involves the interrelatedness among the constituent elements of complex human organizations and the constraints on choices about particular rules and procedures, which result from pressures to maintain consistency and compatibility within the larger structure. A concluding consideration of the suitability of applying metaphors from evolutionary biology to the phenomena of institutional development leads to some critical qualifications of the analogies drawn between technological systems and human organizations throughout the discussion.

## 1. THE NEW INSTITUTIONAL ECONOMICS AND HISTORY

Most of us are inclined to view present-day social conventions and the more consciously formalized rule structures that govern the functioning of organizations and institutions, including many legal institutions, as 'carriers of history'. By this I mean that we suppose many of them to have evolved into their present forms from recognizably similar structures that came into existence at some time in the past to satisfy some once important social purpose.

The commonplace explanation of the widespread convention of extending an open hand in greeting a stranger is thought to have derived from the need to show that one was not bearing a weapon, such as knife or club or a rock. We suppose it to be natural that the convention, once highly functional, at some point became purely customary and persists even though the original function is no longer important.

<sup>1</sup> Department of Economics, Stanford University, Stanford, CA, USA and All Souls College, Oxford, UK.

Another instance of such persistence can be cited in the case of a formal institution: the US Federal Reserve System today—unlike the central bank of other countries—comprises 12 regional banks, rather than a single central bank (possibly with branches). As White's (1983) historical account makes plain, this and other features of the 'Feds' organization reflects the influence exercised in shaping the original 1913 legislation by the national banks and the clearing house associations located in what were then the main financial centres.

In asking why such modes of historical explanation should be accepted as compelling, I am implicitly drawing a contrast between the 'genealogical' explanatory mode and the 'teleological' method introduced by Aristotle and especially favoured by neoclassical economists.<sup>2</sup> The former links the present state of arrangements with some originating context or set of circumstances and interpolates some sequence of connecting events that allow the hand of the past to exert a continuing influence upon the shape of the present. By contrast with that intuitive mode of historical explanation, economists typically have followed Aristotle at least in supposing that the present shape of things can best be explained by considering their function and particularly their function in some future state of the world. The question, then, is why should an exception be allowed by economists for conventions and institutions?

Of course, not all economists would allow such an exception. During the 1970s the emergence of the so-called 'new institutional economics' proposed to explain many current features of organizations and economic institutions in a thoroughly neoclassical fashion, by citing the respects in which these represented presently efficient solutions to resource allocation problems.<sup>3</sup> Much of the work undertaken in this new genre was avowedly inspired by Coase's (1960, 1984) insight, that when it was costless to engage in exchange transactions, the specific details of the relevant institutions would hardly matter, because private parties would readily contract around existing arrangements whenever opportunities for Pareto-improving exchanges presented themselves. Williamson's (1975, 1985) contributions, particularly those that have elaborated the 'transactions cost approach' to explaining the internal organization of firms and the forms of contracting devised by economic agents to cope with problems created by asymmetric information, sunk costs ('asset specificity') and bilateral monopoly, pursued the implications of the obverse side of Coase's (1960) original insight. Where transactions were costly and the monitoring of performance and third-party enforcement of contracts was problematic, organizational arrangements would indeed matter and could be expected to be made the subject of conscious, deliberate exercises in 'institutional mechanism design'. But, whether the focus falls upon the supposed evolutionary tendency towards efficiency in the development of property rights and other, macroinstitutional arrangements or upon the conceptualization of a firm's internal organization and mode of doing business as the consequences of rational, optimizing decisions, the implicit presumption that institu-

<sup>2</sup> This contrast and its relevance to the relationship between historical analysis and the dominant tradition in economic theory, is developed further in David (1992c).

<sup>3</sup> On the contrasting traditions of genealogical and teleological explanation in Western thought, and their influence on the social sciences, see David (1993c). For surveys of the modern economics treatment of institutions, see Hutchinson (1984), North (1984) and Matthews (1986).

tional arrangements are perfectly malleable seems to be a persistent predilection on the part of many mainstream economists.<sup>4</sup>

There also have been some students of economic history who embraced the principle that to understand institutional change the key lay not in the past so much as in the present and future, in the sense that institutional arrangements were plastic and, therefore, could and would be readily adapted to achieve efficiency wherever people saw that doing so would be to their economic advantage. North—beginning in collaborations with Davis and with Thomas—took an early lead in advancing that style of interpretation for the history of institutional arrangements in early modern Europe and the United States (Davis and North, 1971; North and Thomas, 1973). In subsequent works, North (1990, 1991) acknowledges the difficulties of trying to rigorously extend the paradigm of competitive markets to encompass the creation and use of institutions and organizations and allows that distributional as well as efficiency considerations often play an important role. Nevertheless, North has been consistent throughout in maintaining an orientation to his chosen subject that is fundamentally teleological: ‘Throughout history institutions have been devised by human beings to create order and reduce uncertainty in exchanges’ (North, 1991). On this view, it is the end purpose, the function for which they were intended and which they fulfilled that enables us to understand institutions and institutional change.

Overlying this presentist and forward-looking explanatory orientation is the vaguely contradictory emphasis that North (1991, p. 98) lately has begun to place on the old, backward-looking theme that institutions are what I have referred to as ‘carriers of history’. He writes that institutions

‘evolve incrementally, connecting the past with the present and the future; history in consequence is largely a story of institutional evolution in which the historical performance of economies can only be understood as a part of a sequential study . . . .’

But, we are entitled to ask, why in the lives of human organizations is the present coupled so tightly with the past? What is it about institutions that causes them to ‘evolve’ incrementally, like biological processes of evolution that work largely with the materials that are—so to speak—ready to hand? These questions are not the sort that the many contributions of North and the new economic historians of

<sup>4</sup> Like the members of many other intellectual movements, the practitioners of ‘new institutional economics’ have devoted a substantial part of their efforts to pointing out the novel aspects of their work and the respects in which they wish to be distinguished not only from one another, but especially from colleagues who are content to drift along in ‘the mainstream’. The mainstream itself, however, forms an inconveniently fluid point of reference. The total preoccupation with the implications of departures from the conditions of competitive general equilibrium—notably, those due to incomplete information and imperfect competition—that was once distinctive among the ‘new’ institutionalists, has been (for some time) quite ubiquitous within the modern economics profession. Therefore, I find myself inclined to concur with Posner (1992) in the judgement he has recently expressed on this point, if not with the full text of his supporting brief:

‘It seems to me that the new institutional economics is a matter very largely of selecting from the tool bag of modern economic theory those tools (thought) most apt for the study of the narrow though important range of problems, involving impediments to transactions, on which the new institutionalists have chosen to focus’.

institutions have thus far chosen to address—explicitly or otherwise. Nor, for that matter, will you find them directly answered in any of the frequently cited works by other, more theoretically inclined lights of the new institutional economics. Evolutionary change, it would appear, is now taken by all concerned to be an obvious attribute of institutions. The exact workings of the evolutionary process, however, have remained sketchy at best. It would be unwarranted and uncharitable to suppose the lack of explicit discussion in that regard has been in any way ‘strategic’. Nevertheless, such vagueness does mask potential problems of reconciling the specific mechanisms of incremental institutional adaptation with the other favoured simile that continues to be employed. The latter envisages a ‘market’ for innovations involving institutional and organizational arrangements, on which new forms are available to ‘demanders’ in infinitely elastic supply (with regard to the variety of functional and distributional attributes) and existing arrangements remain completely and continuously malleable for reshaping response to the profit-seeking motives of economic agents.

Inasmuch as I reject the conceptualization just described, reticence in confronting the question of why it is better to think of institutions as undergoing evolutionary development strikes me as unnecessary as well as intellectually unsatisfying. I agree wholeheartedly with North’s (1991) position that, because institutions are the carriers of history, history must matter in the functioning of market and non-market economies. Yet, the more strongly one wishes to assert that the slowly evolving institutional matrix of markets constitutes a fundamental historical constraint on the performance of market economies, the more essential it seems to try to understand why ‘history matters’ in the evolution of organizations and institutions, themselves.

That is the simple goal towards which the following pages are directed. To attain it, at least in a first approximation, has become much more straightforward as a consequence of the general insights that have been gained recently into the phenomena of ‘path-dependence’ in stochastic dynamical systems (see David, 1985, 1987, 1988, 1993b; Arthur, 1989, 1990). A process whose outcomes are path dependent is ‘non-ergodic’: systems possessing this property, if they remain structurally unperturbed, are unable to shake off the effects of past events and do not have a limiting, invariant probability distribution that is continuous over the entire state space. In other words, they are drawn into the neighbourhoods of one or another of several possible ‘attractors’, selections among the latter being made, typically, by the persisting consequences of some aleatory and transient conditions that prevailed early in the history of the process. The counterpart of the property of path dependence in the case of deterministic systems manifests itself most immediately through the (equilibrium) outcome’s ‘extreme sensitivity to initial conditions’.

While all that may sound esoteric and rather formidable, its relevance here is quite straightforward and can be presented in the comparatively unforbidding jargon of workaday microeconomics. I perceive there to be three main analytical insights concerning the roots of path dependence in economic phenomena which can take us a long way towards understanding why history matters so vitally where human organizations and institutions are concerned. The first has to do with the role of historical experience in the formation of structures of mutually consistent expectations

that enable coordination to be achieved without centralized direction of the actions of individual economic agents. The second is concerned with the resemblance between the information channels and codes that multiperson organizations require in order to function with even a minimum viable level of efficiency and durable physical capital goods. The third involves the implications of strong complementarities, or interrelatedness—and the consequent necessity of achieving consistency and compatibility—among the constituent elements of complex human organizations.

The next three sections will develop these points *ad seriatim*, as a basis for considering some of the implications for institutional dynamics, in Section 5. A concluding section offers some comments on the suitability of the evolutionary metaphor applied to institutions and organizations and qualifies the analogies that emerge throughout my discussion between technological systems and human organizations.

## 2 MUTUALLY CONSISTENT EXPECTATIONS AND COORDINATION

One view of the social role played by expectations can be formulated this way: a socially established ‘convention’ is merely a way of aligning individuals’ expectations in order to better enable them to select one among a multiplicity of possible solutions to a coordination game. A wide variety of social behaviours and linguistic expressions are referred to as ‘conventions’ to indicate their informal, *de facto* status and to suggest their undesigned, ‘spontaneous’ genesis (Sugden, 1990). Achieving coordination may, equally, be a matter of organizational design, whence one arrives at the related proposition that reciprocally held expectations are likely to be central also to the functioning of formal, ‘institutionalized’ patterns of social interaction. Let us examine each of these formulations of the point in turn, beginning with the emergence of beliefs about the information behaviours of other economic agents.

### 2.1. Conventions

The distinguishing attribute of so-called ‘pure’ games of coordination is that any solution is as good as any other, the point being solely to achieve a congruence of actions among the players. Picking a place to meet friends ‘downtown’, without prior negotiation, thus, is a paradigmatic coordination game in which the complete arbitrariness of the meeting point is evident. ‘Conventional’ solutions to pure coordination problems, such as whether to drive on the left or on the right side of the road or whether to pass to the port or the starboard at sea, are of this character; the alternative conventions are not clearly (Pareto) rankable in terms of their intrinsic economic efficiencies. Yet, there is a wider field of situations which partake of the general character of coordination games, in that the outcomes of correlated actions are preferable to those arising from the absence thereof. And, correspondingly, one is led to the more general observation that the creation of a consistent structure of mutual expectations about the preferences, rationality and actions of agents can help in achieving rational (non-arbitrary) solutions to coordination problems. For, what matters above all, obviously, is that the players, somehow, must possess the same, consistent expectations about the ruling convention and that they must be mutually

aware of the fact. To be effective, which is to say ‘to have force’, a convention must attain the status of being ‘common knowledge’: each player must know that the other players know, that he or she knows, that they know, that he or she knows, that . . . and so on . . . the location of ‘the’ downtown place to meet. The question then becomes: How do such jointly held expectations become established?

The philosopher Lewis (1969, p. 33), in addition to introducing a formal definition of the property of something being ‘common knowledge’, has made the insightful observation that shared historical experiences and conscious perceptions of a shared past provide one of the principal means by which groups of people justifiably may form a system of consistent mutual expectations when they are not readily able to arrive at a common course of action via direct discussion of the problem that is facing them.

According to the classic observations of Schelling (1960, pp. 83–118, 291–303), when people who cannot communicate are confronted with a pure coordination problem, they try for a coordination equilibrium that is in some way ‘salient’—one that distinguishes itself from the other candidates by possessing some unique and remarkable feature, which need not be held to have any intrinsic value. So, precedent emerges as an important source of salience in such contexts: a solution to a coordination game can acquire ‘conspicuous uniqueness’ simply by having been part of the players’ shared history—because they remember having reached it on a previous, similar occasion.

Thus, through the reinforcement of mutual expectations, ‘accidents of history’ may acquire a status of surprising durability in human social arrangements. As Lewis (1969, pp. 39, 41–2) put it:

It does not matter *why* coordination was achieved at analogous equilibria in the previous cases. Even if it had happened by luck, we could still follow the precedent set. . . . Each new action in conformity to the regularity adds to our experience of general conformity. Our experience of general conformity in the past leads us, by force of precedent, to expect a like conformity in the future. And our expectation of future conformity is a reason to go on conforming, since to conform if others do is to achieve a coordination equilibrium and to satisfy one’s own preferences. And so it goes—we’re here because we’re here because we’re here because we’re here. Once the process gets started, we have a metastable self-perpetuating system of preferences, expectations, and actions capable of persisting indefinitely.

## 2.2. *Institutionalization and Role Typing*

A related set of ideas involving the centrality of expectations may be drawn from Berger and Luckman’s (1966) conceptualization of the process of institutionalization in terms of the formation of idealized expectations about behaviour held reciprocally by the occupants of ideal-type roles. In other words, institutions assign individuals to well-defined roles, in which their anticipated range of actions turns out to be consistent (as a Nash equilibrium is consistent) with the actions of other individuals.

Notice that this differs from the conceptualization advanced by Schotter (1981) and others who have gone beyond Lewis’s (1969) insights about conventions, by interpreting both informal and formal institutions as the (Nash) equilibria of non-cooperative games. The idea from Berger and Luckman (1964), instead, is that

membership in the organization or participation in institutionalized activities is made conditional on some tolerable degree of conformity with the behaviours delineated by a well-specified role.

Hence, there must exist one or more mechanisms for enforcing the 'contract' that individuals accept when joining a 'club', 'society' or a still more structured institution—such as a business corporation or a university. Enforcement may be left to internal psychological inhibitions aimed at maintaining the person's self-esteem and avoiding guilt-feelings. A very considerable prior investment in personal socialization, acculturation and ethical education of the individual is usually required to bring these behavioural controls to a tolerably high level of reliability.

Comprehensive institutions, i.e. those which, like the family, structure many aspects of the lives of their members, as is the case for members of the clergy and the military, are therefore observed to require novices to submit to intensive 'acculturation' routines. However, where it is anticipated that the potential members of an organization will be drawn from different and varying backgrounds (unlike the members of a nuclear or stem family household) and that the expected duration of their commitment to the organization will be brief (unlike clerics and military career officers), they cannot be supposed to be mutually well informed as to the extent of each others' prior inculcation with a particular set of commonly held 'values'. In those circumstances, which seem more to typify institutions governing and supporting a variety of commercial transactions, it is especially likely that the 'organizational contract' would make explicit to every individual some threat of externally imposed sanctions in cases of deviant behaviour. The sanctions may be varied, according to the severity of the infractions and may take various forms, ranging from the forfeiture of a bond, to temporary or permanent expulsion from the organization—with whatever penalties or reputational stigma that would carry—and to the exaction of reprisals upon third-party 'hostages'.

Vivid historical illustrations of such reinforcing provisions have been made the focal point of analysis recently in a series of studies of institutional arrangements governing commercial exchanges in the medieval Mediterranean and elsewhere in Europe. This work, by Avner Greif and others (Greif, 1989, 1992, 1994; Greif *et al.*, 1994; Milgrom *et al.*, 1994), has employed the language of non-cooperative games theory to formalize the idea that a group may enforce private contracts amongst its members by articulating the threat of exclusion from such future transactions.<sup>5</sup> The circumstances are shown to be ones in which the sanction could be triggered by documented allegations brought by one member against another who transgressed the collective 'norms'; further, they were structured so that it was evidently in the interests of the passive members of the group to enforce the sanction.

Even though it is now fashionable among game theorists to model everything in terms of non-cooperative games, the provision of procedures for outside adjudication and enforcement of sanctions in the bye-laws of 'less-than-total institutions', suggests that a cooperative game might quite aptly characterize the situation in which the

<sup>5</sup> Greif (1992) provides an overview of these and other related studies, including those of his own which have focused upon the use of the principal of collective responsibility as a mechanism to enforce compliance in contracts with traders of foreign 'nationality'.

players belonging to an institution or a professional society find themselves. Moreover, as has already been remarked, in many formal institutions there is explicit communication and even 'pre-negotiation' amongst the parties when new members are being 'educated', or socialized to accept and value the organizational roles that will be assigned to them. The social anthropologist, Douglas (1985) describes the results of the institutional acculturation process as the channelling of both a person's perceptions of the world and of their proper place within it. Closely related propositions emerge from Kuran's (1993) observations concerning the role of the 'heuristic of social proof'—that is, the reliance upon recurring expressions of a societal or group consensus on substantive issues—in individuals' cognitive processes.

The delineation of those roles and of sets of consistent roles—such as teachers and students, judges and advocates, masters and servants, patients and doctors—is a learned process. It may involve deliberate borrowing or imitation from forms of human interaction that can be supposed to be common knowledge within a particular culture. Or it may emerge spontaneously through a trial and error process in which organizations that have placed individuals in maladapted sets of roles fail to reproduce themselves by effectively socializing new members to take up those roles. In either case, ideal-type roles are not instantly created and learned and so constitute a form of 'durable capital' whose costs are 'sunk': they remain available for use, as do the complicated structures for human interaction that may be built up by the permutation of several basic role types. Indeed, they become more refined and thoroughly ingrained through repeated use, rather than eventually wearing out, as do most tangible forms of productive capital.

### 3 INFORMATION CHANNELS AND CODES AS 'SUNK' ORGANIZATIONAL CAPITAL

Related to the foregoing is the notion that organizations require particular channels for dealing with information and that these channels represent an especially durable form of capital. Arrow (1974, pp. 53–6) points out that while organizations have the advantage of being able to acquire more information than can any individual economic agent, the formation must be filtered, coordinated and compressed if it is to be of use in decision making. Hence, communication channels and information-processing procedures have to be created within any organization. Furthermore, to enhance the efficiency of the design of channels that compress and internally transmit the data acquired by the organization's members, it is possible to select—or otherwise settle upon—some 'code'. But, as Arrow (1974, p. 55) remarks,

the learning of a code by an individual is an act of irreversible investment for him. It is therefore also an irreversible capital accumulation for the organization. It follows that organizations, once created, have distinct identities, because the costs of changing the code are those of unanticipated obsolescence.

Two reasons are cited by Arrow (1974) for the observation that different organizations rarely share identical 'codes'. First, the situation is a combinatorial



one and therefore a very large number of 'optimal' codes may exist—if we supposed that the original conventions for conveying information were deliberately optimized. What matters is not the precise form of the code, but that an individual can readily learn the code(s) being used in the organization in question. The situation in this respect resembles that of the pure 'coordination games' brought to the attention of economists by Schelling (1960), which were the focal point for the discussion of the role of expectations, in the preceding section. In such games, it has been seen, the positive feedback effects or self-reinforcement of early and quite possibly adventitious choices reflecting merely transient conditions, can have profound consequences, in effect 'selecting' the eventual outcome. Although the readers of Arrow's otherwise influential Fels Lectures evidently have taken much longer to grasp its significance, his text is characteristically perceptive and forthright in according recognition to this point (Arrow, 1974, p. 56).

... *history matters*. The code is determined in accordance with the best expectations at the time of the firm's creation. Since the code is part of the firm's or more generally the organization's capital ... [it] will be modified only slowly over time. Hence, the codes of organizations starting at different times will in general be different even if they are competitive firms (emphasis added).

The need for codes that are mutually understandable within organizations causes individuals to become specialized in the information capable of being readily transmitted by the codes, so that, in Arrow's (1974) formulation of the self-reinforcement process

they learn more in the direction of their activity and become less efficient in acquiring and transmitting information not easily fitted into the code. Hence, the organization itself serves to mold the behavior of its members (p. 57).

The latter remark, so casually tossed off, may be seen to both anticipate and provide an economic logic for the observations made by Douglas (1985) in *How Organizations Think*.

#### 4. INTERRELATEDNESS, COMPLEMENTARIES AND PRECEDENTS

All but the simplest organizations and institutions provide ways of performing a multiplicity of generic functions. They must, as we have seen, establish channels for gathering, filtering, internally transmitting and interpreting information. They must have procedures for recruiting or qualifying individual participants and instructing them in the codes and 'mores' to which they will be expected to conform. They must specify, implicitly or explicitly, some incentive or reward structure. They must monitor the performance of either the organization as a whole or subgroups or individuals within it. They must provide procedures whereby individuals can exit or be prevented from participation.

There are numerous possible ways to fulfil each of these functions, if they are considered individually. Some solutions, however, fit together with others more logically and so make the principles or 'culture' of the institution easier to understand and to transmit to new members. An analogy may be drawn here with the concept

of 'technical interrelatedness' stressed by Frankel (1955).<sup>6</sup> However, in place of the necessity of physical compatibility or complementarity between the dimensions of machines and the spacings between the pillars in a factory or between a computer's hardware and software, we need to think about the advantages of having procedures that are functionally compatible, and which give at least a superficial appearance of being consistent in principle.<sup>7</sup>

In illustration of this point, it can be observed that organizations that recruit members on ascriptive grounds (Whose family do you belong to? In what territory were you born?) are likely to find it more difficult to implement meritocratic procedures for the internal promotion or separation of individual members. Hierarchical structures of internal communications are better matched with hierarchical mechanisms for supervision and control than with extreme decentralization and so forth. Marked differences in reward structures or codes established for various departments make the organization as a whole more complex to explain to initiates and increase the costs of retraining individuals in order to reassign them to tasks more suited to their inherent abilities.

The analogy that has just been drawn between the complementary components of a technological system and the interrelated rule-structures of a complex human organization may be extended still further and applied to the manner in which distinct institutional arrangements fit together and so form still more elaborate 'institutional clusters' that are self-reinforcing, as a structure of interindustry input-output relationships can be self-reinforcing.<sup>8</sup>

What the foregoing discussion implies is that extraneous features of the initial conditions, the historical context in which institutions or organizations are formed, can become enduring constraints. They can result in the selection of a particular solution for what is then perceived at the time to be the crucial generic function, for example, recruitment of participants and this can limit the design of other rules and procedures, so that even if the original rationale were to become irrelevant, altering the organization's recruitment policy would possibly disturb many other aspects of its operations and so impose considerable readjustment costs. In this way the organizational structure can become 'locked in' to a comparatively narrow subset of routines, goals and future growth trajectories.

<sup>6</sup> For further discussion of the significance of interrelatedness, which affects the course of both innovation and diffusion in technological development, see David (1975, Chapters 1 and 5).

<sup>7</sup> The institutional analogy with the positive feedback processes that lead to the emergence of *de facto* technical compatibility standards [along the lines in David (1987)], has been further developed, by Sundstrom (1988).

<sup>8</sup> For example, the enforcement of private commercial contracts by an independent judiciary, which was the English common law tradition, fits together less smoothly with a government based on absolute monarchy than it does with a political regime in which the powers of the sovereign to abrogate contracts with private parties are tightly circumscribed, otherwise the lack of credible commitment on the part of the sovereign places the latter in a starkly unfavourable position should it be necessary to compete for loans with the issuers of private debt. There is thus a coupling between the political events of the 'glorious revolution' of 1688, which brought the head of the House of Orange to the throne of England as a constitutional monarch, and the 'financial revolution' that saw the adoption of measures to establish the government's creditworthiness and the ensuing eighteenth century decline in the whole structure of British interest rates. See Dickson (1967) and discussion of these events by North and Weingast (1989).

It is worth emphasizing that institutions typically evolve new functions and because these are added sequentially they are shaped by internal precedents. Formal precedent-based rule structures, such as the common law, provide us with insights into the advantages of maintaining consistency while the structure evolves: expectations about the future interpretation of the law remain more stable if new adaptations are not seen to overturn previous principles, local courts can be allowed a larger measure of autonomy—reducing communications and supervision costs—if their decisions will not have the external effect of vitiating interpretations that are being handed down in other jurisdictions and codification and instruction of novices is simplified if the number of exceptions and superficial (or fundamental) contradictions is minimized.

Historical precedent thus can become important in the shaping of the whole institutional cluster, simply because each new component that is added must be adapted to interlock with elements of the pre-existing structure—unless the whole is to be abandoned and replaced in its entirety. Institutional ‘catastrophes’ of that sort do occur on occasion, but the large sunk costs represented by the development of well-practised routines, supported by locally efficient information codes and the establishment of common knowledge-like expectations on the part of individuals who have become familiar with the particular cluster of organizations and institutions, all combine to favour ‘stasis’ or, at most, a course of change that for the most part is ‘incremental’ and almost imperceptible, rather than discrete. Within those slowly evolving organizations, the ‘ground state’ perception—which is departed from only in episodes of crisis—remains that it is less costly to eschew revolutions and favour a meliorative and essentially conservative mode of response to any dysfunctional aspects that may be noticed in the existing arrangements.

##### 5 FURTHER IMPLICATIONS

Recognition of the quite straightforward microeconomic foundations identified by the preceding sections enables us to retain the fundamental insights of many of the classic discussions of the ‘evolution’ of institutions, while discarding the baggage of mystical and potentially misleading ‘organic’ analogies that so frequently recur in those sources. The concepts of interrelatedness and complementary institutional clusters, for example, lead directly to an alternative and economically intelligible reading of the following famous passage from Carl Menger’s *Untersuchungen über die Methode der Socialwissenschaften und per Politischen Oekonomie insbesondere* (1883):

The normal function and development of the unit of an organism are thus conditioned by those of its parts; the latter in turn are conditioned by the connection of the parts to form a higher unit. . . . We can make an observation similar in many respects in reference to a series of social phenomena in general and human economy in particular. . . . Similarly we can observe in numerous social institutions a strikingly apparent functionality with respect to the whole. But with closer consideration they still do not prove to be the result of an ‘intention aimed at this purpose, i.e., the result of an agreement of members of society or of

positive legislation. They, too, present themselves to us rather as “natural” products (in a certain sense), as *unintended results of historical development*.’ [See Menger (1963, p. 130). Emphasis in original.]

Evidently, precedent-based rule structures, like interrelated organizational mechanisms and clusters of complementary institutional arrangements, all are subject to elaboration through what amounts to branching processes. In such processes, the scope for reversing previous choices tends to narrow sequentially as the development proceeds. Part of the self-reinforcing dynamic is attributable to the consequences of the accumulation of experience, the crystallization of expectations, the widening circle of their diffusion, the diffusion of the knowledge thereof and of the actions predicated upon that knowledge. These serve, as has been seen, to establish spontaneous informal social conventions more solidly and to entrench certain ‘key’ rulings in precedent-based formal rule structures more deeply.

The reasons for there to be a progressively more restrictive ‘channelling’ of incremental organizational and institutional adaptations to changes in the economic political environment also may be of a somewhat more ‘technical’ character, depending upon the nature of the complementarities among the various rules that constitute the system. For example, in the case of precedent-based legal systems, such as common law, they may arise from the logical difficulties of finding some new principle that can rationalize many prior decisions that reference to precedent had made mutually consistent. Curiously enough, the existence of such constraints seems to have been ignored by those modern legal scholars of a Panglossian bent (associated with the Chicago ‘law and economics’ movement) who have focused attention upon the advantages of ‘judge-made’ common law. In this legal system they perceive a scope, greater than that found in the case of statute law, for sequential adaptations to changing local conditions, which, they conclude, must work to eliminate rulings that impeded the efficient use of economic resources.<sup>9</sup> Although the ingenuity of the latter, ‘selective litigation’ argument is admirable, it falls short of being entirely persuasive—for reasons in addition to the one already noted.<sup>10</sup> It should also be pointed out that a precedent-based rule system creates an incentive for agents who anticipate that future litigation will be brought against them to invest more heavily in defending themselves initially and for others to invest in filing suits for the purpose of establishing precedents that would be advantageous to their cause in future litigation. Foresighted maximization of self-interest may thus vitiate the supposed tendency for the law to adapt in a way that improves the social efficiency of current resource allocation.

Readers who already are familiar with models of technology adoption in the presence of positive network externalities [for extensive references and a survey of the relevant literature, see David and Greenstein (1990)] will have by now noticed

<sup>9</sup> See Goodman (1977) and Rubin (1977). The nub of the argument is that legal rulings that result in inefficient resource use will likely be exposed more frequently to economically motivated private litigation, thereby creating a ‘selective pressure’ that must operate inexorably and continuously to render the corpus of the law more efficient

<sup>10</sup> On some other deficiencies in the ‘selective litigation’ thesis, see, e.g. Cooter and Kornhauser (1980) and Cooter and Ulen (1988).

the general similarity between the operation of 'installed base' effects (in the latter case) and 'precedent' effects. An awareness of these on the part of economic agents may induce them to provide subsidies for the early adoption by others of some particular policy—be it technological, organizational or legal—in the expectation of thereby establishing a 'standard' from whose existence the agent in question expects subsequently to profit. The two classes of situations (technological and institutional) appear no less homomorphic with regard to the possibilities that 'bandwagon effects' or 'excess momentum' in the dynamics of individual action, will lead the system to become 'locked-in' to a coordination solution that is less socially efficient than others which were initially available.

#### 6. CONCLUSION INSTITUTIONS, TECHNOLOGIES AND THE CHOICE OF EVOLUTIONARY METAPHORS

Yes, institutions do 'evolve' in a manner that shares important attributes with biological processes of evolution. But, affirming this to be true makes it all the more apposite for economists to grasp the implications of the view that biological mechanisms of selection are very much bounded by the material that they find already on hand. In the modern view, even the biological novelties for the most part are already 'on hand'; the gene pool already is carrying a large inventory of mutations—most of them for dysfunctional traits that, fortunately, remain recessive in the population—so that the generation of phenotypic innovations resembles nothing like a 'just-in-time' system of production. Rather than continuing in the Spencerian tradition of emphasizing evolutionary 'fitness' as the product of Darwinian competitions and conflating the latter with the metaphor of an 'invisible hand' that guides the development of organizations and institutions in the direction of ever-greater economic efficiency, students of the economics of institutions would be better served to keep in mind the image of the Panda's thumb. The latter—not anatomically a finger at all, much less an opposable, manipulating digit, but actually a complex structure formed by the marked enlargement of a bone that otherwise would be part of the animal's wrist—has been tellingly described by Gould (1980, Chapter 1) as a 'contraption, not a lovely contrivance'. In place of the invisible appendage celebrated by Adam Smith, the Panda's thumb metaphor offers institutional economics the paradigm of a serviceable but inelegant resultant of a path-dependent process of evolutionary improvisation, a structure whose obvious functional limitations stem from its remote accidental origins.<sup>11</sup>

To sum up, my suggestion is that the many specific instances of path dependence involving institutional changes and their influence in economic history are understandable in terms that rather closely parallel the fundamental microeconomic conditions which I have identified elsewhere (see David, 1985, 1988, 1993b) as underlying the positive feedback dynamics typical of path-dependent processes involving technological evolution. When we probe beneath the facile view that institutions are self-evidently 'historical', it appears that history really matters

<sup>11</sup> For further development and application of this argument to the evolution of intellectual property institutions, see David (1993a).

where certain conditions obtain: (1) the durability of learned modes of communications and role types, (2) the multiplicity of solutions that may be found to yield coordination benefits and (3) the complementarities that are created when organizations add mutually adapted procedures, and institutions incrementally evolve precedent-based rule structures to maintain time consistency in expectations and minimize the obsolescence of organizational capital.

The parallels thus drawn, between the microeconomic conditions that cause institutions and organizations to be 'carriers of history' and the conditions that are found to underlie the phenomenon of path dependence in technological change, however, should not be projected all the way to the conclusion that 'institutions, after all, are just like technologies'. For some purposes, of course, it is helpful to emphasize structural properties between the two that are analogous: techniques of production, like organizations, can be conceptualized as rule structures that render the interactions of their constituent elements functional. Further, the problems that the rule structures solve may be seen in some instances to be closely similar, which justifies our speaking of the resemblance between human organizations and 'machine organizations', the latter being a descriptor applied usually to complex, distributed technical systems (e.g. parallel data-processing systems) that must solve coordination problems not unlike those encountered in social systems. But, one may logically recognize the shared quality of historicity in institutional and technological change without obfuscating the differences between the two that remain in other respects.

So, it will perhaps be best to bring this discussion to close by recalling that institutions and organizations, being required to coordinate the actions of volitional creatures for their functioning, are obliged to channel and direct the thinking of the human beings who are assigned to fulfil institutionalized roles, whereas purely technological systems (machine organizations) are not composed of sensate, volitional actors. Furthermore, organizational codes and information channels, filtering screens and like apparatus differ from the fixed capital goods that embody technologies, in that the former tend to work more smoothly (and with less attention to maintenance) the more intensively they are used, whereas machines and buildings eventually wear out with use and age. Institutions typically establish procedures for replacing their membership with new individuals who are selected to fit pre-defined roles, whereas purely technological (excluding the biotechnological) systems are not self-perpetuating and require human direction in order to reproduce themselves.

For these and still other reasons, institutions generally turn out to be considerably less 'plastic' than is technology and the range of diversity in innovations achieved by recombinations of existing elements is observed to be much broader in the case of the latter. Thus, institutional structures, being more rigid and less adept at passively adapting to the pressures of changing environments, create incentives for their members and directors to undertake to alter the external environment. Since there are many circumstances in which the external environment proves intractable, organizations and institutions are subject (in ways that properly designed technologies are not) to pressures and stresses that may cause them to abruptly collapse and dissolve or to be captured, dismembered and ingested by other competing organizations.

Finally, it may be remarked that because the extent of tacit knowledge required for the efficient functioning of a complex social organization is far greater—in relation to the extent of knowledge that exists in the form of explicit, codified information—than is the case for technological systems, institutional knowledge and the problem-solving techniques subsumed therein are more at risk of being lost when organizations collapse or are taken over and ‘reformed’ by rivals. Thus, we find the paradoxical state of affairs which contrasts with the more linear, cumulative progress of technological development: while some surviving institutions represent legacies of great antiquity, at the same time much human ingenuity and effort is continually being poured into reinvention and rediscovery of organizational techniques and institutional arrangements that have been lost and found several times over.

#### ACKNOWLEDGEMENTS

The author gratefully acknowledges the support that he received as a fellow of the International Centre for Economic Research during the initial drafting of this work and thanks Professor Enrico Colombatto, Barbara Tomatis and other members of the centre’s excellent staff for the many kindnesses that made his time at ICER both enjoyable and productive. Conversations with Stan Metcalfe and Svetozar Pejovich were particularly stimulating and informative in this connection. A later version of this paper was presented to the Stanford Institute for Theoretical Economics (SITE) Summer Workshop on ‘Irreversibilities’, 8–22 July 1992, where further suggestions for improvements were offered by Stephen Durlauf, Avner Greif and Frank Hahn, among others. The present draft has benefited from the author’s correspondence with Joseph T. Mahoney, R. C. O. Matthews and Oliver E. Williamson, many of whose perceptive comments and criticisms could not be dealt with fully herein.

#### REFERENCES

- ARROW, K. J. (1974). *The Limits of Organization*. W. W. Norton, New York.
- ARTHUR, W. B. (1989). ‘Competing Technologies, Increasing Returns, and Lock-In by Historical Events’, *Economic Journal*, **99**.
- (1990). ‘Positive Feedbacks in Economics’, *Scientific American*, 262.
- BERGER, R. and LUCKMANN, T. (1966). *The Social Construction of Reality*. Anchor Books, Garden City, NY.
- COASE, R. H. (1960). ‘The Problem of Social Cost’, *Journal of Law and Economics*, **3**.
- (1984). ‘The New Institutional Economics’, *Journal of Institutional and Theoretical Economics*, **140**.
- COOTER, R. and KORNHAUSER, L. (1980). ‘Can Litigation Improve the Law Without the Help of Judges?’, *Journal of Legal Studies*, **9**.
- and ULEN, T. (1988). *Law and Economics*. Scott Foresman and Company, Glenview, IL.
- DAVID, P. A. (1975). *Technical Choice, Innovation and Economic Growth*. Cambridge University Press, Cambridge.
- (1985). ‘Clio and the Economics of QWERTY’, *American Economic Review*, **75**.
- (1987). ‘Some New Standards for the Economics of Standardization in the Information Age’, in P. Dasgupta and P. L. Stoneman (eds), *Economic Policy and Technology Performance*. Cambridge University Press, Cambridge.
- (1988). *Path-dependence. Putting the Past into the Future of Economics*. Institute for Mathematical Studies in the Social Sciences Technical Report 533, Stanford University, Stanford.
- (1993a). ‘Intellectual Property Institutions and the Panda’s Thumb: Patents, Copyright, and Trade Secrets in Economic Theory and History’, in M. Walkerstein, E. Mogege and R. Schoen (eds), *Global Dimensions of Intellectual Property Rights in Science and Technology*. National Academy Press, Washington, DC, Ch. 1.
- (1993b). ‘Path-dependence and Predictability in Dynamic Systems with Local Network Externalities: A Paradigm for Historical Economics’, in D. Foray and C. Freeman (eds), *Technology and the Wealth of Nations*. Frances Pinter, London.
- (1993c). ‘Historical Economics in the Long Run’, in G. D. Snooks (ed.), *Historical Analysis in Economics*. Routledge, London.

- and GREENSTEIN, S. (1990). 'The Economics of Compatibility Standards: An Introduction to Recent Research', *Economics of Innovation and New Technology*, 1, 1–32.
- DAVIS, L. E. and NORTH, D. C. (1971). *Institutions of Change and American Economic Growth*. Cambridge University Press, New York.
- DICKSON, P. G. M. (1967). *The Financial Revolution in England*. Macmillan, London.
- DOUGLAS, M. (1985). *How Institutions Think*. Basic Books, New York.
- FRANKEL, M. (1955). 'Technical Interrelatedness and Economic Obsolescence', *American Economic Review*, 45.
- GOODMAN, J. (1978). 'An Economic Theory of the Evolution of the Common Law', *Journal of Legal Studies*, 7.
- GOULD, S. J. (1980). *The Panda's Thumb*. W. W. Norton, New York.
- GREIF, A. (1989). 'Reputations and Coalitions in Medieval Trade: Evidence on the Magrebhi Traders', *Journal of Economic History*, 49, 857–82.
- (1992). 'Institutions and International Trade: Lessons from the Commercial Revolution', *American Economic Review*, 82 (2).
- (1994). 'Cultural Beliefs and the Organization of Society: a Historical and Theoretical Reflection on Collectivist and Individualist Societies', *Journal of Political Economy*, 102, 912–50.
- , MILGROM, P. and WEINGAST, B. (1994). 'Coordination, Commitment and Enforcement: the Case of the Merchant Guild', *Journal of Political Economy*, 102 (4).
- HUTCHINSON, T. W. (1984). 'Institutional Economics, Old and New', *Journal of Institutional and Theoretical Economics*, 140.
- KURAN, T. (1993). 'The Unthinkable and the Unthought', *Rationality and Society*, 5, 475–505.
- LEWIS, D. (1969). *Conventions. A Philosophical Inquiry*. Harvard University Press, Cambridge, MA.
- MATTHEWS, R. C. O. (1986). 'The Economics of Institutions and the Sources of Economic Growth', *Economic Journal*, 96, 903–18.
- MENGER, C. (1883). *Problems of Economics and Sociology*. Translated by F. J. Nock (1963), University of Illinois Press, Urbana, IL.
- MILGROM, P., NORTH, D. C. and WEINGAST, B. (1991). 'The Role of Institutions in the Revival of Trade: The Law Merchant, Private Judges and the Champagne Fairs', *Economics and Politics*, 2, 1–24.
- NORTH, D. C. (1984). 'Transaction Costs, Institutions, and Economic History', *Journal of Institutional and Theoretical Economics*, 140.
- (1990). *Institutional Structure and Institutional Change*. Cambridge University Press, New York.
- (1991). 'Institutions', *Journal of Economic Perspectives*, 5.
- and THOMAS, R. P. (1973). *The Rise of the Western World—An Economic History*. Cambridge University Press, New York.
- and WEINGAST, B. (1989). 'Constitutions and Commitment: The Evolution of Institutions Governing Public Choice in 17th Century England', *Journal of Economic History*, 49, 803–32.
- POSNER, R. A. (1992). 'The New Institutional Economics Meets Law and Economics', Paper presented at the Tenth International Seminar on the New Institutional Economics. Wallerfanger/Saar, Germany, 24–26 June.
- PRIEST, G. L. (1977). 'The Common Law Process and the Selection of Efficient Rules', *Journal of Legal Studies*, 7.
- RUBIN, P. (1977). 'Why is the Common Law Efficient?', *Journal of Legal Studies*, 6.
- SCHELLING, T. C. (1960). *The Strategy of Conflict*. Harvard University Press, Cambridge, MA.
- SCHOTTER, A. (1981). *The Economic Theory of Institutions*. Cambridge University Press, New York.
- SUGDEN, R. (1990). 'Spontaneous Order', *Journal of Economic Perspectives*, 4.
- SUNDSTROM, W. A. (1988). *Institutional Isomorphism: The Standardization of Rules and Contracts in Business Firms and Other Institutions*. Economics Department Working Paper, Santa Clara University.
- WHITE, E. N. (1983). *The Regulation and Reform of the American Banking System, 1900–1929*. Princeton University Press, Princeton.
- WILLIAMSON, O. E. (1975). *Markets and Hierarchies*. The Free Press, New York.
- (1985). *The Institutions of Capitalism*. The Free Press, New York.