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Language, games and language games

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Abstract

How do social values come about and gain legitimacy? Starting from the premise that discourses of social analysis affect the ways in which social norms develop and proliferate, this article models the evolution of professional codes and dialects using Wittgenstein's idea of a language game. A language game is formalized as a repeated game of tacit coordination played among participants with informational asymmetries. The informational asymmetries model the different meanings that people assign to the same word used in a conversation. A language is formalized as a code that emerges as a result of repeated interactions in a language game. The paper argues that certain codes—such as those based on the real number system—lead to more reliable strategies in language games. The result is used to argue that professional dialects based on axiomatizable codes—such as physics, mathematics and economics—are less likely to experience fragmentation into intra-disciplinary 'sects,' camps and incommensurable paradigms than are professional dialects that are not based on an axiomatizable code—such as sociology, psychology, organization studies, and strategic management studies. The idea of a language game is extended to explore ways in which certain disciplines can establish cognitive jurisdiction over particular phenomena, starting from a particular set of codes, and thereby claim 'cognitive monopolies.' A rudimentary theory of the market for ideas is advanced.

Keywords: Axiomatization; Rationalizing; Coordination

1. Introduction

Socio-economic analysis looks beyond the traditional economic focus on incentives and behavior and inquires about the values that underlie individual construals of social situations and payoffs. These values are often shaped by the legitimating discourses produced by philosophers, sociologists, economists and social theorists, discourses which, in turn, increase the economic power of their proponents and practitioners (Abbott, 1988). Understanding the

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processes by which legitimating accounts of economic action come about may, then be usefully approached by first understanding how the rationalizing dialects of various disciplines of social analysis come about. Accordingly, this article asks, 'What are professional dialects? What are they good for and how do they evolve? How do they influence the observable behavior of the groups that use them?'

There are several lines of reasoning in sociology, philosophy and economics that inform these questions, *albeit* indirectly.

1.1. Dialects as social norms and conventions

Dialects can be seen as norms and conventions (Coleman, 1990) that emerge in order to make intra-professional communication more efficient. On this view, codes emerge, like norms do, because they serve the purpose of some or all of the members of the group. Free-rider problems that are associated with collective, norm-affirming action (Olson, 1965) are circumvented in the case of codes of communications, because each user of the code derives immediate individual-level benefits from the conscientious use of the code in his or her communications with other members of the group. Use of the code is a pre-condition for individual participation in group processes. With each use of the code, the individual takes a step towards affirming and entrenching the code. Therefore, individual contribution to the maintenance of the communication code that serves as the group norm for the efficient coordination of activities is a direct consequence of the individual's self-interested participation in the activities of the group. It is in the individual's self-interest to behave in a way that maintains and upholds the group's code of communication. Moldoveanu (1999a,b) has argued that codes of communication can emerge to serve the purposes of greater efficiency, reliability and secrecy in intra-group communication. Reliability refers to the ability of members of the group to predict one another's behaviors on the basis of spoken communication. Reliable codes give rise to mutually predictable actions. Efficiency refers to the relative ease with which information is intelligibly expressed using a particular code. Communicating more efficiently means being able to communicate more rapidly, without a loss in reliability. Secrecy refers to the power of a code of communication to establish a constituency of incumbents simply by virtue of the fact that they 'speak the code.' Professional societies provide good examples of the benefits of excluding others from group membership by virtue of the development of a highly stylized dialect—which no outside can easily and legitimately 'decipher.'

This account of dialects as codes of communication stops short of examining the relationship between the structure and properties of a code and the costs and benefits that accrue to the users of the code. There is no link, therefore, between the observable properties of a code and the dynamics of the competitive interactions among a set of professions employing dialects based on different codes for rents extracted from a market base of laymen who do not fully grasp the codes in question. This paper provides this link.

1.2. Dialects as legitimating accounts and paradigms

Dialects can also be seen as legitimating accounts that are based on particular paradigms, or ways of posing problems, carrying out inquiry, and evaluating the proposed results to

these problems and inquiries. Kuhn (1962) has argued quite convincingly that the evolution of scientific practice can be organized temporally into a sequence of paradigms that individually posit not only 'legitimate' problems and ontologies, but also the methods by which the answers to these problems are considered valid. By Kuhn's account, transition between successive paradigms cannot be rationalized by an a-paradigmatic standard, for the simple reason that the language in which such an evaluation is to be carried out is itself paradigm-bound.

A professional dialect is like a Kuhnian paradigm because it supplies not only the set of code-words that speakers of the dialect use in order to coordinate their joint activities, but also the standards by which various uses of the dialect are to be judged as being correct or incorrect. For example, the standards of acceptance or rejection of a paper to an economics journal are inseparably linked to the theoretical commitments of economists, such as a choice in favor of explanatory parsimony over descriptive realism. Seeing dialects and paradigms as inextricably linked provides a simple sociological explanation for the stickiness of paradigms (Lakatos, 1974; Kuhn, ibid) even after anomalies and refutations of their central dogmas have been convincingly put forth. The explanation is that, since paradigms are linked to the codes that underlie professional dialects, and the codes in question serve significant collective interests of their users, therefore paradigm changes may bring about consequences that run counter to the interests of the incumbent professional group.

However, in spite of significant switching costs, paradigm changes do occur. Why is this the case, when any paradigm can reasonably be salvaged by the addition of fortifying hypotheses (Lakatos, 1974)? And, what is the link between the logical structure of the central dogmas of different paradigms and their relative 'competitive advantage' in the marketplace for ideas? This paper serves to make this link clear.

1.3. Dialects as radial metaphors

Another way to view professional dialects is as a set of shared radial metaphors that structure our understanding of events and problem-situations (Lakoff, 1987, 1997; Lakoff and Johnson, 1991). Radial metaphors are cognitive structures that are often implicit in everyday communication and private deliberation, and which provide a set of implicit pre-understandings of various predicaments, which make interpersonal communication possible. The radial metaphor, 'society as a family,' according to Lakatos, underlies both liberals' and conservatives' positions in the debate over abortion rights and social welfare. However, whereas liberals base their arguments for the right to obtain an abortion and the right to social assistance on a 'nurturing mother' view of the family (and implicitly of society), the conservatives base their arguments for restricting both rights to obtaining an abortion and the rights to obtaining social welfare on the 'severe father' view of the family (and implicitly of society).

If professional dialects are to be understood as originating from 'radial metaphors' that make communication among co-professionals possible, then a whole field of 'cognitive archaeology of professional discourse' opens up. Its task is to unearth the unstated assumptions that are embedded in various forms of discourse, and to make predictions about the powers of various forms of discourse to recruit new minds to their constituencies and new phenomena to their cognitive jurisdictions (Abbott, 1988). In this case, we have reason to inquire into the link

between the structural properties of various radial metaphors and the success of dialects based on these metaphors to recruit minds to their practicing body and problems to their growing repertoire of performances. This paper provides such a link.

1.4. Dialects as outcomes of language games: structure of the paper

In what follows, I will represent professional dialects as a set of codes that evolve through the repeated instantiation of a set of language games (in the sense of Wittgenstein, 1953) among their users. The key to the paper is a model of a language game as a coordination game that proceeds in three stages. In the first stage, participants produce a set of purposive oral noises intended for each others' comsumption (i.e., attempt to communicate). In the second stage, they produce behavior that each may or may not judge to be causally linked to the first-stage oral noises. In the third stage, they privately evaluate the degree to which each others' initial expectations and actions match, or cohere. A successful coordination game will lead to a good match between expectations and observed actions. Successful coordination games are encoded in the memories of the participants. The memory of a successful coordination game around a particular word is the meaning of that word (Wittgenstein, 1953). Behaviors—not essences—create the meanings of words for us. As Wittgenstein points out, if all round objects are white, then there is no way for us to distinguish between the words 'white' and 'round' on the basis of interactions with other users of the same words. Thus, special coordination games called 'language games' give 'meaning' to the 'code-words' that comprise professional dialects.

This paper takes this Wittgensteinian insight one step further, and considers the ways in which the structures of already-evolved codes influences the success of the coordination games that make use of those codes. It shows that, if we start from a model of codes evolving from repeated language games, then we can show that a person's—or a group's—use of a language or a dialect is path-dependent. Previous outcomes of the language game—and therefore the codes that result—will influence the ensuing coordination games played among the communicators. The aim of the paper is to show how the outcomes of previous language games influences the outcomes of future language games. The net result of such an analysis is an understanding of the link between the properties of professional dialects and the nature of the competition between professionals using those dialects for new members and new problems and phenomena.

The paper is structured as follows. In Section 2, I give an explicit model of language games as games of tacit coordination, by formalizing Wittgenstein's idea of a language game using a game of tacit coordination due to Kreps (1988). I then show that codes—the result of language games—can influence the efficiency of the subsequent language games played by communicators. Their influence depends on their logical properties. Codes that can be axiomatized—whose code words can be derived from a small number of axioms—will give rise to more efficient language games than will codes that cannot be so reduced. This fact is used in Section 2 to explain the difference between cohesive, mono-paradigmatic disciplines—such as economics—where evolution proceeds by specialization—and non-cohesive, multi-paradigmatic disciplines—like organization science—where evolution proceeds by fragmentation. Section 3 presents a dynamic theory of competition among professions

based on professional dialects arising from different codes for the establishment of cognitive jurisdiction of new, rent-generating phenomena and problems. Questions such as, 'Why are economists so successful in Washington?' and 'Why are psychiatrists better than psychologists at establishing cognitive jurisdiction over psychological problems?' are addressed, using the framework developed in the first section.

2. Dialects are the outcomes of language games

In this section, I argue that dialects are the outcomes of language games. I will use the concept of language games in the same sense that Wittgenstein used it in his *Philosophical Investigations* (1953). A language game is an interaction between two or more people that develops as follows. One person emits an oral noise directed at another person (a word or a sentence: 'that is a rabbit') and produces an observable behavior (pointing at the animal). The other person observes and records the word and the behavior. In turn, he or she later produces an oral noise 'that is a rabbit' and produces a behavior (pointing to an animal) in the presence of the other person. If the first person agrees that, indeed, the animal that the first person points to corresponds to what the first person would call a rabbit, the language game ends successfully. The two communicators have coordinated on a particular mapping between word and observable behavior. If not, the language game ends unsuccessfully. The two communicators have failed to coordinate their expectations, and further experimentation is needed.

Wittgenstein argues that communicators are perpetually engaged in language games. The meanings' of the words that they use correspond to the observable behaviors that communicators using those words produce in each other's presence. Iterated language games give rise to dialects, or structures of meaning that are particular to the communicators. For example, the word 'organization' may carry one set of meanings for legal scholars 'nexus of contracts' yet a very different set of meanings for economists 'non-market mechanisms for organizing work,' but an apparently similar set of meanings for agency theorists 'nexus of contracts.' The similarity is only apparent, however, as a legal scholar is likely to carry a different meaning for 'nexus of contracts' (set of covenants, implicit and explicit broadly construed) than will an agency theorist (set of specified covenants with measurable economic consequences, where measurements are to be carried out using the positivist epistemological approach of economic science).

Dialects carry significant economic value for their users, because they make redundant the iterative specification of all of the words that embody them. This is because dialects are common knowledge among the participants to the same set of language games (Lewis, 1969): each participant knows it, knows the other knows it, knows the other knows she knows it, and so forth, *ad infinitum*. Past interactions that have given rise to the dialect are common knowledge among the players of the game, and therefore the meaning of the words that comprise the dialect are self-evident to the players (Aumann, 1976). Hence, the players do not need to re-play the past instantiations of their language games every time they use a word that has been used before. Hence, coordination costs are a decreasing function of the number of past interactions for players of an iterated language game.

2.1. Language games are coordination games

To make the concept of language game more precise, we can use the formalization of a coordination game introduced by Kreps (1990). Kreps proposes the following game to model the evolution of an organizational culture. The game is played by two teams of students. One team is from Stanford. The other team is from Harvard. Each team must submit a list of seven cities to an arbiter. The arbiter awards 10 points to each team for each city that appears on one list but does not appear on another list. He subtracts 10 points from each team for each city that appears on both lists. No communication is allowed between the two teams. To do well in the game, the teams must coordinate—tacitly—on a 'rule' for generating cities. Kreps suggests that the teams might choose the rule 'East–West,' given that each team knows where it is from, knows where the other team is from, and this information is common knowledge between the two teams. To follow this rule, the Harvard team can name seven cities east of the Mississippi, the Stanford team can name seven cities west of the Mississippi. Since there is no overlap, the coordination game is successful.

Language games are tacit coordination games of the sort that Kreps analyzes. In spite of their name, they are tacit. Producing a behavior after uttering a word in a language game corresponds to naming a city in the coordination game. Uttering the word corresponds to announcing the rules of the game. In spite of their name, language games are tacit games, because producing a behavior after uttering a word is a tacit process. No amount of specification of the behavior in language suffices to ensure, with logical certainty, that the produced behavior corresponds to the mutual expectations of the players. This tacit component of language games can be understood by considering the language game in which one player points to a bird using her index finger and says 'that is a duck.' To the second player, there are always reasonable doubts about the object to which the first player is pointing (Barnes et al., 1996). The first player could be pointing to the landscape around the animal, to any of the animal's organs, etcaetera. No matter how close to the duck the first player goes in order to point, the second player can raise reasonable alternative mappings of the word 'duck' to an object in the world. Hence, the process of naming must rest on some tacit convention about the duck-hood of ducks. This tacit convention cannot be made explicit by concatenated language games. Hence, language games share with coordination games (1) the tacit dimension, and (2) the dependence of their outcomes on the match or fit between the expectations of the participants.

2.2. Codes are the outcomes of language games

Iterated language games give rise to sets of words, phrases and elementary propositions that are common knowledge among the players of the language game. These elementary particles form what information theorists call codes of communication (Hamming, 1987). Codes can be used to 'encode' various messages in such a way that the messages can be decoded by players of the same language game. The process of encoding a message can be thought of in many ways. The most intuitive way to think of the process of encoding is the process of explaining, defining or accounting for. Once the elements of a code are in place ('covenants,' 'contracts,' pecuniary benefits, non-pecuniary benefits), a word 'organization' can be 'encoded' using the

particles of the elementary code, through a definition of the word in terms of the codewords that are part of the code 'an organization is a nexus of covenants, broadly construed to include provisions for pecuniary and non-pecuniary benefits to its members in various physically possible worlds.'

Professional dialects are ways of speaking that are common to particular groups of people (sociologists, physicians, lawyers) concerned with studying certain phenomena (Abbott, 1988). A professional dialect can be represented by a code i.e., a set of words, phrases and elementary propositions that are the outcomes of language games proper to that particular profession. For instance, the coded message, 'idiopathic hypertrophic subaortic stenosis' is a set of words that are intelligible to cardiologists, internists and cardio-thoracis surgeons, who are in possession of the 'code' required to map this 'diagnosis' into everyday language (a thickening of the left ventricle (hypertrophic) just under and partially obstructing (subaortic stenosis) the aortic valve due to unknown causes (idiopathic)), and would furthermore be known to be identical to the coded message (hypertrophic cardiomyopathy of the left ventricle), which is the 'modern' diagnosis. (Curiously, a professor of anatomy at the Harvard Medical School in the early 1990s did not know what 'IHSS' referred to, possibly because he was not old enough to be privy to the (pre-1970) language games that generated 'IHSS.')

2.3. Functions and properties of codes

Moldoveanu (1999a, p. 1, 1999b, p. 2) showed that communication codes serve several distinct coordinative purposes, and are sometimes purposefully developed for particular purposes. Thus, codes can serve the need to communicate efficiently (as do axiomatized, and thus, highly compact scientific theories and models), to communicate reliably (as do communication codes used to encode binary signals for transmission over noisy channels) and to communicate covertly (as do public and private key crypto-systems meant to protect their users against eavesdroppers). Any communication code must at least minimally efficient (otherwise it would take forever to communicate) and minimally reliable (otherwise no credible expectations about behavior can be formed by their users). In most cases, some degree of secrecy is conferred upon the users of the code by the fact that they alone are privy to the language game that generated the code. Acronyms in professional dialects (IHSS) in large companies and trade groups (MBO: Management by Objectives, TQM: Total Quality Management) and in academic circles and disciplines (TCE: Transaction Cost Economics) serve a dual purpose of efficiency and secrecy.

Thus, codes can be seen as fulfilling important economic functions (Moldoveanu, 1999a, p. 1, ibid). They decrease the costs of internal coordination (reliability) and communication (efficiency) and increase the barrier to entry of people who are not privy to the codes into the groups using the codes routinely (secrecy). A medical education can be seen as an investment in a particular code that will permit one to participate in the language game played by physicians. Because knowledge of the code is the result of an iterated language game played among would-be physicians and their instructors, going the process of a medical education is necessary for one to be able to practice clinical medicine successfully. (Of course, the legitimating story for the need for a medical education is hardly based on mastery of the code of communication, and has to do with the knowledge and skills that the training is supposed to confer on the graduates.)

2.4. Axiomatizable codes: the benefits of the real number system

Of particular interest to the study of the dynamics of communities of practice and discourse and professional dialects are codes that can be axiomatized, or can be reduced to a small number of elementary propositions from which they can be deduced using self-evident steps (*modus ponens*, *modus tollens*, law of excluded middle, identity axiom). The most familiar example of such a code is the body of knowledge known as neoclassical economics (Winston et al., 1995, is an example of a large scale work based on this code). The code can be reduced to a set of elementary propositions about rationality of decisions (transitivity, reflexivity, acyclicity—see Sen, 1982 for an axiomatization of rational choice), a set of elementary propositions about the revelation of preferences through choices (strong and weak axioms of revealed preference, Samuelson, 1938) and a set of elementary propositions about epistemic rationality—generally based on the axioms of probability theory and the Bayesian probability kinematics (see Earman, 1997). These (no more than 20) elementary propositions can be used to generate any of the empirically testable models and hypotheses that economists write papers about. Conversely, any set of empirically testable propositions in neoclassical economics are theorems of the logical system comprising the basic axioms of neoclassical economics. 'Being an economist'—which one becomes by participating in language games to which other economists also participate—entails mastering (1) the set of elementary axioms of the code of neoclassical economics, and (2) mastering (or making use of) the cognitive skills to generate theorems using the elementary axioms.

The transfer of axiomatized codes from one generation of scientists to another or from people within the professional group to people outside of the professional group is more efficient than the transfer of non-axiomatized codes. The reason for this is that the simplicity of the code makes the transfer of information more efficient. Moreover, the parsimony of the code makes it possible for the outcomes of coordination games based on the code to be more easily monitored: it is easy to check whether or not a particular assertion by a member of the group 'profits in concentrated industries are higher than in fragmented industries' is or is not a theorem in the system of axioms that compresses the code.

It is important to realize that the real number system is crucial to the efficiency of an axiomatized code. As Godel showed, it is possible to assign numbers to the logical propositions of a model or a theory in such a way that to each proposition in that system there corresponds a single number. In a self-consistent system, the Godel numbers of all of the propositions (all of the empirical propositions of neoclassical economics, say) can be derived in a finite number of deterministic steps from the Godel numbers of the basic axioms. What we end up with in an axiomatized system is a way of generating hypotheses about the behavior of other people that are participating in the same language game on the basis of observation of their verbal behavior. In the East–West game described earlier, for example, there is a simple way of mapping the description of the game (East–West) and knowledge about the location of the schools from the groups come (west-coast school, east-coast school) into a heuristic for tacitly predicting the behavior of each group. In the absence of such a simple algorithm for synthesizing behavioral rules from semantic content, coordination games are relatively less likely to generate positive payoffs for their participants.

By contrast, non-axiomatized codes—such as those running around in anthropology, social psychology, personality psychology, cultural studies, the sociology of science and so forth are, by contrast, not easily reducible to a set of non-contradictory (logically compatible) axioms. In these cases, the codes used by the practitioners of a discipline cannot be substantially 'compressed' to an unambiguous, small set of logical propositions from which all testable hypotheses can be derived as theorems. Rather, codes are 'individualized' to 'tribes' of people within a particular discipline that are using them. The transfer of the codes to subsequent generations or to 'out-groups' is not as easily accomplished as it is with axiomatized codes, because individual language games must be played out in order to successfully transfer each of the words, phrases and elementary propositions of the code—rather than just the axioms that are generating them.

2.5. Axiomatizable codes, mono-paradigmatic sciences and specialization

Axiomatizable codes, as we saw, offer the participants to the language games generating those codes significant economic advantages that are derived from the higher efficiency of the coordination games based on such codes, relative to coordination games that are not based on axiomatizable codes. Members of a profession or a discipline are participants to a common set of language games, and therefore they evolve a common code of communication. The difference that the axiomatizability of a code makes for the evolution of professions and specialities can be observed when we consider the predicament of a newcomer to a profession, in the case where the code evolved by its members is axiomatized, and in the case where it is not axiomatized.

When the code is axiomatized, the tacit rule by which the coordination game between the newcomer and the incumbents materializes can be derived by self-evident steps from premises that are common knowledge among the members of the profession (i.e., the axioms of the code). These premises become common knowledge between the newcomer and the incumbents during a short period of acculturation (a graduate sequence of two or three courses in neoclassical economics, for example). This period can itself be modeled by a short sequence of language games that produce a code by which the newcomer communicates to his instructors and peers. If the axioms on which this code is based are identical to the axioms on which the professional code is based, then the acculturation of the newcomer has been successful. He or she can begin to function as a member of the profession (i.e., publish papers in peer-reviewed journals). It is always a simple matter for incumbents to check that the newcomer is indeed playing by the rules of the professional language game, as all of the knowledge that he or she produces must be expressible as a set of theorems of the axioms of the code that has evolved as part of the professional language game. Not surprisingly, we find that papers in physics, mathematics and economics have a common form, starting with a set of assumptions and limiting conditions (dependence of cost on experience, say), and then use these conditions, in conjunction with the axioms of the professional code (profit maximization, say) to derive the result in the form of a set of theorems (economies of learning by doing).

There are two effects that increase the success of acculturation of newcomers into professions that have axiomatized codes. The first is the cost/benefit or incentive effect: there is a clear link between attempting to traverse or ignore the language game of the field

(introduce a new axiom, modify an existing axiom, challenge the epistemological bases on which the axioms were arrived at) and the outcome for the participant (exclusion from the media of disseminating knowledge). Because the process of argumentation in fields with axiomatizable codes is transparent to reviewers (who evaluate new work by verifying the consistency of the propositional knowledge produced in that work with the axioms of the professional code) therefore the cost of transgress ion by the newcomer is certain. Moreover, because professional rewards (tenure) depend on the successful dissemination of information to a community of knowledge (other economists, say) and information encoded with the 'right' code is far more likely to be disseminated than is information encoded with the 'wrong' code, there is also a clear link between the newcomer's decisions about using or not using the code and the material benefits he stands to gain in either case. Hence, I conjecture:

Conjecture 1. *Mono-paradigmatic professions will be characterized by axiomatized professional dialects.*

The second effect is the ambiguity effect. Even with the 'best intentions' on the part of the newcomer and his or her reviewers to expand the axiomatic basis of their discipline, in the absence of a stable, agreed upon code of communication, attempts to expand the community of 'innovators' beyond a small nucleus that has developed its own language game will flounder because of coordination failures arising from the impossibility to derive the rules of coordination in the language game by self-evident steps from premises that are common knowledge among the users. Hence, unless the 'innovators' find a way to 'translate' their code into the axiomatized 'mother code,' nuclei in professions with axiomatized codes will remain just that. Hence, I conjecture,

Conjecture 2. *Code-defying* (*assumption-denying*) *innovations in mono-paradigmatic disciplines are less likely to propagate and gather intra-disciplinary supporters than are code-affirming* (*assumption-affirming*) *innovations.*

The incentive effect and the ambiguity effect can also be used to explain the evolution of professional dialects based on axiomatized codes into specialties and sub-specialties. A specialty is a trade practiced by a subset of the members of a professional sect whose language games are based on the code of the mother specialty. Thus, agency theory is a specialty of organizational economics that is based on a code that can be reduced to the axioms of the code of neoclassical economics (see Tirole, 1988, for such a reduction). Although agency theory is apparently based on a challenge to the basic axiom that firms are profit-maximizing entities and the Modigliani–Miller theorem asserting that the capital structure of the firm is irrelevant to the value of the firm—which is derived from the axioms of the mother code—nevertheless agency theory retains the assumption that individuals can be modeled as profit-maximizing agents who are susceptible to localized incentive structures. Hence, agency theorists can effectively communicate with other members of the economics profession. Not surprisingly, agency theorists have no trouble publishing in mainstream economics journals. By contrast, transaction cost economics (Williamson, 1985) is based on axioms that cannot be absorbed into the mother code of neoclassical economics. Not surprisingly, TCE scholars have made the greatest impact in multi-paradigmatic fields such as organization theory and

organization studies, and have remained a fringe group in the economics profession. Hence, I conjecture:

Conjecture 3. *Mono-paradigmatic disciplines evolve through specialization, which is tile evolution of communities of knowledge that play language games using axiomatized codes whose axioms are easily translatable into the axioms of the code by which language games in the dominant field are played.*

2.6. Non-axiomatizable codes, multi-paradigmatic disciplines and fragmentation

When members of a professional group do not communicate on the basis of an axiomatized code, the incentive and ambiguity effects outlined work together to produce a dynamic of intra-professional fragmentation. A newcomer to the field has no clear incentive structure that guides his or her initial steps. Rather, the newcomer must play local language games with the members of his or her immediate community (peers, thesis advisors). These language games evolve codes that are localized: they are peculiar to the particular group of people that are playing them. This is because (1) there is no intra-disciplinary consensus about a set of axioms that can gene rate a discipline-wide code, and (2) the meanings of various words used by the newcomer in conversations with his or her peers are given by the mutually observed set of behaviors of people in this small group (among whom they are common knowledge) but which are not exportable (or expropriable) to (or by) other practitioners, unless they join the same group and participate in the group's language games for a period of time.

It has been known for some time by philosophers of science (Quine, 1970; Feyerabend, 1980) that there exist codes (Quine gives the example of Japanese and English) that are radically incommensurable or mutually untranslatable. Hence, it is possible—even likely—that mutually untranslatable codes will come to govern language games where there is no professional, axiomatized mother code for the entire discipline. The phenomenon of untranslatability gets played out at the level of the peer review process, where papers based on different paradigms (written in codes that evolved according to very different language games) are accepted or rejected according to their correspondence to the reviewers' own paradigmatic commitments. Multi-paradigmatic disciplines—such as organization science (Pfeffer, 1993)—are examples of communities of discourse and communication that have evolved as a parallel series of language games, leading to incommensurable codes of communication. Hence, I conjecture:

Conjecture 4. *Disciplines that are hot based on axiomatized codes of communication will be characterized by multiple, incommensurable paradigms of discourse and knowledge creation.*

The evolution of multi-paradigmatic disciplines towards greater division of labor will be governed not by specialization, but by fragmentation. Innovators do not need to develop theories and models that can be reduced to the axioms of a mother code. Rather, they simply need to make their theories intelligible in the context of language games that are played in localized 'pockets' of scholars that are engaged in active conversation at any one time. Thus,

we might expect—as Baum (1999) finds—that multi-paradigmatic disciplines 'strategy' are net importers of theories from several different mono-paradigmatic disciplines 'economics,' just as mono-paradigmatic disciplines are net exporters of theories to multi-paradigmatic disciplines. The explanation for this finding rests, I have argued, in the nature of the codes—and ensuing language games—that characterize each of these disciplines. Axiomatizable codes make a difference to the evolution of a field whose members use that code. Hence, we should find—as we do, as of recently (Kamps and Polos, 1999; Kamps and Masuch, 1997)—that practitioners in multi-paradigmatic disciplines (such as organization science) will try to axiomatize their theories using simple axioms which can be used as a basis for codes that compress large bodies of knowledge. This is—as my theory predicts—a first step towards the construction of a stable paradigm. Hence, I conjecture:

Conjecture 5. *Multi-paradigmatic disciplines will evolve by a sub-division of labor through fragmentation rather that specialization. 'Fragments' are sub-groups of practitioners engaged in language games that use mutually incommensurable and untranslatable codes of communication.*

3. The architecture of codes and the dynamics of dialects

This section aims to lay out a theory of the evolution of professional dialects as a function of the structure of the codes underlying those dialects. The analysis in this section builds on Abbott's analysis of the phenomena surrounding the establishment of cognitive jurisdiction by different professions (psychology, psychiatry, for instance) over a particular phenomenon (children's "misbehavior"). Abbott identifies several strategies—such as abstractization, reduction and the establishment of cognitive jurisdiction over a phenomenon 'occasionally hearing voices' as a consequence of the establishment of cognitive jurisdiction over a 'more severe' form of that same phenomenon 'prolonged episodes of experiences that do not correspond to sensory reality.' I will use the analysis of different kinds of codes and language game given above in order to make predictions about how professions using dialects based on different kinds of codes in their contest for 'cognitive jurisdiction' over new phenomena and over phenomena that are already under a particular jurisdiction. The aim of my analysis is to increase the precision with which we can make predictions about the evolution of a professional dialect, or of a 'conflict' among professions in a particular market setting—such as that between the various social sciences in the context of the North American and Western European business school, or between psychology and psychiatry in the North American 'mental care' industry. To do so, I will attempt to link the plausible effects of various 'cognitive strategies' to the structure and nature of the codes underlying the professional dialects vying for control of a phenomenon or practice. I will show that axiomatized codes confer significant advantages on their practitioners in the contest for legitimacy in the eyes of the 'paying' public. Moreover, simpler axiomatized codes confer greater advantages on their professional users than do more complex axiomatized codes, and also reduce the costs associated with enriching the code in order to account for new phenomena or anomalies.

3.1. Abstraction and reduction: the architecture of codes and the transfer of cognitive jurisdiction

Reduction (of a phenomenon to an abstract concept, or of one abstract concept to another abstract concept) functions to transfer cognitive jurisdiction of a phenomenon from one profession to another. The substantive claim that underlies reductive strategies is that the reduced object (a medical condition, a phenomenon, a treatment) is *nothing but* an element of the reducing object. Thus, the weak axiom of revealed preference (WARP) reduces various human behaviors in the marketplace to the instantiation of a utility-maximizing choice behavior. Gary Becker's treatment of altruism within the family (1981) is a reduction of the phenomena related to altruism to an instantiation of self-interest maximization. A reduction establishes a new cognitive jurisdiction (of the reducing dialect over the reduced dialect or phenomena) by setting up a series of self-evident steps (a deductive process) by which the elements of the reduced dialect can be deduced from the elements of the reducing dialect. Therefore, one might seek to explain the evolution of cognitive jurisdiction over particular phenomena from one profession to another in terms of the strategies of reduction and counter-reduction employed by different professions vying for recognition in the relevant field. Sociology and economics, for instance, might *vie* for legitimacy as dominant discourses in North American business schools.

Which discourses are more likely to prevail in the reduction game? I have demonstrated previously that professions based on axiomatized codes are more likely to evolve towards specialization (as opposed to fragmentation) and are more likely to re-create themselves across many generations of professionals than are professions based on non-axiomatized codes. The same argument applies to show that dialects that are based on axiomatized codes are better reducing agents than are dialects based on non-axiomatized codes. This is because the successful reduction of one dialect to another dialect can be represented as the outcome of a series of language games played among members of the reduced dialect (or their clients) with the members of the reducing dialect.

Let us model the language game as one played between three parties: a professional using a dialect based on a non-axiomatized code—the incumbent (I)—his or client (C)—successfully engaged in various coordination games with (I)—and the entrant (E)—who is a professional using a dialect that is based on an axiomatized code. The latter will try to steal C from I by reducing I's code to E's code. A successful reduction will have resulted if C comes to see the phenomena that are driving his or her interactions with I—the problem situations that generate C's demand for I's services—as being completely expressible in the dialect that E uses. If this is the case, E will have established cognitive jurisdiction over these phenomena, and will have 'stolen business' from I.

The situation can be modeled by a language game played between C on one hand, and E or I on the other hand. C depends on I for insight and reinforcement. Insight depends on the explanatory power of I's theories (explaining a lot by a little) (Quine and Ullyan, 1972), whereas the reinforcement of C's behaviors that I is able to provide depends on the efficiency of the language games played between C and I—as I already explained. The explanatory power of a theory depends on the efficiency of the language games that someone using that theory can play with other people using that same theory (i.e., that C can play with other people, including friends and family), because it is these language games that supply further 'evidence' for I's

theories. Confirmation biases, naïve realism and the false consensus effect (Nisbett and Ross, 1980) thus, serve to reinforce the dependence of C on successful language games played with other people, who become 'users' of the code. As Astley and Zammuto (1992) point out, the function of theories of management, strategy and organization is to provide practitioners with new building blocks for language games. Their paper, however, stops short of saying which language games will 'win out' in market place for ideas, and that is what the present paper tries to accomplish. *If theories function as coordinating principles for the language games that supply 'evidence' for or against them, then 'better' theories will be those theories that lead to more efficient language games*.

Thus, the efficiency of the language game (the coordination game based on utterances of various code-words) between C and I (or E) determines the absorptive power of the dialect of I (or E) for the phenomenon about which they are interacting with C. I have shown that axiomatized codes confer users of dialects based on such codes an advantage in coordinating amongst themselves over users of dialects that are based on non-axiomatized codes. Hence, I conjecture,

Conjecture 6. *Professions whose dialects are based on axiomatized codes will be more likely to win contests for cognitive jurisdiction than will professions whose dialects are based on non-axiomatized codes*.

For example, the theory predicts that the 'contest' between economics and sociology to establish cognitive jurisdiction in North American business schools (or in policy-making bodies in Washington) is more likely to favor economists, in those cases where the sociological 'knowledge' is not axiomatized. The recent attempts by sociologists (Kamps and Masuch, 1997; Kamps and Polos, 1999) to provide axiomatized accounts of classic texts in sociology can be interpreted as a reflexively rational response by sociologists to the 'language wars' involving economists and sociologists.

3.2. Code complexity and the efficiency of coordination games

The effects of differences in the complexity of a code on the efficiency of the intra-disciplinary coordination problem can be examined by an extension of Kreps' model of coordination that I presented in Section 2. Recall that, in the game played by the two teams from the East and West Coasts, there is precisely one 'coordinating principle' that is both self-evident and common knowledge between the two teams. It is 'which side of the Mississippi the school from the team comes, lies on.' This principle is common knowledge between the two teams and is 'self-evident'—by the construction of the game—as the only relevant principle that is common knowledge among the participants. I have argued that a professional 'code' serves precisely the role of the coordinating principle in Kreps' game. Thus, the axioms of rational choice serve as a code—or a coordinating principle—that makes coordination games played among economists highly efficient, relative to a similar coordination game played among people using a non-axiomatized code.

What is the effects of the complexity of the code on the efficiency of the coordination game? For the purpose of this discussion, I will define complexity as the minimum number of elemental propositions (or 'axioms') that can be used to deduce all of the code-words of

a code. For instance, the self-maximization principle can be used to derive a vast number of results pertaining to individual and social choice theory, just as the principle of energy minimization can be used to derive a vast number of results in classical mechanics. In order to understand the effects of the complexity of the code on the efficiency of a language game based on that code, it is important to understand that a language game—like a coordination game—'works' when the participants take matching actions—actions that are in some sense compatible with one another. This is precisely the case in Kreps' example of a coordination game, where 'East–West' functions as an axiom for the tacit coordination game that is unique, relevant, and common knowledge among the participants to the game.

The axiom 'East–West' functions as a set-theoretic filter on the possible choices that the participants make: any one city that can legitimately be named as part of the game must be either east of the Mississippi or West of the Mississippi, assuming that everyone knows enough about the geography of the United States to know whether or not a city lies East or West of the great river. What is the effects on the probability of effective coordination as the number of axioms increases? Adding just one axiom that is also common knowledge among the participants in virtue of their geographical location (Harvard/Stanford) (North or South of Washington, DC, say) introduces one more possible filter on the set of possible actions of the participants. Application of both filters without common knowledge about which filter is to be used (i.e., without unambiguous pre-play communication) makes it likely that the resulting actions will not be compatible, and will not produce the optimal payoffs. Of course, any communication will itself make use of a code, which may give rise to another tacit coordination game of the same type. If, for instance, members of the different teams attach different meanings to 'North,' then several (unsuccessful) coordination games will have to be played until the participants converge to a compatible set of behaviors in the language game using the word 'North.' Therefore, each additional axiom that can function as a filter on the set of actions that participants can take induces a meta-coordination game aimed at figuring out which axiom is to be used in the particular coordination game now being played. Hence, the complexity of the 'code' (the minimum number of axioms that can function as a finite basis for its code-words) is inversely related to the efficiency of the language game played by people using that code. Therefore, I conjecture,

Conjecture 7. *Professional dialects based on axiomatic codes of lesser complexity will confer a coordination cost advantage on the profession that uses them, over professional dialects based on axiomatic codes of greater complexity*.

This hypothesis provides a simple explanation for the evolution of professional dialects towards greater simplicity. Innovations such as the weak axiom of revealed preference are cherished in the economics profession precisely because they reduce the science of understanding human choice patterns to exercises in constrained maximization. In the language, I have developed in this article, they reduce the axiomatic base of the code used by economists to a single 'rule' (utility maximization with perfect information about the outcomes). The coordination gain that accrues to simplicity of dialect also explains why economists have been slow to embrace relaxations of the axioms of revealed preference and perfect information, in spite of their patently unrealistic nature.

3.3. Reduction and gradient effects: the architecture of codes and the establishment of cognitive jurisdiction over new phenomena

Abbott (1988) presciently discusses the strategies by which professions achieve cognitive jurisdiction over the problems and phenomena that their practitioners depend upon to generate rents for their professional activities, and shows that these strategies can be grouped under at least two general classes: reduction strategies and gradient strategies. The two strategies are complementary. Reduction strategies aim to show that a phenomenon or problem that is recognized as a legitimate ground for professional advice or intervention (child misbehavior, or behavior that contravenes the norms of the family, say) is nothing but an instantiation of a particular problem or phenomenon that properly falls under the legitimate jurisdiction of a professional group (pathological hyperactivity, falling into the proper domain of intervention for psychiatrists). Gradient strategies aim to establish professional cognitive jurisdiction over a particular phenomenon or problem (obsessive ideas, say) that can generate rents for professionals engaged in a particular dialect by first establishing jurisdiction over an extreme form of that phenomenon (obsessive–compulsive behavior, say), and then showing that there exists a continuum of behaviors that fall in between the more extreme form of the phenomenon and the less extreme form of the phenomenon. Professions are engaged in a contest for cognitive jurisdiction over rent-generating problems (Abbott, 1988, ibid). It is interesting, therefore to come up with a theory that predicts the winners in the contests for cognitive jurisdiction over any particular phenomenon, and this is what the theory developed in this paper allows us to do.

As we saw, axiomatized codes offer participants to a professional dialect based on those codes a coordinative advantage over participants to a professional dialect based on non-axiomatized codes. To extend this insight to the problem of cognitive jurisdiction, it is important to note—as Astley and Zammuto (1992) have done—that clients are themselves—in virtue of their seeking professional advice and engaging in practices that make use of that advice—also engaging in a language game with the professional care-giver—and amongst themselves. This language game is a coordination game that generates theories and accounts that the client uses to explain her behavior (a) to herself, (b) to other professionals in the same field, from which he or she might seek other opinions, and (c) to friends and family and other users of the code. Therefore, the better a professional dialect is at providing an efficient coordination game amongst practitioners, the better it will also be at providing an efficient coordination game amongst clients, on which the profession depends for generating rents. The economics profession, for instance, is successful at generating rents among politicians without massive contributions by the American Economic Association to the U.S. Congress because it provides an efficient code by which politicians can engage in discourse about social problems, unlike the American Medical Association, which must make significant monetary contributions and lobby fiercely for the preservation of the monopoly of physicians over the means of investigating and treating illness. Thus, we have,

Conjecture 8. *Professions using dialects based on axiomaitzed codes will be favored in the competition for cognitive jurisdiction for new phenomena and problems with professions using dialects based on non-axiomatized codes.*

It is also useful to ask, 'What happens when two professions using axiomatized codes fight for cognitive jurisdiction over a phenomenon?' Here, the analysis of the dependence of the efficiency of the resulting coordination game on the complexity of the underlying code becomes relevant. As we saw, more efficient axiomatized codes confer a coordinative advantage to professionals using them over less efficient codes. By the argument I have made about the ubiquity of language games among clients and the use of professional dialects for establishing such language games, it is easy to answer the question: 'Who will reduce whom?' In particular, we have,

Conjecture 9. *Professions using dialects based o simpler axiomatized codes will be favored in the competition for cognitive jurisdiction for new phenomena and problems with professions using dialects based on more complex axiomatized codes*.

This conjecture predicts that psychiatrists—using explanatory terms and theories that are centrally codified in a relatively simple document (DSM-IV) will enjoy a competitive advantage over psycho-analysts and clinical psychologists in the contest for cognitive jurisdiction over new phenomena—such as stress, hyperactivity and obsessive thinking about a single image or idea.

It remains to show that axiomatized codes also offer an advantage for the pursuit of gradient strategies for establishing cognitive jurisdiction over a new idea or phenomenon. To do so, remember that the gradient strategy relies on the subsumption of a less extreme case of a phenomenon or problem under the cognitive jurisdiction of the profession that legitimately is seen as governing the more extreme version of the same phenomenon. The key to making a gradient strategy work is to get the client or patient or user of the professional advice to see his or her predicament as an instantiation of the same phenomenon as the more extreme version that legitimately falls under the cognitive jurisdiction of a particular profession. The 'trick,' here, then is to provide a continuous transformation of 'extreme' problems into 'mild' problems.

To see how an axiomatized code can establish this transformation more effectively than a non-axiomatized code, consider the following example, due to Sainsbury (1993). Start with the axiom, 'a 10,000 grain assembly of sand is a heap' (I) and the 'self-evident' axiom, 'taking one grain away from a heap of sand will not make it a pile of sand' (II). Now, anyone would agree that 10 grains will not form a heap. Nevertheless, by starting from (I) and applying (II) recursively 9,990 times, we get that 10 grains will still be a heap. Hence, the axioms (I)–(II) have provided an axiomatization of a phenomenon that continuously maps a heap into a pile, thus, cognitive 'reducing' a pile to a heap. The essence of gradient strategies is this 'pile-to-heap' reduction, based on the axiomatization of the heap-hood of a heap, coupled with an axiomatization of its neighborhood.

Now, apply this insight to the problem of establishing cognitive jurisdiction over a psychological problem (overly optimistic expectations) starting from cognitive jurisdiction over a more extreme problem (psychosis). Gradually removing features of psychosis from the 'official' diagnosis of psychosis accomplishes the smooth transformation of over-confidence into a form of psychosis. Hence, behaviors that were previously considered to be 'healthy' are now considered to be pathological, because of the 'starting point'—or cognitive anchor—that the professional dialect offers its practitioners. Hence, the axiomatization of the description

of a phenomenon that a code offers its practitioners gives them a competitive advantage in establishing cognitive jurisdiction over new phenomena that can plausibly be 'absorbed' into the repertoire of problems over which that profession has cognitive jurisdiction. The success of gradient strategies at establishing cognitive jurisdiction suggests that professions based on axiomatized codes are more likely to play 'corner strategies'—as in the popular board game, Othello—than are professions using dialects that are not based on axiomatized codes. Hence, we have,

Conjecture 10. *Professions using axiomatized codes are more likely to use gradient strategies for establishing cognitive jurisdiction over a phenomenon successfully than are professions using non-axiomatized codes.*

We can interpret the attempts by some economists (Becker, 1976, 1992) to formulate an axiomatic treatment of addiction or family problems as an attempt to use this 'corner strategy' in reverse: adding a grain of sand to a pile of sand will not turn the pile into a heap. Hence, by iterative application of the weak axiom of revealed preference to the choices of the addicted, we can come to see addictions as instantiations of rational choice behavior driven by self-maximization.

4. Conclusions

The growth of a professional discipline depends on the recruitment of (a) new minds to its community of knowledge; (b) new phenomena to its universe of competence and (c) new clients to its market for ideas. These processes are, of course not independent. The recruitment of new minds to a community of discourse and an efficient set of language games can produce theories that effectively subsume new phenomena and problem-situations to the cognitive jurisdiction of that profession and attract new sources of demand for the theories and ideas created by its practitioners. This paper has argued for the language game as an essential building block for the analysis of competitions among professional dialects, ideas, theories and ideologies.

Professional dialects are codes of communication that are the products of previous language games played among their users, and influence the efficiency of the subsequent language games played by the same users. Axiomatized codes lead to more efficient language games. Not surprisingly, they lead to specialization in various professions that is driven by elaborations of the axiomatic foundations of the code on which the professional dialect is based, rather than by new phenomena and problems described by new and potentially incommensurable—dialects. By contrast, professions characterized by dialects based on codes that cannot be axiomatized exhibit growth through fragmentation into multiple paradigms. These effects can be predicted on the basis of a model that represents the evolution of codes as a sequence of tacit coordination games whose 'coordinating principles' are supplied by the axioms of the code.

Language games are ubiquitous. Professionals play them amongst themselves, between themselves and other professionals—leading to games of mutual absorption and reduction in the cognitive domain—and with their clients—leading to games used to establish cognitive jurisdiction over new phenomena. Language games based on professional dialects are also played inter-personally among laymen, giving rise to cult-like followings of particular

professional disciplines. The model I have put forth argues that the success of a profession to lay claim to a new phenomenon or rent-generating problem situation—or to appropriate such a rent-generating problem situation from the cognitive jurisdiction of another dialect—depends on the efficiency of the language games that the new dialect permits, (a) between its incumbents and its potential clients and (b) amongst potential clients, as they try to make sense of their own situations through interactions with other people. Thus, we find that we can explain the ubiquity of economics faculty in business schools—to pick an example—by the relative efficiency of the language games that the (axiomatized and simple) code of the economics profession permits amongst (a) faculty and students and (b) students themselves. Of course, it helps that the 'codewords' of the economics discipline have mush in common with the 'code words' of accounting—the universal language of business. Thus, the popularity of economics in business school curricula can be explained by the ability—post-Samuelson—of economists to provide an efficient axiomatization of an already-existing language game played amongst practitioners.

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