RULE-BOUND SYSTEM ANALYSIS AS A TOOL FOR ECONOMIC DEVELOPMENT

by

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ABSTRACT

Human behavior is often governed by sets of rules. A successful theory of rule bound systems should be able to predict the properties of the system thus governed, by study of the properties of the rules. Rule-bound systems analysis derives from social anthropological study of cultural systems, economic analysis of regulatory systems, analysis of legal systems, and from the formal logics derived for study of temporal and concurrent operating systems. Such theory then has value for problems of design of human rule bound systems, such as those which arise in legal and economic development. This paper outlines the subject and gives several examples of its application One of these examples is the World Bank policy for energy sector lending, based on their experience in lending for major energy projects. This policy sets requirements on the regulatory rules and institutions of a country as pre-conditions for future lending, using requirements very similar to the principles identified by analysis of rule-bound systems. Thus, rule-bound systems analysis may be considered as a formal framework for application of such policy development tools.

The worlds of theory and practice often are as apart as separate planets in a solar system, joined only by the belief that they share the same source of light. It is therefore somewhat unusual when the practical world and the abstract independently evolve similar or identical tools for similar problems. Previous instances are not unknown. For example, the economic analysis of marginal cost turned out to be formally identical to the engineering technique of lagrangian analysis for maximizing economy of dispatch of a power system, a fact which was true for decades but only became well known to both sets of professionals in about the 1950's. Systems analysis seeks such similarities among fields of study. It is particularly interesting to find such similarities when the subject matter has practical application, such as in a major area of policy. This paper summarizes similarities in forms of analysis from several fields, including legal analysis, constitutional economics, social

anthropology, and in the theory of design of computer operating system logics. It then gives examples of how these common principles arise in several concrete problems of analysis in economic development, including as an example the Bank's policy statement for electric sector lending.

I. INTRODUCTION: PRINCIPLES AND RELATIONSHIPS TO FIELDS OF STUDY

Foundations in Related Fields

To identify the subject of the systems theory of rule bound systems it is useful at the outset to distinguish it from jurisprudence. Jurisprudence is a positive study of which rules "ought" to occur.[1] The theory of rule-bound systems is not a positive theory. Rather, the purpose is to understand why which set of rules exists, and to be able to know in advance the effect of adaptation of one or another set of rules. In an evolutionary sense, the subject seeks to understand why some sets of rules survive and others do not. Were the subject instead a positive study, then it would be restricted to analysis only of the possible survival of some pre-judged set of systems which "ought to" survive, and would thereby lose much of the possible subject matter and its sources of scientific validity. In addition, a positive theory is almost by definition not useful for analysis; instead, a positive theory must itself be analyzed to see whether its assertions are correct. To understand the distinction, note that in one example given below, the Bank's policy statement on electric sector lending is a positive assertion, against which conditions are tested using concepts and techniques of rule-bound systems analysis.

The subject matter of the theory of rule-bound systems incorporates legal and judicial systems, but it also incorporates other human systems of rules which may not be explicitly embedded in legal systems. For example, the present subject includes human cultural systems of rules, such as marriage rules, and it also includes economic systems. It is true that in modern societies, these systems of human rules, in particular, are often subsumed by the legal system. But the theory of rule-bound systems does not assume that all subsystems of human rules necessarily become included in the legal system. If so, this would be a very strong result, necessary of proof and ultimately very challenging to many existing legal systems[2] and especially to many existing political systems.

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[1] *Black's Law Dictionary*, 5th Edition, 1969. See as well Paragraph i.1 in the lecture of Friday, December 24, 1762, in *Adam Smith, Lectures on Jurisprudence*, edited by R.L. Mech, et al, Liberty Classics, 1982.

[2] This observation especially shows why the present subject differs from the study of rules by Joseph Raz, such as in *Practical Reason and Norms*, Princeton University, Press, 1990, which at page 151 characterized legal systems as those which "claim authority to regulate all forms of behavior" (emphasis added). Many important systems of law make no such claim. It is not merely that some "western" systems regulate private behavior by permission, as Raz suggests. Instead, a significant

This research also differs from jurisprudence in that the present subject, the theory of rule bound human systems, is ultimately a mathematical subject. The paper later discuses why that is true, and the nature of the mathematics which would (or more accurately, does) comprise this subject. Relationship to existing mathematical work in social anthropology and in computer logics (temporal logic) is briefly noted below. The present paper concentrates however on relationships to economic and legal systems.

Scottish economist Adam Smith used a positive definition in his study of jurisprudence, but his study of economics was more concerned with forming notions of actual rules, and of predicting the consequences of particular rules of behavior. Smith showed how these behaviors form a system with predictable effects on economic efficiency and creation of wealth. For example in *Theory of Moral Sentiments* Smith explicitly cites mechanisms by which individuals form rules, by observations and experience in a society. In his more famous work *The Wealth of Nations* he then analyzes the consequences of people acting according to particular patterns of behavior, which we have come to think of as rules of self-interested rational action.

Other economists have also studied the interaction of rule-bound systems and economic systems. Buchanan identified constitutional economics as a separate area of study:

> "...constitutional economic analysis attempts to explain the working properties of alternative sets of legal -institutional - constitutional rules that constrain the choices and activities of economic and political agents, the rules that define the framework within which the ordinary

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portion of the activity of a legal system may actually go toward enforcing exclusions of authority, such as happens in the American system. On the British system see a similar discussion by A. V. Dicey at Chapter XV of his *Introduction to the Study of the Law of the Constitution*, reprinted 1982 by Liberty Classics. Raz (above, page 171) also states that for a legal system to be in force "...the courts must regard ordinary citizens as required to be ideal law-abiding citizens and judge them accordingly." Certainly in American law, and probably in the British tradition of common law generally, there is no such rule. In some areas, such as criminal law, such a rule of judgment would be patently unconstitutional. The criterion in criminal law for example is whether the accused has violated the known specific acts defining a crime. The accused may have acted in truly horrid ways by community standards, but would be innocent of the crime accused if the commission of the specified acts is not proven. It is arguable that human history has spent the last several centuries specifically discarding the kind of encompassing legal systems assumed by Raz, and especially discarding those which command all to conform to "ideal" behaviors. It seems peculiar to define the positive study of law in a way that only encompasses systems we presently regard as totalitarian. But in any event, the theory of rule-bound systems avoids this trap in part by not being a positive theory at all.

choices of economic and political agents are made."[3]

Friedman similarly summarizes:

> "The economic analysis of law involves three distinct but related enterprises. The first is the use of economics to predict the effect of legal rules. The second is the use of economics to determine what legal rules are economically efficient, in order to recommend what the legal rules ought to be. The third is the use of economics to predict what the legal rules will be."[4]

Other economists have worked in these same directions, including several in well known works.[5]

Historical analysis of the economic effect of legal rules is also related to the systems theory of rules. For example, Horowitz analyzed how the dynamic economic growth of the United States in its first eighty years was driven by judicial reinterpretation of legal rules which affect commerce.[6] He shows that the result was a more dynamic system which allowed capital formation. Nelson[7] similarly showed how the pre-revolutionary legal system of the American state (which was then a British colony) of Massachusetts was designed to promote stability of a system of status-based wealth, using a notion of community. But the post-revolutionary system evolved rules that instead

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[3] "Constitutional Economics", pages 134 -142 in Eatwell, et al. (eds.) *The New Palgrave "The World of Economics"* W.W. Norton 1991.

[4] David Friedman, "Law and Economics", pages 371-380 in Eatwell, et al. (eds), *The New Palgrave "The World of Economics"* W.W. Norton, 1991.

[5] Von Hayek analyzed the existence of the legislative function in democratic societies, such as in F.A. Von Hayek *Law, Legislation and Liberty* 3 volumes from 1973 to 1979, University of Chicago Press. Posner applied economic analytical techniques to understand why particular rules of law exist and how they function; see Richard Posner, *Economic Analysis of Law*, Little, Brown, 1986, and also "A Theory of Primitive Society, with Special Reference to Law", pp 1 - 53 in *The Journal of Law and Economics* vol. 23, no. 1. That paper contains a section on "Legal Process" in which Posner presents conclusions regarding flexibility of legal rules, and contains a concluding paragraph which asserts a relation between the time available for a system to evolve and the stability of the rules, similar to the ideas found here. Coase and Calabresi analyzed how rules of tort law operate to create socially efficient results. See for example R.H. Coase "The Problem of Social Cost" pages 1 -44 in *Journal of Law and Economics* Vol 3, October, 1960, and G. Calabresi "Some thoughts on risk distribution and the law of torts", in *Yale Law Journal*, volume 70, March, 1961.

[6] Milton J. Horwitz *The Transformation of American Law 1780 to 1860*, Harvard University Press, 1977.

[7] William E. Nelson, *Americanization of the Common Law, The Impact of Legal Change on Massachusetts Society, 1760-1830*, Harvard University Press, Cambridge, 1975.

allowed more fluid relationships and economic growth in a more monetized and dynamic economy.

Thus the topic of the theory of rule-bound systems is not merely of academic value. As an economic policy, reinterpretation of an existing legal system may be a less capital intensive policy instrument to achieve growth. With the extensive modification of economic law now occurring in many parts of the world, the possibility of encouraging growth by use of rule analysis in connection with or even in substitution for capital spending should not be overlooked as a development tool.

Issues in Analysis of Rule-Bound Systems

Anthropology, particularly social anthropology and structural anthropology, have also sought to abstract general rules and then to find the consequences of existence of such rules. For example, Ballonoff defined the purpose of mathematizing cultural analysis this way:

> "... the study of culture, defined as the study of rules and their consequences ... must be capable not only of describing the rules, but of correctly predicting their consequences on material objects subject to their operations. ... it should also be possible to predict the properties of systems using the rules, and the conditions under which such systems may exist and would be observed".[8]

While Ballonoff did not explicitly use an "efficiency" formulation such as is common to economics, that study went on to describe the structures of marriage rules, to predict when particular rules would exist or occur, and to compute (demographic) properties associated with the existence of such rules. Therefore, except that this study did not attempt the positive program of which marriage rules "ought" to be used in particular societies, it did otherwise fulfill the definition of Buchanan and of Friedman as defined for economic analysis of law. It describes rules, shows the function of rules, and predicts the existence and consequence of existence of rules.

Note that economics is also not limited to the study only of hypothetically "rational" actors -- existence is also relevant. For example, Jack Hirshleifer's classic micro economics textbook[9] has this as the first sentence "Economics concerns decisions - choosing among actions". He elaborates " .. economics as a science is not irrevocably wedded to the rationality postulate. When an alternative that proves more useful comes along it will be adopted instead"[10]. Many of the studies cited here fit both of these concepts. The purpose of rules is to affect human choices of actions. But, most studies

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[8] From page 1 in Paul Ballonoff, *A Mathematical Theory of Culture*, Monograph No. 40, Austrian Society for Cybernetic Studies, 1987.

[9] J. Hirshleifer, *Price Theory and its Applications* 4th Edition, 1988, Prentice Hall.

[10] See page 7 of Ballonoff 1987 cited above.

cited here are based on an "existential" description of the rules, rather than a presumption of rationality (or its absence) in the use of those rules.

The concept of existence is very important in theories of rule bound systems. Predictions are tested against what is found to exist, while actions of persons following (or avoiding) rules within particular systems also cause events (or objects) to exist. Thus both Posner and Ballonoff test their theories by describing theoretical structures, and then compare to what actually exists. Friedman simply included predictions of existence as a defined aim of the subject. Conclusions related to efficiency of the operation of rule-determined systems are deduced from such existential descriptions. It may be that when rule-bound systems are described existentially, then predictions of the existence (including of the duration, etc.) of a particular system are associated with analysis of the consequences of that system on material efficiency which results from following it.[11]

Closely related to both existence and efficiency are matters of system size. System size issues arise in several different forms. For example, in standard microeconomic analysis of production in a competitive market, it is assumed that there are sufficient producers that none is large enough relative to the size of the market to determine their own price. But how many producers is enough so that none is large enough to dominate the market? Some literature suggests that the number may be as small as two -- this is certainly one interpretation of the "theory of contestable markets". On the other hand, the standard textbook analysis of the case of "few" producers (oligopoly), two producers (duopoly) and one producer (monopoly) strongly implies or directly asserts that system behavior dramatically changes as system size (measured by number of actors) becomes smaller.

The economic analysis of monopoly in particular shows that system size (as counted by number of producers) is also related to both efficiency of production and the total size of the market. For example, the condition known as "natural monopoly" arises when the total size of the market is found within the declining cost portion of the average cost curve of a single producer. This kind of condition in turn has consequences for development policies. For example, Leibowitz[12] argues that small national or territorial size creates the possibility that the local market is insufficiently large even to support an efficient local monopolist. Therefore, in a small economy export may be required to

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[11] This property is shared by all of the above studies, including that of Ballonoff which was constructed in part from a microeconomic resource allocation framework.

[12] A.H. Leibowitz, *Defining Status, A Comprehensive Analysis of United States Territorial Relations*, Martinus Njhoff Publishers, 1989. The citation is but a small part of the subject of the text cited. This work can be read as a detailed analysis of change in rule-bound systems (the pre-existing cultures of people in U.S. territories) when a common set of rules (the U.S. Constitutional and legal system) is deliberately superimposed.

sustain an industry at all. Ballonoff[13] similarly discovered that the size of the Jamaican business community may be small enough that prohibitions on interlocking directorates acceptable for larger economies could hinder company formation in Jamaica. These kinds of claims are clearly predictions about not only size and efficiency but also existence. Thus, conclusions about market efficiency that seem axiomatic for large systems may have radically different implications when used to form policy (i.e. to determine rules of behavior) for small systems.

Interrelation of system size and existence is also found in analysis of cultural systems. In analysis of marriage rules, Ballonoff[14] used the concept of "minimal structure" to find the smallest self-replicating structure which maintained the existence of the rule. The parameters of this structure then were found to relate to the operating population statistics of any size system following the rule, not only of the theoretical minimum sized system. The argument used to derive this result was based on possibility densities, in a manner similar to thermodynamics. Thus while the underlying probability distributions of cultural systems are not those of thermodynamics, this similarity of theory construction shows that similar efficiency arguments apply to cultural analysis as well.

Issues raised above can generally also be rephrased in the form of the adequacy and consistency of a description. For example, if a culture is described to have a marriage rule of a particular type, but the population size is described to be smaller than the minimal structure for that rule, one would question if the ascription of the rule to the culture is correct. Or, if someone describes a market as "competitive" and then tells us there is only one producer, then at the least many other empirical questions must be raised, and probably we would reject the description as correct.

Issues of logical consistency, adequacy and completeness of description arise in many cultural, legal or economic contexts. For example, one could conceivably construct a kind of "completeness" theory based on methods such as used in the Russian folklorist V. I. Propp's *Morphology of the Folktale*, and from this infer existence of as yet undiscovered examples of the cultural form, or the content of incomplete texts.[15] It is arguable that the "structural analysis" of the French social

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[13] In a report to the Inter American Development Bank on a proposed Competition Act for Jamaica, 1991.

[14] See Ballonoff, 1987 cited above.

15 Ballonoff has demonstrated that the fact that cultures are often taken as unique literary objects does not make them unable to be analyzed. In contrast, the rules structure of the system is subject to analysis, and such analysis can derive predictions of properties which may be tested against empirical observations. See P. A. Ballonoff, “More on the Mathematics of Rule-Bound Systems” *Cybernetics and Systems,* 26:129-132, 1995.

anthropologist Claude Levi-Strauss is exactly that kind of application of completeness theory for descriptions. Very much this approach was also applied by Akenson in his analysis of the common origins of the modern Christian and Jewish faiths, by analysis of the common body of texts from which both arose.[16]

In summary, theories of rule-bound systems which can anticipate the consequences of particular cases or events can have very practical consequences for prescriptions of policy. Such issues are not "merely" philosophical, they are essential.

Terminology for Analysis of Rule-Bound Systems

It is now useful to define some terms which are useful in analysis of systems of rules. Apply the term "transformational system" to whatever organization or institution does the natural, physical work of the system, that is, the operating system. Label as "reactive" those institutions or organizations which regulate interactions among transformational systems and their environment. Label as "logic" whatever rules govern the reactive systems.

Note that these terms derive directly by analogy with what's called temporal logic of reactive and concurrent systems.[17] That is a mathematical means of analyzing operating systems of computers that are simultaneously running different programs, which programs may also be using common data sources and generating results used by each other. Temporal logic alone is a theory of logic which

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16 Donald Harman Akenson *Surpassing Wonder: The Invention of the Bible and the Talmuds*, 1998 Harcourt Brace and Company. While the book is primarily an analysis of the classical texts, at times Akenson writes about his own analytical method in language striking similar to that used here. For example consider this selection at page 267:

> "... we have been sharing metalanguage: the discussion of one symbolic system through the employment of another. It cannot be any other way. The form of meta-language I have been employing throughout this book owes more to literature than to linguistics. ... these metaphors, while employed as literary devices, are more than that: each of the central devices is a behavioural model which explains how thousands and thousands of tiny datum points are encompassed within single system - and if successful does so with a good deal more efficiency of explanation and communication than would a page of algorithms. ... This is a set of rules that are clearly observable... [in the classical texts] ... and once these rules were set down, anyone who was to invent, write, preach, heal, in that tradition had to observe them or be thuddingly unsuccessful."

17 Z. Manna and A. Pnueli, *The Temporal Logic of Reactive and Concurrent Systems, Specification*, 1992, Springer-Verlag, New York.

involves formal operations which draw inferences about conditions of the past or future states of a system, based on the logic of that system. I specifically mean to imply that this computer programming derived logic, or something very much like it, will be a necessary part of a fully developed theory of rule based human systems. Each human system has its own past, present and future. A logic of operations of rules over such a time dependent system must account for these temporal states.

Indeed the notion of "survival" of a rule requires explicit treatment of temporal existence, co-existence, and continued application of rules and of the effects of rules. The mathematics known as the temporal logic of reactive and concurrent systems does temporal analysis very rigorously for computer programs. Legal analysis does this kind of analysis in its normal course, it merely does not do so using formal mathematics. To create a cultural mathematics[18] it was similarly necessary to deal with temporal sequences, and with problems of structural relations determined at a point in time by the existence of rules in some temporal sequence. Economic analysis often does not repeat its temporal assumptions in each application, but is clearly making such assumptions in the elementary texts.

The purpose of rule-bound systems analysis is creation of useful theory, not just description. To understand what a full theory of rule based systems would produce, impose an axiom: the logic of the system has to be capable of representation as a mathematical group. This has very precise meaning in mathematics, which is literally met in several examples of rule bound systems cited below. In cultural theory several authors have each shown that when you can represent marriage rules abstractly, that the rules are also representable as symmetric groups[19], that is, by similar mathematics to that used to describe the symmetry of crystals or the nature of patterns in works of art.[20] The work

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[18] Such as cited in references of Ballonoff, 1987 cited above.

[19] The classical anthropological literature on the oral culture of Australian preliterate tribes led to discovery that cultural rules have the property of mathematical groups. Although almost never given credit for the discovery, this was apparently first written out by B. Ruhemann, "A Method for Analyzing Classificatory Relationship Systems", pages 531 - 576 in *Southwestern Journal of Anthropology*, Vol. 1, 1945; also in "Purpose and Mathematics: A problem in the analysis of classificatory kinship systems", pages 83 - 124, in *Bijdragen*, Vol. 123.

[20] See for example A. Weil "On the Algebraic Study of Certain Types of Marriage Laws (Murngin's System)", which originally appeared in the French edition of Levi-Strauss' *Elementary Structures of Kinship*, Presses Universitaries de France, Paris, 1949. The work was reprinted in English as an appendix to H. White, *An Anatomy of Kinship*, Prentice Hall, 1963. White's work especially applies group mathematics from the viewpoint of crystal theory to a more general class of marriage rules.

of Ballonoff on cultural mathematics shows that important population parameters of a cultural system are related to the order (size) of the mathematical group which represents the marriage rule[21]. For temporal logic the sets of operators representing past and future conditions of an operating system each form a symmetric group[22]. Thus, the axiom is very reachable.[23]

Since mathematical cultural theory is already described elsewhere[24] for present purposes, it is more useful to consider what it means to impose the group axiom on representation of a legal system. First, a logic based on a mathematical group would not just be a semi-group. That is, it would not just be a generator of strings, like sentences. Instead, we would also have some means to discover if the sentences are true or false. The phrase "this contract is valid" may be a correctly constructed sentence, under a semi-group. But "this contract is not valid" may also be correctly constructed. In a semantic system however, and with consistent rules of construction, both can not be true at once. Under an effective legal system, not all of the strings one can generate that are grammatically correct are going to be acceptable under the law. Another way of saying the same thing is to say that these valid statements are going to have a semantic meaning. There is some means of relating the empirical content of a statement to the way that content is evaluated within the legal system, in a sentence of given structure.

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[21] See P. A. Ballonoff, "Mathematical Theory of Social Demography", pages 101 - 112 in Trappl, ed., *Progress in Cybernetics and Systems Research*, Vol. X, 1982; and "Mathematical Theory of Social Demography, II" pages 555 - 560 in Trappl, ed., *Cybernetics and Systems Research*, 1982.

[22] See Chapter 3 of Manna and Pnueli, 1992, cited above.

23 Furthermore, when it is reached, the results are very powerful. For example, in analysis of cultural rules of marriage, it is known that such rules can be represented as mathematical groups, as cited in other footnotes of this paper. It was also know than presentation of such groups as matrices of zeros and ones was possible, and that the diagonal of such matrices in certain conditions was always filled with zeros. Ballonoff has demonstrated that this seemingly trivial fact has powerful consequences: due to theorems in the mathematical theory of “group representations” it means that the population statistics of any sized system operating under a rule with group characteristics, is computable from knowledge only of the order (size) of the smallest group which represents the operation of that rule. That is, the demographic characteristics of any culture are computable (predictable) from knowledge of the form of cultural rules alone. See P. A. Ballonoff “Comparison of Rule-Bound Systems Theory to Traditional Systems Theory” *Cybernetics and Systems*, 27: 317-326, 1996. See Ballonoff 1982 cited above for development of the theory which does the demographic computations.

[24] See especially citations in Ballonoff, 1980, 1982 and 1987 cited above.

Place these ideas in a legal context. Within a given system, the law must say things that are mutually consistent with each other. The law also tells what will happen, legally, in a particular factual situation. This ability to evaluate particular facts in particular contexts is an important property of a system of law. Another way to say the same thing is to say that what is true under a given system of law is not arbitrary. It is not just that a judge makes a decision, and it could be any decision, because that person is the judge. The decision maker must follow various established rules in reaching the outcome. Imposing the heuristic requirement that the theory which one constructs has the properties of a mathematical group therefore also imposes strong conditions, which conditions legal systems do often have.

Now consider the kinds of issues raised by application of the group axiom to analysis of legal systems. The first seems startling: the future is predictable. But this is not such a surprising result when one considers it's empirical meaning. Take a potential contract to your lawyer and ask "is this contract is valid? Will it be possible to enforce the contract or to get damages?". Therefore, a legal opinion, in this example about a contract, is really a prediction, usually a very accurate prediction if the lawyer is competent, about the future.[25] The prediction is reached by proper application of the rules of that system to the relevant facts.

The next implication is that to make such predictions possible, a system of communication of past case outcomes is necessary. In pre-literate societies, this may take the form of recitations of "tales". In literate societies, this would normally take the form of written decisions. Also, since a judge does not have arbitrary authority, a written decision enables the judge to state (and others to verify) whether the decision is made according to the law. Judges in turn must have some means of generating their conclusions. *Stare decisis* means respecting a prior decision. Usually it means respecting the prior decision of a higher court, but it is also a kind of consistency rule. This rule, which is part of common law traditions, is almost a direct interpretation of the group axiom.

The use of the principle of *stare decisis* makes a strong statement about the consistency and predictability of the system. Prior judicial decisions, known because they are written, become "analogics" or surrogates for explicit rules, which give the ability to compute a result in a new case by applying the reasoning of older cases to the new set of facts, using the prior decision by analogy. The description of the use of precedent as analogy for deciding future cases is not new to the literature on jurisprudence. For example, M. J. Horowitz summarizes a debate between philosophies of United States Supreme Court justices on the role of analogical reasoning in the common law. One need not take any position on what may be the "proper" role for such analogy, to recognize that all sides of this debate acknowledge the presence of analogical reasoning in an important form. For

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[25] The cultural example cited in Ballonoff 1980 and 1982 above used post-diction, that is use historical of data and show that you can predict from the structure to the measures, and vice versa. One could use a theory predictively with more confidence, if it works post-dictively.

purposes of the present paper what is important is that the presence of analogical reasoning, or something similar, is implied by the group axiom, and is found in empirical reality.[26]

Related issues have been raised by Attiyah in comparing American and British systems of law.[27] The use of this device in the British system of law evolved as judges more or less created their own powers even when Parliament had made no direct grant, and all began acting according to rules like *stare decisis*. While the British have an extensive system of common law, Parliamentary Acts, and related historic documents, there is no written British constitution, in the sense that the United States or many other countries have a written constitution which purports to be the body of law from which all else flows or must be consistent.[28] Thus for reasons of consistency, completeness and

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[26] M. J. Horowitz, *The Transformation of American Law, 1870 - 1960*, Oxford University Press, 1992, at pages 204 to 205

[27] See P. S. Atiyah and R. S. Sommers *Form and Substance in Anglo-American Law*, Clarendon Press, Oxford, (1991).

[28] An interesting if perverse form of support for many conclusions of this article may be found in Jerry Mander, *In the Absence of the Sacred, The Failure of Technology and the Survival of the Indian Nations*, Sierra Club, 1991. As the subtitle implies, the author is an unabashed critic of technological progress, *per se*, which he claims causes demise of many "native peoples" around the world. (In contrast Robert Edgerton in *Sick Societies*: *Challenging the Myth of Primitive Harmony* 1992 The Free Press, demonstrates that many primitive societies were dysfunctional and failed of their own merits).

Mander argues that the Iroquois Nations had a constitutional form of government with an elaborate civil and criminal code long before formation of the United State Constitution or its predecessor document, the Articles of Confederation. But says Mander, several elements of modern life are a vital attack on the Iroquois system. First, despite the present existence of written copies of the Iroquois Constitution, that code was inherently an oral document; the existence of a written form is itself a compromise of the structure and operation of the culture of transmission. An oral code is shared only by and among culture bearers. Clearly, when a code is only oral and thus only accessible to people with special knowledge, then that code is of very limited use in a more dynamic environment which must deal with many "outsiders", each of whom may require clear and certain knowledge of the rules of action within the society. Thus, Mander's seemingly romantic opposition to written culture is an implicit corroboration of one argument of this article, that written codes enhance system viability in a more open environment.

A second argument of Mander is similar: the advance of technology is destructive to native, oral cultures, again giving the Iroquois as one example. Mander seems to view changing technology as some from of intentional evil plot, perhaps by big corporations. Such vehement opposition to technological change in order to preserve oral culture is also affirmation of the conclusion here that

computability, it is a serious question whether or not common law and written constitutional systems can exist simultaneously. Either the two systems of law must govern different subject matters, or, one system must govern the other. In the American context, the later has generally become the case -- where constitutional and common law provisions conflict, the constitutional provision will prevail.

Richard Posner has argued by example that legal systems must be looked on as coherent structures whose rules must be interpreted in the context of other rules in the same system, not merely as separate entities to be compared against each other on an ad hoc basis.[29] That is also one of the critical conclusions of the present paper. By conducting an analysis of the full systems of US and UK law, Posner concluded that the "English legal system is closer in an important sense to the Continental legal system than it is to the American" (page vii).

This result parallels two observations of the present author. One, argued in footnote 2 of this paper, the work of Raz on legal rules is not a general theory of legal rules, since it defines law in a narrow way which excludes American law. In fact, Raz seems unaware of the differences between UK and American law; his theories are perhaps better viewed as applicable to Continental law. Second, this paper later analyzes aspects of Philippine law as examples of how to apply rule-bound analysis. Philippine law provides another example of how looking only at pieces of the law and not the whole system can lead to wrong conclusions. For example, in appearance, Philippine law looks

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such systems are not "wired" to function in more dynamic environments. It may also be noted that there is a version of the Iroquois Constitution available on bulletin boards of the Internet, which if Mander is correct means that this very posting is a further act of destruction of the Iroquois; be that as it may, the written Internet version, if accurate, contains a recognition that change in the code may be necessary but does not contain any explicit rule of self-change. This also tentatively supports my conclusion in the main text that presence of a workable rule of self-modification is a requirement for a viable rule system in a technologically dynamic environment.

Finally, Mander also suggests that the Iroquois constitutional code was the model for the American one. He makes a strong case that many of the features of the Iroquois code are also present in the American basic documents, including separations of powers among various constitutional bodies, specific duties of different bodies or officers, codes for election and removal of officials, and so forth. Indeed, most of these features are the essence of what is often referred to as "Western Democracy". Geographically the Iroquois are no doubt in "the West" (the Iroquois Nations exist in the norther-eastern portions of North America), but culturally they are not, and if Mander's history is right then historically in many ways their code pre-dates "the West". Thus, the Iroquois example together with other anthropologically documented examples cited, show that the theory of rule bound systems is not a matter of "West vs East". The theory comprehends issues which relate to any system of rules.

29 *Law and Legal Theory in the UK and USA* 1996 Clarendon Press, Oxford.

"American" in use of forms and language, and also seems to be a "common law system" in ways similar to American law. But when looked at more closely, the powers of the Philippine Congress are much closer to those of a Continental type legislature or parliament; it is more unrestricted in ways perhaps that Raz might find familiar; and it is much more of a system of Code law, including many elements drawn from Continental Civil Law, than a common law system.

II. EXAMPLE 1: THE BANK'S ELECTRIC SECTOR LENDING POLICY

The International Bank for Reconstruction and Development, also known as the World Bank or simply "the Bank", is one of a small number of intergovernmental institutions created after the Second World War, to encourage economic development through technical lending without being tied to the foreign policy of any particular country. Rather, the Bank proposes and carries out its own analyses and policies, while acting as lender of last resort for countries undergoing economic development. The Bank has been particularly interested in infrastructure development through physical projects, such as power plants and electric transmission systems.

In January, 1993, following an intense analysis of its own experience over many years, the Bank issued a new statement of policy.[30] This statement marked a significant departure from previous policy practices of the Bank, because it was stated neither in engineering nor economic terms. Rather, the policy requires that certain forms of regulatory structures and processes be in place, before lending will be undertaken for the electric power sector. This policy is expressed through several "principles", whose over-all impact is to encourage movement to greater independence and self-management of the power sector, using corporatization of institutions, privatization, competitive entry from foreign providers or managers, and other rather familiar techniques.

The first named and numbered "principle one" of the Bank's policy statement says that "A requirement for all power lending will be explicit country movement toward the establishment of a legal framework and regulatory processes satisfactory to the Bank". To do so, the Bank lists six criteria which must be met for this "principle one" to be met. These are:

- a clear set of rules, known in advance,
- rules actually in force,
- mechanisms to assure the application of the rules,
- conflicts resolved through binding decisions of an independent judicial body or through arbitration,
- known procedures for amending the rules when they no longer serve their purpose,
- a framework of regulatory incentives ... to support competition and induce efficiency.[31]

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[30] See *The World Bank's Role in the Electric Power Sector, Policies for Effective Institutional, Regulatory and Financial Reform,* A World Bank Policy Paper, The World Bank, 1993.

[31] See the policy statement especially at pages 60 to 61.

Of these six bulleted requirements, only the last, a framework of regulatory incentives to support competition and efficiency, is clearly derived from and based on economic and engineering considerations. The other five items are requirements about the form and functioning of institutions. Even more subtly, the requirements are not stated as requirements for any specific form of institution, rather they are requirements on what might be called the cultural form of the system, design requirements for how the system shall be constructed and operate. The importance of the "cultural design" nature of these requirements is reinforced by the only part of them which is institutionally specific, the reference to "an independent judicial body" or binding arbitration. Even this however does not specify the type of judicial body, only that it be "judicial" (presumably of a type which reaches decisions through application of known rules), and that it be independent (presumably of the entities about which decisions are reached, and also of direct political administration). But these features are also more a requirement for cultural design of the operations of the broader system, than for the specific form of any institution.

III. GENERALIZING THE BANK'S REQUIREMENTS

The Bank's electric sector lending policies are also interesting because a very similar set of conclusions arose from a completely independent line of research, related to the theory of rule-bound systems. This implies that the Bank's "principle one" especially may be a more general requirement for the efficient operation of an economy operating in a technologically dynamic and also politically charged environment. The papers of interest were presented by the present author to a series of seminars in 1988, 1990 and 1992. and which arose completely independently of the Bank's policy.[32] The comparisons are as interesting for the substance of their content as for the history of the respective documents, itself often not a matter of special interest. The 1988 paper[33] was written as

[32] The papers were presented as part of the European Meetings on Cybernetics and Systems Research, which occur each two years at the University of Vienna, Austria. The 1988 paper was published in the meetings volume, cited below. The 1990 paper is cited from an expanded version of the papers subsequently published. The 1992 paper is cited to an in-press expanded version of the seminar paper. Some of the literature summary from the 1992 paper appears here in revised and expanded form. Omitted from present discussion of all these previous papers is their application to the American regulatory system, and, from the 1992 paper also a discussion of application of rule-bound systems analysis to large scale problems of development. A fourth paper in that seminar series, from 1994 and otherwise published only in the proceedings of the meetings, is the basis for this discussion of the Bank's policy statement.

[33] P. A. Ballonoff "Is There a Role for Regulators in a Deregulated or Less Regulated Economy?", in R. Trappl (ed.) *Cybernetics and Systems '88*, 525 - 532.

the result of an internal self-examination of the role of a regulatory institution of a US state.[34] The institution had recognized that it had a statutory mandate to act, yet faced competing philosophies as to how to act.

Review of the technical economics literature led to two conclusions. First, given a choice, for economic reasons the best utility regulation is no regulation (except the application of antitrust policy). Even in the presence of natural monopoly, direct economic regulation of the sort often practiced by US utility regulators can not achieve lower price nor greater efficiency than would an unregulated market; at most, the effect of regulation is to reallocate economic rents away from the holder of the natural monopoly, to other supply entities.[35]

Thus, a second conclusion reached was that if despite the first conclusion a regulator is forced to act, then the best policy it can follow is to permit entry (or even encourage entry). If the regulator must set price, then it should do so in no more restrictive form and by the same criteria as would be applied in an antitrust proceeding. By this means, the regulator would meet its statutory requirement to act, and at the same time reach as closely as possible to the economically efficient result which may occur if the political requirement to regulate had not been imposed.

The 1988 paper thus relates to the Bank requirements in several ways. It concludes that the purpose of specific utility regulation must be to support competition, which therefore also encourages efficiency. These are both specific criteria of the Bank. The paper also concludes by describing policies which are not dependent on the form of the institution. Rather, these are policies which could be enforced by either a quasi-judicial regulator, or by a court, or by an administrative agency. All that is presumed is that the broader legal system contain antitrust rules which confine the actions of these various forms of judicial bodies. Such requirement for a system of known rules, in place, is also a requirement of Bank policy. The 1988 paper differed from the Bank policy largely by specifying that the broader rules that should be applied by the regulator were antitrust laws (that is, competition laws).

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[34] The Illinois Commerce Commission is the public utility regulator for the state of Illinois. In 1987 the executive director (chief of the staff) of that Commission requested staff members to analyze what was "good regulation". The 1988 paper cited here was a published version of the present author's response to that question.

35 This result was documented in depth as to both economic and legal foundations in P. A. Ballonoff, *Energy: Ending the Never-Ending Crisis*, CATO Institute 1997.

The 1990 paper[36] also has a relevant history. The paper was specifically written with a working title "cultural assumptions of utility regulation in the United States". The paper outlines the broader context of rules and institutions which exist in the U.S. and which in fact (in retrospect) carry out major features of the Bank's policy. The paper describes the broader system of rules, their functions and their inter-relationships. It describes the criteria under which particular forms of rules are selected and applied, some of the forms of regulatory error which can occur when applying rules, and why these may occur. It describes some of the mechanisms which assure enforcement of rules, and some of the limits to rule enforcement placed by the larger political structure of a federal system. Thus, this paper implicitly addresses the first four of the Bank's listed requirements for its policy, as applied to a particular system (the U.S. regulatory/legal system).

Finally, the intent of the 1992 paper[37] was to generalize the concepts of the earlier papers, by placing their results in the context of three other bodies of research: jurisprudence analysis of legal rules, social anthropological analysis of cultural rules, and logical analysis of how operating systems process control rules. But a primary conclusion of the 1992 paper was that formalized rule systems evolved within human systems which must manage relatively more frequent technological and economic change. Therefore, these systems are subject to relatively more frequent need to change their own rules, and, therefore, the viability of such rule systems is closely dependent on their internal rule of how they change their own rules.

This seems at first glance to be a subtle conclusion about a seemingly technical feature of a rule system. Yet a requirement for a viable means to change the rules of a regulator when the old rules no longer apply, shows up as one of the Bank's requirements for an acceptable legal or regulatory system; it is the fifth listed requirement in the summary above. At the level of the broader society, this turns out to be a requirement about the structure of the political constitution. At the level of a regulatory institution or judiciary, this amounts to a requirement that the system be self conscious about its own rules of decision, have self-conscious means of identifying those rules, and have previously published means to change both the rules of how decision are reached and the rules stating substantive applications. In any particular political structure, these particular sets of rules could be distributed as legislative acts (laws), court decisions, or administrative actions.

Thus, rule-bound systems provide a specific framework in which important matters of development policy may be analyzed. Rule bound systems analysis finds the kinds of rules which may occur, shows why they are important, and provides means of describing and analyzing particular systems of rules and their consequences. That a major institution, the World Bank, has independently

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[36] P. A. Ballonoff, "Is the U.S. Free Market Really Free (Of Government)?", in *Cybernetics and Systems: An International Journal*, Volume 22, pages 425 - 441 (1991)

[37] P. A. Ballonoff, "Theory of Rule Bound Human Systems", *Cybernetics and Systems* to appear.

derived very similar conclusions as did this series of three EMCSR papers, also confirms that the objective of the third paper may have been met: "to understand why which set of rules is in fact selected, and to be able to know in advance the effect of adoption of one or another set of rules, ... to understand why some sets of rules survive and others do not".[38]

While for research purposes these seem abstract questions, for the Bank, these are very practical issues. That very similar considerations and conclusions result from both directions of analysis tends to confirm that both are moving in the right direction.

IV. EXAMPLE 2: PHILIPPINE ENERGY REGULATION

Application of the Bank's policy for power sector lending requires, among other analysis, consideration of the legal and regulatory system. This section discusses transparency using an example based on the regulatory institutions of the Philippines. This section of the text discusses the Philippine utility regulatory system emphasizing how principles of rule-bound system analysis help to understand that system. The next section shows how the Bank's policy applies in analysis of the Philippine system, again using rule-bound systems principles. The basic legal and regulatory rules of the Philippines are set forth in the Constitution of the Philippines and in various legislative acts, in executive orders which have the force of law, and in court decisions which together form an internally consistent legal framework. The Philippine legal system is a common law system, and draws upon case law from other common law jurisdictions in reasoning toward decisions in cases where local law or precedent do not determine the result.

The Philippines have a history of public service regulation which can be traced back to legislation from 1903, creating municipal franchises. The Philippines therefore have a history of modern regulatory structures which is as long or longer than that of most other countries using similar systems. A general description of the Philippine system and its functions can be given with terms common to describing similar systems in other countries. But as should be expected for any system with ninety years of history, functioning of the Philippine system is particular to the country.

The current regulatory structures are based on authority created by legislation passed in 1936, and as subsequently amended (especially Commonwealth Act CA 146 of 1936 and Presidential Directive PD 1206 of 1977). This series of laws defined the powers and functions of the institution currently known as the Energy Regulatory Board (ERB), itself created in its present form in 1987 (by Executive Order EO 172). ERB is a quasi-judicial/quasi-legislative body with price regulatory powers, duties and procedures resembling those of similarly functioning bodies in other jurisdictions. In 1973, legislative power over utility franchises was delegated to the National Electrification Administration (NEA, created by PD 269). The most recent major change in regulatory structure was

[38] See the first page of the 1992 paper.

passed in December, 1992, when the Philippine Congress created the Department of Energy, granting that Department responsibility for energy policy and centralizing price regulatory functions in the ERB (Republic Act RA 7638, the DOE Act).

Other legislation is also relevant and is cited below as required. A principal body of legislation important to understanding Philippine administrative systems, and especially the meaning of "transparency" in such systems, is the Administrative Code of 1987 (hereafter referred to as the "Code"). The Code is important because it sets at least minimum standards for transparency for all agencies with regulatory or rule making powers. Two sections of the Code are relevant for this purpose. At Book VII, Chapter 2 Section 9(2) the Code requires that "if not otherwise required by law, an agency shall, as far as practicable, publish or circulate notices of proposed rules and afford interested parties the opportunity to submit their views prior to the adoption of any rule". This section therefore applies to all of DOE, ERB and NEA when acting in any rule making capacity.

The Code also applies to government corporations when acting in governmental capacity, and therefore also applies to the National Power Corporation (NPC), which is in any event part of and responsible to the DOE. Code Book VII, Chapter 3 then also lays out more detail for processes of administrative agencies in contested cases. Both ERB and NEA have prescribed rules for their electric energy hearings processes, which meet or exceed Code standards, therefore which directly govern their processes without further reference to the Code. DOE is however governed more directly by the Code. As an example of this, in 1989 the NPC intentionally complied with Code requirements by holding a series of public meetings around the country, prior to issuing a final version of its rules implementing co-generation legislation known as EO 215.

The specific authorities and duties of ERB and DOE are summarized in Tables 1 through 4 below, giving specific legislative citations. Table 1 shows the basic powers and duties of ERB, which are generally to regulate prices for all electric energy public service companies, to regulate service quality including efficiency and safety, and including a broad investigative power with power of subpoena, all subject to safeguards of proper notice and hearing processes. Table 2 summarizes the basic powers and duties of DOE, which can be more clearly seen as oriented toward policy formation, to meet the broad purposes required by law. Because the statutes specify the particular structure and allocation of duties in DOE in some detail, Table 3 summarizes the specific duties of the Bureaus within the DOE.

Table 4 summarizes and compares the differences in basic powers of the two agencies. Table 4 is better understood if viewed with reference to certain Opinions issued by the Philippine Department of Justice (DOE) in reply to questions posed by the DOE. In particular, in Opinion 98 of the 1993 series, the DOJ stated that the differences in powers and duties of the two agencies lies in their differences in essential functions and processes. While a more superficial reading of the broad purposes of the two agencies makes them appear to be in overlap and conflict, Table 4, reflecting Opinion 98, shows that their basic functions are decidedly different. DOE is predominantly a policy

making body acting largely through administrative processes, but generally lacking direct jurisdiction. ERB, while also having some rather prominent quasi-legislative functions and duties, is predominantly seen as a quasi-judicial body with direct jurisdiction and enforcement powers.

Now notice that thus far the "description" given has really been application of the principles of completeness, analogy and prediction, stated in the summary of the theory of rule-bound systems. Tables 1, 2 and 3 lay out the details of the system. The DOJ Opinion 98 states a conclusion, which was based on rules of common law and precedent applicable to the Philippines. Opinion 98 then takes the form of a general rule or precedent. Taken literally, the Opinion makes a statement only about those two lines in Table 3 shown by a "**". But taken as a rule of inference, Opinion 98 provides an analogy which applies to all of the simple assertions represented by Table 3 on DOE authority, leading to the general conclusion that DOE is a policy body while ERB is a predominantly judicial body. These are simple seeming but very strong conclusions, whose truth depends on rather deep chains of logic which apply principles of analysis of rule bound systems. Note that below I also use these principles to predict some possible future properties of this system.

It is therefore a reasonable over-simplification to use European parliamentary terms which describe the Philippine DOE as "the Government's cabinet agency which forms policy" and the ERB as "a special court with investigative powers". DOE has resource policy and resource planning authority, energy regulatory policy authority, and various related administrative and research duties. ERB has price and certificate regulatory authority (subject to DOE policies when DOE has properly issued rules for such purposes). DOE acts via publication of rules and policies using administrative proceedings governed by the Code. ERB acts in formal proceedings governed by notice and hearing, with jurisdiction and powers appropriate to such processes.

Although authority of each agency is defined by the law and interpreted by the Department of Justice such as in its Opinion 98, in some areas there is an apparent overlap of authority. It is useful to describe several examples. ERB has authority over certificates of public convenience and of public convenience and necessity for private utilities (other than cooperatives), while NEA has similar responsibility for certificates for cooperatives. The essential purpose of a certificate of public convenience is to define operating terms and conditions. However, DOE has authority to establish policy for utility operations. DOE can also establish policy related to market entry. The terms and conditions of service expressed in the certificate can also affect whether, as a practical matter, entry is possible, powers held by ERB or NEA.

Entry is also of course related to whether a franchise area is granted or to modifications of franchises, authority held by NEA. ERB must review costs in the process of setting rates, while DOE can issue policies which affect costs. ERB can not only review costs, it can and often does evaluate efficiency is determining whether a cost can properly be passed to consumers; DOE has explicit authority for many areas which result affect efficiency of elecncluding production planning, short and long term fuel mix, plant dispatch, operations policy generally, and many other areas. DOE is also

responsible for strategic planning in the sector, both directly and through control of actions of NPC, all of which also strongly affect service efficiency and quality (areas of interest to ERB). ERB is responsible for price, which includes for review of costs for purchased energy such as from IPP's, but DOE establishes independent power producer purchasing policy and NPC implements this. Also, ERB would be responsible for any demand side management program rates or rate base elements, but DOE is responsible for conservation programs.

Despite what seems a daunting list of conflicting authority, it would be incorrect to conclude that the two agencies are necessarily in continual conflict. Rather, the differences in procedure and definitions of purpose of the two agencies can permit the result that no actual conflicts result. This because what the law requires is that where DOE has properly issued a policy rule on a subject matter, then ERB must apply that policy if lawful. Where DOE has issued no policy on a matter properly before ERB, then ERB proceeds with normal common law rules of precedent, etc. to determine the correct result in that case. The result would be that while both ERB and DOE can at times affect the same subject matter, there is an effective "sequencing" rule which assures that no conflicts of authority arise.

V. EXAMPLE 3: APPLICATION OF THE BANK'S STANDARDS FOR TRANSPARENCY

Principles of rule-bound systems analysis allow application of the Bank's principles rather rigorously, and without prejudging the merits of the answer in a positive framework. Such analysis of Philippine regulation is presented in this section.

Philippine energy price regulation is conducted by ERB. ERB is a non-constitutional body created by legislation, and can trace its origins to legislation dating to the early twentieth century. Executive Order 172 of 1977 created the entity currently named ERB under legislative limited term authority prior to establishment of the present Philippine Constitution. EO 172 primarily reorganized specific previously legislatively created regulatory authority, a matter in any event within the executive authority, but did not either create nor destroy any quasi-legislative or quasi-judicial powers. To do either requires an act of the Philippine Congress. ERB has its own sets of published procedural rules, published case decisions, and related case law dating from at least 1936, which form sets of predictable precedents for its action. All matters which reach the ERB therefore are potentially decidable based upon known rules of law and procedure, much as in any other common law jurisdiction.

The second Philippine energy regulator, the DOE, has responsibility generally for "non-price" matters including NPC planning, coordination among utilities, and energy sector policy generally. The DOE was created in December, 1992 under the Department of Energy Act (DOE Act), Republic Act 7376. The DOE is an administrative agency with powers to "formulate such rules and regulations as may be necessary to implement the objectives of this Act".

As such, DOE therefore falls under the Administrative Code of 1987, Book VII, Chapter 2, Section 9, Paragraphs (1) and (3):

> "(1) If not otherwise required by law, an agency shall, as far as practicable, publish or circulate notices of proposed rules and afford interested parties the opportunity to submit their views prior to the adoption of any rule. ...
>
> "(3) In the case of opposition, the rules on contested cases shall be observed."

More detailed rules for conduct of contested proceedings are then laid out in Chapter 3 of the Administrative Code, Book VII. The Chapter 3 rules are in general those of a quasi-judicial or quasi-legislative regulatory body in any common law jurisdiction, while the Chapter 2 rules for rule-makings are certainly at least the minimal requirements for transparent rule-makings.

Since ERB has its own rules which meet or exceed Code standards, the Code rules do not impose additional constraints on ERB procedure. Similarly, when NEA is acting in a quasi-judicial or quasi-legislative capacity, such as deciding on its Congressionally delegated franchise matters, it also uses transparent processes. However, in the electric sector DOE has no other administrative processes nor quasi-judicial powers, therefore DOE is required to follow at least the above cited minimal Code administrative processes in rule setting. In 1989 NPC did follow the Code by holding public meetings prior to publication of the rules for EO 215. Code Book VII Chapter 2 Section 9 (1) however is rather vague about the public processes which should be followed in rule-makings. It is likely that as more frequent and complex rule-makings are used, that the vague language of the Code may not seem adequate. Therefore, the DOE should conduct a rule making whose purpose is precisely to set forth rules and processes for future DOE rule-makings.

DOE does not have quasi-judicial processes for complaints which could arise in the electric industry, nor for means of enforcing its rules and policies. Therefore complaints which arise about DOE processes would likely be taken to the Philippine courts at present. But careful review of ERB electric industry authority shows that ERB already has transparent quasi-judicial processes, jurisdiction over the most of proper parties, and enforcement authority for proper policies of the DOE. Further, any party can make a complaint at ERB, and, therefore, certainly DOE can make complaints or other formal filings at ERB. Therefore, as a practical matter the DOE can enforce its policies by making such appropriate filings at ERB. Such enforcement would also therefore fall under transparent processes.

Court, ERB and NEA rules of practice, procedure, evidence, and decision are published and enforced in a manner generally similar to those of other common law jurisdictions. As in other common law jurisdictions, the remedy for failure to properly apply a rule (or to follow a contract) is appeal to the courts, or, where the rule is an order of, or in the jurisdiction of the ERB, by complaint before the ERB. The ERB enforces its own orders. Errors of the ERB can be and are corrected by the courts by normal appeals processes similar to other common law jurisdictions. In contrast, NPC has published rules for independent power producers (under EO 215) and the DOE have published rules for the BOT Law. Although DOE actions, if challenged, could be appealed to the courts, it is

suggested that the ERB is already structured as both the appeals and enforcement body for DOE policy, since ERB has the appropriate jurisdiction, ERB is required to follow proper DOE policy, and since ERB (and not DOE) has the appropriate quasi-judicial powers and ability to impose remedies.

Transparency also requires analysis of processes for changes in rules. ERB has known rules and procedures for both establishing and changing any of its published rules, namely "notice and hearing". ERB can change price policies as evidence warrants, and set prices according to policies which ERB may determine, subject to proper notice and hearing. In so far "changing rules" relates to industry structure, the Bank's framework presumes that the ability to effect such changes may be specified to some named regulatory body. To the extent such body exists in the Philippines this body is DOE. The Administrative Code of 1987 provides for notice and public comment for major actions of policy when issued as rules, which is how DOE would so act. Assuming DOE uses Code processes, then changes in sector policy would also become subject to transparent process.

VI. EXAMPLE 4: ECONOMIC DISPATCH METHODS

The theory of rule bound systems is applicable to systems of rules other than legal; systems, which also can affect investment decisions. For example, electric power dispatch and power system coordination are themselves regulatory systems strongly governed by sets of rules, and therefore are also subject analysis using concepts of rule-bound systems. This analysis also reveals properties of the dispatch system which affect contracting and investment decisions. To illustrate this I describe below three models for dispatch. These show that understanding how power systems can be structured is not merely a technical engineering nor economic problem. Electric power dispatch is a very good example of a rule bound system which acts very much like a legal system, with a decision maker (called the system dispatcher) who makes continual choices of resource allocation questions, among competing potential providers, based on an explicit set of rules. Electric power system dispatch however is also a good example of a literal concurrent operating system of the technical sort, making electrical flows proceed in certain very technical ways. Thus, analysis of dispatch is very much a question for analysis of rule-bound systems, using similar principles as discussed above.

Under Model I all power producers and all power buyers join a power pool, which is a contractual relationship comprising all power producing and power purchasing entities. There is a privately organized and operated single national market-based mechanism to set price for short term dispatch, to effect such dispatch, and effect billing at the market prices for each transaction. Transactions are subject to pool rules determined by a private contractually based association of all transmission and distribution entities, which also coordinates all long term generation expansion and transmission planning of all members. Model I is an artificial market device, structured to create dispatch according to market supply-demand curves on a continuous basis. Relative "bargaining power" of parties due to aggregate annual load or load shape, which would result in the contracts of Model II (below), do not affect dispatch decisions. While the actual dispatch would be a pure market (except for necessary considerations for voltage stability and system transmission security), it does

not necessarily result in the same outcomes as pure economy dispatch because parties offering power pool purchase or sale prices may determine their offers using more than just than short term fuel economy information.

Under Model II power sellers and power buyers contract with each other as they deem, using the transmission system as an open access network (perhaps subject to appropriate transmission pricing under regulation. The central dispatcher applies contract rules to determine hourly priority of dispatch of each unit, up to the greater of the actual hourly loads or the maximum of capacity under such contracts. The central dispatcher applies rules such as determined in merit order dispatch (Model III below) for loads above the threshold in (2). This Model II, seeming the "pure market" solution, is likely to be affected by various policy constraints which affect formation of contracts, and also may have the problem of "lumpiness" of relative size of contracts and available production to market size, which would result in distortions from efficient market results. As a result, Model II is likely to result in dispatch which differs from pure economy dispatch (Model III) by more than just considerations of engineering stability. In particular, Model II is highly likely to result in contract order dispatch which places plants with higher short run marginal cost ahead of plants with lower short run marginal cost.

Under Model III the system dispatcher uses a rule of pure engineering economic dispatch from all available plants on each interconnected grid at any given moment. Dispatch is subject to exceptions onl-existing contracts with energy type take-or-pay restrictions (which themselves will be subject to least cost supply-substitution crediting or brokering requirements, without penalty providing the plant has also met its availability requirements), hydro best practice use of reservoir, geothermal best practice use of reservoir, engineering best practice voltage stability control conditions, any other demonstrable (and probably very rare) similar exceptions. All dispatch rules are set by a committee consisting of all generation, transmission and production entities to advise and recommend all such rules to the system dispatcher. Model III permits some necessary policy choices to be exercised explicitly, and to effect pure engineering economy from all remaining plants. Model III is based entirely on non-market decisions, whether by choices necessary to accommodate system stability, voltage control or other agreed technical factors, or by use of engineering criteria for measurement of current real time running cost which may however approximate some market information (short term marginal cost).

The point to be most noted here is that in their purest sense, Models I and II are each different versions of a "free market", and show that even competitive markets are strongly structured by assumptions about business practices, that is, about system rules. In an ideal world, including one which has a large enough market size, many players and infinite time (or numerous repetitions), all three models might on average have identical results. In reality, market size, past history, and especially the structure of the local rules as applied to the facts of recent local history, can cause each model to have very different actual results in any application.

VI. EXAMPLE 5: ANALYSIS OF EMERGENT SYSTEM PROPERTIES

One application of analysis of rule-bound systems is to identify possible emergent or future properties of a system of rules. This is especially useful to do when the system of rules is changing. Strictly stated, an emergent property of a system is one which arises from the operation of the system, but which was not directly described by the structure of the system nor intentionally designed as a behavior of the system. Rather, the property "emerges" from the operation of that system. Emergent properties are typically capabilities that arise from adaptive solutions of one problem, which properties also have totally different and otherwise unexpected capabilities in other applications; the unexpected capability is the emergent one. Here the term is used also in a looser sense of properties that would arise from partial implementation of system design, or from more complete logical analysis of contingencies inherent in the system design. In economic analysis one better known emergent property is that an economy meeting the assumptions of free market microeconomic static equilibrium also has high rates of technological progress in dynamic conditions.

In a study of regulatory reform, potentially emergent issues fall into four general groups: (1) regulatory issues which result from carrying out other structural reforms; (2) regulatory issues which result from carrying out regulatory structural reform; (3) regulatory issues which result from inconsistencies in law used to define regulatory reforms; and (4) regulatory issues that arise from incomplete carrying out of regulatory reforms. I again illustrate these using the Philippine example.

Emergent problems can arise in the Philippine example in several interrelated, yet distinct, ways. One question of interest for investors is whether there is potential for regulation of IPP's should system behavior change. Following Philippine Department of Justice Opinion No. 95 of 1988, IPP's are not regulated by ERB. This occurs because IPP's do not hold themselves uo to seel to the general public but instead sell to one entity, the National Power Corporation, and therefore IPP's are not public utilities under applicable law. This implies however that if IPP's were to hold themselves out to "the public", that they would become classified as public utilities and therefore would be subject to ERB jurisdiction. Also, in the same circumstances and for the same reason, such IPP's would likely also become subject to Philippine Constitutional limits requiring at least 60 percent domestic ownership of public utilities.

Note what would happen in the Philippine structure if a "pure free market" model of contracting or of pure market dispatch is applied, in which any producer could contract with any buyer. If such a structure were imposed, then any independent producer which decided to participate in that market could become classified as a public utility. A similar result could occur if legislation which allowed wheeling to (say) commercial and industrial customers over a certain size load, or even which allowed wheeling only to direct sale customers of NPC. Either definition of customer class could permit an interpretation of sales to "the public" in a meaningful sense, hence lead to classification of any producer who offered such sales (even if none were contracted or transacted) as a public utility. Another way IPP's could become classified as public utilities would be for redesign

of the system dispatch to be done in a way that causes producers to be in a position of making offers to the public. Thus could occur in either of the "free market" versions Model I or Model II above, and could even occur in a pure economy dispatch model (Model III above) if the moment to moment dispatch were also to be the basis of matching customers to producers for transactions.

The second major way for emergent regulatory issues to occur is through the same regulatory processes described earlier. In fact, the discussion inherently assumes certain emergent properties in portraying DOE as a general policy body with ERB as essentially a court of first review for that policy. For example, in Table 3 there are nine distinct sections of the DOE Act which use the word "assist" in describing the duties of DOE to make policy. Only two of these shown with a "**" in that table, are cited in DOJ Opinion 98 of 1993, in which Opinion DOJ discussed the differences in jurisdiction of ERB and DOJ. This classification of duties is the basis for the argument that ERB is largely the judicial body, and DOE largely the Government's policy body. Reaching this conclusion depends on the validity of the claim that all DOE responsibilities described in the law as "assist" or similar verbs place DOE in the same relationship to ERB as do the two specified areas. On first glance the above conclusion seems reasonable, but as in any legal system, each action under a statute which has not previously been specifically tested by prior action under that specific portion of the statute raises the risk that some previously unknown legal problem may exist. Thus, the application of a rule of analogy in this case does not guarantee that the application is correct, until tested by the operation of the system itself.

The above logic, in a more extreme form, is also the basis for the third means of emergent issue to arise. Legal systems are designed to resolve conflicts. Conflicts can arise from differences in interpretation of statutes, and to the degree statutes are vague, the presence of such differences is guaranteed. One test of maturity of a legal system is its ability to routinely encounter and deal with disputes such as would arise in the above paragraph or the present one, even where basic interests are involved. A difficult form of this problem would likely be if not all parties agree that ERB is the proper body to enforce DOE policies, and therefore, if some parties seek enforcement of DOE policies through the courts in matters where ERB could also have primary jurisdiction. In many jurisdictions, a court receiving such a matte matter to the entity with primary statutory jurisdiction.

The fourth means for emergent issues to arise can happen in different ways. One way the fourth path to emergent issues differs from the second and third above in that the fourth path is likely to be characterized by the parties involved describing each other as "acting in bad faith" (or similar terms) as relates to a particular dispute. This could occur for example if one party were to simply ignore the restrictions of a statute, or ignore the mandates of a higher court enforcing a statute or decision. To the degree such behavior occurs, and is not resolvable by transparent means such as described in the above two paragraphs, this poses political issues which would also likely cause the Bank to conclude that a legal and regulatory system were not transparent. Another means would be if in fact the entire process of legal activity depended on the personalities of the present occupants of various offices, rather than on the legal structures which govern those offices.

If it is literally the case that the enforcement or not of particular basic laws depends entirely on the personality of the persons in office, then such system is not transparent, despite the appearance at a given moment of transparency due to procedures preferred by the personalities of present office holders. Of course, personality always affects the kinds of professional judgments and form of professional discretion exercised by any holder of public office. A major issue for design of any legal or regulatory system is to permit exercise of necessary discretion while preventing exercise of personal whim that makes "law" a mockery.

TABLE 1
POWERS AND DUTIES OF ERB

"TO ACHIEVE MORE COHERENT POLICY FORMULATION ... CONSOLIDATE AND ENTRUST IN ONE BODY ALL THE REGULATORY AND ADJUDICATORY FUNCTIONS COVERING THE ENERGY SECTOR" (EO 172 PREAMBLE)

PRIVATE[39] ELECTRIC ENERGY COMPANY RATES (CA 146, EO 172)

PRIVATE ELECTRIC ENERGY COMPANY CERTIFICATES OF PUBLIC CONVENIENCE (CA 146, PD 1206, OPINION 98)

COOPERATIVE RATES (RA 7638, PD 269 SEC. 16(O) CHAPTER II)

NPC RATES (RA 7638, RA 6395 SEC. 4)

NOTICE, HEARING, PROCEDURE AND RELATED POWERS (CA 146, ETC)

[39] "Private" used here to mean any non-government company organized as other than a cooperative.

TABLE 2
POWERS AND DUTIES OF DOE

(ALL REFERENCES TO RA 7638)

POLICY OF THE STATE: CONTINUOUS AND ADEQUATE SUPPLY OF ENERGY, ULTIMATELY THROUGH SELF RELIANCE, USE OF INDIGENOUS RESOURCES, EFFICIENT USE OF ENERGY
(SEC. 2 (A), MADE PURPOSE OF DOE BY SEC. 4)

POLICY OF THE STATE: INTEGRATE AND COORDINATE
(SEC. 2 (B), MADE PURPOSE OF DOE BY SEC. 4)

POWERS AND FUNCTIONS OF DOE (SEC. 5)
(A) FORMULATE POLICIES FOR EFFICIENT SUPPLY, ECONOMIC USE
** (A) PROVIDE A MECHANISM TO RATIONALIZE AND INTEGRATE

(B) DEVELOP ENERGY PROGRAM ANNUALLY (INCLUDING PRIVATIZATION AND COMPETITIVE OBJECTIVES)

(C) PROGRAMS FOR ...

(D) SUPERVISE GOVERNMENT ACTIVITIES

** (E) REGULATE PRIVATE SECTOR ACTIVITIES UNDER EXISTING LAW

(F) ... (J) DO VARIOUS THINGS IN FOUR YEARS

** (K) FORMULATE SUCH RULES AND REGULATIONS AS MAY BE NECESSARY TO IMPLEMENT THIS ACT

** (L) OTHER IMPLIED NECESSARY POWERS

TABLE 3
DUTIES OF DOE BUREAUS

(ALL REFERENCES TO RA 7638, SECTION 12)

	VERB	CITE	BUREAU	DUTY
	DEVELOP AND IMPLEMENT			
		12(B)(3)	EUMB	NEW TECHNOLOGIES
		12(B)(6)	EUMB	MIDDLE AND LONG TERM ENERGY TECHNOLOGY STRATEGIES
		12(B)(10)	EUMB	ENERGY CONSERVATION PROGRAMS
		12(B)(2)	EPMB	DATA AND INFORMATION PROGRAM
	ASSIST			
		12(A)(1)	ERDB	FORMULATE AND IMPLEMENT PLANS FOR LOCAL SUPPLY OF ENERGY
		12(A)(2)	ERDB	LOCAL RESOURCE PLANS
		12(A)(5)	ERDM	FORMULATION OF POLICIES FOR SERVICE PROVIDERS
		12(B)(1)	EUMB	POLICIES FOR ENERGY SECTOR PRODUCTION, TRANSMISSION AND DISTRIBUTION
		12(B)(4)	EUMB	RURAL ENERGY DEVELOPMENT
		12(B)(5) AND SEC. 25	EUMB	POLICY FOR ALLOCATION IN CRITICAL LOW SUPPLY
**		12(C)(1)	EIAB	REGULATORY POLICIES FOR RESOURCE SUPPLY ACTIVITIES
**		12(C)(3)	EIAB	FINANCIAL AND FISCAL POLICIES FOR ENERGY SUPPLY COMPANIES
		12(D)(1)	EPMB	INTEGRATED SHORT, MEDIUM AND LONG TERM PLANS
	CONDUCT			
		12(A)(3)	ERDB	RESEARCH ON LOCAL RESOURCES
		12(D)(6)	EPMB	STUDIES ON INTERNATIONAL ISSUES
	ASSURE			
		12(D)(5)	EPMB	INCORPORATION OF ENVIRONMENTAL POLICIES
	PROVIDE			
		12(A)(4)	ERDB	CONSULTATIVE TRAINING AND ADVICE TO REGULATORY INSTITUTIONS
		12(B)(6)	EUMB	INFORMATION ON ENERGY TECHNOLOGY

TABLE 3
DUTIES OF DOE BUREAUS (CONTINUED)

(ALL REFERENCES TO RA 7638, SECTION 12)

VERB	CITE	BUREAU	DUTY
REQUIRE			
	12(B)(9)	EUMB	COLLECTION OF WASTE OIL
REVIEW			
	12(D)(4)	EPMB	PATTERNS OF ENERGY CONSUMPTION
SUPERVISE, COORDINATE AND INTEGRATE			
	12(D)(3)	EPMB	PLANS FOR ENERGY SUPPLY DEVELOPMENT
MONITOR			
	12(B)(2)	EUMB	ENERGY SECTOR CONSUMPTION
	12(B)(7)	EUMB	ENVIRONMENTAL STANDARDS OF DENR
RECOMMEND			
	12(B)(8)	EUMB	WAYS TO RESOLVE CITING ISSUES
DRAW-UP			
	12(C)(2)	EIAB	PLANS FOR SUPPLY DISRUPTIONS

TABLE 4
HOW THE AGENCIES DIFFER

ERB	DOE
QUASI-JUDICIAL PROCESSES (CA 146)	CODE PROCESSES (AT MOST)
HAS POWER OF SUBPOENA (CA 146)	HAS NO SUCH POWER
ACTS BY VOTE BASED ON FORMAL EVIDENCE (CA 146)	ADMINISTRATIVE DECISIONS USING AUTHORITY OF EXECUTIVE
ACT USING ONLY FORMAL RULES PROCESSES (CA 146)	FORM OF ACTION NOT DEFINED BUT HAS POWER TO ISSUE RULES AND REGULATIONS NECESSARY TO ITS DUTIES (RA 7638)
ALL PROCEDURES DETERMINED BY CA 146 AND CODE	ELECTRIC PROCEDURES (WEAKLY) DETERMINED BY THE CODE; (PETROLEUM POWERS SET BY RA 6173, PD 1206, PD 1573)
HAS DIRECT JURISDICTION OVER PARTICULAR ENTITIES INCLUDING ENFORCEMENT (RA 146, PD 1206, EO 172)	NO DIRECT JURISDICTION, MAY HAVE IMPLIED JURISDICTION OVER PERSONS AND CORPORATIONS
INVESTIGATE ANY PUBLIC SERVICE MATTER ON OWN MOTION (CA 146)	INVESTIGATE ONLY SPECIFIED OR IMPLIED MATTERS (RA 7638)
NO DIRECT JURISDICTION OVER IPP'S (OPINION 95 OF 1988)	DIRECT IPP JURISDICTION (RA 7638, BOT LAW, EO 215)