POLITY MODELLING.
POLITICAL CULTURE BASED MODELLING
OF THE EASTERN EUROPEAN POLITIES

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Abstract:
   This paper addresses the area of political methodology and presents an approach on polity modelling. Polity modelling is analyzed from both historical and paradigmatic perspective by emphasizing the differences between classic (empirical) approaches and complexity-based approaches. The contribution of the paper consists in the modelling method: it combines democracy modelling with political culture modelling into a unified simulation framework. The modelling approach is focused on the Eastern European polities which have combined after the fall of the iron curtain in 1989 democracy-building with state-building processes. The paper presents a class of simulation models which explain operation of a polity as a complex adaptive system of interdependences between processes of democratization and political culture processes. The paper presents preliminary research results which combine agent-based system with complex adaptive system modelling.

   Keywords: polity modelling, democracy modelling, political culture modelling, political methodology

   JEL Classification code: C63

Why "Polity Modelling"?

   Polity models have mainly employed political, social and economic theories, conceptual architectures and research methodologies for explaining the operation of the state on several interesting and important dimensions, which include (but are not limited to) the aggregation of individual preferences in the social choice processes, or the diagnose and prediction of the political evolutions of democratic regimes.

   The polity modelling has become especially attractive for the students of the newly emerged democracies in the Eastern European geopolitical area after the fall of the iron curtain in 1989. The research approaches which focus on such political regimes have revealed the necessity to develop polity modelling in order to explain their dynamics and, eventually, their

future evolutions. Moreover, the polity modelling methodologies based on artificial agents and artificial life technologies open up the possibility to approach political "experiments" in the so-called virtual laboratories, that is, artificial software and media platforms which allow for computational and simulation-based modelling of polity dynamics and change.

In this context, the operational aspects of polity modelling become particularly challenging for political methodology research since available theories do not fully account for explaining polity evolutions in operational terms. Moreover, theoretical domains like political culture do not provide sufficient conceptual support to explanations of the polity operation in either functionalist, system dynamics or complexity terms.

Brief History of Polity Modelling Research.
The Paradigm Shift

From a historical perspective, polity modelling has been approached from theoretical perspectives covering various approaches from the early ones based on the general systems theory and behaviorism to the later ones mostly based on anthropology, sociology and political theories.

State Model and Systems Theory.
The Behaviorist Approach

One most relevant early polity modelling approach combines the *systems theory* with the *behaviorist thinking* in describing the state as a system with inputs and outputs whose operation can be specified by means of the stimuli and the system's responses to them (Easton, 1957). The idea that the state and its operation can be described as a "system" has been inspired by the modern theories in biology and mechanics (Spencer, 1867). According to this view, the state is described as a living organism: it is able to respond to environmental stimuli, adjust and adapt by means of feedback functions (conversion process). The view has had a huge impact at the time especially due to the influence of Parson's social system theory (Parsons, 1951, 1961, 1975).

Modelling has been fundamentally oriented towards the explanation of the operation of social or political system by means of several principles. One of them is represented by Durkheim (2008) as the necessity to achieve a minimal solidarity amongst the structural actors in order to preserve internal stability.

Polity as a "Political System".
Functionalism

The structural-functionalist approach has basically preserved the system theory approach, however, has modified it so as to explain the state operation in terms of political structures (institutions) and their associated functions (Almond and Powell, 1978). It provides support for the comparative analysis approach by generalizing the concept of political system on a basis of few common characteristics concerning the political structures, their types and degree of complexity, and functions.

The conceptual terminology suffers an essential transformation aimed at the foundations of a new explanative approach in political science: a notion like "state", for example, is replaced by the concept of "political system", which definition covers system theory, as well as political theory conceptual backgrounds. The role played by the structural-functionalism in the political science, in general, and in political modelling methodology, in particular, is decisive for advancing a major theoretical endeavor aimed at explaining polity operation. It redefines the input and output functions of a political system in political science terms: the input functions concern the political socialization, recruitment and communication, and the output functions concern the rule formation, management and application in both internal and external contexts. The structural-functionalist modelling approach succeeds to explain the change in political systems by means of their capacity to adapt to environmental variability over time. Much of the political systems' capability to change and adapt is explained on economic bases. Moreover, it employs the political culture theory as developed earlier by Gabriel Almond and Sidney Verba (1963) in explaining polity operation in terms of distributions of patterns of preferences at the societal level. This makes it one of the most outstanding and still dominant approaches in polity modelling. It has provided support for the development of the some of the most relevant polity models (Almond, 1960; Almond and Verba, 1964; Almond et al., 2006).

One such model explains polity operation in terms of preference aggregation and social choice processes by modelling political socialization, recruitment and communication as *macro variables* and developing empirical polity modelling based on the survey data of the presidential elections in the U.S. (Erikson, McKuen and Stimson, 2002). Another relevant model approaches the political system as *an open polity* which works on the "issue-stress-policy response" cycle (Almond et al., 2006). Modelling approaches on the Eastern European polities combine structural-functionalism with complexity theories, and succeed to explain the polity operation by describing it as a structural hierarchy of mechanisms and processes (Klingemann et al., 2006).

Polity as a Dynamic System.
Constructivism and the Generative Systems

Structural-functionalism criticism has received support from various perspectives, essential ones being associated to the neofunctionalism, which advocated for a more complex, conflict and cultural trauma-capturing modelling approach (Alexander, 2008, 2011).

Polity modelling research has been influenced by the approaches on social conflict (Merton, 1957), social movements and political change phenomena (Laitin, 1995, 1988; Tilly, 1995, 2000, 2001), and conflict modelling in international relations realm (Cederman, 1995; Cederman and Girardin, 2007; Lang and DeSterck, 2012).

The new trends advocated a new research methodology based on the artificial society simulation modelling and different conceptual background by finding inspiration for the *generative paradigm* (Cederman, 2003) in Simmel's theory on social forms (Simmel, 1908).

The new modelling paradigm is based on an integrated modelling approach which combines system theory, system dynamics, complex adaptive systems and agent-based systems (Cioffi-Revilla, 2008, 2009). Polity modelling paradigm shifts in a short while towards a

complex view of the state as a complex entity with internal structure and actors and able to dynamically interact with its environment, which includes physical territory, geography and climate, bordering neighbors, resources and internal map (cities, roads, etc.). The polity becomes operational by means of system dynamic loops describing the mechanisms and conditions which trigger the processes (Cioffi-Revilla, 2009).

Polity Modelling in the Complexity Paradigm.
Complex Adaptive Systems

While both the functionalist and the dynamic approaches on polity modelling have been essentially influenced by the sociological, anthropological and social-psychological theories, the polity modelling research is currently experiencing a fundamental influence from political theory.

Gabriel Almond's contribution in shaping the polity modelling methodological research is not the only one. It has been followed by a new look introduced by Robert Dahl and continued by authors like Wolfgang Merkel and Christian Welzel. This time, the paradigm shift has focused on the complexity of polities by taking into account a new methodological approach which explains the workings of a polity from both top-down and bottom-up perspective. The new paradigmatic approach has been fueled from around the mid-1970s up to the mid-1990s by the need to answer the questions concerning the third wave of democracy expansion in Eastern Europe (Huntington, 1996; Diamond, 1996). The democratic polity becomes the stereotype, and the polity modelling philosophy gains from the reconsideration of principles and theory of democracy. Dahl's new look on the democratic polity, which he calls "polyarchy" (Dahl, 1972), brings to the front the classic theory of democracy as approached in the 18th, 19th and 20th centuries by Montesquieu, Alexis de Tocqueville and Downs, respectively, so as to emphasize the transition from the city-state to the nation-state, and from local to global scale, including the issues of *representation, diversity* and *conflict* (Dahl, 1984).

His approach on the polity modelling has inspired new conceptual and operational modelling developments on how a democratic polity actually works (Merkel, 2004; Welzel, 2013).

Polity Modelling Research:
The Main Issues

Polity models are aimed at explaining how the state actually works. The main issues in approaching the polity modelling concern its internal dynamics and the emergence of change.

Polity models have so far succeeded to explain the polity workings by selecting a particular dimension of modelling, like for example, the emergence of conflict (Cioffi-Revilla, 2008, 2009) or the role of public policies for the governance effectiveness in democratic polity settings (Almond et al., 2006). Each relevant polity modelling approach developed so far has thus introduced a particular reductionist perspective in order to cope with the complexity of the real polity and, implicitly, of the polity model.

However, in order to achieve a polity model able to overcome the intrinsic reductionism and, in the same time, to cope with the complexity of real polities, the modelling should

include all relevant polity dimensions. In this approach, it is our purpose to reveal these dimensions, as well as their attribution and contribution in the design of a polity model. Despite the hardness of this challenge, it has been already answered before. To take but one class of examples, the SimPol Model (Cioffi-Revilla, 2009), the Rebeland Model (Cioffi-Revilla and Rouleau, 2010), as well as the approaches which model the African and Asia polities in a historical evolution perspective (Cioffi-Revilla et al. 2009; Cioffi-Revilla et al., 2011) are mainly aimed at providing complex tools for conflict control and management at the polity level in either local or international geopolitical realms. Notwithstanding the complexity of the approach and the ability to include all dimensions which make the workings of a polity possible, such models aim, first and foremost, in achieving an explanation of conflict emergence in the exercise of domestic and/or international politics.

Our approach aims instead to reveal the configuration and the design and the dynamics of a polity with self-reference characteristics, that is, a polity which is open to change and able to control the change once this has emerged. This comes to the arguments of polity design and polity operation. As a matter of fact, it is not only the polity design which makes this challenge so difficult, but the evolution of political cultures which explains such a design in a historical perspective and eventually makes the polity dynamics foreseeable. For the Eastern European democracies emerged from the fall of the iron curtain these are major aims. These aims not only identify where these democracies actually stand, but also what they are standing for, and moreover where they are heading to.

The *bottom-up* paradigm, as introduced and employed by the *social simulation* (Epstein and Axtell, 1996; Axelrod, 1995; Gilbert and Troizsch, 2005) and *computational sociology* (Squazzoni, 2013) research, provides for a constructivist approach: polity workings are explained by means of interactions between the individual agents. The paradigm is associated with the generative architectures, in which complexity phenomena like the emergence of structure or the emergence of change originate in the individual interactions at the micro (societal) level. Emergence of structure concerns the structures at the macro level, while the methodological individualism is employed to model the generative engine at the micro level.

However, the generative approach as it has been promoted by agent-based models developed by the sociology and social-psychology research might require substantial revisions in order to employ it in explaining the polity workings and dynamics.

The internal dynamics, as well as the external interactions of a polity include the essential processes assigned to four main domains of operation: social, economic, political, and cultural.

The challenge of modelling the complexity of political systems addresses four modelling dimensions:

1. Structural. As a difference from the social structure, a generic polity structure includes several sub-levels, like societal, economy (market), administrative, political, and legislative institutions. The structural dynamics may thus include several types of mechanisms which control or enact various types of processes at all levels (McAdams, Tarrow and Tilly, 2001; Mayntz, 2003).

2. Relational (*interconnecting* or *networking*). The principles which govern the relationships between the components of polity's dynamic structure are derived from the complex nature of a polity. As a difference from the dynamic social systems, political systems include and unite most variate type of dynamic structures from hierarchical to self-organizing

in context-sensitive architectural settings. Relational aspects are, therefore, fundamental in assessing the interconnectivity of the agents at all levels such that the dynamics of a polity could be obtained in a polity model.

3. Communication and the distribution of power within a polity's territory. The overall stability of a polity, approached as either endogenous or exogenous characteristic of polity, is depending heavily on the effectiveness of communication, but also on the persuasive character of the communication methods and contents. Moreover, the communication is dependent on the spatial configuration (territory, geography) of the polity system. This particularity makes it fundamental for the design of the polity model. Relevant examples are provided by the polity modelling research approaches in which communication in relation to the geographical configuration of a polity's territory have essentially shaped the polity's propensity for coercion or violence, social conflict emergence, ethnical and civil insurgency, and civil war. It is often the case that the communication style of the political leadership associated with (a) particular territory and/or political geography, and (b) particular political power territorial distribution is essential for identifying and locating the type of political regime on an axis going from autocracy to democracy. The communication between central and local administration (Cederman, 2008) as well as the communication between the top (central and local) political leadership and the citizens represents the dimension on which both parties could develop (extreme) behaviors and take (radical) actions (Fearon and Laitin, 2003; Lang and DeSterck, 2012). The civil war and insurgency research proved how the communication amongst political and administrative components is dependent on the territorial distribution of power and how this could influence the polity dynamics.

4. (Political) Culture. Political culture approaches are fundamental for understanding how a polity actually works. In spite of rich theoretical and qualitative modelling approaches, political culture theory has not provided so far and has not adopted either an operational view. Due to conceptual weaknesses, political culture research has not succeeded so far to coagulate a methodological approach to polity dynamics.

The empirical models elaborated so far (Inglehart, 1988, 1990; Inglehart and Baker, 2000; Inglehart and Welzel, 2005; Welzel and Inglehart, 2009; Welzel, 2006, 2013) are meant to explain the role of political culture in making individual actors (citizens) acquire the empowerment condition, that is, the capacity to effectively and efficiently participate in the social and political exercise of democracy. However, they do not elaborate on the operational aspects of modelling, but rather on the qualitative, theoretical aspects of human empowerment, and polity change.

In this paper, we focus on two main challenges in polity modelling. One concerns the relationship between its internal complexity and its environment: modelling this relationship could provide for the explanation of polity change, the change emergence and its dynamics. The complexity of the Eastern European polities is approached in terms of their embeddedness (Merkel, 2004). This challenge regards the different historical environment (geopolitical context), and the political culture heritage of the Eastern European post-communist regimes.

The other one concerns the operational role played by the political culture in the workings of a polity: it could explain the classic "downward causation" hypothesis (Coleman, 1990). In social systems, the "emergence" has been studied in complex social settings as a phenomenon of self-organization associated to the "upward" generation of structure at the macro level by means of the interactions at the micro-level (Sawyer, 2002, 2005).

In political systems, this situation might appear in a different perspective and with different consequences: while in the social settings the "emergence" has been approached as a phenomenon associated with the *bottom-up* generative architectures, in political settings it could employ the "emergence" as a top-down generative phenomenon. For example, the emergence of political attitudes cannot be fully explained by means of the micro-to-macro phenomenology: it requires a *top-down* component which could specify the role played by the political organization, leadership, communication, and culture in guiding the collective action.

Artificial Polity Model

The modelling approaches of the Eastern European polities need to take into consideration a specific feature of the European post-communist regimes: they have combined state-building with democracy-building (Klingemann e al., 2006).

This particularity makes our polity modelling approach focused on the classes of processes defining the polity at the operational level:

(i) processes underlying the operational aspects of a democracy as a political regime (i.e., political dimension of the polity model);

(ii) processes underlying the state's structure, organization, and internal communication (i.e., structural dimension of the polity model);

(iii) processes underlying the relations between political, administrative, social and economic levels, i.e., political leadership and institutions (political level), Government (administrative level), market (economic level), society (social level, internal communication and interconnectivity (communication level) of the polity model;

(iv) processes underlying the relation between polity and attitudes of individual agents (i.e., political culture in the polity model).

The first three components of this type of process architecture, namely classes (i), (ii) and (iii) of processes – are inspired by and aim to achieve the operationalization of Merkel's concept of *embedded democracy* (2004). Merkel suggests a conceptual architecture of processes which can account for a polity as a (type of) democracy. This idea allows for the consideration of polity modelling in terms of processes and mechanisms, which allows for the approach of the polity modelling as possibly based on generative rather than on empirical principles and data. The classic functional model based on structural components and their associated functions can now be replaced by a process-based model. This conceptual architecture provides for a most general specification of the democratic polity: it accounts for *how* a process is generated instead of giving an account on *what* particular component(s) produces or triggers *which* process. The main focus is shifted from the notion of "function" to the dynamics of the relationships between processes and their context.

The fourth class of processes is inspired and designed on Welzel's concept of *human empowering*: it is achieved in a sequence of three processes concerning the *action resources*, the *emancipation values*, and the *civic entitlements* (2013).

While Merkel's view is explicitly constructivist with respect to a polity model, Welzel's view upon polity modelling is rather implicit: he assumes that there is an interdependence relationship between the democratic polity and the citizens' effective political participation in

a real democracy. Polity modelling thus appears as implicitly necessary for the study of the human empowerment. While the former provides for the background of polity operation, the latter provides for a side-effect of the polity workings.

The idea is relevant for approaching the issue of political culture in the domain of polity modelling research: it proves the intrinsic relationship between political culture and polity operation. Moreover, it shows how to build-up the polity model in order to provide for the political culture role in further maintaining and evolving the polity as a real democracy.

Our approach builds upon these two theories and further develops them from the operational perspective. As political culture theory has not provided so far for a modelling approach, even less for a computational modelling approach, ours tries to suggest a simulation-based one.

Conceptual Model

This paper introduces a model of polity inspired by a combination between the concept of "embedded democracy" (Merkel, 2004) and the concept of "human empowerment" (Welzel, 2013). In our approach, the polity model combines *bottom-up* and *top-down* architectural assemblies into a unitary complex adaptive system. Its internal working is specified in terms of processes achieving the essential aspects of polity operation: (1) the separation of powers and their interconnection by means of mutual "checks and balances", (2) the horizontal and vertical communication in the polity between the political institutions and the citizens, and (3) the effective power of governance.

The *bottom-up* part of the polity model architecture is constituted by the *society* component of the polity model. This site of the model has a dynamics of its own acquired on the basis of individual agents' interaction at the social level (micro).

The top-down part of the polity model architecture is constituted by several layers: legislative (Parliament), administrative (Government), justice (Judicial System), and the media. The processes evolving in this part of the model have convergent and/or divergent connections to the social layer operated by means of specific mechanisms. The generic task of any process in this site of the model is to achieve the control of any emergent structure at the polity level (macro), and of the collective action of the individual agents at the social level. As the control is achieved, the polity model operates the entire state as a dynamic entity in a dynamic loop which goes on forever. If control is not achieved, the polity undergoes a change, as its processes configuration is modified by the emergent structure(s) and/or the collective action(s) which escape the control exercised from the top-down part of the polity.

The main contribution of our modelling approach consists in defining and operating the dynamic loops in political culture terms: the model employs the value system, belief set, attitudes and behaviors of individual and institutional actors. The dynamic loops are defined by means of political culture elements described in Welzel's model, like (i) *action resources*, (ii) *value system*, and (iii) *civic entitlements* (Welzel, 2013). The loops are interconnected by the conditional activation settings. The conditions of activation allow for the achievement of the strict sequence in the process generation and development (Welzel, 2013).

Dynamics of Value System
One level of operationalization concerns the internal dynamics of the polity: a polity remains stable as long as the value system is stable.

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Value system includes a fix set of ten basic human values (Schwartz, 2012). It also includes social and cultural values (Hofstede et al., 2002). Some values could be active and strongly connected with other values and beliefs, some other values could be weekly connected with beliefs and other values. There are also values which are not active in a given time window during the simulations. At the individual level, the value activation is achieved by means of (political) socialization processes (i.e., learning).

Change in the value system can be induced by means of activation. Value activation is achieved by the connection with (current and acquired) beliefs. As the strength of the connections between beliefs and values vary, a difference between beliefs could arise. If such differences become high (that is, above a certain threshold), then beliefs are repositioned around other values. The belief dynamic repositioning and interconnecting processes provide for the emergence of (political) attitudes toward objects. The attitudinal objects are provided by the processes undergoing the top-down site of the polity architecture model.

Value system stability is achieved by means of interconnecting beliefs and values in a dynamic network: beliefs are dynamically interconnected between them and around active (stable) values (Schwartz, 2012). As the belief system achieves certain stability itself, the strength of the active values could hardly change. As the beliefs change and their distribution is modified, the value stability could be affected. Unstable value system is characteristic to the situations in which (1) values change their status and become active/inactive, or (2) values change as extreme (political) attitudes toward the political leadership may emerge.

Dynamics of Belief Set

The process of beliefs repositioning around active values provides for the attitude change in the individual citizens. The emergence of change of a belief system is achieved by means of a cognitive dissonance mechanism, which enables the process of attitude change.

Dynamics of Attitude Change

Attitude change process could occur at both individual and mass level. It is enabled by the change in the belief system. At the individual level, attitude change processes are controlled by the cognitive dissonance mechanisms. Depending on the extremity of individual attitudes, their change may affect the relationship between the polity leadership and the society. As individual agents prove an ever decreasing level of trust in the Government for example (i.e., belief change), the mechanisms which enable the democratic scaffolding become active in controlling the processes of belief and value dynamic activation. In the communist regimes in exercise in the Eastern Europe before 1989, under low Government-trust conditions, the value system became unstable and provided for the emergence of change at the top polity level: a change of political regime (i.e., polity change) could thus occur from the weakening of certain institutions like Parliament, Government, and the unique leading political party (see Section 4).

Simulation Model

The workings of a polity are simulated by means of an agent-based system which performs all the tasks of the political system in a cluster of inter-dependent dynamic loops during each simulation run. This paper presents preliminary versions of the Eastern European polity

models. The artificial polity model is an agent-based model: the artificial agents provide for the dynamic representation of both individual and institutional actors in a *bottom-up* architecture, while the interactions amongst agents describe in a dynamic manner the relationships between individual actors, between individual and institutional actors, and between institutions.

The approach models the polity by means of several types of agents (citizens, bureaucrats, magistrates, public resource). The organization and operation of the polity are described by a set of few rules which specify the rights of access to resources, the value system, and the change of political attitude toward the Government. A cognitive dissonance mechanism triggers the belief update process and the action choice at the individual level, thus providing for the emergence of a polity change.
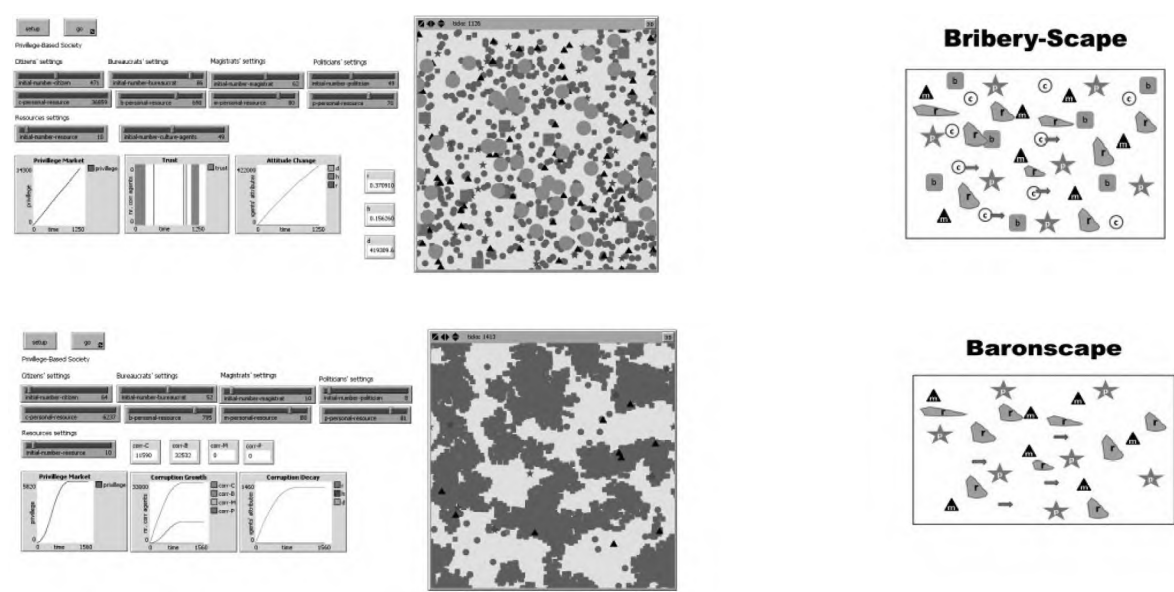

Figure 1.

Briberyscape (Voinea, 2013a) is a polity model which explains how corruption emerges in (1) communist, and (2) democratic regime settings. The model includes: a set of human basic values (honesty, loyalty) and cultural values centered on secular/traditional values (i.e., collectivistic society), a set of beliefs (trust in state, trust in family and close ties, trust in parallel networks), and a political attitude toward the Government (see **Figure 1**).

The model is operationalized by defining as many types of agents and processes as necessary to define the institutional and power configuration of the political system: there are individual agents (citizens, politicians, magistrates, bureaucrats), institutional agents (Government, Party-in-Power), and public resources (Public Budget).

The resource access rules differ for different types of agents: as the resources diminish at the individual level and the public resources access rules limit the number of citizens able to access the public resource, the survival values are replaced either by sacrifice values (i.e., corruption emerges and affects the entire political system, thus called "briberyscape"), or by the value of liberty (i.e., polity change emerges).

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If individual agents bribe the institutional agents in order to get access to the public resource, the mechanism of compliance modifies the strength of the moral value ("honesty") so as it decreases until the value set becomes unstable (i.e., severe suffering from compliance with the state requirement to get privilege of access to the public resource). The value strength modifications brings about a change in the normative system, thus corruption emerges and evolves. If individual agents refuse to bribe the institutional agents and make use of a different value (i.e., their liberty) to justify the access the public resource in order to survive, then the entire political system is subject to change.

Baronscape (Voinea, 2013) is a polity model which explains the formation of patron-client networks as parallel networks of trust. The mechanism of parallel networks of trust is described as a mechanism which, if enabled, might weaken the rule of law in democratic polities (Tilly, 2000).

The simulation model explains how this mechanism can make a liberal democracy turn into an illiberal democracy: as the trust in Government decreases and the individual citizens abandon the governmental network of trust, individual agents which control local administrative areas and which possess both resources and information (called "barons") acquire more power from attracting individual agents without resources and with low information level to join private networks (see **Figure 1**).

Thus, *patron-client* networks emerge and achieve control over larger administrative areas, called "baronscapes". The model explains how belief change can provide for value instability and the emergence of negative political attitudes toward polity institutional actors (i.e., Government).

Preliminary experimental simulation results show that the polity modelling in the combined paradigm of state-building and democracy-building explains the polity operation as achieved by means of political culture mechanisms and processes.

Conclusions

In our approach, which combines the conceptual models of *embedded democracy* (Merkel, 2004) and *human empowerment* (Welzel, 2013), polity is simulated with a complex adaptive system with self-organizing capabilities at some layers, that is, the social layer.

From a political methodology point of view, simulation methodology and the *artificial polity model* provide the means to approach the polity modelling in terms of complexity. Combining the democracy concept with political culture-based specifications of polity operation provides for a better explanation of the transition-to-democracy and democratic consolidation processes in current Eastern European regimes. This proves helpful for understanding how the quality of democracy could be improved by modifying the polity dynamics.

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