

An Essay on Adaptive Development

Un ensayo sobre el desarrollo adaptativo

Um ensaio sobre o desenvolvimento adaptativo

Gabriel Braga Filartiga*

Keywords:

Development,
Adaptive Efficiency,
Learning,
Spontaneous Order.

Abstract: Development theory and practice need a new approach that, more than pointing out institutions to be improved, unveils the underlying mechanisms of path dependent processes of underdevelopment. This paper presents insights for such approach while making the statement that development is not exclusively an issue of interventionism, but rather must be taken from the perspective of spontaneous order. The starting point is the idea that development is an evolutionary process of trials, errors, learning and adaptation. The keystone is the concept of learning as a process of adaptive reorganization that links the microgenesis of capabilities and institutions to the production of social goods. The main argument in that adaptive efficiency is the product of an evolutionary process in which certain types of learning prevail, locking societies in vicious cycles of underdevelopment or unlocking the path to prosperity. When individuals and groups learn reflectively, in the sense that they reflect upon not only their problem-solving tasks but also upon the assumptions underlying their actions, they are more likely to adaptively reorganize capabilities and institutions locally. Without such reflection, they keep locked in unreflective patterns of underdevelopment.

Palabras clave:

Desarrollo,
eficiencia adaptativa,
aprendizaje,
orden espontanea.

Resumen: La teoría y la práctica del desarrollo necesitan un nuevo enfoque que, más que señalar las instituciones a mejorar, revele los mecanismos subyacentes de los procesos de subdesarrollo dependientes de la trayectoria. Este documento presenta ideas para dicho enfoque al mismo tiempo que afirma que el desarrollo no es exclusivamente un problema de intervencionismo, sino que debe tomarse desde la perspectiva del orden espontáneo. El punto de partida es la idea de que el desarrollo es un proceso evolutivo de pruebas, errores, aprendizaje y adaptación. La clave es el concepto de aprendizaje como un proceso de reorganización adaptativa, que vincula la microgénesis de capacidades e instituciones a la producción de bienes sociales. El principal argumento en el sentido de que la eficiencia adaptativa es el producto de un proceso evolutivo en el que prevalecen ciertos tipos de aprendizaje, lo que encierra a las sociedades en ciclos viciosos de subdesarrollo o abre el camino hacia la prosperidad. Cuando los individuos y los grupos aprenden de manera reflexiva, en el sentido de que reflexionan no solo en sus tareas de resolución de problemas sino también en los supuestos que subyacen en sus acciones, son más propensos a reorganizar las capacidades e instituciones de manera adaptativa a nivel local. Sin dicha reflexión, se mantienen encerrados en patrones irreflexivos de subdesarrollo.

Palavras-chave:

Desenvolvimento,
Eficiência Adaptativa,
Aprendizado,
Ordem espontânea.

Resumo: Teoria e prática do desenvolvimento precisam de um novo enfoque que, além de sinalizar as instituições a serem melhoradas, revele os mecanismos subjacentes dos processos de desenvolvimento dependentes da trajetória. Este documento apresenta ideias para esse enfoque, enquanto afirma que o desenvolvimento não é exclusivamente um problema de intervencionismo, mas que deve ser analisado pela perspectiva da ordem espontânea. O ponto de partida é a ideia de que o desenvolvimento é um processo evolutivo de provas, erros, aprendizagem e adaptação. O ponto central é o conceito de aprendizagem como processo de reorganização adaptativa, que vincula a microgênese de capacidades e instituições à produção de bens sociais. O argumento principal é que a eficiência adaptativa é o produto de um processo evolutivo em que prevalecem certos tipos de aprendizagem que, ou condenam as sociedades a ciclos viciosos de subdesenvolvimento, ou pavimentam seu caminho para a prosperidade. Quando indivíduos e grupos aprendem de forma reflexiva, no sentido de que refletem não apenas sobre suas tarefas de resolução de problemas, mas também sobre as suposições que subjazem suas ações, ficam mais propensos a reorganizar capacidades e instituições de forma adaptativa a nível local. Sem tal reflexão, mantêm-se presos a padrões irreflexivos de subdesenvolvimento.

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* Gabriel Braga Filartiga é PhD pela Universidade da Califórnia em Santa Cruz, com ênfase em Economia Política e Instituições, Mestre em Ciência Política pela UFF, especializado em Políticas Públicas e Governo, e Engenheiro de Produção pela UFRJ. Email: filartiga@yahoo.com

Introduction

Great efforts have been made by governments, multilateral organizations, development banks, as well as by all kinds of public and private agents, including the academy, in order to understand and implement solutions to drive less developed societies to prosperity. Prescribed responses in mainstream development theory and public policy are mostly based on incentives and constraints that might produce better choices, usually aiming at some sort of institutional improvement, but when these initiatives fail there is not so much left in the manuals. The persistence of poverty in all continents is the unfortunate evidence that such efforts have been seldom successful. Development theory and practice need a new approach that, more than pointing out institutions to be improved, unveils the underlying mechanisms of path dependent processes of underdevelopment. This paper presents insights for such approach while making the statement that development is not exclusively an issue of interventionism, but rather must be taken from the perspective of spontaneous order.

The starting point is the idea that development is an evolutionary process of trials, errors, learning and adaptation, as Hayek (1960) suggests. The keystone is the concept of learning as a process of adaptive reorganization, a definition proposed by Hutchins (1995), which links the microgenesis of capabilities and institutions to the production of social goods. The main argument is that adaptive efficiency is the product of an evolutionary process in which certain types of learning prevail, locking societies in vicious cycles of underdevelopment or unlocking the path to prosperity. When individuals and groups learn reflectively, in the sense that they reflect upon not only their problem-solving tasks but also about the assumptions underlying their actions, they are more likely to adaptively reorganize capabilities and institutions locally. Without such reflection, they keep locked in unreflective patterns of underdevelopment. In this sense, society evolves according to the dispute between reflective and unreflective learning types, an evolutionary process beyond central planning and design, in which intentionality, reflection and adaptation occur mostly locally.

This essay intends to contribute to the process of building a new perspective to development theories and practices. An approach centered on learning processes that go beyond the human mind and intentionality may be the key for understanding the dynamics of development in terms of how capabilities and institutions evolve and, moreover, may produce practical implications for public policies. Rather than the usual responses of institutional incentives, this approach inquires how individuals, organizations and societies deal with changing circumstances and learn from trials and errors over time. The identification and study of patterns that block such learning processes may be a relevant step for the development of new solutions towards the path of prosperity.

1. Development and Learning

The search for the primary causes of economic growth and development produced convincing theories and empirical evidences for several possible explanatory variables, such as geography and natural resources (DIAMOND, 1999; SACHS, 2012); human (ROMER, 1986; LUCAS, 1988) and social capital (PUTNAM, 1993), institutions (NORTH, 1990; MACFARLAN;

[EDISON; SPATAFORA, 2003; ACEMOGLU; JOHNSON; ROBBINSON, 2004](#)), and so on, an inquiry that has been always pervaded by a passionate debate about the role of the state. The Cold War was the background of a dispute between the principles of the free market and the developmental state in Economics that was reopened for Politics and other fields when institutions became the mainstream's explanatory variable. Neoclassical economics expanded to New Institutional Economics (NIE) relaxing assumptions about perfect information and utility maximization, while the developmental state embraced institutions as fundamental variables in approaches such as the Varieties of Capitalism.

Institutions are now central not only in development theory, but also in public policy practice, as seen in projects managed by multilateral organizations such as the World Bank, the United Nations and the International Monetary Fund. There is a settled belief that well designed institutions are able to provide incentives that will guide different societies to prosperity, even with the evidence of the contrary exposed by the challenges faced by state building and local development projects in poor nations.

While recent research in Social Sciences seems mostly focused on how incentives and constraints shape human behaviour, there is an implicit and yet unexplored role for adaptive learning that may complement the approaches that explain how institutions embed agency. More than the static influence of the "rules of the game" driving decisions, one should try to grasp the dynamics of the process of learning, decision after decision, which consolidates experiences into capabilities, institutions and practices. It is in this sense that this article looks at learning as the microgenesis of development.

Individuals, organizations and society change as they learn in the face of ongoing new challenges. The ability to adjust to such dynamic change, what North (2005) called "adaptive efficiency", was first pointed out by Hayek (1945) as the "economic problem of society" and later (HAYEK, 1960) developed to the idea of progress as a "process of adaptation and learning". As a matter of fact, the concept of development as a learning process has its foundations in the early days of Political Economy. Adam Smith's invisible hand was taken by a positivist economic theory to explain market equilibrium, but this metaphor is part of a broader tradition, as pointed out by Hayek (1960), that understands the power of spontaneous order in all human endeavors as a process of continuous imitation, trial, error and learning from experience, from which new institutions and practices emerge. Hayek states that one should "think of progress as a process of formation and modification of the human intellect, a process of adaptation and learning in which not only the possibilities known to us but also our values and desires continually change" (HAYEK, 1960, p. 37).

Hayek adds to this tradition an insight about the use of knowledge in society that make experimentation the social learning mechanism *par excellence*. Hayek (1948) states that as the main problems of society are related to rapid adaptation to changes in particular circumstances, one should leave the decisions to the people who are familiar with these circumstances, maximizing the chances that knowledge will be properly used. Based on the idea of adaptation in face of complexity, this is a strong argument in favor of decentralization and spontaneous order not only for market relations, but also for institutional and cultural change. He points out that the problem of the use of knowledge, which is not given to anyone in its totality,

“is by no means peculiar to economics”, but rather “constitutes really the central theoretical problem of all social science” ([HAYEK, 1948](#), p. 88).

Notice that the process of evolution in focus is not the mechanism of “natural selection” in which individuals and organizations compete to “survive”, but rather the learning processes that generate capabilities and institutions that will support these individuals and organizations in the adventure of building prosperous societies. It is the fitness of a superior learning type that matters here. The issue is neither just about stocks of knowledge operating as sources of path dependence of one technology over the other, nor stocks of human capital that increase productivity and produce growth. The subject is the dynamics of learning processes that produce such stocks and, moreover, the fitness of types of learning in certain environments and how they produce or slow down development.

Hayek also proposes an epistemology of complexity to this evolutionary approach. Milton Friedman ([1966](#)) was very influential in this matter, arguing that there is a normative agreement on economic prosperity, but researchers still have to find consensus about the most adequate economic policies to achieve such “ought to be”, a task to be engaged by Economics as a positive science. Moreover, he states that hypotheses should be confirmed by the comparison of predictions with experience, in order to build a “body of tentatively accepted generalizations about economic phenomena”. These methodological claims justified empirical assumptions, hypotheses and models designed in the manner of the Natural Sciences, while theories became validated by their problem-solving effectiveness. Curiously enough, although sharing political preferences with Friedman, Hayek presents a distinct epistemological position in his “Theory of Complex Phenomena”. He argues ([HAYEK, 1967](#)) that for complex phenomena, such as those studied by Social Sciences, the conception of “law” in the cause and effect sense of Natural Sciences is inappropriate. Such phenomena must be studied and explained as patterns that emerge from the relations between the elements of a system, rather than by individual events. He explains that economic theory must describe patterns observed under certain circumstances and “rarely if ever derive from this knowledge any predictions of specific phenomena”.

Hayek’s epistemology encourages the adoption of development as a learning process to be studied by its composite processes rather than by explanatory variables in unidirectional causality. Instead of the primary causes development studies have been looking for, one should try to grasp the patterns of development as processes of fortune taming, of adapting in the face of changes and achieving goals through a decentralized learning process of trial and error. Rather than a state to be reached, development may be the process of learning by which human organizations get ready to act when opportunities arise from the continuously changing environment. Hayek’s perspective goes beyond the limits of the intentionality of private and public agents, including social and cultural traits that are not necessarily products of human design. Rather than a theory of choice under uncertainty in which incentives and constraints are the focus of analysis, one may need to start studying learning processes and patterns, in order to approach the political economy of prosperity with a theory of social change. In this sense, development is an evolutionary process of adaptive learning.

2. Adaptive Efficiency and Learning

Mantzavinos, North and Shariq (2004, p. 76) define learning as the “complex modification of mental models according to the feedback received from the environment”. Environmental feedbacks can reinforce mental models, consolidating beliefs, or lead to their creative modification. The authors explain that in the societal level learning occurs collectively, modifying shared mental models and producing belief systems that will support institutions, policies and, ultimately, economic performance. Since the mind interprets reality in on the basis of shared mental models of , path dependence in economic growth can be traced from the cognitive level.

While this “cognitive approach” allows learning processes to connect very distinct levels of the political economy of development, from individual cognition to economic prosperity, it seems the evolutionary explanation of the emergence of institutions presented in the article is still more a functionalist process of selection than an adaptive process of learning. The authors explain the rise of the state as a solution for the problems of trust and protection from aggression. When a society grows bigger and relationships become increasingly impersonal, “individuals capable of learning are bound to realize” that the probability of dealing with defectors increases. This collective lesson implies a demand for protection that will be provided by many protective agencies, because of the higher transaction costs of the formation of coalitions for each time defection occurs. With access to violence mechanisms with nothing else than informal rules to constrain them, the protective agencies engage in a trial and error process of competition and cooperation, “from armed battles to complete fusions”, in order to keep control. They conclude that this evolutionary process generates governmental organizations taxing constituents for protection.

The evolutionary process in the selection of agencies is clear, but when learning takes place adaptive efficiency is taken as given: individuals realize the increase of defections and higher transaction costs of certain solutions to make choices. The authors cautiously address the point that from an evolutionary perspective this story is just one of many possible outcomes, but while history takes the path of the emergence of the state because of settled relative costs, learning is still implicit in a model of incentives and constraints.

Transaction costs are, in short, the costs of ambiguity. Imperfect information, unclear rights and inefficient enforcement produce ambiguities that will be objects of bargaining all the way to the courts. Such ambiguities can be reduced by contracts in the free market or by social rearrangements that absorb these transactions in administrative decisions and norms, such as firms (COASE, 1937) or governmental regulations (COASE, 1960). The static way to explain the emergence of the state from an institutional perspective is that cost and benefit analysis weighed by transaction costs led choices to “agencies” and then to governments. The complementary dynamic explanation might be that ambiguities continuously blocked reflections about adaptive rearrangements in the market, driving history to a reinforcement cycle of power concentration. Perhaps more than the level of uncertainty for political and economic choices, transaction costs influence the kind of learning that prevails.

North (2005) himself admits that while his initial studies placed institutions in the center of economics as incentive structures, they disregarded “the way humans understand and act upon” societal change. He takes a step outside the individual boundaries of mental

models with Hutchins and Hazlehurst's (2003) concept of "artifactual structure". He points out that what is learned by one generation is transmitted to the other by artifactual structures of beliefs, knowledge, institutions, tools, technology and so on. Such structures shape the "immediate choices of players" as well as provide clues to the dynamics of "success or failure of societies through time". He explains that the richer the artifactual structure, the greater is the reduction of uncertainty in making choices and the wider is the range of possibilities of experimentation and creative competition. "The richer the artifactual structure, the more likely are we to confront novel problems successfully. That is what is meant by adaptive efficiency" (NORTH, 2005, p. 70).

North, Wallis and Weingast (2009) advance in the study of adaptive efficiency as an essential force of long-run stability of developed societies fostered by competition and credible commitments. They explain that open access to organizations and the free flow of ideas enhance the ability of individuals to pursue their interests and find better solutions for new problems, in a Schumpeterian process of political and economic creative destruction. Conflicts related to this competition of ideas do not generate disorder because commitments established by institutions are credible and impersonal in the so-called "open access" social order. On the other hand, in "natural states" privileged groups control valuable resources and activities constraining the ability of individuals to explore new opportunities and solutions. Competition is limited and institutions are unable to create credible commitments in the economy and the polity.

Like in North (2005) and in Mantzavinos, North and Shariq (2004), in North, Wallis and Weingast (2009), adaptive efficiency is characterized as a process of competition that selects solutions framed by a set of institutions that produce better choices. These insightful works advance in the concept of development as an evolutionary process and provide ideas for a grounded concept of learning in this context. One can picture a process in which mental models modify, artifactual structures evolve, new solutions are continuously tested and mental models change again. However, in order to figure out how to improve adaptive efficiency to produce prosperity one should observe not only the selection of solutions, but also how they are produced. Rather than between solutions, the competition is between the learning processes that produce such solutions to never-ending new arising challenges. It seems the study of development in terms of adaptive efficiency is beyond mental models, frames for choices and arenas of experimentation of ideas and solutions. Hutchins takes this step further by understanding artifactual structures and mental models as media of the learning process in distributed cognition.

3. Adaptive Learning

Hutchins (1995) is an important reference to this paper because his approach of distributed cognition brings together learning and complexity in a concrete and observable manner. Hutchins rejects the idea of culture as a "collection of things" and, in the manner of Hayek, proposes that culture is an adaptive process that accumulates partial solutions while our everyday practices are enacted. He explains that as a consequence of each task performance and its repetition over time individuals reorganize their minds to develop skills, while partial solutions are crystallized in material artifacts and in the social organization of the work. He

understands stocks of knowledge as well as logbooks and pencil marks on charts as residues of this process, observing the microgenesis of cultural elements in the details of the ongoing practice.

In his research, Hutchins describes navigation tasks performed by a team at the bridge of a Navy ship as a process of propagation and transformation of representations distributed across members of the group, through time and beyond the “skin or skull” of an individual. He believes the real power of human cognition is the ability of bringing bits of structure into coordination in order to organize solutions, defining learning as a process of “adaptive reorganization in a complex system” (HUTCHINS, 1995, p. 289). He explains that in the task of “fixing” the position of the ship a “wave of organization” propagates through time and space from external media, such as written procedures and navigation instruments, to internal media, such as individual minds that coordinate words and meanings, and back to external media, such as the map where the position is marked. Cognition is distributed in the sense that cognitive processes related to memory, reasoning and learning are not closed within the boundary of individual minds, but can also be observed in the social and material world, coordinating minds and material artifacts. Learning is a cognitive process of adaptive reorganization of parts of a system in relation to other parts.

Hutchins states that the conduct of the activity, the development of the practitioners and the evolution of the practice are all the same process, explaining that its products go beyond the end of the task as new ways of solving problems written down in improved procedures or remembered as memories, habits and skills. A learned lesson shapes the immediate performance and the future career of a military officer, rewrites the formal process of a task in manuals that will be used by different crews, and may change patterns of behavior and social organization that affect the whole corporation. In this sense, Hutchins’ concept of learning has the plasticity of a wave of adaptive organization that propagates in all dimensions connecting subsystems, that can be seen as individuals, teams or sub-processes, in various levels and time scales.

The study of distributed cognition throughout the web of connected subsystems is in the domain of Hayek’s epistemology of complexity and provides evidences of his hypothesis of decentralized adaptive learning. When the ship’s propulsion system failed during an entry into San Diego Harbor, Hutchins observed two modes of adaptive responses to the problem of fixing their position without the support of crucial electrical devices. The first was an unreflective process of adaptive interactions among subsystems in which the calculation of the position of the ship was made differently depending just on the availability of data, without further reflection upon neither the local nor the overall process. The second was the case of local design, in which one person was aware that was falling behind and implemented a local change in the calculation process that in sequence triggered both unreflective and locally designed adaptive responses in other subsystems. Hence, the ship is a complex system of processes and mediating artifacts in which organization is achieved by adaptations to emerging circumstances. Learning is this process of adaptive reorganization in which representations of reality change in mental models and material artifacts. Hutchins points out that systems change in part by an evolutionary process and in part by design. Even when subsystems change by local design, adaptation in the system level is evolutionary in the sense that many other subsystems may present unreflective responses to such change. With an anthropological

approach, he doesn't make judgments about which learning type is desirable, but rather realizes that solutions "we recognize in retrospect as being just the sort of solution we would hope designers could produce" are a "product of adaptation rather than of design" ([HUTCHINS, 1995](#), p. 317).

Hutchins' concept is powerful for many reasons. First, the learning process that builds artifactual structures is explicit from the very beginning as a wave of organization connected to the microgenesis of capabilities and institutions. In this sense, it has the flexibility to navigate in various levels and time scales, from individual skills to cultural elements. Second, the identification of reflective and unreflective learning types and their combination in evolutionary processes may help us explain unintended and even counterintuitive patterns in social systems, including in the political economy of development. Third, the proposition that cognition is distributed has interesting empirical implications. It encourages not only ethnographic approaches, as adopted by Hutchins with recording and observations *in loco*, but may also inspire the researcher to see collected data as residua of learning waves through time. In order to identify what types of learning are at play, one can analyze data not just from "internal media" by interviews, surveys or experiments, but also from "external media" such as databases, reports and archives.

Hutchins' perspective is by no means limited to his ship's problems. One can imagine learning as the rearrangement of processes within firms deciding to contract or expand activities in order to reduce transaction costs, or as the improvement of institutions to coordinate relations between labor and business in varieties of capitalism, or yet as the reengineering of "routines" in innovation processes of evolving technologies. I see learning as the adaptive reorganization of capabilities and institutions in the pursuit of prosperity. These processes of change can be unreflective, reflectively designed or evolutionary combinations of both. While in the level of the system the challenges are always changing and never completely known, Hutchins offers an approach that traces learning from the level of local design in subsystems.

4. Adaptive Development and the Production of Social Goods

The main idea of this essay is that development is an evolutionary process of adaptive learning, in which a competition between more or less reflective learning types take place. One of the most important differences between traditional and evolutionary games is that the latter relaxes the assumption of rationality. So, I invite the reader to avoid the temptation of thinking of the encounter between learning types as a moment of calculated choice. Individual minds are only part of the learning process, only media through which learning waves pass by. Learning may be reflective, but its prevalence after each encounter with other types is not a product of rationality whatsoever. It is a process of adaptation in which distinct types of reorganization may occur depending on how ambiguous and defensive the system is. Since we seldom realize these barriers to learning, we may reflect about the problems we solve, but not quite about the learning type we follow.

Consider the production of social goods¹ by the government in a process in which subnational entities such as states make investments with credit contracts from a development bank. In order to access each planned disbursement the states need to accomplish some requirements, such as those regarding environmental licensing and the correct expenditures report of the previous tranche. Of course, some states will be more successful than others, providing solutions for the requirements, managing their projects and delivering their contribution to local development. For those that fail to access the resources, the usual responses of the creditors are financial covenants in contracts with incentives or sanctions. This is an example in the micro level of the solutions prescribed by development theories that take institutions as explanatory variables. On the other hand, a learning approach would ask, first, how are the states dealing with their mistakes? Are they keeping the same pending requirements or anticipating future solutions?

Consider now one state that, locked in the unreflective learning type, couldn't build a school on time because of recurrent pending environmental requirements, and another state that after experiencing the same problem for a while created an online application and reengineered the permitting processes. If both started with the same incentives in terms of the expected payoffs, contracts and regulation, the question is why did one reflectively solve the problem, while the other didn't? One quick answer would be about levels of development, with the unsuccessful state falling behind in education, economic performance, institutional effectiveness and so on. While this answer would describe the status of the problem it wouldn't explain the inability of the state to change. It would describe the stocks of the artifactual structure without the flows that change them. What would be the dynamic explanation in terms of adaptive efficiency? Which impediments to adaptively reorganize in order to carry on their projects did the unsuccessful state face?

New Institutional Economics introduced the adaptive feature of the market into the organizations as strategic choices between aggregating and disaggregating activities, depending on the costs of transaction. Williamson (1991) summarizes this idea contrasting Hayek's spontaneous order of market relations to the purposeful cooperation of formally organized hierarchies. He argues that hierarchies replace market incentives, which are typically driven by relative prices, with administrative controls; and substitutes formal contract law for internal relations in which "hierarchy is its own court of ultimate appeal" (WILLIAMSON, 1991, p. 274). He explains that the craft of internal coordinating mechanisms supplants the "autonomous" adaptation of the free market when authority relations have adaptive advantages over autonomy.

One hypothesis to be empirically studied is that hierarchical organizations, in opposition to and without real adaptive advantages over market-based organizations, create defensiveness and ambiguity as barriers to reflective learning. The following are two real examples that illustrate this idea, selected from a broader research on water and sanitation projects in Brazil.

With the best of the intentions, one state decided to have the signature of the accountability office before sending each of the expenditures reports to the development bank, a process of compliance that usually takes place afterwards. The timing of compliance and project

¹In the sense that they are not strictly public goods, but rather any project considered meritorious to be part of a public program of investment, such as water & sanitation, hospitals, schools, roads, etc.

management were quite different and frequently engineers had the feedback from the office too late to make adjustments, making the new process strictly bureaucratic. The new procedure also created ambiguities and, apprehensive with the kind of control they would be exposed to, engineers and bureaucrats became more and more defensive, providing the minimum information and avoiding any kind of creative solution for the project. Because of misperceptions of timing and defensiveness, the reporting process of each tranche was extended for weeks with marginal quality improvement and all projects were rescheduled several times. Instead of developing for a prosper mix of project management capabilities, creative institutional change and entrepreneurial practices, the state reinforced this vicious cycle for a long time. In this first example, a good intention enacted in one subsystem generated adaptive reorganizations in other parts of the system that locked the system in a path of low performance.

The second real example is a R\$ 1 billion program of investments that takes place in nine municipalities, with a 1,000 km sewer network, seven treatment facilities, 100 pumping stations and other items. The agent is a publicly traded company, with good credit rating, access to international capital markets and diversified funding instruments, including loans and debentures. Given the size of the investment, technical complexity and the bureaucracy the project went through, it was remarkably successful. Analysts and project managers were able to anticipate the risks of delay, budget shortage and regulatory uncertainties about the agreements between the agent and the municipalities in which facilities would be constructed.

One of the critical factors of this project was the number of environmental processes that would have to be managed, so the agent worked to obtain such documents right away. Moreover, the agent was reportedly able to contribute for the improvement of the environmental authority within the state bureaucracy, supporting the creation of a fast track licensing process for projects with low or positive environmental impacts, such as sewage facilities. This is the learning wave in motion: from the desk of the analyst a reflective solution propagates throughout the minds and documents of various groups involved with the project, reaching a meeting room in the environmental department where managers discuss and adaptively reorganize the procedures that simplify authorizations for sewage projects. In this case, there was an adaptation to improve the “rules of the game”, resulting in better conditions not only for the project, but also for the production of all kinds of social goods.

Summing up, in these examples project teams organized and reorganized solutions attempting to comply with the requirements that would open access to funding for their planned investments. Beyond individuals and organizations, reflective and unreflective learning took place in this process of adaptation gaining and losing shares as time goes by in waves of reorganization spreading throughout the system. In the first example, ambiguity and defensiveness blocked learning, project teams were unable to comply with the bank’s requirements and the population ended up without the social goods. In the second example, a local reflection transformed the institutions, improving the licensing process for all future projects. Where the reflective learning type prevailed, development in the form of social goods was delivered.

The next step of this research is the empirical study of the dynamics of shares of learning types changing through time. By studying such dynamics with the support of Evolutionary

Game Theory, I expect to find the underlying patterns of path dependence to reflective or unreflective learning types.

Conclusion

Development is a learning wave. There is nothing metaphorical in the idea of the microgenesis of development as a wave of adaptive learning. More than an appealing image of development propagating in every direction and through time, the dynamics of adaptive learning is a real process with material and non-material consequences. Depending on the type of learning that prevails, artifactual structures evolve and barriers to learning strengthen or weaken. When they grow, strong barriers lock individuals, organizations and societies in vicious cycles of unreflective learning. This work is an attempt to understand and unlock such patterns towards the path to prosperity.

In order to do so, I suggested an evolutionary approach that takes development by its composite systemic processes rather than by explanatory variables in unidirectional causality. Understanding development as a process of fortune taming by decentralized adaptive learning, I argued that society should be taken as a learning system in which capabilities and institutions co-evolve. In this context, I looked at Distributed Cognition ([HUTCHINS, 1995](#)) as a perspective to complex systems that allows a drill down to the microgenesis of development in the learning process of adaptive reorganization, arguing that capabilities and institutions are products of reflective and unreflective learning types that combine in evolutionary processes. Learning is adaptive reorganization in the process of trials and errors; and development is an evolutionary process in which more or less reflective learning types gain or lose shares over time.

Systems and their subsystems deal with errors differently, learning reflectively, unreflectively or maybe not learning at all. Learning is unreflective when adaptive reorganization occurs without reflection about the underlying structure of the problem. On the other hand, learning is reflective when adaptive reorganization designs solutions that challenge the structure of the problem. These learning types combine in evolutionary processes that may produce unintended and counterintuitive consequences such as unfavorable path-dependent patterns in less developed societies. Organizations Theory adds to this approach some insights for investigating these dynamics through the impediments to learning. The literature discussed in this essay is only preliminary on this matter, but provides the interesting starting point of the empirical question about how learning types are affected by barriers such as ambiguity and defensiveness.

Based on the ancient idea of institutional evolution that, according to Hayek, was borrowed from the social sciences by biologists and not the other way around ([HAYEK, 1960](#), p. 53), this paper opens a research agenda with learning types in its core and development taken as a process of fortune taming and continuous improvement of adaptive efficiency. By understanding the dynamics of adaptive development from the perspective of spontaneous order, individuals and organizations will learn how to learn and produce reflective solutions that will set them free from path-dependent patterns of underdevelopment.

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