Why Public Policies Fail

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Abstract
The standard approach to making public policy involves listing possible states of the world given the set of feasible choices, assigning a probability to each state, and calculating expected outcomes by considering costs and benefits. This approach works well in situations where choices are well-known and where uncertainty can be quantified as risk. But public policy often takes place in complex domains that are non-linear, emergent, non-ergodic, evolutionary, reactive and populated by actors prone to cognitive biases. These characteristics make prediction and control difficult or impossible. This paper analyzes the extent to which public policies are prone to these pathologies and analyzes what classes of policies are immune to their effect. Although a series of innovative approaches are found that obviate the need for prediction and control, they ameliorate the challenges faced by the polices without eliminating the fundamental nature of complex systems, so that a major reassessment in expectations of what public policies can effectively achieve, is nonetheless, also necessary.

Keywords: Public policies; complex systems; prediction; emergence.

JEL: D78; E61; H50; I38; L51; O21; P11
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A lot of people including myself, had naively assumed that what we’d get from the physicists and the machine-learning people would be new algorithm, new problem-solving techniques, new technical frameworks. But what we got was quite different – what we got was very often a new attitude, a new approach, a whole new world view.

Brian Arthur quoted in Waldrop (1992, p. 255)

After working in government, in think-tanks, and in the charities sector trying to tackle our most intractable social challenges, it became clear to me that the complexity of our social systems was far out-stripping our capacity to intervene.

Mustafa Suleyman co-founder of DeepMind

1. Introduction

Public policy is the collection of actions and rules set forth by government to promote social goals. Public policy is, therefore, what government does. An important regularity about public policy is that it often fails. Public policy fails a lot. That is not an ideological statement. It is not a statement about the desirability of small government or large government. It is a statement of fact. Public policy fails when governments are large and interventionist and when they are small and take a more hands-off approach. Policy fails in democracies and in autocracies, in presidential systems and parliamentary system. They fail under capitalism, socialism and everywhere in between. Public policy fails under all political parties. They fail at the federal level, at the state level, and at the local level. Policy fails in developed countries and in developing countries. They fail when they involve routine, day-to-day issues, and when they seek to achieve large radical change. Substantive public policy fails and so does procedural policy. Regulatory, distributive, redistributive and constituent policies all fail. Public policy has failed in the past and continues to fail in the present. Inevitably it will also fail in the future.

These statements should not be controversial. I have not claimed that policy fails any more or any less in any of the categories listed above. The point is simply that wherever you

2 Definition from http://kwhs.wharton.upenn.edu/term/public-policy/
have public policy being pursued there is a large chance of failure. The evidence for this statement is not hard to find. It jumps at you when you watch the news, read the papers or walk down the street. The next section makes this point by describing several conspicuous examples of public policy failure. The examples are cases of large failures of policies that have at one time or another been highly favored by economists and other experts as smart solutions to important problems. There are obviously many other public policy failures, from small local issues (potholes in the street) to large global ones (climate change). And there are also many public policy successes. The point is not to tally which is the most prevalent, but simply to make the point that public policy failure is ubiquitous. Although this point might seem so evident that it does not need repeating, the surprise and indignation with which policy failure is often met by citizens, press, voters, politicians and experts, suggests that the propensity of policy to fail has not been fully assimilated.

Section 3 considers why public policy failure is so common. Clearly, each failure has its own idiosyncratic proximate causes that are related to the details of the specific case. Here, however, I am interested instead in the fundamental causes that more generally determine policy failure. Even at this higher level of abstraction there are different sources of failure. Three important classes of causes are: (i) incompetence & ignorance; (ii) corruption & self-interest; (iii) transaction costs, incomplete property rights & asymmetric information. All three causes are pervasive and go a long way in explaining why so much of what government does is botched. They are not mutually exclusive and often all three operate simultaneously. The focus in this chapter, however, is in a less obvious and less remembered fundamental determinant of policy failure. That is the complex system nature of many policy domains. These domains are non-linear, non-ergodic, dynamic, out-of-equilibrium, diverse, interconnected, adaptive, exhibit positive feedback, and are peopled by actors with endogenous preferences that do not always act rationally. These domains are emergent, and what emerges is not always what was intended or expected.

The traditional approach to decision making in both business and in public policy involves listing possible states of the world given the set of possible choices, assigning a probability to each state, and calculating an expected outcome by considering costs and benefits. This approach works well in situations where the choices are well-known and where uncertainty can be quantified as risk. But both business and public policy often take place in complex
domains where it is not possible to conceive of all the possible states of the world, much less to quantify probabilities and costs or benefits. Whether the interest is to produce a new product or to create a new program, the systems nature of public policy means that prediction, evaluation and control (hallmarks of good policy-making) are difficult or impossible. The attempt to apply the traditional approach to such a domain often leads to unintended consequences or failure. And typically, things cannot not be made better by simply getting smarter experts, more data or larger budgets. Using the same approach that failed before, but doing it better, can only take you so far.

In section 3 I describe five different “pathologies” of complex systems that often contribute to derail public policies. These are characteristics of the situation in which public policies are made and implemented, or of the relations they entail, that make it difficult to control, assess, evaluate, and predict what will happen when the planned actions are taken. The upshot from this section is that it is no wonder that public policy fails so often when it is beset with so many obstacles. More importantly, policy fails when complex problems are addressed using standard linear and reductionist approaches that presuppose more knowledge and control than is ever possible in such situations.

This is a bleak message as it implies that the best that can be done in terms of policy-making is often much less than the high bar that we usually expect from government. But it does not mean that we are impotent and should just throw up our hands in despair. Complex systems cannot be controlled or predicted, but they can be harnessed, influenced, constrained, tweaked, hedged and (at a certain level) understood. If we more realistically reassess how much we can actually control and manage complex policies, at the very least many of the most egregious policy failures can be avoided. Section 4 considers what kinds of policy approaches are applicable to complex problems. This is not a complete toolkit, but rather a set of examples that show the nature of some approaches to policy-making in complex domains that have proved useful. They do not allow for close control, first-best solutions and fine-tuning, but they can help to understand and, within the limits of the possible, to deal with the complex nature of the policy domain. In the end, however, it is still necessary to adjust our expectations about what public policy can actually achieve.

2. Examples of Public Policy Failure

Ideally, we would like a complete dataset of comparable public policies from many different countries to assess the extent of policy failure. But policies are too diverse and a
complete dataset does not exist. In addition, it is hard to even define what is a policy failure. Some public polices have the opposite effect of what was intended or so obviously cause harm that they can unambiguously be labeled as a failure. But in many cases, it is not so clear whether the policy has rightly failed. Many policies have different dimensions, so that some dimensions can meet their targets while others can miss. Furthermore, policy evaluation is hard to do properly so it may be unclear how well a policy has fared. Also, what is a failure to one person might be a success to another, as different people have different policy preferences and policies often lead to winners and losers. One definition due to McConnell (2015, p. 221) states that “a policy fails, even if it is successful in some minimal respects, if it does not fundamentally achieve the goals that proponents set out to achieve, and opposition is great and/or support is virtually non-existent.” Alternatively one may want to focus only on cases of large failure. King and Ivor (2014), for example, define a policy blunder, as opposed to a simple policy mistake, as “a case of a government initiative to achieve one or more stated objectives which not only fails totally to achieve those objectives, but in addition wastes very large amounts of public money, and/or causes widespread human distress, and was eventually abandoned or reversed, and was foreseeable.”

My approach in this section will not be to try to be comprehensive or to pin down exactly what is or is not a public policy failure. The objective is simply to make the case that public policy often fails spectacularly by providing some examples of classes of policies, as opposed to specific cases, that have frequently led to big conspicuous failures. It is thus not a representative sample, but rather a purposefully chosen sample of memorable policy failures. All the examples are types of policies which were well-thought through and debated and which have many defenders, including academics, experts, politicians, and often public opinion. That is, they are not one-time slip-ups that were quickly perceived and abandoned or rectified with little harm or damage. Their inclusion in this sample does not mean that all instances of these policies have failed, but rather that there have been many cases of failures and a general disappointment with the idea. The three examples are: (i) microcredit; (ii) individual transferable quotas (ITQs) for fishing rights; and (iii) mega-projects. I give a list of other examples in the end of the section.³

Microcredit

³ The descriptions of each policy area will be brief with references given for readers interested in greater detail.
Microcredit is a policy of providing small loans to poor people (often women) who are typically illiterate, excluded and would not normally have access to official or private credit of any form. It is conceived to promote entrepreneurship and reduce poverty by giving the beneficiaries a foothold on which to build human, financial and social capital. The idea of microcredit as a developmental and antipoverty policy is attributed to Muhammad Yunnus who founded the Grameen Bank in 1983 in Pakistan. This initial model was highly praised by policymakers, academics, international organizations, donors, celebrities and public opinion. It was extensively copied and extended by other institutions across the world. In 2006 Yunnus was awarded a Nobel Peace Prize for the idea and the endeavor. The appeal of microcredit is evident. It addresses one of humanity’s most important problems, poverty. It is based on communities and is gender sensitive. Also, it is decentralized and scalable, and founded on the notion of individual entrepreneurship. The United Nations declared 2005 as the International Year of Microcredit and by 2009 there was an estimated 74 million people around the world holding a total of US$38 billion in microloans.4

But despite this enthusiasm, as the policy matured and a track record became available to allow for proper evaluation, doubts arose if microcredit effectively had the purported impacts on its beneficiaries. As is often the case with public policy, it was not clear if the expected benefits for individuals and communities actually materialized. Critics started portraying microcredit “as an interesting idea formulated by possibly well-meaning individuals, but an idea that nevertheless went very wrong” (Bateman, 2014, p. 3). Also, a microcredit industry had developed that in some cases veered into profiteering and exploitation.

Microcredit as a public policy has attracted both defenders and detractors, so it is difficult to ascertain how well the policy has fared. Policy evaluation is hard to do rigorously and both sides have made claims based on anecdotes, poor data and flawed studies. Nevertheless, some rigorous evaluations have been performed. A study by Banerjee, Karlan, and Zinman (2015) uses careful empirical strategies that exploit randomness in the allocation of microcredit in a way that allows the identification of causal effects of microcredit on beneficiaries. The authors study six cases and are very careful to note the limitations of the tests and the possibility that other indirect and unmeasured benefits might have been realized. Nevertheless, their main conclusion is that:

4 Data from Wikipedia https://en.wikipedia.org/wiki/Microcredit.
... there is little evidence of transformative effects. The studies do not find clear evidence, or even much in the way of suggestive evidence, of reductions in poverty or substantial improvements in living standards. Nor is there robust evidence of improvements in social indicators. (Banerjee et al., 2015, p. 13)

Although elsewhere the authors do find some “modestly positive, but not transformative, effects”, this is still very little from a policy that was expected to be a game changer (Banerjee et al., 2015, p. 1). Whether one accepts the critiques or this more moderate view, microcredit has been, relative to expectations, a failed policy.

*Individual Transferable Quotas for Fishing Rights*

The collapse of fish stocks across the world is one of the great tragedies of the past fifty years. Overfishing and mismanagement of stocks has caused not only biological loss but also social and economic upheavals in communities that depend on fishing activity and produce. Worm et al. (2006) found that approximately 27% of the world’s fisheries had collapsed by 2003 and extrapolated that if the same rate of decline continues, 100% will be collapsed by 2048. Economists and biologists have addressed the issue of fishery management at least as early as Hardin (1968), Gordon (1954), and A. Scott (1955). Many different public policies have been devised over the decades to address these problems.

One of the most popular, especially amongst economists, has been the policy of individual transferable quotas for fishing rights (ITQs). The method, first proposed by Christy (1973), recognizes that the essence of the problem is the lack of property rights to fish, which gives incentives for overfishing rather than careful husbandry, as a fish not caught today is up for grabs by others. ITQs create property rights to fish and a market in which these rights can be traded. The government determines the optimal economic sustainable annual yield for a given fishery and distributes rights to fish that amount amongst the eligible fishermen. Each holder of the ITQs can decide whether to effectively use their rights to bring in fish, or alternatively to sell the ITQs in the market. Similarly, fisherman can purchase additional rights to catch more than their initial share. This creates an opportunity cost to catching fish as a right that is used cannot be sold. The resulting market has the effect of allocating the permits to those fishermen that can catch the fish at lower cost. This is an allocation that command and control policy would probably never get right, given the difficulty in obtaining the information on each fisherman’s costs and preferences. The beauty of the scheme is that it limits the annual catch to a sustainable
level and assures that the activity is done in the least cost manner. In addition, it provides incentives for innovation in organizational forms and technology.

Because of the theoretical elegance of the idea, ITQs have attracted many supporters. In 1992 an influential essay in the Journal of Economic Literature elected markets for permits as one of the main contributions that environmental economists had made in the previous years (Cropper & Oates, 1992). Since then a great number of policy experiments using different formulations of ITQs have taken place across the world. According to Chu (2009), by 2008 ITQs were used in eighteen countries to manage the stocks of over 249 species. This form of management has thus become a major form of public policy.

How well have those policies fared? As with the other examples in this section, the answer is controversial, as there are both proponents of the policy as well as critics. The purpose here is not to settle the issue by rigorously evaluating the different claims. Rather the intent is simply to show that despite its appeal and widespread adoption the policy has failed in a great number of instances, and generally disappointed relative to expectations. In a paper published in *Science*, Costello, Gaines, and Lynham (2008) assemble a global database of 11,135 commercial fisheries out of which 121 used some variation on ITQs by 2003. They find that implementation of an ITQ reduced the probability of a collapse by 13.7%. Although this is less than could be wished, it could also be considered a positive evaluation. Other studies reached even more mixed results. Chu (2009) found that of a sample of 20 fisheries where ITQs were used, only 12 showed any improvement in stocks. Acheson, Apollonio, and Wilson (2015, p. 2) argue that “ITQs may be highly successful in ending the race for fish and increase revenues to fishermen, but their limited success in improving stocks is a serious indictment.” Branch (2009, p. 39) analyzed 227 papers that evaluated ITQs and found that 23% reported negative effects on fish stocks and 14% mixed effects. The impacts on bycatch of non-ITQ species, fishing effort, the ecosystem and habitat, among other harder to measure dimensions were also mixed. Bromley (2009, p. 280) criticized ITQs for effectively “free gifting to the commercial fishing sector of permanent endowments of income and wealth” and thereby increasing inequality.

The purpose here is not to ascertain whether ITQs have on balance been more or less successful as a way to deal with the tragedy of the world’s declining fish stocks. The point has been to show how a type of policy that commands much support among policymakers,

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5 They focused on markets for pollution emission, which are fundamentally similar to ITQs.
academics and experts has in many cases and many dimensions failed to live up to the promise it once inspired.

*Mega-Projects*

Mega-projects are “large-scale, complex ventures that typically cost US$1 billion or more, take many years to develop and build, involve multiple public and private stakeholders, are transformational, and impact millions of people” (Flyvbjerg, 2014, p. 6). Although they can be both public and private, by their very nature most mega-projects are the object of public policy. Examples are bridges, tall buildings, high-speed rail and events such as the Olympics and the World Cup. In January of 2017 the 9 largest mega-projects in construction in the world were (Desjardin, 2017): (i) International Space Station – $150 billion; (ii) Al Maktoum International Airport - $82 billion; (iii) South-to-North Water Transfer Project (China) – $78 billion; (iv) California High-Speed Rail – $70 billion; (v) Dubailand (themepark) – $64 billion; (vi) London Crossrail Project – $23 billion; (vii) Beijing Daxing International Airport – $13 billion; (viii) Jubail II industrial city in Saudia Arabia – $11 billion; and (ix) Hong Kong-Zhuhai-Macao Bridge – $10.6 billion.6

Spending on mega-projects has already reached more than 8% of global GDP and is expected to continue to grow in the future. Flyvbjerg (2014) attributes the attraction of mega-projects, in both developed and developing nations, to what he calls the four sublimes that enrapture different groups into a diverse coalition that favor the venture. The technological sublime attracts engineers and technologists; the political sublime brings in politicians; the economic sublime speaks to business people, trade unions, bankers, investors and consultants; and an aesthetic sublime engages those who like iconic design.

Given the recurrent commitment of so much public policy effort and resources in the form of mega-projects, one would expect a positive track record in terms of net benefits and general satisfaction with the ventures. Furthermore, given the attention and scrutiny that mega-projects naturally receive one would expect that eventual problems would be quickly detected and rectified. And although there are some memorable mega-project failures, such as cities that regretted hosting sporting events, and infrastructure projects that produced dramatic cost overruns, time overruns or simply failed to deliver the expected benefits, it may seem that these are just some inevitable exceptions. But that is not so. These failures are not exceptions but

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6 See the December 2017 issue of the Project Management Journal for a special issue dedicated to mega-projects.
rather the rule. As it turns out, “there seems to be consensus pertaining to the poor performance of megaprojects” (Söderlund, Sankaran, & Biesenthal, 2017, p. 6). The numbers are surprising. Flyvbjerg (2014) analyzed data on mega-projects in the past 70 years:

Success in megaproject management is typically defined as projects being delivered on budget, on time, and with the promised benefits. If, as the evidence indicates, approximately one out of ten megaprojects is on budget, one out of ten is on schedule, and one out of ten delivers the promised benefits, then approximately one in one thousand projects is a success, defined as “on target” for all three. Even if the numbers were wrong by a factor of two—so that two, instead of one out of ten projects were on target for cost, schedule, and benefits, respectively—the success rate would still be dismal, now eight in one thousand. (Flyvbjerg, 2014, p. 11)

Because of this track record Merrow (2011, p. 12) concludes that most mega-projects “end up being disappointing to their sponsors; a fewer number turn out to be destroyers of shareholder wealth; and a few are horrendous with respect to anything and everything involved—the investing companies, the local population and the environment.”

The persistent failure of public policy in the form of mega-projects has many causes, including corruption, incompetence, over-optimism, political incentives, nationalism and others. And of course some mega-projects do succeed. Shenhar and Holzmann (2017) analyze successful megaprojects and conclude that one of the common elements they share is a capacity to adapt to complexity. While all the determinants of public policy failure cited above play an important role, the aspect that I will focus upon in the next sections will be specifically this complex nature of the domain in which public polices take place and the relationships they entail.

Other examples of public policy failure

This section has sought to substantiate the claim that public policy failure is pervasive by providing three conspicuous examples. Many more could be given. Land reform, for example, is a public policy which many countries have adopted to change the structure of land ownership to achieve greater agricultural efficiency and social justice. The track record of land reform across space and time is dismal and the few cases that have succeeded did not do so under democratic institutions, e.g. Taiwan, Japan and South Korea (Alston, Libecap, & Mueller, 2010; De Janvry & Sadoulet, 1989; Rashid, 2000).
Another area of public policy that has failed spectacularly in the past and continues to do so in the present is that of urban planning. The case against urban planning was forcefully made by Jane Jacobs in 1961 in the book *The Death and Life of Great American Cities*, and by James Scott in 1998 in *Seeing like a State: How Certain Schemes to Improve the Human Condition Have Failed*. Both argue that urban planning theories descendent from Ebenezer Howard’s Garden Cities of the early 1900s and Corbusier’s subsequent Radiant Cities, frequently fail to produce vibrant, pleasant and innovative cities, and tend to lead instead to urban blight, drabness, gentrification and failure to deliver human betterment.

A further example of disappointment in public policy is the use of mechanism design as a major policy instrument. Whereas game theory takes rules and constraints (the game) as given, and tries to figure out how the players will act, mechanism design seeks to achieve certain desired actions by creating rules and constraints that will induce players to act that way. The theoretical body of mechanism design is highly elegant and impressive, yet the practical application in terms of policy have been scant. There are some successful uses in designing auctions and matching of employers/employees, students/schools, etc., but the grand vision of a world in which a large slice of human choices is cleverly shepherded by altruistic policy makers seeking societies best interest, never really materialized (Bowles, 2016). What we observe instead is a third-best world of low-powered incentives in which public policy makes use of very blunt instruments that leave many potential gains unrealized (Dixit, 1996).

Humanitarian aid (more often a curse than a blessing), environmental policy and health care are some final examples of areas that experience persistent public policy failures throughout the world. These will not be described here, but a moments reflection should convince most readers that they clearly fit the bill. Little effort is required to think of many additional instances of public policy failure.

3. The complex nature of public policy

Public policy fails for many reasons. Even a relatively simple objective, such as a vaccination campaign, requires myriad pieces of information and expertise, and involves the mobilization, cooperation and coordination of a great number of people and organizations, with often conflicting objectives, that must act in certain ways at precise times. Many policies fail because the tasks are hard to do. Add to that the propensity for corruption, incompetence and political motivations, to which many public policies are prone, and it seems quite natural that
things often do not turn out as expected. But although these evident frailties of the policymaking process are serious predicaments, they are problems that can in principal be dealt with. More effort, more information, better governance, smarter experts, more transparency and good will, all can do much to mitigate those problems and improve the delivery of public policy. Whole disciplines of economics, project management, and public administration provide theories, ideas and techniques for how to achieve better public policy results. Much improvement can certainly be achieved through such means. Better checks and balances on political organizations and improved accountability, for example, can do wonders to make public policy better serve the public interest.

But the focus in this chapter is on a different source of public policy failure. One that cannot be rectified by simply using better practices and more knowledgeable experts. The interest here is to understand the implication of the fact that public policies are embedded in complex systems. A complex system is one in which diverse agents linked in networks interact selectively following simple rules (that is, not necessarily optimizing) without centralized control, and from which emerges (often unpredictable) patterns, structures, uses and functionalities (that may be desirable or not), and do so continually, never settling on definitive equilibria, but always learning, adapting and evolving. In this section I explicitly describe how public policies fit this description of complex systems. But more importantly, I stress why it is that these characteristics of the interactions that make up public policies imply that they are hard to control and are continually subject to failure. To set this up, consider the requirements of the standard approach to policymaking based on decision theory. A policymaker is tasked with solving a given problem. She collects information and enlists experts to determine a set of policy options. Each option is considered to determine the payoff it will entail in each future state of the world, taking in to account the probability of each possible contingency and possibly factoring in the strategic reaction of all relevant parties. From this analysis the option with the best net benefit is selected and implemented. Results are evaluated and the policy is fine-tuned if necessary. In many instances this approach works reasonably well. Yet, given the extent of policy failure, as documented in the previous section, in many other cases the approach fails.

I argue that the fundamental reason for this failure lies in the complex system nature of public policies. This section is setup in five subsections that each describe a ‘pathology’ of complex public policies that undermines the standard approach. Together these pathologies
explain why it is that even when done with the best of intentions by the best experts, that is with no corruption or incompetence, public policies nevertheless tend to fail.

3.1. Public policies are non-linear and emergent

The thinking behind the standard approach to policy making follows the reductionist view that dominates much of science. Reductionism assumes that to understand a large and complicated matter one can break it into smaller and more easily understood components. Once these are understood, the pieces are put together to reveal the working of the whole. This is a good strategy to understand how, for example, a clock or a car works. It requires the whole to be simply the sum of the parts. In other words, it requires the relationship between the parts to be linear.

Economic theory, on which public policies are generally based, is quintessentially linear. It was purposefully modelled on 19th century classical mechanics which was firmly constructed on reductionist logic. Linearity also conveniently makes the mathematics more tractable. An example of linearity in economic theory is the derivation of the market demand for a good as the simple summation of the demand of all individuals in society. This might be a suitable approximation in many cases, but requires the assumption that the individual demands are independent, except through the effect of prices. In many real-world cases, however, this assumption is invalidated by phenomena such as imitation, fads, habit, hysteresis, and several types of externalities. That is, in these systems, people impinge on other people and adapt to what other people do across a many different margins (Schelling, 1978).

A related example of reductionism in economic theory is the use of representative agent models, where a single agent (a consumer, a firm, etc.) is modeled and its behavior is then linearly multiplied by the number of agents in the economy to derive aggregate behavior. This approach provides macro models with microfoundations and couches the theory in methodological individualism, both of which are desirable qualities. But the linear aggregation of preferences is often unrealistic and the results serve as poor guides to understand societies and to make public policies (Jackson & Leeat, 2017; Kirman, 1992).

Linearity is also present in the way cause and effect is commonly modelled and tested in economic theory. In a linear causal relation, a unit increase in the cause $x$, yields the same magnitude of change in the effect $y$, for all levels of $x$. Much of econometrics is the estimation of the coefficients that capture these supposedly linear relationships. But in complex systems there
is often no proportionality between cause and effect. Often large causes can have no impact, such as a lake that receives considerable runoff from agriculture and other human uses, yet continues to be clear and sustain life. At some point the pollution passes a threshold level and the lake suddenly flips to becoming eutrophic, loosing attractiveness and life (Allen & Holling, 2012). The switch does not come about gradually, but rather in a punctuated manner. Complex systems are characteristically beset by such tipping points and public policies are mired in discontinuities. And because the flips often come about in unexpected and unpredictable manners, this makes it all the more difficult to predict and control public policies in these domains.

The consequence of non-linearity is that the final effect of a public policy will not be the sum of the effect of its parts. Another way to say this is that the policy produces emergent phenomena, that is, results that cannot be easily predicted by looking at the constituent parts, but can only be gleamed and (possibly) understood by running the system. Emergence is the classic signature of a complex system. Thomas Schelling’s book, *Micromotives and Macrobehaviors*, provides a wealth of examples where the dependence of people’s choices on other people’s choice produce surprising emergent results.7

These situations in which people’s behavior or people’s choices depend on the behavior or the choices of other people, are the ones that usually don’t permit any simple summation or extrapolation to aggregates. To make that connection we usually have to look at the system of interactions between individuals and their environment, that is, between individuals and the collectivity. And sometimes the results are surprising. Sometimes they are not easily guessed. Sometimes the analysis is difficult. Sometimes it is inconclusive. But even inconclusive analysis can warn against the jumping to conclusions about individual intentions from observations of aggregates, or jumping to conclusions about the behavior of aggregates from what one knows or can guess about individual intentions. (Schelling, 1978, pp. 14, 2006 edition)

It should be clear that when results are surprising, difficult to guess or analyze and are often inconclusive, it is hard to make public policies, and for that reason they often fail.

3.2. *Public policies do not settle in equilibria and are hard to predict*  
Predictions are a fundamental requirement of the standard approach to public policies. All possible options must be mapped out and their cost and benefits considered in every possible

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future state of the world. This is a formidable requirement. In complex systems it is also an impossible requirement. As we have seen, the emergent phenomena that arise from the iterative interaction of multiple diverse agents is hard to foresee and can only be known by actually trying it out. Although many public policies often seem to play out as expected and settle on the anticipated results, this may be the temporary state of complex system. Stability and regularity might persist for long periods, but phase transitions can bring about unexpected change without warning. Often it is this veneer of familiarity that instills the false sense of control that lies behind many misguided public policies. The logic is that the future will be like the past, so we can rely on experience and on experts to show the way.

But with complex systems, neither experience or experts are a guarantee of success. As noted by Watts (2011, p. 27) we are not only bad at predicting, but we also have trouble understanding what has already happened:

Whenever something interesting, dramatic, or terrible happens we instinctively look for explanations. Yet because we seek to explain these events only after the fact, our explanations place far too much emphasis on what actually happened relative to what might have happened but didn’t. Moreover, because we only try to explain events that strike us as sufficiently interesting, our explanations account for a tiny fraction even of the things that so happen. The result is that what appear to us to be causal explanations are in fact just stories – descriptions of what happened that tell us little if anything about the mechanisms at work. …In this way we deceive ourselves into believing that we can make predictions that are impossible, even in principle.

Simply beefing up the science is not much of a solution. Science is currently in the throes of a credibility crises due to widespread lack of replicability, underpowered results and bias for positive results (not to talk of fraud) (Ioannidis, 2005; Ioannidis, Stanley, & Doucouliagos, 2017; Maniadis, Tufano, & List, 2017). Economist have claimed that economics has undergone a credibility revolution in which sound empirical design has reduced the extent of the problem (Angrist & Pischke, 2010). Yet, although practices have improved and testing for policy treatment effects appears to have become the central activity of economists, most studies require natural or quasi-natural experiments which tend to provide little guidance for broader policymaking. As noted by Leamer (2010, p. 33), “since hard and inconclusive thought is needed to transfer the results learned from randomized experiments into other domains, there must therefore remain uncertainty and ambiguity about the breadth of application of any
findings from randomized experiments.” There is currently hope that Big Data may be able to improve policy design and delivery, but at least for now, as put by Tim Hardford in the Financial Times (March 24, 2014) “Big Data has arrived, but big insights have not” (see also Dodson (2014); Economist (2014); Marcus and Davis (2014); O’Niel (2016)).

Neither does it seem that the problem can be solved by getting more and smarter experts to get better understanding and better predictions. Although most real-world instances of public policy failures can probably be significantly ameliorated by having better people involved, this cannot solve the inherent problem of lack of predictability. In Expert Political Judgement: How Good is it? How can we Know?, psychologist Philip Tetlock describes a twenty-year long experiment in which he collected prediction from 284 experts from all areas about a wide variety of events of the kind that experts typically address, such as, ‘would the US go to war in the Middle East’ (Tetlock, 2006)? In all there were more than 28,000 forecasts. The results showed that on aggregate, experts’ forecasting ability is pathetic. They did only marginally better than dart-throwing monkeys (that is, marginally better than chance), but did worse than well-educated non-expert dilettantes, and worse than simply always saying that the future will be a continuation of the past. They did however, do better than Berkley undergraduates, that were simultaneously tested and did worse than chance (Tetlock, 2006, p. xx).

With public policies the task is even more difficult than anticipating a series of future scenarios. In complex systems it is not even obvious what you need to predict. Emergent phenomena might involve variables and dimensions that one would not even think of considering until the system takes that unexpected change (Watts, 2011). That is, you not only don’t know what will happen, but you don’t even know what can happen. And that makes pursuing public polices particularly difficult.

The difficulty of prediction and of making policy is fundamentally related to the non-ergodicity of the environment in which these actions take place. Non-ergodicity is another signature of many complex systems. Douglass North was one of the first to bring the concept to social sciences:

If I say the world is ergodic, I mean that it has a stable underlying structure, such that we can develop theory that can be applied time after time, consistently. It is very important to understand that the world with which we are concerned is continually changing, is continually novel. That does not mean that there are not ergodic aspects of the world. But
we cannot develop theory that can be used over and over again and over time. For an enormous number of issues that are important to us, the world is one of novelty and change; it does not repeat itself. There may be lessons in history, but we have to be careful about them. We have to be careful about the lessons that history may teach, if we are going to try to unravel the problems that concern us here. If indeed these issues with which we are concerned, such as global warming and the global commons, belong in a world of continuous change, a non-ergodic world, then we face a set of problems that become very complex. (North, 1999, p. 2)

In a non-ergodic world of continuous change neither experts nor experience can fully compensate our inability to fully understand the working of the system in which public policies operate and the difficulty of predicting what will happen in each known and unknown scenario. In the next subsection I argue that the specific mechanism through which this change takes place, that is Darwinian evolution, makes these tasks even more difficult.

3.3 Public policies evolve and coevolve

In biological evolution what is being evolved is not the organism, but rather the information contained in the DNA for how to produce a new copy of that design. Evolution is an algorithm that works through variation, selection and replication. The result of this process applied over and over again is the rise and increase in population of those designs that are more fit than others given the constraints put forth by the environment. The unit of selection is the genome, or rather, the information contained therein.

Information in the form of culture, beliefs, institutions, norms and technologies, also changes through a process of variation, selection and replication. This is not the place to make the case for epistemic evolution, so I will reference the literature and take it as given that these forms of information evolve through a process that is similar, yet with some specificities, to biological Darwinian evolution (Arthur, 2009; Bisin & Verdier, 2001, 2015; Cavalli-Sforza & Feldman, 1981; Mokyr, 2000; Richerson & Boyd, 2006). The important point here is that public policies are crucially determined by culture, beliefs, institutions, norms and technologies, so if these things evolve according to the specific algorithm of variation-selection-replication, this affects which public policies arise, how they operate and the impact they have.

The first thing to note is that evolution does not optimize. It looks for fit design, which means design that replicates faster than competing design given the environment. Contrary to the
world of standard economics, complex systems don’t have a single global maximum, that is, one knowable best choice. Rather, they are composed of an unobservable rugged landscape of myriad peaks and throughs, so it is hard to even know what is the globally fittest solution. The result is usually for the design to get stuck on local maxima even when there are better solutions nearby. In the context of public policies this means that the problem to be addressed admits too many solution, most that cannot even be known in advance, and that once that design has been implemented it is difficult to change. That is, initial conditions matter and there is strong path dependence.

A second characteristic of evolution is that it cannot be easily steered, controlled, or predicted. In biological evolution variation comes about by recombination (sexual reproduction) and mutation. For any given environment there are many possibilities and most of them never get visited (i.e. there are almost no birds that eat leaves from the top of trees, though this seems like a design that would make sense (Levins & Lewontin, 1985, p. 98)). In epistemic evolution there is intentionality by humans, as they try to achieve specific objectives. Nevertheless, the existence of purpose is subverted by accident, chance, unintended consequences, and serendipity, so that in the end the process is unpredictable and uncontrollable. Most medical discoveries, for example, are the result of luck or accident rather than purposeful knowledge (Taleb, 2012). Public policies in complex systems are similarly intendedly purposeful but subject to lack of control and predictability, often producing unintended results.

The isolated evolution of culture, beliefs, institutions, norms and technologies makes the public policy process elusive. But the situation is even more difficult than that, because each of these forms of information not only evolves itself, but in the process, coevolve with each other. Coevolution takes place when a change in one evolving agent, say the design of a parasite, affects the fitness of a host. In this new environment, the host’s old design is now less fit, so its ability to replicate diminishes. But this change in environment may also spurs the evolution of a new design for the host that allows it to better resist the parasite’s attack. If this comes about, then the new design of the parasite is now less fit. The result of this coevolving relationship is that there is never a final stable equilibrium set of designs, rather each species must forever keep changing in response to the changes in the other, in a ‘Red Queen’s Race’ where one must forever run faster and faster to stay in the same place (Carroll, 1871).
An early example of the coevolution of technology and culture is the claim that the adoption of the plough by some societies with suitable soils and topographies, led to the rise of less equal gender norms than that which arose in societies that did not use the plough (Alesina, Giuliano, & Nunn, 2013). This tool required greater upper body strength and thus led to a gender-based division of labor, which in turn got internalized in the form of beliefs about the roles of men and women in society, which in turn got codified in institutions and informally in norms. Closing the circle, beliefs, institutions and norms then shaped and constrained the evolution of other technological advances. The upshot of coevolution for public policies is this churning and everchanging relationship between beliefs, institutions, norms and technology that make them hard to predict, control and understand.

3.4 Public policies are subject to cognitive biases

Designing and implementing public policy requires creating incentives and constraints that will affect the choices and behavior of both the target public and those in charge of carrying out the policy. To get those incentives and constraints right it is necessary to have a good understanding of how people behave and respond to different stimuli. The model of human behavior that underpins the standard approach to policy making is rational choice theory, which describes optimizing agents that have a fixed set of preferences which strictly guide the choices they make. This is a reasonable approach in that people do seem to pursue their own self-interest, even when acting pro-socially. However, the theory also requires that preferences be consistent in terms of conforming to a series of characteristics (completeness, transitivity, logically ordered, etc.) and that they be fixed. If preferences are not well-behaved in this manner, many of the important results that arise from micro-economic theory, may not be assured, such as the existence, unicity and stability of a market equilibrium. Mechanism design, which is essentially a tool for making policy, is wholly dependent on the adherence of the subject population to rational behavior patterns.

While rational choice theory may be a suitable template for many situations, especially to use as a benchmark or when dealing with large aggregates rather than small groups or individuals, in many other situations it can fail spectacularly. The recognition that deviations from full-blown rationality is not contained to a few amusing anecdotes, but is rather deeply enmeshed in human societies has spurred the growth and acceptance of behavioral economics as a discipline (Ariely, 2010; Fehr & Schmidt, 1999; D. Kahneman, 2013; Daniel Kahneman &
The point here is not to discuss this shift in the discipline or the merit any of the many cognitive biases that have been proposed (Wikipedia lists 175 of them, such as confirmation bias, sunk cost fallacy, endowment effects, etc.) The point here is that if people are limitedly rational and subject to all sorts of cognitive biases, public policies become considerably harder to get right. Perfect rationality makes thing considerably easier as it makes very straightforward predictions of how people will act. But if instead actors are susceptible to a wide variety of biases, it becomes much harder to foresee how they will react to different incentives and constraints in different circumstances. A classic example of this is the failure of payment for blood as a policy to increase donations (Buyx, 2009; Niza, Tung, & Marteau, 2013; Titmuss, 1970). Whereas rational agents would be expected to increase donations if offered economic incentives, in many cases payment was found to crowd out altruism.

A complex system approach of how people behave recognizes that making decisions is costly, so people economize by using heuristics, short-cuts, rules of thumb, trial and error, imitation, etc. The nature of these simple rules involves repeated interaction with other agents, including having one’s preferences affected by the actions of others. The work of Thomas Schelling, cited above, perhaps best shows the unpredictable macro patterns, structures and functionalities that can arise from such iterative interactions (Schelling, 1978). Making policy in circumstances where one cannot deduce how people will react is a major cause of the failure of public policy even when it is otherwise well designed.9

3.5 Public policies suffer from reactivity and the Lucas Critique

A final cause of public policy failure addressed in this chapter is the problem of reactivity. This is the fact that the groups and individuals subject to a policy are often aware of the fact that they are being manipulated and purposefully react, altering the impact of the policy in the process (Frey, 2017). In the natural sciences this does not occur (though there are observer effects in quantum physics). Molecules or rats are unaware of the scientists’ intent and therefore not strategically react to the fact that they are being experimented upon. In the social sciences this is not the case, and with public policies it is most explicit. When a public policy is

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9 While the purposeful use of cognitive biases for policy purposes – known as ‘Nudge’ - can often harness these ‘irrationalities’ in the policy maker’s favor, it is, almost by definition, only able to achieve marginal and specific policy intentions rather than more encompassing objectives (Thaler & Sunstein, 2008).
announced, those that stand to gain or to lose have incentives to strategically change their behavior to make the most of the situation. Policies are typically conceived taking the pre-policy behavior of the population as a guide. Therefore, when the policy is started it will already be operating on flawed premises as that behavior has changed in reaction to the knowledge that there is now a policy in operation. Even if policymakers try to foresee the strategic behavior and build it into the policy in game theoretic fashion, it is typically very difficult to cope with the tenacity and creativity of the subjects.

This problem is not new and has been recognized in several different areas. In economics it is known as the Lucas Critique, which caused a paradigm shift in macroeconomics in the 1970s by “criticizing the use of estimated statistical relationships from past data to forecast the effects of adopting a new policy, because the estimated regression coefficients are not invariant but will change along with agents’ decision rules in response to a new policy” (Ljungqvist, 2008). Similarly, Goodhart’s Law states that “When a measure becomes a target, it ceases to be a good measure” (Goodhart, 1981). And Campbells Law states that “The more any quantitative social indicator is used for social decision-making, the more subject it will be to corruption pressures and the more apt it will be to distort and corrupt the social processes it is intended to monitor” (Campbell, 1979). A well know example of these phenomena is teaching to the test, when a policy seeks to improve education by measuring only students’ performance on tests.

The implication of reactivity is that public policy often fails. It is hard enough to get right in normal circumstances, and much harder when the those affected by the policy keep trying to second-guess the policy makers and keep changing their behavior. And although new methods like Big Data and Machine Learning might be able to give policymakers an edge, it is unlikely that this can solve the fundamental problem given people’s creativity to pursue their own interests (Frey, 2017).

3.6 Other pathologies

This section has presented five different classes of reasons why public policies, when they have the characteristics of a complex system, are hard to plan, implement, evaluate and reform. Many public policies do have these characteristics because they are the result of diverse iteratively interacting agents that react continuously to each other and to the policy environment. The five pathologies do not exhaust the problems that complexity imposes on public policies. Some others, that will not be discussed here, but are nonetheless important, include: (i) public
policies are chaotic (in the sense of being sensitive to initial conditions) and thus have multiple unpredictable equilibria, or simply no equilibria at all; (ii) public policies tend be subject to winner-take-all dynamics or preferential attachment; (iii) public policies often face environments that self-organize as power laws, exhibit positive feed-back, and superlinearity.

4. **How to make public policies fail less**

Although all types of policies fail, they do not all do so for the same reasons. Many policies fail because of incompetence, corruption, lack of resources, and/or bad governance, but could be set straight with more effort, resources and good will. Other policies also fail because of incompetence, corruption, lack of resources and bad governance, but even without these predicaments would still be highly vulnerable to failure. These are policies that suffer from some or all of the ‘pathologies’ identified in the last section: (i) non-linearity / emergence; (ii) non-predictability; (iii) (co)evolution; (iv) reactivity; (v) cognitive biases. These characteristics make these policies complex and thus hard to predict, control and manage.

In this final section I consider how complex policies, could be approached to avoid or minimize the chance of failure. Ideally, we could classify each type of policy as being complex or not complex, to allow comparisons. But that turns out not to be an easy task, as almost every policy area seems to have many of the characteristics of complex systems. Consider the following list of policies taken from Wikipedia: information policy, human resource policies, privacy policy, defense policy, economic policy, education policy, energy policy, environmental policy, foreign policy, forest policy, health policy, housing policy, macroeconomic policy, monetary policy, population policy, science policy, security policy, social policy, urban policy, transportation policy, and water policy. At this level of generalization and aggregation it is hard to point out a policy area that does not involve the multiple interactions of diverse agents that characterize complex systems. Perhaps a better level of analysis would be to consider more specific objectives within these broader areas. Then it might be easier to classify policy objectives along a continuum of complexity / non-complexity. Rather than attempting such a classification I just claim that some policy areas have more attributes of a complex system than others and discuss what kind of approaches can be used for the complex policies. Those that are not complex, e.g. (perhaps) running national parks, may be hard and complicated, but they can be better designed and implemented in a straightforward manner by using more resources, more experts, more data, better governance, etc.
Complex policy areas can also benefit greatly from these straightforward remedies, but these do not address all the problems, risks and liabilities to which complex policies are prone. The reason is because the five ‘pathologies’ discussed above cannot be resolved with standard policy making based on decision theory, prediction and evaluation. These are situations in which the Hayekian impossibility of acquiring, processing and interpreting all the necessary information impedes considering and comparing all alternatives to trace out the best response (Hayek, 1945). They are policy areas where past experience is a poor guide for future action because of its non-ergodic nature. They are policy areas where “a mechanical application of generic rules that ignores these [local] particularities is an invitation to practical failure, social disillusionment, or most likely both” (J. C. Scott, 1998, p. 318).

If this is the case, how can public policy proceed in complex areas? Given that the fundamental cause of the intractability of these policies is their complex nature, any solution must be immune to the specific problems that complexity creates. This means that the solutions must not have unrealistic informational requirements, must not necessitate unreasonable prediction, and will probably involve little control and direct detailed intervention from policymakers. Note that any policy along these lines is quite different from the standard approach to public policies that seeks better results through more control, more information, and more prediction and evaluation.

There are several innovative approaches in business and in government that have characteristics that make them suitable for dealing with complex problems. Many of them use new information technologies to get around those obstacles and enable solutions to emerge, many times, from the bottom up. I describe some of these approaches below. Yet, though these solutions are promising and many times even astonishing, it is important to point out that they are usually not silver bullets that suddenly allow all policy goals to be magically reached. I argue that even when these complexity-compatible approaches are used, they usually only ameliorate some dimensions or aspects of the problem and not the entire policy concern. The fundamental complexity of the problem still remains. Therefore, it is essential that in addition to using smarter and more appropriate tools and approaches, one realistically reassess what can be expected from the policy. Almost always, what can truly be achieved is much less than our expectations demand. Smarter approaches can greatly improve a complex situation, but they cannot transform a complex situation into a simple problem that can be controlled at will. Complex policy areas
remain complex and some objectives simply cannot be achieved, so we should soberly downgrade our excessive policy expectations.

In some cases, this means simply abandoning the intent to pursue that specific policy. It’s just too complex, too risky and can fail in ways that do not compensate the risk. An example is a policy to forcefully promote democracy, rule of law and other liberal values into other nations. There is much evidence that such efforts have not fared well historically, and in some cases, has been disastrous, e.g. Iraq and Afghanistan (Diamond & Plattner, 2015; Hermann & Kegley, 1998; Meernik, 1996). Most policies that fit this category are controversial for a lot of reasons, political, ethical, philosophical, etc. But even setting aside these ideological issues, policies like geoengineering, cloning, and new planned cities, are probably too complex and interdependent to ever get right.10

In many cases the option to forego the policy area is not realistic and it has to be pursued. An example is health care policy. Health care has failed in most countries. It is a prototypical complex system (Bar-Yam, 2006; Kannampallil, Schauer, Cohen, & Patel, 2011; Lipsitz, 2012). It is an area that must have public policy guidance and coordination. But whatever that policy should be, the track record suggests that it will not be the current grand visions that require too much knowledge and control. Probably, whatever it is that can work, will be much humbler.

It is not in the scope of this chapter to provide a comprehensive list of all the tools that have already been created and tried for dealing with complex policies. That is a topic for a paper of its own. Furthermore, my impression is that there are not that many examples to report yet.11 There is a tendency to view methods like crowd-sourcing, sharing, prediction markets, big data, AI, machine learning, blockchain and others, as the solution to all of humanity’s ills. That is not what I am suggesting here. Nor do I cover the many ways in which these approaches can improve the standard approach to public policies, making the them faster, cheaper and more knowledgeable. Instead, I describe a small sample of new methods that can specifically address

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10 Charles Perrow’s book *Normal Accidents: Living with High Risk Technologies*, has a similar outlook to the approach of this paper. He argues that policies and projects that are characterized by many interacting parts, and by many couplings (that is, that are complex), almost inevitably lead to failure and accidents. Furthermore, these accidents cannot be avoided by conventional planning, testing and engineering, thus the name ‘normal accidents’. He argues that ‘… certain technologies should be abandoned, and others, which we cannot abandon because we have built our societies around them, should be modified’ pg. 4.

11 D. C. Colander and R. Kupers (2014) book “*Complexity and the Art of Public Policy Solving Society’s Problems from the Bottom Up*” presents a convincing indictment against existing policy approaches when the policy domain is complex. Yet, as noted by some reviewers, they were not able to find many examples to illustrate their claims (Squazzoni, 2014).
one or more of the ‘pathologies’ of complex systems reviewed above: (i) non-linearity / emergence; (ii) non-predictability; (iii) (co)evolution; (iv) reactivity; and (v) cognitive biases. This serves both the purpose of illustrating how complex public policies can be more properly conducted, and to reiterate the limits of what even these complexity-appropriate policies can achieve.

**Methods that obviate prediction**

In *Everything is Obvious Once You Know the Answer*, Duncan Watts forcefully makes the point that “there is a difference between being uncertain about the future, and the future itself being uncertain. The former is really just a lack of information—something we don’t know—whereas the latter implies that the information is, in principle, unknowable” (Watts, 2011, p. 147). Although we tend to think of prediction as uncovering something that in a sense is already there, predetermined but not yet realized, in reality, what will happen is still to be determined and depends on a series of other things that are also not realized or certain, so the best we can do is to think in terms of probabilities. In complex systems, even that is hard to do. Not only is there little basis for making specific predictions, but we don’t even know what it is we should be making predictions about. When designing policy in a given area there are not just a few easily distinguishable scenarios or options, each with a manageable number of variables for us to consider what can happen with probabilities that can be estimated. Instead, there are infinite possibilities and no way to know which are relevant or not.

Given the impossibility of prediction in complex systems, how can public policy be designed and implemented? It must be done without the need for prediction, at least by the policymakers themselves. One way to do this is through prediction markets, which try to capitalize on the wisdom of the crowds to get more accurate predictions than can be made by individuals or experts.\(^\text{12}\) In prediction markets anybody with an insight or an opinion can ‘put their money where their mouth is’ and buy or sell a contract for a given pre-specified event, such as, who will be elected in a forthcoming presidential election. By aggregating information held by people with different perspectives and different outlooks, prediction markets offer an approach to deal with the Hayekian problem of the use of knowledge in society (Hayek, 1945).

\(^\text{12}\) An example is Agur http://www.augur.net/, whose homepage boasts: “Welcome to the future of forecasting. Agur combines the magic of prediction markets with the power of a decentralized network to create a stunningly accurate forecasting tool - and the chance for real money trading profits.”
According to Williams (2011, p. 1) the markets have been used to forecast uncertain outcomes ranging from influenza outbreaks, to the spread of infectious diseases, the demand for hospital services, the box office success of movies, climate change, vote shares, election outcomes and the probability of meeting project deadlines at Google.

But although prediction markets are a smart tool that can certainly improve policymaking by allowing for better forecasts and more access to information, they do not solve the fundamental problem of complexity, in particular, the fact that in many cases you don’t even know what it is you need to predict. Furthermore, different authors have run horseraces between prediction markets and other simpler models (such as using historical probabilities) and found that even when prediction markets do outperform the others, they do so by very small margins (Erikson & Wlezien, 2008; Goel, Reeves, Watts, & Pennock, 2010). As noted by Watts (2011, p. 2) “predictions about complex systems are highly subject to the law of diminishing returns: The first pieces of information help a lot but quickly you exhaust whatever potential for improvement exists.”

Another approach is to give up the pretense of prognostication and rely instead on experimentation and trial-and-error. Watts (2011, p. chap. 8) gives several examples of strategies for what he calls ‘reacting to the present’. The first is the strategy used by the Spanish clothing retailer Zara for deciding on future designs, styles, fabrics, etc. Instead of depending on the wisdom of stylists and couturiers to divine the fashions that the whims of consumers will favor in the upcoming season, Zara follows what they call a measure-and-react strategy, where they have a large number of agents across the world go to places where people gather and transit, to harvest ideas from what the man and woman on the street are currently wearing. These inspirations are quickly designed and produced in small batches that are, in a short span of time and at low cost, tried out in stores across the world. Those that are well-accepted have their production expanded and further pursued, while those that fail are quickly abandoned. This strategy has made Zara (Inditex fashion group) the top fashion apparel retailer in the world (in 2017) and its founder, Amancio Ortega, the third richest man in the world (Jan. 2018).

This strategy allows the design to emerge from the bottom up rather than being decided from the top. It could potentially be used for public policy purposes in those situations where it is hard to predict how the subject of the policy will react or what are their preferences. This would

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13 These are examples of strategies by private firms, but similar approaches could be used for policy purposes.
require, however, a change in society’s and the government’s mentality towards public policy, as the strategy involves error and failure. The traditional approach to public policy see’s failure not as a means to learn and reveal information, but as incompetence and something that must be averted and punished.

Two other strategies in the same spirit are “bucket testing” and the “Mullet Strategy”. The first is used, for example by companies that market through websites. The strategy involves running “two simultaneous versions of a single or set of Web pages in order to measure the difference in clicks, traffic, transactions, and more between the two. Bucket testing provided a great way to send a small amount of traffic (usually less than 5%) to a different user interface without negatively impacting the bottom line if our new design had unintended negative consequences.” It is thus similar in effect to running small randomized controlled experiments to test different policy conceptions and applications. The “Mullet Strategy” refers to the (tacky) hairstyle of the 1980s, in which the hair is short over the forehead but long in the back; business up front and party at the back. This strategy is used, for example, by the Huffington Post (online news aggregator) to test new and potentially risky content from different contributors. This outlet uses both regular and eventual contributors, as well as user-generated material. Because too much content is generated through its extensive network, it is not possible to screen and edit all the material. But it would also be too risky to just publish without vetting what might be offensive, nonsense or wrong. The “Mullet strategy” involves putting this new material in the back pages of the website and promoting to the front that which catches the readers whimsy, while dropping anything that is flagged as objectionable before it has enough exposure to cause any problems. In terms of policies this would once again involve experimentation in safe scenarios to test what works and what doesn’t before committing the entire enterprise. While strategies like these are smart and can probably improve public policies even in complex areas, at the present they just seem to improve some tasks or dimensions of real world policymaking and not are not capable of radically substituting entire operations. More importantly, many of the fundamental difficulties that arise due to the non-linear, emergent, non-ergodic, evolutionary, reactive and irrational nature of complex system remain unattended or might even be exacerbated.

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14 See Watts (2011, p. chap. 8) for details.
15 https://www.360logica.com/blog/what-is-bucket-testing/
Methods that economize on information and obviate control

Another margin on which to adapt policy to its complex nature is to design them so that command, control and constant hands on management are less needed. This is not a new idea. ITQ (individual transferable quotas) and much of mechanism design are attempts to set up situations so that the actors themselves make most decisions without the policymaker having to have all the relevant information or establish what actions the agent should take. While these approaches to policy making can yield good results in some cases, recall that in section 2 I used them as examples of public policy failures, based on the poor record in real world applications. Quite possibly with new information technologies and more experience these approaches can fulfill their promise, as theoretically they do make clever use of information constraints. Their failure to generally do so thus far is indicative of the difficulties of applying many of the ideas being described here to real-world situations.

There are other more radical proposals to address the fundamental problem that complex systems are hard to run and control. One of these is the notion of ‘shared spaces’ to deal with the problem of traffic in cities. David C. Colander and Roland Kupers (2014) describe the implementation of a scheme in the Netherlands that sought to deal with the damaging competition for space on city roads between vehicles, pedestrians, cyclists and other users, not by adding more signs, speed bumps, traffic lights, speed limits, etc., but on the contrary removing all rules and attempts to steer behavior. Counterintuitively, this slowed down average speeds, reduced traffic incidents and gave many areas a renewed liveliness, as “long lost public space was won and people reclaimed the streets.”16 By forcing all users to negotiate the use of the road, instead of dictating behavior from above, a more amiable environment emerged. It is not clear, however, to what extent this idea is scalable or valid for other environments.

Several other schemes are already being tried that have the potential to greatly improve public policy. Bike sharing schemes using new technologies have already transformed several major cities, visually and in terms of accessibility. Today there are more than 1,600 bike sharing schemes, and many new ones come on line every month (Economist, 2017). Colorful undocked bikes have, for example, taken over major Chinese cities. Most of these schemes are private rather than public but help to deal with problems that concern transport policy.

16 Quote taken from the Project for Public Spaces website (https://www.pps.org/article/what-is-shared-space)
Prizes are another scheme that have been increasingly used throughout the world to achieve specific policy goals with less direct governmental involvement. This strategy is not new. In 1714 the Longitude Act in Britain established a prize for devising a simple method for the precise determination of a ship’s longitude at sea, worth £10,000, £20,000 or £30,000 (depending of accuracy). Napoleon offered a prize in 1795 for a method to preserve food to be used in battle. Today prizes are back in favor, used by governments, businesses, international organizations and philanthropists. An example is the Ansari Xprize which: “challenged teams from around the world to build a reliable, reusable, privately financed, manned spaceship capable of carrying three people to 100 kilometers above the Earth's surface twice within two weeks. The prize was awarded in 2004 and along with it, a brand new private space industry was launched.”17 Among the hundreds of others prizes that a quick internet search uncovers are: to invent an affordable, accurate, fast and easy-to-use test for bacterial infections that will allow health professionals worldwide to administer the right antibiotics at the right time18; creating solutions that advance the autonomy, scale, speed, depths and resolution of ocean exploration19; the development of scalable, efficient and effective decentralized solutions to sustainability challenges which exploit the Distributed Ledger Technology (DLT) used in blockchains.20

The attraction of prizes are that they provide a low cost means to explore ideas distributed across diverse groups with different perspectives, providing a greater chance of finding innovative solutions than a centralized government effort would afford. In a sense they are equivalent to performing many simultaneous experiments to see what works best, yet with less control by the government or overseer about what is tried.21

These new approaches and technologies can be tantalizing and transformative. Some like blockchain still need to prove their worth for policy uses, but others like sharing have already made a mark. Nevertheless, the central point made above remains valid. When they do not address the fundamental nature of complex systems, the methods provide agility and expediency, but cannot eliminate the inherent pathologies of complex systems. Society’s expectations for

17 https://ansari.xprize.org/
19 https://oceandiscovery.xprize.org/
20 https://ec.europa.eu/research/eic/index.cfm?pg=prizes
21 I have focused on tools that are compatible with unpredictability, uncontrollability and the emergent nature of public policies. An example of policies that are compatible with cognitive biases are those that use Nudge Theory (Thaler & Sunstein, 2008). For policies prone to evolutionary dynamics, an example are research funding strategies that are sensitive to serendipity (Editorial, 2018; Yaqub, 2018)
what public policies can realistically deliver should be prepared for this inherent and inalienable predicament.

5. Conclusions

On April 26, 2010 the New York Times printed a graph that had been presented to the leader of the US and NATO forces in Afghanistan, General Staley A. McChystal. The graph “was meant to portray the complexity of American military strategy, but looked like a bowl of spaghetti” (Bumiller, 2010). Hundreds of squiggly arrows linked dozens of nodes with labels such as; overall government capacity; tribal governance, popular support; insurgents; narcotics; infrastructure, service & economy; population conditions & beliefs; coalition capacity & priorities; among others. Each of these linked to dozens of other smaller labels in even finer print. The article went viral for bemoaning the use and abuse of Powerpoint even in the US military. The general is reported to have remarked “When we understand that slide, we’ll have won the war” (Bumiller, 2010, p. A1).

The slide may have been ridiculed as the butt of a joke, but it was not an inaccurate depiction of the situation faced by the US and allied forces’ operation in Afghanistan. The policy for delivering aid and reconstruction to this war-torn region has all the characteristics of a complex system and suffers from the pathologies that make it so hard to get things right. The same failures experienced by US and NATO missions were previously endured by British (1830s) and Soviet (1979-1989) incursions in Afghanistan (Loyn, 2009). It is possible to draw a simpler and more easily understood picture of the players, interactions and catalyzing forces that characterize the problem. But the reality of the policy problem would still be subject to the burdens inherent to complex systems.

Albert Hirschman coined the ‘Hiding Hand Principle’ to refer to tendency of policy makers to underestimate the complexity and challenge inherent in the projects they initiate, to get stuck when things don’t work, but then, under a pinch, to become creative and find solutions or alternatives that would never had occurred to them without the unexpected complications (Hirschman, 1967). According to Hirschman (2011, p. 13) “the only way in which we can bring our creative resources fully into play is by misjudging the nature of the task, by presenting it to ourselves as more routine, simple, undemanding of genuine creativity than it will turn out to be.” In one sense Hirschman’s principle is very much in the spirit of this chapter. It recognizes that many public policy initiatives are less predictable, controllable and understandable than what we
usually presume. But in another sense, this chapter has the opposite recommendation. Rather than embracing our ignorance and lack of true command over what the policy will achieve and how, I have stressed the importance of recognizing when a public policy has the characteristics of a complex system and adjusting both the expectation of what can be achieved, as well as the types of policy tools and instruments to pursue those ends. Flyvbjerg and Sunstein (2016, p. 984) study a much larger sample than Hirschman’s 11 projects and found that rather than the benevolent version, a Malevolent Hiding Hand Principle was much more prevalent, “which also hides obstacles and difficulties, but in situations in which creativity does not emerge, or emerges too late, or cannot possibly save the day … it hides not only the initial obstacles and difficulties, but also the barriers to creativity itself.” They recommend greater use of cost-benefit analysis to avoid such malevolent public policy outcomes, though they recognize that the very same unprecise expectations that are at the root of the Hiding Hand Principle may make these analyses hard to do properly. Public policies in non-linear, emergent, non-ergodic, evolutionary, reactive and cognitively biased domains are even harder to get right. Recognizing that fact, not misjudging it, is the first step to avoid failure.
References


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