

CHAPTER 1

Twin Peaks

The ideas of economists and political philosophers, both when they are right and when they are wrong, are more powerful than is commonly understood. Indeed the world is ruled by little else. Practical men, who believe themselves to be quite exempt from any intellectual influence, are usually the slaves of some defunct economist.¹

—J. M. KEYNES

Traveling from Amsterdam to Johannesburg on business, one of us settled into his seat and opened up the *Economist* magazine. Because of the mountainous terrain below, he knew that the flight would likely be rough, as the hot air from the plains rose above the mountainous terrain below and slammed into the colder upper layers of the atmosphere. Luckily, this flight was smooth as the pilots were outrunning the turbulence. Settling back into his seat he started reading an article² about the other's work:

In 1996, David Colander of Middlebury College, in Vermont, expressed his dissatisfaction with decades of economics by invoking a lofty analogy. He felt macroeconomists had clawed their way up a mountain, only to discover, when they broke through the clouds, that a neighbouring mountain would have taken them higher. . . .

Mr. Colander's analogy does not imply that economists are getting nowhere: they can make progress up their chosen peak, even if other, higher mountains beckon. Mainstream models of the macroeconomy, for example, are more sophisticated than they were, allowing for different kinds of shocks, better statistical testing and a variety of dramatic personae beyond the economic Everyman of yore. This progress is the result of hard theoretical work in response to successive rounds of criticism. The critics, who don't think the climb is worth the effort,

may not always appreciate quite how far the leading economists have ascended. . . .

The twin peaks image has a further, unsettling, implication. To get from one peak to the other, economists will have to lose a lot of altitude first. To tackle questions in a fresh way, they may have to set aside many of their favourite techniques and methods. This prospect probably explains a lot of the resistance to new economic thinking. Economists tend to cling to whatever assumptions are required to use the techniques they favour.

Not long after that, the two of us met at a climate change conference in Berlin, and we both had the same reaction to much of the discussion; it missed many of the central elements of policy. The policy discussion was framed between two polar options: either leaving it to the market or counting on government for the solution: either *laissez-faire* or government activism. What these approaches miss is that those very choices will themselves influence the dynamics of the system, as well as people's tastes and preferences. It won't be the same system once the policies are under way, and that very fact can bring about both opportunities and unforeseen consequences.

In our view this way of framing the policy choices was undermining useful discussion. It forced the debate into two camps—those in favor of the market, and those in favor of government control. We fit in neither camp. We both believed that any viable solution had to involve the market. But it also had to involve government. For us policy was not a choice between the market and government; policy necessarily involved both government and the market working together. We see them as symbiotic, not opposed.

This government/market symbiosis argument is viewed by some promarket advocates as a liberal trap to undermine the market, leading to an expansion of government and more government control. We agree that it has sometimes worked out that way in the past, but it need not and should not. To say that government is essential is not to say that current governmental structures are doing a good job, or that governments are always focusing on the right kinds of activities.

Why did we both come to this recognition? After all we had very different experiences and backgrounds. What connected us was that

we both had an interest in the new science of complex systems; the way we thought of policy is the way someone trained in complexity science would think of policy. Complexity was the link between us. Roland, a physicist by training and a businessperson by vocation, had spent time at Santa Fe where complexity science first emerged as a discipline, and had done work in complexity theory at university. David, an economist by training and a professor by vocation, had an interest early on in complexity economics and wrote some articles and edited books about complexity's importance to economics and its relevance for policy and teaching. It was from that early work that the *Economist* was quoting.

We both saw complexity as the missing link in thinking about policy (for those unfamiliar with the complexity field, don't worry, we will provide an introduction in chapters 4 and 7; for now simply think of complexity science as the science of highly interconnected systems). In the metaphor picked up by the *Economist* magazine quoted above, complexity is what David referred to as the second peak: we were both thinking of policy on the newly discovered complexity mountain, whereas the standard policy debate was framed on a mountain that preceded the discovery of complexity science.

THE COMPLEXITY POLICY NARRATIVE

The central narrative of complexity science involves viewing the social system as a complex evolving system—beyond control of government or anyone. It is more a living entity than a mechanical entity. Its fundamental nature does not allow for the type of governmental control that unsophisticated liberals are seen to be advocating. Likewise, seeing the social system as a complex evolutionary system is quite different from seeing it as a self-steering system requiring the government to play no role, as seems to be suggested by unsophisticated market advocates. Instead, it sees the social system as complex and adaptive, developing multiple endogenous control mechanisms that make it work, and which are continually evolving over time. Government is just one component of those endogenously evolved control mechanisms.

Sophisticated liberals and sophisticated market advocates have always recognized this, and political theory has heuristically explored this interconnection in depth. But when discussion of economic policy is placed within the standard policy frame, that sophistication is often lost, and the debate is pushed into a fruitless standoff about unsophisticated positions, leading to name-calling and miscommunication. That is where complexity science comes in. It explores highly interconnected systems mathematically, and develops models that shed light on how such interconnected systems work. In doing so, it attempts to provide models that capture the sophisticated views of both progovernment liberals and market fundamentalists.

THE WRONG COMPASS

Most such insights from spontaneous conversations die; this one didn't because of serendipity. We were on the same flight out of Berlin, where we shared our views of policy. The similarity was clear, and it was also clear that we were viewing policy in a quite different way than were many of the conferees—who were thoughtful and articulate academics and policy makers on climate change. We recognized that we were viewing policy from a complexity frame, distinct from the policy frames that were guiding most others. The complexity policy frame rejects the standard policy compass—government control on the one side and free market on the other—and replaces it with a new policy frame that provides a much richer and more fruitful environment for policy discussion. This book is designed to introduce you to the complexity policy frame.

There have been many books about complexity, but most of those books have not been about policy—complexity science is the realm of some high-powered scientists, who are very bright, but whose interests and expertise seldom extend to the intricacies of policy, narratives, and history. But our interests are policy—Roland got out of physics and into business with AT&T and Shell because he was intrigued about how economics systems actually worked; his father, an economist, was one of the designers of the European Union and gave him an early taste of a free market by design. Later he got involved in academia with issues such as green growth and

the interface between business and policy. Dave wrote on abstract economic theory, writing his dissertation under the supervision of two Nobel Prize winners. But he maintained an interest in policy. He worked in Washington for a while but quickly discovered that he didn't have the temperament to do policy in Washington with all its intrigue. So he withdrew and focused on teaching; he wrote a top-selling textbook on principles of economics and studied the economics profession, titling one of his books *Why Aren't Economists as Important as Garbagemen?* Such books soon earned him the reputation as the economic court jester—the economist who said what all economists knew, but knew better than to say.

These different backgrounds provide a quite different view of complexity and policy than you get from most of the high-powered scientists who advance complexity science, or from writers who popularize it. It reflects a middle ground—an appreciation of the technical nature of complexity science, but with a primary interest in policy implications, not science. We discuss how textbook simplifications have evolved to capture complex scientific understanding, and how those simplifications have become deeply built into discussions of economic policy. The current simplification is based upon a narrative that frames policy as the state attempting to control the economy. This is quite understandable, since that is the policy compass that scientists have provided to the public.

The problem with scientists structuring frames for policy is that generally they put too little emphasis on intuitive understanding, and too much focus on quantitatively tractable models. For pure science, that's a plus. For policy, it can be a problem if the model becomes too firmly rooted in formal modeling, and the scientist using the model does not sufficiently recognize the model's limitations. That's what happened with economic and social policy.

The current policy compass is rooted in assumptions necessary a half century ago to start developing a tractable model of the economy. However both mathematics and modeling have advanced light years since then. But while cutting-edge social and economic theory has advanced, the policy model has not. It is this standard policy compass that is increasingly derailing the policy discussion. It is leading policy wonks into thinking they know what they are

doing and not realizing that their compass has a limited range. In our twin peaks analogy, the standard model is valid only on the first peak and does not work well beyond it.

In the complexity policy frame, one starts with a recognition that there is no ultimate compass for policy other than a highly educated common sense. Scientific models provide, at best, half-truths. In our view the education of that common sense very much includes a basic appreciation of complexity, as well as humanities, mathematics, and others. Policy compasses are created and evolve; they are fallible products of a particular time and place, and must be treated as such.

It's here that the *Economist's* metaphor, quoted above, comes in: The standard free market or government control frame is the compass that is used to find the way on the lower mountain. To appropriately navigate the higher peak, one has to recognize that the policy terrain is constantly changing. On some of these terrains, the standard policy compass works quite well. But on others, it doesn't. These other terrains require one to avoid thinking in terms of that dual polarity, and to see policy in a more integrated way. The goal of this book is to provide an alternative complexity policy compass that helps frame policy for those terrains on which the standard compass doesn't work.

The central policy choice in a complexity frame is not—either the market or the government. The goal of policy in the complexity frame is not to choose one or the other. Instead, policy is seen as affecting a complex evolving system that cannot be controlled. But while it cannot be controlled, it can be influenced, and policy makers have to continually think how to work with evolutionary pressures, and try to guide those pressures toward desirable ends. Within the complexity frame, top-down control actions are a last resort. Their use suggests that you have failed in your previous attempts to get the ecostructure right. The primary reason you would choose to resort to it, is that the problems you are facing are seen as such systemic threats, so that you can't wait for the slower, but more sustainable, bottom-up policies to work. We call the policy that follows from taking a complexity frame *laissez-faire* activism. *Laissez-faire* activism is an activist policy to design and create an ecostructure in which a *laissez-faire* policy can flourish.

FREEDOM AND COLLECTIVE GOALS

One way to have government influence without control is to have as many positive voluntary actions as possible. If people through their own wishes do what is socially desirable, control is not needed. People exhibit self-control. If a society has positive norms, far fewer regulations are needed. In a society with positive norms, individuals can have significant freedom of action, while still achieving collective social goals. This emphasis on individual freedom is usually associated with promarket advocates, but it is also an emphasis of complexity policy advocates. What simplistic or fundamentalist free market advocates sometimes miss is that a complex system works only if individuals self-regulate, by which we mean that they do not push their freedom too far, and that they make reasonable compromises about benefiting themselves and benefiting society. When those reasonable compromises are built into the norms of behavior, one has the best of all worlds. In complexity policy norms are considered endogenous to the system and are interconnected with policy. The government does not impose norms, or even force individuals to self-regulate. Instead it attempts to encourage the development of an ecostructure that encourages self-reliance, and concern about others.

One of government's important roles in the complexity frame is to encourage people to adopt positive social norms. But that "norm influencing" role for government is seldom part of the economic policy discussion. A norms policy is designed to influence the rules and tone of the social game. It involves creating a civil society within which individuals can prosper on their own terms. It does not involve imposing the government's will upon individuals, since government is simply a means through which individuals solve collective problems.

Our point is that government has an important policy role in both frames, but those roles are quite different. On the higher peak, the government is seen as simply a manifestation of bottom-up collective choice interaction, as natural to a social system's evolution as supply and demand. Without government, we wouldn't have markets as we know them, and without markets we wouldn't have

government as we know it. They are symbiotic and coevolving. As such market and government cannot be a polarity for the policy compass.

The symbiotic nature of the government and the market is not a new insight—all one has to do is read Classical economic and political thought to find a full recognition of it. But Classical social science scholars didn't formalize their insights in such a way that policy could be directly derived from them. As Classical thought evolved into the more formal neoclassical thought, many complexity insights were lost to economic policy and to a certain extent to all of social policy. Policy discourse became framed as a deterministic science of control—with economists advising an “outside-the-system” government that knew what was best for people. The fact that what was best could be discovered only by the process of evolution was lost. Consistent with this view, policy makers adopted a compass that saw government and the market as polar opposites. Government policy became focused on government control, and those who favored encouraging people's social nature found themselves pushing for control policies—government regulation, forced redistribution, and directly limiting markets—not for influence policies—self regulation, charity, empathy, and sympathy—that left people free to discover what sustainably was best for themselves.

Complexity science provides a fundamentally different policy frame—which we'll call the complexity frame, one in which the role of government is quite different. In the complexity frame, policy is designed to play a supporting role in an evolving ecostructure—it is not designed to control the system. This book is our attempt to introduce you to that complexity policy frame, and to show you how we think the policy debate should be organized when climbing the second, higher peak.

CHANGING FRAMES

This is a short book, and you may wonder how we plan to accomplish such a large goal with such a short book. Our answer is that the issue is one of framing, not of knowledge. Changes in frame do not occur through Talmudic study, but simply by changing the way one looks

at something. So what we try to do in this book is to look at policy choices a little differently. A good way to think of what we are trying to do is to consider figure 1, which is often presented in beginning psychology books. You can look at the image through two different frames: in one you will see two men looking at each other; in the other you will see a vase. Which is it? It's both and neither, simultaneously. The analogy with policy training in universities, in business, and in government is that one is most likely to see the duality of the standard free market and government control policy frame, while being oblivious to other possible frames. Because most social policy makers and policy experts see the picture in the standard frame, the policy debate has missed issues that should have been part of the debate. Training in complexity science changes that; it allows recognition of an alternative policy frame where the government and the market are symbiotic. Doing so opens up a whole new set of avenues to explore.

While a lot of our focus in this book is on economic policy, the implications go far beyond economics. The reason we initially focus

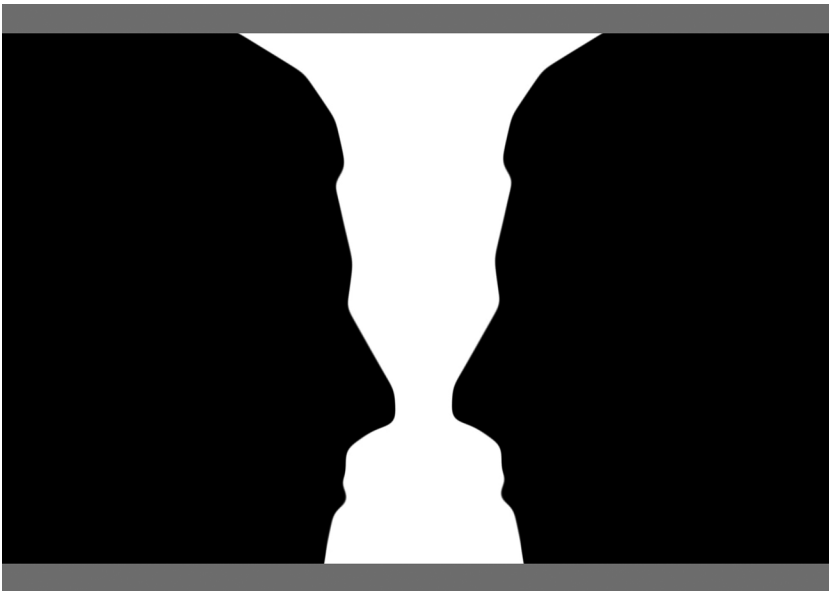


Figure 1. Two silhouette profiles or a white vase? (An optical illusion.)
Source: Brocken Inaglory / Wikimedia Commons.

on economics is that the current “economists’ standard guide” to policy has influenced far more than economics—it has provided the primary frame for thinking in public policy, business, and even individual decisions. In many ways the economists’ standard policy frame has become the one we use in Western society to think about problems. It has become so built in that it is often considered the only rational way to think about policy.

Individuals who think of problems in other, often more creative, ways—language majors, history scholars, humanists, postmodernists, or artists—are discounted or even labeled irrational. We believe that this is a big loss; humanists might not be able to translate their complex insights into the math underlying the standard policy compass, but they have important insights that have been lost to policy. Until those insights are recovered, we will be unable to effectively deal with the intertwined problems of our age.

COMPLEXITY AND INTERCONNECTEDNESS

Why do the recipes on offer for the big questions of our time seem increasingly inadequate? Policies for health care, financial regulation, and climate change all struggle to be effective, notwithstanding lots of smart scientists, politicians, and journalists chipping in. It is not that the solutions are ill thought through, or that the analysis is wrong. It is that we look for solutions through a frame that doesn’t capture the interplay that drives complex systems. The interconnected nature of the problems we are facing doesn’t fit the standard frame’s simplified assumptions. Complexity science came about in an attempt to understand these kinds of highly interconnected systems.

The complexity frame provides a new way to look at problems, and it is already starting to influence policy discussion. Terms and ideas from complexity science, such as tipping point, lock-in, and ecosystem, are sneaking into routine political debates, but they generally are used out of context and sit uneasily within the standard frame. They are add-ons, not central issues; it is now time to consider the complexity policy frame in its entirety.

In some ways, our complexity approach to policy is novel—we don’t know of any book that has framed the policy issues as we

do. But in other ways, it's not; the approach we outline is simply a description of the approach that wise decision makers (economists and others) use. They just don't tell people that it is their approach. What we are attempting to do with the book is to surface the reasoning for this approach and explicitly integrate it into the broader policy discussion.

We debated what to call the approach. We were hesitant to call it a "complexity approach to policy" because the term "complexity" has been overhyped in academic circles and the terminology doesn't always resonate with those unfamiliar with it. People see it as either an ultra-mathematical approach that requires a PhD to understand, or as a statement of the obvious. Reasonable people know things are complex, so what else is new? But after much debate and feedback from our friends, we decided to use the complexity nomenclature, but also to emphasize that we are not claiming that complexity is a whole new way of doing science.

In analyzing a complex system you have to consider the interconnectedness of the parts together with the parts themselves, which implies that in a complex system, the whole is not necessarily equal to the sum of the parts. In technical jargon, that means that dynamics and statics become blended, and the math becomes wickedly difficult. That's why most economists and social science policy makers have shied away from formal complexity models, and instead used noncomplex models in which the dynamics are tractable. While these noncomplex models seem hard to nonmathematicians, they are really simple to mathematicians. They've been designed so that the math becomes doable, by making whatever assumptions are necessary to make the equations tractable. Developing such simplified models makes a lot of sense in a standard frame as long as one remembers that the model is a first, rough approach. The problem arises when one starts basing all one's policy thinking on these oversimplified models, and not on the complex realities lying beyond them. Any policy that requires a focus on the dynamic interdependencies among the parts is simply ruled out. That's what we believe has happened in standard social policy. Like players in a game of Mikado (or pick-up sticks) policy makers have chosen to focus exclusively on those sticks that you can pick up without influencing the others. The problem is that in real-life

social systems, most of the sticks hang together, so you need to find entirely new strategies to deal with clusters of interconnected sticks.

To move from the math to policy you're going to have to simplify, so even if a problem is a complex systems problem, it still might make sense to treat it as noncomplex for the purpose of policy thinking. But in doing so, the model you end up with has to be seen as simply a rough guide, not a policy compass. Policy thinking must go beyond that simple model, and not fall into the trap of believing that the simple model is an accurate guide for reality. Accepting that the problems one is dealing with are technically complex suggests a different policy frame from that generally used by policy makers—a complexity frame. Seeing that frame opens up the policy discussion to a much broader range of policy options.

We'll talk more about complexity science in later chapters, but at this point let's simply sketch out an answer to this question:—How do you decide which frame to use—a complexity frame or a standard frame? There's no single answer to that—the same problem can be framed as either complex or noncomplex. The relevant issue is which frame is more useful for the particular problem at hand. Our general answer is that the more dynamically and tightly interrelated the parts are, the more likely the complexity frame will be the more useful one. Let's consider an example. A tropical forest is a complex system, but a suburban garden is not. The reason is that the former is deeply interconnected, and it is the interconnected links that define it. A tropical forest will likely collapse if you disturb the natural balance too much, while in a suburban garden you can generally safely remove entire flower beds without affecting its overall health or integrity.

The standard way of doing policy considers our social system as a suburban garden. It tills, plants, and cultivates as if the parts are not interrelated. For example, it accepts that people have the tastes they have, and works within that framework. The complexity way of doing policy sees everything as interrelated; tastes are endogenous, and one must consider how tastes are affected by policy, whereas in the standard frame one does not. As we will argue below, that difference alone has an enormous influence on how one conducts policy.

In a complexity frame, it is much harder to have a single objective rationality, putting any “proof” or certainty of the effectiveness of a policy beyond reach. In a complex system, in principle, everything influences everything else. In order to make sensible choices you have to choose boundaries for the problem at hand. This means that policy makers need to necessarily wrap their proposals in a shroud of humility.

Generally, policy isn’t based on cutting-edge techniques—it’s based on highly simplified policy frames. Those simplified frames reflect the required heuristic simplifications necessary to move from science to policy. In the standard social science policy model the dynamic interconnections among agents in the society are suppressed and their importance hidden by the assumptions of the model. In the complexity frame they are not. But that presents a problem—so many interconnections, such limited modeling techniques. There’s no way all the interconnections can be captured in any model. So in the complexity frame one accepts this limitation and treats all frames, even the complexity frame, as to some degree arbitrary.

SEARCHING WHERE THE LIGHT IS

An increasing number of critics are picking up on the problems with the standard frame of economics. This is sometimes accompanied by the conclusion that this frame is incorrect. In our view the problem is not that the standard frame is wrong; all frames are wrong. The problem arises only when the complexity frame is not also considered. You can see the difference in the following story that Dave told while testifying to the U.S. Congress on where economics had gone astray. He explained it by starting with a variant of the “street-light” joke, well known among economists and policy wonks. Here is the modified form: A person is walking home late one night and notices an economist searching under a lamppost for his keys. The person stops to help. After searching a while without luck he asks the economist where he lost his keys. The economist points far off into the dark abyss. The person asks, incredulously, “Then why the heck are you searching here?” To which the economist responds—“This is where the light is.”

Critics of economists like this joke because it nicely captures economic theorists' tendency to be, what critics consider, overly mathematical and technical in their research. Superficially, searching where the light is (letting available analytic technology guide one's technical research) is clearly a stupid strategy; the obvious place to search is where you lost the keys.

Telling old jokes doesn't do much, and in this case the joke was a setup for a different punch line. That punch line is that the critic's lesson taken from the joke is the wrong lesson if the economy is complex. For a complex system, which the social system is, a "searching where the light is" strategy makes good sense. Since the subject matter of social science is highly complex—arguably far more complex than the subject matter of most natural sciences—it is as if the social science policy keys are lost in the equivalent of almost total darkness. The problem is that you have no idea where in the darkness you lost them, so it would be pretty stupid to just go out searching in the dark. The chances of getting totally lost are almost 100 percent. In such a situation, where else but in the light can you reasonably search in a scientific way?

What is stupid, however, is if the scientist thinks he or she is going to find the keys under the lamppost. That's where standard economists, and even complexity economists who think that the complexity frame is going to lead to definitive policy conclusions, are looking. Within the complexity frame searching where the light is makes good sense only if the goal of the search is *not to find the keys*, but rather to understand the topography of the illuminated land. In the complexity frame, scientific models provide a vision for policy, not an answer for policy. So how does one arrive at a policy? By touch, feel, and intuition. You have to use information gained in that lighted topography to help guide you when searching in similar topography in the dark where the keys are lost. In the long run, the knowledge gained in scientific models is extraordinarily helpful in the practical search for the keys out in the dark, but it is helpful only when the topography that people find as they search in the dark matches the topography of the lighted area being studied.

The complexity frame includes all frames as possible frames, including itself. This presents what is known as a Russell Paradox.

How can something include itself as one of the elements of the set? If we were worried about providing definitive policy guidance, this would be a problem. But in the complexity frame it isn't. A basic premise of the complexity frame is that there is no definitive policy guidance. We're simply providing an alternative frame, which recognizes that it is itself incomplete, and part of a higher-level complexity frame also includes other frames. In the higher level complexity frame the best you can hope for is to come close enough. In this book we focus just on giving you a sense of the first-level complexity frame. We are trying to make sure that you will see both the vase and the faces in the picture, and that you will be open to people pointing out other hidden images.

Including the complexity frame is not just a nice addition to the policy menu; it's an absolute necessity. The standard polar set—free market versus government control—has created a Buridan's ass deadlock. One side just cannot understand what the other side is saying. The result is that both the market and the government are losing credibility. This loss of credibility may ultimately seriously erode the ability of society to organize itself, and leaves it vulnerable to people who claim to have easy and convenient answers. The rise of the populist parties in Europe, and of the extremes on the right and the left in the United States, hints at these dangers. The complexity frame offers new ways for policy makers to search for pragmatic answers to our intractable problems. People will still hold different views on politics, but they will have a shared frame to debate more constructively within. As such it can refresh and reinvigorate the policy discussion.

ORGANIZATION OF THE BOOK

The rest of the book develops the above ideas more fully. It is divided into four parts. In this first part we introduce the complexity frame and describe how social policy would be different if it were to be taken seriously. In the second part we survey the history of the relationship among economics, policy, and complexity, explaining how they parted company and how they are once again coming together. In the third part we explore some complexity policies and describe

examples of how the complexity frame might change the policy debate. The fourth part considers what we call the lost agenda. In it we discuss how social science training should change to better integrate a complexity vision into policy thinking, and how policy thinking will change if the complexity frame is adopted.