

Introduction

The conventional ways of thinking in the social sciences, and in economics in particular, offer at best a partial and at worst a misleading view of the how the world operates. In essence, the world is seen as a machine. The machine may be very complicated, but in principle it can be understood completely, and the consequences of using it in various ways can be predicted. A lever pulled here or a button pressed there will have entirely predictable consequences.

The failure of such conventional thinking to explain events can be seen each Christmas. Whether it is Buzz Lightyear or Ninja Turtles, Teletubbies or Cabbage Patch dolls, the level of demand for the toy which becomes the *ne plus ultra* of every child's Christmas stocking almost invariably runs far ahead of the supply. Shops are stripped of all their stocks, and the toy becomes simply unavailable. Firms appear to be congenitally incapable of anticipating the level of sales.

In just the same way, enormous uncertainty and difficulty of prediction appears to be inherent in the film industry. Even the existence of major Hollywood stars and a huge advertising budget is no guarantee of success. In contrast, improbable, low budget movies such as *The Full Monty* and *Anaconda* - the latter being dismissed memorably by a critic as a 'movie about huge snakes devouring a B-grade cast' - occasionally become major successes.

Consumer markets such as those for Christmas toys or films raise serious problems for conventional economic theory. In such theory the tastes and preferences of individuals are fixed, and prices are supposed to adjust in a mechanical way to balance out supply and demand. But in the film or Christmas toy industries, when a new release or product is issued, consumers do not know in advance whether they will like it or loathe it. People have to learn what their own preferences are, and the choice of any individual is influenced powerfully by the opinions and actions of others. Popular toys or films become even more popular precisely because they are popular. Hence the enormous differences seen in revenues between the most and least successful films, and

the spectacular bursts in demand for a single product which occur almost every year at Christmas.

Conventional approaches to the analysis of the economy and of society must be altered fundamentally if we are to make progress in understanding both how world operates, and how we might try to change it for the better. Economies and societies are not machines. They are more like living organisms. Individuals do not act in isolation, but affect each other in complex ways.

The title of the book - *Butterfly Economics* - emphasises this fundamental view of society as a living creature, which adapts and learns. The behaviour of the system as a whole can never be understood by mechanistically adding together its component parts. Just as a living creature is more than the sum of the individual cells which make up its body, so the economy and society is more than the sum of the individuals who inhabit it.

The image of the butterfly also draws upon popular ideas of chaos theory, in which the beating of the wings of a butterfly can in principle cause a tornado on the other side of the globe. The key theme of my book is to take these ideas even further in the practical context of modern economies and societies. These are complex systems which hover on the brink, which live at the edge of chaos.

The butterfly emphasises the non-mechanistic nature of my thinking, yet, paradoxically, the ideas I advance in the book demand the use of far more modern mathematics than is the case in conventional economics, which remains fixated with the maths of nineteenth century engineers. Readers are immediately reassured that the main text of the book consists entirely of words and not equations. But the complex inter-relations between the behaviour of individuals and the overall outcome lead to arguments of subtlety and refinement, which are underpinned by the new maths of the analysis of society.

In the living, constantly changing economic and social worlds, the connection between the sizes of events and the magnitudes of their effects is no longer routine

and mechanical. Small changes often have small consequences, but occasionally these are large, and from time to time dramatic. Equally, large changes sometimes have large effects, but they may also make surprisingly little difference to the eventual outcome.

An important implication of the often blurred, unfocused connection between the sizes of events and the magnitudes of their effects is that predicting what will happen in the immediate future with any degree of accuracy is at best very difficult and sometimes impossible.

Yet in the longer run, there *is* considerable regularity of behaviour. The often unpredictable interactions between individuals lead to a certain kind of self-regulation in the behaviour of the system as a whole. We cannot say exactly where the system will be at any point in time, but we can often set bounds around the areas in which it will move.

The analysis of the economy and society which I advance in this book illuminates a world of paradox and subtlety. The key to a better understanding of many economic and social phenomena lies in a seemingly innocuous observation, already introduced by the examples of Christmas toys and Hollywood. Namely, that the behaviour of an individual can be affected directly by observing the behaviour of others. In other words, people see what others do, and can be influenced by it.

Trivial and obvious though this idea may seem, it leads to situations of great analytical complexity. In contrast, orthodox economics is forced to assume that the tastes and preferences of individuals are completely fixed. For all its apparent sophistication, its machine-oriented maths cannot cope with situations in which these can change according to how others behave. Systems in which individuals copy each other's behaviour require different techniques of analysis - mathematical results only available during the past ten to fifteen years, and the new power of computers to simulate artificially the behaviour of such societies.

The apparently straightforward assumption that individuals live in society and can be influenced directly by the behaviour of others has profound implications for the conduct of public policy. Once we think of the economy and society as a complex, living system, the frequent failures of policy can be readily understood. Systems such as these are inherently extremely difficult to predict and control. This is not merely a point of intellectual interest, but of great practical import. For it implies that much of the control which governments believe they exercise over the economy and society is illusory.

The fundamental difficulties of short-term prediction in complex systems mean that it is not a matter of thinking of cleverer, more sophisticated ways of carrying out forecasts. In the current state of scientific knowledge, it is simply not possible to carry out forecasts which are systematically accurate over a period of time. An individual prediction may prove to be broadly correct, but in a series of such predictions, substantial errors will inevitably be made.

In a world in which the difficulties of short-term prediction are deep and intrinsic, any efforts by governments to intervene and alter the immediate outcome are unlikely to meet with very much success.

Governments of all political persuasions have come to play an ever increasing role in our lives, as they grapple with multifarious problems whose persistence make the classical labours of Hercules look like child's play in comparison. In Britain and America there has been some check to the growth of the public sector in recent years, but the sheer size of government is by historical standards enormous.

The New Deal was bitterly vilified as socialism in the 1930s, but spending by the US Federal government at that time was less than 6 per cent of the overall economy. The state's share of the economy in Britain under Margaret Thatcher was considerably higher than it was under the most openly socialist administration in the country's history, that of Clement Attlee in the late 1940s. But it is not just in terms of spending that government has become bigger - restrictions, regulations and legislative controls of various kinds have grown and grown like Topsy.

Despite this huge growth in government activity, problems stubbornly remain. And the Law of Unintended Consequences often applies to policy actions: their impact either turns out to be the opposite of what is intended, or even if they succeed in their aims, there are unforeseen adverse consequences elsewhere.

This does not mean that governments are powerless, or that the economy and society have no structure at all. Far from it. There *is* regularity and self-organisation of such systems, but not in the conventional ways. Governments should step back and take a wider perspective rather than constantly intervening. In terms of successful policies, less can be more.

Policy makers have been long encouraged to believe in the check list mentality which lies at the heart of conventional economics. Do A, B and C, and the consequence *will* be X. But this offers merely the illusion rather than the reality of control.

We need to change our perceptions of the role and power of governments. Much government intervention is motivated by specific, short-term ends, and depends crucially on the idea that the economy and/or society is a predictable machine. But accurate short-term prediction is at best difficult and at worst impossible. Small changes can have big consequences and vice versa. Policies can also have seemingly perverse effects. With a proper appreciation of how economies and societies work, the role of government is reduced whilst, paradoxically, its powers are increased.

We need to build on principles of thought drawn from biology rather than mechanics to get a better understanding of how the economy and society really work. The image of the butterfly is intended to reflect the softer, less dogmatic approach which is required. Other biological analogies are introduced in chapter 1, which uses the example of the behaviour of an ant colony to describe many of the most important features which we need to understand. In chapter 2, the ideas and concepts are applied directly to illuminate an apparently completely disparate range of problems, from why,

for example, products with inferior technologies can often drive their superior rivals out of business to why financial markets are so dramatically volatile.

In chapter 3, I switch focus away from economics to social questions, and use the theory of interacting agents to examine the problems of crime. Sudden changes can occur which are difficult to relate to changes in overall economic and social conditions. And, in the case of crime for example, there is the paradox that poverty is advanced as a reason for the soaring crime of the 1980s, yet the genuinely poverty stricken 1930s were a period of very low crime rates. Chapter 4 looks at another key social question from the same perspective, namely the dramatic changes over the past thirty years in family structures in the West.

Chapter 5 steps back to look at the current state of economic theory, and offers examples of areas in which it can still be very helpful. But even on its own basis, the most elegant and advanced expressions of free market theory serve only to highlight its inadequacies.

Economic forecasting and attempts to control the economy by changes in taxation, public spending or interest rates remain a key part of government activity in the developed world. But the control which governments believe they have, in their ability both to make reasonably accurate forecasts and to understand the consequences of policy changes designed to alter the outcome, is largely illusory. Chapter 6 shows why this is so, and why the evidence is far more consistent with our complex world of interacting agents than it is with the mechanical world of conventional theory. Chapter 7 looks in a bit more detail at what some economists, particularly those who pop up in the media, think they know about how government policy affects the economy. It explains why they do not actually know this at all, and gives some positive examples of what governments really can do.

There are two striking features of the Western market economies. First, there is slow but steady growth over very long periods of time. Second, there are persistent fluctuations - the booms and recessions of the business cycle - around this long term trend. The phenomena of growth and the business cycle have occupied many of the

best economists for over two hundred years, since the time of Adam Smith, and are absolutely central to our grasp of how the economy behaves. Their importance - both in practice and in theory - is reflected in the fact that a substantial part of the second half of the book, chapters 8 to 12, is devoted to them.

These chapters elucidate and explore the inadequacies of the orthodox approaches to business cycles and growth. But they also offer new theories based upon interacting agents, upon the basic principles of the world seen as a complex, living system, as alternative accounts of these fundamental features of capitalist economies.

Once we accept the idea that the behaviour of individuals can be affected directly by the actions of others, we move into an entirely different world from the conventional one of the social sciences. A wide range of seemingly disparate social and economic phenomena can be explained far more satisfactorily in this way than they can be by conventional thinking. Each one has its own nuances, but they are linked by their general implications. What is needed is a new, organic economics, one with a light touch, one sophisticated enough to allow for interaction - what, for the purposes of this book, I call 'Butterfly Economics'.