



# INET Oxford Highlights

2012—2014

Institute for  
**New Economic Thinking**  
AT THE OXFORD MARTIN SCHOOL



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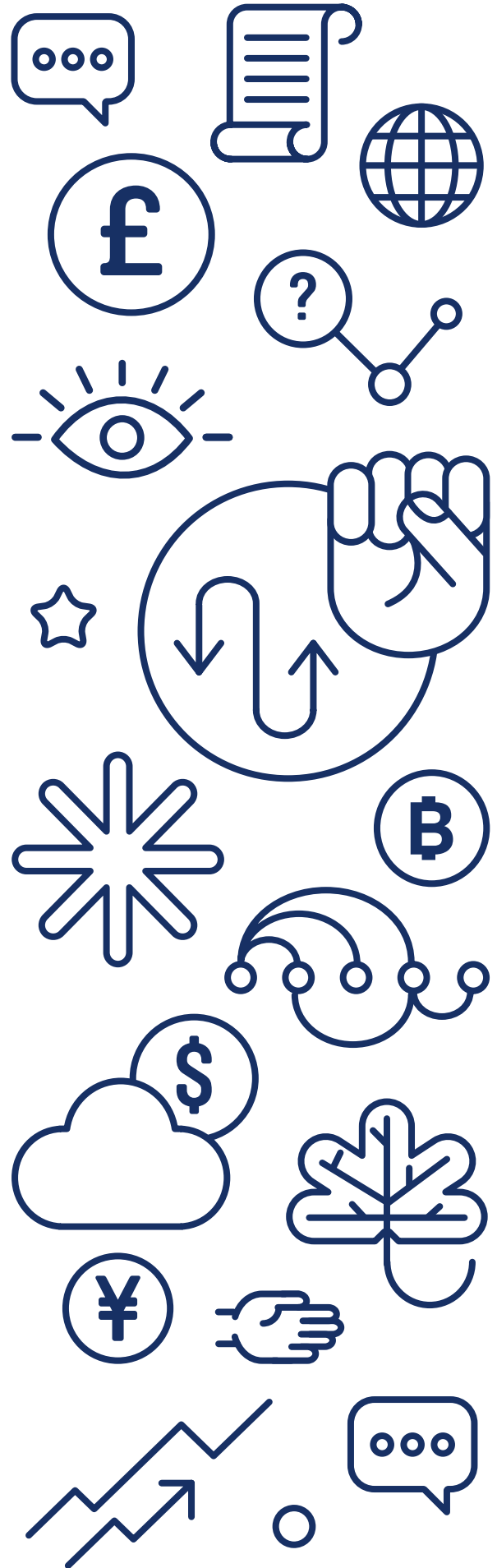
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# Welcome

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*Eric Beinhocker,  
Executive Director,  
INET Oxford*

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*The Institute for New Economic Thinking at the Oxford Martin School (INET Oxford) was founded in May 2012 as a partnership between the University of Oxford and the Institute for New Economic Thinking (INET), a global philanthropic foundation dedicated to broadening and accelerating the development of innovative economic research.*



The vision for that partnership was that INET Oxford would become a major hub of new economics research, drawing on the University's diverse community of leading scholars, and furthering INET's mission of creating new economic knowledge to help address some of the world's most important challenges.

That ambitious vision remains a work in progress, but as we approach our third anniversary I am pleased to report that we are having an impact. As this report details, we have built a team of exceptionally talented scholars who are conducting ground-breaking research on topics of great relevance to public policy and the world more generally. I am very proud that this group has been willing to take risks, question orthodoxies, and be relentless in its pursuit of knowledge that can help us better understand humankind's most complex system — the economy.

I am also proud of the group of post-doctoral scholars and students that our faculty have mentored and developed. They will be one of the Institute's most important legacies as they continue to push the field in new directions and take up leadership positions of their own. We are also fortunate to have a highly capable administrative staff who ensure that our fast growing organisation runs smoothly.

We have benefited enormously from the active support of colleagues from across the University, notably the Social Sciences Division and the heads of our partner schools, departments, and colleges. We have also built a strong global network of collaborators, and are working with over 50 institutions around the world.

Finally, it is important to thank our funders, without whose support this work would not be possible. In addition to our core grant from INET, we are grateful to have support for our programmes from the Open Society Foundations, Resolution Foundation, European Commission, Economic and Social Research Council (ESRC), Engineering and Physical Sciences Research Council (EPSRC), US Department of Energy, US National Science Foundation (NSF), Rockefeller Foundation, James Martin 21st Century Foundation, the Nuffield Foundation, Saïd Business School Foundation, the Ocean Conservancy, the Bill and Melinda Gates Foundation, and the generosity of Dr Otto Poon and the Nick and Leslie Hanauer Foundation.



## Why we need new economic thinking

*In the wake of the 2008 global financial crisis, and with society facing challenges ranging from growing economic inequality to the threat of climate change, we need new insights into how the economy works and how it might be made to work better.*

For much of the 20th century economics was dominated by ideas that humans are perfectly rational, markets are perfectly efficient, and institutions are optimally designed. The orthodox view also said that market economies tend to self-correct, finding an equilibrium that delivers full employment and the best social outcome.



“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.”  
*John Maynard Keynes*

New economic thinking takes a more realistic view that embraces the messy reality of the economy. It sees the economy as a dynamic, complex, evolving, network of interacting individuals and institutions who don't always behave rationally and have limited information, but nonetheless learn, are innovative, and evolve over time. In the real world, economies may sometimes self-correct, but they may also be prone to instabilities, or become trapped in dysfunctional states. The economy has more in common with complex systems such as biological ecosystems, the brain, or the

internet, than it does with the mechanistic models used in much orthodox economic theory.

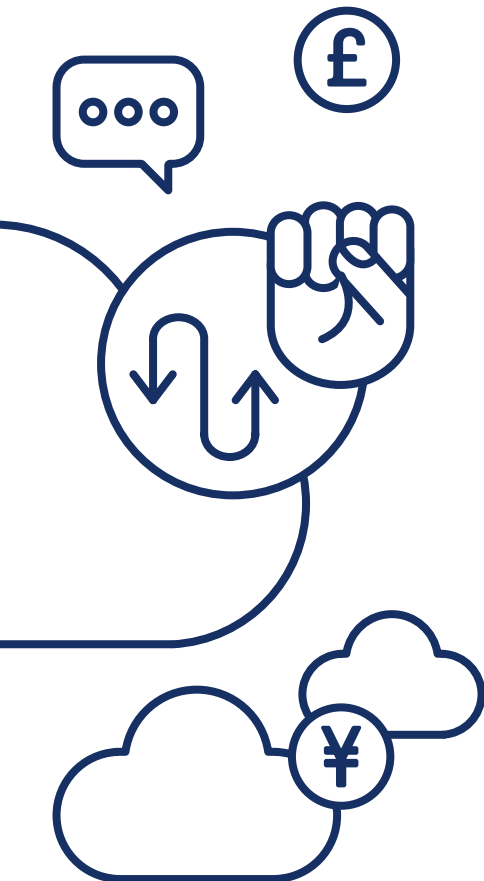
Understanding the economy in this way requires economics to break out of its disciplinary silo and embrace new tools from a range of fields including computer science, physics, mathematics, biology, ecology, psychology, sociology, anthropology, political science, and philosophy. It requires both quantitative and non-quantitative analyses, a deep appreciation of economic history, and a strong orientation towards data to re-ground economics as an empirical science.

A more realistic and empirically based understanding of the economy could have a broad and positive impact on society by helping leaders in government, business, and the social sector make better decisions on a host of critical issues. These issues range from financial system reform, to policies to spur growth and innovation, initiatives to address rising inequality, policies to address climate change and other environmental issues, and efforts to reduce poverty and encourage economic development.

We also believe it is essential to change the way students are taught economics to ensure that the next generation of leaders is equipped with the most effective intellectual tools possible for the challenges they will face.



“We cannot solve problems by using the same kind of thinking we used when we created them.”  
*Albert Einstein*







# The Institute

The Institute for New Economic Thinking at the Oxford Martin School (INET Oxford) is a multidisciplinary research institute dedicated to applying leading-edge thinking from the social and physical sciences to global economic challenges.

Our aim is to stimulate innovation and debate in economics, support visionary research, and redefine the education of the next generation of economists and leaders in business and government.

The Institute is a part of the University's Oxford Martin School, which is a community of over 200 scholars working on issues related to the major challenges of the 21st century.

The Institute is funded by and affiliated with the Institute for New Economic Thinking (INET), a New York based philanthropic foundation dedicated to fostering innovative economic research.

INET Oxford, headed by Executive Director Eric Beinhocker, is organised into six research programmes, each led by a senior academic director or co-directors. INET Oxford's faculty, fellows, and students includes over 70 affiliated scholars from across the University.

The Institute conducts research on fundamental issues in economics ranging from new theoretical and empirical methodologies, to exploring the moral foundations of the economy. INET Oxford uses a range of leading-edge tools and techniques in its work including: behavioural economics, experimental economics, advanced econometrics, reflexivity, network theory, complex systems theory, agent-based modelling, and "Big Data" methods.

Institute researchers also work closely with policymakers and leaders in business and civil society to bring new economic ideas into debates and practice.



## Research themes

*INET Oxford's research is focused on eight major thematic areas and the Institute's scholars are working on a variety of projects within each theme.*



### Financial System Stability

INET was founded in the aftermath of the 2008 financial crisis in the belief that new economic ideas were needed to help create a financial system that is less prone to crises, more resilient to shocks, and that better supports societal objectives of inclusive economic growth. INET Oxford has several major projects contributing to this agenda. The Economic Modelling team has pioneered advanced econometric techniques to better detect structural breaks in the economy and better forecast economic performance. The Complexity Economics group is a member of two major European Commission projects: Project CRISIS, a consortium of eleven institutions working with central banks and other policymakers on developing a large-scale agent-based model of the interlinked macroeconomy and financial system; and the Forecasting of Financial Crises (FOC) project which has developed new tools to provide an early warning of future crises. In addition, INET Oxford researchers are working on understanding risks in the interbank network and from high-frequency trading.



### Economic Inequality

The decades since the 1980s have seen sharply rising income and wealth inequality in a number of developed countries, notably the US and the UK. The rise is particularly marked at the top of the income distribution, and there is little sign that this has been reversed and indeed may have been accelerated by the 2008 crisis. Many countries have also experienced a stagnation in middle-class income growth and a decline in social mobility. INET Oxford researchers are playing a leading role collecting and analysing data on income and wealth inequality from around the world, and exploring the causes of this shift. Our scholars are also investigating the links between trends in inequality and different modes of economic growth, technology, globalisation, labour market arrangements, the financial system, and public policies.



### Economic Growth and Innovation

Standard economic models view growth as an aggregate phenomenon and leave the major driver of growth – the advancement of human knowledge – largely unexplained. INET Oxford is leading several projects that are attempting to develop a bottom-up theory of growth that is empirically valid and has a truly endogenous view of innovation. At the core of the work is the idea that the economy is a constantly evolving network of technologies that makes possible networks of productive capabilities, that in turn enable the creation of products and services. It is the evolution of these networks, and the search for new combinations of technologies, capabilities, and products in enormous combinatorial spaces of possibility, that drives economic growth. Our research is also examining the implications of this “bottom-up” view for policies for growth and innovation, as well as implications for inequality and sustainability.





## Economics of Sustainability

The world needs a new model of economic growth that enables humanity to prosper within planetary boundaries. The current model of growth, with its origins in the Industrial Revolution, produced a massive increase in human wealth and well-being during the 19th and 20th centuries. But in the early 21st century it has become increasingly clear that this model is environmentally unsustainable, insufficiently equitable, and inadequately robust. The goal of INET Oxford's research on sustainability is to develop insights that can help lead us to a new economic model that enables humankind to prosper within the "safe operating space" of our planet's physical and ecological systems.



## Risk and Resilience

Issues ranging from the 2008 financial crisis, to the impact of the Fukushima nuclear disaster on global supply chains, to climate change, highlight that our understanding of risk is often insufficient and our tools for measuring and managing risk are often inadequate. INET Oxford researchers are bringing a cross-disciplinary perspective to these issues. Economists, mathematicians, physicists, engineers, biologists, and psychologists are collaborating to develop new tools that can better inform decision-making by both policymakers and business leaders. As risk cannot always be predicted or managed, INET Oxford is also researching the properties that make systems resilient and applying those insights to a variety of economic, social, and policy issues.



## Ethics and Economics

The global financial crisis and its impacts have raised important questions about the role of ethics in economic thinking and the responsibilities that a market capitalist system has in relation to wider social and political concerns. In particular the programme is examining how the culture and value systems of financial institutions changed in the years leading up to the crisis, and what practically might be done to rebuild trust and encourage stronger and more ethically based standards of behaviour in financial and economic activity.



## Foundations of Economics

The advent of inexpensive high-speed computing, the explosion of data made available by the web, and methodological advances in other fields have opened up economics to an array of new tools and methods. INET Oxford is working on methodological advances including computerised automatic model selection that can detect and model multiple structural breaks in time series, and novel methods of modelling nested, multiple-level networks which are a common feature of many economic systems. Members of the group are also leaders in the use of agent-based modelling. INET Oxford researchers are experimenting with evolutionary models of economic growth, machine learning on large 'Big Data' sets, and collaborating with experimental economists to incorporate behavioural heuristics derived from laboratory experiments into economic models. Finally, members of the Institute are also exploring the philosophical foundations of economics, notably understanding the economy as a reflexive system and exploring its implications for the epistemology and ontology of economics.



## Economic Curriculum Development

The curriculum development project was created by the INET foundation in New York in response to widespread discontent among students, employers and university instructors with the traditional economics curriculum. The Curriculum Open-access Resources in Economics (CORE) project, based at INET Oxford, is a new approach to economics teaching for undergraduates that addresses three gaps: the gap between what economists know and what we teach to undergraduates; the gap between the questions economists are being pressed to answer by the public and the often-unrelated content of the curriculum; and the gap between conventional text-and-lecture methods and available low-cost, individualised, and interactive learning technologies.

## Spotlight on Research

### *Unknown unknowns in macroeconomics*

Economies are complex and do surprising things. They lurch unexpectedly into stubborn recessions, and then just as surprisingly recover and grow stably for many years. Economists turn to mathematics to try to model and understand these behaviours, to make economic predictions or to gain insight into the likely consequences of different policies. The general approach is to build simplified models in which individuals and firms make decisions in response to economic conditions, for example, deciding how much to save or invest; these decisions then determine what the economy does next.

Today's state of the art macroeconomic models – Dynamics Stochastic General Equilibrium Models, or DSGE for short – accept that the world is uncertain, and that we all have to make decisions with limited information, never knowing what the future will bring. To capture this reality, economists include a random or stochastic element in their models by assuming that economies get hit now and then with random shocks, such as the invention of new technologies.

But there is a deep problem lingering in the core of these models, according to INET Oxford economists David Hendry and Grayham Mizon. The way economists have included the unpredictable in their models vastly oversimplifies the unpredictability of the real world. Unfortunately, this gives macroeconomists misplaced certainty in their models, even as it makes these models ineffective just when they're needed most – during sudden and unforeseen economic crises.

The trouble, Hendry and Mizon argue, is that economists have included randomness in the simplest way, supposing that economies get hit by shocks which can be modelled as random selections from a known set of possibilities. It's the mathematical generalization of flipping a coin. This approach implicitly assumes that the economic environment is fixed, and that the kinds of shocks likely next year or five years from now will be precisely the same as those likely today.

Without this assumption – known technically as 'stationarity' – one has to face up to the fact that totally unanticipated events can and will occur, bringing with them unpredicted shifts of the distributions of economic variables (see Figure 1). That's more complicated, but also more realistic.

In 2014, Hendry and Mizon argued that this simple observation has dramatic consequences for the standard macroeconomic forecasting models used by governments around the world. Since the so-called "rational expectations" movement of the 1970s, economists have aimed to build their models to be "structurally stable", meaning that they would depend only on "deep structural" assumptions about human behaviour, assumptions that would remain valid even through a shift in economic policy. Yet non-stationarity means that no DSGE model can possibly live up to this standard. However useful they may be before such a shift, they'll be misleading afterwards, when the economic world has changed fundamentally.

And such fundamental shifts are not at all unusual. Over the past 150 years, the UK economy experienced at least four major shifts illustrated by unemployment rates in Figure 2: a business-cycle era between 1860 and 1914 gave way to a period of much higher unemployment after World War I and up to 1939, then a third, low-unemployment period after World War II and until 1979, followed by a more turbulent period ever since, with much higher and more persistent unemployment. In between there were many smaller shifts. It seems unlikely, Hendry and Mizon suggest, that economic agents will be any more successful than professional economists in foreseeing when breaks will occur. Hence, economists need to find better ways to include authentic uncertainty and the human response to it into their theories, bringing into the centre of economics the "unknown unknowns", or what economists call "Knightian Uncertainty", that make our world so rich and surprising. The resulting theories won't be so tidy and certain, but they might be a lot more useful.

Figure 1. A structural shift

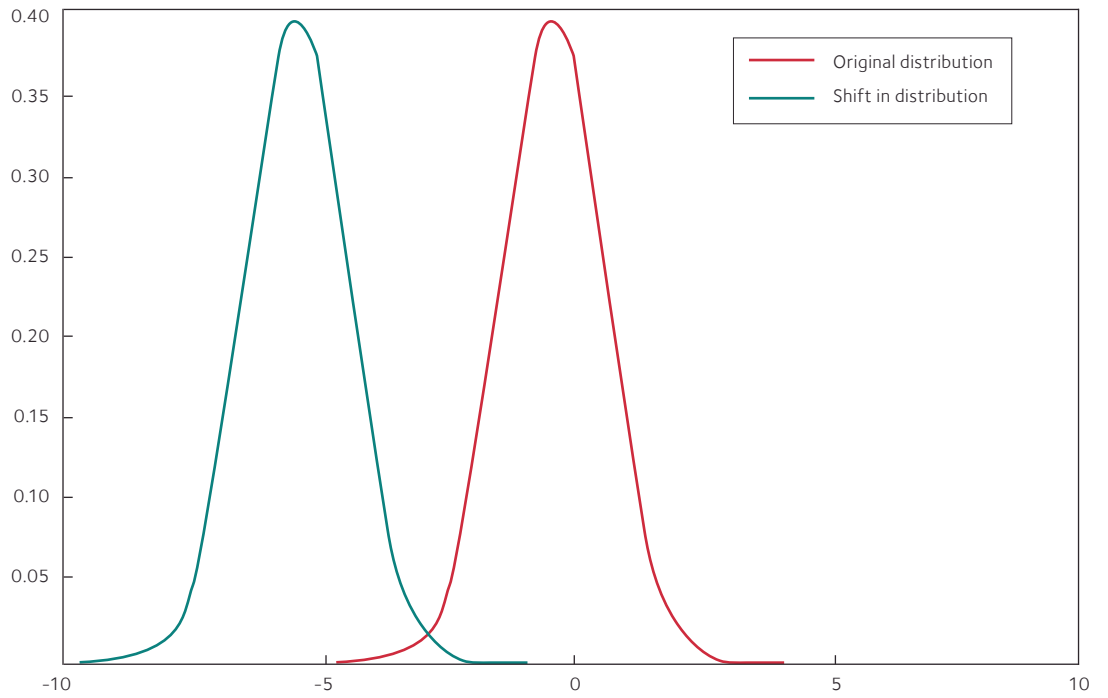
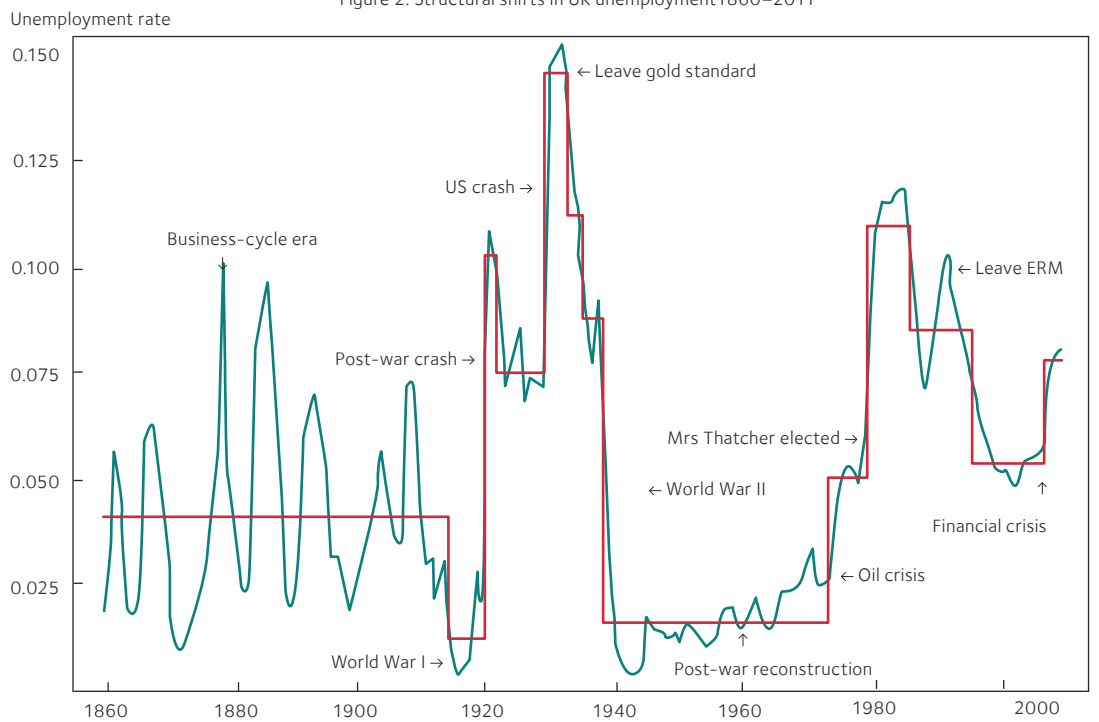


Figure 2. Structural shifts in UK unemployment 1860–2011



## Spotlight on Research

### *Taming the leverage cycle*

Credit is the lubricant of any modern economy. People borrow to buy houses and other goods, and companies borrow to invest in growing their businesses. In good economic times, financial institutions borrow to amplify or “leverage” the returns on their investments. Prior to the 2008 financial crisis, the big investment banks were leveraged more than 30-to-1. Many market experts see the recession of the past six years as a direct consequence of slow de-leveraging, as financial institutions, businesses, and individuals pay down the debt overhang from the credit explosion that preceded it.

Economists have long studied these waves of rising and falling leverage – the leverage cycle, (see Figure 3). They understand roughly how and why it happens, yet have lacked methods for probing the dynamics of the cycle more closely. Are these cycles inevitable? What determines their character? Might they be minimised with better financial and economic policy?

INET Oxford’s Doyne Farmer is pioneering research that brings the best of traditional economic knowledge about the leverage cycle together with new methods for modelling inspired by the natural sciences. The research suggests that some of the finer details of how banks adjust their leverage in the face of perceived risks crucially determines how the leverage cycle works. Intuitive and seemingly sensible regulations might actually make it worse; well-designed but less intuitive regulations might help control it.

The models being developed – known as “agent-based” models – exploit the power of modern computation to study the complex interactions between diverse market participants. The idea is to create a virtual market with artificially intelligent agents who trade and interact and compete with one another much as participants in a real market do. The models then explore the overall market behaviour that emerges from these interactions, as individuals, banks, hedge

funds and other players, even regulators, respond to one another.

Several years ago, in exploratory work, Farmer and colleagues developed a model that revealed how ordinary competition between financial firms can quite easily lead to an arms race into higher leverage, eventually producing financial collapse. In the model, hedge funds competed with one another to earn good returns so as to attract investors. Over time, firms had an incentive to use ever higher leverage, as this was an easy and direct way to get an edge. Simulations showed that high leverage eventually pushed the market across a hidden threshold of instability, after which a financial crash became certain. Leverage then falls, and the cycle repeats.

More recently, Farmer and Christoph Aymanns, a doctoral student affiliated with INET Oxford, have studied how various regulatory policies might help to control the leverage cycle. A key element driving the cycle, as their early model confirmed, is the nature of the rules that force banks and other firms to change their leverage in response to evolving market risks. So they tested how their model worked under different rules. These rules allowed them to address three important cases: In one case – akin to the Basel II rules in place before the financial crisis – banks were required to reduce their leverage whenever markets become more volatile. In another case banks were allowed higher leverage in more volatile markets, while restricting it under calmer conditions. In the third case, banks were required to hold roughly constant leverage throughout.

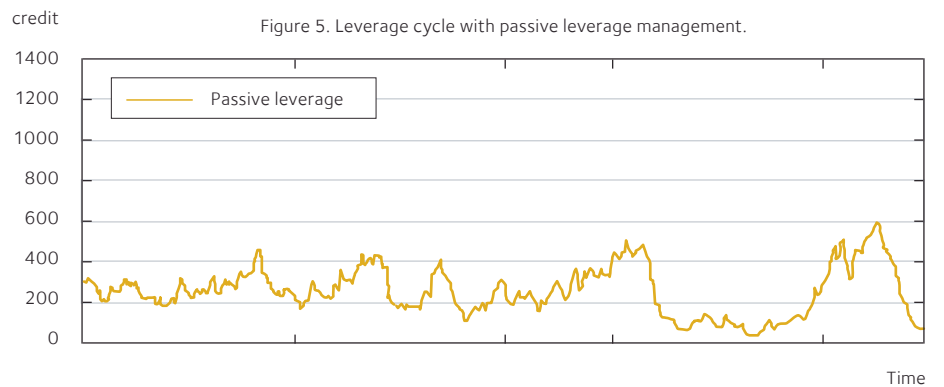
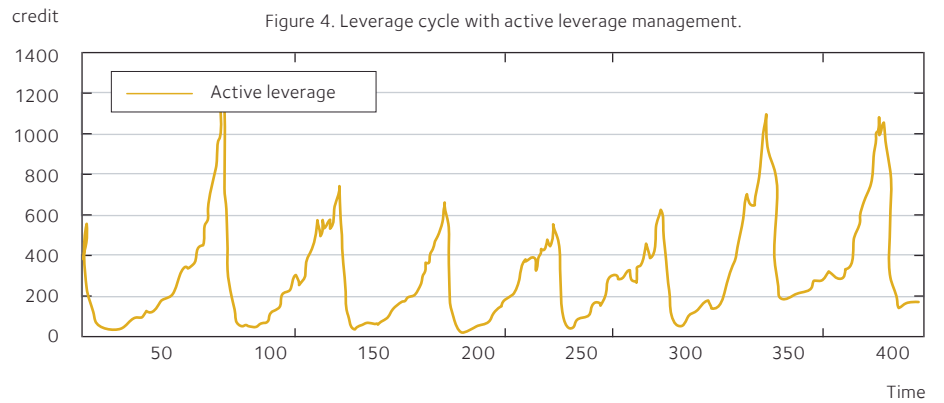
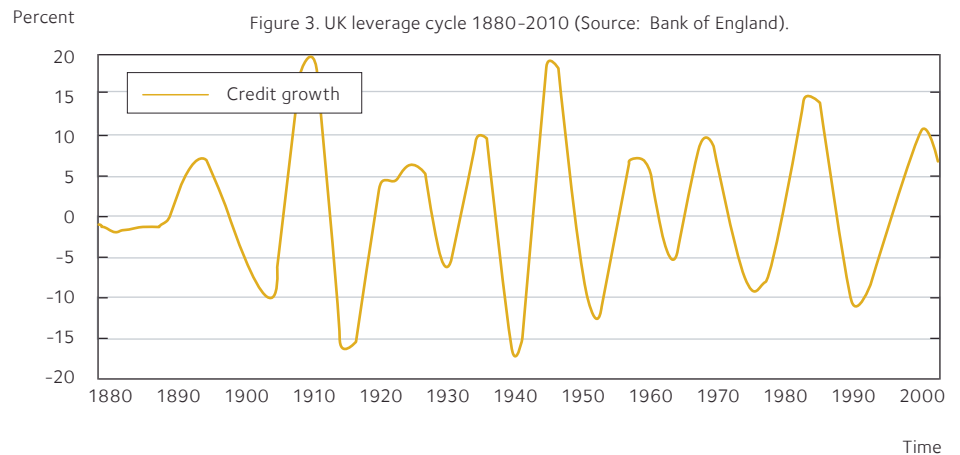
They found that a strong leverage cycle always emerged under the Basel II style regulations, which naturally seem to stir up boom and bust cycles, (see Figure 4). The attempt to “actively” manage leverage is counter-productive. Also the opposite case, in which banks were allowed higher leverage in more volatile markets, while restricting it under



calmer conditions, did not resolve the instabilities fully. In order to assess the different rules they compared the trade-off between bank leverage and risk of financial crises.

Surprisingly, under this measure, the most desirable leverage rule corresponded to the “passive” case where banks would hold their leverage roughly constant throughout (Figure 5).

As Farmer and his colleagues readily admit, these models need a lot more development and testing. And perhaps no system of rules or regulations will ever eliminate leverage cycles in general. But this kind of work makes it possible to test the possible consequences of new regulations in more detail than ever before.



## Spotlight on Research

### *The evolution of technological innovation*

Economists have long believed that advancing technology is the ultimate engine of economic growth and improvement in human societies. New technologies emerge sometimes from the discovery of completely new phenomena, in science, for example, but also arise from perpetual tinkering and the recombination of older technologies into new inventions. In this, technological change looks rather like biological evolution – a process that explores a space of possibilities through combinatorial rearrangement.

That idea has been common in studies of technology for several decades. Yet it has mostly remained qualitative and anecdotal, lacking any hard backing by data. Now a team of INET Oxford researchers led by Doyne Farmer and Hyejin Youn along with a number of collaborators have used patent data on technology going back 200 years to show that the analogy makes mathematical sense as well.

The United States Patent and Trademark Office (USPTO) defines inventions as bundles of technological capabilities, and labels every patent with a set of “technology codes” describing the collection of technological capabilities it employs. The record of patents and codes reveals some interesting trends. In the 19th century, as Youn et al. point out, nearly half of all patents were single-code inventions; this proportion then steadily decreased over the 20th century, and currently stands at only about 12%. As time passes, single technology inventions have become less common, while combinatorial invention has become the norm (see Figure 6).

The shift to combinatorial innovation shows up as well in the comparative growth of the total number of patents, distinct codes, and combinations of codes through time. Starting in 1790, all three of these variables grew exponentially for the first 80 years, during a period when most new

inventions involved a new technology. Things abruptly changed around 1870, when growth in the number of distinct technology codes slowed, falling behind the number of patents and number of new combinations.

After 1870, in other words, the nature of invention changed – the basic technologies of the industrial revolution had been invented – but people turned out new inventions just as quickly as before by putting existing technologies together in novel ways. Since then the process of invention has been driven almost entirely by combining existing technologies. This transition is possibly due to the power of combinatorial processes: once the number of available “letters” (technological capabilities) is large enough that they can be combined into a near-infinite number of new “words” and “sentences” (i.e. new technologies).

Although the nature of invention transformed into the combinatorial era, invention seems to have conformed to a fairly regular law expressing a balance between exploitation of existing ideas and exploration for new ones. Consistently, over the past two centuries, roughly 40% of inventions have reused a previously existing combination of technologies, while 60% have introduced a totally new combination of technologies.

Even so, Youn and colleagues found that the invention process has been more creative in some periods than in others. Using the technology codes, they could calculate the fraction of inventions in any period that put together widely different technologies, and compare this to those mingling technologies only from a limited domain. You might call the former “broad” inventions, and the latter “narrow” inventions. Before about 1930, the data show, roughly half of all new inventions were “broad” combinations, but this abruptly

increased to 70% in the decades following WWII, widely described as a particularly innovative period for the US economy. Then, starting around 1970, the proportion of broad technological combinations again fell to around 50%.

The number of patents, number of technology codes, and combinations of technology codes, grow as inventions accumulate in the system. Figure 6 shows the increase in these quantities over time. Figure 7 shows their increase as functions of the number of patents. The red solid line is a linear fit with C (combinations). Because the number of patents increases approximately exponentially in time, the gaps between year marks get shorter and shorter as one moves to the right of Figure 7.

All in all, this analysis shows that the introduction of new technological functionalities plays a minimal role in fuelling invention, at least once the innovation process has become mature. It's tinkering, modification, and rearrangement that are most important in pushing invention forward. Discoveries rarely spring forth as true novelties, but result from putting together familiar things in new ways.

The invention of the smartphone, which combined existing computer, telecommunications, GPS, camera, and software capabilities into a new architecture is a good example.

Figure 6.

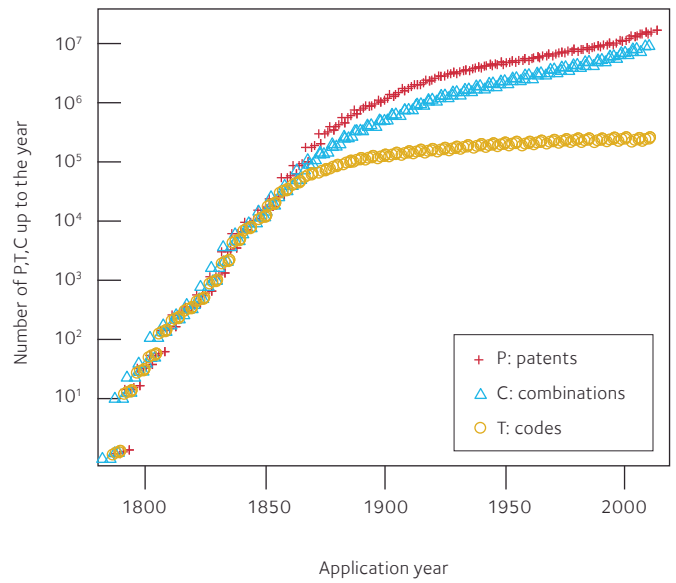
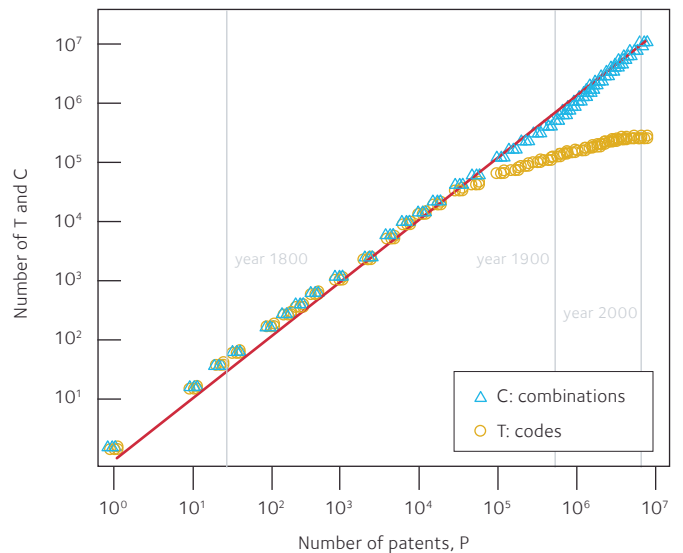


Figure 7.



## Spotlight on Research

### *How labour flows*

Governments around the world work to encourage economic activity and to create sufficient employment for their people. They battle to help the unemployed find new jobs, and to design economic policies that grow businesses. Business economists have a few observations – it seems that smaller businesses, for example, tend to have more growth potential than do larger ones – but policy making to encourage job growth includes a lot of guesswork.

Researchers from INET Oxford are trying to help by bringing new kinds of data and analysis to bear. Over the past 15 years, the science of complex networks has advanced rapidly, transforming the way we understand and study everything from the internet to ecological food webs. When it comes to the economics of labour, early work by Omar Guerrero of INET Oxford and Robert Axtell of George Mason University and a Visiting Professor at INET Oxford suggests that the network approach has a lot to offer here as well, by building a much more detailed picture of how labour flows between companies.

Economists studying labour flows have traditionally tried to stay above the level of individual companies, thinking instead about flows from the overall pool of unemployed into the set of available jobs in a nation. In contrast, Guerrero and Axtell exploit detailed data from Finland on the movements of individual employees between some 230,000 companies from 2005 thru 2008.

This data can be used to construct an abstract network – a set of points or nodes connected by links – showing how people move between firms. In the network, the nodes are firms, and any two firms are linked if at least one employee has worked at both. The strength of the links reflects the total flow of labour between the two firms in either direction. Looking at labour movements this way, Guerrero and Axtell found a number of interesting features never considered in earlier studies.

To begin with, this labour flow network has a highly concentrated character, which it shares with many other complex networks. Studies show, for example, that a few airports in the air transport network act as dominant hubs, linking up with far more airports than do most others; also, far more traffic flows along some links – New York to London, for example – than flows between most others. A similar pattern holds for the labour flow network, where a small number of firms act as hubs, and a small number of pairs of firms dominate the overall flow of individuals within the network.

The researchers also found that the labour flow network has what scientists call a “core-periphery” structure. A cluster of large, well connected firms forms a central core of the network, with the majority of smaller firms forming a less connected periphery, only linking into the core through one contact. This structure, Guerrero and Axtell suggest, has important implications for the job-finding prospects of individuals. Those leaving core firms will generally find it easier to locate new employment, whereas individuals leaving firms in the periphery will struggle because of the poor connectivity of their former company.

Guerrero and Axtell also used this network picture to examine which firms tend to create new employment. One common idea in the business literature holds that small businesses are responsible for most employment creation, and the labour flow network supports this idea. Yet it also shows that firms tend to grow faster if they’re linked intimately into a community of other firms. The analysis also shows that only 30% of all firms in the network were responsible for a full 90% of employment growth.

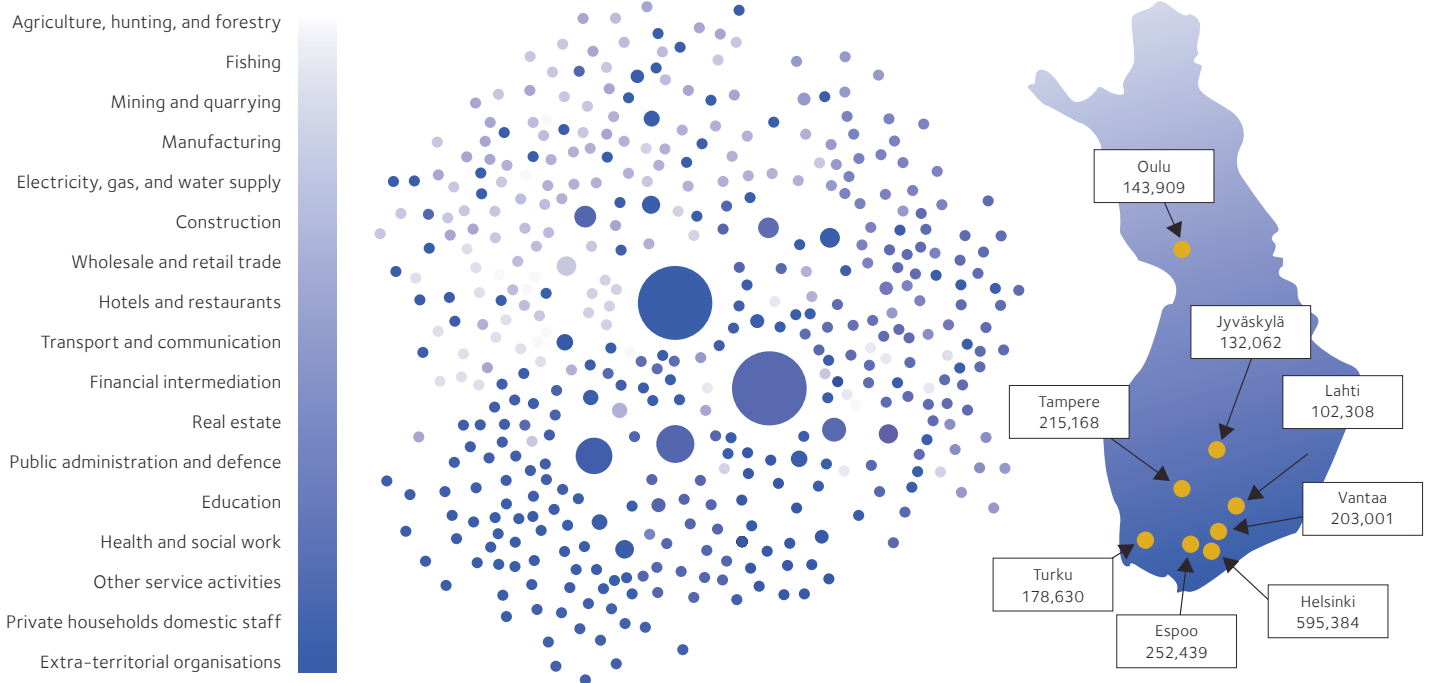
Future work will test if these basic patterns in Finland hold in other nations as well. If so, the network perspective may offer a fruitful complement to traditional studies of labour growth, and may help policy makers focus their initiatives on the most promising targets.



Figure 8. Industrial communities



Figure 9. Geographic communities



Figures 8 and 9 provide a visual example of clusters in a reduced version of the labour flow network. The nodes represent industrial/geographical sectors as defined by the three-digit classifications from Statistics Finland.

In Figure 9 we provide information about the population of the eight largest cities in the country in order to illustrate the high concentration in southern districts. For both figures the colour gradient corresponds to two-digit classifications. Their networks are laid out by the Force Atlas algorithm, which groups nodes according to the strength of their ties.

## Spotlight on Research

### *Income inequality through time*

Over the past 30 years, the income gap between rich and poor has grown dramatically in many developed countries, especially in the US and UK. The issue gained prominence in 2014 following the publication of the best seller, *Capital in the 21st Century*, by French economist Thomas Piketty. Piketty hit a global nerve, arguing that data over a century show that the share of income going to the top, at relatively low levels between 1930 and 1970, has again risen back to levels comparable to the 1920s. (illustrated in Figure 10).

In 2013, INET Oxford economist Tony Atkinson, along with Piketty and other economists, offered a concise review of the broad forces behind this trend. The data, they show, indicate that the past 30 years marked a significant turning point in economic history – and that we should probably expect even higher levels of inequality unless prevailing economic policies and structures change.

One way to track the level of economic inequality through time is to follow the share of a nation's income that is going to the top 1% of incomes. In the US, Atkinson and colleagues show the 1% held roughly 15% of the total in 1940, about the same as in 1920. Income then became significantly less concentrated over the period between the start of World War II through the 1960s. Since then, it has again grown dramatically, especially from 1980 on, with the top 1% today again holding as much as they did in 1920. The financial crisis hasn't done anything to change that underlying trend, interrupting it only briefly.

A similar pattern holds over this period in the other Anglo-Saxon countries – Australia, Canada, and the UK. Strikingly, however, this pattern is not seen in many nations of continental Europe or Japan, where the top 1%'s share of total income is no larger than it was in the late 1940s.

Why is there such a marked difference between these high-income countries with economies built around similar

technologies and methods of production? Atkinson and colleagues argue it is due to different institutions and policies, and see several contributing factors.

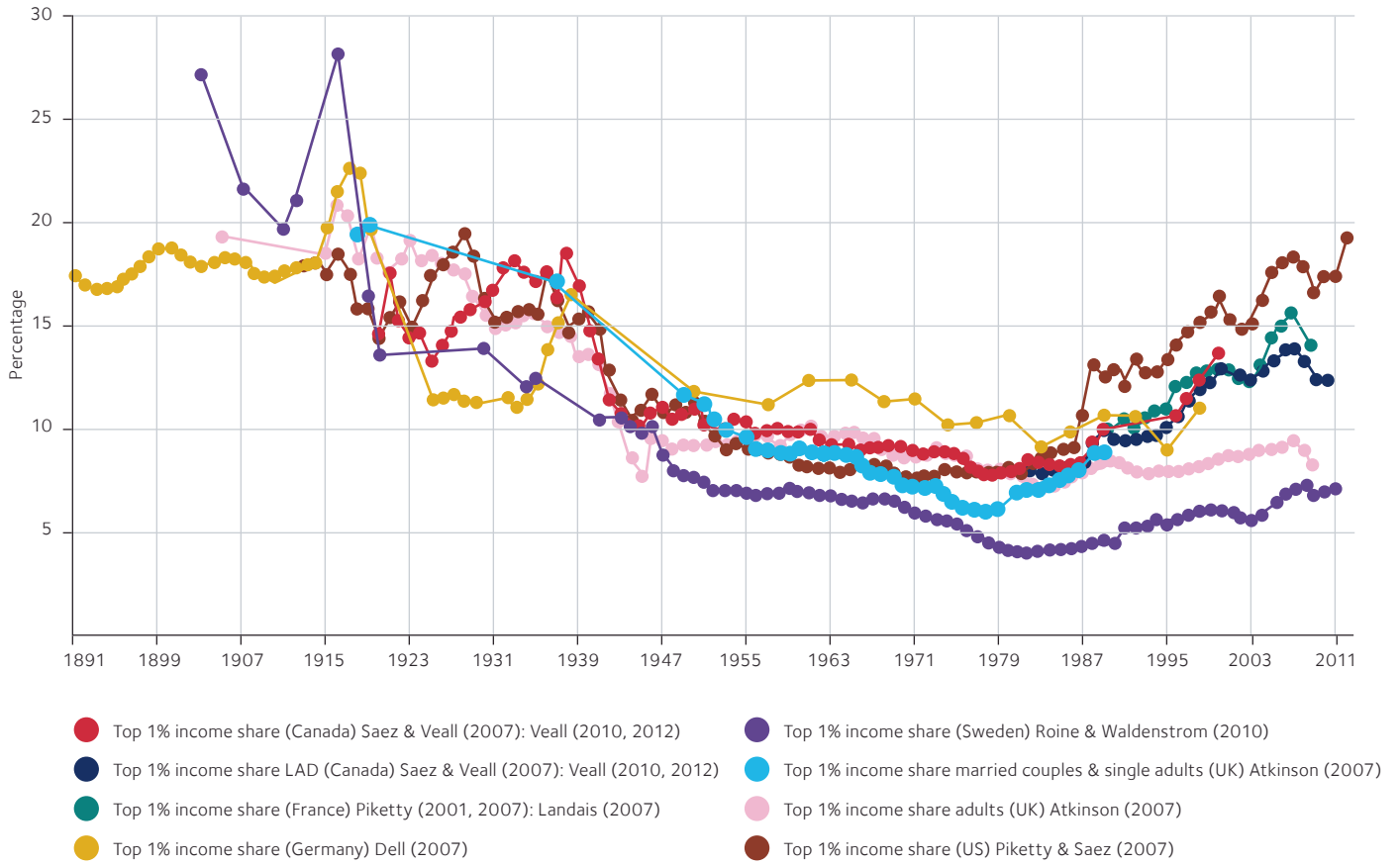
The first is tax policy. As they note, top tax rates in Anglo-Saxon nations, as well as in France and Germany, went up between 1930 and 1970, before falling more recently. Tax rates follow a curve that is virtually a mirror image of the income share going to the 1%. Moreover, they suggest, the political movements behind these tax cuts also brought about broad deregulation of the high-income financial services sector, while spreading a new culture in which vastly higher pay was seen as acceptable.

A second factor driving widening inequality, Atkinson and colleagues suggest, was changes in business which increased the bargaining power of high-income employees and encouraged managers to achieve higher personal incomes through stock options. The spectacular rise in CEO pay in the US and UK over this period is at least consistent with this view.

The third important factor appears to be a shifting balance between wage income and capital income, and the increasing power of accrued wealth to generate still more wealth. As they note, the level of privately held wealth in Europe was around six times the national income in 1910, and then fell to half that after the world wars. Since then it has again risen sharply back to more than five times national income. A similar change, though not quite as dramatic, has taken place in the US. This suggests that the power of capital wealth to generate more income and wealth has become ever more influential in the economy, leaving wage earners behind.

INET Oxford's Employment, Equity and Growth programme, led by Brian Nolan, is delving more deeply into these trends and looking at responses that could help create a more inclusive model of economic growth.

Figure 10. Top income shares 1891–2012. Source: The World Top Incomes Database



## Spotlight on Research

### *Mis-measuring our wealth*

Economics aims to teach us how best to create and maintain wealth so as to further human well-being. You would hope that by now we'd have a way to measure wealth accurately, so we could know if we're succeeding, or instead ought to be trying to change our ways. Unfortunately, our actual measures of wealth remain surprisingly, even shockingly, primitive.

For more than 50 years, the focus of economic policy has been upon Gross Domestic Product (GDP) – the monetary value of all the goods and services a nation produces in a single year. It's the measuring stick that economists, governments, and the media habitually turn to when judging the health of any economy. But the focus on the flow of GDP has diverted attention from the more important stock of wealth which goes far beyond the activities reflected in GDP. Sensibly, it ought to include everything from the total stock of physical buildings and machinery to the level of skills and education of the people, from financial assets to minerals and fuels, not to mention clean water and air and healthy ecosystems.

INET Oxford's Cameron Hepburn and colleagues are among a group of economists and scientists now trying to develop more accurate measures that go beyond GDP and give a more complete accounting of total wealth.

After all, the consequences of mistaking GDP for real wealth can be perverse. A destructive event – polluting a river, for example, and partially cleaning it up – might be counted as being actually good, as it boosts production and consumption. Thinking of GDP alone might encourage politicians or policy-makers to deplete valuable natural resources, such as minerals or fossil fuels, for short-term gains, even though this diminishes the long-term prospects of the country and its people.

Economists estimate that today's most comprehensive wealth measures – following the UN System of National Accounts (SNA), which has been in place since 1947 – still only measure a small fraction of the real wealth that supports human well-being. The SNA includes physical and intellectual property, financial assets and the commercial value of natural resources, but it doesn't attempt to include human or social/institutional capital, or the non-commercial value of natural resources.

Doing better means finding ways to count the value of the natural recycling of wastes, or of the maintenance of soil integrity by normal ecosystem processes. It means finding ways to measure and quantify the depletion of natural capital – through the extraction of exhaustible resources such as minerals or fossil fuels – or the destruction of renewable resources such as fisheries or forests. Including these other stores of wealth, Hepburn and colleagues suggest, could help political leaders make better decisions.

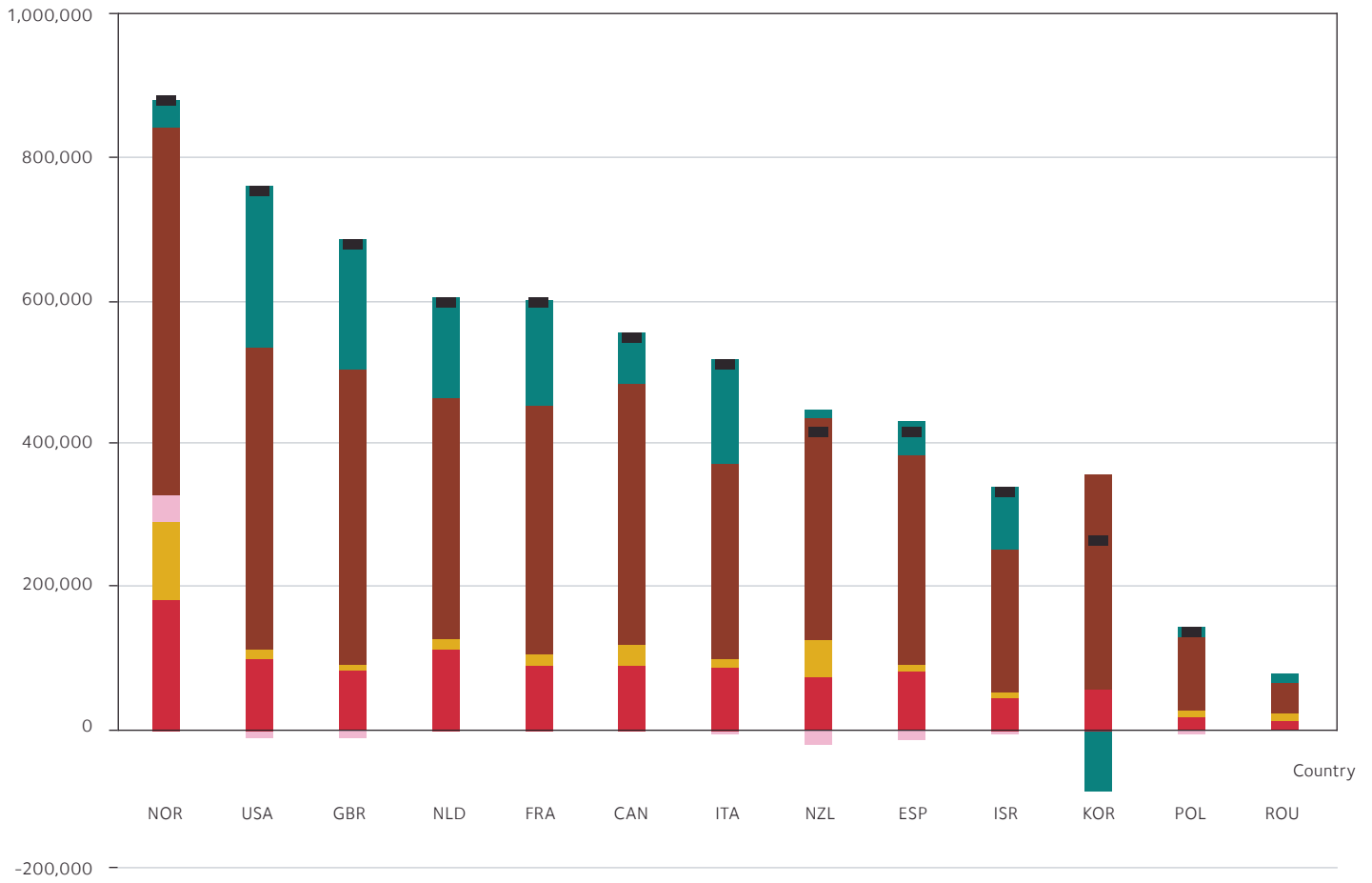
Imagine how things might change if politicians had up-to-date measures of real wealth, and the media and public paid attention to these numbers rather than just GDP. Politicians of nations refusing to invest in education, in health, the environment, or in building and maintaining infrastructure – the investments that create wealth long term – would be rightly seen as wealth destroyers, and embarrassed by clear international comparisons.

That would be a huge achievement, and could help to pull the world away from past practices which have led to global problems such as climate change, resource depletion and ecosystem destruction. In the past half century since GDP has been the main target for economic policy, the globe has been transformed by unprecedented growth in the use of energy and raw materials. We've become more wealthy in many ways, yet still don't know how much wealth we've lost, or what hidden stores of wealth we ought to be desperate to preserve.



Wealth per capita (US\$)

Figure 11: Wealth decomposition, 2005 (level in nominal US\$ per capita by market exchange rate), discount rate = 4.58% for both natural and human capital.



- Produced capital
- Human capital
- Natural capital
- Intangible residual
- Net foreign assets
- Total wealth

Source: Hamilton and Hepburn (2014)

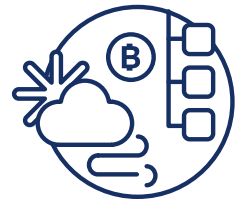
## Programmes

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*INET Oxford is organised into six programme teams who are collectively working across the eight thematic areas. While each programme has its own methodological and topical focus, there is significant collaboration across the teams, reflecting INET Oxford's interdisciplinary environment.*

Economic Modelling  
(EMoD)

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Complexity Economics

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Employment, Equity  
& Growth (EEG)

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Economics of  
Sustainability (EoS)

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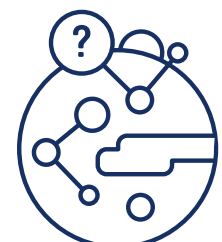
Ethics and Economics

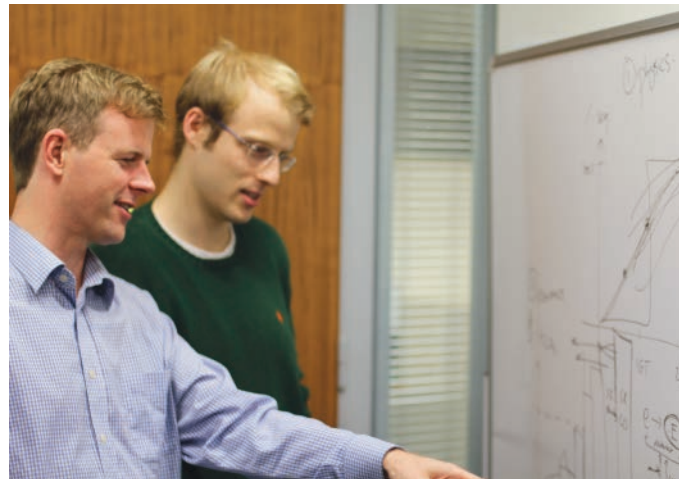
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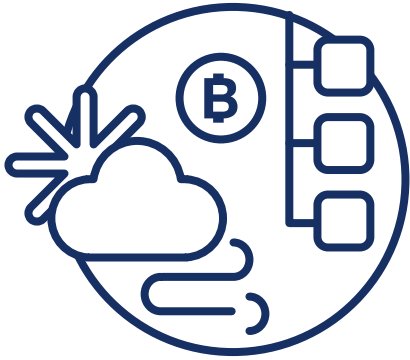
Curriculum (CORE)

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# Economic Modelling (EMoD)



## People

### Director:

Professor Sir David Hendry

### Deputy Director:

Professor John Muellbauer

### Faculty:

Professor Sir Tony Atkinson (Deputy Director 2010–2013), Professor Peyton Young, Professor Grayham E. Mizon (Southampton University), Professor Michael P. Clements (Reading University), Professor Ian Goldin, Dr Facundo Alvaredo, Dr Janine Aron, Dr Jennifer L. Castle, Dr Jurgen A Doornik, Dr Sophocles Mavroides, and Dr Bent Nielsen

### Post-doctoral Research Fellows (since 2010):

Dr Vanessa Berenguer-Rico, Dr Liang Chen, Dr James Duffy, Dr Mike Mariathan, Dr Vitaliy Oryshchenko, Dr Daniel Gutknecht, Dr James Wolter, and Dr Ansgar Walther

### Doctoral students (since 2010):

Nicholas Wellkamp, Max Roser, Salvatore Morelli, Sebastian Königs, Christoph Lakner, Felix Pretis, Oleg I. Kitov, Matthias Qian

### MPhil Student:

Andrew Martinez

The Economic Modelling Programme (EMoD) aims to develop new methods of economic analysis and forecasting that can take account of abrupt changes in economies. The programme was initiated by an Open Society Foundations (OSF) grant in October 2010 and then incorporated into INET Oxford in May 2012. The programme is affiliated with the Department of Economics and has strong links with Nuffield College.

## About the Programme

The global financial crisis and ensuing “Great Recession” of 2008–2010 exposed the failure of mainstream economic models used by governments, central banks and private financial institutions to forecast or respond to the crash. A key focus of EMoD’s research is to develop and promote alternative approaches that improve on those currently in place.

EMoD researchers engage with academics and policymakers to disseminate their work and show how their approach differs substantively from conventional methods. Policymaker interactions include the central banks of Argentina, Australia, Austria, Brazil, Canada, Cyprus, England, Greece, South Africa, Sweden, and Switzerland; US Federal Reserve Board, European Central Bank, World Bank, IMF, Bank for International Settlements, Statistics Norway and Statistics South Africa. In 2012 EMoD organised and hosted the Economic and Social Research Council (ESRC) International Symposium on Macroeconomics and in 2014 an International Econometric Modelling Conference bringing leading academics and policymakers to Oxford to engage with EMoD’s work and each other. There have been more than 2,200 citations of EMoD’s work since the programme’s inception.



David Hendry EMoD Programme Director



## Research Projects and Insights

### *Why DSGE Models Fail During Crises*

David Hendry and Grayham Mizon

Many central banks, finance ministries, multilateral organisations, private forecasters and others depend on Dynamic Stochastic General Equilibrium (DSGE) models for their macroeconomic forecasts, and for policy development and scenarios. Hendry and Mizon (2014) derived mathematical proofs showing that when distributions shift unexpectedly, today's conditional expectation of events tomorrow can be biased and dominated by other predictors, and the "law of iterated expectations" fails. Thus DSGEs are intrinsically non-structural as their very mathematical basis fails when distributions shift. Facing location shifts, economists cannot rely on theory-based model selection alone.



David Hendry receives Lifetime Achievement Awards from the Economic & Social Research Council

### *Rejection of the New Keynesian Phillips Curve*

Jennifer Castle, Jurgen Doornik, and David Hendry

The same neoclassical theory that produced the Rational Expectations Hypothesis (REH), Real Business Cycle Theory, and Dynamic Stochastic General Equilibrium (DSGE) models, also predicts the existence of the New Keynesian Phillips Curve (NKPC), structurally relating actual and expected inflation rates to measures of aggregate marginal cost. Castle, Doornik, Hendry and Nymoen (2014) reject the invariance of rational expectations models in New Keynesian Phillips Curves for inflation, demonstrating that the NKPC is an artefact of inappropriate modelling. Their work is important for modelling inflation expectations and central bank policy.



EMoD's Tony Atkinson at Worldstat, May 2014

### *Improving Economic Forecasting*

Jennifer Castle, Jurgen Doornik, David Hendry, Michael Clements, and Grayham Mizon

The reflexive nature of the economy – the two-way feedback between agents' beliefs, their actions, and the environment they are taking action in – ensures that the structure of the economy changes dynamically and endogenously over time. Structural features of the economy such as technologies, labour markets, the financial system, and policies can change and have significant impacts on economic time series such as output, employment, interest rates, and inflation. Traditional econometric forecasting techniques make implicit assumptions about structural continuity and have difficulty when faced with underlying structural changes and location shifts in the data. EMoD researchers have developed a statistical methodology for modelling multiple location shifts of any magnitude, sign, and number by indicator saturation. Once believed impossible, EMoD's model selection algorithm *Autometrics* handles such problems by block multiple-path searches (Castle, Doornik and Hendry, 2012). EMoD researchers have invented a new class of robust methods for forecasting during and after location shifts (Castle, Clements and Hendry, 2013), and modelling break trajectories by non-linear methods (Castle and Hendry, 2014).

## *New Approaches to Modelling Expectations*

David Hendry and Grayham Mizon

EMoD researchers have also shown that agents (and economists) cannot tell what aspect of a model has shifted until long after it has occurred (Hendry and Mizon, 2012) making the rational expectations (REH) forecasts of conventional neoclassical theory impossible (further strengthening the work above showing problems with current DSGE and NKPC models). However, if agents use EMoD's robust methods for forecasting breaks, a new basis for expectations in macroeconomic analysis can be forged, that is not exploitable by the Lucas Critique. These results have potential applicability for both better forecasting and policy development by central banks and other policymakers.

## *Contagion in Financial Networks*

Peyton Young

Interconnections among financial institutions create potential channels for contagion and amplification of shocks to the financial system. Young and Glasserman (2014) estimated the extent to which interconnections increase expected losses and defaults for a wide range of shock distributions, assuming minimal information about network structure, and using instead information about the institutions that are the nodes of the network. Spill-over effects are most significant when node sizes are heterogeneous and the originating node is highly leveraged with high financial connectivity. Mechanisms that magnify shocks include bankruptcy costs, and mark-to-market losses resulting from credit quality deterioration or a loss of confidence, illustrated by data on the European banking system.

## *Housing Bubbles and Financial Crises*

John Muellbauer

Duca, Muellbauer, and Murphy (2012) modelled key aspects of the interactions between the financial sector and real economy using flow-of-funds balance sheet data, and showed that financial fragility from credit booms and over-valued house prices depends on institutional heterogeneity across countries. The financial accelerator links in US and UK are missing in France and Germany as home equity loans are unavailable. So higher house prices have negative effects on consumption as aspiring home-owners must save more. This makes the French and German economies more robust against housing bubbles.



Prof Sir David Hendry meeting former US Vice-President Al Gore

## *World Top Incomes Database*

Facundo Alvaredo and Tony Atkinson

EMoD researchers helped create the World Top Incomes Database (WTID) which provides a long time series of top-income shares covering 27 countries, with 40 more in progress (the data are freely available on <http://g-mond.parisschoolofeconomics.eu/topincomes>). The WTID has attracted extensive research and media impact with more than 150,000 visits from 180 countries. Analysis of the data (Alvaredo, Atkinson, Piketty and Saez, 2013) shows that increases in income inequality are not just due to skill-biased technological change and globalization, but also to an increased association between capital and income over the last three decades. Furthermore, the issue of gender was examined by Atkinson, Casarico and Voitchovsky as few of the top 1% are women. A "glass ceiling" seems to prevent women from reaching the very top of the income distribution.

## *Chartbook of Economic Inequality*

Tony Atkinson and Salvatore Morelli

The Chartbook of Economic Inequality (Atkinson and Morelli, 2012) provides a factual picture of changes in economic inequality and has been widely used for research (it is freely available on [www.chartbookofeconomicinequality.com](http://www.chartbookofeconomicinequality.com)).

## *Our World in Data*

Max Roser

EMoD's optimism website, [www.ourworldindata.org](http://www.ourworldindata.org), demonstrates the successes of modernity and enlightenment, from increasing prosperity and technological progress to declines in violence and increases in tolerance in an open society. The site has received extensive media coverage and had 250,000 visitors since June 2014 and has reached over half a million people via social media.



## *The Butterfly Defect*

Ian Goldin and Mike Mariathan

In their book *The Butterfly Defect*, Goldin and Mariathan (2014) demonstrated that systemic risks are endemic in supply chains, diseases, infrastructure, ecology and climate change, economics, and politics. In the absence of action to mitigate the problems, these could lead to more protectionism, xenophobia, nationalism, rising conflict, and slower growth. Drawing on insights from a variety of disciplines, they provide practical guidance for how governments, businesses, and individuals can better manage risk in our contemporary world.

## *New Approaches to Modelling Atmospheric CO<sub>2</sub>*

David Hendry and Felix Pretis

Utilising some of the same novel techniques EMoD have developed for modelling economic time series, Hendry and Pretis (2013) modelled atmospheric CO<sub>2</sub> levels from 800 candidate variables, including emissions, production, and natural factors, showing anthropogenic forces alone explain the dominant trend. The research has attracted considerable interest from climate scientists, including the US National Center for Atmospheric Research. Pretis's article in *Nature Geoscience* was reported on the BBC and various other media outlets.

## *Household Saving and Transmission of Monetary Policy*

Janine Aron, John Duca, John Muellbauer, Keiko Murata, and Anthony Murphy

This 2012 paper, which won the 2014 Kendrick prize, contrasts the aggregate saving and spending behaviour of Japanese consumers with those of the US and the UK. It explains how shifts in the credit market architecture, particularly in mortgage markets, profoundly shifted saving behaviour in the US and UK. Previous research on saving rates in these economies had neglected these shifts and reached highly misleading conclusions. Japanese households have world record holdings of bank and saving deposits compared to income, and relatively low debt. Lower real interest rates increase household saving rates in Japan by making most households worse off. The opposite is true in the US and UK. This research shows that it is a serious error to apply to Japan conventional thinking on monetary policy derived for the US and the UK.



EMoD Deputy Director John Muellbauer

## Awards and Achievements

In the period 2012-14, the members of the EMoD Programme were recognised with a number of awards. Sir Tony Atkinson received the Jerzy Neyman Medal of the Polish Statistical Association; an honorary degree from the Universidade Tecnica de Lisboa; was named the 2012 Thomson Reuters Citation Laureate; and advised UK National Audit Office and Statistics Authority.

Sir David Hendry was also named a Thomson Reuters Citation Laureate in 2013, so along with Atkinson, two out of the UK's three Laureates in Economics are members of EMoD. Hendry also received an honorary degree from Aarhus University, the Isaac Kerstenetzky Scholarly Achievement Award, and was elected an Academician of the Academy of Social Sciences. Hendry's contributions to economics and econometrics were recognised by a Lifetime Achievement Award from the Economic and Social Research Council (ESRC).

Professor John Muellbauer's 1980 paper with Angus Deaton was designated one of the 20 most important papers in the *American Economic Review* over the last century. He, and John Duca and Anthony Murphy won the best paper prize at the Financial Management Association European Meeting. Muellbauer, Janine Aron and their co-authors won the Kendrick Prize of the International Association for Research in Income and Wealth for the best macroeconomic paper of the past two years for their work on housing. Muellbauer was also awarded a Wim Duisenberg Research Fellowship at the European Central Bank, and joined the IMF's new Advisory Group of international experts.

# Complexity Economics



## People

### Director:

Professor J. Doyne Farmer

### Faculty:

Dr Felix Reed-Tsochas (co-Director 2012–2014), Eric Beinhocker

### Post-doctoral Research

#### Fellows (since 2012):

Dr Olaf Bochmann, Dr Fabio Caccioli, Dr Daniel Fricke, Dr Adam Kay, Dr Austin Gerig, Dr Omar Guerrero, Dr Tomomi Kito, Dr Francois Lafond, Dr Eduardo Lopez, Dr Milan Lovric, Dr Ioannis Psorakis, Dr David Pugh, Dr Daniel Tang, and Dr Hyejin Youn

### Senior Software Engineer:

Kieran Phillips

### Doctoral students (since 2010):

Christoph Aymanns, Alysia Garmulewicz, Anatolij Gelimson, Jens Krause, Nicholas Sabin, Charles Savoie, and Victor Spirin

### Research Assistants (since 2012):

Diana Greenwald, Ariel Hoffman, and Ross Richardson

### Visiting Researchers (since 2012):

Lorena Fricke, Daniel Kim, and Phillip Staniczenko

### Visiting Faculty:

Professor Robert Axtell, Professor Prasanna Gai, Dr Matteo Richiardi, and Professor Geoffrey West

*A growing number of economists and social scientists view the economy as a ‘complex adaptive system’ - a distributed network of dynamically interacting, heterogeneous agents, whose behaviours, strategies and relationships evolve over time. Under such a view the economy is more akin to an ecosystem, the brain, or the internet than to the mechanistic models traditional theory.*

## About the Programme

The Complexity Economics Programme is applying leading-edge tools from complex systems science to generate new insights into a wide range of economic problems. The group utilises methods such as network analysis and agent-based computer simulation to incorporate realistic portrayals of human behaviour and institutions in its models and better understand how economic systems evolve dynamically over time. This approach enables researchers to see how macro patterns in the economy, such as financial crises, emerge out of micro level behaviours, interactions, and structures.

The group is applying these techniques to issues including financial system stability, innovation, and growth, and is also collaborating with the EEG programme on inequality and employment, and the EoS programme on issues related to sustainable growth.

The group includes scholars from a number of disciplines, including economics, maths, physics, and computer science, and collaborates with the Oxford Martin Programme on Complexity, Risk and Resilience. The programme is partnered with Oxford’s Mathematical Institute and the Saïd Business School. The programme’s work has generated significant interest from policymakers, particularly through the group’s leadership role in Project CRISIS (see p29). Interactions with policymakers include the Bank of England, European Central Bank, New York Federal Reserve, Deutsche Bundesbank, European Commission, BIS, IMF, OECD, UK HM Treasury, UK Department of Business Innovation and Skills, US Department of Energy, US Senate, and various policy think tanks in the US and UK.



Eric Beinhocker at the US Senate



Doyne Farmer at the CRISIS workshop at the Bank of England

## Research Projects and Insights

### *Project CRISIS – An Agent-Based Model of the Economy for Studying Systemic Risk, Financial Stability, and Macro-Financial Interactions*

*Project funded by the European Commission FP7.*

*J. Doyne Farmer (Scientific Coordinator), Eric Beinhocker (Stakeholder Coordinator), Olaf Bochmann, David Pugh, Daniel Fricke, Christoph Aymanns, Anatolij Gemlinson, Victor Spirin, Milan Lovric, Kieran Phillips, Ross Richardson, and Daniel Tang*

Standard macroeconomic policy models performed poorly during the crisis of 2008. This was partly due to insufficient detail about key economic institutions, such as banks. The goal of the CRISIS project is to develop agent-based models of the economy that could be used by central banks and governments to support policy development and analysis, as well as by academic researchers. The CRISIS project seeks to develop a standard software library that can provide the foundation for a new generation of models that can improve upon the standard DSGE models that are currently dominant in economics. CRISIS is a three-year project funded by the European Commission with a budget of €3.3 million. The project involves 11 collaborating research units across Europe and has involved significant collaboration with policymakers from central banks and other institutions. INET Oxford has played the lead role in building the integrated financial-macro agent-based model.

### *Key insights emerging from the work include:*

- **Market impact**  
The activity of buying and selling assets in a market impacts the price of the asset. During normal trading market impact may be modest, but when

investors simultaneously buy or sell large quantities of assets, either during a bubble or crash, the effect can be dramatic. We have shown that market impact follows a universal square root law across all markets and time periods that have been studied to date.

- **Impact-adjusted valuation**  
The standard method of valuing portfolios uses mark-to-market accounting. In theory this provides a current market based valuation of a bank or fund's portfolio, and in normal times and with highly liquid assets this may be a good approximation. But during a crisis, the combination of mark-to-market accounting, market impact, and leverage can trigger cycles where the price of an asset falls, forcing investors to sell more assets, causing the price to drop further, creating reinforcing feedback that accelerates a market collapse. We have proposed a new method for valuing assets taking into account market impact, liquidity, and leverage that could help mitigate such cycles.
- **Overlapping portfolios**  
Standard theory recommends asset diversification as a strategy for managing risk. However, if investors hold similarly diversified or "overlapping" portfolios then this can lead to synchronised behaviour in a crisis amplifying market movements, e.g. when one bank sells its assets, this depresses the value of the same asset held by other banks, which can cause them to sell, leading to a downward spiral. Thus the similarity of portfolios leads to a channel of contagion and sources of systemic risk. We developed the first quantitative theory for overlapping portfolios, providing a quantitative understanding of the trade-off between diversification, asset crowding, and leverage.
- **Basel II/III and pro-cyclical policies**  
In a series of papers we have shown how the common practice of pro-cyclical leverage, in which banks increase leverage when volatility is low and decrease it when it is high, leads to persistent oscillations and financial instabilities. Such pro-cyclical behaviours can be induced by both the risk management policies of individual banks and regulatory policies such as Basel II and III. Our agent-based models suggest that key provisions of Basel II and III may actually increase financial instability relative to no regulation at all. We find that there may be a zone of stability approximating a policy of constant leverage that lies between pro-cyclical and counter-cyclical policies. This could provide a basis for more effective policy.



### *Pro-cyclical Leverage and Access to Liquidity on the Interbank Market*

*Project in collaboration with the Deutsche Bundesbank  
Christoph Aymanns*

The primary objective of this project is to analyse the impact of a bank's position in the interbank network on the pro-cyclicality of its leverage. Initial checks indicate that pro-cyclical leverage is indeed present in the German banking system, confirming the results of Adrian and Shin (2010) for the US. We move beyond this initial link by hypothesizing that a bank's position in the interbank market as a proxy for the bank's access to liquidity has a significant impact on the bank's ability to leverage and de-leverage. The bank's position in the interbank network will be measured by different centrality measures, among them: closeness centrality, "betweenness" centrality, or eigenvector centrality. The interbank network is constructed from the large credit register (Kredit-Mio) and information about banks' balance sheet is obtained from monthly balance sheet statistics (BISTA).

### *On Specialists and Generalists: Loan Relationships, Systemic Risk, and Monetary Policy Transmission*

*Project in collaboration with the Deutsche Bundesbank  
Daniel Fricke, Felix Reed-Tsochas, Tariq Roukny (IRIDIA, Université Libre de Bruxelles), and Stefano Battiston (University of Zurich)*

This project aims to study the structure of relationships between banks and firms for an entire economy. The population of banks in an economy range from specialists to generalists, in terms of whether they choose to invest in firms across different sectors and geographical locations or not. Similarly, firms can be specialist or generalist in terms of whether they spread sources of loans, or concentrate on favoured relationships. Preliminary work suggests that the resulting structure of loan relationships between banks and firms demonstrates very particular patterns, captured by a measure known as "nestedness" which originates in theoretical ecology and has strong connections to important systemic properties such as resilience. The objective of this project is to understand the nature of firm-bank networks in national economies, to relate this to important functional properties of the network (and systemic properties of the economy), and to develop theoretical models of how such properties evolve. A key test for this project will be to develop and apply these measures and models to highly detailed data for Japan provided by NIKKEI.



Complexity Economics Programme Director J. Doyne Farmer

### *Forecasting Financial Crises (FOC)*

*Project funded by the European Commission, FP7  
Austin Gerig, Nicholas Sabin, Phillip Staniczenko,  
and Felix Reed-Tsochas*

The focus of this project is to significantly improve our understanding of systemic risk in financial markets and, if possible, to forecast global financial instabilities. FOC aims to provide a novel, integrated, and network-oriented approach to understanding financial crises. This includes a theoretical framework for measuring systemic risk in global financial markets and financial networks, and a collaborative ICT platform for monitoring systemic fragility and the propagation of financial distress across institutions and markets around the world. This will enable experts to evaluate different algorithms and models for forecasting financial crises, and make it possible to visualise possible future scenarios interactively.



Lecture by Andy Haldane, Chief Economist, Bank of England, February 2014

## *High-Frequency Trading and Market Synchronisation*

*Austin Gerig and Felix Reed-Tsochas*

High-speed computerised trading, often called high-frequency trading (HFT), has increased dramatically in financial markets over the last decade. It currently accounts for 55% of trading volume in US equity markets, 40% in European equity markets, and is quickly growing in Asia. Although some suggest that HFT increases market efficiency, there are serious concerns that HFT firms contribute to market instability, possess an unfair speed advantage over other investors, and siphon money from markets with no added social benefit. Because of these concerns, policy makers worldwide are spending considerable effort deciding if and how to regulate HFT. Our work, while at a preliminary stage, suggests that, while HFT may not be a significant source of market volatility, millisecond speed trading does not create benefits in terms of market efficiency either.



*Understanding Technological Progress*  
*Project funded by the US Dept. of Energy, European Commission FP7 and National Science Foundation*  
*J. Doyne Farmer, Eric Beinhocker; Francois Lafond, Ioannis Psorakis, Hyejin Youn, Jan David Bakker, and Diana Greenwald*

A variety of studies have shown that technological improvement is the dominant factor underpinning economic growth. Economics has traditionally studied technological progress in a highly aggregated manner, representing all of technology by a single number, which is the leading term in a production function representing knowledge or factor productivity.

In our view, this is far too simple: To understand technology one must understand the relationship between technologies and how they influence each other.



Senior Research Fellow and Programme Co-Director (2012-2014) Felix Reed-Tsochas

Toward this end our goal is to develop models for technological evolution that can provide an underpinning for a theory of economic growth.

The INET Oxford research group consists of three inter-related projects: a group collaborating with researchers at the University of North Carolina and Arizona State University funded by the US Department of Energy, a group working with the University of Rome, London Institute for Mathematical Sciences, University of Fribourg, and Hangzhou Normal University funded by the European Commission, and a group funded by the NSF collaborating with the Santa Fe Institute.

These projects and collaborations have both empirical and theoretical components. Our empirical work includes collecting and analysing data on the cost, production, and other performance measures for a wide variety of different technologies, as well as factors that influence technological progress, such as research and development. In addition we have a comprehensive data set on US patents. We are studying these data using a variety of techniques, with the goal of making better forecasts of technological progress. Our long-term goal is to develop an empirically grounded evolutionary theory of technological progress.

Some key insights emerging from the work include new methods of conducting time series forecasting of technological cost trends. The trends with which technologies drop in cost are remarkably persistent. We have shown that it is possible to take advantage of these trends to make useful forecasts of technological progress, and to estimate the errors associated with such forecasts. Thus it is possible to show, for example, that it is highly unlikely that in 2030 photovoltaic solar energy will be cheaper than nuclear power.

### *Innovation and Cities*

*Project funded by US National Science Foundation  
Hyejin Youn and Daniel Kim*

Cities have historically played a crucial role in innovation and economic growth. This project, funded by the NSF and in collaboration with the Santa Fe Institute, is examining empirical regularities in city growth, in particular scaling laws. The work has shown that different sectors of city economies scale at different rates, e.g. physical infrastructure versus knowledge and services activities. This work, in combination with INET Oxford's innovation work, is developing a general network-based, empirically derived theory of city growth and development.



Milan Lovric and Dan Tang

### *Network Study of Labour Dynamics*

*Omar Guerrero, Eduardo López, and Robert Axtell (Visiting)*

This project focuses on the study of labour dynamics, i.e. the processes through which people find jobs, become unemployed, and enter and exit the labour force. We have developed a framework that provides new insights into these processes by looking at labour dynamics as flows of workers moving through networks of firms. We have found that the structure of these networks (e.g. hub and spoke, core and periphery) has a significant impact on macro labour market variables. Economists have long observed a negative empirical relationship between unemployment and job vacancies known as the Beveridge Curve. Our theory provides micro-foundations for this empirical regularity and also accounts for other regularities such as the employer size-wage effect. Using these insights we can build agent-based models with more realistic agent behaviour. These models will allow academics and policymakers to have a better understanding of the impact of labour policies.

### *Complexity, Resilience, and Risk*

*Project funded by the Oxford Martin School and the Rockefeller Foundation*

*Eduardo López, Martino Tran, and Felix Reed-Tsochas*

The primary purpose of this research cluster is to use an interdisciplinary perspective and methods from complexity science to address two key questions. First, what structural and behavioural characteristics make many of the infrastructural, ecological, economic, financial, social, and technical systems that underpin modern life inherently robust or fragile, and to what extent are we able to identify and design mechanisms that can enhance their resilience? Second, how should we measure, evaluate, and manage systemic risk in a highly connected and uncertain world, where the relationship between individual and collective behaviour is highly non-trivial? Our aim is to develop novel, interdisciplinary frameworks and methods for addressing the challenges of resilience and risk in a complex world.



Part of the CRISIS team at the Milan conference



## Supply Chain Mapping

Project funded by the Saïd Business School Foundation

Tomomi Kito, Alexandra Brintrup, Felix Reed-Tsochas, and Steve New

Understanding firms' supply chains has become both a key issue for business research, and a central issue for corporations. Firms do not compete as atomistic islands of activity, but in complex webs of other organisations: firms' fates are tied up with those of their supply chain partners. Over a 20-year period, this idea has achieved central prominence in business: should firms make or buy? Should they form a small number of key and stable relationships, or should they use the power of the market to adaptively draw on a wide pool of suppliers? Should they seek to manage the firms several stages down the chain from them? Although the evidential base of supply chain management is very substantial, much of the work describes only fragments of chains, or rests on the analysis of idealised models which do not reflect empirical reality. This work is taking a systemic, network-based view to better understand supply chain risk, resilience, and effectiveness.



INET Oxford Visiting Fellow Prasanna Gai



Christoph Aymanns speaking at the CRISIS Conference in Milan

## Social Embeddedness of Economic Microfoundations

Felix Reed-Tsochas and Nicholas Sabin

This project uses highly detailed group loan data from a microfinance organisation in Sierra Leone to investigate how social ties and spatial embeddedness influence economic decisions, how groups holding joint liability are formed, and how cooperative behaviour evolves in groups when they take successive rounds of loans. Data are available on individual characteristics of all borrowers including spatial location, as well as detailed repayment behaviour. The context provides a natural experiment for observing how economic behaviour is shaped by social embeddedness, and how behaviours evolve over time based on previous choices and decisions. Overall, the objective is to develop new and more realistic micro-foundations of individual-level economic behaviour, in a social context.

## Employment, Equity, & Growth (EEG)



### People

*Director:*  
Professor Brian Nolan

*Faculty:*  
Professor Sir Tony Atkinson,  
Professor John Muellbauer,  
Professor Martin Seeleib-Kaiser,  
Dr Craig Holmes, Dr Carl Frey,  
and Eric Beinhocker

*Post-Doctoral Research Fellows:*  
Dr Max Roser, Dr Marii Paskov,  
Dr Stefan Thewissen

*Research Assistant:*  
Joachim Mowinckel

*Recovery from recession is not yet delivering significant real income gains for those on middle and lower incomes in Britain and other developed economies, and even before the crisis economic growth was not “trickling down” sufficiently, while those high up the income scale raced away.*

### About the Programme

The Employment, Equity, and Growth research programme is a partnership between INET Oxford, the Department of Social Policy and Intervention, and the Resolution Foundation launched in September 2014. The programme will investigate why growth has failed to deliver for middle-income and below working households, and what policy and institutional responses might produce a better, fairer growth model.

### Research Projects and Insights

#### *Cross-Country Comparisons of Inequality and Living Standards*

*Brian Nolan and Max Roser*

How distinctive is Britain’s experience in terms of inequality and living standards, and was pre-crisis stagnation a sign of things to come? Answering these questions will involve the construction and analysis of a database tracking the evolution of income shares, real incomes, and living standards of different segments of the working-age population over time and across countries, together with key macroeconomic aggregates. The distributional outcome variables will in the first instance be drawn from the Luxembourg Income Study and OECD databases, with national sources used to check, complement, and supplement them. A range of indicators will capture the main links in the chain of transmission from aggregate economic activity to household disposable income, and the aim is to be able to estimate baseline models by the end of the first year.

#### *Drivers of Income for the Middle and Below*

*Craig Holmes, Brian Nolan, and Carl Frey*

How are labour market changes, linked with technology and globalisation, driving trends in middle and below incomes from work, and what role does income from capital play? The focus initially will be on the evolution of earnings and their dispersion in the UK in the decades up to the economic crisis, and on potential drivers such as changes in educational attainment and occupational structures, declining unionisation, and the minimum wage. This will involve the application of frontier statistical decomposition methods to microdata for the UK over time. A comparative

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perspective will also be adopted on the way the structure of jobs in the UK has been developing. Based on this recent experience and the likely nature of technological change in the coming decades, its potential impact on the future structure of jobs will also be examined.

### *Pre-Distribution of Market Income versus Redistribution via Taxes and Transfers*

*Brian Nolan and Stefan Thewissen*

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How might pre-distribution of market income and redistribution via taxes and transfers deliver more effectively for middle and below households? This will focus initially on identifying the full range of levers potentially open to policymakers to influence the distribution of income from the market, and assessing the extent to which these have been successfully employed to date or appear to have real potential. In parallel, the role which changes in the overall redistributive impact of direct taxes and transfers have played in the evolution of income inequality in the UK over time, and how this compares with other OECD countries, will be analysed. This will provide a base from which the impact of specific actual or prospective tax/transfer strategies can subsequently be studied, especially with respect to supporting families relying on low-paid work.

### *Intergenerational Threats from Rising Inequality*

*Brian Nolan and Marii Paskov in collaboration with Erzsebet Bukodi and John Goldthorpe, Dept. of Social Policy and Intervention*

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What are the long-term/intergenerational threats from increasing inequality and stagnating living standards and how can they be averted? This will focus initially on the nature of 'middle and below' households in terms of social class and age in particular, and on identifying the potential barriers to mobility across the life course and intergenerationally posed by increasing inequality and stagnating living standards. Patterns in mobility to date, and what this implies for future prospects, will also be considered. The way the distribution of wealth has been evolving as income inequality has risen will also be examined. The impact of increasing inequality and stagnating living standards on trust and social cohesion, and the ways in which this may feed into political behaviour and attitudes, will also be analysed.

### *Successful Growth Models*

*John Muellbauer, Brian Nolan, and Stefan Thewissen*

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What growth models have been successful in securing rising prosperity for middle and below households and what policies and institutional structures have supported such growth models? Identifying countries and periods in which middle and below households fared particularly well or poorly, in absolute and relative terms, will provide a basis for exploring the variety of institutional settings in which good performance was achieved, and relating these to underlying economic and social models. In parallel, research focused on the UK linking microdata on income, expenditure, and assets/debt will allow them to be analysed jointly over time, including fluctuations in household debt and their relationship to the housing market and to income levels and expenditure patterns.



Brian Nolan launching the EEG programme, September 2014

### *Capitalism Redefined*

*Eric Beinhocker and Marii Paskov in collaboration with Nick Hanauer*

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How do we best define and measure prosperity and how should the economic system be organised to deliver true increases in prosperity? Market capitalism has delivered enormous increases in living standards in the West and more recently has been transforming emerging markets, yet citizens around the world are increasingly dissatisfied with their economic system. The financial crisis of 2008, the stagnation of the middle class in many developed countries, rising income inequality, the concentration of wealth and power, and the threat of global climate change are challenging some of our most deeply held beliefs about how a fair and well-functioning society should be organised. This project is asking fundamental questions about the nature of prosperity, our theories of economic growth, and the purpose of a market capitalist system, and seeks to engage a broad debate amongst thought leaders, policymakers and the general public on these critical issues.

## Economics of Sustainability (EoS)



### People

#### Director:

Professor Cameron Hepburn

#### Faculty:

Professor Bob Hahn, Associate Professor Richard Bailey, and Eric Beinhocker

#### Post-doctoral Research Fellows:

Dr Alex Teytelboym

#### Doctoral students:

Penny Mealy and Alex Pfeiffer

#### Visiting faculty:

Professor Dan Kammen (2015)

#### Visiting Doctorate Student:

Lorena Fricke

*The Economics of Sustainability Programme seeks to understand the economy and environment as a deeply interlinked complex system and is working to gain insights into how the human economic part of this integrated system might be transformed to become more sustainable.*

### About the Programme

The Economics of Sustainability Programme commenced in autumn 2013 and is developing new ways to account for natural capital, measure wealth creation, stimulate green technology innovation, and assess climate and economic risk.

The programme is also building a collaboration with the Complexity Economics group to pioneer the use of agent-based modelling to study economy-ecosystem interactions to better understand the impact of climate and environmental policies on economic growth, employment, and political economy. This work is aimed at developing new policy insights for mitigating climate change and for ecosystem management, notably oceans and fisheries.

The programme is also examining the behavioural shifts and institutional innovations needed to transition to a sustainable economy. The programme is conducted in partnership with Oxford's Smith School of Enterprise and the Environment and the School of Geography and Environment and in collaboration with the Oxford Energy Network.



Programme Director Cameron Hepburn (right) and Prof. Ian Goldin (3rd from right) with Richard Branson at the 'Necker Meets Oxford' event on Necker Island



## Research Projects and Insights

### *Green Growth and Prosperity*

Cameron Hepburn, Robert Hahn, and Eric Beinhocker

The programme's research on green growth and prosperity will examine questions for government and business such as:

- What would "green prosperity" actually look like? What are potentially realistic scenarios?
- How should governments design and implement policies to support the widely stated goal of "green growth"? What is the role of market-based environmental instruments? What is the role of regulation, taxation, and subsidies?
- What role might the financial sector play?
- Who will win and lose from such policies?
- How can businesses design their strategies to create wealth for shareholders from the transition to sustainable economic growth? How are consumer preferences towards sustainable products shifting? What insights can behavioural and experimental economics yield into marketing strategies for sustainable product lines?
- What are the potential implications of stranded assets for high-carbon businesses?
- How will technology change impact the transition to green growth, are there potential "tipping points"?

In addition to scholarly output, the work is aimed at government departments (e.g. finance, economic and environmental ministries, central banks), natural resource and energy businesses, businesses driving low-carbon technology development, pension funds, foundations, endowments, and sovereign wealth funds, with a geographic focus on the US, Europe, China and other major emerging economies.

Output from this work to date includes three special issues of the *Oxford Review of Economic Policy* and a publication in *China & World Economy*. In addition, during the World Economic Forum's 8th Annual Meeting of the New Champions in China, September 2014, Cameron Hepburn gave an interactive presentation on these issues.

### *Next Generation Modelling of Economy-Ecosystem Interactions*

Cameron Hepburn, J. Doyne Farmer, Robert Hahn, Robert Axtell (Visiting), and Eric Beinhocker

An important tool for policymakers working on climate change issues are so-called Integrated Assessment Models (IAMs) that model the interactions between the economy and the physical climate system. These are the models that policymakers and bodies such as the IPCC use to assess the likely impacts of human activity on atmospheric carbon, global temperatures, sea level rises, etc. and the costs of mitigation policies and benefits of avoided climate damage. While physical climate models have advanced significantly in recent decades, the economic models paired with them are limited at best and misleading at worst. The economic models are typically highly aggregated, assume rational behaviour and equilibrium, and fail to adequately take into account technology or institutional change. This programme seeks to develop a next generation of IAMs that is able to model behaviour and institutions in a realistic way, incorporate technology innovation, and capture the complex two-way dynamic feedbacks between the economy and climate. We expect such a model to provide a more realistic and dynamic account of the transformation to a sustainable economy and provide new policy insights into how such a transition could be achieved. This research theme will extend an existing macroeconomic-financial model being built by INET Oxford as a part of Project CRISIS, an EC-funded effort conducted in collaboration with major central banks.



Cameron Hepburn at the World Economic Forum, Tianjin, China 2014

A paper on this work was submitted to the Global Commission on Economy and Climate for the Commission's *New Climate Economy* report provided to world leaders at the 2014 UN Summit.

## *New Strategies for Oceans and Fisheries Management*

Project funded by the Ocean Conservancy  
Richard Bailey, Robert Axtell (Visiting), and Eric Beinhocker

Oceans are one of the planet's most important ecosystems and are in a state of crisis with fish stocks collapsing in many parts of the world. The current method of managing fisheries, Maximum Sustained Yield (MSY) is expensive, slow, non-adaptive, and in many fisheries has either been insufficiently effective or not feasible. This project, in collaboration with the Ocean Conservancy, University of California Santa Barbara, and George Mason University, will look at new approaches to fisheries management utilising new economic tools such as agent-based modelling. The project will attempt to develop a more complete and dynamic picture of interactions between diverse fish species in the ocean with the economics and incentives of diverse fishing fleets above the ocean, leading to new insights on fisheries management approaches and policies.



Hal Harvey, CEO of Energy Innovation, lecturing at Oxford, September 2014

## *Nature in the Balance: the Economics of Biodiversity*

Dieter Helm and Cameron Hepburn.

This book, edited by Helm and Hepburn and published by Oxford University Press, sets out the building blocks of an economic approach to biodiversity and in particular brings together conceptual and empirical work on valuation, international agreements policy instruments, and the institutions. The objective is to provide a comprehensive overview of the issues and evidence, and to suggest how this very urgent problem should be addressed. Whilst there has been enormous growth in research focused on climate change, less attention has been paid to biodiversity. This book focuses on the economics, but incorporates the science and philosophy of biodiversity preservation combining the application of a number of theoretical ideas with a series of policy cases.

## *Economics of Energy Innovation*

J. Doyne Farmer, François Lafond, Ioannis Psorakis, Diana Greenwald, Cameron Hepburn, and Eric Beinhocker

The Complexity Economics Programme is engaged in work, funded by the US Department of Energy's SunShot Program, examining the prospects for significant cost reductions in key renewable technologies.

The Economics of Sustainability group will be collaborating with the Complexity Economics team on this project to develop the policy implications of this work, notably looking at policies that could accelerate renewable cost declines, and the implications of potential grid parity for key renewables. Key questions the project is asking include:

- What drives rates of technology progress in innovation in the energy sector?
- Can we improve forecasting of energy technology cost declines?
- What actions can government take to accelerate such progress and thus accelerate the transition to a sustainable economic growth model?
- What are the implications for energy policy, including the balance between the deployment of existing vs. future technologies?

The team has collected significant data on technology cost declines (i.e. "learning curves") and has developed a rigorous methodology for making probabilistic forecasts of future cost reductions. Preliminary work shows that the fuel prices of commodity-based energy sources (e.g. coal, oil) follow a random walk over long periods with no fundamental cost decline, and only modest improvements in energy production costs from these fuels. Nuclear energy has actually experienced real cost increases over its lifetime. In contrast, technology-based renewables, notably solar, have experienced rapid cost improvements following a cost decline law known as Wright's Law (similar to Moore's Law).



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## *Sustainable Choices and Behaviours*

Robert Hahn

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Working in collaboration with Dr Robert Metcalfe (University of Chicago), this project is identifying economical ways of getting consumers and businesses to conserve on using electricity, energy, and water. The project will use randomised controlled trials to determine what actually works in the field. These trials have now become the “gold standard” in social science for measuring the effectiveness of particular policy interventions.

### *Questions include:*

- How to get customers and businesses to adopt smart metering and make better use of smart meters;
- Designing more effective ways of managing resources during extreme situations, such as droughts and energy shortages;
- Determining the effectiveness of different policy tools, such as pricing, information, and the use of social norms, for promoting conservation.

The project’s results will be relevant to environmental and energy policymakers, energy and water utilities, utility regulators, and consumer and retail businesses.

## *Institutions for managing the commons*

Robert Hahn and Robert Axtell

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This project examines the evolution of different institutions for managing common property resources, such as the atmosphere, and the oceans. It will also examine the likely effectiveness of particular institutions for managing common property resources. Some of these institutions may be “top-down”, introduced by a central government; others may be “bottom-up”, developed by local residents; and some may be a combination of the two.

### *Questions include:*

- What kind of institutions would we want to have to promote sustainable growth?
- How can we promote the development of such institutions?
- How can modelling tools, such as agent-based modelling, be used to further our understanding of the development of institutions to address commons problems?

## *Metrics for Prosperity within Planetary Boundaries*

Cameron Hepburn, Dieter Helm, Kirk Hamilton, and Eric Beinhocker

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Work by a large international group of scientists has identified boundaries and a “safe operating space” for key planetary systems (Rockstrom et al. 2009). Yet our concepts and metrics for economic performance do not take this into account. This programme of research on metrics for wealth and prosperity will support a shift away from the current focus on flows of GDP and toward stocks that matter, in particular natural capital. There are three streams to this research:

1. **Wealth:** Working with Dr Kirk Hamilton, formerly of the World Bank, progress on national accounting is being synthesised into a special issue edited by Professor Cameron Hepburn of the *Oxford Review of Economic Policy* and a book to be published by Oxford University Press.
2. **Prosperity:** Working with Nick Hanauer, Eric Beinhocker is fundamentally re-examining notions of prosperity, providing a critique of utilitarian notions of prosperity and standard welfare economics, and proposing an alternative framework based on “solutions to human problems” that integrates material and environmental concepts of prosperity.
3. **Natural capital:** Professors Helm and Hepburn are engaged in efforts examining a number of critical questions regarding natural capital:
  - How much natural capital can we afford to lose?
  - Given that humanity will almost certainly destroy a vast amount of biodiversity, where should this destruction occur and how should trade-offs be made?
  - How should governments measure natural capital and incorporate it into national accounts? What policies should be put in place to price and manage natural capital?
  - What risks are faced by businesses with supply chains that involve the depletion of natural capital? What opportunities arise for companies that are able to protect and manage natural capital?

This work-stream convened a seminar series on natural capital in 2014 and contributed to a special issue of the *Oxford Policy Review*. In July 2014, Professor Hepburn presented a seminar on Wealth at the second “Government Economic Service at 50” Seminar Day at HM Treasury attended by over 200 UK government economists.

## Ethics and Economics



### People

#### Director:

Professor David Vines

#### Faculty:

Professor John Armour

#### Collaborators (since 2011):

Nicholas Morris, Academic Visitor and Senior Research Associate at Balliol Oxford, Oxford. Authors of chapters in the book included Onora O'Neill, chair of Equality and Human Rights Commission and former President of the British Academy; Professor John Armour, Hogan Lovells Professorship of Law and Finance at Oxford University, Professor Justin O'Brien, Director of the Centre for Law, Markets & Regulation at the University of New South Wales; Professor Peyton Young, James Meade Professor of Economics at Oxford University, Professor Jeffrey Gordon Richard, Paul Richman Professor of Law; Co-Director, Richman Center for Business, Law & Public Policy, Columbia University; Professor Tom Noe, Professor of Finance at Oxford University; Dr Natalie Gold, philosopher at Kings College London; Richard Davies, formerly of the Bank of England; Professor Joshua Getzler, Professor of Law and Legal History at Oxford University; Avner Offer, Emeritus Professor of Economic History at Oxford University; Edward Sawbridge, who worked for many years with American and French investment banks; Boudewijn de Wijn, Professor of Financial Ethics at Gronigen University; Seamus Miller, Professor of Philosophy at Charles Sturt University, and Senior Research Fellow, 3TU Centre for Ethics and Technology, Delft University of Technology.

*A group of economists, philosophers, lawyers, historians, regulators, and financial services practitioners convened a series of seminars and working groups to more deeply understand the role of ethics, values, codes of conduct, and behaviour in the financial sector.*

### About the Programme

The interdisciplinary Ethics and Economics group is examining the extent to which the attitudes and behaviour of managers and employees in the financial services industry actually contributed to the financial crisis, and how changes in such attitudes and behaviour might be achieved, alongside regulatory reforms.

### Research Projects and Insights

The group's work has included a series of seminars, which were held in both the Economics Department and at Balliol College, under the auspices of the Balliol Interdisciplinary Institute, and with the support of the Oxford Martin School and INET Oxford. The participants examined philosophical, legal, historical, economic, and regulatory aspects of the problem and produced a number of papers. These papers were brought together in a collaborative book titled *Capital Failure: Restoring Trust in Financial Services*, edited by Nicholas Morris and David Vines, and published in autumn 2014 by Oxford University Press.

The arguments of the book may be summarised as follows. Trustworthiness in the financial services industry was eroded by deregulation and the changes to industry structure and remuneration which followed. Deregulation was based on a belief that the self-interest of individuals would produce good outcomes (Adam Smith's "invisible hand") and economists' belief in efficient markets took this idea further by assuming that all individuals are selfish, and have no regard for the interests of other people. However, although Smith accepted that individuals may be self-interested, he also believed that they have "other-regarding" motivations, including a desire for the approbation of others. The book argues that the trust-intensive nature of financial services makes it essential to cultivate such motivations, and provides proposals for how this might be done.

The book suggests reforms of governance, and of legal and regulatory arrangements, to address these issues. Such reforms would promote an ethical culture that reinforces other-regarding behaviour. Such proposals would encourage firms and individuals in financial services to act in a more trustworthy manner by focusing on four key requirements:

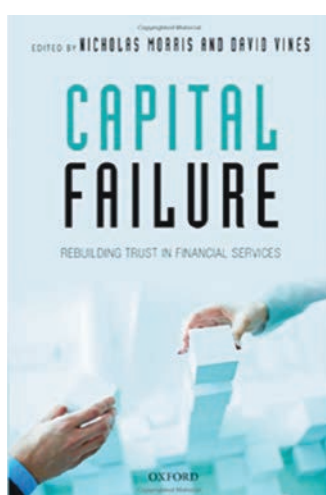
1. The appropriate definition of obligations;
2. The identification of corresponding responsibilities;
3. The creation of mechanisms which encourage trustworthiness; and
4. The holding to account of those involved in an appropriate manner.

Financial reforms since the crisis have lacked sufficient focus on these requirements. The book explores how these requirements can be better met in specific parts of the financial services industry so as to bring about better outcomes.

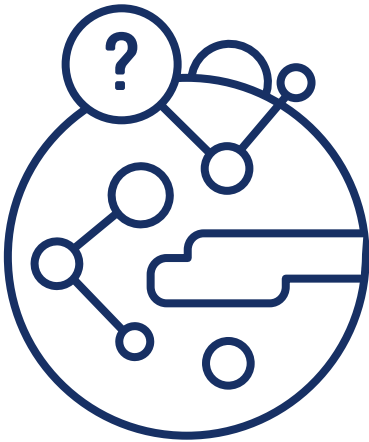
Members of the group are presenting their work at a large number of conferences, seminars, and events, including at the Finance Foundation in London and at the Bank of England. They plan further interdisciplinary work to extend the ideas in the book and look more broadly at the ethical foundations of the modern economy.



David Vines (left) and Andrew Haldane of the Bank of England (centre) February 2014



## Curriculum (CORE)



### People

#### Director:

Professor Wendy Carlin, University College London and Visiting Professor of Economics, University of Oxford

#### Steering Group:

Professor Wendy Carlin, Professor Samuel Bowles Head of Behavioral Sciences Program at the Santa Fe Institute, and Professor Oscar Landerretche, Head of School of Economics and Business at the University of Chile

#### Contributors:

Yann Algan, Sciences Po, Paris; Tim Besley, London School of Economics and Political Science; Sam Bowles, Santa Fe Institute, US; Antonio Cabrales, University College London, UK; Juan Camilo Cardenas, Universidad de los Andes, Bogotá, Colombia; Diane Coyle, University of Manchester, UK; Nick Crafts, University of Warwick, UK; Georg von Graevenitz, Queen Mary University of London, UK; Cameron Hepburn, University of Oxford, UK; Daniel Hojman, Kennedy School, Harvard University; US and Universidad de Chile; Arjun Jayadev, University of Massachusetts, Boston, US and Azim Premji University, Bangalore, India; Oscar Landerretche, Universidad de Chile; Suresh Naidu, Columbia University, US; Robin Naylor, University of Warwick, UK; Kevin O'Rourke, University of Oxford, UK; Begum Ozkaynak, Boğaziçi University, Istanbul; Malcolm Pemberton, University College London, UK; Louis Putterman, Brown University, US; Nicholas Rau, University College London, UK; Rajiv Sethi, Barnard College, Columbia University, US; Margaret Stevens, University of Oxford.

*The Curriculum Open-Access Resources in Economics (CORE) project was launched in November 2013 by INET New York and is developing a new approach to teaching undergraduate economics.*

### About the Programme

Led by Professor Wendy Carlin of University College London and INET Oxford, the CORE project aims to update the undergraduate economics curriculum and how it is delivered, in order to make economics both more relevant and more accessible.

The CORE Project, based at INET Oxford, is part of a larger strategy by the INET foundation in New York to reform global economics teaching and stimulate the development of a variety of curricula and materials to support the teaching of new economic ideas.

*The project aims to change how economics is taught by addressing three gaps:*

1. The gap between what economists know and what students are taught;
2. The gap between the questions students have when they come into the classroom and the unsatisfactory answers they receive; and
3. The gap between standard text-and-lecture teaching methods and newly available low-cost interactive learning technologies.

### Research Projects and Insights

The project has gathered more than 20 leading economists from around the world to create an online textbook for a new introductory economics course. In September 2014 the beta test version of the first ten chapters of the project's e-textbook *The Economy* was released for free in open access online and printable versions (see [www.core-econ.org](http://www.core-econ.org)). The beta test version of the course is currently being taught in a number of universities in both undergraduate and Masters of Public Policy courses. The beta test universities are a global group that includes participants in the US, Europe, Australia, and India. Participating institutions include the University of Massachusetts, Boston, University College London, Columbia University, School of Public Policy, Central European University, Hungary, Sciences-Po, France (January 2015), University of Sydney (March, 2015), Azim Premji University, India (March, 2015), and University of Siena, Italy (March 2015).



The remaining eleven chapters are in production for the start of the second semester and a further six universities are lined up to pilot the course later in the academic year 2014-2015.

The CORE textbook incorporates recent insights from economic research on the important dynamics at play in the economy today. The teaching material can be accessed on and offline on a personal computers and mobile devices such as tablets and smartphones. The CORE material includes interactive content that brings economic principles to life. Dynamic diagrams, videos, definitions, explanations, short tests, and calculus appendices are available at a click. The material contains many class exercises and discussions to stimulate students' analytical and critical thinking. The editorial team receives feedback from students and teachers in real-time and can take comments into consideration immediately and are able to improve the material iteratively.

Interest in CORE has grown rapidly. The e-textbook has been downloaded over 6,000 times and a Twitter account, a Facebook page, and a newsletter are keeping the community of students and teachers informed about the latest developments. The CORE project has received media coverage in *The Financial Times*, *The Economist*, *VoxEU*, *The New Yorker*, *BBC*, *the Guardian* and *the Washington Post* among others. Professor Wendy Carlin is also currently involved in a documentary on curriculum reform produced for BBC Radio 4.

Professor Carlin has been invited to numerous conferences and talks to present the curriculum to the economics community. Notable appearances include the Annual Conference of the Institute for New Economic Thinking in Toronto in April 2014, the Annual Conference of the Royal Economic Society in April 2014, the European Economic Association's Annual Conference in Toulouse in August 2014. The incoming and outgoing Presidents of the International Economics Association (IEA) Tim Besley and Joe Stiglitz invited Professor Carlin to present to both the Council and the Executive Committee of the International Economic Association's Triennial Congress in Amman in June 2014. Lord Nicholas Stern invited her to present at a meeting at the British Academy in March 2014.

The CORE Project is gaining recognition by the economics profession, the wider public, and, most importantly, by students. As the first edition of the e-book and the beta test are completed, the team plans to incorporate the feedback of the first wave of teaching and refine the course and book. The team then plans to roll out the course and text to a wider global group of universities and students and continue to build the community involved in the project.



CORE project pilot class at UCL



Wendy Carlin at the project launch, HM Treasury, November 2013

## People

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*There are over 70 faculty members, post-doctoral researchers, graduate students and administrative staff drawn from across the University of Oxford affiliated with INET Oxford.*



**Eric Beinhocker**  
Executive Director

Eric Beinhocker is the Executive Director of INET Oxford. Beinhocker is also a Senior Research Fellow at Oxford's Blavatnik School of Government, a Supernumerary Fellow of Oriel College and a Visiting Professor of Economics and Public Policy at Central European University in Budapest. He was formerly a partner at McKinsey & Company and held leadership roles in McKinsey's Strategy Practice, its Climate Change and Sustainability Practice, and the McKinsey Global Institute. Beinhocker writes extensively on economic, business, and policy issues and his work has appeared in the *Financial Times*, *Newsweek*, *The Times*, *Harvard Business Review*, and various academic journals. He is the author *The Origin of Wealth: The Radical Remaking of Economics and What it Means for Business and Society*, one of Amazon's "Top Ten Business Books" in 2006. Beinhocker is a graduate of Dartmouth College and the Massachusetts Institute of Technology where he was a Henry Ford II Scholar.

### Programme Directors



#### Economic Modelling (EMoD)

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**Professor Sir David Hendry**  
Professor of Economics, Programme Director

Professor Sir David F. Hendry, an econometrician, is currently Professor of Economics and Fellow of Nuffield College, Oxford University. He obtained an MA in Economics from the University of Aberdeen and holds both an MSc and Ph.D. from the London School of Economics. From 2001 to 2007, he was the Head of the Economics Department at the University of Oxford. Prior to this, he was a Professor of Economics at the LSE and a research professor at both UC San Diego and Duke University. His work is predominantly on time-series econometrics and its applications. In recent years he has worked on the theory of forecasting and also on automatic model building. He was knighted in 2009 and received a Lifetime Achievement Award from the ESRC in 2014; is an Honorary Vice-President and past President of the Royal Economic Society; a Fellow of the British Academy, the Royal Society of Edinburgh, the Econometric Society, the Academy of Social Sciences and the *Journal of Econometrics*, as well as a Foreign Honorary Member, American Economic Association and the American Academy of Arts and Sciences, and an Honorary Fellow, International Institute of Forecasters. He has received eight Honorary Doctorates, is a Thomson Reuters Citation Laureate, and has published more than 200 papers and 25 books, including *Empirical Model Discovery and Theory Evaluation* with Jurgen Doornik, *Forecasting Economic Time Series* with Michael Clements, and *Dynamic Econometrics*.





## Economic Modelling (EMoD)

*Professor John Muellbauer*

Professor of Economics, Deputy Programme Director

Professor Muellbauer is primarily an applied macroeconomist, though his microeconomic textbook with Angus Deaton, *Economics and Consumer Behaviour*, Cambridge University Press, 1980, is still in print. His 1980 paper with Angus Deaton, "An Almost Ideal Demand System" in the *American Economic Review* was selected as one of the top 20 papers published in the first 100 years of that journal. One important aim of his current research is to achieve a better understanding of interactions between the financial sector and the real economy. He has contributed extensively to the UK debate over housing market issues, including property taxation, and also to the argument as to whether the UK should join the euro. He holds a Ph.D. from the University of California, and is a Fellow of the British Academy, a Fellow of Econometric Society, and a Fellow of the European Economic Association.



## Complexity Economics

*Professor J Doyne Farmer*

Professor of Mathematics, Programme Director

Doyne Farmer is a physicist with a doctorate from the University of California, who at present works on systemic risk, agent-based modelling in economics, sustainability, and technological progress. Other areas to which he has contributed include dynamical systems theory, theoretical biology, and time series forecasting. Prior to arriving in Oxford he was a professor in residence at the Santa Fe Institute, where he is currently an external professor. He founded the Prediction Company, a quantitative trading firm, where he was co-President and Chief Scientist. At Los Alamos National Laboratory he was an Oppenheimer Fellow and founded the Complex Systems Group. Several popular books have been written about his work including *The Newtonian Casino* by Thomas Bass, *Chaos* by Jim Gleick, *Complexity* by Mitchell Waldrop, and *The Predictors* by Thomas Bass.



## Employment, Equity and Growth Programme (EEG)

*Professor Brian Nolan*

Professor of Social Policy, Programme Director

Prior to joining INET Oxford Brian Nolan was Principal of the College of Human Sciences and Professor of Public Policy at University College Dublin. He is an economist by training, with a doctorate from the London School of Economics, and his main areas of research are income inequality, poverty, and the economics of social policy. He has been centrally involved in a range of collaborative cross-country research networks and projects, most recently the Growing Inequalities' Impacts (GINI) multi-country research project on inequalities and their impacts funded by the EC Framework Programme 7. Recent books published by Oxford University Press include *The Handbook of Economic Inequality* (2008) which he co-edited with Wiemer Salverda and Tim Smeeding, *Poverty and Deprivation in Europe* (2011) co-authored with Christopher T. Whelan, *The Great Recession and the Distribution of Household Income* (2013), edited with Stephen Jenkins, Andrea Brandolini, and John Micklewright, and two co-edited volumes from the GINI project in 2013.



## Economics of Sustainability (EoS)

*Professor Cameron Hepburn*

Professor of Environmental Economics, Smith School, Programme Director

Cameron Hepburn is an economist with expertise in energy, resources, and the environment. In addition to his INET Oxford and Smith School roles he is also a Professorial Research Fellow at the Grantham Research Institute at the London School of Economics and a Fellow at New College, Oxford. He has degrees in law and engineering from Melbourne, a doctorate in economics from Oxford as a Rhodes Scholar and many peer-reviewed publications in economics, public policy, law, engineering, philosophy, and biology. His work has been referred to in publications such as the *Economist* and the *Financial Times*. He has provided advice on energy and environmental policy to governments and international institutions around the world. He has also had an entrepreneurial career, co-founding three businesses and investing in several start-ups.



## Ethics and Economics

### *Professor David Vines*

Professor of Economics, Fellow of Balliol College, Programme Director

In addition to his role at Oxford, Vines is also Adjunct Professor of Economics at the Australian National University, and a Research Fellow of the Centre for Economic Policy Research. From 2008 to 2012 he was the Research Director of the ECFP2 PEGGED Research Programme, which analysed Global Economic Governance within Europe. Professor Vines received a BA from Melbourne University in 1971, and subsequently an MA and Ph.D. from Cambridge University. From 1985 to 1992 he was Adam Smith Professor of Political Economy at the University of Glasgow. His research interests are in macroeconomics, including financial frictions, fiscal and monetary interactions, and financial crisis. His recent books include: *The Leaderless Economy: Why the World Economic System Fell Apart and How to Fix It* (Princeton University Press, 2013, with Peter Temin); *The IMF and its Critics: Reform of Global Financial Architecture* (Cambridge University Press, 2004, with Christopher Gilbert) and *The Asian Financial Crisis: Causes, Contagion and Consequences* (Cambridge University Press, 1999, with Pierre-Richard Agénor, Marcus Miller, and Axel Weber).



## Economic Curriculum Development (CORE)

### *Professor Wendy Carlin*

Professor of Economics, University College London, Visiting Professor, Department of Economics, University of Oxford, Programme Director

Wendy Carlin is a Research Fellow at the Center for Economic and Policy Research and a Fellow of the European Economics Association. She is on the Expert Advisory Panel, Office for Budget Responsibility in the UK and on the Advisory Board of INET. Her research focuses on macroeconomics, institutions, and economic performance. She is co-managing editor with Philippe Aghion of *Economics of Transition* and has published on ownership, finance, and growth; competitiveness and export performance; the economics of transition and the legacy of communism; the political economy of Germany and the Eurozone; and macroeconomics. She has co-authored with David Soskice two macroeconomics books. She has just published a third, with the title: *Macroeconomics and the Financial System* (Oxford University Press, 2014).

## Economic Modelling (EMoD)

### Senior Research Fellows



### *Professor Sir Tony Atkinson*

Fellow of Nuffield College, Centennial Professor at the London School of Economics Deputy Director 2010-2013

Research Interests: economics of income distribution and poverty, microeconomics and public economics.



### *Professor Peyton Young*

Research Interests: learning in games and its application to the diffusion of innovations, the evolution of social norms and institutions, and the design of decentralised systems of communication and control.



### *Dr Facundo Alvaredo*

Research Interests: public economics, personal taxation, income and wealth concentration, and economic history.



### *Dr Janine Aron*

Research Interests: monetary and exchange rate policy and macroeconomics in South Africa.



### *Dr Jennifer Castle*

Research Interests: econometric modelling and the use of general to specific methodology in modelling economic time series.



### *Dr Jurgen Doornik*

Research Interests: the intersection of econometrics, statistics, computer science, and numerical algebra.



### *Dr Sophocles Mavroeidis*

Research Interests: econometrics and empirical macroeconomics.



### *Dr Bent Nielson*

Research Interests: econometric and statistical theory including the theoretical properties of algorithms.

## Research Fellows



*Dr Vanessa Berenguer-Rico*

Research Interests: econometric modelling and statistical treatment of non-linear long run relationships that involve persistent processes such as those observed in macroeconomic data.



*Dr James Duffy*

Research Interests: time series econometrics and macroeconomic modelling, with particular emphasis on non-linear models involving strongly dependent processes.



*Dr Daniel Gutknecht*

Research Interests: endogeneity in non-linear regression models, measurement error in particular classes of non-linear regression models and statistical tests for monotonicity under endogeneity.



*Dr Ansgar Walther*

Research Interests: financial regulation, banking models and their links with the macroeconomy.



*Dr Liang Cheng*

Research Interests: econometric theory, high dimensional modelling, empirical macroeconomics and finance.

## Doctoral Students



*Oleg Kitov*

Research Interests: forecasting and empirical macroeconomics, nowcasting using Automatic Model Selection and forecasting in the presence of structural breaks and measurement errors.



*Felix Pretis*

Research Interests: statistical detection of structural breaks and model selection within time series analysis with a focus on climate data.



*Nicholas Wellkamp*

Research Interests: the applications of model selection within time series analysis to empirical macroeconomics, and energy policy.

## Research Assistant



*Andrew Martinez*

M.Phil. student

Research Interests: time-series econometrics and forecasting, and international macroeconomics.

## Research Associates



*Professor Michael P. Clements*

Professor, University of Reading

Research Interests: the modelling and forecasting of data subject to revision, mixed-frequency models, factor models, and the analysis of survey expectations.



*Professor Grayham Mizon*

Research Interests: Econometrics; model selection, hypothesis testing, model evaluation; and encompassing, analysis of time series and applied econometric modelling, especially of macroeconomic time series.



*Salvatore Morelli*

Research Interests: income and wealth distributions, their relationship with financial markets and the distributional impacts of banking crises and international financial integration.



*Dr James Reade*

Research Interests: applied econometrics and what we can learn about economics from 'Big Data'.

## Past Staff and Visitors

*Visiting Fellows:* Professor Javier Fernandez-Macho, Professor Gunnar Bardsen, Professor Genaro Sucarrat, Professor Alessandra Casarico, Dr Neil R Ericsson, Professor Timo Ehrig, Professor Anders Rygh Swensen, Professor Sven Crone, Mika Mahosenaho, Palma Moshberger, Dr. Roger Hammersland and Professor Tony Hall.

*Research Fellows:* Mike Mariathasan, Vitaliy Oryshchenko, and James Wolter

*Doctorate Students:* Sebastian Königs and Christoph Lakner

## Complexity Economics

### Senior Research Fellow



#### *Dr Felix Reed-Tsochas*

James Martin Lecturer in Complex Systems, Saïd Business School, Co-Director of the CABDyN Complexity Centre, Director, Oxford Martin Programme on Complexity, Risk, and Resilience, and co-Director 2012-2014.

Research Interests: interdisciplinary approaches to understanding the dynamics and functional properties of complex networks in different contexts; the connection between individual and collective behaviour in social systems, and models of the emergence and structure of cooperation in biological and social systems.

### Research Fellows



#### *Dr Daniel Fricke*

Research Interests: the application of methods from complex system analysis to economic contexts, the structure, dynamics, and regulation of financial markets.



#### *Dr Omar Guerrero*

Research Interests: developing agent-based models that generate realistic economic dynamics and can be used for policy design, large-scale micro-data, analysis of complex networks, and agent-based modelling to improve understanding of labour markets.



#### *Dr Tomomi Kito*

Research Interests: the analysis and design of organisations which are comprised of various decision-makers, taking environmental uncertainty, structural complexity, and bounded rationality into account.



#### *Dr Francois Lafond*

Research Interests: innovation and development, theoretical and empirical models of knowledge networks as self-organising bipartite graphs.



#### *Dr Eduardo López*

Research Interests: complex networks and statistics, transport processes, Big Data, analysis and human communication patterns.



#### *Dr Ioannis Psorakis*

Research Interests: modelling technological innovation and designing optimal tech investment portfolios, through mining large data sets of patent associations and economic performances.



#### *Dr David Pugh*

Research Interests: modelling business cycles; developing agent-based models of the macroeconomy with credit markets and banks, the role of financial frictions in propagating shocks; financial fragility and asset price volatility in agent-based models, analysing the role for monetary policy and macro-prudential policy within agent-based models.



#### *Dr Daniel Tang*

Research Interests: software engineering, climate modelling, entrepreneurship, and brewing, wealth inequality effects on systemic financial stability and individual well-being.



#### *Dr Hyejin Youn*

Research Interests: urban scaling and dynamics transportation network and network theory.



## Senior Software Engineer



*Kieran Phillips*

Research Interests: algorithm engineering, agent-based simulations and creative treatment of contemporary scientific challenges.

## Research Assistant



*Diana Greenwald*

Research Interests: statistical and qualitative analyses of technology change.



*Dr Ross Richardson*

Research Interests: agent-based simulations of the economy, a desire to understand the processes linking fundamental economic microstructure to higher level macroeconomic phenomena.

## Doctoral Students



*Christoph Aymanns*

Research Interests: system risk modelling in financial markets, contagion in financial networks, optimal regulation of financial sector leverage.



*Alysia Garmulewicz*

Research Interests: technology and supply chain networks and stability.



*Anatolij Gelimson*

Research Interests: applying statistical physics techniques to economic problems.



*Jens Krause*

Research Interests: interdisciplinary covering evolutionary game theory, network theory, and agent-based modelling.



*Nicholas Sabin*

Research Interests: microfinance and complex systems, seeking to relate social structure and economic action in the context of microfinance groups in developing countries.



*Charles Savoie*

Research Interests: agent-based modelling, economic growth, energy, and climate modelling.



*Victor Spirin*

Research Interests: the integration of interbank markets into a macro-financial agent-based model.

## Visiting Fellows



*Professor Prasanna Gai*

Professor of Macroeconomics at the University of Auckland

Research Interests: the theoretical underpinnings of financial crises, current problems facing the international monetary system, models on the boundary of macroeconomics, finance, network theory, and game theory.



*Dr Matteo Richiardi*

Marie Curie Fellow, Assistant Professor at the University of Torino and Affiliate at Collegio Carlo Alberto.

Research Interests: labour economics and computational economics.



*Lorena Fricke*

Doctorate Student

Research Interests: the sustainability and resilience of marine ecological-economic systems, aiming at understanding the economic causes and effects of regime shifts in marine ecosystems.



*Phillip Staniczenko*

Research Fellow

Research Interests: the effect of anthropogenic change on ecological networks representing interactions between species in a community and new techniques for analysing large and complex multispecies data.

## Past Staff and Visitors

*Visiting Professor:* Rob Axtell

*Visiting Fellows:* Daniel Kim, Jiyoung Park

*Research Fellows:* Olaf Bochmann, Fabio Caccioli, Austin Gerig, and Milan Lovric

*Research Assistant:* Ariel Hoffman

*Doctoral Student:* Adam Kay

## Employment, Equity and Growth (EEG)

### Senior Research Fellow



*Dr Carl Benedikt Frey*

Research Interests: the transition of industrial nations to digital economies, and subsequent challenges for economic growth and employment. In particular, technology shocks and associated impacts on labour markets and urban development.



*Dr Craig Holmes*

Research Interests: Labour economics, behavioural economics, experimental economics, economics of education.

### Research Fellows



*Marii Paskov*

Research Interests: economic growth models, inequality, and living standards, quantitative research, social policy, solidarity, and public attitudes.



*Dr Max Roser*

Research Interests: income inequality and inclusive growth, analysing the growth of average incomes in different percentiles of the income distribution, factors causing unequal growth.



*Stefan Thewissen*

Research Interests: earnings inequality, globalisation, social policy, and redistribution preferences in industrialised countries.

### Research Assistant



*Joachim Mowinckel*

M.Phil. Economics Student

Research Interests: demographics and income inequality.

## Economics of Sustainability (EoS)

### Senior Research Fellows



*Professor Robert Hahn*

Director of Economics and a Professor at the Smith School of Enterprise and the Environment, Senior Fellow at the Georgetown Center for Business and Public Policy and non-resident Senior Fellow at the Brookings Institute.

Research Interests: regulation, energy policy, environment, internet policy, and political economy



*Dr. Richard Bailey*

Associate Professor in Geochronology, Oxford School of Geography & the Environment.

Research Interests: dynamics of natural environmental systems and human-environment interactions over a range of timescales and contexts, complex systems research, particularly in regard to modelling human-environmental systems.

### Research Fellow



*Dr Alex Teytelboym*

Research Interests: market design, social and economic networks, how best to run complex auctions, how networks shape the diffusion of innovations, and climate change policy.

## Doctoral Student



*Penny Mealy*

Research Interests: agent-based modelling, technological evolution, economic growth, and sustainable development.

## Research Assistant



*Alexander Pfeiffer*

Research Interests: stranded carbon assets and the carbon bubble, energy policy, effects of climate policies on financial markets, carbon tax, and carbon emissions trade systems.

## Ethics and Economics

### Senior Research Fellow



*Professor John Armour*

Hogan Lovells Professor of Law and Finance.

Research Interests: the integration of legal and economic analysis, with particular emphasis on the impact on the real economy of changes in the law governing company law, corporate insolvency, and financial regulation.

## Curriculum



*Robert Denham*

Project Manager



*David Hope*

Research Officer



*Tim Phillips*

Research Officer

## Administration



*Sarah Kirk*

Administrative Assistant to the CORE, EEG, and Economics of Sustainability research programmes.



*Susan Mousley*

Assistant to the Executive Director.



*Dorota Pawlik*

Programme Administrator for Complexity Economics.



*Tanya Vale*

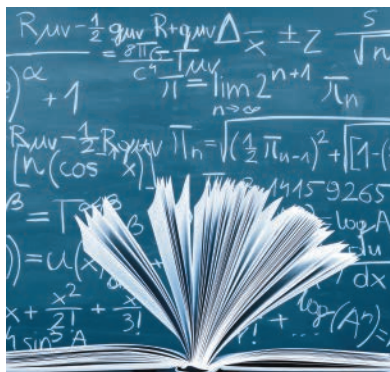
Centre Manager.



*Angela Wenham*

Assistant to the Director and Programme Administrator for Economic Modelling.

# Publications



## Economic Modelling

### Academic Publications

Alvaredo, F. (2013). "Las rentas altas en España: panorama histórico y evolución reciente", *Papeles de Economía Española*, 10, Special Issue, Crisis, desigualdad económica y mercado de trabajo en España, 135.

Alvaredo, F., Atkinson, A. B., Piketty, T., and Saez, E. (2013). "The top 1 per cent in international and historical perspective", *Journal of Economic Perspectives*, 27(3): 3–20.

Aron, J. (2012). "Macroeconomic policy and its governance after apartheid", in Kahreen Tebeau and Ian Shapiro (eds), *After Apartheid: Reinventing South Africa*, University of Virginia Press, 136–78.

Aron, J. (2013). "Growth and institutions: a review of the evidence". Reprinted in Kunal Sen (ed.), *Institutions and Governance in Developing Countries*, Edward Elgar Publishing, vol. 1, ch. 16.

Aron, J. (2013). "Introduction to special section on exchange rate pass-through in developing and emerging markets", *Journal of Development Studies*, 50: 97–100.

Aron, J., Creamer, K., Muellbauer, J., and Rankin, N. (2013). "Exchange rate pass-through to consumer prices in South Africa: evidence from micro-data", *Journal of Development Studies*, 50: 165–85.

Aron, J., Farrell, F., Muellbauer, J., and Sinclair, P. (2013). "Exchange rate pass-through to import prices and monetary policy in South Africa", *Journal of Development Studies*, 50: 144–64.

Aron, J., Macdonald, R., and Muellbauer, J. N. J. (2013). "Exchange rate pass-through in developing and emerging markets: a survey of conceptual, methodological and policy issues, and selected empirical findings", *Journal of Development Studies*, 50: 97–100.

Aron, J., and Muellbauer, J. N. J. (2012). "Improving forecast accuracy in an emerging economy, South Africa, by means of changing trends, long run restrictions and disaggregation", *International Journal of Forecasting*, 28: 456–76.

Aron, J., and Muellbauer, J. N. J. (2012). "The aggregate mortgage possessions outlook", *Economic Outlook*, 36(2): 20–32.

Aron, J., and Muellbauer, J. N. J. (2013). "New methods for forecasting inflation, applied to the USA", *Oxford Bulletin of Economics and Statistics*, 75: 637–61.

Aron, J., and Muellbauer, J. N. J. (2013). "Wealth, credit conditions and consumption: evidence from South Africa", *Review of Income and Wealth*, 59: S161–S196.

Atkinson, A. B. (2013). "Beyond GDP: a post-crisis agenda for measuring government performance", in O. Cramme, P. Diamond, and M. McTernan (eds), *Progressive Politics after the Crash*, I. B. Tauris, 209–17.

Atkinson, A. B. (2013). "Getting the EU back on course", *Zeitschrift für Staats- und Europeawissenschaften*, 11: 162–8.

Atkinson, A. B. (2013). "Reducing income inequality in Europe", *Journal of European Labor Studies*, 2(12) (online journal).

Atkinson, A. B. (2014) "Optimum population,

welfare economics, and inequality", in I. Goldin (ed.), *Is the Planet Full?*, Oxford University Press.

Atkinson, A. B. (2014). *Public Economics in an Age of Austerity*.

Atkinson, A. B., and Bourguignon, F. (eds) (2015) *Handbook of Income Distribution*, vol. 2, Elsevier (forthcoming).

Atkinson, A. B., Backus, P. G., Micklewright, J., Pharoah, C., and Schnepf, S. V. (2012). "Charitable giving for overseas development: U.K. trends over a quarter century", *Journal of the Royal Statistical Society, A*, 175: 167–90.

Berenguer Rico, V., and Gonzalo, J. (2014). "Summability of stochastic processes: a generalization of integration for non-linear processes", *Journal of Econometrics*, 178, 331–41.

Castle, J. L., Clements, M. P., and Hendry, D. F. (2013). "Forecasting by factors, by variables, by both or neither?", *Journal of Econometrics*, 177, 305–19.

Castle, J. L., Doornik, J. A., and Hendry, D. F. (2012). "Model selection in equations with many "small" effects", *Oxford Bulletin of Economics and Statistics*, 75, 6–22.

Castle, J. L., Doornik, J. A., and Hendry, D. F. (2012). "Model selection when there are multiple breaks", *Journal of Econometrics*, 169, 239–46.

Castle, J. L., Doornik, J. A., Hendry, D. F., and Nymoen, R. (2013). "Mis-specification testing: non-invariance of expectations models of inflation", *Econometric Reviews*, 33, 553–74.

Castle, J. L., and Hendry, D. F. (2013). "Model selection in under-specified equations with breaks", *Journal of Econometrics*, 178: 286–93. DOI:10.1016/j.jeconom.2013.08.028.

Castle, J. L., and Hendry, D. F. (2014). "Semi-automatic non-linear model selection", in N. Haldrup, M. Meitz, and P. Saikkonen (eds), *Essays in Nonlinear Time Series Econometrics*, Oxford University Press.

Castle, J. L., Qin, X., and Reed, W. R. (2013). "Using model selection algorithms to obtain reliable coefficient estimate", *Journal of Economic Surveys*, 27: 269–96.

Chen, Liang, Dolado, J. J., and Gonzalo, J. (2014). "Detecting big structural breaks in large factor models", *Journal of Econometrics*, 180: 30–48.

Clements, M. P. (2013). "Probability distributions or point predictions? Survey forecasts of U.S. output growth and inflation", *International Journal of Forecasting*, 30: 99–117.

Clements, M. P. (2014). "Forecast uncertainty – ex ante and ex post: U.S. inflation and output growth", *Journal of Business and Economic Statistics*, 32, DOI: 10.1080/07350015.2013.859618.

Clements, M. P. (2014). "U.S. inflation expectations and heterogeneous loss functions, 1968–2010", *International Journal of Forecasting*, 33: 1–14.

Clements, M. P., and Galvão, A. B. (2012). "Improving real-time estimates of output and inflation gaps with multiple-vintage models", *Journal of Business and Economic Statistics*, 30: 554–62.

Clements, M. P., and Galvão, A. B. (2013). "Forecasting with vector autoregressive models of data vintages: U.S. output growth and inflation", *International Journal of Forecasting*, 29: 698–714.



Clements, M. P., and Galvão, A. B. (2013). "Real-time forecasting of inflation and output growth with autoregressive models in the presence of data revisions", *Journal of Applied Econometrics*, 28(3): 458–77.

Cuaresma, J. C., and Roser, M. (2012). "Borders redrawn: measuring the statistical creation of international trade", *World Economy*, 35: 946–52.

Doornik, J. A. (2012). "A Markov-switching model with component structure for U.S. GNP", *Economics Letters*, 118: 265–8 [2013].

Duca, J., and Muellbauer, J. N. J. (2013). "Tobin LIVES", in Bernhard Winkler, Ad van Riet, and Peter Bull (eds), *A Flow of Funds Perspective on the Financial Crisis*, Palgrave Macmillan, vol. 2, ch. 2.

Duca, J., Muellbauer, J. N. J., and Murphy, A. (2012). "Credit standards and the bubble in U.S. house prices: new econometric evidence", in *Bank for International Settlements*. 83–9.

Engsted, T., and Nielsen, B. (2012). "Testing for rational bubbles in a cointegrated vector autoregression", *Econometrics Journal*, 15: 226–54.

Foster, D. P., and Young, H. P. (2012). "A strategy-proof test of portfolio returns", *Quantitative Finance*, 12: 671–83.

Harvey, A. C., and Oryshchenko, V. (2012). "Kernel density estimation for time series data", *International Journal of Forecasting*, 28: 3–14.

Hendry, D. F. (2013). "Retrospective on 'Econometric Modelling: The Consumption Function in Retrospect'", *Scottish Journal of Political Economy*, 30 (1983), 193–220", *Scottish Journal of Political Economy*, 60: 523–5.

Hendry, D. F. (2015). *Macro-econometrics: An Introduction*, Timberlake Consultants Press (forthcoming).

Hendry, D. F., and Doornik, J. A. (2014). *Empirical Model Discovery and Theory Evaluation*, MIT Press.

Hendry, D. F., and Johansen, S. (2014). "Model Discovery and Trygve Haavelmo's Legacy", *Econometric Theory*, doi:10.1017/S0266466614000218.

Hendry, D. F., and Mizon, G. E. (2012). "Open-model forecast-error taxonomies", in X. Chen and N. R. Swanson (eds), *Recent Advances and Future Directions in Causality, Prediction, and Specification Analysis*, Springer, 219–40.

Hendry, D. F., and Mizon, G. E. (2014). "Unpredictability in economic analysis, econometric modeling and forecasting", *Journal of Econometrics*, 182: 186–95.

Hendry, D. F., and Pretis, F. (2012). "Anthropogenic influences on atmospheric CO<sub>2</sub>", in R. Fouquet (ed.), *Handbook on Energy and Climate Change*, Cheltenham: Edward Elgar, 287–326..

Johansen, S., and Nielsen, B. (2013). "Outlier detection in regression using an iterated one-step Huber-skip estimators", *Econometrics*, 1: 53–70.

Kreindler, G. E., and Young, H. P. (2013). "Fast convergence in evolutionary equilibrium selection", *Games and Economic Behavior*, 80: 39–67.

Kuang, D., Nielsen, B., and Nielsen, J. P. (2014). "The geometric chain-ladder", *Scandinavian Actuarial Journal*, DOI: 10.1080/03461238.2013.821952.

Magnusson, L., and Mavroeidis, S., (2014). "Identification using stability restrictions", *Econometrica*, 82(5): 1799–1851.

Mariathasan, M., and Merrouche, O. (2012) "Recapitalisations, Credit and Liquidity", *Economic Policy*, 72: 603–46.

Mavroeidis, S., Plagborg-Møller, M., and Stock, J. (2014). "Empirical evidence on inflation expectations in the new Keynesian Phillips curve", *Journal of Economic Literature*, 52: 124–88.

Miranda, M. R. M., Nielsen, B., and Nielsen, J. P. (2014). "Inference and forecasting in the age-period-cohort model with unknown exposure with an application to mesothelioma mortality", *Journal of the Royal Statistical Society, A*, DOI: 10.1111/rssa.12051.

Mizon, G. E. (2013). "Seconding the vote of thanks on the retrospective reading of 'A return to an old paper: Tests of separate families of hypotheses by D.R. Cox'", *Journal of the Royal Statistical Society, B*, 75: 213–14.

Morelli, S., Smeeding, T., and Thompson, J. P. (2014). "Recent trends in inequality in developed countries", *Journal for a Progressive Economy*, 2: 24–8.

Muellbauer, J. N. J. (2012). "Housing and the economy", in Susan J. Smith, Marja Elsinga, Lorna Fox O'Mahony, Ong Seow Eng, and Susan Wachter (eds), *International Encyclopaedia of Housing and Home*, Elsevier, vol. 3, 301–14.

Muellbauer, J. N. J. (2012). "Monetary policy, wealth effects and housing", in Susan J. Smith, Marja Elsinga, Lorna Fox O'Mahony, Ong Seow Eng, and Susan Wachter (eds), *International Encyclopaedia of Housing and Home*, Elsevier, vol. 4, 317–25.

Muellbauer, J. N. J. (2012). "When is a housing market overheated enough to threaten stability?" in Alexandra Heath, Frank Packer, and Callan Windsor (eds), *Property Markets and Financial Stability*, Reserve Bank of Australia,

Muellbauer, J. N. J. (2013), "Conditional eurobonds and the Eurozone sovereign debt crisis", *Oxford Review of Economic Policy*, 29(3): 610–45.

Muellbauer, J. N. J. (2014). "Economic fundamentals and Eurozone sovereign spreads: will the good news continue?" *Economic Outlook*, April: 16–26.

Muellbauer, J. N. J., and Williams, D. M. (2012). "Credit conditions and the real economy: the elephant in the room", in *Bank for International Settlements*. 95–101.

Pradelski, B. S. R., and Young, H. P. (2012). "Learning efficient Nash equilibria in distributed systems", *Games and Economic Behavior*, 75: 882–97.

Pretis, F., and Allen, M. (2013). "Climate science: breaks in trends", *Nature Geoscience*, 6: 992–3, doi:10.1038/ngeo2015.

Pretis, F. and Hendry, D. F. (2013). "Comment on 'Polynomial cointegration tests of anthropogenic impact on global warming' by Beenstock et al. (2012) – some hazards in econometric modelling of climate change", *Earth System Dynamics*, 4: 375–84, doi:10.5194/esd-4-375-2013.

Young, H. P., and Glasserman, P. (2014). "How likely is contagion in financial networks?", *Journal of Banking and Finance*, DOI: 10.1016/j.jbankfin.2014.02.006.

## Forthcoming Publications

Alvaredo, F. and Gasparini, L. (2015). "Recent trends in inequality and poverty in developing countries", in A. B. Atkinson and F. Bourguignon (eds), *Handbook of Income*, Elsevier.

Aron, J., and Muellbauer, J. N. J. (2015). "Inflation", in Haroon Bhorat, Alan Hirsch, Ravi Kanbur, and Mthuli Ncube (eds), *The Oxford Companion to the Economics of South Africa*, Oxford University Press.

Atkinson, A. B., and Bourguignon, F. (eds) (2015). *Handbook of Income Distribution*, vol. 2, Elsevier.

Atkinson, A. B., and Bourguignon, F. (2015). "Introduction", in A. B. Atkinson and F. Bourguignon (eds), *Handbook of Income Distribution*, vol. 2, Elsevier.

Atkinson, A. B., and Brandolini, A. (2015). "Unveiling the ethics behind inequality measurement: Dalton's contribution to economics", *Economic Journal*.

Castle, J. L., Clements, M. P., and Hendry, D. F. (2015). "Robust approaches to forecasting", *International Journal of Forecasting*.

Castle, J. L., Hendry, D. F., and Kitov, O.K. (2015). "Forecasting and nowcasting macroeconomic variables: a methodological overview", *Handbook on Rapid Estimates*, Eurostat.

Clements, M. P. (2015). "Are professional macroeconomic forecasters able to do better than forecasting trends?", *Journal of Money, Credit and Banking*.

Clements, M. P., Carriero, A., and Galvão, A. B. (2015). "Forecasting with Bayesian multivariate vintage-based VARs", *International Journal of Forecasting*.

Crespo Cuaresma, J. and Roser, M. (2015). "Why is income inequality increasing in the developed world?", *Review of Income and Wealth*.

Doornik, J. A., (2015). "Numerical evaluation of the Gauss hypergeometric function by power summations", *Mathematics of Computation*.

Martinez, A. (2015). "How good are U.S. government forecasts of the federal debt?", *International Journal of Forecasting*.

Mavroeidis, S., and Kleibergen, F. (2015). "Identification issues in limited-information Bayesian analysis of structural macroeconomic models", *Journal of Applied Econometrics*.

Mavroeidis, S., and Magnusson, L. (2015). "Identification using stability restrictions", *Econometrica*.

Morelli, S., Smeeding, T., and Thompson, J. P. (2015). "Post-1970 trends in within-country inequality and poverty", in *Handbook of Income Distribution*, vol. 2, ed. A. Atkinson and F. Bourguignon, Elsevier.

## Reports

Aron, J., and Muellbauer, J. N. J. (2012). *New Forecast Scenarios for U.K. Mortgage Arrears and Possessions*, ISBN: 978-1-40984755, Report, Department for Communities and Local Government, London.

Lucchino, P., and Morelli, S. (2012). *Inequality Debt and Growth*, Report for the Resolution Foundation, London.

## Working Papers

Alvaredo, F., and Gasparini, L. (2013). *Recent Trends in Inequality and Poverty in Developing Countries*. CEDLAS Working Paper 151/2013.

Alvaredo, F., and Londoño Velez, J. (2013). *High Incomes and Personal Taxation in a Developing Economy: Colombia 1993–2010*, CEQ Working Paper 12.

Alvaredo, F., and Piketty, T. (2014). *Measuring Top Incomes and Inequality in the Middle East: Data Limitations and Illustration with the Case of Egypt*, Economic Research Forum Working Paper 832.

Atkinson, A. B. (2013). *Wealth and Inheritance in Britain from 1896 to the Present*, CASepaper 178, LSE.

Atkinson, A. B. (2014). *The Colonial Legacy: Income Inequality in Former British African Colonies*, UNU-WIDER Working Paper/2014/045.

Atkinson, A. B., and Morelli, S. (2012). *Chartbook of Economic Inequality: 25 Countries 1911–2010*, INET research note series #15.

Atkinson, A. B., and Sogaard, J. E. (2013). *The Long-Run History of Income Inequality in Denmark: Top Incomes from 1870 to 2010*, EPRU WP 2013–01.

Berenguer Rico, V., and Gonzalo, J. (2014). *Co-summability: From Linear to Non-linear Co-integration*.

Castle, J. L., Doornik, J. A., Hendry, D. F. and Pretis, F. (2013). *Detecting Location Shifts by Step-Indicator Saturation*.

Königs, S. (2013). *The Dynamics of Social Assistance Benefit Receipt in Luxembourg: A Descriptive Analysis*.

Lakner, C., and Milanovic, B. (2013). *Global Income Distribution: From the Fall of the Berlin Wall to the Great Recession*, World Bank Working Paper, 6719, Dec.

Lakner, C. (2014). *“Top Incomes in the USA, 1960–2005: Family Size and Factor Income Composition”*.

Lakner, C. (2014). *The Inequality of Real Wages in Germany*.

Oryshchenko, V., and Smith, R. J. (2013). *Generalised Empirical Likelihood-Based Kernel Density Estimation*.

Pretis, F., and Roser, M. (2014). *World CO2 Emission Intensity is Rising Contrary to IPCC Climate Scenarios*.

Walther, A. (2014). *“Jointly optimal regulation of bank capital and maturity structure”*, submitted to *Journal of Money, Credit and Banking*.

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## Complexity Economics

## Academic Publications

Arcaute, E., Hatna, E., Ferguson, P., Youn, H., Johansson, A. and Batty, M. (2013). *“City boundaries and the universality of scaling laws”*, arXiv:1301.1674.

Aymanns, Ch., and Farmer, J. D. (2014). *“Pro-cyclical leverage in a simple agent-based model”*, *Journal of Economic Dynamics and Control*.

Berton, F., Richiardi, M., and Sacchi S. (2014). *“Non-standard employment across occupations in Italy: the role of replaceability and labour market flexibility”*, in W. Eichhorst and P. Marx (eds), *Labour Market Change and Occupational Diversity*, Berlin.

Bettencourt, Luís M. A., Samaniego, Horacio, and Youn, H. *“Professional diversity and the productivity of cities”*, *Scientific Reports*, 4: 5393.

Caccioli, F., Bouchaud, J.-P., and Farmer, J. D. (2012). *“Impact-adjusted valuation and the criticality of leverage”*, *Risk*, 74–7.

Caccioli, F., Farmer, J. D., Foti, N., and Rockmore, D. (2014). *“How interbank lending amplifies overlapping portfolio contagion: a case study of the Austrian banking network”*, *Journal of Economic Dynamics and Control*, arXiv:1306.3704

Caccioli, F., Shreshtha, M., Moore, C., and Farmer, J. D. (2014). *“Stability analysis of financial contagion due to overlapping portfolios”*, *Journal of Banking and Finance*.

Cellai, D., López, E., Zhou, J., Gleeson, J. P., and Bianconi, G. (2013). *“Percolation in multiplex networks with overlap”*, *Physical Review E*, 88: 052811.

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Farmer, J. D., and Skouras, S. (2013). *“An ecological perspective on the future of computer trading”*, *Quantitative Finance*, 13(3): 325–46.

Finger, K., Fricke, D., and Lux, T. (2013). *On Assortative and Disassortative Mixing in Scale-Free Networks: The Case of Interbank Credit Networks*, Kiel Working Paper, 1830, Kiel Institute for the World Economy (submitted to *Journal of Economic Interaction and Coordination*).

Fricke, D., and Finger, K. (2014). *Tax Evasion in an Artificial Financial Market*, QBER Discussion Paper 01/2014.

Fricke, D., and Lux, T. (2014). *“Core-periphery structure in the overnight money market: evidence from the e-MID trading platform”*, *Computational Economics* (forthcoming)

Fricke, D., and Gerig, A. (2014). *Liquidity Risk, Speculative Trade, and the Optimal Latency of Financial Markets*, available online: SSRN.

Fricke, D., and Lux, T. (2013). *On the Distribution of Links in the Interbank Network: Evidence from the e-MID Overnight Money Market*, Kiel Working Paper 1819, Kiel Institute for the World Economy (submitted to *Empirical Economics*).

Fuentes, M. A., Gerig, A., and Vicente, J. (2012). *“Non-Gaussian price dynamics: derivative securities pricing and modelling”*.

Geanakoplos, J., Axtell, R., Farmer, J. D., Howitt, P., Conlee, B., Goldstein, J., Hendrey, M., Palmer, N., and Yang, Ch- Y. (2012). *“Getting at systemic risk via an agent-based model of the housing market”*, *American Economic Review: Papers and Proceedings*, 102(3): 53–8.

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Nagy, B., Farmer, J. D., Bui, Q. M., and Trancik, J. E. (2013). *“Statistical basis for predicting technological progress”*, *PLoS ONE*, 8(2): e52669.

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Presbitero, A., Richiardi, M., and Amighini, A. (2014, forthcoming). *“Is labor flexibility a substitute to offshoring? Evidence from Italian manufacturing”*, *International Economics*.

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## Working Papers

Amador, J., and Guerrero, O. (2014). *Networked Saving Behaviour and Poverty Traps*.

Bettencourt, L. M. A., Lobo, J., West, G. B., and Youn, H. (2013). "The hypothesis of urban scaling: formalization, implications, and challenges", arXiv:1301.5919.

Caccioli, F., Bouchaud, J.-P. and Farmer, J. D. (2013). "A proposal for impact-adjusted valuation: critical leverage and execution risk", submitted to *International Journal of Central Banking*.

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Gerig, A. (2012). "High-frequency trading synchronises prices in financial markets", arXiv:1211.1919.

Gerig, A., and Michayl, D. (2013). "Automated liquidity provision".

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Grazzini, J., and Richiardi M. (2014, forthcoming). "Consistent estimation of agent-based models by simulated minimum distance", *Journal of Economic Dynamics and Control*.

Guerrero, O., and Houser, D. (2014). "Search in networked economies: labour market efficiency through search externalities".

Guerrero, O., Lopez, E. and Axtell, R. (2014). "Labour dynamics mediated by labour flow networks".

Hamilton, M. J., Lobo, J., Rupley, E., West, G. B., and Youn, H. (2014). "The ecology and energetics of hunter-gatherer residential mobility".

Kito, T., Brintrup, A., New, S., and Reed-Tsochas, F. (2014). "The structure of the Toyota supply network: an empirical network analysis".

Krause, J., Reed-Tsochas, F., and Young, P. H. *The Emergence of Interbank Markets*, Saïd Business School working paper.

Myers, B., and Gerig, A., "Simulating the synchronising behaviour of high-frequency trading in multiple markets", arXiv:1311.4160.

Reed-Tsochas, F., Battiston, S., Fricke, D., and Rounky, T., (2014). "The ecology of the banking system".

Sabin, N., and Reed-Tsochas, F. (2014). *Structural Embeddedness and Economic Performance in Microfinance*, Saïd Business School working paper.

Salnikov, V., Schien, D., Youn, H., Lambiotte, R., and Gastner, M. (2013). "The geography and carbon footprint of mobile phone use in Cote d'Ivoire", arXiv:1308.3603.

Youn, H., Bettencourt, L. M. A., Lobo, J., Strumsky, D., and Samaniego, H. (2014). "The systematic structure and predictability of urban business diversity".

## Economics of Sustainability

### Academic Publications

Beinhocker, E., Hepburn, C., Farmer, D., and Teytelboym, A. (2014). "Resilient and inclusive prosperity within planetary boundaries", *China and World Economy*.

Bowen, A., and Hepburn, C. (2014) "Green growth", *Oxford Review of Economic Policy*, 30(3): 1–16.

Cole, M. J., Bailey, R. M., and New, M. G. (2014). "Tracking sustainable development with a national barometer for South Africa using a downscaled 'Safe and Just Space Framework'", *Proceedings of the National Academy of Science*.

Farmer, D., and Hepburn, C. (2014). "Less Precision, more truth: uncertainty in climate economics and macroprudential policy", *Bank of England interdisciplinary workshop*, 2 April.

Hahn, B., and Richards, K. (2013). "Understanding the effectiveness of environmental offset policies", *Journal of Regulatory Economics*, 44(1): 103–19.

Hahn, B., and Ritz, R. (2015). "Does the social cost of carbon matter: evidence from U.S. policy," *Journal of Legal Studies* (forthcoming).

Hamilton, K., and Hepburn, C. (2014). "Wealth", *Oxford Review of Economic Policy*, 30(1): 1–20.

Helm, D., and Hepburn, C. (eds.) (2014). *Nature in the Balance: The Economics of Biodiversity*, Oxford University Press.

Thomas, V., Albert, J. R. G., and Hepburn, C. (2014). "Contributors to the frequency of intense climate disasters in Asia Pacific countries", submitted to *Climatic Change*.

## Ethics and Economics

Vines, David A., and Morris, N. (eds) (2014). *Capital Failure: Rebuilding Trust in Financial Services*, Oxford University Press.

## Curriculum

Carlin, W., and Soskice, D. (forthcoming). "Macroeconomics: Institutions, Instability and the Financial System", Oxford University Press.

"The Economy", beta-test of online e-book <http://core-econ.org/the-core-curriculum/>





# Events

## 2012

- 1–2 Oct 2012 ESRC International Scientific Symposium on Macroeconomics
- Oct 2012 Foundations of Complexity Economics Workshop (Esalen, CA)
- Nov 2012 Rockefeller Risk & Resilience Workshop

## 2013

- 29 May 2013 Future of Finance Conference with Saïd Business School and Oxford Man Institute for Quantitative Finance
- July 2013 Risk, Behaviour and Regulation Workshop with Oxford Risk
- 7 Aug 2013 Inside the Black Box: Innovation and Technological Progress (SFI)
- 23 Sept 2013 International Agent Based Modelling Workshop
- 8 Oct 2013 Reflexivity Workshop – Central European University, Budapest
- 10 Oct 2013 Agent Based Modelling Workshop – INET Oxford, Eagle House, Oxford
- 14 Oct 2013 CRISIS at Work: explaining and managing financial–real interlinkages
- 18 Oct 2013 Nuffield Econometric/EMod Seminar: Generalised instrumental variable models; Professor Adam Rosen
- 25 Oct 2013 Nuffield Econometric/EMod Seminar: Discriminating between fractional integration and spurious long memory; Professor Niels Haldrup
- 1 Nov 2013 Nuffield Econometric/EMod Seminar: Classical Laplace estimation for inconsistent estimators: improved convergence rates, and rate–adaptive inference; Professor Sung Jae Jun
- 11 Nov 2013 INET CORE project workshop at HM Treasury: Teaching economics as if the last three decades had happened
- 11 Nov 2013 Nuffield Econometric/EMod Seminar: Efficient shrinkage in parametric models; Professor Bruce E. Hansen
- 18 Nov 2013 INET workshops: Extending the Economics of Innovation
- 25 Nov 2013 CRISIS Review Meeting – Brussels
- 29 Nov 2013 Nuffield Econometric/INET Seminar: Semi-parametric Bayesian Partially Identified Models Based on Support Function; Anna Simoni
- 3 Dec 2013 Oxford–Man Institute Seminar: Conditional Eurobonds and the Eurozone Sovereign Debt Crisis; John Muellbauer

## 2014

- 17 March 2014 Project CRISIS International Workshop
- 8 May 2014 Complexity and the Art of Public Policy: Solving Society's Problems from the Bottom Up; Roland Kupers, Eric Beinhocker
- 13 May 2014 Nuffield Econometric/INET Seminars: Forecasting Bond Excess Returns and Bond Yields; Daniel Thornton
- 16 May 2014 Nuffield Econometric/INET Seminars: Robust Nonparametric Confidence Intervals for Regression–Discontinuity Designs; Professor Matias Cattaneo
- 23 May 2014 Nuffield Econometric/INET Seminar: An Empirical Model of Network Formation with Heterogeneous Agents;

- Professor Bryan Graham
- 5 June 2014 "A New Agenda for Inclusive Growth"; Liam Byrne MP
- 6 June 2014 Nuffield Econometric/INET Seminars: Time–Varying Moments and Crisis Warning: A Master Equation Approach of the Birth–Death Process; Ping Chen
- 1 Sept 2014 Econometric Modelling Conference
- 3 Oct 2014 Oxford Seminar: Improving Employment in Europe: Opportunities and Constraints; Martin Seeleib–Kaiser, László Andor
- 8–10 Oct 2014 CRISIS Final Conference – Milan, Italy
- 13 Oct 2014 Employment, Equity and Growth Launch; Rob Johnson, Clive Cowdery, Brian Nolan, John Kay
- 15 Oct 2014 CRISIS Advisory Board Meeting, Bank of England
- 22 Oct 2014 Capital Failure: Rebuilding Trust in Financial Services – A debate with Nicholas Morris and David Vines

## INET Seminar Programme

### Trinity Term 2012

- **April**
- Professor Thomas Homer–Dixon Waterloo Institute for Complexity and Innovation, University of Waterloo "Catastrophic dehumanisation: the psychological dynamics of severe conflict"
- **May**
- Dr Anders Johansson The Systems Centre, University of Bristol "Multiscale human mobility"
- Dr Sandra Gonz ales–Bail n Oxford Internet Institute, University of Oxford "Broadcasters and hidden influentials in online protest diffusion"
- Dr Ross A Hammond Centre on Social Dynamics and Policy, Brookings Institution "Agent–based computational modelling and public health: progress and potential"
- **June**
- Dr Ken Khan Oxford University Computing Services "Agent–based modelling in education, public engagement, policy making, discussions, and research"

### Michaelmas Term 2012

- **September**
- Martha G. Alatr ste Contreras GREQAM
- **November**
- Dr Daniel Ladley Department of Economics, University of Leicester "Contagion and risk–sharing on the inter–bank market"
- Dr SangHoon Lee OCIAM, Mathematical Institute, University of Oxford "Exploring road networks with greedy navigators and their core–periphery structures"
- Dr Stuart Armstrong Future of Humanity Institute, University of Oxford
- "Anthropic probability and other puzzles affecting human survival"
- Professor Magda Fontana Department of Economics, University of Turin, Vilfredo
- Parteo Doctoral School – Economics and Complexity "Dimensions of change in economic thought: the Santa Fe Institute case"

### Hilary Term 2013

- **January**
- Dr Deborah Strumsky Department of Geography and Earth Sciences, University of North Carolina–Charlotte
- Dr Jose Lobo School of Sustainability, Arizona State University "Using data on patents to build and study technology spaces"
- Dr Ginestra Bianconi Department of Physics, Northeastern University "Dynamics of temporal social networks"
- **February**
- Dr Timo Ehrig Max Planck Institute for

- Mathematics in the Sciences"Inductive reasoning about novelties, and reflexive expectations formation"
- Professor Richard Wilson Department of Computer Sciences, University of York "Generative models of networks"
- Dr Stephen Kinsella Lecturer in Economics, University of Limerick "Agent based stock flow models"
- Professor H. Peyton Young Department of Economics, University of Oxford "How likely is contagion in financial networks"
- **March**
- Dr Stefan Thurner Centre for Medical Statistics, Informatics and Intelligent Systems, Section for Science of Complexity Systems, University of Vienna "How to use DebtRank to eliminate systemic risk in financial networks"
- Professor Giorgio Fagiolo Laboratory of Economics and Management, Sant'Anna School of Advanced Studies "Macroeconomic networks: trade, migration and finance"
- Dr Elizabeth Sawin Andrew Jones "En–ROADS: interactive experiments with a policymaker–oriented global energy and climate simulator" Climate Interactive

### Trinity Term 2013

- **April**
- Dr Thilo Gross Department of Engineering Mathematics, Merchant Ventures School of Engineering, University of Bristol "Analytical approaches to network dynamics"
- **May**
- Dr Mikko Kivel  OCIAM, Mathematical Institute, University of Oxford "Multiscale analysis of spreading in a large communication network"
- Tarik Roukny Visiting Researcher at Deutsche Bundesbank "Default cascades in complex networks: topology and systemic risk"
- Dr Matteo Richiardi Department of Economics and Statistics, University of Turin "Consistent estimation of agent–based models by simulated minimum distance"

### Michaelmas Term 2013

- **October**
- Dr Li Zheng Ping and Dr Tan Puay Siew, Singapore Institute of Manufacturing Technology "An investigation of random disruptions on supply chain performance and the development of techniques to mitigate demand variability".
- **November**
- Melanie E. Moses, Santa Fe Institute External Faculty "Evolving decentralised and scalable technology".
- **December**
- Imre Kondor, Parmenides Foundation "Expected Shortfall the new regulatory risk measure: merits shortcomings and remedy".

### Hilary Term 2014

- **February**
- Aaron Maniam, Blavatnik School of Government, University of Oxford "Managing complexity, managing in complexity Singapore's public policy experiences".
- Matthew Karlson, Department of Computing, University of Surrey "Understanding the effect of exemplars on technological paradigm formation".
- **March**
- Professor Mariana Mazzucato, Reginald M. Phillips Professor in the Economics of Innovation, SPRU, University of Sussex "The entrepreneurial state and the risk–reward relationship".
- Lorena Fricke, Dep. of Economics, Environmental, Resource and Ecological Economics University of Kiel "The Economic causes of regime shifts in marine ecosystems".
- Professor David H. Wolpert, Santa Fe Institute



“Statistical prediction of the outcome of a noncooperative game”.

- Professor David H. Wolpert, Santa Fe Institute – “Information geometry of influence diagrams and noncooperative games”.
- Professor Robert Ayres (Emeritus, INSEAD) “How black became gold”

## Hilary Term 2014

April

- Professor Steven Kimbrough, Wharton “Alternatives to ideal rationality”.

May

- “My first employee: the microfoundations of firm growth”; Dr Alex Coad
- Professor Janet C. Gornick, Director of LIS, Cross-National Data Center in Luxembourg “Introduction to LIS, Cross-National Data Center in Luxembourg: data, access, and research supporters and partners”.
- Professor Janet C. Gornick, Director of LIS, Cross-National Data Center in Luxembourg “Introduction to LIS, Cross-National Data Center in Luxembourg: data, access, and research supporters and partners”.

June

- “Dynamics among nations: the evolution of legitimacy and development in modern states”; Professor Hilton Root
- “Collective action, institutions, and self-governance”; Professor William Ferguson
- “Global liquidity as a leading indicator of financial crises”; Michael Howell & Hari Krishnan
- July
- “Evolution as computation”; John Mayfield
- September
- “Regime shifts in financial crises and in coupled systems”; Charlie Brummitt

## Michaelmas Term 2014

October

- 6 Oct 2014 How to Design the Policies that can Save the Planet; Hal Harvey
- 16 Oct 2014 “Transmission of global liquidity through capital flows”; Brenda Gonzalez-Hermosillo
- “Evaluating a gamble – a dynamics perspective”; Ole Peters
- “A flow-of-funds perspective on unconventional monetary policy”; Bernhard Winkler
- November
- 18 Nov 2014 Richard Foster

## CaBdyn/INET Seminar Series

## Trinity Term 2012

April

- Professor Thomas Homer-Dixon Waterloo Institute for Complexity and Innovation, University of Waterloo, Canada “Catastrophic dehumanization: the psychological dynamics of severe conflict”

May

- Dr Ross A Hammond Centre on Social Dynamics and Policy, Brookings Institution “Agent-based computational modelling and public health: progress and potential”
- Dr Sandra González-Bailón Oxford Internet Institute, University of Oxford “Broadcasters and hidden influencers in online protest diffusion”
- Dr Anders Johansson The Systems Centre, University of Bristol “Multi-scale human mobility”

June

- Dr Ken Kahn Oxford University Computing Services “Agent-based modelling in education, public engagement, policy making, discussions, and research”

## Michaelmas Term 2012

November

- Prof Magda Fontana Department of Economics University of Turin Vilfredo Pareto Doctoral School – Economics and Complexity “Dimensions of change in economic thought: the Santa Fe Institute case”
- Dr Stuart Armstrong Future of Humanity Institute, University of Oxford “Anthropic probability and other puzzles affecting the human survival”
- Dr SangHoon Lee OCIAM, Mathematical Institute, University of Oxford “Exploring road networks with greedy navigators and their core-periphery structures”
- Dr Daniel Ladley Department of Economics, University of Leicester “Contagion and risk-sharing on the inter-bank market”

## Hilary Term 2013

January

- Ginestra Bianconi Department of Physics, Northeastern University “Dynamics of temporal social networks”
- Deborah Strumsky Department of Geography and Earth Sciences, University of North Carolina-Charlotte
- Jose Lobo School of Sustainability, Arizona State University “Using data on patents to build and study technology spaces”

February

- H. Peyton Young Department of Economics, University of Oxford “How likely is contagion in financial networks?”
- Stephen Kinsella Kemmy Business School, University of Limerick “Agent-based models and stock flow consistent models: a coherent alternative?”
- Department of Computer Science, University of York “Generative models of networks”
- Timo Ehrig Max Planck Institute for Mathematics in the Sciences “Expectation formation: inductive reasoning about novel opportunities, and reflexivity”
- March
- Elizabeth Sawin & Andrew Jones Climate Interactive “En-ROADS: interactive experiments with a policy-maker-oriented global energy and climate simulator”
- Giorgio Fagiolo Laboratory of Economics and Management, Sant’Anna School of Advanced Studies “Macroeconomic networks: trade, migration and finance”
- Stefan Thurner Centre for Medical Statistics, Informatics and Intelligent Systems, Section for Science of Complexity Systems, University of Vienna “How to use DebtRank to eliminate systemic risk in financial networks”

## Trinity Term 2013

April

- Thilo Gross Department of Engineering Mathematics, Merchant Venturers School of Engineering, University of Bristol “Analytical approaches to network dynamics”
- Michael Chertkov Los Alamos National Laboratory “Getting a grip on the grid: physics in electrical power systems”

May

- Mikko Kivela Oxford Centre for Industrial and Applied Mathematics, Mathematical Institute, University of Oxford “Multiscale analysis of spreading in a large communication network”
- June
- Noshir Contractor Director of the Science of Networks in Communities (SONIC) Research Group, Northwestern University “Some Assembly Required: Organizing in the 21st Century”
- Daniel Fricke “Coping with the Complexity of Financial Markets”

## Michaelmas Term 2013

October

- Hyejin Youn “The hidden structure in urban economic complexity”
- Omar Guerrero “Labour flow networks and new ways of understanding labour markets”

November

- Eduardo López “Weighted projected networks: mapping hypergraphs to networks”
- Phillip Staniczenko “The ghost of nestedness in ecological networks”

December

- Rui Carvalho Research Fellow, School of Mathematical Sciences, Queen Mary, University of London
- “Resilience of natural gas networks during conflicts, crises and disruptions”

## Hilary Term 2014

January

- Felix Reed-Tsochas “Persistence of social signatures in human communication”
- Robert L Axtell “Agent-based computing in economics and other social sciences: prospects and opportunities”

February

- Sebastian Ahnert Royal Society University Research Fellow, TCM, Cavendish Laboratory, University of Cambridge “Compressible components reveal network architectures”
- Sofia Olhede Professor of Statistics, Honorary Professor of Computer Science, UCL
- “Network histograms and universality of blockmodel approximation”
- Kimmo Kaski Professor of Computational Science, Dean of Aalto School of Science, Supernumerary Fellow of Wolfson College “Computational sociology: studies of in vivo social networks”
- François Caron Marie Curie Research Fellow, Department of Statistics, Fellow of University College, University of Oxford Sparse random graphs with exchangeable point processes
- March
- Serguei Saavedra Postdoctoral Fellow, Integrative Ecology Group - Bascompte Lab, Estación Biológica de Doñana “The structural stability of complex ecological systems”
- Nimalan Arinaminpathy (Nim Pathy) Senior Lecturer in Population Biology, School of Public Health, Imperial College London “The role of networks and confidence in financial stability”

## Trinity Term 2014

May

- Austin Gerig Senior “High-frequency trading: what is it good for?”
- Stefano Battiston Department of Banking and Finance, University of Zurich “Systemic risk in financial networks”
- Henrik Jeldtoft Jensen & Eduardo Viegas Complexity & Networks Group, Department of Mathematics, Imperial College London “The economy seen as an evolutionary ecological system”
- June
- François Lafond “The evolution of knowledge systems”

## Michaelmas Term 2014

November

- Prasanna Gai “Global stores of value in a multipolar world”
- Matteo Richiardi “Partial identification in non-ergodic agent-based models”

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*Under the leadership of a group of distinguished scholars, the Oxford centre is bringing INET's vision into a myriad of important research themes including financial stability, resource sustainability, and growth and innovation. INET Oxford holds great promise to advance new economic thinking into influential conversations across the globe.*



**Robert Johnson**

*President, Institute for  
New Economic Thinking*

*INET Oxford was established in May 2012 as a result of a generous grant to the University of Oxford by the Institute for New Economic Thinking (INET).*

The Institute for New Economic Thinking ([www.ineteconomics.org](http://www.ineteconomics.org)) is a New York City-based research and education foundation whose mission is to broaden and accelerate the development of new economic thinking that will lead to real-world solutions to the key challenges of the 21st century. Created in response to the 2008 global financial crisis, the Institute is supporting a fundamental shift in economic ideas by funding innovative academic research, building communities of new economic thinkers, and spreading the word about the need for change. The Institute's co-founders are George Soros, William Janeway, and Jim Balsillie.

The Institute provides research grants, convenes conferences and leads a variety of research initiatives. It also collaborates with researchers at many leading universities. In addition to INET Oxford, the Institute has partnerships with: the Centre for International Governance Innovation (CIGI), Azim Premji University, the University of Cambridge, Central European University, the University of Copenhagen, the Fung Global Institute, the Fields Institute, the Kiel Institute for the World Economy, the New Economic School, Saint Petersburg State University, Tsinghua University, and the University of Southern California.

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