



LIMITS TO GROWTH AND FAILURES OF ECONOMIC POLICY

CLIMATE CHANGE AND THE FLORIDA KEYS

FACT SHEET 8

FKNMS/NOAA SOCIOECONOMIC RESEARCH AND MONITORING PROGRAM

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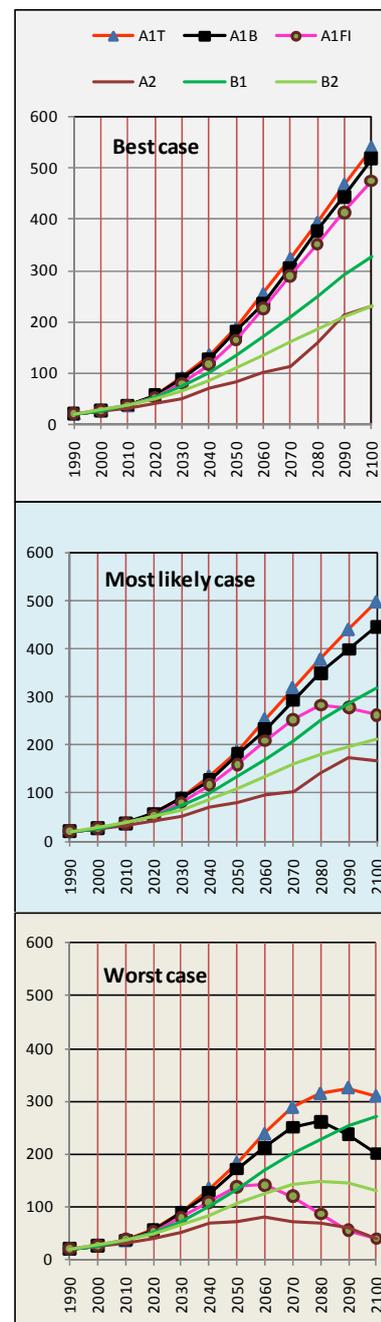
COULD GLOBAL GROWTH TURN NEGATIVE?

The global economy will face its greatest challenge if it insists on following a “business-as-usual” scenario, allowing greenhouse gases to continue to build up in atmosphere and ocean. The scientific evidence for this is overwhelming, and a growing number of economists who look beyond the immediate short term agree.

Current economic statistics suffer from the flaw that the main indicator of economic growth, Gross Domestic Product, does not incorporate the depletion of non-renewable resources that have taken millions of years to accumulate. Fossil fuels are the prime mineral example here, as well as being the prime cause of global warming.

Neither do the conventional statistics value the destruction of ecosystems such as coral reefs and rainforests, intensifying during the past decade according to climate scientists. It is admittedly very difficult to evaluate the environmental costs of economic activity, but ignoring them feeds an illusion among statisticians and those using their data that the world is a less hazardous place than it really is.

Many scientists, economists and social commentators have commented that a “business-as-usual” scenario could have terrible consequences for the global economy, but without quantifying what this might mean. This project includes a background paper that attempts to demonstrate for the first time how the projected global temperature rises may affect economic growth, measured in conventional GDP terms. The right-hand graph includes three variants of the global growth scenario A1: “T” for a full transition to renewable energy, “B” for a “balanced” mix, and “FI” if the world economy remains fossil-intensive.



IPCC's economic projections are highly optimistic for the three A1 variants, showing the global economic product growing to over \$500 trillion in 2100 (at constant 1990 prices). In the best global warming case, defined from projected greenhouse gas emissions in the Fourth Assessment Report, all three variants show strong growth. However, even in the most likely IPCC case, the fossil-intensive A1 variant causes global GDP to start declining from the late 21st century, if the assumptions in our model are even approximately correct.

In the worst case, derived from the IPCC projections, five of the six scenarios result in negative growth. *The exception is the global environmentally friendly B1 scenario*, which shows a relatively modest 18% reduction between the best and worst case. Of all the scenarios, B1 provides the best security through lower but less risky economic expansion towards a significantly richer world.

The experience during the first decade of the new century has been a tendency for worst cases to move closer to the center of the bell-shaped probability distribution, or for the bell curve to become flatter – the “fat tail” illustrated in Fact Sheet 2. This reinforces the case for sustainable economic growth – fitting the economy within the limits of the environment.

ECONOMICS OF CLIMATE CHANGE

Economists refer to *market failure* when the main coordinating mechanism in a market – prices – sends the wrong signals. Without policy intervention too much of these goods will be produced and consumed. Market failures can occur as an *externality* when someone's action directly affects the prospects of others, like when the atmosphere is treated as a free *public good*. Greenhouse gas emissions are clearly a market failure because the actions of those producing them are paid for by everyone else.

Nicholas Stern's study of the economics of climate change in 2006 filled a gap in economic theory. He saw climate change as the greatest market failure ever, in the sense that producers could contaminate the atmosphere at no cost to themselves. Prices of petrol or aluminum produced with dirty energy do not reflect the true cost to society of producing and using these goods. Without putting a price on greenhouse gas emissions the price structure becomes distorted. Stern has said in a subsequent publication: “By producing and consuming less of these products and more of others, we create economic gains that can make everyone better off. Markets with uncorrected failures lead to inefficiency and waste.”

There is a strong ethical element in Stern's economics. He and most other economists advocate using a low discount factor in favor of future generations, while recognizing that there is a competing concern for the inequities in the present world.

ANIMAL SPIRITS

The economics of John Maynard Keynes, who wrote his *General Theory* in 1936, has greatly assisted 20th century growth though it lost influence to so-called neoclassical economic theory, especially since the late 1970s. Crudely expressed, the latter taught that the market was right and should be allowed as much freedom as possible.

The current global financial crisis has caused a reappraisal. Chapter 12 of the *General Theory* acknowledged that the stock market in particular behaved less than “rationally”. Keynes

talked about “animal spirits” that should be managed to prevent excesses. This was taken up by Nobel Prize winning economist George Akerlof and Yale professor Robert Shiller who describe how “animal spirits” such as confidence, fear, bad faith, corruption, a concern for fairness and the stories we tell ourselves about our economic fortunes, replace the “rational” expectations of neoclassical economics. Animal spirits contributed in a major sense to the severity of the current crisis, and the reality of irrational markets should be reinstated in economic theory in the effort to provide adequate guidance to policy makers.

SANTA FE COMPLEXITY THEORY

Comparing complexity economics and traditional economics
1 System is open, dynamic, and nonlinear, not closed and static
2 Agents are diverse, not "rational economic", individuals
3 Networks are through real and changing relations between individuals, not through indirect abstract market mechanisms
4 No distinction between micro and macro economics, as in traditional economics
5 The evolutionary process of differentiation, selection and amplification provides the system with novelty and is responsible for its growth in order and complexity. Traditional: no mechanism for endogenously created novelty, nor growth in order and complexity
6 Technology is an integral (endogenous) part of the system (Schumpeter), not given from outside
7 Formulation of preferences becomes central; individuals are not necessarily selfish. In traditional economics preferences are given and individuals selfish
8 Based on biology (fluid structure, pattern, self-organized) not 19 th century physics (equilibrium, stability, comparing static stages rather than dynamic change)
9 Based on patterns and possibilities rather than price and quantity

From Figure 5, Background paper 3.

Economic theory is also being influenced by other sciences. The New Mexico-based Santa Fe Institute was founded by a group of eminent physical and social scientists in 1984. The new complexity economics which has emerged is compared with conventional economic theory in the left-hand figure.

The attempt to arrive at a more realistic model of human behavior and interaction is a major enhancement of current economics.

The restoration of technology as an integral part of the economic system, rather than an external influence, is another new feature that is

highly relevant for the emerging environmentally inspired economic model. It was advocated by Joseph Schumpeter as early as 1914 but was lost for many decades to the conventional economic model. Schumpeter’s ideas have been an important influence on the development of a framework for understanding the nature of technology itself, as discussed in Fact Sheet 9.

ECONOMICS AND THE FLORIDA KEYS

The new concepts of economics have profound implications for prospects at the local level of the Keys. It is implicit in the scenarios where the best hopes lie in the adoption of environmentally friendly policies rather than “business-as-usual”. The latter is likely to be guided by the type of “neo-classical” economic policies that emerged in the second half of the 20th century.

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Further reading:

Climate Change and the Florida Keys, Chapter 2 (Global Change). For the four main scenario storylines, see Chapter 8.

Background papers 2 (*Limits to economic growth*) and 3 (*The changing economic paradigm*).

George Akerlof and Robert Shiller (2009), *Animal Spirits: How human psychology drives the economy, and why it matters for global capitalism*. Princeton University Press.

John Maynard Keynes (1936), *The General Theory of Employment, Interest and Money*. Macmillan & Co Ltd, London. Especially Chapter 12, 147-164, 'The state of long-term expectation.'

Mark Lynas (2008), *Six Degrees: Our future on a hotter planet*. National Geographic, Washington, DC. (Originally published in Great Britain in 2007.)

Nicholas Stern, (2009), *A Blueprint for a Safer Planet: How to manage climate change and create a new era of progress and prosperity*. The Bodley Head, London.

Joseph Stiglitz, Amartya Sen and Jean-Paul Fitoussi (2009), *Report by the Commission on the Measurement of Economic Performance and Social Progress*. http://www.stiglitz-sen-fitoussi.fr/documents/rapport_anglais.pdf.

Pictured: Sunset over Grassy Key (HHG 2009)