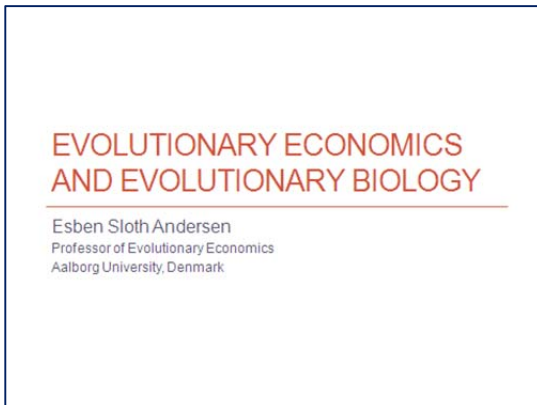


Evolutionary Economics and Evolutionary Biology

Esben Sloth Andersen, Aalborg University

Invited speech for the Outreach Symposium at the 13th Congress of the European Society for Evolutionary Biology, Tübingen 22 August 2011

1. Introduction

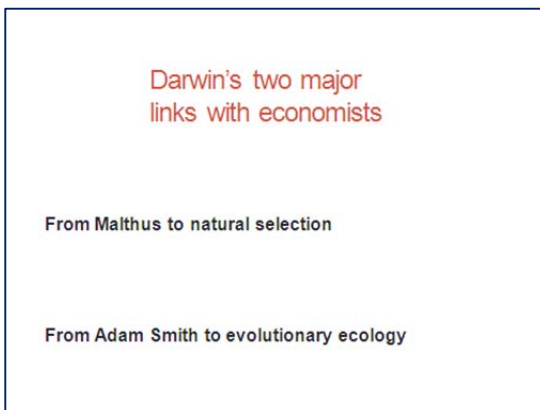


As a representative of evolutionary economics, I am very happy to contribute to this conference on the frontiers of the much more well-established evolutionary biology.



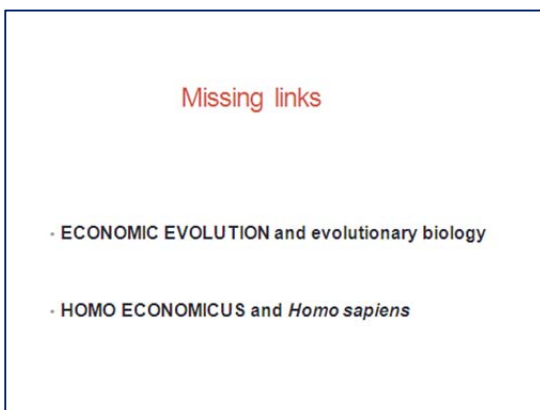
I am especially happy of attending the 13th biannual congress of a society that publishes the *Journal of Evolutionary Biology* and awards the John Maynard Smith Prize since I was last year responsible for the 13th biannual congress of a society that publishes the *Journal of Evolutionary Economics* and awards the Joseph Schumpeter Prize. But my task is to introduce you to the broad aspects of evolutionary economics, and I will try to make my presentation easily comprehensible for you by considering some major links between economics and biology.

2. Darwin, economics, and evolutionary economics



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It is well known that Darwin's theory of natural selection was inspired by the population theory of the economist Robert Malthus. It is less known that Darwin apparently used Adam Smith's theory of economic evolution through the division of labour between the different branches of industry to develop his understanding of how different species fill out the "economy of nature" by evolutionary radiation and convergence. Darwin might also have got a few other ideas from economists, but it seems clear that there are many more possibilities of linking between economics and biology.



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Adam Smith can be described as the founding father of two fields of study. On the one hand, he developed a theory of gradual economic evolution through the increasing specialisation and technological refinement of different industries under competitive conditions. On the other hand, he founded the non-evolutionary analysis of the functioning of economic systems in a model of Homo Economicus, the *individual* Rational Economic Man who optimizes the use of given economic resources. These two fields of study have shown up to be incompatible. A fully informed Homo Economicus finds solutions immediately rather than through an evolutionary process. As a result most economists for a very long time ignored the study of economic evolution, but recently an alternative have become ever more popular. This is to develop realistic models of the economically relevant aspects of the capabilities and behaviour of *Homo sapiens*. This is, however, only a first step. The next step is to develop the analysis of the surprisingly complex phenomenon of economic evolution. Here evolutionary economics has got much help from evolutionary biology. Although

economic evolution is radically different from biological evolution, some sort of modest “Generalised Darwinism” has helped evolutionary economics.

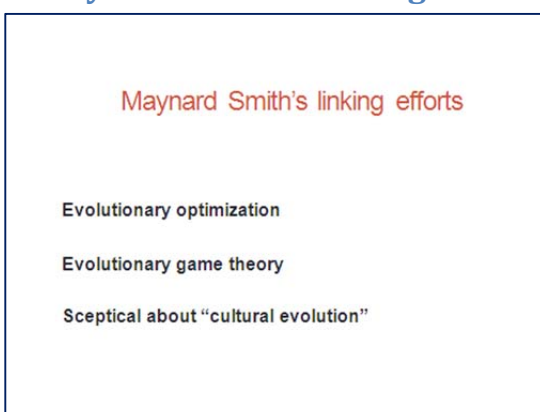
3. A short history of evolutionary economics



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Economists from Adam Smith to Joseph Schumpeter were pragmatic and analysed economic evolution informally and sometimes sloppily. In the case of Schumpeter the reason was not that he wished to avoid clarity, but he simply lacked the necessary analytical tools for handling the process of economic evolution. This *old* type of evolutionary economics was crowded out by formal models of optimization that no room for an evolutionary process. But the “dark ages” for evolutionary economics [1930-1970] was also a period of rapid progress in non-evolutionary economics. Economists became accustomed to high degrees of analytical clarity, so it was not by chance that a *new* evolutionary economics imported many more or less formalised ideas from evolutionary biology. The early highlights were evolutionary game theory and Schumpeterian models of economic evolution implemented by means of computer simulation. Later the new evolutionary economics has branched in many directions that include applied studies in organisation science, finance, industrial dynamics, economic geography, economic development studies, and environmental economics.

4. Maynard Smith’s linking efforts

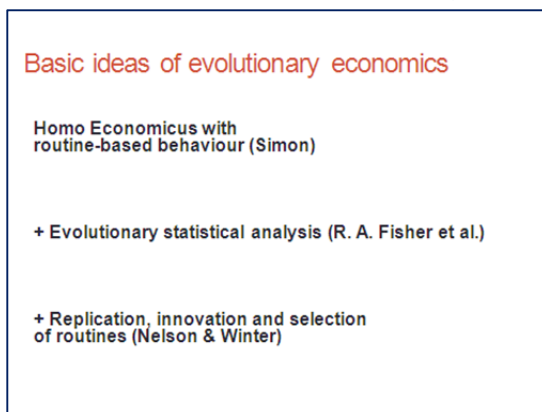


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To understand the efforts of evolutionary economists, it is helpful to consider John Maynard Smith’s creative application of economic concepts within evolutionary biology [at a time when the

unrealistic version of Homo Economicus was still predominant]. To analyse biological adaptations as results of evolutionary optimization, he had to reinterpret the mathematical models of the optimizing Homo Economicus. Some critics have argued that this analysis of adaptations leads to the Panglossian view of super-optimization in the best possible world, but both Maynard Smith and evolutionary economists have demonstrated that we can convincingly analyse optimization that is heavily constrained by the characteristics of evolutionary processes. However, among economists Maynard Smith is mostly known for developing game theory. Classical game theory was developed by economists who built on the rational Homo Economicus, but Maynard Smith simply dropped this assumption and developed evolutionary game theory with wide-ranging consequences for evolutionary economics. Economists might also embrace his scepticism about the idea of “cultural evolution” while they stick to the idea of economic evolution because economic life is characterised by significant degrees of replicability and therefore also of an operational concept of innovation.

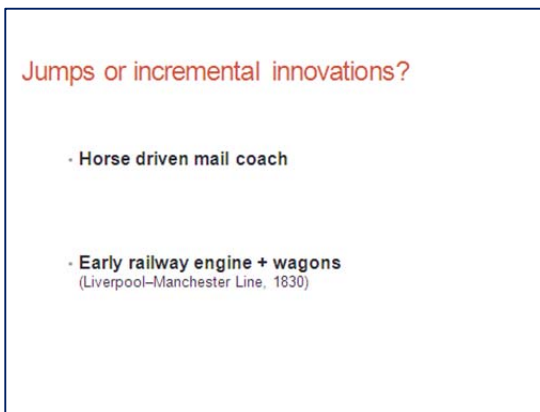
5. Basic ideas of evolutionary economics



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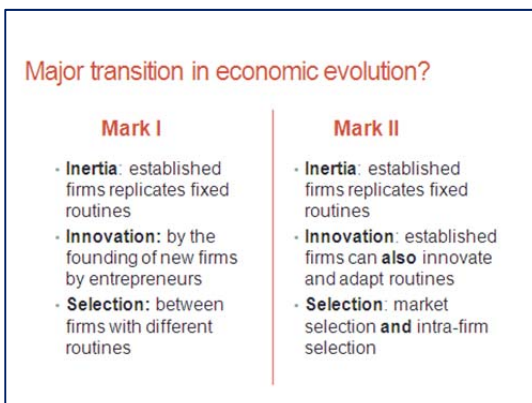
The exact replication of economic activities is enforced by the need for obtaining economies of scale and by the expectations of the customers. We can also – with the Nobel laureate Herbert Simon – say that economic activities become routine-based and that the functioning of complex economic systems is critically dependent on a high degree of routinisation. This routinisation provides the well-defined background for recognising and evaluating innovations – both for customers and for would be innovators. It also eases the collection of evolutionary statistics and the analysis of these statistics. Actually, evolutionary economists have clarified fundamental connections between the evolving mean, the variance and covariance – and only later found realised that these connections had already been explored by evolutionary biologists like R. A. Fisher and George Price. But they have also recognised specific characteristics of economic evolution, not least that evolution is not only driven by selection but also by directional innovation and adaptation. Thereby it has become clear that the applications of common tools of evolutionary analysis can lead to results that are very different from those of evolutionary biology. Nelson and Winter’s pioneering simulation models of evolutionary dynamics have also served to demonstrate a large number of specific patterns of economic evolution.

6. Some basic issues of evolutionary economics



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Schumpeter's favourite example of economic evolution was the replacement of horse-driven mail-coaches by railways in the nineteenth century. He provocatively used this example to reject the evolutionary gradualism that was preferred by most evolutionary economists. However, Schumpeter's innovative jumps are not like Goldsmith's "Hopeful Monsters", which are rightly rejected by evolutionary biology. They are instead radical innovations that define the agenda and selection pressures for a trajectory of incremental innovations. And that is obvious when we compare the early railways with the later ones.



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The functions of radical and incremental innovations have been analysed by means of two very different Schumpeterian models- The Mark I model describes an evolutionary process in which established firms are conservative replicators and are in the long run replaced by new innovation-based firms – like when mail-coach firms are replaced by railway companies. In contrast, the Mark II model describes established firms as combining two activities. On the one hand, they replicate given routines. On the other hand, they engage in innovative moves and counter-moves – like those of competing railway companies. But Schumpeter also considered Mark I and Mark II as representing what Maynard Smith has called a major transition in evolution. This transition largely took place in the first decades of the twentieth century when Mark II became the dominant force of economic evolution. Another major transition had taken place a few centuries earlier when credit-based firms replaced artisan workshops. Like in biology, such transitions tend to accelerate the evolutionary process, and the present speed is astonishing.

Socio-economic coevolution?

ECONOMIC EVOLUTION

- + Scientific evolution?
- + Political evolution?
- + Family-sector evolution?

The speed of economic evolution in different kinds of capitalist economies have for five hundred years put heavy pressures on the other sectors of society. Schumpeter suggested that these interactions can be analysed in terms of asymmetric coevolution. Present-day evolutionary economists are more sceptical. Although there are theories of the evolutionary process within science, it seems premature to study systematically the coevolution of the economic and science systems. And it is still unclear whether the political system and the family-sector system can be adequately analysed by evolutionary models. However, this is a question for the other participants in this outreach symposium! I will simply conclude that the old-style evolutionary economists like Adam Smith and Joseph Schumpeter defined a wider research agenda that the one new evolutionary economics is presently able to cope with!