DRAFT

We are here tonight to talk about economics, so I guess everyone here either is an economist or has an interest in the subject. Well, you are in for a pretty boring time if you haven't.

I want to start off by being very positive about economics. At conferences, I come into contact with a wide range of people from other disciplines. For example, anthropologists, sociologists, physicists, mathematicians, control engineers, computer scientists. These are all conferences on social, economic and cultural topics, so there is a lot going on outside of economics itself.

But economics has one great insight which none of these other disciplines has, and without which many clever people struggle to understand events. I am talking about the role of incentives, and the fact that agents respond to incentives. I think it is this insight above all else which distinguishes economics from other disciplines. And it is something which I think should be taught much more widely, many more students in all disciplines should be exposed to this.

Of course, to say this does not mean that agents respond rationally, and economics has a lot to learn from other disciplines about this. But I'm going to come back to this point later.

I think that a serious problem with the way much economics is taught is that theorems are presented as if – that's one of our favourite phrases, as if, so I can't resist getting a mention of it in early – as if they had the same standing as, say, propositions in engineering textbooks. This is very far from being the case. Economics is much more a way of thinking about the world than learning about undisputed, scientifically settled theorems.

Here is what Clive Granger, Nobel Prize winner in 2003, has to say about it: 'I think it is true to say that I am not the first Nobel Prize winner in economics to have little formal training in economics. I wonder if economics has less basic core material than is necessary for fields such as mathematics, physics, or chemistry, say.… Economic theory does seem to maintain common concepts and features but these may be quite simplistic and are not necessarily realistic.'

What I would like to do in fact is to look a bit more closely at the work of those who have been awarded the Nobel Prize in the 21st century. Most of which of course is based on their output in

the closing decades of the 20th century. Here, I suggest, is the basis for a more eclectic, wider ranging syllabus for economics students now. We should be teaching them about the very best ideas in our discipline, the ones which will shape its future. I am not offering a detailed prescription, but a sketch of a wider ranging set of ideas to be explored by students. Some are already part of the standard curriculum, others are not.

I am fundamentally in agreement with Hayek when he wrote: 'an economist who is only an economist cannot be a good economist'.

Let's go back to 2000 and the micro econometricians Heckman and McFadden. Quite rightly, their statistical techniques are taught. But what about the implications of their work? Here is Heckman in his Prize lecture: 'an important empirical regularity is the diversity and heterogeneity of behaviour'. Let me repeat this for emphasis: 'an important empirical regularity is the diversity and heterogeneity of behaviour'. So why are we still bothering to teach models in which the behaviour of the whole economy is reduced to that of a single 'representative agent'. Theoretical critiques of this are widespread, I might mention Alan Kirman's brilliant article in the 1989 *Economic Journal* about the Emperor's new clothes. But here is decisive empirical evidence on the pervasiveness of heterogeneity amongst agents.

All theories, even quantum mechanics, are of course approximations to reality. The question is always: how good are these approximations? And are we making the right simplifications. In terms of the representative agent, the evidence rejects the approximation decisively, and we should stop teaching it. Chemists stopped teaching their students about phlogiston over a century ago.

In 2001, we have Akerlof, Stiglitz and Spence. Their work on asymmetric information and bounded rationality goes back almost 40 years and, quite properly, is an important part of current teaching. But Akerlof and Stiglitz in particular have moved even further towards a rejection of rational agent models, think for example of Akerlof.....

Daniel Kahneman and Vernon Smith shared the prize in 2002, for their work in psychology and experimental economics. Kahneman's summary of the entire corpus of this empirical work is: 'humans reason poorly and act intuitively'. An empirical vindication of Herb Simon's view expressed in the 1950s of how agents actually behave.

We cannot ignore this evidence. We should be teaching much more about empirical evidence on agent behaviour from the discipline of psychology instead of insisting on a single approach which is everywhere applicable or whose assumptions can only be 'relaxed' at a later stage. As Vernon Smith said in his lecture: 'Within economics there is essentially only one model to be adapted to every application: optimization subject to constraints due to resource limitations, institutional rules and /or the behavior of others, as in Cournot-Nash equilibria'.

I am not saying that the standard model should not be taught at all. There will be circumstances in which its assumptions are a sufficiently reasonable approximation to reality. But we need to recognize explicitly that this is just one possible candidate model of how agents behave. The empirical evidence suggests very clearly that it is a special and not the general case.

It might be objected, indeed it *is* objected, that the standard model enables analytical results to be obtained, which is not necessarily the case with more realistic alternative models of agent behavior. Further, how do we know which one to use?

This brings me back to the fundamental points that, first, economics is a way of thinking about the world and not a set of theorems. Second, it must be empirically based. We must be teaching students to think about the appropriate assumptions on agent behavior in different contexts.

The personal computer frees us from the constraints of requiring analytical results in order to understand the implications of a hypothesis. Thirty years ago, this was a reasonable, indeed almost the only, way to proceed. But now, agent based models can be readily programmed and their implications explored using simulation techniques. There is an explosion of interest in this methodology in other disciplines, and economics risks getting left behind. We should be

teaching the methodologies of simulation and agent based modeling to equip our students for the 21st century.

Let me move back to the Nobel Prize winners. I've already mentioned the 2000-2003 ones. 2004, Kydland and Prescott. Well, anyone can make a mistake. I just note in this context that when the American authorities saved the world in September 2008, they didn't do so by consulting rational expectations and dynamic stochastic general equilibrium models. They acted, in conditions of great uncertainty, relying to a large extent on the economic history of the 1930s and hoping that it had something to teach them.

I've only got time to mention two more, though Elinor Olstrom's recent award emphasizes the crucial need to broaden the curriculum, some knowledge of anthropology seems important for economists. But here is Edmund Phelps, 2006 winner: 'After some neoclassical years at the start of my career I began building models that address modern phenomena. At Yale and at RAND, in part through my teachers William Fellner and Thomas Schelling, I gained some familiarity with the concepts of Knightian uncertainty, Keynesian probabilities, Hayek's private know-how and M. Polyáni's personal knowledge.' Here is a whole syllabus in a single sentence! Surely following the financial crisis, we need, for example, to be teaching about Frank Knight's uncertainty as well as how to solve the Black-Scholes model

Phelps mentions Thomas Schelling, 2005 winner and a great polymath. One of his most brilliant papers was on segregation, how strong residential segregation on racial lines can emerge even though no single agent has a preference for this. In other papers at around the same time he introduced the idea of 'binary choice with externalities'. Agents are connected on a network. They have a 0,1 choice, buy or not buy, move or stay put. Their tastes and preferences are not fixed but can be altered by the behavior of other agents to which an agent is connected. Agents are heterogeneous in their willingness to be persuaded by others. They observe the behavior of the agents to which they are connected, and if the proportion making a different choice to them exceeds their personal threshold, they switch.

This is the one point I think it is essential to teach students. Tastes and preferences are in general not fixed, but can be altered by the behavior of others, not just indirectly via the price mechanism, but directly. We have only to look at the modern world to see how pervasive this phenomenon is. As a result, for example, market demand and supply functions become non-additive.

In the past 10 to 15 years there has been an explosion of work in other disciplines, physics, mathematical sociology, computer science, anthropology, on social networks, both in theory and in practice. And in particular on how cascades of behavior either spread or are contained across such networks. Economists in general have only the haziest idea, if they have heard of it at all, about such work. Yet it is fundamental to understanding how the modern social and economic world works.

It is essential that economics students are familiarized with this work, along with the techniques of simulation and agent based modeling.

There is certainly a place for the standard model, but as I say as a special and not a general case. Above all, we need a broader curriculum, in which are not afraid to borrow from other disciplines. More eclectic, less dogmatic, based more on empirics than on *a priori* assumptions.