

write a textbook. He told to assemble the exams and problem sets that you want the students to be able to solve by the time they had finished the course, and then write the book that would show them how to solve them. In general, I have tried to follow this advice, with, I think, some success.

Economics is amenable to experimental verification

Because neoclassical economic models enables one to compute answers to problems, it is possible to compare the answers you get with the outcomes of controlled experiments. In my view, experimental economics has been one of the great success stories of the last 20 years. We now have rigorous ways to test models of human behavior in the laboratory. Some standard models, such as supply and demand, have turned out to be much more robust than we would have thought 20 years ago. Other models, such as expected utility, have turned out to be less robust.

But this is to be expected---if there were no surprises from experiments, they wouldn't be worth doing. The growth of experimental economics has led many theorists to construct theories that simple, concrete and testable, rather than theories that are complex, abstract, and general. And experience in observing human subjects in the laboratory has no doubt contributed to the current emphasis on investigating models of learning. Laboratory observations have also been instrumental in alerting us to theoretical dead ends, such as some of the more convoluted refinements of game-theoretic equilibrium concepts.

I expect that the interaction between theory and experimentation will continue to grow in the future. As economists become more comfortable with experimentation in the laboratory, they will also become better at identifying "natural experiments" in real-world data. Such developments can only lead to better models of economic behavior.

6. Summary

I have argued that in order to why economic theorists behave in the way they do one has to understand how economic theory is used in policy analysis. The fact that economics is fundamentally a policy science allows one to explain many aspects of economic theory that are quite mysterious otherwise.

I then described a number of ways that economic theory contributes to the analysis of economic policy. No doubt there are many more ways that I haven't thought of yet; perhaps the readers of this essay will help me in this task.

of milk since farmers will have to increase output to maintain the same income. The second effect *sounds* like it might be possible---after all, farmers wouldn't advance the claim unless it had some plausibility. However, theory shows us that this particular claim cannot be true if the farmers attempt to maximize profits.

Strategic interactions are a good source of counterintuitive results. A simple analysis of a two-person zero-sum game shows that improving your backhand in tennis may lead to your using it less often.

It would seem that a public offer to match any competitor's price is a sign of a highly competitive market. But when you think about the problem facing a cartel it is not so obvious. The prime problem facing a cartel is how to detect cheating on the agreed-upon prices and quotas. Offering to match a competitor's price is a cheap way to gain information about what your competitors are doing. What appears to be a highly competitive tactic can easily be viewed as a device to support collusion.

Theory allows for quantification and calculation

According to Lord Kelvin, "When you cannot measure it, when you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind."

Theoretical economics gives us a framework to calculate and quantify economic relations. Consider the Laffer curve mentioned above. Laffer gave the existence proof, but it took some theoretical calculations to see what magnitudes were important.

In fact, one of the major differences between economics and the other social sciences is that in economics you can *compute*. There is very little computation in sociology, political science, history or anthropology. But economics is filled with computation.

Economic theory is useful since you can use it to compute answers to problems. They aren't always the *right* answers---that depends on whether the model you have is right. (Or, at least, whether it is good enough for the purposes at hand.) But a desideratum of a good model is that you can compute with it: the model can be *solved* to determine some variables as a function of other variables.

In my view, it is impossible to learn economic theory without solving lots of problems. Richard Hamming, a highly prolific electrical engineer, once gave me some excellent advice about how to

Theory is an antidote to introspection

Most people get their economic beliefs from introspection and their personal experience---the same place that they get their beliefs about most things. Economic theory---and indeed science in general, can serve as an antidote to this kind of introspection.

Consider, for example, the widely held belief that all demand curves are perfectly inelastic. If the price of gasoline increases by 25%, a layman will argue that no one will change their demand for gasoline. He bases this argument on the fact that *he* would not change his demand for gasoline.

Indeed, it is perfectly possible that *most* people wouldn't change their demand for gasoline. . . but some would. There are always some people at the margin; these people would change their demand. At any one time, most people are inframarginal in most of their economic decisions. The marginal decisions are the ones that you agonize over. If the price were a little higher or a little lower, the results of your agonizing might be different, and this is what causes the aggregate demand curve to slope downward.

Another nice example of this phenomenon is free trade. It's hard to convince a layman of the advantages of free trade since it is easy to see where the dollars go, but difficult to see where they come from. People have personal experience with imports of foreign goods of foreign goods; but they rarely encounter their own country's exports unless they travel abroad extensively. Only by abstracting from introspection can we see the total picture.

A third example is the bias in perceptions of inflation: price moves are perceived to be exogenous from the viewpoint of the individual, but wage movements are personalized. Even if prices and wages move up by the same amount, people may *feel* worse off since they think that they would have gotten the wage increases anyway.

Verifying that something is obvious may show that it isn't

One of the criticisms that economists have to deal with is that they spend a lot of time belaboring the obvious. Isn't it obvious that demand curves slope down and supply curves slope up? But many theories that seem to be obvious turn out not to be. It may be obvious that demand curves slope down---but as the theoretical analysis shows, it is possible to have demand curves that don't.

Economic theory shows that a profit-maximizing firm will decrease its supply when the output price decreases. But farmers often claim that removing milk price supports will increase the supply

up by the same amount due to the subsidy on interest payments. This is a simple insight, but it would be very difficult to understand without a model of the functioning of the market for loans.

A theory that is wrong can still yield insight

Pure competition is certainly a “wrong” theory many markets; pure monopoly is a wrong theory for other markets. But each of these theories can be very useful for yielding significant insights for how a particular market functions. No theory in economics is ever exactly true. The important question is not whether or not a theory is true but whether it offers a useful insight in explaining an economic phenomenon.

In my undergraduate textbook I examine a very simple model of conversion of apartments to condominiums. One result of the model is that converting an apartment to a condominium has no effect on the price of the remaining apartments---since demand and supply each contract by one apartment.

This result can hardly be thought of as literally “true.” There are a host of reasons why converting an apartment to a condominium might influence the rent of remaining apartments. Nevertheless, it focusses our attention on a crucial feature of such conversions: they affect both the supply *and the demand* for apartments. The simple supply-demand framework shows us how to start thinking about the impact of condominium conversion on apartment prices.

Theory provides a method for solving problems

I take the method of neoclassical microeconomics to be 1) examine an individual’s optimization problem; 2) look at the optimal equilibrium configuration of individual choices; 3) see how the equilibrium changes as policy variables change.

This methods doesn’t always work---the models of behavior or equilibrium may be wrong. Or it may be that the specific phenomenon under examination is not fruitfully viewed as an outcome of optimizing, and/or equilibrium behavior. But any method is better than none. In the words of Roger Bacon: “More truth arises through error than confusion.”

Methodological individualism is a limited way of looking at the world, no question about it. It probably doesn’t do very well in describing phenomenon such as riots or class loyalty. Certainly this sort of individualistic methodology works better for describing some sorts of behavior than others. But it is likely to add insight to *all* problems.

something, then we can get an idea of what is being optimized by looking at agents' choices. This objective function can then be used as an input to making policy decisions. In some cases, one may need a quantitative estimate of the objective function. In other cases, one may want to show that one kind of market structure, or tax structure, may do a better job of satisfying consumers' objectives than another. But the basic framework of moving from individual objectives, to individual choice, to social objectives and social choice is common to many, many economic studies.

Theory helps relate seemingly disparate problems

If one describes a model in a purely mathematical way, it often happens that the underlying equations will describe a rich set of economic phenomena. The classic example of this phenomenon is the Arrow-Debreu general equilibrium model. The concept of "good" can be interpreted as a physical commodity available at different times, locations, or states of nature. One theoretical model can thereby provide a model of intertemporal trade, location, and uncertainty.

Another example from general equilibrium theory is the First Welfare Theorem. This result shows the intimate relationship between the apparently distinct problems of equilibrium and efficiency.

A third example is that a formal analysis of the problem of second-degree price discrimination shows that it is equivalent to the design of an auction or the determination of optimal provision of qualities. Quality discrimination, auction design, and nonlinear price discrimination are essentially the same sort of problem.

Each of these insights came from examining an abstract theory. Once the the "irrelevant" details are stripped away, it becomes apparent that the same essential choice problem is involved.

Generating insights

Let me illustrate this role of economic theory with an example. In the U.S. most interest receipts are taxable income, but many kinds of interest payments are tax deductible. This policy has been criticized as "subsidizing borrowing." Does it?

The answer depends on the tax brackets of the marginal borrowers and lenders. If the tax brackets are the same, for example, the policy has no effect at all on the equilibrium after-tax interest rate. The supply curve tilts up due to the tax on interest income, but the demand curve tilts

The Laffer analysis demonstrates both good and bad economic theory. The bad theory is that inference that because the Laffer effect *can* occur it *does* occur. The good theory is that we can use simple supply and demand analysis to determine what magnitudes the elasticity parameters have to be for the Laffer effect to occur. We can then compare the magnitudes of estimated elasticities to estimated labor supply elasticities. In the simplest model a marginal tax rate of 50% requires a labor supply elasticity of 1 to get the Laffer effect. The theory tells us what the relevant parameters are; without the theory, one would have no idea of the relevant parameters are. Indeed, if one examines the rather sordid history of the use of the Laffer curve in public policy debates in the U.S. this becomes painfully clear.

For another example, consider the theory of investment in risky assets. I take it as given that risk is a “bad.” Therefore when wealth goes up, people may want to purchase less of it. On other hand, you can afford to bear more risk when you have more wealth. So an argument based on intuition alone shows that investment in a risky asset can go up or down when wealth increases. A systematic theoretical analysis shows what the comparative statics sign depends on: how risk aversion changes with wealth. So the risk aversion parameter is the one you want to estimate in order to predict how investment in risky assets changes with wealth. Conversely how investment changes with wealth tells you something about how risk aversion changes with wealth.

Theory helps keep track of benefits and costs

I indicated above that the sorts of optimizing models used by economists serve the purpose of providing guidance for policy choices. Indeed one of the important roles of economic theory is to keep track of benefits and costs. The idea of opportunity cost is a fundamental one in economics, and would be very difficult to use without a theoretical model of economic linkages.

This brings up the important point that the correct way to measure an economic benefit or cost can only be determined in light of a theoretical model of choice: a specification of what objectives and the constraints facing an economic agent.

Consider for example, the practice of computing present value or risk adjusted rates of return. These computations are only meaningful in light of a model of choice behavior. If the model of behavior does not apply, the policy prescription cannot apply either.

Benefit-cost analysis is only one small field of economics. But the *idea* behind benefit-cost analysis permeates all of economics. If economic agents are making choices to maximize

how the person chose previously---that is, we would just use brute induction. And we know why induction works---it has always worked in the past!

But we rarely observe all possible choices; typically we observe only a few of the possible choices. Theory allows us to *interpolate* from what we observe to what we don't observe. In the case of the $\{A, B, C\}$ example brute induction requires observing all choices the consumer could make from the various proper subsets available, which requires 3 choice experiments. But if the assumption of transitivity holds, then 2 choice experiments are all we need. The theory of consumer choice allows us to economize on the data.

Naive empiricism can only predict what has happened in the past. It is the theory---the underlying model---that allows us to extrapolate.

Data as a substitute for theory

Of course, if you are interested in making a prediction about how some policy will work it is always desirable to run a controlled experiment. Even better is to find an experiment that has already been run. "Experiments" like North and South Korea, or East and West Germany, can tell us quite a bit about what kinds of economic policies work---or fail to work.

This has always seemed to me to be a great advantage of have relatively independent local and state governments, as we do in the U.S.: it allows us to experiment with different public policies. Michigan can learn from Ohio's mistakes, and vice versa. But when we come to consideration of national policies, controlled experiments become much more difficult. Nations are just too different to make comparisons simple---there are too factors that can't be controlled.

When we don't have controlled experiments we have to resort to a model to have any hope of extracting useful information from historical data. We have to have a model of causation in order to have a hope of coming up with any useful results.

Theory tells what parameters are important and how we might measure them.

The Laffer curve depicts the relationship between tax rates and tax revenue. At some tax rates tax revenue decreases when the tax rate increases. It has been said that the popularity of the Laffer curve is due to the fact that you can explain it to a Congressman in six minutes and he can talk about it for six months.

Alternatives to neoclassical general equilibrium theory such as Marxian, Sraffian, or Austrian analysis have not succeeded in becoming operational in the sense that GE analysis has become operational. As I argue below, this tendency to push even high theory such as general equilibrium analysis to develop in a way that stresses application is something that is fundamental to the functioning of economics as a policy science.

5. Role of theory in a policy science

Given my view that economics is a policy science, if I want to defend a practice in economics, then I must defend it from a policy perspective. So I need to argue about how economic theory is *useful* in policy. The remainder of the paper will consist of a list of several such ways. The list is no doubt incomplete, and I would welcome additions. But perhaps it can help focus some discussion on *why* economists do what they do, and how theory helps them do it.

Theory as a substitute for data

In many cases we are forced to use theory because the data that we need are not available. Suppose, for example, we want to determine how a market price will respond to a tax. We could estimate this effect by running a regression of market price against tax rates, controlling for as many other variables as possible. This would give us an equation that we could use to predict how prices respond to changes in taxes.

We rarely have data like this; taxes just don't change enough. But if people only care about the total price of a good, inclusive of tax---a theory---then we can use estimated price elasticities to forecast the response of price to the imposition of a tax.

This uses a theory about behavior---people will respond to the imposition of a tax in the same way that they respond to a price increase---in order to allow data on price responses to be useful. We can use the theory to forecast the outcome of an experiment that has never been done.

Here is another, slightly more esoteric example. Consider the assumption of transitivity of preferences mentioned briefly above. This theory asserts that if A is chosen when $\{A, B\}$ is available and B is chosen when $\{B, C\}$ is available, then we can predict A will be chosen when $\{A, C\}$ is available. This is certainly a theory about behavior; it may or may not be true.

If we had data on choices between all pairs of A, B, and C, then the theory wouldn't be necessary. When we want to predict the choice out of the set $\{A, C\}$ we would simply look at

Suppose for example that an individual exhibits intransitive choice behavior: A is chosen over B , B is chosen over C and C is chosen over A . How should we treat these preferences in order to make social choices? In my view it makes sense to seek a transitive ordering that is closest in some norm to the intransitive ordering exhibited by the individual to use as a guide to policy choice. These “rationalized” preferences be used for a guide to policy; the “irrational” preference cannot.

This particular approach may not be appropriate in all cases. If you want to predict how consumers will react to a new marketing campaign you obviously want to have a descriptive model of behavior. But if you want to do cost-benefit analysis, you are going to have to come up with a consistent way to measure benefits. Starting with a model of rational behavior is probably a sensible way to proceed.

4. High theory

There is a small group of researchers who study the methodology of economics. However, I feel that this group has paid much too much attention to a very limited subfield of economics---namely, general equilibrium theory. I think that GE theory is an important subfield of economics---its influence permeates the whole field---but it is only one small subfield. Perhaps 50 people in the world worked on the theory of general equilibrium, even when it was a peak subject matter. Today, little work is being done in the “pure” theory of general equilibrium---most of the focus is on the applications of the theory.

GE theory has often been criticized as being overly esoteric. Yet the work of McKenzie, Arrow, Debreu, and others in the 50s has had an immense impact on practice in fields like international trade, public finance, financial markets, and macroeconomics. The construction of computable general equilibrium (CGE) models is now a standard part of policy analysis. CGEs played a major role in recent trade negotiations between Canada, the US, and Mexico, and such applied general equilibrium modeling will no doubt increase in the future.

It is true that these models are often special cases of the Arrow-Debreu model. And even the practitioners of CGE agree that the role of such modeling is more to understand the major paths of interaction of economic variables, rather than prediction per se. However, this is still a very young field; as more economists gain more experience with these models, we can hope to see better models.

subjects’--- engineering, medicine, or dentistry---is much concerned about methodology, and economists, by and large, aren’t either.

When you think about it, it is quite surprising that there isn’t more work on the methodology of engineering or medicine. These subjects have exerted an enormous influence on twentieth century life, yet are almost totally ignored by philosophers of science. This neglect should be contrasted with other social sciences where much time and energy is spent on methodological debate. Philosophy of science, as practiced in philosophy departments, seems to be basically concerned with physics, with a smattering of philosophers concerned with psychology, biology, and a few social sciences.

I think that many economists and philosopher who have written on economic methodology have not given sufficient emphasis to the policy orientation of most economic research. One reason for this is the lack of an adequate model to follow. There is no philosophy of engineering, philosophy of medicine or philosophy of dentistry---there is no model of methodology for a policy science on which we can build an analysis. The task of constructing such a theory falls to economists. This is, in my view, one of the most interesting problems for those concerned with methodological issues and the philosophy of the social sciences.

3. Explaining economists’ behavior

In my view it is important to understand the policy orientation of economics if you want to understand many of the things that economists do. Consider for example, the emphasis that economists place on optimizing models of behavior.

As the psychologists never cease reminding us, people don’t optimize very well. There are several examples of laboratory studies in which people violate transitivity, expected utility maximization, and elementary probability calculations. If economists were only interested in descriptive models of choice behavior, they would certainly have to abandon the optimization model.

But economists are not simply interested in descriptive models. Economists want to use observations of choice behavior to make policy recommendations. It can well be argued that even if people make “irrational” decisions on their own, it still makes sense to have “rational” decisions for public policy reasons.

economic theory as a subfield of economics. The view I will describe is a personal view, of course, but one that I think is widely shared among economists. However, it is far from universal---after all, if this view were universally held, it would be of no interest to articulate it.

1. Why is economic theory worthwhile?

Why is economic theory a worthwhile thing to do? There can be many answers to this question. One obvious answer is that it is a challenging intellectual enterprise and interesting on its own merits. No one complains about poetry, music, number theory, or astronomy as being “useless,” but one often hears complaints about economic theory as being overly esoteric. I think that one could argue a reasonable case for economic theory on purely aesthetic grounds. Indeed, when pressed, most economic theorists admit that they do economics because it is fun.

But I think purely aesthetic considerations would not provide a complete account of economic theory. For theory has a *role* in economics. It is not just an intellectual pursuit for its own sake, but it plays an essential part in economic research. The essential theme of this essay that economics is a *policy science* and, as such, the contribution of economic theory to economics should be measured on how well economic theory contributes to the understanding and conduct of economic policy.

2. Economics as a policy science

Part of the attraction and the promise of economics is that it claims to describe policies that will improve peoples’ lives. This is unlike most other physical and social sciences. Sociology and political science have a policy component, but for the most part they are concerned with understanding the functioning of their respective subject matters. Physical science, of course, has the potential to improve peoples’ standards of living, but this is really a by-product of science as an intellectual activity.

In my view, many methodologists have missed this essential feature of economic science. It is a mistake to compare economics to physics; a better comparison would be to engineering. Similarly, it is a mistake to compare economics to biology; a better comparison is to medicine. I think that Keynes was only half joking when he said that economists should be more like dentists. Dentists claims that they can make make peoples’ lives better; so do economists. The methodological premise of dentistry and economics is similar: we value what is useful. None of the “policy

What Use is Economic Theory?

Hal R. Varian

Neoclassical economic theory is under attack. Critics argue that it is too esoteric and too mathematical. According to these critics neoclassical economic theory should pay more attention to psychology, history, sociology, biology, and policy and less attention to mathematics, physics, and rigor. It should be more dynamic, more empirical and more sensitive to institutional structure. And so on . . .

Many of these criticisms are valid---everyone would like to have an economic theory of institutions and a better understanding of economic dynamics. It would be wonderful to have good models of endogenous taste change. The reason that we don't have satisfactory models in these areas is not that mainstream economists perceive the benefits from such investigations to be low, as many critics seem to think, but rather because they perceive the costs to be high. No one knows how to develop good models of economic dynamics, or taste change, and careful theoretical and empirical studies of economic institutions are very difficult to do. These are simply hard problems, and most theorists have followed the natural research strategy of trying to understand easy problems before hard ones.

However, some progress is being made---there is a lot of interest among economic theorists in models of evolution, organization, institutions, and other topics that have long been neglected. I don't think that recent progress in these areas is because economic theorists have just become aware of the importance of such topics---I think that it was because methods of analysis have developed to the point where these topics can be addressed in a fruitful way.

You must walk before you can run, and perhaps all that walking that economic theory has done in the past has moved the field to the point where many of these important issues can be understood. Developments in our understanding of asymmetric information, game theory, organization theory and the political process are giving us fresh insights into a host of problems. We may not be running, or even jogging, but at least we have some ideas about how to proceed.

Despite these cautiously optimistic remarks about the progress of economic theory, my main focus in this essay is not about the frontiers of economic theory, but rather about the place of

What Use is Economic Theory?

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Abstract. I examine how neoclassical economic theory is useful to the understanding of economic policy. I also describe what I view as the role of economic theory in economics. This talk was prepared for the conference “Is Economics Becoming a Hard Science?” 29--30 October, 1992, Paris, France.

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