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The Role of Economic Theory

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9 CONCEPTUAL ECONOMIC THEORY

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Abstract

Economic theory is often thought of as being either positive or normative. But this classification scheme is too constraining; there is a large body of theory that does not fall neatly into either category. Much of this is what I would call *conceptual* theory—work that describes the world neither as it is nor as it should be but instead provides us with a set of tools that enable us to answer both positive and normative questions. I illustrate this point of view using two prominent concepts from modern theory—signaling and perfect equilibrium.

Introduction

Economic theory is commonly divided between the *positive*—the study of behavior and institutions as they actually are—and the *normative*—the study of how they should be. Of course, the dichotomy is often a fuzzy one. Is the assertion that equilibrium in a certain market is Pareto efficient a positive or normative claim? Moreover, much economic analysis entails a

close interplay between the two perspectives. For example, when considering the various ways in which sellers might auction off an item they have for sale we might be led to investigate optimal auctions—those that maximize the seller's expected revenue (Myerson, 1981; Riley and Samuelson, 1981; Maskin and Riley, 1984). This is a normative enterprise, but any deviation between the theoretical optimum and what we observe in practice immediately prompts the positive question of why there should be a discrepancy.

Despite the practical difficulties in keeping normative and positive economics separate, I do not object to the view that attempting to draw a distinction is methodologically useful. Where I do take exception is in limiting the classification system to a dichotomy. There is, I maintain, a large body of theory that does not fall into either the positive or normative category. Much of this is what I would call *conceptual* theory—work that does not focus on the world (either as it is or as it ought to be) but on abstract concepts, such as equilibrium or expectations. Such concepts are, naturally, useful as tools for answering both positive and normative questions. In fact, it was usually their usefulness that motivated their creation in the first place. But they have become legitimate objects of study in their own right. And this is not simply a matter of abstraction for abstraction's sake. By turning our attention to the tools themselves, we can examine their robustness and see whether they hold up in extreme circumstances. We can refine and polish them to make them more effective lenses in the scrutiny of economic life. We can use them to see the essential connections between what had appeared to be disparate phenomena. We may even discover important positive or normative questions that might not have occurred to us had we not abstracted away all the inessentials.

I will argue by example, taking as my illustrations two abstract concepts from modern economic theory—signaling and perfect equilibrium.

Signaling

The concept of signaling, like many other abstractions, was developed in the first place to help shed light on a specific economic phenomenon—in this case, the common labor-market practice of setting the salary of new employees according to their educational background. Such a practice is, on the face of it, puzzling. After all, as Michael Spence (1974) noted, the lessons taught in classrooms often seem to have little to do with a job's demands. It is unlikely, for example, that bank tellers' marginal products

are so greatly enhanced by university training to account for the salary differential between those who are and are not college-educated. Spence argued, however, that even if education has no effect on an employee's productivity (nor even any other worthwhile effect), it may still serve as a signal of a worker's innate talent and therefore of his marginal product.

To see why, suppose that a new worker's ability cannot be readily gauged by an employer, but that this ability is the main determinant of how productive he will be. Assume, moreover, that the worker himself knows how talented he is. Suppose, finally, that graduating from college confers no benefits in and of itself but imposes lower costs on those with higher ability. (Even if people of limited ability manage to get through, their psychic and financial sacrifices are likely to be substantial.) Under these circumstances, a college graduate may be able to command a substantially higher salary than someone without a degree. The reasoning works as follows. A relatively untalented person will not go to college because, even if college graduates are paid more, this does not outweigh the substantial cost of getting through. A talented individual, however, *will* choose to get a degree if the consequent salary is high, since for him the cost of college is relatively slight. Finally, an employer is prepared to pay a high salary to a college graduate since she knows that only able people choose to go to college. Thus, the behaviors of the three actors—talented worker, untalented worker, and employer—are mutually self-sustaining and form an equilibrium. Notice, moreover, that in this equilibrium the talented individual in effect *signals* his ability by choosing to go to college (just as the less able person signals his lack of talent by refraining from doing so).¹

I have sketched a simple model designed to explain salary differentials linked to education level. But the driving force behind the model—signaling—is quite pervasive in economic life. For example, think of an industry in which there is an incumbent monopolist and a potential entrant. It may well be the case that entry is profitable for the latter only if the incumbent's costs of production are relatively high (in which case, the incumbent's output would be low were entry to occur, implying high residual demand for the entrant). As Milgrom and Roberts (1982) showed, the incumbent, should its cost actually be low, may be able to signal that fact (and thereby deter entry) by producing at a high level before the entrant has a chance to come in. Such a signal would be successful provided that the same strategy is unprofitable in the case where its costs are high. To take another common situation, imagine individuals with inside information about the value of an asset they are selling. Such individuals may be able to signal that the asset has high value by offering it at a high price. This is something they would not do if the value were actually low

since a high price entails a high risk of no sale, and this risk matters more if the seller could get stuck with an asset having low value (see Laffont and Maskin (1989)).

I have mentioned just three examples of signaling, but there are probably hundreds of such models in the literature. Virtually all of them, however, have the same basic structure. Agent 1 but not agent 2 knows the value of a parameter θ that enters both their utility functions. Agent 1 acts first and chooses an action a_1 . After noting agent 1's choice, agent 2 chooses a_2 . The payoff functions are $u_1(a_1, a_2, \theta)$ and $u_2(a_1, a_2, \theta)$. In the education model, a_1 corresponds to the education level, a_2 to the salary offer, and θ to the ability of the worker.

Although the notion of signaling was introduced to explain a particular economic phenomenon, and although most papers on the subject are devoted to specific applications, there is a considerable literature devoted to the pure theory of signaling—to studying the properties of the abstract model of the preceding paragraph. A brief (and far from exhaustive) list includes Cho and Kreps (1987), Cho and Sobel (1987), Engers (1987), Crawford and Sobel (1982), Farrell (1985), Maskin and Tirole (1992), and Ramey (1988). Such work is precisely the sort of conceptual theory—neither positive nor normative—that I referred to in the introduction.

There are several considerable advantages that this pure theory confers. First, as I mentioned, most of the applied models share the same basic structure, and so there is a clearly an economy of scale entailed in being able to appeal to a general framework rather than setting up the model from scratch each time around. More important, the nature of the equilibrium set in signaling models is complicated (Note 1 points out two equilibria, one pooling and one separating, but there is a continuum of others as well), and so repeating the characterization of equilibrium each time around would be extremely wasteful.

Second, the abstract model pares the signaling structure down to the bone, whereas any good model of a real economic situation normally injects a multitude of special features peculiar to that specific situation. By comparing the specific model to the general model it becomes possible to see which of these features make an essential difference and which do not. Reconciling differences between the predictions of particular models is also facilitated. For example, Spence's model allows for a separating equilibrium, but the model due to Crawford and Sobel (1982) does not. Before the development of a more general model of which these two are special cases, it was not possible to reach a full understanding of the reasons for the discrepancy (see Laffont and Maskin (1988)).

Third, working with a general model enables researchers to investigate

the *robustness* of the properties of signaling equilibria, to elucidate the weakest possible conditions under which they can occur. Thus, for instance, Engers (1987) showed that equilibria are relatively unaffected if we generalize the model to make signaling multidimensional (suppose, for example, that a worker has a choice of where she goes to college as well as how much higher education to get). As another example, Maskin and Tirole (1992) showed that the conclusions of the standard model remain more or less intact if a_1 and a_2 are negotiated together between agents 1 and 2 rather than being chosen sequentially.

Signaling models, as I have mentioned, typically have a plethora of equilibria. This makes their predictive or explanatory power problematic unless we can single out a small number of equilibria as being particularly likely. A final reason for treating signaling models in the abstract, therefore, is to deal with this equilibrium selection issue. There are two principal lines that have been explored. One is to study the implications of *stable* equilibrium (a strengthening of Nash equilibrium due to Kohlberg and Mertens, 1986) for models with signaling (see Cho and Kreps (1987)). The other is to imagine that agent 1—the agent with private information—can communicate with agent 2 using a sufficiently rich language (Farrell, 1985). Both lines achieved some success in reducing the set of equilibria to a manageable number—in some cases just one separating equilibrium.

I would like to make two points about equilibrium selection. First, the idea that the richness of language—how many different things we can say—can be relevant to the issue of signaling was something quite unexpected before Farrell's work, and probably would not have been discovered had the similarities between a large number of signaling models already been well elucidated at the general level. Second, equilibrium selection is itself a general concept—just as signaling is—and it is therefore appropriate to consider it generally, without worrying too much about particular applications.

Perfect Equilibrium

An important issue in many dynamic economic models is how to capture the idea of a credible promise or threat. When can an agent who claims that he will follow a particular strategy be believed? This is a question that arises in settings ranging from monetary policy (see Kydland and Prescott, 1977) to entry-deterrence (see Dixit, 1980).

My argument here for the value of abstraction is rather different from before. It is that the very difficulties we face in even adequately formalizing

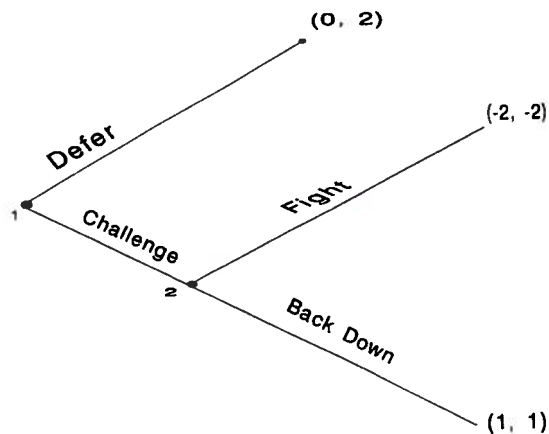


Figure 9.1

the concept of credible commitment call for a general approach. By focusing on commitment, we can try out alternative formalizations in a large variety of circumstances.

One important attempt to capture the notion of a credible strategy is through the concept of a subgame-perfect equilibrium (SPE) (see Selten, 1965). An SPE in a game is a vector of strategies that form a Nash equilibrium not just at the beginning of the game but at all subsequent points (subgames) as well. To see that an SPE lends credibility to strategies, consider the game in Figure 9.1. In this game, player 1 moves first and chooses to defer or challenge. If player 1 defers, her payoff is 0 and that of player 2 is 2. If player 2 is challenged, then she fights (in which case, both players' payoffs are -2) or backs down (both players get 1). Notice at the point where 2 has already been challenged, it is optimal for him to back down (his payoff is 1 rather than -2). Thus, the unique SPE is for player 1 to challenge and for player 2 to back down. There is, however, another Nash (but not perfect) equilibrium in which player 1 defers because of the threat that player 2 will fight. The threat to fight is optimal for player 2 to make as long as player 1 actually defers. However, it is not credible, in the sense that, if player 2 is actually put to the test (that is, if player 1 goes ahead and challenges), he would back down.

Although SPE has merit as a formulation of credibility, it also has weaknesses. To see one difficulty, suppose that we add an additional choice to the beginning of the game in Figure 9.1 (see Figure 9.2). Specifically, we now permit player 2 to decide between bribing player 1 to go away (in which case the payoffs are $(\frac{1}{2}, \frac{3}{2})$) or not doing so, in which case the game

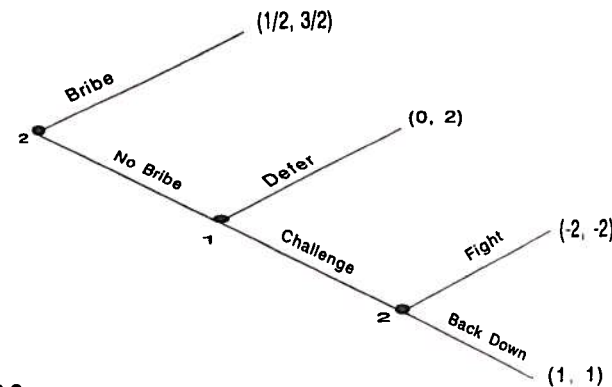


Figure 9.2

of Figure 9.1 is played. I claim that there is a unique SPE in Figure 9.2. As we already saw, given a choice between fighting and backing down, player 2 will back down. Thus, player 1 will challenge rather than defer since she prefers the payoff 1 to 0. This implies that, should player 2 fail to bribe, he can expect a payoff of 1 (from 1's challenging and then 2's backing down). But if he bribes, his payoff is $\frac{3}{2}$. Thus, in SPE, player 2 will indeed bribe.

But what if player 2 does not bribe? Notice that player 1's decision to challenge in the above argument was predicated on his forecast that player 2 would back down. But player 2, by failing to bribe, may call his own rationality into question. After all, he has a sure payoff of $\frac{3}{2}$ by bribing, whereas otherwise, according to player 1's forecast, his payoff is only 1. Player 1 might well worry about this seemingly perverse behavior and, in particular, about the risk entailed in challenging: if player 2 was erratic enough not to bribe, perhaps he cannot be counted on to back down. Indeed, player 1 may well decide that challenging, with a possible payoff of -2 , is too dangerous and elect to play it safe by deferring.

All this calls into question the plausibility of SPE as the outcome of the game. Indeed, we have, in effect, argued in favor of the imperfect Nash equilibrium in which player 2 chooses not to bribe, and player 1 then defers for fear that 2 will fight. Clearly, this is neither a positive nor a normative argument. We have simply been exploring the implications of a particular concept—subgame-perfect equilibrium—to see how well they accord with the idea of credible commitment. But this is precisely the style of analysis to which a great deal of theoretical research is devoted. Indeed the vast literature on the refinement or strengthening of Nash equilibrium

(of which subgame-perfect equilibrium is just one example) is largely an exercise in trying out concepts in many different contexts—sometimes rather contrived contexts—to see whether they do what they are supposed to (see, for example, Selten, 1975; Kreps and Wilson, 1982; Myerson, 1978; Kohlberg and Mertens, 1986).

Conclusion

Economics is a science, at least a would-be science, and any concept will ultimately prove of little value unless it helps us explain the economic world or improve it. Nevertheless, my point here, to use a carpentry analogy, is that to build a good cabinet one needs good tools. Let us tend to the tool kit as well as to the cabinet.

Note

1. It should be pointed out, however, that despite the virtue of distinguishing between the two types of workers (which makes this a *separating* equilibrium), this equilibrium is wasteful: the able individual goes to college—a costly activity—only because of its signaling value. There is, in fact, another more efficient equilibrium of the model in which neither the able nor the untalented worker goes to college (so that they are indistinguishable to the employer), and both types of worker receive a wage that is an average of the high and low wages in the separating equilibrium. This is called a *pooling* equilibrium because the workers are treated the same.

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