Dilemmas of An Economic Theorist

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1. **An economic theorist's motivation**

I could say that I am going to talk about several pieces of research which I have been involved in during the last few years. And I could say that these are only a means to an end and that I would like to use them to illustrate three dilemmas which I have encountered in my work as an economic theorist. The three dilemmas are:

The dilemma of absurd conclusions: Should we abandon a model if it produces absurd conclusions or should we regard a model as a very limited set of assumptions which will inevitably fail in some contexts?
The dilemma of responding to reality: Should our models be judged according to experimental results, should they provide the hypothesis for testing or are they simply exercises in logic and regularities can be found without theoretical models?
The dilemma of relevance: Do we have the right to give advice or to make statements which are meant to have an influence in the real world?

Lurking in the background is one big question which I ask myself obsessively: What on earth am I doing? What are we trying to accomplish as economic theorists? In some sense, we essentially play with toys called "models". We have the luxury of remaining children for our whole professional lives and are even well paid for it . We get to call ourselves economists and the public naively thinks we are improving the economy, increasing the rate of growth or preventing economic catastrophies. Of course, we can justify our public image by repeating some fancy sounding slogans we often use in our grant proposals, but do we believe in those slogans?

I recall a conference I attended in Lumini, France in the summer of 1981 which was attended by the giants of the game theory profession. They were standing around in a beautiful garden waiting for dinner after a long day of sessions. Some of us, the junior, were standing off to the side eavesdropping on their conversation. They loudly discussed the relevance of game theory and one of them suggested that we are just "making a

living". I think he merely intended to be provocative but nonetheless his response traumatized me. Are we no more than "economic agents" maximizing our utility? Are we members of an unproductive occupation which only appears to others to be useful?

Personally, I did not fulfill any childhood fantasy by becoming a professor. It was never my dream to become an economist. Frankly, I respect philosophers, teachers, writers and nurses not less than I do economists. I don't care about stock market prices and I'm not sure I know what "equities" are. I am reluctant to give advice to government bodies and I am not happy with the idea that I may be acting in the service of fanatic profit maximizers. Fortunately, people seldom ask me what I do. I was once asked for advice about real estate. My very honest answer - that I didn't have the slightest idea about real estate - was viewed as arrogant. Perhaps, I am a proud skeptic. However, after many years in the profession, I still get excited when formal abstract models are successfully constructed and meaning emerges from the manipulation of symbols. It is moving when I observe that same excitement in students' faces. Thus, my greatest dilemma is between my attraction to economic theory on the one hand and my doubts about its relevance on the other. In this lecture I will try to decompose this basic dilemma into three parts.

2. **The Dilemma of Absurd Conclusions**

Consider lonely Adam in the garden of Eden who is taking a crash course in what life is all about. At each episode he will be endowed with the right to pick a certain stream of apples from the trees. Each date he will have to exercise his right to pick the apples or not, however once he picks them he has to eat them right away, namely he cannot store apples from one day to the next. At each episode he will be given options for exchanging his endowment for other streams of apples.

Adam was created rational and he is aware of the fact that a rational decision maker has to identify first what a "final consequence" is. This is an opportunity to say that I am more than a little confused about the meaning of this concept. Can there be a "final consequence" when it appears that most of us do in fact care about events after our death? Shouldn't the term "consequence" be interpreted as subjective, corresponding to

what the decision maker considers “final” in a particular context? In any case, at this point Adam adopts the standard economic view that a “final consequence” is a list of quantities of apples to be consumed on each day. Thus, for example, the sequence which describes eating one apple on April 13th 2071 is a final consequence (not only for the apple) independent of the day on which I pick the decision to consume this sequence.

We now look at the first traumatic event experienced by Adam in Eden. Adam possesses preferences $\succsim$ over the set of streams of apple consumption. Given a consumption stream $c = (c^s)$ and a day t, his preferences $\succsim_{t,c}$ over the changes in his consumption from time t on is derived from $\succsim$. The preferences satsify:

▸ Likes to eat up to 2 apples a day and cannot bear to eat 3 apples a day.

▸ Is time impatient. He will be delighted to increase his consumption at day t from 0 to 1 or from 1 to 2 apples at the expense of an apple he is promised at a day later than t.

▸ Whenever he lacks an apple he prefers to get it right away in exchange for two apples tomorrow. (This assumption is not implausible even for individuals outside the garden of Eden. One of the primary motivations of the hyperbolic discounting literature is the fact that there are people who prefer one apple today over two apples tomorrow and at the same time prefer two apples in 31 days to one in 30 days.)

▸ He cares only about his consumption in the first 120 years.

Adam is endowed with a stream of 2 apples per day starting in day 18 for the rest of his life. We can prove for him the following calibration ”theorem” Adam should be willing to exchange the stream of 2 apples per day starting in day 18 for the rest of his life for 2 apples right away! You are supposed to say ”wow!”.

The essence of the proof can be seen from the following observation: The stream of two apples per day for 2^1 days after a delay of 2^0 day, namely $(0,2,2)$, is inferior to $(1,0,2)$, and also to $(1,1,0)$ and, by impatience, also to $(2,0,0)$. Similarly, the stream of two apples per day for 2^2 days with a delay of 2^1 days, namely, the stream $(0,0,2,2,2,2)$, is by the previous setp inferior to $(0,2,0,2,0,0)$ and therefore to $(1,0,1,0,0,0)$ and thus to

$(2,0,0,0,0,0)$. By induction we conclude that he must find the stream of 2^{17} days of two apples per day with a delay of 17 days inferior to receiving 2 apples right away. It is only left to calculate that in 120 years there are no more than 2^{17} days and we are done.

■ You might have noticed a similarity between the above observation and an argument due to Matt Rabin in the context of Decision Making under uncertainty (see Rabin (2001)). Rabin considers a decision maker who behaves according to expected utility theory, is risk averse and takes the final consequence to be the amount of money he will hold after all uncertainties are resolved. Such a decision maker, who rejects, at all levels of wealth in the interval, $[0,\$4000]$), the lottery $0.5[-10] \oplus 0.5[+11]$, will reject an equal chance to lose a moderate amount like $\$100$ and to make a large gain like $\$64000$ when he holds the initial wealth of $\$3000$. The basic idea is as follows: denoting the vNM utility function by u we obtain $u(w+11)-u(w) < u(w)-u(w-10)$ for all $w \in [0,\$4000]$ and thus the marginal utility function $mu(w)$ satisfies
$mu(w+11) \leq [u(w+11)-u(w)]/11 < (10/11)[u(w)-u(w-10)]/10 \leq (10/11)mu(w-10)$ in that domain. In other words, it falls at a faster rate than that of a geometrical sequence.

How should we respond to such observations? When I initially added Rabin's argument to the material for my graduate micro-economics course, I added sarcastically: "What conclusion should we derive from this observation? Do we economists take our own findings seriously?" My first instinct was that something is deeply wrong with the model we so commonly use. I felt that the situation is similar to the case in which a set of assumptions yields a contradiction and thus any conclusion can follow. If our model of decision making with time preferences or under uncertainty yields conclusions which are absurd, what is the validity of conclusions which are not? So how should we proceed? Presumably by changing the assumptions we will prevent the absurd conclusions.

■ So, Adam learns (following Strotz) that he should split his personality. He withdraws from the assumption that the consequences are independent of time. He thinks about himself as a collection of egos each with a different perspective. The consequences of an agent's choice at time t will be all streams of apples from time t on. The meaning of

eating an apple at day 17 will not necessarily be the same at $t = 0$ as at $t = 16$. He is ready to replace 2 apples tomorrow for one today but not two apples at date 17 for one apple at date 16. Adam holds a sequence of preference relations $(\succsim_t)$ one for each date, each is defined on the streams of future consumption streams.

The same alteration has to be made in the context of decision making under uncertainty to deal with Rabin's observation. The absurd conclusion reached by Rabin was not only an outcome of expected utility theory assumptions but also of the assumption that there is a single preference relation $\succsim$ over the set of lotteries with prizes being the "final wealth levels" such that a decision maker at any wealth w who has a vNM preference relation $\succsim_w$ over the set of "wealth changes" derives that preference from $\succsim$ by $L_1 \succsim_w L_2$ iff $w + L_1 \succsim w + L_2$. Nothing in the vNM axioms dictates that consequences should be the final wealth levels rather than wealth changes. When discussing vNM theory, standard textbooks are actually vague on the interpretation of "w"- usually they state that the decision maker derives utility from "money", with no discussion of whether "money" is a flow or a final stock. Kahneman and Tversky (1979) have already pointed out that this assumption clashes with clear cut experimental evidence and in particular that there is a dramatic difference between our attitudes towards relative gains and our attitude towards relative losses. Withdrawing from the assumption that the consequences are always the final wealth level prevents from deriving Rabin's absurd conclusion. (See Cox and Sadiraj (2001) for an independent similar argument). It will allow us to make the plausible assumption that for a wide range of moderate wealth levels w a decision maker rejects the lottery $0.5[-10] \oplus 0.5[+11]$ (as he holds an instinctual aversion to risk) and were he to start from wealth 0, for example, he would prefer the lottery $0.5[w - 10] \oplus 0.5[w + 11]$ over the sure amount $[w]$ (using an argument of the type that all possibilities are similar and thus I will decide simply by calculating the expectation).

■ Once Adam was split into a collection of infinite agents, one for each point in time, naive Adam approaches his second experience (the rest of this section is based on Rubinstein (1998)): His first trauma changed his preferences and he has less appetite and does not eat more than one apple per day. He lost his confidence and he has become an extreme example of a hyperbolic discounter who cares only about what happens in the next two days but whenever he compares eating an apple today to eating

an apple tomorrow, he prefers to delay the delight.

By now, Adam finds Eve, who is a very tempting lady. Eve offers Adam one apple. When he is about to eat the apple she tells him, “Why don’t you give me the apple and get another one tomorrow?” At this point Adam still does not realize that he might have a conflict between his selves. He is still naive. Each of his selves takes actions as if the others did not exist. Naive Adam will take the bait and never eat the apple. Sad.

■ Frustrated by Eve, Adam goes to Mr. Snake, a successful consultant who has graduated from a course in game theory. The snake tells Adam that he must be more sophisticated regarding the interaction between his various selves. He explains to Adam that the common assumption made in economics is that the decision maker’s behavior must be consistent with a “perfect equilibrium procedure” (“sophisticated behavior” as it is called in the behavioral economics literature). The snake shows Adam that there are only two perfect equilibria for the game between his selves and thus that as a “sophisticated” decision maker he should eat the apple on the first or second day. Adam feels relieved.

■ The snake has already won Adam’s trust, but now Adam has his third experience. Adam is told that he can pick one free apple every day. What could be simpler than that? Adam plans to pick an apple every day. However, the snake has other plans for Adam. He recommends a “perfect equilibrium” to Adam : Adam should pick an apple only after an odd number of consecutive days in which he has not done so. Adam is impressed by the snake’s originality.

Adam verfies that there is no hypothetical history after which one of Adam’s selves can find a reason not to follow the snake’s advice.
Consider a self after an history in which he is not supposed to pick an apple, that is, after an even number of dates that he did not eat apples. The self expects to get an apple a day later which is better for him than eating the apple now and not eating it on the second day (he recalls that the equilibrium suggests that the next self will not eat the apple after he has eaten it the previous day).
Consider a self after an history in which he is supposed to eat an apple, that is, after an odd number of dates that he did not eat apples. The self expects to get an apple a day later which is better for him than eating the apple now and not eating it on the second

day (he recalls that the equilibrium suggests that the next self will not eat the apple if he does not since he will have in his history even number of days of not eating apples) and this is worse for the self than eating the apple right away.
To conclude, Adam does not find any problem with the snake's advice and eats apples only once every two days.

■ Attempting to escape from the calibration theorem we find Eve and escaping from Eve we find the snake Rabin and Thaler, use Rabin's calibration theorem to attack expected utility theory. They say they feel "much like the customer in the pet shop, beating at a dead parrot". If we were following their methodology, we would trash not only expected utility and constant discounting preferences but hyperbolic discounting as well.

We have now arrived at the **Dilemma of Absurd Conclusions**. We want assumptions to be realistic and to yield only sensible results. Thus, nonsensical conclusions will lead us to reject a model. However, unlike parrots, human beings have the ability to invent new ways of reasoning that will confound any theory. I doubt if there is any set of assumptions which will not produce absurd conclusions when we apply them to circumstances which are far removed from the context they were originally intended for. So, how should we respond to absurd conclusions derived from sensible assumptions?

3. The Dilemma of Response to Reality

The connection between our models and reality is tricky. I don't think that many of us take our theoretical models seriously enough as to consider them to be a platform for producing verified predictions in the same way the sciences do. When comparing a model to real data, we hope at best to find some evidence that "something" in reality is correlated with a prediction of the model. A theoretical model in economics is judged by the plausibility of both its assumptions and its conclusions. Experiments are used to verify its assumptions and often applied economists feel they need a model to derive a conjecture before they mine data for a pattern or regularity. Should we change the

model if one of its assumptions is experimentally refuted? Do we need a model to come up with plausibile conjectures about reality?

Let us consider, just as an example, the evaluation of assumptions regarding time preferences. Recently, there has been a trend in “behavioral economics” to replace the traditional discounting formula with a variation of the hyperbolic discounting formula whereby for each day the payoffs from that point on are discounted by 1, $\beta\delta$, $\beta\delta^2$, $\beta\delta^3$….. This trend has gained popularity despite the problem mentioned above, that it involves much more than just changing the scope of the preferences: it introduces time inconsistencies and requires assumptions about the interaction between the different selves.

The hyperbolic discounting literature (see for example Laibson (1996)), states quite unequivocally that: ”Studies of animal and human behavior suggest that discount functions are approximately hyperbolic”. In our case we have reliable evidence (especially as it is confirmed by own thought experiments) that for certain decision problems stationary discounting is inconsistent with the experimental results while hyperbolic discounting preferences fit the data better. For example, there are more people who prefer an apple today over two apples tomorrow than there are who prefer 2 apples in 21 days over 1 apple in 20 days. So, we adopt hyperbolic discounting or, to be more precise, a simple version of this approach characterized by two parameters, β and δ. But what if we can easily design experiments which reject the alternative theory as well?

Following are the results of an experiment I conducted recently on the audiences of a lecture I delivered at two universities. Students and faculty at the University of British Columbia were asked to respond online to Problem 1:

Problem 1

Imagine you have finished a job and have to choose between two payment schemes:

*A) Receiving $*1000 *in* 8 *months time.*

*B) Receiving $*500 *in* 6 *months and $*500 *in* 10 *months.*
What scheme would you choose?

Students and faculty invited to a lecture at Georgetown University were asked to respond online to Problem 2:

Problem 2
Imagine you have bought a computer and you have to choose between two payment schemes:
*A) Paying $*1000 *in* 8 *months time.*
*B) Paying $*500 *in* 6 *months and $*500 *in* 10 *months.*
What scheme would you choose?

Receiving $\$1000$ in 8 months time is not much different from receiving $\$500$ at $8-\epsilon$ and $\$500$ at $8+\epsilon$. Thus, a reasonable application of the (hyperbolic) discounting approach in this case would imply that advancing the receipt of $\$500$ from $t=8$ to $t=6$ has more weight than postponing the receipt of $\$500$ from $t=8$ to $t=10$. Therefore we would expect the vast majority of people to choose B in Problem 1 and A in Problem 2. Here are the "survey" results:

Problem	University	#	8	6/10
1-Receipt	U. British Columbia	354	54%	46%
2-Payment	Georgetown U.	382	39%	61%

The survey results are the opposite of what is predicted by the standard economic approach. In fact, a majority of subjects chose one payment when they had to choose between "gains" and an even larger majority chose two installments when they had to choose between "losses".

I believe that the phenomenon we are observing here is related to the findings of Kahneman and Tversky (1979) in the context of decision making under uncertainty. People tend to prefer the average, certain expectation of a lottery when the lottery involves only gains and tend to prefer the lottery over the expected sum when it involves only losses. In the context of streams of money the averaging is done on the time component and leads one to prefer one installment in the case of receipts and the multiple installments in the case of payments.

So should we dismiss the hyperbolic discounting model? According to the methodological principles implicitly followed by some behavioral economics, the answer is yes. Of course, there is an alternative, to simply dismiss evidence we don't like. I know of one paper which presented the results of several experiments aimed at refuting the hyperbolic discounting theory. The editor of a very prestigious journal, which has published many of the hyperbolic discounting papers, commented as follows: "Ultimately this seems like a critique of the current approach which is right in many ways, but criticisms and extensions of existing research are best sent to more specialized outlets."

Taking a more serious approach, we are faced here with one part of the dilemma of response to reality. We want our assumptions to reflect reality, but you can spell out a combination of reasonable assumptions and someone will find an experiment to defeat your theory. So how can we find a balance between our desire for reasonable assumptions and the fact that rejecting assumptions using experimental results is so easy?

Theoretical Economic models are also used to suggest regularities in human behavior and interaction: By regularities I mean similar phenomena which are repeated in similar social scenarios at different points in time and at different locations. Do we need economic theory to find these regularities? Somehow, we hope that real life regularities will miraculously emerge from the formulas we write leisurely at our desks. Wouldn't it be better to go in the opposite direction: examining the real world, whether through empirical or experimental data, to find unexpected regularities? My limited personal experience creates doubt in my mind as to the need for theories to find regularities.

To illustrate, let us have a look at the traveler's dilemma (due to Kaushik Basu):

Imagine you are one of the players in the following two-player game:
*- Each of the players chooses an amount between $*180 *and $*300*.*
- Both players are paid the lower of the two chosen amounts.
- Five dollars are transferred from the player who chose the larger amount to the player who chose the smaller one.
- In the case that both players choose the same amount, they both receive that amount and no transfer is made.
What is your choice?

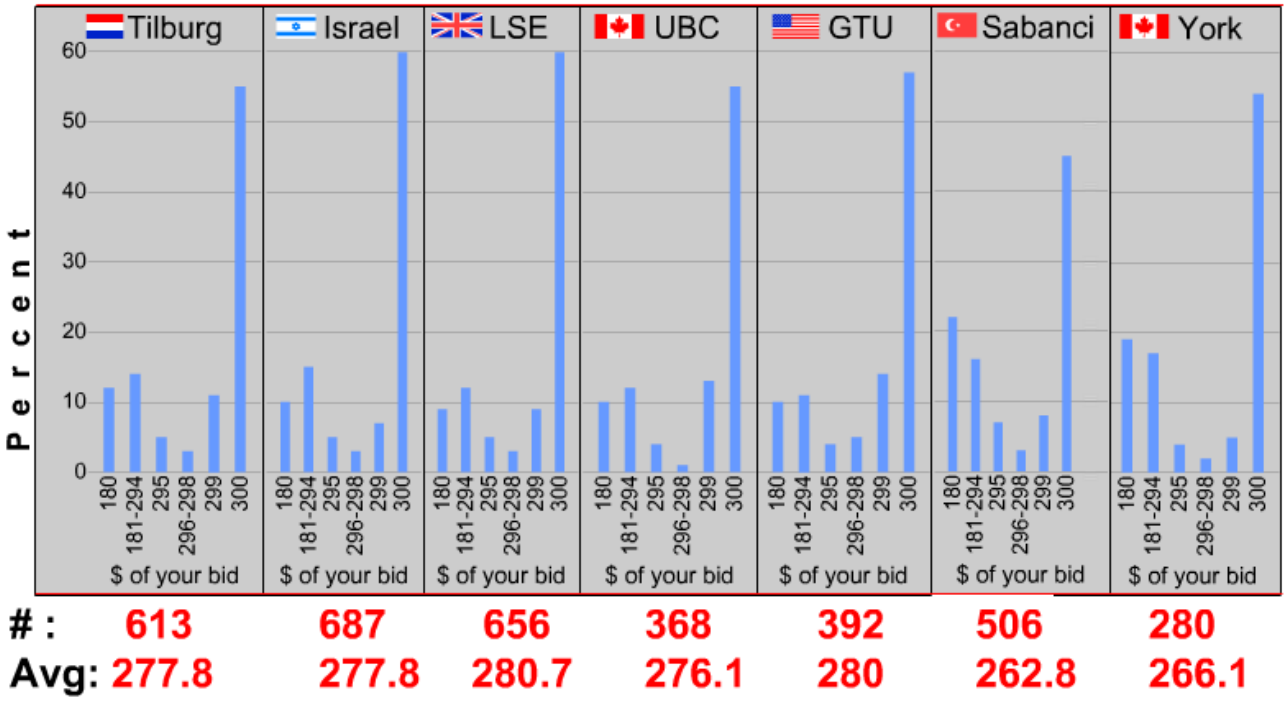
Assuming that the respondents care only about their final dollar payoff, the only equilibrium strategy in this game is the choice of 180. Thus, the standard game theoretic analysis points to the unique prediction that all participants in the game will choose 180. I am not familiar with any game theoretical model that would predict a distribution of responses like the following:

180	181-294	295	296-8	299	300
13%	15%	5%	3%	9%	56%

During the past two years, I have had the opportunity to collect large amounts of data from audiences of a public lecture titled "John Nash, Beautiful Mind and Game Theory", which I have delivered at several universities. In the lecture, I spoke about my personal encounter with John Nash, critically introduced the basic ideas of Game Theory and spoke a little bit about the book and the movie. People who planned to attend the lecture (mostly students and faculty) were asked to respond to several questions via the site gametheory.tau.ac.il before the lecture.

Here are the results for 9 universities in 5 countries: Beer Sheva, Tel Aviv, Technion (Israel), Tilburg University (Holland), the London School of Economics (UK), University

of British Columbia and York Univeristy (Canada), Georgetown University (USA) and Sabanci (Turkey), where I delivered the lecture:



The six graphs look quite similar revealing a regularity which I have no explanation to.

Any hope to explain such a distribution will require a better psychological understanding of the meaning of each of the responses. The group of players who chose 180 seem to be playing according to the game theoretical prediction, they do extremely badly and can consider themselves to be ”victims” of game theory. The subjects whose answers were in the range 295-9 clearly exhibit strategic reasoning. 300 seems to be an instinctive response in this context and the responses in the range 181-294 appear to be the results of random choice.

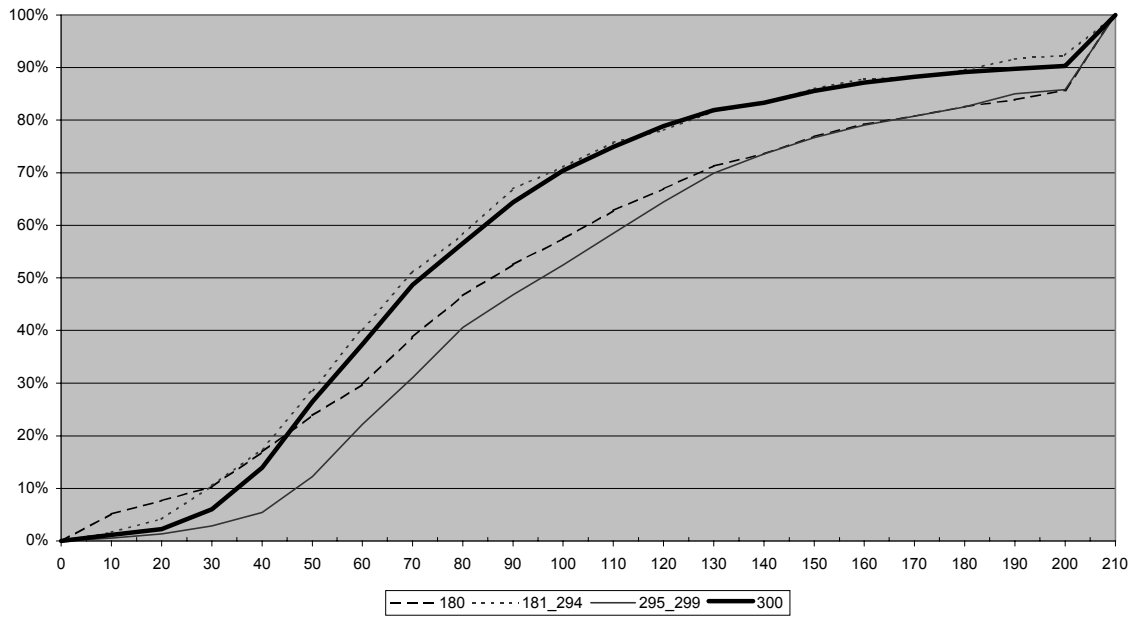
To support this interpretation I found it useful to gather more data. For 7 out of the 9 lecture audiences I also recorded the subjects' response time. It is true that response time is a very noisy variable due to differences in server speeds, differences among subjects in the speed with which they read and think, etc. Nevertheless, when the

sample is large enough, as this one was, we should get a reliable picture. The following table and figure summarize the results for 2985 subjective:

	Nash Lectures	Median Response Time (MRT)
n	2985	77s
180	13%	87s
181-294	14%	70s
295-299	17%	96s
300	55%	72s

Next figure presents the accumulative distribution of the time response of the subjects in each of four categories, $\{180\}$, $\{181,\ldots,294\}$, $\{295,\ldots,299\}$ and $\{300\}$:

Bid 180-300 - time frequencies



There is a clear pattern in the responses: the response 300 and the results in the range 181-294 are the quickest. Apparently 300 is indeed the instinctive response. The results 181-294 seem to be the result of a "random" process without a clear rationale. The responses in the range which require more cognitive efforts, i.e. 295-299, indeed take the most time. The "victims" of game theory are somewhere in between. The shape of their graph seems to indicate that some of them calculated the equilibrium (a

cognitive operation) and that some of them were already familiar with the game. A regularity is found. Time response data adds meaning to the various results. No model preceded looking at the data. And we are still very far from explaining the stable distribution of responses across different populations.

So, we have arrived at the second part of the **dilemma of response to reality**. We want our models to produce interesting conclusions which are consistent with observed regularities. However, finding interesting regularities can be done very satisfactory without solving complicated models but rather by looking at data directly, even without having any model in mind.

4. The Dilemma of Relevance

Yes, I want to change the world just like everyone else. I want people to listen to me. But as an economic theorist, do I have anything to tell them?

One of my earliest interests in economic theory was bargaining theory. There were two sources for my interest: First and most important, it allows for the construction of models which are simple but nevertheless rich in results which have attractive interpretations. The possibility of deriving meaningful statements through the manipulation of mathematical symbols was something which attracted me to Economics in the first place. Second, as a child I frequented the open air markets in West Jerusalem and later the Bazaar in the Old City of Jerusalem and as a result bargaining had an exotic image for me. I came to prefer bargaining theory over auction theory since auctions were associated with the rich while bargaining was associated with the ordinary people in the markets of Jerusalem. But, I have never dreamed of becoming a better bargainer. When people approached me later in life for advice in negotiating the purchase of an apartment or to join a team planning strategy for political negotiations, I declined, politely telling them that as an economic theorist I had nothing to contribute. I did not say that I lacked common sense or life experience which might be useful in negotiations, but rather that professional knowledge was of no help in these matters.

This response was sufficient to deter them. Decision makers usually look for an assertive advisor and not one who is offering common sense; they believe, perhaps rightly so, that they have at least as much of that as do professional economists.

But I am a micro economics teacher. I am a part of a big "machine" which I suspect not only influence the world but even is brainwashing students to think in a way which I do not particularly like. A few months ago I conducted a survey among six groups of Israeli students. The students were approached by E-mail and had to respond to a series of questions on the web (for a demo see http://gametheory.tau.ac.il/expEconEng/). The six groups were comprised of undergraduate students in the departments of Economics, Law, Mathematics and Philosophy at Tel Aviv University, MBA students at Tel Aviv University and economics undergraduates at the Hebrew University of Jerusalem. I will refer to the six groups using the abbreviations Econ-TAU, Law, Math, Phil, MBA, Econ-HU. The students were explicitly told that the questionnaire was not an exam and that there were no "right" answers. The core of the questionnaire was the following question:

Q1-Table (translated from Hebrew)

Assume that you are vice president of ILJK company. The company provides extermination services and employs permanent administrative workers and 196 non-permanent workers who are sent out on extermination jobs. The company was founded 5 years ago and is owned by three families. The work requires only a low level of skills: each worker requires only one week of training. All the company's employees have been with the company for between three to five years. The company pays its workers more than minimum wage. A worker's salary includes payment for overtime which amounts to 4,000 to 5,000 shekels per month (comment: the minimum wage in Israel was about 3,300 IS at the time of the experiment). The company makes sure to provide its employees with all the benefits required by law.

Until recently, the company was making large profits. As a result of the continuing recession, there has been a significant drop in its profits although the company is still in the black. You attend a meeting of the management in which a decision will be made regarding the layoff of some of the workers. ILJK's Finance Department has prepared

the following forecast of annual profits:

Number of workers who will continue to be employed	Expected annual profit in millions of IS
0 (all the workers will be laid off)	Loss of 8
50 (146 workers will be laid off)	Profit of 1
65 (131 workers will be laid off)	Profit of 1.5
100 (96 workers will be laid off)	Profit of 2
144 (52 workers will be laid off)	Profit of 1.6
170 (26 workers will be laid off)	Profit of 1
196 (no layoffs)	Profit of 0.4

I recommend continuing to employ _____ of the 196 workers in the company.

Observation 1: **There were sharp differences between groups in confronting the dilemma of profit maximizing vs. worker layoffs.**

The following table presents the 764 responses (of 100 or more) to question 1-Table:

Q1-Table	EconHu	EconTA	MBA	Law	Math	Phil	Total
n=	94	130	172	216	64	88	764
100	**49%**	**45%**	**33%**	**27%**	**16%**	**13%**	31%
144	**33%**	**31%**	**29%**	**36%**	**36%**	**19%**	31%
170	**7%**	**9%**	**23%**	**18%**	**25%**	**25%**	18%
196	**6%**	**13%**	**12%**	**13%**	**11%**	**36%**	15%
other	4%	2%	3%	6%	13%	7%	5%
Average	127	133	142	144	151	165	143

The differences between the groups are striking. The economics students both at the Hebrew University and Tel Aviv University are much more pronounced profit maximizers than the students in the other groups. 45-49% of the Econ students chose the profit maximizing alternative, as compared to only 13-16% of the Phil and Math students. The MBA and Law students are somewhere in between.

The response of “no layoffs” was given by only a small number of respondents (ranging

from 6-15%) in five of the six groups; the only exception was the philosophers - 36% of them chose to ignore the profit maximizing target. A major surprise (at least for me) was the fact that the MBA students responded differently than the Econ students. My conjecture is that this has to do with the way in which the MBA program is taught. The study of cases triggers more comprehensive thinking about real life problems. Study using formal exercises conceals the need to balance between conflicting considerations.

Following their response to question 1, all subjects had to indicate what do they thought would be the choice of a real vice president?

Observation 2: There were almost no differences between groups as to what the subjects thought a real vice president would do.

In Law and Phil all subjects received the version 1-Table (presented above). The other four groups, who were better trained mathematically, were randomly allocated two versions of the question. The second version, Q1-formula, was identical to question 1-Table with the only difference that the table was replaced with:

"The Finance Department has prepared a forecast of profits according to which the employment of x workers will result in annual profits of (in millions of shekels):

$2\sqrt{x} - 0.1x - 8$"

This profit function yields similar values to those presented in the table. Its maximum is at $x = 100$. Note that Q1 explicitly emphasized that with no layoffs, profits will be still positive.

Observation 3: The formula distortion

The following table summarizes the 298 answers of 100 or more:

	EconHu	EconTA	MBA	Math	Total
n=	55	74	125	44	298
100	**74%**	**77%**	**73%**	**75%**	75%
101-195	**10%**	**9%**	**11%**	**15%**	11%
196	**16%**	**14%**	**15%**	**10%**	14%
Average	120	117	120	116	118

There are no major differences between the groups. A vast majority of subjects in all groups maximized profits though many of them were aware of the existence of a trade-off (as is evident from the fact that many of those who chose 100 said that they believe that a real vice president would fire less than the number required to maximize profits). Thus, presenting the problem formally, as we do in economics, seems to conceal the real life complexity of the situation from most students (including Math students).

Our view of the results cannot be separated from our personal evaluation of the behavior of economic agents in such a situation. If you believe that the manager of a company is obligated morally or legally to maximize profits, then you should probably hail economics for its achievement in educating its students so well. On the other hand, one might approach the results with the belief that a manager should also take into account the welfare of his workers, particularly when the economy is in recession and unemployment is high, but then one feels uncomfortable about the results.

Of course, it is possible that the differences between the two groups of economics undergraduates and the other groups is due to selection bias and not a result of indoctrination. The fact that the economists are different from the lawyers and MBA students and not only from the philosophers and mathematicians makes this possibility more doubtful. The minimal differences in the responses to questions 1-formula appear to also somewhat support the indoctrination hypothesis.

And, it may be that there is no connection between the responses of subjects in such a questionnaire and the choices they would make in practice. But if there is no connection, are we saying that what a student learns in economics will have no influence on his future behavior? And if there is such a connection, shouldn't we be revising our curriculum?

Overall, I am left with the suspicion that in the best case the formal exercises we give our students, make the study of economics less interesting; in the worst case, they

contribute to the shaping of a rather unpleasant ”economic man”. I find it difficult to say that the way I teach economics does not effect the world in a direction I am not happy with.

■ Those guilt feelings probably led me to a recent paper (Piccione and Rubinstein (2003)) I coauthored with my friend Michele Piccione from the London School of Economics. This may be a provocative statement, but let me say that this was my only paper which was motivated by real world problems. We constructed a model which we called a jungle. Whereas in an exchange economy transactions are made with the mutual consent of two parties, in the jungle it is sufficient that one agent who happens to be stronger than another is interested in the transaction. The model is meant to be similar to the exchange economy model with the exception that there is no ownership and agents do not come to the model with an initial endowment. The main difference is that the vector of initial endowments is replaced in this model with a power relationship.

After spelling out the model and the definition of a jungle equilibrium examples are brought to illustrate the richness of the model. Several propositions are proved: Existence. Uniqueness. “First Fundamental Welfare Theorem”: Under some smoothness assumptions the jungle equilibrium is efficient. . An analogy to the second welfare fundamental theorem is discussed and it is shown that every jungle equilibrium allocation is almost supported by equilibrium prices such that the stronger are also the richer. One might like to interpret this statement as saying that power and wealth go hand in hand.

When I present the model in public lectures I ask the audience to imagine that they are attending the first lecture of a course at the University of the Jungle designed to introduce the principles of economics and to show how the **visible iron hand** produces order out of chaos and results in the efficient allocation of available resources without the interference of a government. Making an analogy, I argued that the market economy accepts the natural desire of people to be richer, to have more. In the same way, the jungle economy accepts people’s desire to use their strength to take advantage

of those weaker than them. The market economy encourages people to produce more, the jungle economy encourages people to develop their power, thus facilitating society's expansionist desires.

I view our jungle model as a rhetorical exercise. The whole idea was to build a model which is as close as possible to the standard exchange economy, using terminology that is familiar to any economics student and to conduct the same type of analysis found in any microeconomics textbook on competitive equilibrium. Standard economic courses impress students with their elegance and clarity. We have tried to do the same with the model of the jungle. This exercise is directed at economics students with the goal of creating more question marks in their minds when they study models of competitive markets.

■ This brings me to the **dilemma of Relevance**. I believe that as an economic theorist I have very little to say which is of relevance in the real world and I do believe that there are very few models in economic theory (and the more elaborate ones not among them) that could be used to provide serious advice. But I cannot hide behind the view that there are pure theoretical musings. I cannot ignore the feeling that our work as teachers and researchers influences students' minds in a direction I am not happy with. Can I find a way to be relevant or am I doomed to be another charlatan?

5. Concluding Words

■ It's time to sum up the discussion. How do I relate to these three dilemmas?

As economic theorists, we organize our thoughts using what we call "models." The word "model" sounds more scientific than "fable or fairy tale" but I don't see much difference between them. The author of a fable draws a parallel to a situation in real life. He has some moral he wishes to impart to the reader. The fable is an imaginary situation, somewhere between fantasy and reality. Any fable can be dismissed as being "unrealistic" or simplistic. But this is also a fable's advantage. Being between fantasy and

reality gets rid of extraneous details and annoying diversions. In this unencumbered state, we can clearly discern what cannot always be seen from the real world. On our return to reality, we are in possession of some sound advice or a relevant argument that we can use in the real world.

We do exactly the same thing in economic theory. A good model in economic theory, like a good fable, identifies a few themes and elucidates them. We perform thought exercises which are only loosely connected to reality and which have been stripped of most of their real life characteristics. However, in a good model, as in a good fable, something significant remains in our mind.

Like us, the teller of fables confronts the dilemma of Absurd Conclusions. The logic of his story may lead to absurd conclusions as well.
Like us, the teller of fables confronts the dilemma of Responding to Reality. He wants to maintain a connection between his fable and what he observes. There is a fine line between a fantasy without content and a fable with a message.
Like us, the teller of fables confronts the dilemma of Relevance. He wants to influence the world, but knows that his fable is only a theoretical argument.

Like in the case of fables, absurd conclusions reveal contexts in which we find the model to be reasonable and may not necessarily make the model uninteresting.
Like in the case of fables, models in economic theory are derived from observations of the world but they are not meant to be testable.
Like in the case of fables, a good fable and a good model can have an enormous influence on the real world, not by providing advice or by predicting the future, but rather by influencing culture, that is, the collection of ideas and conventions which people believe in and which influence the way they reason and act.

Yes, I do think we are simply tellers of fables. But, isn't it wonderful?

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