

The Economic Consequences of Cognitive Dissonance

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Since the publication of *The Wealth of Nations*, economists have built an entire profession on a single powerful theory of human behavior based on a few simple assumptions. That model has been fruitfully applied to a wide range of problems.

But, while economists have been elaborating their analysis, keeping their basic behavioral assumptions the same, sociologists, anthropologists, political scientists, and psychologists have been developing and validating models based on very different assumptions.

For most types of economic behavior, the economists' model is probably quite adequate.¹ The models developed by other social scientists are generally ill-suited for direct incorporation into economic analysis. Nevertheless, insofar as studies in these other disciplines establish that people do not behave as economists assume they do, economics should endeavor to incorporate these observations.

This paper presents an example of how this might be accomplished in one special case. Psychologists have devoted considerable attention to the theory of cognitive dissonance. This theory has been used earlier by Albert Hirschman (1965) to describe attitude changes toward modernization in the course of development. Our paper expands the economic applications of cognitive dissonance and analyzes its welfare consequences in a formal model.

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¹The approach of this paper to what economists might call the economics of "irrational" behavior differs from that of Gary Becker (1962). Becker views irrational behavior as random deviations from economic rationality. We use the findings of the psychologists who view irrational behavior as predictable, and therefore not totally random. Welfare implications seem to follow from the predictability of such behavior.

I. An Overview

A. *The Basic Premises*

To begin, we must translate the psychological theory into concepts amenable to incorporation into an economic model. We think the theory of cognitive dissonance can be fairly represented in economists' terms in three propositions: First, persons not only have preferences over states of the world, but also over their beliefs about the state of the world. Second, persons have some control over their beliefs; not only are people able to exercise some choice about belief given available information, they can also manipulate their own beliefs by selecting sources of information likely to confirm "desired" beliefs. Third, it is of practical importance for the application of our theory that beliefs once chosen persist over time.²

In the next section we will give a brief summary of results from studies in social psychology which show that people in certain circumstances behave according to each of these three premises.

B. *The Fundamental Model*

The meaning of each of these premises and a practical application are illustrated by a model given in Section III. A great deal of anecdotal information suggests that workers in dangerous jobs are often quite oblivious to the dangers that are involved.³ In this regard,

²Actually, these assumptions allow for a much richer type of behavior than simple cognitive dissonance. Some of the "applications" in Section IV take advantage of this.

³Another possible explanation for this phenomenon is that workers have noisy estimates of the safety of different jobs. In that case, there will be a tendency for workers who take a job to be those who underestimate its danger. Some of the implications of such a model have been considered in Dickens (1981).

interviews with benzene workers, some of whom denied that they were working with dangerous chemical substances, are typical (see Daniel Ben-Horin, 1979). Alternatively, Brian Main has related to us his experience in a nuclear plant where workers were given specially designed safety badges to collect information on radiation exposure in a weekly checkup. All workers in this plant, some of whom were Ph.D.s, failed to wear these badges; they were put in workers' desks and only brought out for the weekly checkup. Howard Kunreuther et al. (1978) related similar tales regarding failure for persons with high risk of flood or earthquake damage to purchase flood or earthquake insurance.

The model presented in Section III is constructed as an explanation for such phenomena. In that model, people prefer to believe that their work is safe. This corresponds to the first premise that workers have preferences over their states of beliefs. Workers make a choice about whether to believe the activity is safe or not safe. This accords with the second premise that workers have a choice about their beliefs. There is a benefit to believing that a job is safe, but also a cost. Those who choose to believe the job is safe do not experience the unpleasant feelings of constant fear or unsettling doubts about how wise it was to take such a dangerous job. On the other hand, if they convince themselves the job is safe, they may make costly judgment errors due to the discrepancy between their beliefs and the true state of the world.

In our model the cost of believing that work is safe is the possibility of making a mistake in the choice of safety practice. The worker chooses his beliefs according to whether the benefit exceeds the cost, or vice versa. If the psychological benefit of suppressing one's fear in a particular activity exceeds the cost due to increased chances of accident, the worker will believe the activity to be safe. Otherwise he will believe it to be unsafe. (This model assumes that the worker's beliefs are totally plastic: he can believe whatever he chooses irrespective of the information available to him. Of course this is a polar case. More complicated and general models would endow persons with a set of beliefs that may be chosen given the avail-

able information. Given his total choice set the agent chooses beliefs, and other things, to maximize his utility.)

A model of such a decision process is presented in Section III. It is analyzed with respect to how wages and labor supply will respond to the introduction of new safety equipment. The effects of safety legislation are also considered, as are the conditions under which such legislation will cause a Pareto-superior shift in the use of resources.

This paper is not to be interpreted as suggesting that cognitive dissonance is a significant feature of every economic transaction. To the contrary, in the model presented in Section II cognitive dissonance reactions are self-limiting. In most economic transactions there is no gain to rationalizing and cognitive dissonance plays no role. There are, however, special circumstances in which the assumptions mentioned in Section II will apply and cognitive dissonance will play an important role.

Besides safety regulation, we believe cognitive dissonance may be important in understanding innovation, advertising, crime, and Social Security legislation. These applications are potentially of great importance; they are, however, much more speculative than the straightforward application of our model to safety legislation. Section IV explains these applications. Section V then gives conclusions.

II. Psychological Evidence for the Basic Premises

Much social psychology is based on the theory of cognitive consistency. At the most abstract level this means that persons are uncomfortable in maintaining two seemingly contradictory ideas. Cognitive dissonance theory is one application of cognitive consistency theory. In practice most cognitive dissonance reactions stem from peoples' view of themselves as "smart, nice people." Information that conflicts with this image tends to be ignored, rejected, or accommodated by changes in other beliefs.⁴ Among other appli-

⁴The description of cognitive dissonance in this paper as well as our choice of which experiments to present owes a great deal to the excellent book by Elliott Aronson (1979).

cations, persons who have made decisions tend to discard information that would suggest such decisions are in error because the cognition that the decision might be in error is in conflict with the cognition that ego is a smart person. Cognitive dissonance theory would suggest that persons in dangerous jobs must decide between two conflicting cognitions. According to one cognition, ego is a smart person who would not choose to work in an unsafe place. If the worker continues to work in the dangerous job, he will try to reject the cognition that the job is dangerous.

The question naturally arises whether the behavior that psychologists label as cognitive dissonance could be considered instead as rational behavior under Bayesian decision theory. Agents with cognitive dissonance reactions have posterior distributions that are unwarranted solely by the information available to them. Their estimate of the state of the world is influenced by their preferences over their state of belief. Using Bayesian decision rules, agents' estimates of the state of the world is only influenced by the information available to them and their preferences over states of the world, but these estimates are independent of their preferences for beliefs per se. The typical psychological experiment motivated by cognitive dissonance theory compares the beliefs of two groups of agents—one a control group and the other a group whose preferences for different beliefs have been changed by the experimenter. The experimenter attempts to change these preferences while no new information is imparted to this second group that could be considered relevant to their estimate of the state of the world. From our examination of the evidence, we find it all but impossible to give a Bayesian interpretation to the results of many of the experiments, because it is all but impossible to give an explanation of the relevance of the differences in information available to the two groups.

This paper relies heavily on our three premises for which there is supporting data from psychological experiments. The presentation of just a bit of this data is useful not only because it lends support to the three premises but also because it shows the types of situations in which cognitive dissonance

reactions will be likely to occur. It should be understood, however, that the following paragraphs are merely illustrative. In their brevity, they fail to give the best possible evidence for our three premises and for the theory: That evidence being the great number of experimental results which are easily explained in terms of cognitive dissonance.

Experiments show that groups of persons with the same information have systematically different beliefs that accord with natural theories about their preferences. For example, persons like to view themselves as having made correct decisions. Interviews of bettors at a race track (Robert Knox and James Inkster, 1968) indicate that persons just leaving the betting window place much higher odds on "their horse" than persons in the queue just prior to their bet. As another example, in an experiment, an investigator (Jack Brehm, 1956) asked women to rate the worthiness of two appliances. They were then allowed to choose between the two appliances, which were given *wrapped* to the women. A few minutes later with the appliances still wrapped the women were asked for a second evaluation. These evaluations systematically changed in favor of the appliance that had been chosen.

Many laboratory examples concern immoral or cruel behavior. One experiment (Keith Davis and Edward Jones, 1960) asked students to watch another student being interviewed and then tell this student he was shallow, untrustworthy, and dull. The students who engaged in such behavior systematically changed their attitudes against the object of their cruelty. In terms of our first two premises, persons prefer to think of themselves as nice people. This self-image can be preserved if they have a low opinion of the object of their cruelty. They revise their opinions accordingly. A similar experiment (David Glass, 1964) reports that students who gave electrical shocks to victims lowered their opinion of their victims.

The cognitive dissonance model not only predicts systematic differences in interpretation of given information but also systematic differences in receptivity to new information according to preferences. In one example (Jerald Jellison and Judson Mills, 1967), some women were first asked to rate a group of

products. They were then asked to choose between two of these products of quite different desirability. Before this choice was final, however, one group of these subjects was presented with information on the rejected product and a second group was presented with information on a product that had been similarly rated but had not been one of the possible choices. Curiously, the subjects for whom the information was irrelevant to their decision spent more time reading it than the subjects for whom the information was relevant. This is one of many experiments that purport to show a biased receptivity to new information.

We should not lose sight of our third premise: that the effects of cognitive dissonance on beliefs may be long lasting. It is claimed as one application of cognitive dissonance theory that persons who justify to themselves some difficult undertaking are likely to have a strong and persistent belief that the undertaking is a good one. If an undertaking is difficult and the external reward is small (in comparison to the effort involved), the individual must either justify the undertaking to himself or consider himself stupid to engage in it. Many experiments show such effects over a short time; one particular experiment (Danny Axsom and Joel Cooper, 1980) shows that these effects may be quite long lasting. Two groups of women engaged in two weight-reduction programs, both for four weeks, one involving much effort, the other involving little effort. Over the four weeks, both programs were equally effective in weight reduction. However, a year later the women in the high-effort program had an average weight loss of eight pounds, while those in the low-effort program had on average lost virtually nothing. We consider this as evidence that cognitive dissonance may well have long-lasting effects.

III. A Model

A. *General Description of the Model*

This section presents and analyzes a simple model to show the economic consequences of cognitive dissonance. There are

two periods. In the first period, workers have a choice between working in a hazardous job or working in a safe job. The worker will choose the job with the highest combined pecuniary and nonpecuniary benefits.

In the first period, workers in the hazardous industry have no choice but to face the possibility of an accident as there is no safety equipment available. If the cost imposed by future wrong decisions is not too great, workers in the hazardous industry will, because of cognitive dissonance, come to believe that the job is really safe.

In the second period, cost-effective safety equipment becomes available. But, because by then workers in the hazardous industry believe the jobs to be safe, they will not purchase the equipment. Safety legislation is needed to restore Pareto optimality since the workers have an incorrect assessment of the marginal rate of substitution between safety equipment and money income.⁵

In this model, both labor markets and product markets are competitive. Also, workers begin with rational expectations. These workers know upon taking a job in the hazardous industry that they will experience cognitive dissonance and alter their estimated probabilities of accident. The purpose of building such a "complete information" model is not realism; we would not expect people to be aware of their future behavior.⁶ Rather, the purpose of this assumption is to show that even in a model where workers entering a hazardous job perfectly foresee their future psychological reactions to the unsafe conditions, there may be a welfare-improving role for safety legislation. Such a role is obvious in models without rational expectations in which governments have more information than private agents.

The assumptions of our model are presented in Part B; the model is analyzed in Part C; in Part D the resulting equilibrium is illustrated; in Part E the nature of the equi-

⁵We assume that workers cannot precommit themselves to buy the safety equipment. That assumption is analyzed in Section III.F.

⁶The implications of models where people are not completely aware of their future behavior are considered in fn. 8.

librium and the effects of the introduction of safety legislation are discussed; initially, in Parts B, C, D, and E, it is assumed that workers do not make contracts which precommit themselves to the purchase of safety equipment. Part F discusses that assumption and its implications.

B. Assumptions of the Model

The assumptions of the model are given in four parts: the description of the demand for labor in the safe industry; the description of the demand for the product of the hazardous industry; the description of the nonpecuniary disadvantages of the hazardous jobs; and the description of the individual worker's psychological choice.

The Labor Market in the Safe Industry. The safe industry is pictured as large relative to the hazardous industry. A job in the safe industry pays a fixed wage, denoted w_s . This wage anchors the wage of workers in the hazardous industry in both periods 1 and 2; that wage is determined by an appropriate equality between the pecuniary plus nonpecuniary benefits in safe and in hazardous jobs.

The Demand for the Product and the Supply of the Product in the Hazardous Industry. The demand for the product of the hazardous industry in each period is given by a downward-sloping demand function $D = D(p_h)$, where D is the demand for the good and p_h is the price of the good. The good is produced by labor alone. One worker produces one unit of the good in each period. The producers are competitive, so that the supply of the good is infinitely elastic at the wage in each period.

The Nonpecuniary Disadvantages of Work in the Hazardous Industry. Without safety equipment, all workers in the hazardous industry have a probability q of accident in periods 1 and 2. The cost of an accident to a worker is c_a .

In the first period, no safety equipment is available. In the second period, a worker in the hazardous industry can purchase a new safety device which eliminates the possibility of an accident at a cost c_s . To make this equipment economically relevant, it is as-

sumed that $qc_a > c_s$. We will also assume that workers cannot precommit themselves to purchase this safety equipment. They must decide at the beginning of the second period. The effect of relaxing this assumption and the reasonableness of doing so are considered in Part F. (Note also that in a competitive model it makes no difference whether workers or firms purchase the safety equipment.)

In addition, each worker in the hazardous industry in each period has a psychic cost of fear, equal to $c_f f$, where c_f is the unit cost of fear and f is the level of the worker's fear. (As an expositional convenience the uncomfortable feeling of a worker in a job believed to be unsafe is called "fear." This convention should not mask the relevance of our model for the economic consequences of cognitive dissonance. Cognitive dissonance theory has a more complex explanation than animalistic fear for the worker's uncomfortable feeling: he is torn between two cognitions: that he is a smart person; yet he has chosen to work in a hazardous job. The welfare implications and market solution are independent of the precise description of the uncomfortable emotion.)

The Relation between Fear and the Perceived Probability of Accident q^ ; and the Worker's Choice of q^* .* In general, f will be a function of q^* , the worker's subjective assessment of the probability of an accident occurring during the period. This function is assumed to be of the form

$$(1) \quad f = q^*/q$$

over the range $0 \leq q^* \leq q$. For each worker, prior to his choice between work in the hazardous or safe industry, q^* starts off equal to q , the true probability of an accident. But, cognitive dissonance is modeled by letting each worker choose any value of q^* in the range between 0 and q . However, once that choice has been made, the worker must behave as if the new value of q^* is the true probability of accident. In this model workers are fully aware of the decision environment: they have rational expectations.

C. Description of the Equilibrium of the Model

It is easy to analyze the equilibrium of the model by working backwards from period 2. Formal proof that the equilibrium accords with the description given here is available in an appendix on request from the authors. The proof is outlined here. The analysis of the equilibrium proceeds according to four propositions.

PROPOSITION 1: *The wage in the hazardous industry in period 2 is $w_s + c_s$.*

Because real costs of producing in the hazardous industry in the second period are lower than in the first period due to the introduction of the new safety equipment, the price of the good will be lower in the second period, and therefore the demand will be higher. As a result, more of the good will be produced and hence more workers hired in period 2 than in period 1. Of necessity, the marginal worker in period 2 must come from the safe industry. Such a worker believes $q^* = q$ and will therefore purchase the safety equipment. This worker must be compensated for the wage lost from not taking a safe job, w_s , and also for purchasing safety equipment at cost c_s . Such compensation makes the two jobs exactly comparable. Thus the wage in the hazardous industry in period 2 is $w_s + c_s$.

PROPOSITION 2: *A worker in the hazardous industry in period 2 chooses to buy safety equipment if*

$$(2) \quad q^* > qc_s / (qc_a + c_f).$$

The worker buys safety equipment in period 2 if the perceived cost of fear and the perceived cost of accident exceeds the cost of the safety equipment. The level of fear is q^*/q . The cost of fear is therefore $(q^*/q)c_f$. The perceived cost of accident is q^*c_a . Thus the worker chooses to purchase (or not purchase) safety equipment accordingly as $q^*c_a + (q^*/q)c_f$ is greater than (or less than) c_s . Inequality (2) follows.

PROPOSITION 3: *A worker in the hazardous industry in period 1 chooses*

$$(3) \quad q^* = 0$$

$$\text{if} \quad (qc_a - c_s) < c_s c_f / (qc_a + c_f),$$

$$(4) \quad q^* = qc_s / (qc_a + c_f)$$

$$\text{if} \quad (qc_a - c_s) > c_s c_f / (qc_a + c_f).$$

The variable q^* is chosen by each worker in period 1 to maximize his welfare. The worker correctly perceives that if he chooses q^* below the critical level $qc_s / (qc_a + c_f)$ he will make the wrong decision in period 2 regarding the purchase of safety equipment.

A worker who chooses q^* in the range below the critical level $qc_s / (qc_a + c_f)$ should choose $q^* = 0$, the level which minimizes his fear. The cost to him of fear in this case is 0, but the cost of making the wrong decision in period 2 regarding the purchase of safety equipment is

$$(5) \quad qc_a - c_s$$

and will be the same for any value of $q^* < qc_s / (qc_a + c_f)$.

Alternatively, the worker could maintain q^* sufficiently high so that he will correctly purchase safety equipment. This will occur as long as $q^* > qc_s / (qc_a + c_f)$ according to Proposition 2. And $q^* = qc_s / (qc_a + c_f)$ will minimize the cost of fear.

What value of q^* should the worker choose? To maximize his combined pecuniary and nonpecuniary income he should compare the cost of fear at the level $q^* = qc_s / (qc_a + c_f)$ to the cost of failure to purchase safety equipment at $q^* = 0$. The cost of fear at $q^* = qc_s / (qc_a + c_f)$ is $(q^*/q)c_f$, or

$$(6) \quad c_s c_f / (qc_a + c_f).$$

Accordingly the worker should choose $q^* = 0$ if (6) exceeds (5) and $q^* = qc_s / (qc_a + c_f)$ if (5) exceeds (6).

PROPOSITION 4: *The wage of workers employed in the hazardous industry in period 1 is*

$$(7) \quad w_{h_1} = w_s + qc_a + \min(qc_a - c_s, c_s c_f / (qc_a + c_f)).$$

are exactly the same as those of a worker in the safe industry. In period 1, however, he has an additional cost of accident equal to qc_a and an additional cost of fear equal to $(q^*/q)c_f$. Thus he must receive additional compensation relative to a worker in the safe industry in amount $qc_a + c_s c_f / (qc_a + c_f)$ so that

$$(9) \quad w_{h_1} = w_s + qc_a + c_s c_f / (qc_a + c_f).$$

Putting together these cases, they yield the proposition.

D. Illustration of the Equilibrium

Figure 1 illustrates this equilibrium. In each period the demand for workers in the hazardous industry exactly equals the demand for the good, because it takes one worker to produce one unit of the good. In the first period there is an infinitely elastic supply of workers at the reservation wage

$$(8) \quad w_{h_1} = w_s + qc_a + (qc_a - c_s).$$

$$(10) \quad w_{h_1} = w_s + qc_a + \min(qc_a - c_s, c_s c_f / (qc_a + c_f)).$$

In Case II, where the worker chooses $q^* = qc_s / (qc_a + c_f)$, he buys safety equipment in period 2 at a cost c_s and he receives a wage $w_s + c_s$. Therefore his net benefits in period 2

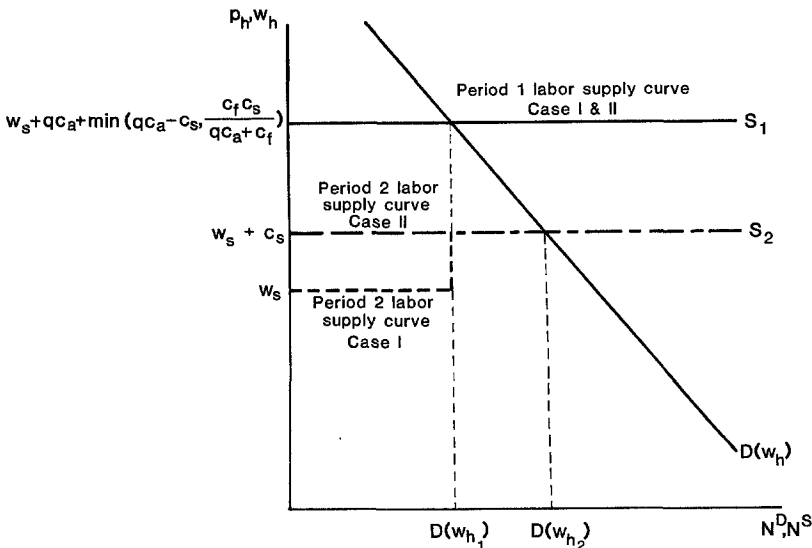


FIGURE 1. LABOR DEMAND AND SUPPLY IN THE HAZARDOUS INDUSTRY FOR PERIODS 1 AND 2

Thus the equilibrium wage in the first period is $w_s + qc_a + \min(qc_a - c_s, c_s c_f / (qc_a + c_f))$. In the second period, there are two possible supply curves for labor. In Case I with $q^* = 0$, workers supply labor up to quantity $D(w_{h_1})$ at wage rate w_s ; beyond $D(w_{h_1})$ there is an infinite supply of labor from the safe industry at wage $w_s + c_s$. In Case II with $q^* = qc_s / (qc_a + c_f)$, there is an infinite supply of labor to the hazardous industry at the wage $w_s + c_s$. In both Cases I and II, the equilibrium wage in the second period is $w_s + c_s$ because the demand curve for labor meets each of the two possible supply curves to the right of $D(w_{h_1})$ where labor supply is infinitely elastic at wage $w_s + c_s$.

E. *The Equilibrium Discussed; Introduction of Safety Legislation*

What are the distributional implications of this equilibrium? First, all workers no matter what their employment history will have the same expected pecuniary and nonpecuniary income when summed over the two periods: $2w_s$.⁷ When the relative costs of safety, fear, and accidents are such that all workers will choose to buy the safety equipment in the second period, all workers will have an expected income of exactly w_s in each period. If the parameters of the decision problem are such that workers in the hazardous industry in the first period will choose not to buy the safety equipment in the second period, the situation will be somewhat different. Those workers will perceive themselves as earning $w_s + c_s$ in the second period when in fact their expected income will be

$$(11) \quad w_s + c_s - qc_a < w_s.$$

However, because they foresaw this eventuality at the beginning of the first period, their first-period wages compensated them for this loss. Thus the introduction of the consideration of cognitive dissonance does not change the distribution of utility among workers. What about the distribution between workers and consumers?

⁷Workers in the safe industry receive a wage of w_s in each period for a total net benefit of $2w_s$.

We now compare the equilibrium just derived to one with safety legislation. This safety legislation requires the purchase of safety equipment which has been found to be cost effective. In this case the reservation wage for working in the hazardous industry in the first period will be only

$$(12) \quad w'_{h_1} = w_s + qc_a.$$

Since workers know that they will be required to adopt the new safety technology they will always choose $q^* = 0$ and will experience no fear in the first period. Since they will be required to purchase safety equipment in the second period, they will not require compensation for making a wrong decision in period 2 or for keeping fear at a level that will allow them to buy safety equipment when available. With safety equipment, the reservation wage for all workers in the second period will be $w_{h_2} = w_s + c_s$. The wage in the second period will be the same with and without safety legislation:

$$(13) \quad w_{h_2} = w'_{h_2} = w_s + c_s.$$

The net change over the two periods due to safety legislation is a lower wage in the hazardous industry in the first period—hence a lower price of the good produced by this industry.

With safety legislation the workers still have the same expected income summed over both periods, $2w_s$. But, consumers are better off since they pay a lower price for the good of the hazardous industry in the first period. Thus safety legislation causes a Pareto-superior result.⁸ If consumers have constant

⁸Customers are the beneficiaries of safety legislation only if workers perfectly foresee their future behavior. If workers are unaware of the impending improvement in safety technology, the effect of fear, or the possibility of changing their beliefs, then the benefit of safety legislation, if any, will go to workers in the hazardous industry. That gain will be $qc_a - c_s$ per worker and will obtain in all cases where workers decide to believe that their jobs are not dangerous during the first period. That would be all situations where the cost of fear is greater than $qc_a - c_s$, and all cases where workers do not know that they may change their beliefs or are unaware of the effect of that choice on their decision to buy safety equipment in the second period. A typescript with a

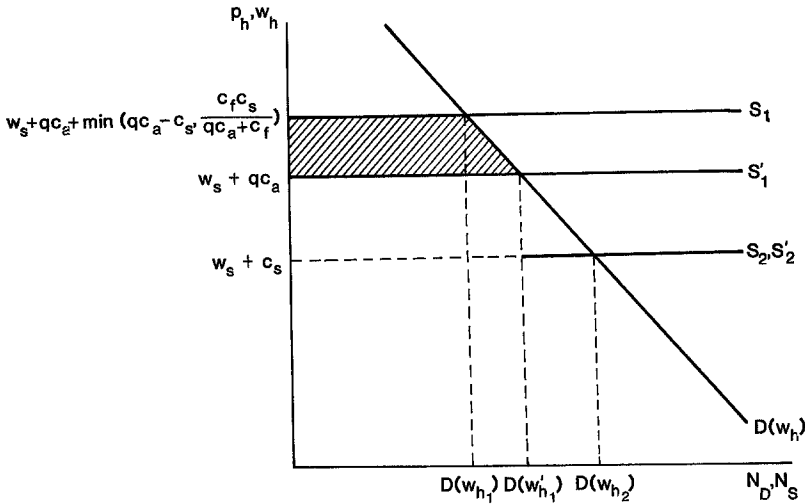


FIGURE 2. LABOR DEMAND AND SUPPLY IN THE HAZARDOUS INDUSTRY WITH AND WITHOUT SAFETY LEGISLATION

Note: The shaded area illustrates the welfare gain from legislation; the S are supply curves without safety legislation; the S' are supply curves with safety legislation.

marginal utility of income the welfare gain from safety legislation is equal to the shaded area in Figure 2.

F. *Precommitment Contracts*

Jack Hirshleifer has pointed out to us that, in a perfect foresight world, if workers can enter into contracts at the beginning of period 1 which will bind them to purchase safety equipment in the second period, a Pareto-optimal equilibrium can be obtained through the voluntary actions of the workers without government intervention. Whether or not such precommitment contracts are possible depends on the nature of the legal system. If recontracting is allowed in the second period, workers may try to precommit themselves but will want to recontract at the beginning of the second period. Such recontracting must lead to a Pareto-optimal result given the workers' tastes and beliefs as they stand at the beginning of the second period. Thus, if

workers have taken advantage of their precommitment by allowing themselves to come to believe that their job is safe they will now want to break their contract. If recontracting is allowed, they may do so by paying some amount (less than c_s) to the person with whom they contracted. If the workers have rational expectations and correct perception of the true model in the first period, as we have assumed, they will perceive the futility of precommitment in the presence of possibilities for recontracting and will refrain from trying.

However, in a model where agents acquire reputations from past dealings, precommitments may be viable. Agents who sell safety equipment may not be willing to recontract if by so doing they would jeopardize their reputations, thereby reducing their possibilities for advantageous future precommitment contracts. But, a model in which reputation plays a role ipso facto involves an institutional framework different from the usual competitive model and is likely to have non-Pareto-optimal outcomes.

Finally, if we relax the assumption that workers can foresee their cognitive disso-

detailed analysis of these possibilities is available from the authors.

nance reactions, then precommitment contracts become impossible.

IV. Potential Applications

The model described in the last section is illustrative of the use of psychological findings in economic models. In this section we suggest some other possible applications for similar models. Some of these potential applications are directly motivated by cognitive dissonance theory. Others are merely suggested by the economic interpretation we have given that psychological theory.

A. Sources of Innovation

Our model describes an economic theory of the choice of beliefs: initially, beliefs are only adopted if the net pecuniary and psychic benefits are positive. Because of cognitive dissonance, beliefs are persistent once adopted. Persons tend to avoid or resist new information that contradicts already established beliefs. As an application, this model yields some insight into the economics of innovation. In the context of the last section, in Case I, the innovators who purchased the new safety equipment in period 2 were not workers familiar by experience with the conditions of the hazardous industry, but, instead, were new workers, who in period 1 worked in the safe industry and then transferred in period 2.

The prediction from the model that innovators are previous outsiders to an activity agrees with two observations. First, in the history of science, Thomas Kuhn (1963) has claimed that the persons who first adopt a new scientific paradigm are predominantly new entrants into the field. In the field of industrial organization, it is believed that industrial laboratories are responsible for much minor innovation, but the major innovations mainly come from outside (Edwin Mansfield, 1968, p. 92). John Jewkes et al. (1959) found that prior to World War II only twelve out of the sixty-one major inventions in their study came from industrial laboratories. Over half came from private individuals. Daniel Hamberg (1963) reports similar findings after World War II.

B. Advertising

How does advertising work? Why do companies spend millions of dollars on advertising campaigns and why are people more likely to buy an advertised brand than one which does not advertise, all other things held equal?

This is undoubtedly a complicated question with answers dependent on the particular products and situations. But, the textbooks on advertising emphasize one factor: advertisements convey information about the product. The term "information," as used here, does not only refer to facts about the physical attributes of the advertised product. Advertising may also convey information about the social significance of consuming the product and how it may serve the psychological needs of consumers as well as their physical needs.⁹

If the information provided by ads generally allowed people to distinguish the functional or psychological value of a product, then it would be easy to understand how it worked to help determine peoples' choices. But, advertising textbooks admit that there are cases when the information conveyed in ads is irrelevant.

For example, one undergraduate advertising text divides products into three categories: those with significant differences in physical performance, those that differ only in "design or formulation characteristics" (Weilbacher, p. 174), and "generic" products or those that are "if not identical, at least indistinguishable from each other" (Weilbacher, p. 178). When brands in the latter category (and to some degree in the second category) claim a distinction from other brands, the claim is based "on the pre-emption of a quality or ingredient common to or inherent in all of the individuals in the category or on some abstract or even imagined quality" (Weilbacher, pp. 179, 181). Products

⁹For example, one undergraduate text on advertising suggests that: "Consumers often expect marketing entities to perform for them, both in an overt physical sense as well as in a psychological sense. Most marketing entities promise some sort of specific psychological satisfaction as well as physical performance" (William Weilbacher, 1979, p. 159).

that the author sees as belonging in this last category are some of the most heavily advertised. Another book suggests that there are two ways to meet consumers' desires once they have been identified. First, a new product can be created. The authors refer to this as a "product strategy." As an alternative they advise their readers that they might want to adopt an "advertising strategy" with the goal of changing "the consumers' perceptions" of an existing product so that it would be seen as filling those needs (see David Aaker and John Myers, 1974, p. 158). Finally, although the advertising texts would like to treat peoples' psychological needs as being fully commensurate with the "overt physical" needs, it is clear that at least with respect to the relevance of the information about the products conveyed by ads, they are not. The trunk size or head room of a car is relevant to someone buying a car if they carry large loads or are tall. A car with a large trunk or high ceiling may be more valuable than one without these attributes. However, the type of toothpaste that an individual uses is going to do little to affect how socially acceptable he may be. Likewise, the type of soft drink one brings usually does not affect the fun of a picnic.

If the information conveyed by ads of this type is of so little value, why would anyone ever pay attention to them?

The theory of belief proposed in this paper suggests an explanation for this phenomenon. As the advertising practitioners point out, people do have needs and tastes and they do buy goods to satisfy them. Some of these needs and tastes are quite obscure or subtle; it may be hard to tell when the needs are being met. In such cases people may *want* to believe that what they have just bought meets their needs. Advertisements give people some external justification for believing just that. People like to feel that they are attractive, socially adept, and intelligent. It makes them feel good to hold such beliefs about themselves. Ads facilitate such beliefs—if the person buys the advertised product.

This formulation also suggests a limitation to the power of advertising. People may be willing to pay a little more for a product with an attractive fantasy attached. However,

there are limits to their willingness to pay. When the value of the belief is less than the additional cost of the advertised brand, advertising will fail. Such a view of advertising suggests an approach to the welfare analysis of advertising different from that in the advertising textbooks and also in the economics literature (Richard Schmalensee, 1972).

C. *Social Security*

Another application of this type of model of potential economic importance concerns old age insurance. Social Security legislation is based on the belief that persons left to their own devices tend to purchase too little old age insurance.

If there are some persons who would simply prefer not to contemplate a time when their earning power is diminished, and if the very fact of saving for old age forces persons into such contemplations, there is an argument for compulsory old age insurance. The case, as we see it, is analogous to the case for safety legislation made in the last section. In that model workers found it uncomfortable to contemplate the dangers involved in working in the hazardous industry. For that reason they sometimes failed to have the appropriate marginal rate of substitution between safety and wages. In a similar mode persons may find it uncomfortable to contemplate their old age. For that reason they may make the wrong tradeoff, given their own preferences, between current consumption and savings for retirement.

D. *Economic Theory of Crime*

One application of cognitive dissonance theory is to the economic theory of crime. According to Gordon Tullock (1974), the economists' theory of crime involves a straightforward application of standard price theory:

Most economists who give serious thought to the problem of crime immediately come to the conclusion that punishment will indeed deter crime. The reason is perfectly simple.... If you increase the cost of something, less will be consumed. Thus, if you increase

the cost of committing a crime, there will be fewer crimes. [pp. 104–05]

Psychological experiments motivated by cognitive dissonance theory strongly suggest that Tullock's conclusions are only partially correct. While it may be true that less obedience will be observed when there is greater deterrence, these experiments show that once the threat of punishment is removed, people who have been threatened with relatively severe punishment are more likely to disobey than those threatened with relatively mild punishment.

In an experiment that has been performed under a variety of conditions, children are told not to play with a very desirable toy. One group is threatened with severe punishment; and another with mild punishment for disobedience. The children are then allowed to play in the room with the toy for some time. Later (in one experiment several weeks later, see Jonathan Freedman, 1965), the children are again put in the room with the toy, only this time without the threat of punishment. Those who have been threatened with the more severe punishment are more likely to play with the forbidden toy than those threatened with mild punishment. It has similarly been shown that children who are punished severely for aggressive behavior at home are more violent in school than those who are mildly punished (see Robert Sears et al., 1953).

The interpretation of these studies is that those who obey rules for which the penalty of violation is relatively small need to create an internal justification for their actions. When they get into a situation where external sanctions for violating the rule are reduced or eliminated, they are less likely to break the rule because they are inhibited by the internal justifications they created in the first situation.

Thus the application of price theory to crime is not so natural as Tullock, and also Becker (1968), would have us believe. Increased punishment may act as a deterrent where its effect is obvious and the probability of apprehension for crime is well understood by the criminal. But most crime is committed with the expectation by the crimi-

nal that he will not be caught. Thus self-motivation to obey the law is undoubtedly a key factor in the reduction of crime—and this may decrease with the severity of punishment.

V. Conclusion

This paper has provided an example of how psychological theory can be incorporated into theoretical economic models. In particular, a decision model motivated by cognitive dissonance theory has been constructed that is a modification of the usual model of rational decision making.

This model closely follows standard economic analysis insofar as persons are completely informed about the potential consequences of their actions and make their decisions to maximize their own welfare. But, analysis that takes account of cognitive dissonance gives different results from the standard analysis, and, in particular, provides better explanations for some phenomena that are a puzzle according to the standard approach.

For example, the approach in this paper suggests a good reason why noninformational advertising is effective, why Social Security legislation and safety legislation are popular, and also why persons fail to purchase actuarially beneficial flood and earthquake insurance. The explanations do not rely on an assumption that people are basically misinformed—if they believe something other than the truth, they do so by their own choice.

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