4. X-EFFICIENCY THEORY: 1

4.1. INTRODUCTION

In the last chapter, we examined data (seemingly) inconsistent with orthodox neoclassical theory, as well as Leibenstein's initial attempt to provide a explanation for these data. In the next two chapters we will analyze this explanation - XE theory - in more detail.

The X in X-efficiency represents an unknown factor responsible for a nonallocative type of inefficiency. That is, the data presented in the last chapter revealed unexploited, low-cost opportunities for increasing intrafirm productivity and hence for reducing the firm's costs. These (X) unexploited opportunities are due to factors such as lack of motivation, human inertia, and biases in human decision making that lead to non-maximizing behavior, suboptimal performance, and waste. These unexploited opportunities are a form of inefficiency, but not allocative inefficiency. These inefficiencies are not related to prices and markets per se. They are related to intrafirm activities and to both type-1 and type-2 errors made by individuals, which affect the firm's performance.

One of the tasks of the next two chapters is thus to explain how the individual's "internal" environment (personality) and "external" environment can produce both these types of behaviors. XE theory will be discussed in the following sequence. First, we will discuss the psychology and behavior of the individual. Second, we will discuss the individual as a group member. Third, we will present the implications of the theory. Fourth, we will provide an application of the theory to the determination of productivity.

4.2. THE INDIVIDUAL IN XE THEORY

XE theory is largely a reaction to two things: orthodox economic theory which presents production as technologically determined, and formal and anecdotal evidence seemingly inconsistent with this theory. If production is not the outcome of merely technological forces, then what does determine input:output relations? In part, XE theory explains both these issues by exploring the component parts, or meanings, of some commonly used words and terms, including decision making, effort (physical and/or mental), pressure, maximization, and rationality. In each case, the reader will see a tendency to think of these as being defined by a range of possibilities; for example, decision making can be either "tight" or "loose," and effort and pressure can vary from a little to a great deal. The reader will also recognize a tendency for XE theory to inquire about the behavioral or procedural aspects of these words. For example, what are the component parts of effort, and under what conditions is a high effort level more likely to be forthcoming? Similar to Herbert Simon, rationality is used in a procedural sense. That is, what procedures are necessary for a rational decision to be made? 1

4.2.1. The Dual Personality

The concept that an individual can contribute to X-(in)efficiency arises from the dual nature of the human personality. On the one hand, we want to adhere to standards, to strive for the maximum, and to strive by being calculating and attentive to details. In other words, this aspect of the personality is our rational self, the part of us that uses "tight," focused, or rational decision-making procedures. Leibenstein refers to this aspect of our personality as the "superego function." (Although this term was used by Freud, it would be incorrect to assess its use here as implying that Leibenstein is attempting to incorporate Freudian psychology into economic theory.) The other tendency is for each of us to "kick back," to use "loose" decision-making procedures, to follow our "animal spirits." Leibenstein refers to as the "id function." It is the id function that leads us to be "unconstrained," that is, unwilling but not necessarily unable to be calculating, attentive, rational.

XE theory assumes that, on the average, each individual is influenced by both functions in a way that leads to a compromise between the two. That is, each of us forges a compromise between the way we feel we must behave and the way we would like to behave were it not for a sense of obligation to duty or to a set of standards. In other words, each individual strikes a compromise that provides them with a sense of (psychological) "comfort."

The words “constrained” and “unconstrained” have been used in the context of an individual's ability and willingness to be attentive to details, to calculate, to be rational. "Constrained" and "unconstrained" are now going to be considered as the two end points of a personality trait that could be measured on a continuous scale. That is, the personality could exhibit complete constraint concern, at one end of the spectrum, and a complete lack of concern for constraints at the other end. Thus, an individual could employ the full power of his or her attention to details and to calculating costs and benefits. Such an individual would be completely or fully rational. On the other hand it is possible to imagine an individual placing less than 100% of this power on the details and calculations necessary to make a fully informed decision. Such an individual is referred to as "selectively rational." Rationality is thus a continuous variable with an "economic person" exhibiting complete constrain concern. The economic person is thus a limiting case: a characteristic of the decision-making procedures used by some people at some times but not necessarily characteristic of all people at all times.

4.2.2. Selective Rationality

An extended look at the behavioral or procedural elements consistent with full and selective rationality will now be undertaken. The purpose of this element of the theory is to develop a list of decision-making procedures that are as consistent as possible with full, and hence selective, rationality. Such a list gives the concept of rationality a behavioral meaning and, therefore, denies that rationality can simply be assumed.

Six elements of rational decision making will be explored. These are: realism in assessing the environment, nonreflexive assessments of the environment, independence of judgment, magnitude sensitivity, nondeferral of decisions and actions, and learning from experience. Some of these elements may overlap each other; for example, a nonreflexive (nonknee-jerk) assessment may imply a more realistic one. Be that as it may, our major concern here is in creating a framework or research agenda in which rationality can be studied, and in order to do this the concept of rationality has to be made operational. The above list is one possible approach.

Each of the elements in this list is believed to be a continuous variable. For example, a decision can be based either on a completely realistic assessment of the environment or on completely wishful thinking. Another possibility is that a decision will be made on the basis of a realistic assessment of some parts of the environment and wishful thinking towards other parts. The assessment of the riskiness of a project should make the importance of realism apparent.

A reflexive assessment of the environment is a knee-jerk reaction or decision. It is a noninformed decision based on the first impulse experienced by the decision maker. On the other hand, a nonreflexive assessment is characterized by a cool appreciation of the relevant facts. The term "knee-jerk" is not synonymous with "spontaneous"; "spontaneous" implies an almost instantaneous decision made by an expert nonreflexively but "unconsciously."

Independence of judgment may also vary from completely independent to completely dependent. Dependence would include at least the following decision making procedures: accepting advice from those with less information than that possessed by oneself; behaving simply to please others or gain their approval; and noncritical emulation. (In)dependence, as is true of the other elements of rationality, is often a matter of degree, rather than an all-or-nothing event.

Complete constraint concern - complete rationality - is seen as the outcome of a decision that is sensitive to changes in the environment. Only those who are (highly) magnitude sensitive are able to take advantage of (small) changes in relevant environmental data - prices, income, demand, etc. - which warrant an appropriate response in terms of a change in their behavior.

Never put off until tomorrow what you can do today, but especially when you are betting that tomorrow will never come. (It always does!) Time deferral refers to this behavior or pattern, and to the practice of implementing "loose" decision making procedures today in the hope that you will gain the ability and/or willingness to be highly rational tomorrow. Time deferral is clearly distinguished from delaying a decision until the information search and analysis are completed.

The result of a decision depends upon its informational content. Some decisions are based upon all relevant past experiences, regardless of whether they were successful or un-successful. At other times we may remember only the successful experiences and base our

current decisions accordingly. Ceteris paribus, the outcome of a decision will be different depending on this degree of selective learning, or how we learn from past experiences. In all people, the components of rationality are believed to be continuous, not binary (all-or-nothing) variables, and the degree of rationality exhibited by any one individual at any time is the outcome of the dual influences of both the superego and id functions on the individual's behavior. Furthermore, complete rationality is seen as the outcome of a decision-making procedure characterized by the optimal use of realism, nonreflexivity, independence, a high degree of magnitude sensitivity, nontime deferral, and a willingness and ability to learn from all (relevant) past experiences.

4.2.3. Deductive Thinking

The fact is, we are not prone to logical or deductive thinking. Although we make good decisions - even optimal ones - despite our lack of logical reasoning ability I want to make this point: our formal logical decision-making abilities are limited. Deductive reasoning is neither our usual practice nor is it natural. Much of the time we reason nondeductively, that is, inductively. Deductive thinking is believed to be product of our first 12 to 15 years of life, a skill that needs to be developed rather than an inherited part of adult reasoning. As a result, logical thinking is not a *given*.

In addition we suffer from many biases that distort our decision making abilities. Although these biases may be the product of human evolution, they reduce our ability for optimal decision-making, and they are correctable. Before we can minimize our biases, we must recognize them. Seventeen biases are listed and discussed briefly below.

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4.2.4. Common Biases in Human Decision Making

Bias # 1: Acquiescence to Majority Opinion. Studies have shown that even when asked to judge the length of a line, individuals knowingly answer incorrectly in order to agree with the (overwhelming) majority. Individuals also violate their own personal judgments when faced with a presumed representative of community standards.

Bias # 2: Reactions to Excessive Stress. Excessive stress is anathema to deliberative or reflective decision-making. The decision-making affects of excessive stress include distorting facts, denial of one's true values or goals, maintenance of the status quo, procrastination, knee-jerk decision-making in order to reduce the stressful situation, "passing the buck," and hypervigilance to immediate and trivial details at the expense of the total costs and benefits of various alternatives.

Bias # 2a: Approach-Avoidance Conflict. Some situations or things both attract and repel us at the same time: the possibility of profits but the risk of losses, the possibility of publishing an article but the fear of rejection by the publisher, the pure joy and pure horror of chocolate

chip cookies. The danger inherent in an approach-avoidance conflict is a source of stress, leading to vacillation rather than to a rational decision.

Bias # 2b: Approach-Approach Conflict. At times we must choose between two equally desirable alternatives: for example, choosing which school to attend, which neighborhood to live in, which woman to date (the "so many women, so little time" syndrome). The desire to avoid regret is a source of stress, leading us to decide in an arbitrary way as much as in a rational way.

Bias # 2c: Avoidance-Avoidance Conflict. At times we must choose the lesser of two evils. The undesirable outcome that awaits us is a source of stress, leading us to become preoccupied with trivial details as a way of denying or withdrawing from the stress.

Bias # 3: Need for a Consistent and Coherent View of Ourselves and Our Relationship With the World. Consider the fact that on the one hand I hold to the belief that I am a hardworking tenured full professor, but on the other hand my student evaluations are below par and I haven't published anything since Haley's Comet appeared over the night sky. These inconsistent facts are disturbing or troublesome and are called cognitive dissonance. The reaction to cognitive dissonance is often to accept the most psychologically comfortable alternative. In my case, this may be the rationalization that students are in no position to evaluate me, and the referees of the journals to which I have submitted articles are simply jealous! The important issues of my commitment to teaching and (scholarly) research will never be resolved if I take this approach of eliminating the dissonance without eliminating the conflict that gave rise to it in the first place.

Bias # 4: Confirmation Bias. Once I've decided that the students cannot realistically evaluate me, then I listen only to those colleagues who agree with me and even overestimate their ability for clarity in these matters.

Bias # 5: Halo Effect. We tend to experience clusters of properties and evaluate something or someone on the basis of the cluster as a whole. The quiet CPA with a wife and three children who attends church regularly with his entire family could never be a child molester. The Halo Effect distorts our ability to correctly evaluate information and hence to make appropriate decisions.

Bias # 6: Ignoring the Odds. We ignore the odds even when they suggest that we are incorrect. This bias is also known as the representative heuristic. (A heuristic is a shortcut device for making decisions.) For example, is Michele a librarian or a salesperson? She is shy and withdrawn, a meek soul, always helpful, has a need for order, and a passion for detail. You probably believe that Michele is a librarian because her personality more adequately fits the description of a librarian. Odds are, you're wrong. Don't worry: approximately 67% of 1000 business executives surveyed made the same error. They, and perhaps you as well forgot to figure the odds: there are approximately 200,000 librarians in the U.S. but 75 times as many salespersons - approximately 14 million. Despite certain personality traits, Michele is more likely to be selling something than she is to be stacking books at the local library.

Bias # 7: The Self-Serving Bias. We tend to attribute desirable outcomes in our life to our own intelligence, effort, or diligence. On the other hand, we blame the external environment for undesirable outcomes. We also overestimate the chance of positive things happening to us (winning the lottery) but underestimate undesirable outcomes happening to us (being in a car accident). Distorting our abilities and the reasons for success and failure cannot help but reduce our decision-making abilities.

Bias # 8: Sour Grapes. We tend to devalue a goal simply because of our fear that it is unattainable. Although this can be a healthy response to the truly unattainable goal, it is costly if we have a tendency for underestimating our abilities and then convincing ourselves that we do not want to attain that goal in the first place.

Bias # 9: Discounting the Future. Especially during times of duress and stress, we tend to place more importance on the present and to overly discount the future. On the other hand, economic success requires us to postpone immediate gratification and sacrifice for the future.

Bias # 10: Overconfidence. We allow overconfidence to lead us to believe that what we do know is accurate and complete - especially when the information at hand is incomplete - and that what we don't know isn't worth knowing. (College professors suffer a great deal from this mistake.) An example of this mistake is buying a product about which, in fact, you have very limited information and relying only on the information given to you by the seller.

Bias # 11: Data are Good. We rely on (inadequate or irrelevant) data just because they are data. Psychologists Amos Kahneman and Daniel Tversky (1974) refer to this as an anchoring heuristic. For example, in a study of anchoring, a group of real estate agents were shown a house, were given a talk about the neighborhood and home values, and were told that the asking price was $65,900. The agents' evaluation of the house placed its value at $66,755, on average. Another group of agents shown the same house and given the same talk was told that the asking price was $83,900. They evaluated the same house at $73,000, on average, or approximately 10% above the average figure given by the other group of agents. We tend to use any data given to us and to "anchor" our judgments with them.

Bias # 12: Overestimating Memorable Events. We tend to overestimate the frequency of events that we more easily remember, as well as dramatic and memorable events. This bias is referred to as the availability heuristic. For example, do words beginning with the letter R occur more often than words whose third letter is the letter R? The answer is "no." However, most persons surveyed give the incorrect answer, perhaps because it is easier to think of words beginning with R than words whose third letter is R. Buying the stock of a company that announces a hot new product is another example of how dramatic events affect our inferences. We infer that a hot new product will increase company profits, while ignoring all other - less dramatic - information about the company, the industry, and the economy in general. Persons who have just seen an automobile accident are more likely to overestimate the frequency of such accidents. Approximately 70% of persons surveyed believe that

murder is more common than suicide in the U.S. However, although we hear more about murders than suicides, suicides out numbered murders 3 to 2 in 1987.

Bias # 13: We See Patterns Where They Don't Exist. We underestimate the role of chance in everyday events. We "see" patterns that which, in fact, are random or chance events. Professor Werner De Bondt of the University of Wisconsin estimates that by chance alone - not related to superior management - approximately 15% of mutual funds that invest in stocks will outperform the average equity fund for three consecutive years. Or, in flipping a coin 20 times, there is an 80% chance that you will draw either three heads or three tails in a row. Drawing three consecutive heads (tails) is not a pattern; the statistical odds of drawing a head is .50; the odds of two consecutive heads is (.50) x (.50), or .25; the odds of three in a row is (.50) x (.50) x (.50), or .125.

Bias # 14: Principle of Proportionality. We don't always treat a dollar as a dollar. Research has shown that three out of four people will go ten blocks to save $25 on a clock radio, paying $25 rather than $50. This is a saving of 100%. However, only one in five will go ten blocks to save $25 on a $1500 stereo system. This same $25 is a saving of approximately 1.5%. The fact that you will not walk ten blocks to save 1.5% is not rational; it is a mistake created by a common bias in human decision making. And the bias is costly because the people who sell expensive items tend to know this.

Bias # 15: Mental Accounts. We mentally "pigeonhole" money and create mental accounts that may not make sense. For example, people who win $1,000 gambling in Las Vegas are more likely to bet even more the next day than people who discover an additional $1000 in their savings account: $1000 is obviously not just $1000. Some people are more likely to purchase something by charging it to their credit card - paying in the range of 18% interest - than to purchase it with money in their bank, which is earning an interest rate of 5% to 8%. It is also the case that the people who overwithhold on their income taxes in order to guarantee that they won't owe any taxes at year's end, and won't have to draw on their savings are often the same people who build up large indebtedness on their credit cards and who, in effect, draw on their savings.

Bias # 16: Sunk Costs. We often throw good money after bad money. Once we pay for something, we have a tendency to become irrationally committed to it. The money paid is a sunk cost. Yet, decisions should be made regardless of sunk costs - regardless of the past. Individuals have been known to react to a drastic fall in the price of their stock by investing more as a way of trying to recoup their (paper) losses. Throwing good money after bad simply as a way of avoiding acknowledgment of a bad decision and a loss is not rational.

Bias # 17: Opportunity Costs. We think too much about obvious out-of-pocket expenses and not enough about less obvious lost opportunities (opportunity costs). Professor Richard Thaler (1980) finds this a curious phenomenon. When asked hypothetically, people who have won a ticket to the Super Bowl will sell it only at a very high price. However, they would spend only approximately half as much had they not owned a ticket but wanted to attend the game. Thaler's explanation is that we are more aware of how much money we would have to

take out of our pocket to buy the ticket, but less aware of how much we could put into our pockets by selling the ticket\(lost opportunity). Theoretically, the two prices should be approximately equal to each other.

Given the range of these seventeen biases there would seem to be no lack of opportunities for X-inefficient decision making.

4.2.5. Selective Rationality and Heuristics

Some of the 17 biases above are referred to as heuristics or shortcut methods for making decisions. A heuristic is a method of reducing complexity without loss of accuracy. Purchasing the same brand names and/or quality of goods as your neighbors is an often used heuristic: those subscribing to it believe it reduces their need to search while giving the appearance of correctness and good taste. Screening potential employees by their educational attainment is a commonly used heuristic. However, while useful, heuristics can also lead to serious errors in judgment and to X-inefficiency.

4.2.6. Some Psychological Studies on Human Cognition

A tradition within psychology, studies of human cognition date back to the work of E.H. Weber (Geldard, 1972) and G.T. Fechner (1860) of the mid-nineteenth century (in 1860, Fechner coined the term psychophysics to refer to the study of human cognition), to Tanner and Swets' 1954 seminal paper on signal-detection theory (Tanner and Swets, 1954), and to Estes' (1980) work on decision making. These and other related papers have led to the conclusion that the human nervous system makes errors in judgment, and that both human and animal decisions are based not only upon costs and benefits but also upon motivations and our (not totally reliable) nervous system. In this regard, two characteristics of the human sensory system are discussed: the difference threshold, and adaptation. All sensory systems have difference thresholds. That is, if changes in the environment are to be perceived, then the change must be greater than some minimum amount. Some environmental changes, therefore, are not noticed. The difference limen is then defined as this minimum amount of environmental change necessary for it to be noticed. Sensory systems are also characterized by adaptation, that is, the sensory effects of a constant amount of energy varies. Thus, if you immerse your hand in hot water, the sensation of hot gradually is replaced by thermal neutrality. These "imperfections" in our sensory system which increase the likelihood of habitual behavior and reduce magnitude sensitivity. Habits, of course, need not be inefficient. But by reducing our awareness of the environment, they increase the likelihood of our being out of step with our environment.

Individuals may have preferences, but not necessarily the ability or the willingness to make clearcut distinctions about changes in their environment. That is, we do not always know when a choice about two different states can be made. Secondly, while we do make choices based on our preferences, at times our habits mitigate both our choices and our preferences.

In other words, we may be selectively rational, but not necessarily completely rational. The question of effort levels illustrates these ideas.

Some effort levels are certainly preferred to others. For example, most of us prefer not to be bored or excessively overworked. However, between boredom and exhaustion there are many effort levels. Some of these are more likely to be indistinguishable from each other because of our cognitive limits, discussed above. Hence it would not be accurate to state that we have preferences among indistinguishable effort levels. In addition, we also want to admit the possibility that apart from these cognitive limits, we simply do not always think in terms of the maximizing type of behavior assumed essential to economic man. Hence it would not be accurate to state that we have preferences among "indistinguishable" effort levels. In other words, whether motivated by cognitive limits or a simple lack of concern, we often "don't care one way or the other." While such inertia can occur at any satisfaction (or effort) level, let us assume, for the purposes of illustration only, that it occurs at relatively high levels of satisfaction.

4.3. CONCLUSIONS

In this chapter, we have discussed the psychology of the individual with no regard for his or her external environment. In the next chapter, we will discuss some aspects of the external environment. The first aspect to be discussed is the individual's relations with others. This will allow us to investigate group behavior, particularly group-determined effort levels. We will then ask how these effort levels are affected by the market structure within which the firm operates; the second aspect of the external environment that we will consider. The internal and external environments will then be shown to simultaneously affect the degree of X-(in)efficiency. An application of XE theory to the determination of productivity and to government regulation will conclude the next chapter.