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MANAGERIAL ECONOMICS

A PROBLEM SOLVING APPROACH

FOURTH EDITION





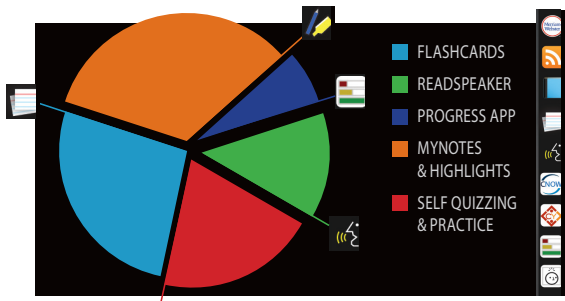
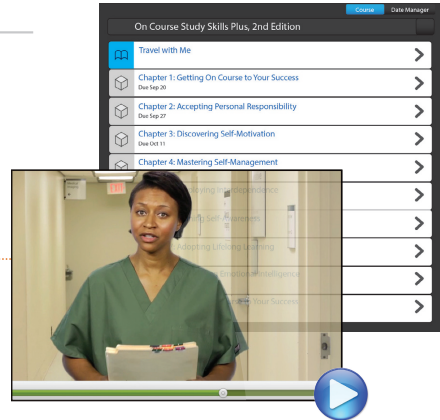
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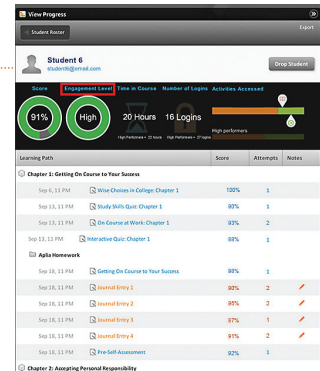
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MANAGERIAL ECONOMICS

A Problem Solving Approach

4e



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PREFACE

Teaching Students to Solve Problems¹

by Luke Froeb

When I started teaching MBA students, I taught economics as I had learned it, using models and public policy applications. My students complained so much that the dean took me out to the proverbial woodshed and gave me an ultimatum, “improve customer satisfaction or else.” With the help of some disgruntled students who later became teaching assistants, I was able to turn the course around.

The problem I faced can be easily described using the language of economics: the supply of business education (professors are trained to provide abstract theory) is not closely matched to demand (students want practical knowledge). This mismatch is found throughout academia, but it is perhaps most acute in a business school. Business students expect a return on a fairly sizable investment and want to learn material with immediate and obvious value.

One implication of the mismatch is that teaching economics in the usual way—with models and public policy applications—is not likely to satisfy student demand. In this book, we use what we call a “problem-solving pedagogy” to teach microeconomic principles to business students. We begin each chapter with a business problem, like the fixed-cost fallacy, and then give students enough analytic structure to understand the cause of the problem and how to fix it.

Teaching students to solve real business problems, rather than learn models, satisfies student demand in an obvious way. The approach also allows students to absorb the lessons of economics without as much of the analytical “overhead” as a model-based pedagogy. This is an advantage, especially in a terminal or stand-alone course, like those typically taught in a business school. To see this, ask yourself which of the following ideas is more likely to stay with a student after the class is over: the fixed-cost fallacy or that the partial derivative of profit with respect to price is independent of fixed costs.

ELEMENTS OF A PROBLEM-SOLVING PEDAGOGY

Our problem-solving pedagogy has three elements.

Begin with a Business Problem

Beginning with a real-world business problem puts the particular ahead of the abstract and motivates the material in a straightforward way. We use narrow, focused problems whose solutions require students to use the analytical tools of interest.

Teach Students to View Inefficiency as an Opportunity

The second element of our pedagogy turns the traditional focus of benefit-cost analysis on its head. Instead of teaching students to spot and then eliminate inefficiency, for example, by changing public policy, we teach them to view each underemployed asset as a money-making opportunity.

Use Economics to Implement Solutions

Even after you find an underemployed asset, moving it to a higher-valued use is often hard to do, particularly when the inefficiency occurs within an organization. The third element of our pedagogy addresses the problem of implementation: how to design organizations where employees have enough information to make profitable decisions and the incentive to do so.

Again, we use the tools of economics to address the problem of implementation. If people act rationally, optimally, and self-interestedly, then mistakes have only one of two causes: either people lack the *information* necessary to make good decisions or they lack the *incentive* to do so. This immediately suggests a problem-solving algorithm; ask:

1. Who is making the bad decision?
2. Do they have enough information to make a good decision?
3. Do they have the incentive to do so?

Answers to these three questions will point to the source of the problem and suggest one of three potential solutions:

1. Let someone else make the decision, someone with better information or incentives
2. Give more information to the current decision maker
3. Change the current decision maker's incentives

The book begins by showing students how to use this algorithm and subsequent chapters illustrate its use in a different context, for example, investments, pricing, principal-agent relationships, and uncertain environments.

USING THE BOOK

The book is designed to be read cover-to-cover as it is short, concise, and accessible to anyone who can read and think clearly. The pedagogy is built around business problems, so the book is most effective for those with some

work experience. Its relatively short length makes it reasonably easy to customize with ancillary material.

The authors use the text in full-time MBA programs, executive MBA programs (weekends), healthcare management executive programs (one night a week), and nondegree executive education. However, some of our biggest customers use the book in online business classes at both the graduate and undergraduate levels.

In the degree programs, we supplement the material in the book with online interactive programs like Cengage's CourseMate or Samuel Baker's *Economic Interactive Tutorials*.² Complete Blackboard courses, including syllabi, quizzes, homework, slides, videos to complement each chapter, and links to supplementary material, can be downloaded from the Cengage website. Our *ManagerialEcon.com* blog is a good source of new business applications for each of the chapters.

In this fourth edition, we have updated and improved the presentation and pedagogy of the book. The biggest change is in the supplementary material: we have added videos to complement each chapter, included worked video problems, and dramatically increased the size and quality of the test bank. In addition to the other updates throughout the text, Chapter 24, "You Be the Consultant," has all-new content.

We wish to acknowledge numerous classes of MBA, executive MBA, nondegree executive education, and healthcare management students, without whom none of this would have been possible—or necessary. Many of our former students will recognize stories from their companies in the book. Most of the stories in the book are from students and are for teaching purposes only.

Thanks to everyone who contributed, knowingly or not, to the book. Professor Froeb owes intellectual debts to former colleagues at the U.S. Department of Justice (among them, Cindy Alexander, Tim Brennan, Ken Heyer, Kevin James, Bruce Kobayahsi, and Greg Werden); to former colleagues at the Federal Trade Commission (among them James Cooper, Pauline Ippolito, Tim Muris, Dan O'Brien, Maureen Ohlhausen, Paul Pautler, Mike Vita, and Steven Tenn); to colleagues at Vanderbilt (among them, Germain Boer, Jim Bradford, Bill Christie, Mark Cohen, Myeong Chang, Craig Lewis, Rick Oliver, David Parsley, David Rados, Steven Tschantz, David Scheffman, and Bart Victor); and to numerous friends and colleagues who offered suggestions, problems, and anecdotes for the book, among them, Lily Alberts, Olafur Arnarson, Raj Asirvatham, Bert Bailey, Pat Bajari, Molly Bash, Sarah Berhalter, Roger Brinner, the Honorable Jim Cooper, Matthew Dixon Cowles, Abie Del Favero, Kelsey Duggan, Vince Durnan, Marjorie Eastman, Keri Floyd, Josh Gapp, Brock Hardisty, Trent Holbrook, Jeff and Jenny Hubbard, Brad Jenkins, Dan Kessler, Bev Landstreet (B5), Bert Mathews, Christine Milner, Jim Overdahl, Rich Peoples, Annaji Pervajie, Jason Rawlins, Mike Saint, David Shayne, Jon Shayne, Bill Shughart, Doug Tice, Whitney Tilson, and Susan Woodward. We owe intellectual and pedagogical debts to Armen Alchian and William Allen,³ Henry Hazlitt,⁴ Shlomo Maital,⁵ John MacMillan,⁶ Steven Landsburg,⁷ Ivan Png,⁸ Victor Tabbush,⁹ Michael Jensen and William Meckling,¹⁰ and James Brickley, Clifford Smith, and Jerold Zimmerman.¹¹ Special thanks to everyone who guided us through the publishing process, including Daniel Noguera, Steve Scoble, Michael Worls, and Jyotsna Ojha.

END NOTES

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MANAGERIAL ECONOMICS



SECTION 1

Problem Solving and Decision Making

- 1 Introduction: What This Book Is About**
- 2 The One Lesson of Business**
- 3 Benefits, Costs, and Decisions**
- 4 Extent (How Much) Decisions**
- 5 Investment Decisions: Look Ahead and Reason Back**

1

Introduction: What This Book Is About

In 1992, a junior geologist was preparing a bid recommendation for an oil tract in the Gulf of Mexico. He suspected that this tract contained a large accumulation of oil because his company, Oil Ventures International (OVI), had an adjacent tract with several productive wells. Since no competitors had neighboring tracts, none of them suspected a large accumulation of oil. Because of this, he thought that the tract could be won relatively cheaply and recommended a bid of \$5 million. Surprisingly, OVI's senior management ignored the recommendation and submitted a bid of \$21 million. OVI won the tract over the next-highest bid of \$750,000.

If the board of directors asked you to review the bidding procedures at OVI, how would you proceed? What questions would you ask? Where would you begin your investigation?

You'd find it difficult to gather information from those closest to the bidding. Senior management would be suspicious and uncooperative because no one likes to be singled out for bidding \$20 million more than was necessary. Likewise, our junior geologist would be reluctant to criticize his superiors. You might be able to rely on your experience—provided that you had run into a similar problem. But without experience, or when facing novel problems, you would have to rely on your analytic ability.

This book is designed to show you how to complete an assignment like this.

1.1 Using Economics to Solve Problems

To solve a problem like OVI's, first, figure out what's causing the problem, and second, how to fix it. In this case, you would want to know whether the \$21 million bid was too high at the time it was made, not just in retrospect. If the bid was too aggressive, then you'd have to figure out why the senior managers overbid and how to make sure they don't do it again.

Both steps require that you predict how people behave in different circumstances, and this is where the economic content of the book comes in.

The one thing that unites economists is their use of the **rational-actor paradigm** to predict behavior. Simply put, it says that people act rationally, optimally, and self-interestedly. In other words, they respond to incentives. The paradigm not only helps you figure out why people behave the way they do but also suggests ways to motivate them to change. To change behavior, you have to change self-interest, and you do that by changing incentives.

Incentives are created by rewarding good performance with, for example, a commission on sales or a bonus based on profitability. The performance evaluation metric (revenue, cost, profit, or similar outcome) is separate from the reward structure (commission, bonus, raise, or promotion), but they work together to create an incentive to behave a certain way.

To illustrate, let's go back to OVI's story and try to find the source of the problem. After his company won the auction, our geologist increased the company's oil reserves by the amount of oil estimated to be in the tract. But when the company drilled a well, they discovered only a small amount of oil, so the acquisition did little to increase the size of the company's oil reserves. Using the information from the well, our geologist updated the reservoir map and reduced the reserve estimate by two-thirds.

Senior management rejected the lower estimate and directed the geologist to "do what he could" to increase the size of the estimated reserves. So he revised the reservoir map again, adding "additional" reserves to the company's asset base. The reason behind this behavior became clear when, several months later, OVI's senior managers resigned, collecting bonuses tied to the increase in oil reserves that had accumulated during their tenure.

The incentive created by the bonus plan explains the behavior of senior management. Both the overbidding and the effort to inflate the reserve estimate were rational, self-interested responses to the incentive created by the bonus. Even if you didn't know about the geologist's bid recommendation, you'd still suspect that the senior managers overbid because they had the incentive to do so. Senior managers' ability to manipulate the reserve estimate made it difficult for shareholders and their representatives on the board of directors to spot the mistake.

To fix this problem, you have to find a way to better align managers' incentives with the company's goals. To do this, find a way to reward management for increasing profitability, not just for acquiring reserves. This is not as easy as it sounds because it is difficult to measure a manager's contribution to company profitability. You can do this subjectively, with annual performance reviews, or objectively, using company earnings or stock price appreciation as performance metrics. But each of these performance metrics can create problems, as we'll see in later chapters.

1.2 Problem-Solving Principles

This story illustrates two principles that will help you learn to diagnose and solve problems. Notice that (1) we reduced the problem (overbidding) to a

bad decision by someone at the firm (senior management) and (2) we used economics to find the source of the problem. Under the rational-actor paradigm, bad decisions happen for one of two reasons: either decision makers do not have enough information to make good decisions, or they lack incentive to do so. Using this insight, you can isolate the source of almost any problem by asking three simple questions:

1. Who is making the bad decision?
2. Does the decision maker have enough information to make a good decision?
3. Does the decision maker have the incentive to make a good decision?

Answers to these three questions not only point to the source of the problem but will also suggest ways to fix it by:

1. letting someone else—someone with better information or better incentives—make the decision,
2. giving more information to the current decision maker, or
3. changing the current decision makers' incentives.

In OVI's case, we see that (1) senior management made the bad decision to overbid; (2) they had enough information to make a good decision, but (3) they didn't have the incentive to do so. One potential fix is to change the incentives of senior management so that they are based on profitability, not oil reserves.

When reading about various business mistakes in this book, you should ask yourself these three questions to see if you can find the cause of each problem, and then try one of the three solutions to fix it. By the time you finish the book, the analysis should become second nature.

Here are some practical tips that will help you develop problem-solving skills:

Think about the problem from the organization's point of view. Avoid the temptation to think about the problem from the employee's point of view because you will miss the fundamental problem of goal alignment: how does the organization give employees enough information to make good decisions and the incentive to do so?

Think about the organizational design. Once you identify a bad decision, avoid the temptation to solve the problem by simply reversing the decision. Instead, think about why the bad decision was made, and how to make sure that similar mistakes won't be made in the future.

What is the trade-off? Every solution has costs as well as benefits. Avoid the temptation to think only about the benefits, as it will make your analysis seem as if it were done to justify your own foregone conclusion. Instead, use the three questions to spot problems with a proposed solution; that is, in whatever solution you propose, make sure decision makers have enough information to make good decisions and the incentive to do so.

Don't define the problem as the lack of your solution. This kind of thinking may cause you to miss the best solution. For example, if you define a problem as “the lack of centralized purchasing,” then the solution will be “centralized purchasing” regardless of whether that is the best option. Instead, define the problem as “high acquisition cost,” and then examine “centralized purchasing” versus “decentralized purchasing” (or some other alternative) as potential solutions to the problem.

Avoid jargon because most people misuse it. Force yourself to spell out what you mean in simple language. It will help you think clearly and communicate precisely. In addition, almost every scam is “sold” using jargon. If you use jargon, experienced listeners may suspect fraud.

1.3 Test Yourself

In 2006, an investigative news program sent a TV reporter with a perfectly good car into a garage owned by National Auto Repair (NAR). The reporter came out with a new muffler and transmission—and a bill for over \$8,000. After the story aired on national TV, consumers began avoiding NAR, and profit plunged. What is the problem, and how do you fix it?

Let's run the problem through our problem-solving algorithm:

1. Who is making the bad decision?
The mechanic recommended unnecessary repairs.
2. Does the decision maker have enough information to make a good decision?
Yes, in fact, the mechanic is the only one with enough information to know whether repairs are necessary.
3. Does the decision maker have the incentive to make a good decision?
No, the mechanic is evaluated based on the amount of repair work he does, and receives bonuses or commissions tied to the amount of repair work.

Answers to the three questions suggest that the use of quotas, commissions, or similar compensation provides an incentive for mechanics to recommend unnecessary auto repair services.

NAR tried two different solutions to fix the problem. First, they reorganized into two divisions: one responsible for recommending repairs where mechanics were paid a flat salary, and the other responsible for doing them. Rather than solving the problem, however, mechanics in the two divisions got together and began colluding. In exchange for recommending unnecessary repairs, the recommending mechanic received a portion of the commission received by the service mechanic for the work that was done.

After they recognized this new problem, NAR went back to the old organizational structure, but they adopted flat pay for the mechanics. This removed the incentive to do unnecessary repairs, but it also removed the incentive to work hard. Since the mechanics made the same amount of

money regardless of whether they recommended and performed repairs, the mechanics ignored all but the most obvious problems.

This example illustrates several of the problem-solving principles mentioned earlier. First, it highlights the crucial role played by information. If you are going to let someone else make the decision, as in the first solution, you have to ask whether the new decision maker (the recommending mechanic) has enough information to make good decisions, as well as the incentive to do so. As a third potential solution to this problem, I would keep the original commission scheme, but develop new sources of information (an additional performance evaluation metric) based on reports provided by “secret shoppers” who bring cars into the garage in order to see if the mechanics are ordering unnecessary repairs.

The example also illustrates the trade-offs you face when proposing solutions. The first solution involved the costly duplication of effort by the two recommending and service mechanics, the second led to mechanic shirking, and the third would require a new reward scheme based not only on a sales commission but also on the reports of the secret shopper. Figuring out which solution is most profitable involves weighing the trade-offs associated with the various solutions.

1.4 Ethics and Economics

Using the rational-actor paradigm in this way—to change behavior by changing incentives—makes some students uncomfortable because it seems to deny the altruism, affection, and personal ethics that most people use to guide their behavior. These students resist learning the rational-actor paradigm because they think it implicitly endorses self-interested behavior, as if the primary purpose of economics were to teach students to behave rationally, optimally, and selfishly.

These students would probably agree with a *Washington Post* editorial, “When It Comes to Ethics, B-Schools Get an F,”¹ which blames business schools in general, and economists in particular, for the ethical lapses at Enron, Goldman Sachs, and other companies.

A subtle but damaging factor in this is the dominance of economists at business schools. Although there is no evidence that economists are personally less ethical than members of other disciplines, approaching the world through the dollar sign does make people more cynical.

What these students and the author, a former Harvard ethics professor, do not understand is that to control unethical behavior, you first have to understand why it occurs. When we analyze problems like the one at OVI, we’re *not* encouraging students to behave opportunistically. Rather, we’re teaching them to anticipate opportunistic behavior and to design organizations that are less susceptible to it. Remember, the rational-actor paradigm is only a tool for analyzing behavior, not advice on how to live your life.

It is also important to realize that these kinds of debates are really debates about value systems. Deontologists judge actions as good or ethical

by whether they conform to a set of principles, like the Ten Commandments or the Golden Rule. Consequentialists, on the other hand, judge actions by their consequences. If the consequences of an action are good, then the action is deemed to be good or moral. To illustrate these contrasting value systems, consider this story about price gouging.²

When Notre Dame entered the 2006 season as one of the top-ranked football teams in the country, demand for local hotels during home games rose dramatically. In response, local hotels raised room rates. According to the *Wall Street Journal*, the Hampton Inn charged \$400 a night on football weekends for a room that cost only \$129 a night on nonfootball dates. Rates climbed even higher for games against top-ranked foes. For the game against the University of Michigan, the South Bend Marriott charged \$649 per night—\$500 more than its normal weekend rate of \$149.

On a campus founded by priests of the Congregation of Holy Cross, where many students dedicate their year after graduation to working with the underprivileged, these high prices caused alarm. The *Wall Street Journal* quotes Professor Joe Holt, a former priest who teaches ethics in the school's executive MBA program: "It is an 'act of moral abdication' for businesses to pretend they have no choice but to charge as much as they can based on supply and demand." The article further reports Mr. Holt's intention to use the example of rising hotel rates on football weekends for a case study in his class on the integration of business and values.

Deontologists like Professor Holt would object on principle to the practice of raising prices in times of shortage.³ We might label one such principle, the *Spider Man principle*: with great power comes great responsibility. The laws of capitalism allow corporations to amass significant power; in turn, society should demand a high level of responsibility from corporations. In particular, property rights might give a hotel the *option* of increasing prices, but possession of these rights does not relieve the hotel of its *obligations* to be concerned about the consequences of its choices. A simple beneficence argument might suggest that keeping prices low would be better for consumers.

Economics, on the other hand, provides us a *consequentialist* defense of high prices by comparing them to the implied alternative of *not* raising prices during periods of high demand. Economists would show, using supply-demand analysis, that if prices did not rise, the *consequence* would be excess demand for hotel rooms. Would-be guests would find their rooms rationed, perhaps on a first-come, first-served basis. More likely, arbitrageurs would set up a black market, by making early reservations, then "selling" their reservations to customers willing to pay the market-clearing price. Without the ability to earn additional profit during times of scarcity, hotels would have less incentive to build additional rooms, which would make the long-run problem even worse!

Versions of this debate—between those who criticize business on ethical grounds, and those who are simply trying to make money—have been going on in this country since its founding. Although a full treatment of the ethical dimensions of business is beyond the scope of this book, many disagreements are really about whether morality should be defined by deontology or consequentialism. Once you realize that a debate is really a debate between value

systems, it becomes much easier to understand opposing points of view, and to reach compromise with your adversaries. For example, if the government were considering price-gouging laws that made it illegal to raise prices on football weekends, you might offer to donate some of the profits earned on football weekends to a local charity. This might assuage the concerns of those who ascribe to the Spider Man principle.

As a footnote to our story of prices in South Bend, when someone offered our former priest \$1,500 for his apartment on home-game weekends, he took the offer and now spends his weekends in Chicago. Apparently his principles became too costly for him.

1.5 Economics in Job Interviews

If this well-reasoned introduction doesn't motivate you to learn economics, read the following interview questions—all from real interviews of my students. These questions should awaken interest in the material for those of you who think economics is merely an obstacle between you and a six-figure salary.

- - - - - Original Message - - - - -

From: "Student A"
Sent: Friday, January 2, 3:57 PM
Subject: Economics Interview Questions

I had an interview a few weeks ago where I was told that the position paid a very low base and was mostly incentive compensation. I responded that I understood he was simply "screening out" low productivity candidates [low productivity candidates would not earn very much under a system of incentive compensation, and would be less likely to accept the position]. I "signaled" back to him that this compensation structure was acceptable to me, as I was confident in my abilities to produce value for the company, and for me. [Note: "Signalling" and "screening" are both solutions to the problem of adverse selection, the topic of Chapter 19.]

- - - - - Original Message - - - - -

From: "Student B"
Sent: Tuesday, January 18, 1:22 PM
Subject: Economics Interview Questions

I got a question from Compaq last year for a marketing internship position that partially dealt with sunk costs. It was a "true" case question where the interviewer used the Internet to pull up the actual products as he asked the question.