

Managerial Economics and Decision Making

Learning Objectives

After studying this chapter, you will be able to:

- 1.1 Describe managerial economics and explain how it can help advance your career.
- 1.2 Define what a firm is and describe the legal structures of for-profit firms.
- 1.3 Compare opportunity cost and accounting cost and explain why using opportunity cost leads to better decisions.
- 1.4 Explain how managers can use marginal analysis to make better decisions.

Managers at Sears Holdings Use Opportunity Cost to Make Tough Decisions

Ask people in your parents' generation about Sears, and their answers will be the same: Yes, they shopped at Sears. Who didn't? For decades, Sears was the dominant retailer in the United States, selling homes (and home insurance to protect them), blouses (and washing machines to clean them), and nails (and hammers to drive them). Today, Sears no longer sells homes or home insurance at all, and it sells far fewer blouses, washing machines, nails, and hammers.

In 2005, Kmart purchased the original company and now runs it as a subsidiary of the new parent company, Sears Holdings. When Kmart purchased the company, Sears had over 1,600 stores. Sales and profit at Sears had been declining slowly over three decades but accelerated in more recent years as customers embraced

online shopping. As sales rapidly declined, Sears Holdings' top executives knew they had to close some stores and faced two difficult decisions: how many stores to close and which ones. Profitability was the key: The executives needed to close unprofitable stores and retain profitable ones. They consulted their accountants about each store's profit. Should they use the numbers the accountants provided? Or should they use another definition of profit?

This chapter introduces some of the fundamental concepts of managerial economics that will help you answer these questions. At the end of this chapter, you will see how Sears Holdings' managers used the concepts of opportunity cost and marginal analysis to make their decisions.

Sources: Krystina Gustafson, "Sears to Accelerate Closings, Shutter 235 Stores," CNBC, December 4, 2014 <http://www.cnbc.com/2014/12/04/sears-to-accelerate-closings-shutter-235-stores.html>; Phil Wahba, "Sears CEO Lampert Explains Why He Closed 200 Stores," *Fortune*, December 15, 2014; Suzanne Kapner, "Department Stores Need to Cull Hundreds of Sites, Study Says," *Wall Street Journal*, April 24, 2016; <http://money.cnn.com/2017/01/05/investing/sears-kiat-closing-stores/>; <https://blog.searsholdings.com/eddie-lampert/moving-forward/>.

Introduction

Decision making is the most important task you will face as a manager. Companies pay most managers quite well to make decisions. In some cases, the decisions are small: Which custodial service should your company hire? On other occasions, the decisions are large: Should your company build another plant to expand into China? Your decisions will help determine the success of your company—and your career.

The quality of your decisions as a manager can help or hurt every functional area within the firm. Unfortunately, there is no cut-and-dried formula that will always lead to the correct decision, but basic economic principles can help you make better decisions. Although these principles obviously apply to economic decisions such as pricing, they apply equally well in virtually every business division, including marketing, finance, and human resources.

We base many examples in this text on for-profit firms, and for simplicity, we frequently refer to “firms.” But keep in mind that the lessons and economic principles you will learn apply equally well to making decisions and achieving goals in all types of organizations, ranging from nonprofit organizations to government agencies to nongovernment organizations (NGOs). Once you understand the basic economic principles, you will be well prepared for success as a manager of any type of organization.

To begin your study of the economic principles involved in managerial decision making, Chapter 1 includes four sections:

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- **Section 1.1** defines managerial economics, describes economic models, and explains why using them can help your career.
 - **Section 1.2** explains how economists define a firm and provides an overview of the common legal categories of for-profit firms.
 - **Section 1.3** focuses on opportunity cost, which should guide the decision-making process for managers of all types of organizations, and compares it to accounting cost.
 - **Section 1.4** defines and then applies the key decision-making tool of marginal analysis.
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1.1 Managerial Economics and Your Career

Learning Objective 1.1 Describe managerial economics and explain how it can help advance your career.

When you realized your program of study required a course in managerial economics, you may have asked yourself a question or two:

1. “Why do I need this class? I’ve already taken an economics course.”
2. “How will a course in managerial economics help my career?”

These are excellent questions. Let’s start with the first one: Your previous economics courses helped you understand how the economy functions. In contrast, this course explains how microeconomic concepts can help you manage a firm more effectively. **Managerial economics** is the application of microeconomic principles and tools to business problems faced by decision makers.

Whenever you must make a business decision on behalf of your firm, microeconomic principles can assist you in making the best decision possible. That brings us to the answer to the second question: Applying the microeconomic principles we discuss in this text can help you make better decisions and, as a result, have a successful career as a manager. Understanding how to use economics to make better decisions is the driving goal of this class and text.

As we guide your study of managerial economics, we present and illustrate microeconomic principles and tools using economic models. An **economic model** is an abstract, simplified representation of the real world and real-world situations. In the real world, there are an infinite number of complications. Models strip away those complications to focus on what is important. For example, suppose

Managerial economics

The application of microeconomic principles and tools to business problems faced by decision makers.

Economic model

An abstract, simplified representation of the real world and real-world situations.

that you want to use Google Maps to plot a quick driving tour of Napa Valley's highlights, including its many wineries. The satellite photos in the "Earth" view reveal an immense amount of detail—including buildings, parked cars, pedestrians, and traffic signals. You don't need this level of detail to plan your trip. It is far easier to use the "Map" view, which focuses on the roads. Economic models are similar: They strip away the inessential minor details that clutter the issue and focus directly on the key factors important to your managerial decisions—and to your career.

Because they are abstract and simplified, economic models are not recipes that tell you exactly how to make a business decision. You will often find that getting to an optimal outcome is a repetitive trial-and-error process. Fortunately, following economic principles and models can help you identify both the optimal solution *and* the steps you need to take to reach it.

Before we examine some of the tools of economic analysis, let's review basic information about firms and their organization.

1.2 Firms and Their Organizational Structure

Learning Objective 1.2 Define what a firm is and describe the legal structures of for-profit firms.

Understanding two concepts—the exact definition of a firm and the different legal methods of organizing for-profit firms—is an essential first step in your study of managerial economics.

Definition of a Firm

A **firm** is an organization that converts inputs (such as labor) into outputs (goods and services) that it can sell or distribute. This definition applies to *all* firms. It is as true for Intel, which purchases silicon to produce computer chips, as it is for Frito-Lay, which purchases potatoes to produce a different kind of chip. It is easy to see that the definition applies to for-profit firms, such as Intel and Frito-Lay. But it also applies to nonprofits, such as the American Red Cross; to government agencies, such as the U.S. Justice Department; and to NGOs, such as Amnesty International. These groups all use various inputs to produce an output, such as housing people made homeless because of a tornado, enforcing the nation's anti-trust laws, or increasing justice worldwide. Managers in all of these different types of firms can use the principles of managerial economics to make better decisions that further the goal of their organization.

Firm An organization that converts inputs (such as labor) into outputs (goods and services) that it can sell or distribute.

The Legal Organization of Firms

Let's focus for the moment on privately owned, profit-seeking firms. For-profit firms include giants, such as Microsoft in the United States, Total S.A. in the European Union, and Industrial Bank Company, Limited, in China, as well as small, local firms, such as the thousands of local laundries and restaurants that we find in all the cities of the world. For-profit firms are pervasive in the economies of virtually all nations. These firms come in a vast array of sizes and produce a nearly infinite variety of goods and services, so their owners use different methods to legally organize them. Let's review the four major categories of legal organization of firms used in the United States: sole proprietorships, partnerships, limited liability companies, and corporations.

Sole Proprietorship

The simplest form of business organization is a *sole proprietorship*, a firm owned by one person. Examples of sole proprietorships include an owner–operator of a taxi, a farmer, a solo-practitioner lawyer, and an owner of a small laundry or restaurant. In some of these firms, the owner has minimal supervisory duties: The owner–operators of taxis must organize their own labor services, but they have few, if any, supervisory duties. In other firms, the owners have more responsibilities: Owners of small retail stores have employees to supervise, which complicates their business operations and requires increased decision making.

As a form of business organization, a sole proprietorship offers several advantages. First, legal formation is easy, since the owner does not need to prepare any paperwork. Another advantage is that the government taxes a sole proprietorship's profits only once. The owner of a sole proprietorship adds all of the firm's profit to any other income and then pays personal income tax on the sum of the profit plus other income. Of course, a sole proprietorship also has disadvantages. When the owner dies, the sole proprietorship also dies, which makes it difficult for sole proprietorships to raise large sums of money to invest in the business. Another disadvantage is that the owner of a sole proprietorship faces unlimited liability. If the sole proprietorship fails, the owner can be liable for *all* of the company's debts, such as payments to creditors or back rent on office space.

Partnership

Partnerships are businesses owned by two or more people. Although the laws that govern partnership formation vary from state to state, partners must register their partnership with the state, and at the very least, they must carefully spell out each partner's responsibilities and rights in the registration papers. Types of partnerships differ depending on the rights and responsibilities accorded to the partners,¹ but most partnerships share a few characteristics. Let's start with the advantages of partnerships:

1. The government taxes a partnership's profits only once. Each of the owners reports his or her share of the profit, along with any other income, on his or her personal income tax form and pays the required tax. In this sense, partnerships are like proprietorships.
2. Many partnerships, such as law firms and accounting firms, motivate their employees by offering them the chance to become a partner, an opportunity that can often be lucrative.

Most partnerships, however, have a significant disadvantage: Partners face unlimited joint and individual liability for the decisions made by all of the partners and for all the debts of the partnership. If a partnership goes bankrupt, each partner is personally responsible for *all* of the partnership's debts. Exceptions to the rule of unlimited liability are limited partnerships and limited liability partnerships. The latter form of organization is available only to a few types of professional services.

Limited Liability Company

A relatively new form of business organization, the *limited liability company (LLC)*, is a firm owned by one or more members who have limited liability for its debt. In three respects, LLCs are similar to partnerships:

¹ For instance, *general partnerships* typically divide management rights and profit shares equally among partners. In contrast, *limited partnerships* have two types of partners: general partners, who run the company and have unlimited liability, and limited partners, who have limited management rights and enjoy limited liability.

1. The LLC members may create an operating agreement that carefully describes each member's rights and responsibilities. If they do not, the state laws from the state in which the LLC is formed will govern many of these issues.
2. The LLC members must file paperwork with the state in which the LLC is formed; regulations determining what information must be filed differ from one state to the next.
3. All of the LLC's profit is allocated to the members, who pay personal income tax on their share of the profit.

As suggested by their name, however, LLCs differ in one important way from partnerships (and sole proprietorships): The members of an LLC have limited liability for the company's debt. If the LLC goes bankrupt, its members are not personally liable for the company's debt.

Corporation

A more complicated form of business organization is the *corporation*, a firm owned by one or more shareholders. Professional managers often run corporations on a day-to-day basis. In the United States, a board of directors usually serves as the interface between the shareholders and the management team. The shareholders, who generally have one vote for each share owned, elect the board members. Typically, the top executives of the company are board members, but in the United States, in aggregate approximately two-thirds of board members are independent, with no direct connection to the management of the firm. Board members are responsible for ensuring that the executives run the company for the benefit of the shareholders and must approve significant actions of the firm, such as purchasing another large company or entering into a major new product line. The board also decides the amounts of any dividends. A *dividend* is a dollar amount per share the company pays to the shareholders, who are the owners of the firm. For example, the pharmaceutical firm Pfizer Inc. might pay an annual dividend of \$1.08 per share.

Compared to the other organizational forms, corporations have more legal requirements, such as setting up a double-entry bookkeeping system to record business transactions and filing an annual report to the state in which they are incorporated. One important disadvantage is that the government taxes a corporation's profits twice, once at the corporate level via a corporate income tax and again at the personal level when the owners pay their personal income taxes on any dividends they receive and on any gain they make when they sell shares. Corporations, however, have at least two major advantages:

1. Because a corporation has perpetual life, its managers can raise funds more easily. Lenders know that a corporation with many shareholders will survive the death of any one shareholder, so they are more willing to lend money to corporations than to sole proprietorships or partnerships.
2. Shareholders have limited liability for the debts and actions of their company. Consequently, if a corporation fails, owing millions or perhaps even billions of dollars, the shareholders are *not* responsible for repaying any of the debt.

Table 1.1 summarizes the key characteristics of the four forms of legal organization.

Now that you understand the definition of a firm and the different ways of organizing for-profit firms, it is time to focus on the goal of many business owners: profit. This discussion leads naturally to an examination of your first economic tool, opportunity cost, and how it differs from accounting cost.

Table 1.1 Legal Organization of Firms

Type of Firm	Characteristics	Advantages	Disadvantages	Examples
Sole proprietorship	<ul style="list-style-type: none"> • A firm owned by one person 	<ul style="list-style-type: none"> • Easy to organize • Profits taxed only once 	<ul style="list-style-type: none"> • Exists only for the life of the owner • Unlimited liability 	<ul style="list-style-type: none"> • Taxi owner-operator • Solo-practitioner lawyer • Restaurant owner
Partnership	<ul style="list-style-type: none"> • A firm owned by two or more people 	<ul style="list-style-type: none"> • Profits taxed only once • Employees motivated to become partner 	<ul style="list-style-type: none"> • Registration required • Unlimited liability (except for limited partnerships and limited liability partnerships) 	<ul style="list-style-type: none"> • Law firm • Medical practice
Limited liability company	<ul style="list-style-type: none"> • A firm owned by one or more members 	<ul style="list-style-type: none"> • Limited liability • Profits taxed only once 	<ul style="list-style-type: none"> • Registration required 	<ul style="list-style-type: none"> • Edgeworth Management, LLC • Mack Construction, LLC
Corporation	<ul style="list-style-type: none"> • A firm owned by one or more shareholders • Typically run on a day-to-day basis by professional managers and overseen by a board of directors 	<ul style="list-style-type: none"> • Perpetual life • Limited liability 	<ul style="list-style-type: none"> • Registration required • Additional legal requirements • Profits taxed twice (corporate income tax on profits and personal income tax on shareholder income) 	<ul style="list-style-type: none"> • Pfizer • Microsoft • Ford Motor Company

1.3 Profit, Accounting Cost, and Opportunity Cost

Learning Objective 1.3 Compare opportunity cost and accounting cost and explain why using opportunity cost leads to better decisions.

Profit The difference between total revenue and total cost.

Total revenue The firm's total receipts from the sale of its goods and services.

A key factor motivating owners and managers of profit-seeking firms is the firm's **profit**, the difference between total revenue and total cost. In order to better understand profit, you need to understand total revenue and total cost in more detail. Defining **total revenue** is easy: It is the firm's total receipts from the sale of its goods and services. Identifying *total cost* is more difficult because *cost* means different things to different people. Let's begin by discussing the role played by profit and then turn to total revenue and total cost.

Goal: Profit Maximization

Although many goals might motivate the owners of profit-seeking firms, generally the prime motivator is profit maximization. Owners who put profits first have the most income to spend on the goods and services they want to consume.

If an owner puts other considerations, such as staff maximization, revenue maximization, or even the appearance of the employees, ahead of profits when making business decisions, the firm's profit will decrease, along with the owner's personal consumption of goods and services. In addition, competition from profit-maximizing firms will drive firms that do *not* maximize profit out of business. Most empirical evidence suggests that profit maximization is the goal pursued by owners, so assume that all owners of for-profit firms seek to maximize their firms' profits.

The owners of a profit-seeking firm may have a primary goal of profit, but the professional managers who run that firm on a day-to-day basis may have different goals. Managers are interested in enhancing their own well-being, an objective not always consistent with the goals of the owners, so some conflict of interest can easily arise when managers are not owners of the firm. Managers who believe that their prestige depends on the number of people reporting to them may hire too many staff members. Others may put family concerns ahead of business concerns and hire their own children. These actions could decrease profits. Owners often respond to this challenge by making it costly for managers *not* to maximize profit. For example, owners can use executive stock options, bonuses, and raises as incentives for the managers to put the firm first and maximize its profit. Chapter 15 examines the ways in which owners can motivate managers to maximize profit in more detail. Because the evidence suggests that managers as well as owners are rewarded for profit maximization, assume that successful managers also make decisions that maximize their firms' profits.

In general, because firms have a stream of profits and losses over time, owners and managers strive to maximize the value of the stream of profits. Often, however, the decisions that maximize profit in a given year are the same ones that maximize profit over time. For this reason, and to simplify the analysis, most of the discussion throughout the text focuses on maximizing profit for a shorter time period. You can then apply the lessons you learn from this shorter-term analysis to the more complex situation of maximizing profit over time after you study Chapter 16, which focuses on multiperiod decision making.

Profit does not motivate managers of nonprofits, government agencies, or NGOs. Instead, achievement of the organization's goal serves as a motivator. These managers, however, still need to use their resources as effectively as possible. Opportunity cost remains crucial for managers in these sectors because it will show them the true cost of their resources and help them efficiently allocate these resources. Although the examples in this section use for-profit firms, the lessons about cost are important for managers of *any* type of firm.

Total Revenue

Total revenue generally means the same thing to accountants, economists, and managers: the firm's total receipts from the sale of its goods and services. At its most basic level, a firm's total revenue (TR) is the price of the good or service (P) multiplied by the quantity sold (Q):

$$TR = P \times Q$$

For example, Gannett Company publishes *USA Today*, a newspaper that covers nationwide news, and sells it nationally. If Rogermark, a company like Gannett, sells 1.8 million issues of its newspaper, *America Today*, per day to its distributors at a wholesale price of 40¢, then the firm's total revenue is 40¢ \times 1.8 million or \$720,000 per day.

Of course, total revenue is not always this straightforward. Some complications can occur, but fortunately they are not overly complex. Discounts, rebates, returns, and allowances—all called *contra revenue* by accountants—can affect a firm's total revenue:

1. **Discounts and rebates.** Producers offer buyers discounts for various reasons. For example, Gannett sells *USA Today* to distributors such as Hudson Group, which in turn sells the newspapers to consumers at its Hudson News stores. Suppose that Rogermark sells its newspapers to another distributor, Realnews. Rogermark's contract with Realnews might set a price of 40¢ per paper but might also offer Realnews a discount if Realnews pays its bill promptly. A "1/10 net 30" discount is common. If the distributor pays the bill within 10 days, the distributor can take a 1 percent discount. If the distributor does not pay during that period, the bill is due in full after 30 days. If Realnews purchases 1,000 newspapers at a price of 40¢ for its store in Boston's Logan Airport and pays within 10 days, it receives a discount of $0.4¢ \times 1,000 = \$4$. In this case, Rogermark's total revenue is $(40¢ \times 1,000) - \$4 = \396 . Effectively, Rogermark receives a price of $\$396/1,000 = 39.6¢$ per paper.
2. **Returns.** Producers often allow retailers to return unsold product at the end of the selling season. For example, Rogermark's contract might specify that Realnews pays 40¢ per paper but can return all unsold copies for credit. If Rogermark sells 2,500 issues of *America Today* to Realnews for distribution at LaGuardia Airport and the Realnews stores sell only 1,500 papers, Realnews will return 1,000 papers for credit. In this case, Realnews will claim a credit of $40¢ \times 1,000 = \$400$. With the returns, Rogermark's total revenue is $(40¢ \times 2,500) - \$400 = \600 . With the return credit, Rogermark receives an effective price of $\$600/2,500 = 24¢$ per paper for the 2,500 papers.
3. **Allowances.** Producers frequently enter into agreements with retailers about allowances for various factors, such as advertising, retail display, or spoilage. Rogermark might offer Realnews a contract including a 5 percent retail display allowance for placing the *America Today* issues at eye level. If Rogermark sells 1,200 issues of *America Today* to Realnews to sell in Penn Station, before the discount Rogermark would receive $40¢ \times 1,200 = \$480$. Realnews will claim an allowance of 5 percent, or $0.05 \times \$480 = \24 , leaving Rogermark with total revenue of $\$480 - \$24 = \$456$, for an effective price of $\$456/1,200 = 38¢$ per paper for the 1,200 sold to Realnews.

To calculate total revenue, it is easier to adjust the price than to take these sorts of factors explicitly into account. The equation $TR = P \times Q$ is still used, but P is now the adjusted price. For example, if Rogermark offers a 5 percent advertising allowance, reduce the price by 5 percent (from 40¢ to 38¢) to capture the effect of the discount. With this change, the total revenue from 1,200 issues of *America Today* equals $38¢ \times 1,200 = \$456$. Although the economic models you will study in this text do not specifically discuss adjustments for discounts, rebates, returns, or allowances, in *your* calculations as a manager you might need to make some modifications depending on the contractual arrangement.

Accounting Cost and Opportunity Cost

Cost is more complicated than revenue. Accountants use a measure of cost called accounting cost, while economists and successful managers use a different measure, called opportunity cost. Why do accountants use one measure and economists use

another, and which should you use in making decisions? Let's compare the two and see why opportunity cost is the preferred measure for managers to use.

Accounting Cost

When keeping a firm's financial records, accountants generally record what are called **accounting costs**. For the most part, accounting costs are **explicit costs**, costs incurred by running a business that involve cash outflows. Examples of explicit costs include wages paid to employees and rent paid on a lease. Sometimes accountants also include **implicit costs**, costs incurred by running a business that do not involve cash outflows. Depreciation creates a noncash expense, that is, an implicit cost. In general, *depreciation* refers to the wear and tear on buildings or machinery that lowers its value. For example, newspaper publishers, such as Gannett (and Rogermark), use huge web presses (printing presses that use paper fed from rolls) to print each issue of their newspapers. As operators use these presses, the wear and tear lowers their value. The fall in the presses' value is a cost of producing the newspapers. No cash leaves the firm to pay for the machines' depreciation, so the fall in value is an implicit cost for the publisher.

Opportunity Cost

When economists use the term *cost*, they mean **opportunity cost**, the return from the best alternative use of a resource. Of all of the possible ways to use a resource, the best alternative use is the one that, if selected, would yield the highest return. Because opportunity cost measures what a firm gives up when a resource is used, it is the best decision-making tool for managers. For a profit-seeking firm, the return is often the profit that the alternative use would have provided. For example, if Rogermark uses a web press to print its *America Today* newspaper, it cannot use the same press to print its *Dallas Sun* newspaper. If printing the *Dallas Sun* is the only other option for the press and it has a profit of \$2,000, then the opportunity cost of using the press to print *America Today* is the profit lost from not printing the *Dallas Sun*, \$2,000.

Like accounting cost, opportunity cost includes both explicit and implicit costs. There is often no difference in how accountants and economists measure explicit costs. If Rogermark pays a press operator a salary, including all benefits and taxes, of \$44,000 per year, then both accountants and economists agree that the explicit cost to Rogermark of employing the press operator is \$44,000. Accountants and economists, however, treat implicit costs in substantially different ways. These differences can be particularly large when considering the cost of inventory, capital assets, competitive return on investment, and owner's time. We consider each of these topics in turn in the following sections.

Cost of Inventory Manufacturing, construction, retail, and many other businesses hold inventories of raw materials, works-in-progress, and/or finished goods. These goods either are ready to be sold (finished goods) or, after some additional work, will be finished and then available for sale (raw materials, works-in-progress). Managers need to determine the cost of items held in inventory. Accountants and economists value the cost of inventory differently. Accountants must use one of the inventory valuation methods approved by the Internal Revenue Service (IRS), and these methods depend on the historical acquisition cost. In contrast, economists use the opportunity cost, the best alternative use for the goods, in the valuation of inventory. These two measures are rarely equal.

To see the difference between accounting and opportunity costs, suppose that Christina Corporation, a jewelry manufacturer and retailer like Zale Corporation, bought 1,000 ounces of gold at a price of \$1,300 per ounce and then purchased an

Accounting costs The costs accountants use to keep a firm's financial records.

Explicit cost A cost incurred by running a business that involves cash outflows.

Implicit cost A cost incurred by running a business that does not involve cash outflows.

Opportunity cost The return from the best alternative use of a resource.

additional 1,000 ounces at a price of \$1,400 per ounce. Christina now has 2,000 ounces of gold in its inventory. When the firm uses 500 ounces of gold to manufacture necklaces to sell in its jewelry stores, what is the cost of the gold? An accountant answers this question by using one of the following three IRS-approved inventory valuation methods:

1. *Last in, first out (LIFO)* assumes that the last units added to the inventory are used first. Using this method, the accounting cost of the gold is \$1,400 per ounce.
2. *First in, first out (FIFO)* assumes that the first units added to the inventory are used first. This method yields an accounting cost of the gold of \$1,300 per ounce.
3. A *weighted average valuation* uses the weighted average of the costs, making the accounting cost of the gold \$1,350.²

The managers' selection of an inventory valuation method is important because it affects the taxes the firm must pay. However, none of these methods determines the opportunity cost to the firm of using the gold. To determine the opportunity cost of using the gold to make necklaces, you must ask the following question: "Other than using the gold to make necklaces, what else can Christina do with it?" The answer that gives the largest profit is the opportunity cost of using the gold. Because the company owns the gold, often its most profitable alternative action is to sell the gold at the current market price. For example, if the current market price of an ounce of gold has risen to \$1,600, then the opportunity cost of using the gold to make necklaces is \$1,600 per ounce. By using the gold to make necklaces, Christina loses the opportunity of selling it at \$1,600 per ounce. Regardless of what price the firm paid for the gold, its opportunity cost of using the gold to make necklaces is the current market price of gold.

The jewelry company example generalizes easily: The opportunity cost to *any* firm of *any* good or product in inventory is the current market price of the item. If there is a well-established market, as is the case with gold, the market price is easy to discover. Many items, however, have no market price. In the case of half-finished air conditioners or six-month-old red wine being held to age for three years, a market price is more difficult to establish, and a manager must come up with an estimated price to determine the opportunity cost.

The Christina Corporation example made a very important point: The price initially paid for the gold has no bearing on the opportunity cost of using it to make necklaces. The price paid for the gold is an example of a **sunk cost**, a cost that cannot be recovered because it was paid or incurred in the past.

For Christina, the initial price paid for the gold is a sunk cost. For Intel, last month's cost of research and development is a sunk cost. Profit-maximizing managers realize that sunk costs have no bearing on current decisions. Why? Managers make decisions to minimize costs; because they cannot change sunk costs, effective managers ignore them when making business decisions.

Cost of Using a Capital Asset Virtually every firm owns some *capital assets*, assets that managers cannot quickly sell and that the firm must have to produce its goods or services. Capital assets include machinery (such as the web presses owned by Gannett), buildings (such as the building occupied by the Walgreens drugstore at 7600 Debarr Road in Anchorage), and land (such as the 6,800 acres

Sunk cost A cost that cannot be recovered because it was paid or incurred in the past.

² The weighted average is calculated according to $\left(\frac{1,000 \text{ ounces}}{2,000 \text{ ounces}}\right) \times \$1,300 + \left(\frac{1,000 \text{ ounces}}{2,000 \text{ ounces}}\right) \times \$1,400$, where the weights, $\left(\frac{1,000 \text{ ounces}}{2,000 \text{ ounces}}\right)$, are the fractions of the gold purchased at the different prices.

**DECISION
SNAPSHOT**

Sunk Costs in the Stock Market

Suppose that you are a manager of a mutual fund specializing in biotech companies that spent \$4.5 million to purchase 100,000 shares of Dendreon Corporation for \$45 per share. Dendreon made a treatment for prostate cancer, but the treatment did not prove profitable, and the price of a share fell to \$3. As a fund manager, should you hold (not sell) the stock because you paid \$4.5 million for shares of stock that are now worth only \$300,000? Explain your answer.

Answer

The \$4.5 million spent for the shares is a sunk cost because you have already incurred it and you cannot change it. Consequently, you should ignore it in making your decision. As a manager, you should compare the profit you expect from holding the 100,000 shares of Dendreon to the profit you expect from the most profitable alternative use of the funds and then select whichever is the larger. You can sell the stock and invest the \$300,000, or you can hold onto the stock hoping that the price increases. As it happens, Dendreon eventually went bankrupt, and its stock became worthless. If you had decided you could not sell because of your initial \$4.2 million loss, you would eventually have lost the entire \$4.5 million!

of fertile farmland in Michigan owned by Zwerk & Sons Farm). These capital assets are quite different from inventory because they are not immediately used up in the production process.

What is the cost of using a capital asset? Both accountants and economists measure this cost, but they calculate it differently. Accountants use the *depreciation allowance* as the cost of using a capital asset, but as usual, economists use the opportunity cost of using the capital asset.

Depreciation. Some capital assets, such as Gannett's presses and Walgreens' building, have finite lives: They eventually wear out. For these assets, accountants must use one of the IRS-approved methods to calculate the depreciation allowance of using the asset. Land, on the other hand, is a capital asset that does not wear out—it lasts forever—so there is no depreciation allowance.

One IRS-approved depreciation formula is *straight-line depreciation*, which distributes the depreciation allowance evenly over the expected useful life of the asset. For example, Rogermark has purchased a \$20 million web press with an expected useful life of 10 years. After 10 years, the press is valueless. If Rogermark's accountants use straight-line depreciation for the 10 years, then each year they record $1/10$ of the initial expenditure on the press as that year's depreciation allowance: $1/10 \times \$20 \text{ million} = \$2 \text{ million per year}$. These accountants then record a cost of \$2 million on Rogermark's books.

The accounting depreciation allowance is essentially an arbitrary number created by an arbitrary depreciation formula that the IRS has approved for tax purposes, so it rarely equals the true depreciation cost of the asset. The true cost of depreciation is the change in the market value of the asset. **Economic depreciation** is the change in the market value of a capital asset such as land, equipment, or a

Economic depreciation
The change in the market value of a capital asset such as land, equipment, or a building.

building.³ Notably, the accounting depreciation allowance for land is zero because it does not wear out. Its economic depreciation, however, is not necessarily zero because the market value of land can change.

Suppose that during a particular year the market value of a press Rogermark owns falls from \$20 million to \$17 million. In this year, the economic depreciation of the press equals \$20 million – \$17 million, or \$3 million. By owning the press, Rogermark has incurred an opportunity cost equal to its economic depreciation of \$3 million. Rogermark's true depreciation cost of using the press is not the \$2 million depreciation allowance accountants must use but rather the loss of \$3 million in value. Managers should use economic depreciation rather than the accounting depreciation allowance when making their decisions because economic depreciation accurately measures the firm's opportunity cost of the depreciation from using the asset.

The Opportunity Cost of the Capital Asset. Because accountants must adhere to IRS-approved depreciation schedules, they record the accounting depreciation allowance as the cost of using a capital asset. Economists realize that a firm has options for the capital asset other than using it, so the firm incurs an opportunity cost in addition to the economic depreciation when it uses the asset. To determine this opportunity cost, you must ask yourself the following question: "Other than using the asset itself, what else can a firm do with it?" The best alternative use—the one that generates the largest profit—is the opportunity cost of using the asset.

Take Rogermark's \$20 million web press, for example. Suppose that if Rogermark uses the press, the firm's only option is to use it to print *America Today* newspapers. Other than using the press to print that paper, what else can Rogermark do with it? There are two possible answers to this question: Rogermark can either rent the press (presuming there is a rental market for presses) or sell it. Comparing renting and selling is difficult because it involves comparing a stream of payments over time (from renting the press) to a single payment (from selling the press). Chapter 16 explains how you can make this comparison if the company rents the asset for more than one year. For now, to simplify the analysis, assume that Rogermark is interested in the opportunity cost of using the press for a single year, so the relevant comparison becomes rental of the press for one year versus its sale.

In general, the profit from renting a capital asset is the rental payment minus any related costs incurred by the owner. These costs can depend on the rental contract. For example, a building owner can rent a building using a *triple net lease*, in which case the owner receives the rent and the renter is responsible for the maintenance costs, property insurance, and property taxes. For our Rogermark example, let's suppose that some other printer rents the press for \$3.6 million per year under a triple net lease, so the renter covers the maintenance and insurance costs. There is, however, also the cost of the economic depreciation. At the end of the year, Rogermark still owns the press, so the firm has incurred the opportunity cost of the economic depreciation. Suppose, as above, that the economic depreciation is \$3 million. Subtracting this cost from the rental payment gives Rogermark a net profit of \$0.6 million.⁴

Compare this amount to the return from the other alternative, selling the press. If Rogermark sells the press, how do you determine its return for one year? Suppose

3 Sometimes a capital asset, such as land, rises in value; that is, it appreciates. Regardless of whether the asset rises or falls in value, the change in the market value is still called economic depreciation.

4 If the capital asset (such as land) appreciates in value, you must add the gain to the rental revenue to calculate the profit from renting the asset.

that the firm sells the press for its market value, \$20 million. This price buys ownership of the press. It is *not* the one-year return. To determine the one-year return, you need to analyze Rogermark's investment opportunities. Assuming that the most profitable investment opportunity for the year yields a profit of 12 percent, Rogermark can use the \$20 million gained from the sale of the press to fund this opportunity, for a profit at the end of the year of $\$20 \text{ million} \times 0.12 = \2.4 million . More generally, the one-year profit from selling an asset is equal to

$$P \times r$$

where P is the price of the asset and r is the highest one-year profit rate available to the seller. Economic depreciation does not affect the firm's return from selling the asset because the firm no longer owns it.

Now that you have calculated the values of the alternative uses of the press, you can determine Rogermark's opportunity cost of using it. The opportunity cost equals the higher of the two returns. The return for renting the press is \$0.6 million, and the return for selling the press is \$2.4 million. The most profitable alternative is obviously selling the press, so the opportunity cost to Rogermark of using the press to print *America Today* is \$2.4 million per year.

The example demonstrates a critical difference between accounting cost and opportunity cost: The accounting depreciation allowance (\$2 million per year) is *not*

DECISION SNAPSHOT

Opportunity Cost at Singing the Blues Blueberry Farm

You belong to a group of local entrepreneurs that owns a 10-acre blueberry farm called Singing the Blues. You could farm the land yourselves or rent it out for \$7,000 per year. Another option is to sell the land this year at its current market price of \$80,000. The price of the land next year will be \$78,000. If you sell it, your group has an investment opportunity from which you expect to make a return of 6 percent per year. What is the opportunity cost of using the land this year to grow blueberries?

Answer

To decide how to use the land, your group needs to know its opportunity cost, its best alternative use. The alternative uses are to rent the land or to sell it. If you rent the land, your return is the rent (\$7,000) adjusted by any economic depreciation (change in the market value). In this case, the economic depreciation is \$2,000 because the market price of the land falls from \$80,000 to \$78,000. Accordingly, the total return from renting the land is the rental payment minus the economic depreciation:

$$7,000 - \$2,000 = \$5,000$$

The one-year return from selling the land is

$$\$80,000 \times 0.06 = \$4,800$$

The opportunity cost to the owners of using the land is the greater of these two numbers, or \$5,000. Consequently, when calculating the profit from using the land to grow blueberries, your group should include \$5,000 as the cost of using the land.

the same as the opportunity cost of using the press (\$2.4 million per year). In this particular case, if Rogermark's managers use the accounting allowance, they will underestimate the actual cost of using the press. This error might lead the managers to make bad decisions. For example, underestimating the cost of using the press will encourage the managers to use the press even if the firm's profit would be greater if they sell it.

Cost of Competitive Return on Invested Funds Accountants often ignore the opportunity cost of the funds the owners have invested in the firm. In order to start a business, the founders almost always use some of their own funds, perhaps to purchase machinery, a building, or inventory. By investing their funds in the firm, the owners lose the opportunity to use the funds elsewhere. The opportunity cost of the funds tied up in the firm is the return the owners could have made by using the funds in the next best endeavor. The return the owners can make is determined in competitive markets, so this opportunity cost is called the **competitive return**. For example, if the owners invest \$600,000 in their business when they could make an alternative rate of return of 9 percent on these funds, the owners' competitive return is equal to $\$600,000 \times 0.09 = \$54,000$. In other words, the owners have lost the opportunity to make \$54,000 by committing their funds to the business instead of the alternative opportunity.

Competitive return The opportunity cost of the owners' funds invested in a company.

Cost of Owner's Time Owners of firms who also work in the business typically pay themselves a salary, which constitutes an explicit opportunity cost. This salary, however, does not necessarily reflect the true opportunity cost of the owners' time because owners frequently have other options that affect their opportunity costs. You must take account of the return from these other options to calculate the owners' opportunity cost of working for their own company.

For example, suppose that after graduation, you receive an offer from Compton Consulting, a firm similar to Deloitte Consulting, for a position that pays a salary, including all benefits, of \$105,000 per year. Instead of taking the offer, you opt to create a marketing firm. You pay yourself a salary, again including all benefits, of \$65,000 per year. Your salary is definitely part of the opportunity cost of running the firm, but it is not the total opportunity cost of your time. If you were not running the firm, you would be working at Compton Consulting, making \$105,000 per year. Because working at that firm is your best alternative, the total opportunity cost for your time is \$105,000. Your marketing firm incurs an opportunity cost of \$105,000 for each year you spend in the company. Of the \$105,000 opportunity cost, \$65,000 is an explicit opportunity cost and \$40,000 is an implicit opportunity cost.

Suppose that you decide to pay yourself \$120,000 rather than \$65,000. In this case, the opportunity cost to your firm for your time is *still* \$105,000, your best alternative foregone—that is, the best alternative use of your time. Of your \$120,000 salary, \$105,000 is the opportunity cost of your time, and the remainder, \$15,000, is a payment to you of some of the competitive return on the funds you have invested in your company.⁵

⁵ The IRS limits the amount of salary that owners of a corporation can pay themselves. If owners distribute the corporation's profit to themselves as dividends, the IRS collects both the corporate income tax on the profit and the personal income tax on the dividend income. The IRS's concern is that by "overpaying" themselves, owners transfer the corporation's profit to themselves as salary, thereby avoiding the corporate income tax and paying only the personal income tax.