Life is full of uncertainties. Suppose that you are in the oil business. You might be in charge of a joint venture in Siberia. What obstacles would you face? You would face major risks that plague oil producers everywhere—the risks of a price plunge, of embargo, or of an attack on your tankers by some hostile regime. Added to these are the uncertainties of operating in uncharted terrain: you are unfamiliar with the geological formations, with the routes for getting the oil to the market, with the success rate on drilling wells, and with the skills of the local workforce.

In addition to these uncertainties are the political risks involved in dealing with an increasingly autocratic and nationalistic government in Moscow, along with the problems that arise from occasional wars and from corrupt elements in a country where bribes are common and the rule of law is insecure. And your partners may turn out to be unscrupulous fellows who take advantage of their local knowledge to get more than their share.

The economic issues in your joint venture present complexities that are not captured in our elementary theories. Many of these issues involve risk, uncertainty, and information. Our oil company must deal with the uncertainties of drilling, of volatile prices, and of shifting markets. Likewise, households must contend with uncertainty about future wages or employment and about the return on their investments in education or in financial assets. Additionally, some people suffer from misfortunes such as devastating hurricanes, earthquakes, or illnesses. The first section of this chapter discusses the fundamental economics of uncertainty.

How do individuals and societies cope with uncertainties? One important approach is through insurance. The second section deals with the fundamentals of insurance, including the important concept of social insurance. The third section applies the concept of social insurance to health care, which is a growing political and social dilemma in the United States. We conclude with an examination of the economics of information and apply this to the rise of the Internet.

No study of the realities of economic life is complete without a thorough study of the fascinating questions involved in decision making under uncertainty and the economics of information.

A. ECONOMICS OF RISK AND UNCERTAINTY

Our analysis of markets presumed that costs and demands were known for certain. In reality, business life is teeming with risk and uncertainty. We described
the uncertainties involved in a joint venture for oil in Siberia, but these problems are not confined to the oil business. Virtually all firms face uncertainties about their output and input prices. They may find that their markets are shrinking because of a recession or that credit is hard to find in a financial crisis. Furthermore, the behavior of their competitors cannot be forecast in advance. The essence of business is to invest now in order to make profits in the future, in effect putting fortunes up as hostage to future uncertainties. Economic life is a risky business.

Modern economics has developed useful tools to incorporate uncertainty into the analysis of business and household behavior. This section examines the role of markets in spreading risks over space and time and analyzes the theory of individual behavior under uncertainty. These topics are but a brief glimpse into the fascinating world of risk and uncertainty in economic life.

**SPECULATION: SHIPPING ASSETS OR GOODS ACROSS SPACE AND TIME**

We begin by considering the role of speculative markets. Speculation involves buying and selling in order to make profits from fluctuations in prices. A speculator wants to buy low and sell high. The item might be grain, oil, eggs, stocks, or foreign currencies. Speculators do not buy these items for their own sake. The last thing they want is to see the egg truck show up at their door. Rather, they make a profit from price changes.

Many people think of speculation as a slightly sinister activity, particularly when it arises from accounting frauds and inside information. But speculation can be beneficial to society. The economic function of speculators is to “move” goods from periods of abundance to periods of scarcity. Even though speculators may never see a barrel of oil or a Brazilian bond, they can help even out the price and yield differences of these items among regions or over time. They do this by buying when goods are abundant and prices are low and selling when goods are scarce and prices are high, and this indeed can improve a market’s efficiency.

**Arbitrage and Geographic Price Patterns**

The simplest case is one in which speculative activity reduces or eliminates regional price differences by buying and selling the same commodity. This activity is called arbitrage, which is the purchase of a good or asset in one market for immediate resale in another market in order to profit from a price discrepancy.

Let’s say that the price of wheat is 50 cents per bushel higher in Chicago than in Kansas City. Furthermore, suppose that the costs of insurance and transportation are 10 cents per bushel. An arbitrager (someone engaged in arbitrage) can purchase wheat in Kansas City, ship it to Chicago, and make a profit of 40 cents per bushel. As a result of market arbitrage, the differential will be reduced so that the price differential between Chicago and Kansas City can never exceed 10 cents per bushel. As a result of arbitrage, the price difference between markets will generally be less than the cost of moving the good from one market to the other.

The frenzied activities of arbitragers—talking on the phone simultaneously to several brokers in several markets, searching out price differentials, trying to eke out a tiny profit every time they can buy low and sell high—tend to align the prices of identical products in different markets. Once again, we see the invisible hand at work—the lure of profit acts to smooth out price differentials across markets and make markets function more efficiently.

**Speculation and Price Behavior over Time**

Forces of speculation will tend to establish definite patterns of prices over time as well as over space. But the difficulties of predicting the future make this pattern less perfect: we have an equilibrium that is constantly being disturbed but is always in the process of reforming itself—rather like a lake’s surface under the play of the winds.

Consider the simplest case of a crop like corn that is harvested once a year and can be stored for future use. To avoid shortages, the crop must last for the entire year. Since no one passes a law regulating the storage of corn, how does the market bring about an efficient pattern of pricing and use over the year? The equilibrium is set by the activities of speculators trying to make a profit.

A well-informed corn speculator realizes that if all the corn is thrown on the market after the autumn harvest, it will fetch a very low price because there will be a glut on the market. Several months later...
Shedding Risks through Hedging

One important function of speculative markets is to allow people to shed risks through hedging. **Hedging** consists of reducing the risk involved in owning an asset or commodity by making an offsetting sale of that asset. Let’s see how it works. Consider someone who owns a corn warehouse. She buys 2 million bushels of Kansas corn in the fall, stores it for 6 months, and sells it in the spring at a 10-cents-per-bushel profit, just covering her costs.

The problem is that corn prices tend to fluctuate. If the price of corn rises, she makes a large windfall gain. But if the price falls sharply, the decrease could completely wipe out her profits. How can the warehouse owner make a living storing only corn while avoiding the risks of corn-price fluctuations?

She can avoid the corn-price risk by hedging her investments. The owner hedges by selling the corn the moment it is bought rather than waiting until it is shipped 6 months later. Upon buying 2 million bushels of corn in September, she sells the corn immediately for delivery in the future at an agreed-upon price that will just yield a 10-cents-per-bushel storage cost. She thereby protects herself against all corn-price risk.

Hedging allows businesses to insulate themselves from the risk of price changes.

The Economic Impacts of Speculation

But who buys the corn, and why? Someone agrees to buy the warehouse owner’s corn now for future delivery. This buyer might be a baker who has a contract to sell bread in 6 months and wants to lock in the price. Or perhaps an ethanol plant needs corn for next year’s production. Or the buyer might be a group of investors who believe that corn prices will rise and that they will therefore make a supernormal return on their investment. Someone, somewhere, and at the right price, has an economic incentive to take on the risk of corn-price fluctuations.

Speculative markets serve to improve the price and allocation patterns across space and time as well as to help transfer risks. If we look behind the veil of money, we see that ideal speculation reallocates goods from times of feast (when prices are low) to times of famine (when prices are high).

Our discussion has suggested that ideal speculative markets can increase economic efficiency. Let’s see how. Say that identical consumers have utility schedules in which satisfaction in one year is...
independent of that in every other year. Now suppose that in the first of 2 years there is a big crop—say, 3 units per person—while the second year has a small crop of only 1 unit per person. If this crop deficiency could be foreseen perfectly, how should the consumption of the 2-year, 4-unit total be spread over the 2 years? Neglecting storage, interest, and insurance costs, total utility and economic efficiency for the 2 years together will be maximized only when consumption is equal in each year.

Why is uniform consumption better than any other division of the available total? Because of the law of diminishing marginal utility. This is how we might reason: “Suppose I consume more in the first year than in the second. My marginal utility \( MU \) in the first year will be low, while it will be high in the second year. So if I carry some crop over from the first to the second year, I will be moving consumption from low-\( MU \) times to high-\( MU \) times. When consumption levels are equalized, \( MU \)'s will be equal and I will be maximizing my total utility.”

A graph can illuminate this argument. If we measure utility in dollars, with each dollar always denoting the same marginal utility, the demand curves for the risky commodity would look just like the marginal utility schedule of Figure 5-1 on page 00. The two curves of Figure 11-2(a) on page 000 show what would happen with no carryover and with unequal consumption. Here, price is determined first at \( A_1 \), where higher \( S_1 \) intersects \( DD \), and second at \( A_2 \), where the lower supply \( S_2 \) intersects \( DD \). Total utility of the gray shaded areas would add up to only \( 4/3 \), or \$13.

But with optimal carryover of 1 unit to the second year, as shown in Figure 11-2(b), \( P_s \) and \( Q_s \) will be equalized at \( E_1 \) and \( E_2 \), and the total utility of the shaded areas will add up to \( (4 + 3 + 2) \), or \$14 per person. A little analysis can show that the gain in utility of \$1 is measured by Figure 11-2(b)'s dark green block, which represents the excess of the second unit's marginal utility over that of the third. This shows why the equality of marginal utilities, which is achieved by ideal speculation, is optimal.

While this discussion has focused on commodities, most speculation today involves financial assets such as stocks, bonds, mortgages, and foreign exchange. Every day, literally trillions of dollars of assets change hands as people speculate, hedge, and invest their

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**FIGURE 11-2 Speculative Storage Can Improve Efficiency**

The blue areas measure total utility enjoyed each year. Carrying 1 unit to the second year equalizes \( Q \) and also \( P \) and \( MU \) and increases total utility by the amount of the dark green block.

This diagram will apply equally well to a number of situations. It could be labeled “(a) Without Arbitrage across Regional Markets” and “(b) With Arbitrage across Markets.” We can also use this diagram to illustrate risk aversion if we label it “(a) With a Risky Gamble” and “(b) Without a Risky Gamble.” Insurance then serves to move people from (a) to (b) by spreading the risks across many independent potential gambles.
RISK AND UNCERTAINTY

You have equal amounts of consumption in states 1 and 2, consuming 2 units in both states. Someone comes to you and says, “Let’s flip a coin for 1 unit.” This person is in effect offering you the chance to move to situation (a), where you would have 3 units of consumption if the coin came up heads and 1 unit if tails. By careful calculation, you see that if you refuse the bet and stay in situation (b), the expected value of utility is 7 utils ($7 = \frac{1}{2} \times 7$ units $+ \frac{1}{2} \times 7$ units), whereas if you accept the bet, the expected value of utility is 6½ utils ($6.5 = \frac{1}{2} \times 9$ units $+ \frac{1}{2} \times 4$ units). This example shows that if you are risk-averse, with diminishing marginal utility, you will avoid actions that increase uncertainty without some expectation of gain.

Say that I am a corn farmer. While I clearly must contend with the weather, I prefer to avoid corn-price risks. Suppose that there are two equally likely outcomes with prices of $3 and $5 per bushel, so the expected value of the corn price is $4 per bushel. Unless I can shed the price risk, I am forced into a lottery where I must sell my 10,000-bushel crop for either $30,000 or $50,000 depending upon the flip of the corn-price coin.

Because I am risk-averse, I would prefer a sure thing to such a lottery. The prospect of losing $10,000 is more painful than the prospect of gaining $10,000 is pleasant. If my income is cut to $30,000, I will have to cut back on important spending, such as replacing an aging tractor. On the other hand, the extra $10,000 might be less critical, going toward luxuries like a winter vacation. I therefore decide to hedge my price risk by selling my corn for the expected-value price of $4 per bushel.

People are generally risk-averse, preferring a sure thing to uncertain levels of consumption: people prefer outcomes with less uncertainty and the same average values. For this reason, activities that reduce the uncertainties of consumption lead to improvements in economic welfare.
became permissive as those toward drugs and tobacco hardened. Overall, gambling has been one of the fastest-growing sectors of the (legal) economy in the last two decades. Gambling is a different animal from speculation. While ideal speculative activity increases economic welfare, gambling raises serious economic issues. To begin with, aside from recreational value, gambling does not create goods and services. In the language of game theory, described in the previous chapter, gambling is a “negative-sum game” for the players—the customers are (almost) sure to lose in the long run because the house takes a cut of all bets. In addition, by its very nature, gambling increases income inequality. People who sit down to the gambling table with the same amount of money go away with widely different amounts. A gambler’s family must expect to be on top of the world one week only to be living on crumbs and remorse when luck changes. Some observers also believe that gambling has adverse social impacts. These include addiction to gambling, neighborhood crime, political corruption, and infiltration of gambling by organized crime.

Given the substantial economic case against gambling, how can we understand the recent trend to legalize gambling and operate government lotteries? One reason is that when states are starved for tax revenues, they look under every tree for new sources; they rationalize lotteries and casinos as a way to channel private vices to the public interest by skimming off some of the revenues to finance public projects. In addition, legal gambling may drive out illegal numbers racketeers and take some of the profitability out of organized crime. Notwithstanding these rationales, many observers raise questions about an activity in which the state profits by promoting irrational behavior among those who can least afford it.

**B. THE ECONOMICS OF INSURANCE**

Most people would like to avoid the risks of losing life, limb, and house. But risks cannot simply be buried. When a house burns down, when someone is hurt in an automobile accident, or when a hurricane destroys New Orleans—someone, somewhere, must bear the cost.

Markets handle risks by risk spreading. This process takes risks that would be large for one person and spreads them around so that they are but small risks for a large number of people. The major form of risk spreading is insurance, which is a kind of gambling in reverse.

For example, in buying fire insurance on a house, homeowners seem to be betting with the insurance company that the house will burn down. If it does not, the owners forfeit the small premium charge. If it does burn down, the company must reimburse the owners for the loss at an agreed-upon rate. What is true of fire insurance is equally true of life, accident, automobile, or any other kind of insurance.

The insurance company is spreading risks by pooling many different risks: it may insure millions of houses or lives or cars. The advantage for the insurance company is that what is unpredictable for one individual is highly predictable for a population.

Say that the Inland Fire Insurance Company insures 1 million homes, each worth $100,000. The chance that a house will burn down is 1 in 1000 per year. The expected value of losses to Inland is then .001/1100× $100,000 = $100 per house per year. It charges each homeowner $100 plus another $100 for administration and for reserves.

Each homeowner is faced with the choice between the certain loss of $200 for each year or the possible 1-in-1000 catastrophic loss of $100,000. Because of risk aversion, the household will choose to buy insurance that costs more than the expected value of the household’s loss in order to avoid the small chance of a catastrophic loss. Insurance companies can set a premium that will earn the company a profit and at the same time produce a gain in expected utility of individuals. Where does the economic gain come from? It arises from the law of diminishing marginal utility.

Insurance breaks large risks into small pieces and then sells these smaller pieces in return for a small risk premium. Although insurance appears to be just another form of gambling, it actually has the opposite effect. Whereas nature deals us risks, insurance helps reduce individual risks by spreading them out.

**Capital Markets and Risk Sharing**

Another form of risk sharing takes place in the capital markets because the financial ownership of physical capital can be spread among many owners through the vehicle of corporate financial ownership.
Moreover, the events must be statistically independent. No prudent insurance company would sell all its fire-insurance policies in the same building or sell only hurricane insurance in Miami. Insurance companies try to diversify their coverage among many independent risks.

Additionally, there must be sufficient experience regarding such events so that insurance companies can reliably estimate the losses. For example, after the September 11 terrorist attacks, private terrorism insurance was canceled because insurance companies could not get reliable estimates of the chances of future attacks (see question 3 at the end of this chapter).

Finally, the insurance must be relatively free of moral hazard. Moral hazard is at work when insurance increases risky behavior and thereby changes the probability of loss. In many situations moral hazard is unimportant. Few people will risk death because they have a generous life-insurance policy. In some areas, moral hazard is severe. Studies indicate that the presence of insurance increases the amount of cosmetic surgery, and most medical-insurance policies subsequently exclude this service.

When these ideal conditions are met—when there are many outcomes, all more or less independent, and when the probabilities can be accurately gauged and are not contaminated by moral hazard—private insurance markets can function efficiently. Sometimes, private insurance is limited or expensive because of adverse selection. Adverse selection arises when the people with the highest risk are also those who are most likely to buy the insurance. Adverse selection can lead to a market where only the people with the highest risks are insured, or even to a situation where there is no market at all.

A good example occurs when a company is offering life insurance to a population made up of smokers and nonsmokers. Suppose the company cannot determine whether a person is a smoker, or perhaps there is a government policy which says that companies cannot differentiate among people on the basis of their lifestyles. However, people know their smoking habits. We see here the phenomenon of asymmetric information between buyer and seller. Asymmetric information occurs when buyers and sellers have different information on important facts, such as a person’s health status or the quality of a good being sold.
SOCIAL INSURANCE

When market failures are so severe that the private market cannot provide coverage in an effective manner, governments turn to social insurance. This consists of mandatory programs, with broad or universal coverage, funded by taxes or fees. These programs are insurance because they cover risky situations such as unemployment, illness, or low incomes during retirement. The taxing and regulatory powers of the government, plus the ability to prevent adverse selection through universal coverage, can make government insurance a welfare-improving measure. The rationale for social insurance was explained as follows by the distinguished public-policy economist Martin Feldstein: 1

There are two distinct reasons for providing social insurance. Both reflect the asymmetry of information. The first is that asymmetric information weakens the functioning of private insurance markets. The second is the inability of the government to distinguish between those who are poor in old age or when unemployed because of bad luck or an irrational lack of foresight from those who are intentionally “gaming” the system by not saving in order to receive transfer payments.

The key point is that social insurance is provided when the requirements of private insurance are not met. Perhaps the risks are not independent, as when many people simultaneously become unemployed in a recession. Perhaps adverse selection is serious, as when people choose to buy catastrophic health insurance soon after they learn they have a terrible disease. Perhaps the risks cannot be easily evaluated, as in the case of insurance against terrorist attacks. In each of these cases, the private market functioned poorly or not at all, so the government stepped in with social insurance.

Let’s spend a moment on the example of unemployment insurance. This is an example of a private market that cannot function because so many of the requirements for private insurance are violated: moral hazard is high (people may decide to become unemployed if benefits are generous); there is severe adverse selection (those who often lose jobs are more likely to participate); spells of unemployment are not independent (they tend to occur together.

1 See the reference in this chapter’s Further Reading section.
expectancy—one of the key indexes of health—has improved more in developing countries since 1900 than it did during the entire prior span of recorded history. Advances in medical technology—from arthroscopic knee surgery to sophisticated antican-cer drugs—have enabled more people to live pain-free and productive lives.

Even with these great achievements, major health problems remain unsolved in the United States: Infant mortality is higher than in many countries with lower incomes; many Americans are without health insurance coverage; great disparities in care exist between the rich and the poor; and communicable diseases like AIDS and tuberculosis are spreading.

The issue that most concerns the public, the business community, and political leaders is the exploding cost of health care. Virtually everyone agrees that the U.S. health system has contributed greatly to the nation’s health, but many worry that it is becoming unaffordable.

Special Economic Features of Health Care
The health-care system in the United States has three characteristics that have contributed to the rapid growth of the health-care sector in recent years: a high income elasticity, rapid technological advance, and the increasing insulation of consumers from prices.

Health care has a high income elasticity, indicating that ensuring a long and fit life becomes increasingly important as people are able to pay for other essential needs. Goods with high income elasticities, other things held constant, tend to take a growing share of consumer income as income rises.

Health care has enjoyed rapid improvements in medical technology over the last century. Advances in fundamental biomedical knowledge, discovery and use of a wide variety of vaccines and pharmaceuticals, progress in understanding the spread of communicable diseases, and increasing public awareness of the role of individual behavior in areas such as smoking, drinking, and driving—all these have contributed to the remarkable improvement in the health of Americans. The new and improved technologies have created new markets and stimulated spending in the health-care sector.

Additionally, spending on health care has risen rapidly because of the increased subsidization of
upon the recommendations of the suppliers. Special protection must be given to ensure that consumers do not unwittingly purchase unnecessary, poor-quality, or high-cost services.

There are also informational asymmetries between the patient and the insurance provider. People may know more about their medical condition than do insurance companies. Low-risk individuals may choose not to buy health insurance. This leads to adverse selection, which increases the average riskiness of the group and subsequently increases the cost for those who do participate. It is not surprising that healthy people in their twenties are those most likely to be uninsured.

3. A third concern of government policy is equity—to provide a minimum standard of medical care for all. In part, good health care is increasingly viewed as a basic right in wealthy countries. But good health care is also a good social investment. Inadequate health care is particularly harmful for poor people not only because they tend to be sicker than wealthier individuals but also because their incomes are almost entirely derived from their labor. A healthier population is a more productive population because healthier people have higher earnings and require less medical care.

Inadequate health care is most costly for children. The medical condition of poor and minority children in the United States has in some dimensions actually worsened in recent years. Sick children are handicapped from the start: they are less likely to attend school, perform more poorly when they do attend, are more likely to drop out, and are less likely to get good jobs with high pay when they grow up. No country can prosper when a significant fraction of its children have inadequate medical care.

Rationing Health Care

Whether or not a country provides equal health care for all its residents, health care must be rationed because supply is limited. Until we get to the point where every symptom of every hypochondriac can be extensively examined, probed, and treated, it will be necessary to leave some perceived medical need unsatisfied. There is no choice but to ration health care.

However, it is not obvious how we are to ration such a good. Most goods and services are rationed...
by the purse. Prices ration out the limited supply of fancy cars and mansions, as well as the not-so-fancy food and shoes, to those who most want and can afford them. In many areas of health care, by contrast, we do not allow prices to ration out services to the highest bidders. For example, we do not auction off liver transplants or blood or emergency-room access to the highest bidder. Rather, we desire that these goods be allocated equitably.

The subsidization of health care leads to shortages, and demand for the good must therefore be limited in some other way. This phenomenon is known as nonprice rationing. Many of us have experienced this kind of rationing when we wait in line for a good or service. Because price is not allowed to rise to balance supply and demand, some other mechanism must be found to “clear the market.”

Figure 11-3 illustrates nonprice rationing in the medical market. Suppose that there are only $Q_0$ units of medical care available with a consumer demand function of $DD$. The market-clearing price would come at $C$, where quantities supplied and demanded are equal. However, because the consumer pays only 20 percent of the costs out of pocket, the quantity demanded is $Q_1$. The $AB$ segment is unsatisfied demand, which is subject to nonprice rationing; the greater the subsidy, the more nonprice rationing must be used.

Health care is an economic commodity like shoes and gasoline. Physicians’ services, nursing care, hospitalization, and other services are limited in supply. The demands of consumers—summing up the critical, the reasonable, the marginal, and the nonsensical—outstrip the available resources. But the resources must somehow be rationed out. Rationing of health care according to dollar votes is unacceptable because it does too much damage to the public health, leaves crucial demands unmet, and impoverishes many. What should be the scope of the market, and what nonmarket mechanism should be used where the market is supplanted? These questions are the crux of the great debate about medical care.

**D. INNOVATION AND INFORMATION**

One of the most important topics in economics is the economics of information. Information includes things as varied as e-mails, songs, new vaccines, and even the textbook you are reading. Information is a very different kind of commodity from things like pizza and shoes because information is expensive to produce but cheap to reproduce. Because of the unusual nature of information, it is subject to market failures, so we need to develop different kinds of public policies to regulate it—the law of “intellectual property.”

**Schumpeter’s Radical Innovation**

We set the stage for our discussion by returning to the economics of imperfect competition that we discussed in the previous two chapters. We learned that imperfect competitors set prices too high, earn supernormal profits, and neglect product quality.

This dismal view of monopoly was challenged by one of the great economists of the last century.
Joseph Schumpeter. He argued that the essence of economic development is innovation and that monopolists are in fact the wellsprings of innovation in a capitalist economy.

**JOSEPH SCHUMPETER: ECONOMIST AS ROMANTIC**

Born in the Austrian Empire, Joseph Schumpeter (1883–1950), a legendary scholar whose research ranged widely in the social sciences, led a flamboyant private life.

He began studying law, economics, and politics at the University of Vienna—then one of the world centers of economics and the home of the “Austrian School” that today reveres laissez-faire capitalism. As a professor, he was often the champion of his students. Six months into his teaching career, he charged into the library and scolded the librarian for not allowing his students to have free use of the books. After trading insults, the librarian challenged Schumpeter to a duel. Schumpeter won by nicking the librarian on the shoulder, and his students thereafter had unlimited access to the library.

In between dueling, insulting the stodgy faculty by showing up at faculty meetings in riding pants, and carousing, Schumpeter devoted himself to introducing economic theory to the European continent, founding the Econometric Society, and traveling to England and America. He later moved to Harvard University, where he eventually became embittered as the theories of his great rival, John Maynard Keynes, swept the profession.

Schumpeter’s writings covered much of economics, sociology, and history, but his first love was economic theory. Schumpeter’s early classic, *The Theory of Economic Development* (1911), broke with the traditional static analysis of its time by emphasizing the importance of the entrepreneur or innovator, the person who introduces “new combinations” in the form of new products or methods of organization. Innovations result in temporary supernormal profits, which are eventually eroded away by imitations. Ever the romantic, Schumpeter saw in the entrepreneur the hero of capitalism, the person of “superior qualities of intellect and will,” motivated by the will to conquer and the joy of creation.

His magisterial *History of Economic Analysis* (published posthumously in 1954) is a superb survey of the emergence of modern economics. His “popular” book, *Capitalism, Socialism, and Democracy* (1942), laid out his startling hypothesis on the technological superiority of monopoly and developed the theory of competitive democracy, which later grew into public-choice theory. (See question 7 at the end of this chapter.) He ominously predicted that capitalism would wither away because of disenchantment among the elites. Were he alive today, he might well join in the conservative complaint that the welfare state drains the economic vitality of the market economy.

**The Economics of Information**

Modern economics emphasizes the special problems involved in the **economics of information**. Information is a fundamentally different commodity from normal goods. Because information is costly to produce but cheap to reproduce, markets in information are subject to severe market failures.

Consider the production of a software program, such as Windows Vista. Developing this program took several years and cost Microsoft many billions of dollars. Yet you can purchase a legal copy for about $220 or buy an illegal pirated copy for $5. The same phenomenon is at work in pharmaceuticals, entertainment, and other areas where much of the value of a good comes from the information it contains. In each of these areas, the research and development on the product may be an expensive process that takes years. But once the information is recorded on paper, in a computer, or on a compact disc, it can be reproduced and used by a second person essentially for free.

The inability of firms to capture the full monetary value of their inventions is called **inappropriability**. Inventions are not fully appropriable because other firms may imitate or pirate an invention, in which case the other firms may derive some of the benefits of the inventive investments; sometimes, imitators may drive down the price of the new product, in which case consumers would get some of the rewards. Case studies have found that the social return to invention (the value of an invention to all consumers and producers) is many times the appropriable private return to the inventor (the monetary value of the invention to the inventor).

Information is expensive to produce but cheap to reproduce. To the extent that the rewards to invention are inappropriable, we would expect private research and development to be underfunded, with the most significant underinvestment in basic
research because that is the least appropriable kind of information. The inappropriability and high social return on research lead most governments to subsidize basic research in the fields of health and science and to provide special incentives for other creative activities.

**Intellectual Property Rights**

Governments have long recognized that creative activities need special support because the rewards for producing valuable information are reduced by imitation. The U.S. Constitution authorizes Congress “to promote the Progress of Science and useful Arts, by securing, for limited Times, to Authors and Inventors, the exclusive Right to their respective Writings and Discoveries.” Thus special laws governing patents, copyrights, business and trade secrets, and electronic media create intellectual property rights. The purpose is to give the owner special protection against the material’s being copied and used by others without compensation to the owner or original creator.

The earliest intellectual property right was the patent, under which the U.S. government creates an exclusive use (in effect, a limited monopoly) over a “novel, nonobvious, and useful” invention for a limited period, currently set at 20 years. Similarly, copyright laws provide legal protection against unauthorized copying of original works in different media such as text, music, video, art, software, and other information goods.

Why would governments actually encourage monopolies? In effect, patents and copyrights grant property rights to inventors over books, music, and ideas. By allowing inventors to have exclusive use of their intellectual property, the government increases the degree of appropriability and thereby increases the incentives for people to invent useful new products, write books, compose songs, and write computer software. A patent also requires disclosure of the technological details of the invention, which encourages further invention and imitation. Examples of successful patents include those on the cotton gin, the telephone, the Xerox machine, and many profitable drugs.

**The Dilemma of the Internet**

Inventions that improve communications are hardly limited to the modern age. But the rapid growth of electronic storage, access, and transmission of information highlights the dilemma of providing incentives for creating new information. Many new information technologies have large up-front or sunk costs but virtually zero marginal costs. With the low cost of electronic information systems like the Internet, it is technologically possible to make large amounts of information available to everyone, everywhere, at close to zero marginal cost. Perfect competition cannot survive here because a price equal to a zero marginal cost will yield zero revenues and therefore no viable firms.

The economics of the information economy highlights the conflict between efficiency and incentives. On the one hand, all information might be provided free of charge—free economics textbooks, free movies, free songs. Free provision of information looks economically efficient because the price would thereby be equal to the marginal cost, which is zero. But a zero price on intellectual property would destroy the profits and therefore reduce the incentives to produce new books, movies, and songs because creators would reap little return from their creative activity. Society has struggled with this dilemma in the past. But with the costs of reproduction and transmission so much lower for electronic information than for traditional information, finding sensible public policies and enforcing intellectual property rights is becoming ever more difficult.

Experts emphasize that intellectual property laws are often hard to enforce, especially when they apply across national borders. The United States has a long-running trade dispute charging that China condones the illegal copying of American movies, musical recordings, and software. A DVD movie that sells for $25 in the United States can be purchased for 50 cents in China. The U.S. copyright industries estimate that 85 to 95 percent of all their members’ copyrighted works sold in China were pirated in 2007.

In a world increasingly devoted to developing new knowledge—much of it intangible, like music, movies, patents, new drugs, and software—governments must find a middle ground in intellectual property rights. If intellectual property rights are too strong, this will lead to high prices and monopoly losses, while too weak intellectual property laws will discourage invention and innovation.
## SUMMARY

### A. Economics of Risk and Uncertainty

1. Economic life is full of uncertainty. Consumers face uncertain incomes and employment patterns as well as the threat of catastrophic losses; businesses have uncertain costs, and their revenues contain uncertainties about price and production.

2. In well-functioning markets, arbitrage, speculation, and insurance help smooth out the unavoidable risks. Speculators are people who buy and sell assets or commodities with an eye to making profits on price differentials across markets. They move goods across regions from low-price to high-price markets, across time from periods of abundance to periods of scarcity, and even across uncertain states of nature to periods when chance makes goods scarce.

3. The profit-seeking action of speculators and arbitragers tends to create certain equilibrium patterns of price over space, time, and risks. These market equilibria are zero-profit outcomes where the marginal costs and marginal utilities in different regions, times, or uncertain states of nature are in balance. To the extent that speculators moderate price and consumption instability, they are part of the invisible-hand mechanism that performs the socially useful function of reallocating goods from feast times (when prices are low) to famine times (when prices are high).

4. Speculative markets allow individuals to hedge against unwelcome risks. The economic principle of risk aversion, which derives from diminishing marginal utility, implies that individuals will not accept risky situations with zero expected value. Risk aversion implies that people will buy insurance to reduce the potentially disastrous declines in utility from fire, death, or other calamities.

### B. The Economics of Insurance

5. Insurance and risk spreading tend to stabilize consumption in different states of nature. Insurance takes large individual risks and spreads them so broadly that they become acceptable to a large number of individuals. Insurance is beneficial because, by helping to equalize consumption across different uncertain states, it raises the expected level of utility.

6. The conditions necessary for the operation of efficient insurance markets are stringent: there must be large numbers of independent events and little chance of moral hazard or adverse selection. When market failures such as adverse selection arise, prices may be distorted or markets may simply not exist.

7. If private insurance markets fail, the government may step in to provide social insurance. Social insurance is provided by governments when private insurance markets cannot function effectively and society believes that individuals should have a social safety net for major risks such as unemployment, illness, and low incomes. Even in the most laissez-faire of advanced market economies today, governments insure against unemployment and health risks in old age.

### C. Health Care: The Problem That Won’t Go Away

8. Health care is the largest social insurance program. The health-care market is characterized by multiple market failures that lead governments to intervene. Health-care systems have major externalities. Additionally, the asymmetric information between doctors and patients leads to uncertainties about the appropriate treatment and level of care, and the asymmetry between patients and insurance companies leads to adverse selection in the purchase of insurance. Finally, because health care is so important to human welfare and to labor productivity, most governments strive to provide a minimum standard of health care to the population.

9. When the government subsidizes health care and attempts to provide universal coverage, there will be excess demand for medical services. One of the challenges is to develop efficient and equitable mechanisms of nonprice rationing.

### D. Innovation and Information

10. Schumpeter emphasized the importance of the innovator, who introduces “new combinations” in the form of new products and new methods of organization and is rewarded by temporary entrepreneurial profits.

11. Today, the economics of information emphasizes the difficulties involved in the efficient production and distribution of new and improved knowledge. Information is different from ordinary goods because it is expensive to produce but cheap to reproduce. The inability of firms to capture the full monetary value of their inventions is called inappropriability. To increase appropriability, governments create intellectual property rights governing patents, copyrights, trade secrets, and electronic media. The growth of electronic information systems like the Internet has increased the dilemma of how to efficiently price information services.
## QUESTIONS FOR DISCUSSION

1. Suppose a friend offers to flip a fair coin, with you paying your friend $100 if it comes up heads and your friend paying you $100 if it comes up tails. Explain why the expected dollar value is $0. Then explain why the expected utility value is negative if you are risk-averse.

2. Consider the example of grade insurance (see page 000). Suppose that with a grade-insurance policy, students would be compensated $5000 a year for each point that their grade point average fell below the top grade (the resulting number might be an estimate of the impact of grades on future earnings). Explain why the presence of grade insurance would produce moral hazard and adverse selection. Why would moral hazard and adverse selection make insurance companies reluctant to sell grade insurance? Are you surprised that you cannot buy grade insurance?

3. After the terrorist attacks of September 11, 2001, most insurance companies canceled their insurance coverage for terrorism. According to President Bush, “More than $15 billion in real estate transactions have been canceled or put on hold because owners and investors could not obtain the insurance protection they need.”

## CONCEPTS FOR REVIEW

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## FURTHER READING AND INTERNET WEBSITES

### Further Reading


The Schumpeterian hypothesis was developed in Joseph Schumpeter, *Capitalism, Socialism, and Democracy* (Harper & Row, New York, 1942).


### Websites

One of the most interesting websites about the Internet and intellectual property rights is compiled by Hal R. Varian, chief economist of Google and former dean of the School of Information Management and Systems at the University of California at Berkeley. This site, called “The Economics of the Internet, Information Goods, Intellectual Property and Related Issues,” is at [www.sims.berkeley.edu/resources/inforecon](http://www.sims.berkeley.edu/resources/inforecon).

Information on the American health-care system is usefully compiled by the National Center on Health Statistics at [www.cdc.gov/nchs/](http://www.cdc.gov/nchs/).
As a result, the federal government stepped in to provide coverage for up to $90 billion in claims. Using the principles of insurance, explain why insurance companies might decline to insure property against terrorist attacks. Explain whether or not you think the federal program is an appropriate form of social insurance.

4. In the early nineteenth century, little of the nation’s agricultural output was sold in markets, and transportation costs were very high. What would you expect to have been the degree of price variation across regions as compared with that of today?

5. Assume that a firm is making a risky investment (say, spending $2 billion developing a competitor to Windows). Can you see how the diversified ownership of this firm could allow near-perfect risk spreading on the software investment?

6. Health insurance companies sometimes do not allow new participants to be covered on “existing conditions,” or preexisting illnesses. Explain why this policy might alleviate problems of adverse selection.

7. Joseph Schumpeter wrote as follows:

   The modern standard of life of the masses evolved during the period of relatively unfettered “big business.” If we list the items that enter the modern workman’s budget and, from 1899 on, observe the course of their prices, we cannot fail to be struck by the rate of the advance which, considering the spectacular improvement in qualities, seems to have been greater and not smaller than it ever was before. Nor is this all. As soon as we inquire into the individual items in which progress was most conspicuous, the trail leads not to the doors of those firms that work under conditions of comparatively free competition but precisely to the doors of the large concerns—which, as in the case of agricultural machinery, also account for much of the progress in the competitive sector—and a shocking suspicion dawns upon us that big business may have had more to do with creating that standard of life than keeping it down. (Capitalism, Socialism, and Democracy)

Use this passage to describe the tradeoff between “static” monopoly inefficiencies and “dynamic” efficiencies of technological change.

8. Long-term care for the elderly involves helping individuals with activities (such as bathing, dressing, and toileting) that they cannot perform for themselves. How were these needs taken care of a century ago? Explain why moral hazard and adverse selection make long-term-care insurance so expensive today that few people choose to buy it.

9. Economic studies have found that the private rate of return on inventions is typically as low as one-third of the social return. Explain this finding in terms of the economics of innovation.