

Solutions to Chapter 9 Exercises

SOLVED EXERCISES

If you find a blank space where an equation or figure may appear, please select that area for it to appear.

S1. (a) To achieve separation, t must be such that

$$\begin{aligned}t^2/160 > 10 & \quad \text{and} \quad t^2/320 < 10 \\ \Rightarrow t^2 > 1,600 & \quad \text{and} \quad t^2 < 3,200 \\ \Rightarrow t > 40 & \quad \text{and} \quad t < 56.57.\end{aligned}$$

The minimum wait time that achieves separation is the smallest moment longer than 40 minutes.

(b) The expected benefit has changed for the college students, so t must now satisfy

$$\begin{aligned}t^2/160 > 0.5 \times (10) + 0.5 \times (-5) = 2.5 & \quad \text{and} \quad t^2/320 < 10 \\ \Rightarrow t^2 > 400 & \quad \text{and} \quad t^2 < 3,200 \\ \Rightarrow t > 20 & \quad \text{and} \quad t < 56.57.\end{aligned}$$

The minimum wait time that achieves separation is now a shade more than 20 minutes. The partial identification of college students reduces the minimum wait time required to achieve separation. When the charity has more information about the patrons—even if only partial information—this allows it to distinguish between the two types by means of a less stringent test.

S2. (a) Buyers expect a random Citrus to be an orange with probability $f = 0.6$ and a lemon with probability 0.4. Risk-neutral buyers are then willing to pay up to

$$0.6 \times \$18,000 + 0.4 \times \$8,000 = \$14,000.$$

(b) The willingness to accept (WTA) of owners of oranges is \$12,500. Since the willingness to pay (WTP) of buyers is \$14,000 for a random Citrus, sellers will be willing to sell

and buyers will be willing to buy for any price in the range [\$12,500, \$14,500]. Thus, there will indeed be a market for oranges.

(c) If $f = 0.2$, risk-neutral buyers will be willing to pay up to

$$0.2 \times \$18,000 + 0.8 \times \$8,000 = \$10,000.$$

(d) There will not be a market for oranges when $f = 0.2$. The probability of a random Citrus being an orange is so low that a buyer would only be willing to pay up to \$10,000, but owners of oranges require at least \$12,500. No oranges will be sold.

(e) The minimum f such that oranges are sold is the f that satisfies

$$f_{\text{threshold}} \times \$18,000 + (1 - f_{\text{threshold}}) \times \$8,000 = \$12,500$$

$$\Rightarrow \$10,000 \times f_{\text{threshold}} = \$4,500$$

$$\Rightarrow f_{\text{threshold}} = 0.45.$$

(f) One way to look at it is to redo part (e) in the abstract:

$$f_{\text{threshold}} \times WTP_{\text{orange}} + (1 - f_{\text{threshold}}) \times WTP_{\text{lemon}} = WTA_{\text{orange}}$$

$$\Rightarrow (WTP_{\text{orange}} - WTP_{\text{lemon}}) \times f_{\text{threshold}} = WTA_{\text{orange}} - WTP_{\text{lemon}}$$

$$\Rightarrow f_{\text{threshold}} = (WTA_{\text{orange}} - WTP_{\text{lemon}}) / (WTP_{\text{orange}} - WTP_{\text{lemon}})$$

Increasing WTP_{orange} increases the size of the denominator of the fraction, so $f_{\text{threshold}}$ decreases. Increasing WTP_{lemon} increases the size of both the numerator and the denominator of the fraction by the same amount, which also causes $f_{\text{threshold}}$ to decrease (assuming that $WTP_{\text{orange}} > WTA_{\text{orange}}$).

In an intuitive sense, the more highly buyers value oranges or lemons (or both), the more willing they will be to take a greater gamble on a random Citrus. That is, they'll be willing to pay a higher price for a random Citrus for each possible value of f (compared with before the increase in demand). A buyer's willingness to pay for a random Citrus will thus be sufficiently high for owners of oranges to accept at a lower threshold value of f than before.

S3. A competent electrician's payoff after obtaining the signal (certification) is $\sqrt{100 - C}$; in the absence of the signal, this electrician's payoff is $\sqrt{25}$. The competent electrician will signal as long as $\sqrt{100 - C} \geq \sqrt{25}$, or as long as $10 - C \geq 5$, or as long as $5 \geq C$. The incompetent electrician earns only $\sqrt{100 - 2C}$ after certification versus $\sqrt{25}$ without certification. He signals only if $\sqrt{100 - 2C} \leq \sqrt{25}$, or as long as $10 - 2C \leq 5$, or as long as $5/2 \leq C$. The range of values of C for which the competent electrician signals but the incompetent electrician does not is $5 \geq C \geq 2.5$. If the program is restricted to an integer number of months, $5 \geq C \geq 3$.

S4. (a) The game table in terms of z follows:

		Fordor	
		Regardless (II)	Conditional (OI)
Tudor	Bluff (LL)	$166z + 3, -34z + 5$	$175z + 25, 0$
	Honest (LH)	$141z + 28, -34z + 5$	$172z + 28, -5z + 5$

(b) When $z = 0$ (that is, when Tudor is definitely high cost), the game table, with best responses underlined, follows:

		Fordor	
		Regardless (II)	Conditional (OI)
Tudor	Bluff (LL)	$3, \underline{5}$	$25, 0$
	Honest (LH)	$\underline{28}, \underline{5}$	$\underline{28}, \underline{5}$

There are thus two pure-strategy Nash equilibria: (Honest, Regardless) and (Honest, Conditional). Tudor will always signal that it is high cost (which it is), and Fordor will always enter.

(c) When $z = 1$ (that is, when Tudor is definitely low cost), the game table, with best responses underlined, follows:

		Fordor	
		Regardless (II)	Conditional (OI)
Tudor	Bluff (LL)	<u>169</u> , -29	<u>200</u> , <u>0</u>
	Honest (LH)	<u>169</u> , -29	<u>200</u> , <u>0</u>

There are thus two pure-strategy Nash equilibria: (Bluff, Conditional) and (Honest, Conditional). Tudor will always signal that it is low cost (which it is), and Fordor will never enter.

(d) When z is strictly between 0 and 1, the best responses are

		Fordor	
		Regardless (II)	Conditional (OI)
Tudor	Bluff (LL)	$166z + 3$, <u>$-34z + 5$</u>	$175z + 25$, <u>0</u>
	Honest (LH)	<u>$141z + 28$</u> , $-34z + 5$	<u>$172z + 28$</u> , <u>$-5z + 5$</u>

If Fordor plays Regardless, Tudor's best response is Honest, because $141z + 28 > 166z + 3 \Leftrightarrow 25 > 25z$ for all z such that $0 < z < 1$.

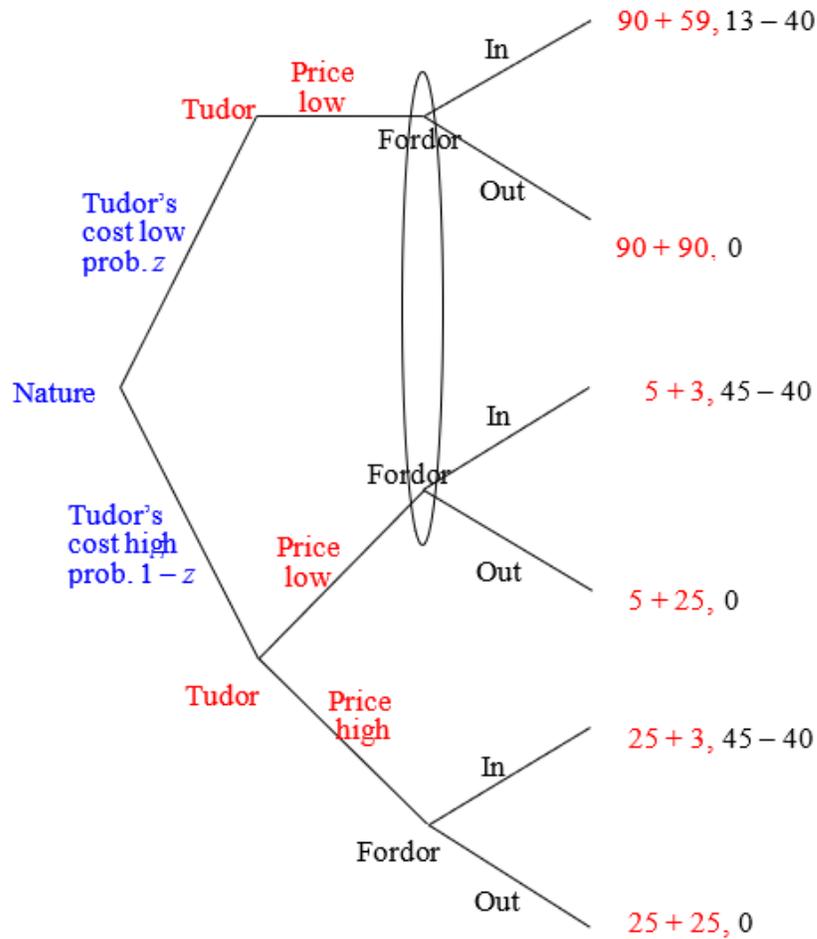
If Fordor plays Conditional, Tudor's best response is Honest, because $172z + 28 > 175z + 25 \Leftrightarrow 3 > 3z$ for all z such that $0 < z < 1$.

If Tudor plays Bluff, Fordor's best response is Regardless if $z \leq 5/34$ and Conditional if $z \geq 5/34$, $-34z + 5 \geq 0$ when $z \leq 5/34$, and $-34z + 5 \leq 0$ when $z \geq 5/34$.

If Tudor plays Honest, Fordor's best response is Conditional, because $-34z + 5 < -5z + 5$ for all z such that $0 < z < 1$.

When z is strictly between 0 and 1 there is thus a unique pure-strategy Nash equilibrium: (Honest, Conditional). Since a low-cost Tudor will always send a different signal from that of a high-cost Tudor, this is a separating equilibrium.

S5. (a) The extensive form of this game, with the low per-unit cost equal to 6, is shown below:



(b) The normal form of the game follows:

		Fordor	
		Regardless (II)	Conditional (OI)
Tudor	Bluff (LL)	$149 \times 0.4 + 8 \times 0.6 = 64.4,$ $-27 \times 0.4 + 5 \times 0.6 = -7.8$	$180 \times 0.4 + 30 \times 0.6 = 90,$ 0
	Honest (LH)	$149 \times 0.4 + 28 \times 0.6 = 76.4,$ $-27 \times 0.4 + 5 \times 0.6 = -7.8$	$180 \times 0.4 + 28 \times 0.6 = 88.8,$ $5 \times 0.6 = 3$

(c) The unique pure-strategy Nash equilibrium of this game is (Bluff, Conditional). This is a pooling equilibrium because both a low-cost Tudor and a high-cost Tudor send the same signal: setting a low price.

S6. (a) The extensive form of this game is shown below:

(b)

The table below shows how the expected payoffs are computed. For an example of how the entries are computed, consider that if Felix uses strategy RP and Oscar uses strategy SF and the cards drawn are (i) HiHi, then Felix raises, Oscar sees, and Felix gets 0; (ii) HiLo, then Felix raises, Oscar folds, and Felix gets 8; (iii) LoHi, then Felix passes and gets -8; and (iv) LoLo, then Felix passes and gets 0. Each of these four outcomes is equally likely, so the expected payoff is $(1/4)(0 + 8 - 8 + 0) = 0$.

Felix's play after		Oscar's play after		Felix's payoff when card draws are				Felix's expected payoff
Hi	Lo	Hi	Lo	HiHi	HiLo	LoHi	LoLo	
P	P	F	F	0	8	-8	0	0
P	P	S	S	0	8	-8	0	0
P	P	S	F	0	8	-8	0	0
P	P	F	S	0	8	-8	0	0
R	R	F	F	8	8	8	8	8
R	R	S	S	0	12	-12	0	0
R	R	S	F	0	8	-12	8	1
R	R	F	S	8	12	8	0	7
R	P	F	F	8	8	-8	0	2
R	P	S	S	0	12	-8	0	1
R	P	S	F	0	8	-8	0	0
R	P	F	S	8	12	-8	0	3
P	R	F	F	0	8	8	8	6
P	R	S	S	0	8	-12	0	-1
P	R	S	F	0	8	-12	8	1
P	B	F	S	0	8	8	0	4

(c) Felix's strategies PP and PR are dominated. Oscar's strategies FF and FS are dominated.

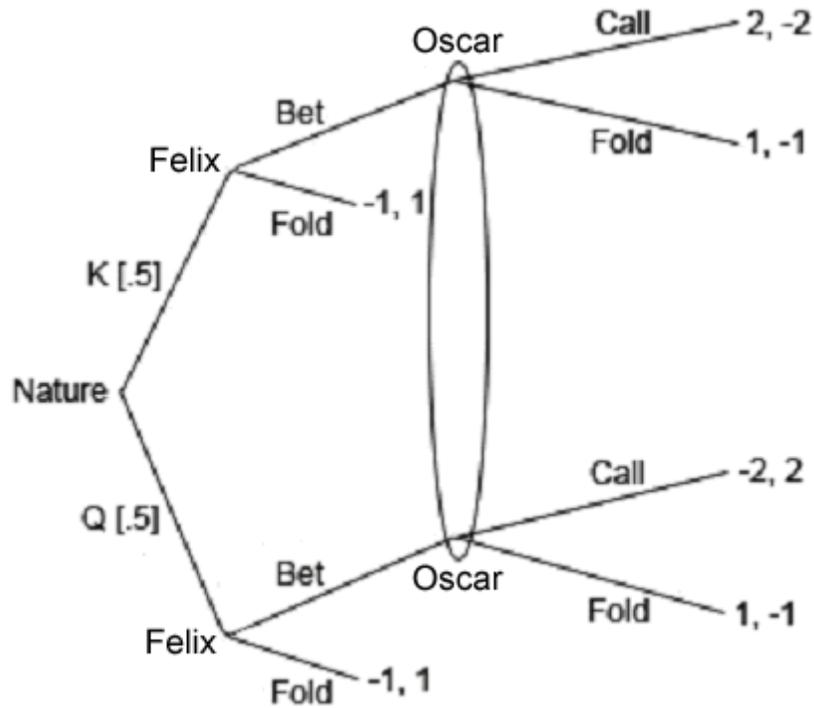
The resulting payoff table follows:

		Oscar		
		SS	SF	q -mix
Felix	RR	0	1	$1 - q$
	RP	1	0	q
	p -mix	$1 - p$	p	

In the mixed-strategy equilibrium, Felix plays each of RR and RP with probability 0.5, and Oscar plays each of SS and SF with probability 0.5. In other words, Felix always Raises when he draws High, and Raises with probability 0.5 when he draws Low. Given that Felix has Bet, Oscar always Matches when he draws the High card, and Matches with probability 0.5 when he draws the Low card.

(d) Felix's decision may reveal information (whether he drew High or Low), and he has an advantage when he draws High. If Felix always Bets when he draws High and always Passes when he draws Low, Oscar can defend optimally, and the subgame-perfect equilibrium outcome then has an expected payoff of 0 (to Felix). Fully revealing his card draw thus limits Felix's winnings. Felix must sometimes (but not always) Bet when he draws Low in order to avoid exploitation. Using this strategy allows him to (partly) conceal his private information; this is signal jamming, or bluffing.

S7. (a) The extensive form of Stripped-down Poker is shown below:



(b) Felix has two actions at each of two nodes, so he has $2 * 2 = 4$ strategies. Oscar has two actions at a single information set, so he has two strategies.

(c) The strategic form follows:

		Oscar	
		Call	Fold
Felix	Bet if K, Bet if Q (BB)	0, 0	1, -1
	Bet if K, Fold if Q (BF)	0.5, -0.5	0, 0
	Fold if K, Bet if Q (FB)	-1.5, 1.5	0, 0
	Fold if K, Fold if Q (FF)	-1, 1	-1, 1

The payoffs in the table are the expected payoffs to the players. For example, if Felix plays BF and Oscar plays Call, with probability 0.5 Felix receives a King and Bets. After this play Oscar calls, for payoffs of (2, -2). And with probability 0.5 Oscar receives a Queen and folds, for payoffs of (-1, 1). The

expected payoffs in the cell (BF, Call) are thus $0.5 \times (2, -2) + 0.5 (-1, 1) = (0.5, -0.5)$. We find the payoffs of the rest of the table the same way.

(d) FB is dominated by BB, and FF is dominated by BF. The reduced game table, with best responses underlined, is

		Oscar	
		Call	Fold
Felix	Bet if K, Bet if Q (BB)	$0, \underline{0}$	$\underline{1}, -1$
	Bet if K, Fold if Q (BF)	$\underline{0.5}, -0.5$	$0, \underline{0}$

The game has no equilibrium in pure strategies, but it has a mixed-strategy Nash equilibrium where Felix plays BB with probability $1/3$ and Oscar Calls with probability $2/3$.

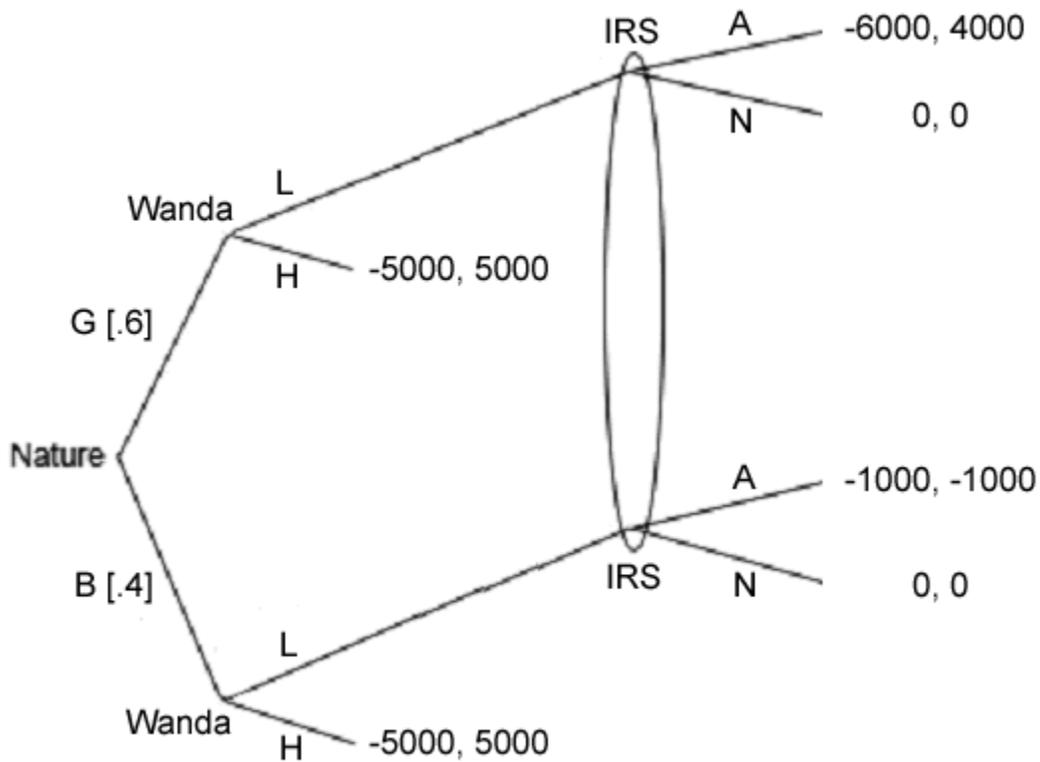
The expected payoff to Felix in equilibrium is a weighted average of the four possible payoffs in the smaller game table, where the weights are given by the products of the probabilities with which the two players' strategies are played in equilibrium:

$$(1/3) \times (2/3) \times (0) + (1/3) \times (1/3) \times (1) + (2/3) \times (2/3) \times (1/2) + (2/3) \times (1/3) \times (0) = 1/3$$

S8. (a) If Wanda has a good year, reports a low income, and is then audited, she will have to pay her tax liability of \$5,000 and lose \$1,000 worth of her time, so her payoff is $-\$6,000$ in this outcome. The IRS receives \$5,000 in tax from Wanda, but has to pay \$1,000 in administrative costs, so its payoff in this outcome is \$4,000.

(b) Wanda has an incentive to bluff, which in this case would consist of her reporting a low income in a good year. If she reports a low income, the IRS doesn't know if it is low because she had a bad year or because she had a good year and is bluffing. If they decide not to audit when Wanda bluffs, she stands to save a considerable amount of money.

(c) The extensive form is shown below:



(d) Wanda has two actions at each of two nodes, so she has $2 \times 2 = 4$ strategies. The IRS has two actions at a single information set, so it has two strategies.

(e) The strategic form follows:

		IRS	
		A	N
Wanda	L if G, L if B (LL)	$-6,000 \times 0.6 - 1,000 \times 0.4 = -4,000$, $4,000 \times 0.6 - 1,000 \times 0.4 = 2,000$	0, 0
	L if G, H if B (LH)	$-6,000 \times 0.6 - 5,000 \times 0.4 = -5,600$, $4,000 \times 0.6 + 5,000 \times 0.4 = 4,400$	$0 \times 0.6 - 5,000 \times 0.4 = -2,000$, $0 \times 0.6 + 5,000 \times 0.4 = 2,000$
	H if G, L if B (HL)	$-5,000 \times 0.6 - 1,000 \times 0.4 = -3,400$, $5,000 \times 0.6 - 1,000 \times 0.4 = 2,600$	$-5,000 \times 0.6 + 0 \times 0.4 = -3,000$, $5,000 \times 0.6 + 0 \times 0.4 = 3,000$
	H if G, H if B (HH)	-5,000, -5,000	-5,000, -5,000

Strategy LH is dominated by strategy LL, and strategy HH is dominated by both LL and HL. The smaller version of the game table, with best responses underlined, is thus:

		IRS	
		A	N
Wanda	L if G, L if B (LL)	-4,000, <u>2,000</u>	<u>0</u> , 0
	H if G, L if B (HL)	<u>-3,400</u> , 2,600	-3,000, <u>3,000</u>

There is no pure-strategy Nash equilibrium. The mixed-strategy Nash equilibrium occurs when Wanda plays LL with probability $1/6$ and the IRS audits with probability $5/6$.

Since Wanda always signals L when she has a bad year and sometimes—but not always—also signals L when she has a good year, this game has a semi-separating equilibrium.

(f) When x is quite low, the IRS has a negative expected payoff from auditing, so that strategy N dominates strategy A. There is then a pure-strategy Nash equilibrium where Wanda always reports a low income and the IRS never audits. For example, when x is 0.1, the payoff table becomes:

		IRS	
		A	N
Wanda	L if G, L if B (LL)	-1,500, -500	<u>0</u> , <u>0</u>
	H if G, L if B (HL)	<u>-1,400</u> , -400	-500, <u>500</u>

Wanda always reports a low income in the pooling equilibrium of this game.

(g) For an arbitrary x , where x is the probability that Wanda has a good year, the reduced payoff table follows:

		IRS	
		A	N
Wanda	L if G, L if B (LL)	-6,000 x - 1,000 \times (1 - x), 4,000 x - 1,000 \times (1 - x)	0, 0
	H if G, L if B (HL)	-5,000 x - 1,000 \times (1 - x), 5,000 x - 1,000 \times (1 - x)	-5,000 x + 0 \times (1 - x), 5,000 x + 0 \times (1 - x)

By the reasoning given in part (f), we need to find the range of values of x such that the payoff to the IRS from not auditing is greater than or equal to its payoff from auditing when Wanda reports a low income. That is, we need to find the set of x such that

$$\begin{aligned}4,000x - 1,000 \times (1 - x) &\leq 0 \\ \Rightarrow 5,000x &\leq 1,000 \\ \Rightarrow x &\leq 0.2.\end{aligned}$$

So for all x between 0 and 0.2 (inclusive), Wanda always reports low income in equilibrium.

S9. The following is a much more involved discussion than the exercise calls for. As you can see, the issue is quite complex. Even the outline below is not meant to be exhaustive; other issues will probably occur to you.

Information Limitations and Asymmetries

Users (Potential and Actual Patients)

1. Know more about their own health risks (creates adverse selection) and control aspects of their behavior that affect the risk (creates moral hazard).
2. Don't know their own diagnosis, and don't know the appropriate treatment (are poorly informed consumers). But they do have some information supplied by the media and the drug companies (which have their own incentives to misinform).
3. Don't know the providers' quality or effort for sure (face adverse selection and moral hazard) but have various sources of partial information, for example, word of mouth, the media, databases on malpractice suits, and so on.

Among Providers

1. The doctor knows much more about the patient's diagnosis and appropriate treatment. But there is some inherent uncertainty.
2. Doctors and hospitals know much more about their own quality (create adverse selection).

Insurers

1. Don't know enough about new customers' health risks and behavior (face adverse selection and moral hazard).

2. Know the historical success record of providers and therefore have better idea of quality.

Government

1. Can centralize information and reduce adverse selection and moral hazard.

Large organizations face limits on their span of control and cannot monitor quality or actions of all employees, users, and so on. This especially increases moral hazard.

Systemwide Objectives

1. Universal coverage
2. Quality of care
3. Cost control
4. Availability of choice
5. Public-private mix

Different systems of insurance, charges to users, payment to providers, and so on affect the participants' incentives, and therefore the achievement of the system objectives, differently. There are trade-offs: a better performance in one dimension may come at the cost of a worse performance in some other dimension. We looked at just a few examples of this.

Users' Incentives

Conventional insurance, with 80% or more coverage, gives the users an incentive to overdemand services. This includes insistence on coverage of very expensive and experimental treatments. Insurance companies try to restrict coverage but with limited success when faced with lawsuits.

The problem would be much more severe for prepaid or HMO-type systems, because the patient's marginal contribution to the cost of each use is essentially zero. HMOs control this by limiting coverage to what is available within the group of providers. But that restricts consumer choice. In national (government-run) systems, queues are used to restrict access to certain procedures deemed less urgent or essential. This is an even more extreme restriction on choice.

If consumers had to pay a much greater share of the cost of each use, this incentive problem would be reduced. But then access would be limited by income or wealth even more than it is now, and coverage would be even less universal.

Providers' Incentives

Under the fee-for-service system, doctors and hospitals have the incentive to overprovide services. When patients have insurance coverage, they offer no opposition. For items such as diagnostic tests, this is worsened by the threat of malpractice suits. To counter this tendency and to control budgetary costs, the government (in its Medicare and Medicaid systems) keeps the reimbursement rates low and uses primary providers as gatekeepers for specialists. But this has reduced the availability of care to people in these systems. Private insurers have instituted prior-approval mechanisms; this has reduced consumer choice and perhaps (at least the doctors claim) has reduced the quality of care.

Under a prepaid or HMO-type system, the providers can have the opposite incentive: to shirk or to provide minimal care. This can be controlled by using reputation mechanisms in repeated relationships. For example, insurance companies might cut off doctors with persistent poor performance. (The profession's own procedures for detecting and removing poor quality seem to work only imperfectly and with very long lags.) More generally, success-based compensation schemes could be used to self-select the most able doctors into specialties.

HMOs have more incentive to offer better preventive care. So should public (national health) systems, but these are often subject to cost-cutting squeezes.

Doctors, hospitals, and equipment and drug makers have mixed incentives to innovate. Technical innovations can bring fame and profit. Cost-cutting ideas may be less attractive, and also limited because many procedures need a certain labor time and their costs go up as productivity and wages in the rest of the economy go up. (This is often called Baumol's disease.)

Insurers' Incentives

Adverse selection can lead to cream skimming. Each insurance company practices screening by offering a contract that is attractive only to the healthiest individuals. Then a residual insurer, such as Blue Cross or the government, is left with the worst risks and the highest costs. In fact, employment-based insurance can act as a screening device of this kind, to the extent that a person needs a certain minimum of good health to get and hold a full-time job.

Cream skimming and the resulting loss of coverage or increase in cost to residual groups can be avoided by requiring pooling: each plan has to have certain basic provisions and must accept all comers. A nationalized system does this automatically, enrolling everyone into the same pool at birth.

S10. The most obvious actions include the gentleman's trying to signal "great cook" or "romantic" or "sophisticated" by serving a great dinner and cappuccino with dessert, the gentleman's trying to signal-jam by faking noises of a cappuccino machine, and the lady friend's attempting to screen by asking to see the machine. The gentleman's false signal will be discovered (and the screen will be successful) if the lady friend enters the kitchen and finds instant cappuccino. The lady friend may, of course, attribute other positive attributes to the gentleman's attempts to sound like a cappuccino machine.

S11. We're looking for the Prob(B conditional on Y). By Bayes' rule, we have

$$\begin{aligned}
 \text{Prob(B conditional on Y)} &= \text{Prob(B and Y)}/\text{Prob(Y)} \\
 &= (1 - p) \times (1 - b)/[p \times (1 - a) + (1 - p) \times (1 - b)] \\
 &= (0.99) \times (0.99)/[(0.01) \times (0.01) + (0.99) \times (0.99)] \\
 &= 0.9801/[0.0001 + 0.9801] \\
 &\approx 0.9999.
 \end{aligned}$$

Enumerating all of the cases, of the 10,000 total people there are 100 who have the defect and 9,900 who don't. Of the 100 who have the defect, 99 test positive and 1 tests negative. Of the 9,900 who don't have the defect, 99 test positive and 9,801 test negative. Of the total of 9,802 people who test negative, 9,801 have a true negative and 1 has a false negative. So the probability that a person with a negative test really does not have the defect is 9,801/9,802, which is approximately 99.99%.

S12. (a) f_{updated} is the fraction of Citruses that successfully complete the trip and that are oranges. That is, f_{updated} is the number of oranges divided by the number of Citruses that successfully complete the trip. All of the oranges will successfully complete the trip, as well as half of the lemons. Since the fraction of oranges in the total population of Citruses is $f = 0.6$, f_{updated} will be

$$f_{\text{updated}} = (0.6) \times 1 / [(0.6) \times 1 + (0.4) \times (0.5)] = 0.75.$$

f_{updated} is greater than f because half of the lemons have been weeded out from consideration (they broke down during the trip). Therefore, the fraction of oranges among this smaller pool of Citruses is larger.

(b) As seen in part (a), once a Citrus has successfully completed the trip, it is more likely to be an orange. Thus, the expected value of a random Citrus from this smaller pool will be higher for a prospective buyer. A buyer will be willing to pay

$$p_{\text{updated}} = \$16,000 \times 0.75 + \$6,000 \times 0.25 = \$13,500.$$

(c) The cost of the trip to the owner of an orange is \$250, but making the trip increases the price buyers are willing to pay to \$13,500. If an owner of an orange doesn't take the trip, the car will be assumed to be a lemon by prospective buyers. It will not be sold, and the owner will earn \$0 surplus. On the other hand, owners of oranges will be able make \$1,000 surplus from selling their oranges after the trip (since an orange is worth \$12,500 to its owner), so they will certainly be willing to pay \$250 to make the trip. They will then enjoy a net surplus of \$750.

(d) If an owner of a lemon doesn't take the trip, the car will be assumed to be a lemon by prospective buyers. It will be sold for \$6,000, and the owner will earn \$3,000 surplus. A lemon that attempts the trip has a probability of 0.5 of not breaking down. If it does break down, the trip will cost \$250, and the car will sell for \$13,500. But a lemon also has a probability of 0.5 of breaking down. If it does break down, the trip will cost \$1,000, and the car will sell for only \$6,000. So net of the trip costs, the owner of a lemon will either earn \$13,250 or \$5,000, with each of these outcomes occurring with probability 0.5. Thus the owner of a lemon can expect to earn \$9,125 from making the trip and selling the

car. Since a lemon is worth only \$3,000 to its owner, the expected surplus is \$6,125. $\$6,125 > \$3,000$, so a risk-neutral owner of a lemon will attempt the trip.

(e) Since the owners of the two types of Citrus both decide to attempt the trip—sending the same signal—this is technically a pooling equilibrium. However, since some of the lemons fail to complete the trip, potential buyers are able to update their prior beliefs about the fraction of oranges in the population of Citruses that succeed. This culling of some of the lemons from the ranks of the Citruses gives this outcome a semi-separating flavor.