5

The Principle Of Diminishing Returns

The principle of diminishing returns describes a relationship of profound importance to economic understanding. It describes how output changes when one kind of input is added to a fixed quantity of other inputs—say, how corn production changes as more laborers are added one by one to a 1000-acre farm.

A Hypothetical Illustration

We shall illustrate the principle with a hypothetical example, then state it formally. Suppose we have a corn farm of 1000 acres with a specified number of tractors, barns, silos, fencing, and other equipment. What would be the output of the farm if there were no laborers? Since plants might grow anyway, there might be some production. But without laborers the farm would be quite a mess after a few years. So let's assume that, without labor, the output of corn per year would be zero. The first row of numbers in Table 5-1 shows this. Next, suppose with the same acres and other farm inputs, we have one laborer (working some specified hours per year). Then the output might be 8000 bushels per year.

Now suppose a second laborer is added and output per year instead of being 8000 is 19,000 bu. Why might the output more than double when the labor input just doubled and when total inputs (labor, land, and capital) rose less than two-fold? There is no assurance that this more than doubling of output would happen. But it might. If it did, it would be because when there were two laborers instead of one, each laborer could specialize in certain chores and become more proficient in these, whereas the one laborer on the farm had to be a "jack-of-all-trades" and did not develop skills as highly in a narrower range of activities. A second reason is that some important tasks, such as lifting or moving heavy loads, are readily done by two people, but require cumbersome, time-consuming methods when one person does them.

Table 5-1 Illustration of the principle of diminishing returns with a hypothetical 1000-acre corn farm

Number of laborers (1)	Total output (2)	Marginal physical product (3)	
(per year)	(thousands of bushels per year)		
0	0	–	increasing returns
1	8	8	
2	19	11	constant returns
3	30	11	
4	39	9	diminishing returns
5	46	7	
6	51	5	
7	55	4	
8	58	3	
9	60	2	
10	61	1	
11	61	0	zero returns
12	60	–1	negative returns

Now let's add a third laborer and note the output per year. The table shows output rising to 30,000 bu. per year. Continuing down the table, we assume with four workers output would be 39,000, with five workers it would be 46,000, with six 51,000 and so on, rising by less and less with each additional worker until another worker adds nothing to output (the 11th), after which more workers cause output to decline.

The Marginal Physical Product Or MPP

Look at column (3). The *marginal physical product,* is *the additional output which results from one additional unit of an input.* As you can see, the size of the MPP depends on how many of the laborers we start with when we add another. When the first worker was added, the output went from zero to 8000, so the MPP was 8000. When the second laborer was added, output rose from 8000 to 19,000, so the increment attributable to the second laborer is 11,000, the difference between 8,000 (with one worker) and

19,000 (with two workers). The MPP for any input is the amount by which output changes as a result of the addition of that input.[1]

Statement Of The Principle

Let us now state formally **the principle of diminishing returns**: with given technological knowledge, as additional units of a variable input are added to a fixed quantity of other inputs, after some point the increments to output will become successively smaller. This means, in terms of our example, as we added additional laborers to the 1000-acre farm the output of corn would rise by less and less from the added labor, after some number of laborers (after three in the table.)[2]

The hypothetical example represents five different ways in which output may change as variable inputs are added:

1. increasing returns, where the MPP is rising;
2. constant returns, where the MPP is constant;
3. diminishing returns, where the MPP is decreasing;
4. zero returns, where the MPP is zero;
5. negative returns, where the MPP is negative.

(Since numbers 4 and 5 could occur along with any of the first three, there are perhaps only three different ways in which output changes with respect to the variable inputs.) The principle of diminishing returns does *not* say that the MPP will go through all five of these possibilities as the variable input is increased from zero toward infinity. Read it carefully. It merely states that stage 3, diminishing returns, will be reached. There could be diminishing returns after the first unit of the variable input, hence no increasing or constant returns. MPP could always decline with added laborers, but never become zero or negative. Thus, there may be diminishing returns from the start but no zero or negative returns. For example, with each successive laborer, the MPP might follow a pattern like this: 64, 32, 16, 8, 4, 2, 1, ½, ¼, $^1/_8$, etc., getting smaller and smaller, but never reaching zero. Finally, the

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[1] If the output is zero when the variable input is zero, then total output for any number of the variable input is the sum of the MPP's up to that number of the variable input. For 7 laborers, total output (in thousands) is 0 + 8 + 11 + 11 + 9 + 7 + 5 + 4 = 55. Thus, column (2) could be derived from column (3) or (3) could be derived from (2).

[2] In the principle of diminishing returns, the word "returns" refers to changes in *units of output,* not to profits or money. In other contexts, such as *returns* to investment, "returns" means dollar profits.

MPP could decline asymptotically toward some number above zero, again giving diminishing returns without zero or negative returns.[3]

Why There Are Diminishing Returns

So far we have stated the principle of diminishing returns. Now let's consider why production follows this pattern. Actually, given that the principle is observed to operate, why it operates is of secondary importance, but worth considering nevertheless. We have already noted that increasing returns may result from specialization of inputs and from cooperation among inputs.

Diminishing returns will occur because as more of the variable input (labor in this case) is added to a fixed quantity of other inputs (land and equipment), each unit of the variable input (including those already there) has less and less of the fixed input with which to work (there is less land and equipment with which each laborer can work). This means there is less useful work for the variable inputs to do. They are assigned less important tasks. So output does not rise as much. Eventually, the variable input may become so numerous relative to the fixed inputs that more of the variable inputs add nothing to output (MPP = 0). After that more variable inputs may simply get in the way of those already working and cause output to decline, in which case the MPP is negative.

The above reasoning should convince you that returns will diminish as variable inputs are added to a fixed quantity of others. Another convincing argument is to imagine the logical consequences of asserting that the principle does not operate. (Note, however, that whether the principle does operate is an empirical question to be ascertained by observation, not a proposition which can be proved by pure reasoning.) If there were no diminishing returns, then there would be indefinitely continuing increasing or constant returns. Consider what this implies. Suppose, in the table, there were constant returns after the third worker. Then each additional worker would add 11,000 bu. – the 100th worker, the millionth, the billionth, etc., all on a 1000-acre farm. This result is so palpably absurd as to convince intuitively that somewhere diminishing returns must set in. Indeed, if we started with a 100-square foot

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[3] Table 5-1 is strictly hypothetical and does not pretend to represent a likely farm. Our urbanite's guess is that the MPP on a 1000-acre corn farm with modern equipment would diminish rapidly after the first laborer, but would not become negative until there were well over 5000 laborers. That is, we expect the MPP's for successive laborers would be something like this (in thousands of bushels per year): 45, 15, 3, 2 5, 2, 1.5, 1.2, 1.0, 0.9, 0.85,. . . . The table was set up to show all possible stages.

farm and never had diminishing returns, we could grow trillions of bushels of corn just by adding more labor.

Diminishing Returns Applies To Nonhuman Inputs Too

The principle of diminishing returns simply mentions variable and fixed inputs, not land, labor, or capital. The illustrative example showed diminishing returns from additional labor to a fixed quantity of land and capital. We could just as well illustrate the principle by varying land (or a type of capital), keeping constant labor and other inputs. Imagine starting with 10 laborers, a specified quantity of equipment, and one acre of land. There would be some output per year. Next, suppose we have the same 10 laborers, but two acres. Output would be larger. Then three acres, 4, 5, etc. Each additional acre will increase output. After some point, there would be diminishing returns from additional acres.

In this example, there might not be increasing returns, although if we started with a very small piece of land (just enough to pile the laborers and equipment on) and increased land from there, there would probably be increasing returns to the land. But would there ever be negative returns to land? It is hard to see why. As acreage increased, increments to output would gradually fall, because the variable input would be combined with less and less of the fixed inputs; that is, each acre would be worked by fewer men and less equipment. However, acres would not get in each other's way; so the worst that would happen would be zero MPP, when an additional acre is simply ignored because the men and equipment cannot use it along with the land already used.

Most economists feel that the principle of diminishing returns applies to all productive processes. Vary any type of input in a company—typists or desks or lathes or trucks—keeping constant all other inputs, and there will be diminishing returns.

How Many Laborers Would You Hire?

Before reading further, try to answer this question with reference to Table 5-1. This leads to an important application of diminishing returns and to the third basic decision: who gets what is produced. Actually, the question cannot be answered from the information in the table. You need two additional pieces of information: (1) how much the corn sells for and (2) the cost of hiring laborers. Well, suppose corn sells for $1 a bushel and labor costs $3500 per year. How many laborers would you hire?

Many people suggest hiring 2 or 3 workers, where the MPP is highest, or

hiring 3 where the output per worker is highest. Others suggest 10 workers, where the total output is highest. None of these is correct. What is the firm's objective? To maximize profits. We can't tell what the firm's profits are in this example, because we don't know the costs of the other inputs (land and equipment). But we can tell when it is or is not profitable to hire workers, knowing the table and the prices of corn and labor. Suppose we had 4 workers. Would a 5th be worth hiring? He would add 7000 bu. of corn, hence, at $1 a bu., $7000 in revenue to the company. Since the wage is $3500, the company clearly gains from this 5th worker. But why stop there? A 6th worker adds 5000 more bushels, worth $5000 and also costs $3500, so he is worth hiring. A 7th adds 4000 bu. or $4000, but costs $3500. So hire him too. The 8th worker, however, adds only 3000 bu. or $3000. At a wage of $3500, the firm would lose $500 by hiring him. Answer: hire 7 workers.

If the wage rate were $6500 per year, the firm would hire only 5 workers, because the 5th adds $7000, while the 6th adds only $5000, not enough to warrant spending $6500 to hire him. Later discussion of wage determination will show that the MPP times the product price tells the maximum wages the firm would pay to hire any given quantity of labor, or, it tells the quantities of labor the firm would hire at various wages: it is the firm's demand for labor.

Operate In Diminishing Returns

The term "diminishing returns" has a connotation of something undesirable, to be avoided. But, as in our example, a firm will always find it most profitable to operate where there are diminishing returns. The unlikely exceptions are (1) if the inputs were free, the firm would hire until MPP = 0; or (2) if the inputs actually paid the company to be hired—negative wages—the firm would operate in negative returns. But then the company's output is not merely the product, but the privilege of working for the company. Perhaps some dude ranches would qualify.[4]

Clearly, with positive input costs, the firm would never add an input which actually caused output to decline or to remain the same (assuming the

[4] Here's a possible example of negative wages. Several years ago, a man in South Carolina found rubies and sapphires along a stream on his property. After prospecting proved unprofitable, the enterprising owner decided to sell the privilege of looking for gems. Now on any warm weekend, people by the hundreds come to the "Gem Capital of the World" and buy buckets of mud which they sift by hand through screens provided by the owner. If the average value of gems recovered per bucket is less than the price per bucket of mud, then people are paying to work on their leisure time—negative wages! Does the fact that *any* gems are found mean the MPP of labor is positive? No. The MPP is not the average gems per bucket, but is the additional gems found

firm is not coerced to hire against its will). This eliminates the operation in stages with zero or negative returns. We can eliminate operation in stages with increasing or constant returns by demonstrating that these stages imply zero or negative returns with respect to the fixed input. That is, if there are increasing returns when labor is increased relative to land, there are negative returns to land: output could be raised by using less land.

This point is proved mathematically in advanced texts. However, for your amusement, we illustrate it with the numbers in Table 5-1 where increasing returns exist:

	Land	Labor	Output	MPP of Labor
(1)	1000	0	0	
(2)	1000	1	8,000 bu.	8,000 bu.
(3)	1000	2	19,000 bu.	11,000 bu.

As labor rises from 0 to 1 to 2, the MPP of labor rises from 8000 to 11,000, showing increased returns. We now show that this implies negative returns to land, that is, more land means less output. To show this, we adopt the reasonable assumption that if *all* inputs are doubled, output would also be doubled. Therefore, if we double both land *and* labor in row (2), we get twice the output of row (2):

(4)	2000	2	16,000 bu.

Row (4) is twice row (2). But compare row (4) with row (3). The increase in acreage from 1000 to 2000 (with the same labor) has *decreased* output by 3000 bu.—the MPP of land is negative where the MPP of labor is rising, q.e.d. This would imply that the second 1000 acres caused men to be spread too thinly over the land. This illustrates the point that where there are increasing returns to a variable input, there are negative returns to other inputs. And since firms would not operate in negative returns, they will not operate in increasing returns. Therefore, firms always operate where there are diminishing returns to all inputs.

Assumptions Of The Principle

The principle of diminishing returns says increments of a variable input will cause successively smaller additions to output under the following four conditions:

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by the marginal sifter. By selling buckets of mud instead of letting people pay to prospect as they wish, the owner is probably preventing the congestion that might otherwise drive MPP below zero and reduce his business. Reported, appropriately, on CBS News with Roger Mudd.

(1) The quantity of other kinds of inputs is fixed.

(2) The units of the variable input are of equal competence. When we add laborers to acres, each laborer is as skillful and industrious as the others. The declining MPP occurs because, with more workers, each worker, the others as well as the new one, has fewer other inputs with which to work. When we have 7 workers in the table, any one could be considered the 7th; and the productivity of all 7 is 7 times the productivity (MPP) of the 7th. Likewise, for the MPP of land, the additional acres are of equal productivity. The MPP of an acre declines when more acres are added to a fixed quantity of labor and equipment because less labor and equipment are used with each acre.

Of course, laborers do differ and so do acres. In principle, a different table applies for each different occupation and for each skill within each occupation. For small differences in ability within a given occupation, one might define a unit of labor (or land) in terms of certain abilities and view a person with less or more ability as less or more than one unit of labor. But carpenters and typists would be two separate kinds of inputs, unless anyone with one skill had the other.

(3) A given state of technological knowledge. The same knowledge of production methods does *not* mean the same method of production is used no matter how many laborers are hired. Indeed, we presume that as each laborer (or acre) is added, other inputs constant, all inputs are rearranged and reassigned in the best possible way. The MPP is found after the rearrangement.

Nor is it assumed that when firms hire workers they do in fact hire one at a time and construct something like Table 5-1. Firms start with a combination of inputs and grow by adding to all inputs. Still, to decide how many of each to hire, they have vague notions of a small but relevant portion of such tables for each input—that is, the firm does estimate whether an additional typist or accountant or 1000 square feet of floor space is worthwhile, also whether one or two fewer might be profitable.

(4) The proportions in which inputs are combined can usefully be varied. In terms of our hypothetical farm, consider how production conditions would be described if the proportions in which inputs are combined could *not* usefully be altered. There would be some necessary ratio of labor to land (ignore equipment for simplicity), say one man for each 20 acres. Starting with this combination, if we added more acres without more men, output would not change. If we added more men without more acres, there would also be no change in output. To increase output at all, we must add one man *and* 20 acres. Clearly, this does *not* describe true production conditions. We *can* add men to acres and raise output, or add acres to men and raise output. And similarly for capital equipment. There is no set proportion or ratio in which inputs must be combined.

Even in situations where the proportions seem fixed, they can generally be varied. The ratios of typewriters to typists, lathes to lathe operators, trucks to truck drivers—all these can be varied by more or less intensive use or by changing the quality of one kind of input, keeping constant the other. Some of these changes do not fit neatly into the table, but they do mean the principle of diminishing returns applies quite generally.

Here as elsewhere in economics one must distinguish the short run from the long run. In the short run, input proportions may be somewhat fixed because changes in work assignments or type of machine or size of classroom (teacher/class-space ratio) cannot be made overnight. But in the longer run (a 5 to 10 year horizon) that is more relevant for economic decisions, nearly all input proportions can be altered.

Effects of a change in assumed conditions. Some insight into the meaning and significance of diminishing returns is gained by asking in what direction would the numbers in Table 5-1 change under either of these situations: (1) the variable input, labor, is added to a larger quantity of other inputs, say, to a 5000-acre farm with more equipment instead of the 1000-acre farm; or (2) with the same combination of variable and fixed inputs as in Table 5-1, there is improved knowledge about how to combine inputs—a new method of production is discovered.

For either situation, the effect is about the same. Both the total output and the MPP's would be higher for given quantities of labor. Probably, but not for sure, the point of diminishing returns would come further down the table (at a larger number of the variable input) and more certainly the point of zero returns would occur at a higher quantity of laborers.

Table 5-2 illustrates the effect of increasing the "fixed" input, land. The MPP's for 1000 acres are repeated from Table 5-1. Notice that any given number of workers have a larger MPP when combined with 5000 acres than with 1000 and larger yet with 10,000 acres. This is the general effect of raising the "fixed" input, land in this example. Similar rises in MPP would follow from improved production knowledge, with land constant.

Thus, we can say: (1) the greater the quantity of the fixed inputs (land and equipment in Table 5-1), the higher will be the MPP's of the variable inputs, and (2) the better the technological knowledge, the higher the MPP's. Therefore, since the demand for labor and hence the wages paid depend on the productivity (MPP) of labor, the larger the amount of capital with which labor is combined and the more advanced the technology, the higher will be the average wage rate. One does indeed find, comparing various countries, that wages are higher where capital per worker is higher and where technological know-how is greater. Thus, workers in America are more productive and get paid more than in India because they are combined with

Table 5-2 Effects of increasing the "fixed" input: hypothetical MPP's of labor for various farm sizes

Number of workers (per year)	Number of acres		
	1000*	5000	10,000
	(thousands of bushels per year)		
0	—	—	—
1	8	10	14
2	11	16	22
3	11	24	28
4	9	25	32
5	7	25	36
6	5	21	36
7	4	18	34
8	3	15	31
9	2	13	27
10	1	11	23
11	0	9	20
12	−1	8	17

* From Table 5-1.

more capital, not because they work more diligently. (Their higher education in America also raises their productivity.) And over time, countries like America and Western Europe and recently Japan where capital investment per worker has risen most are those where wages have risen most too. In effect, this reflects movements to the right in Table 5-2: more capital per worker, higher MPP of workers, and, therefore, higher wages.

Another View Of The Principle: The Law Of Variable Proportions [5]

This alternative and more complicated statement of the principle emphasizes an important point: the MPP of an input will decline, not only (a)

[5] The designation of one as a "principle" and the other as a "law" is arbitrary and insignificant. For the curious, the "law" would read: As one input is increased *relative* to others, after some point, the rate of change of output with respect to the relatively increasing input will fall—which means the MPP of the relatively increasing input will become less and less. The "principle" is a special case of the "law."

when more of the input is added to a *fixed* quantity of other inputs, but also (b) when the variable input is increasing *relative to* the other input. This distinction is shown in the following numbers.

		Quantities of Inputs					
(a)	Labor	1	2	3	4	5	Increasing labor to a fixed quantity of land
	Land	10	10	10	10	10	
(b)	Labor	1	5	9	16	30	Increasing labor relative to land, with the same labor/land ratios as in (a)
	Land	10	25	30	40	60	
(c)	Labor	1	10	6	100	1	
	Land	10	50	20	250	2	
(d)		.1	.2	.3	.4	.5	Labor/land ratios common to (a), (b), and (c)

In all three examples labor is rising relative to land in the same proportion. The law of variable proportions states that the MPP of labor under (b) or (c) will decline moving from left to right the same as under (a). This means the assumption of a fixed quantity of some inputs is not necessary, merely that the variable input rises relative to other inputs. A prediction from this is that for a given technology and labor ability, the average wage level will rise if nonhuman inputs increase over time at a faster rate than human inputs and that the wage level will fall if labor rises faster than capital and land. It also means that, given the growth in capital and technology, the greater the population, the lower the standard of living.

Population Growth, Malthus, And Diminishing Returns

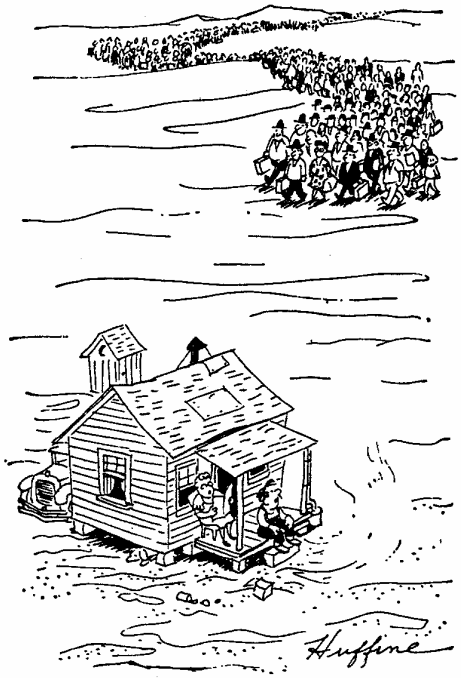
Early in the 19th Century, Thomas Malthus, British philosopher and economist, predicted that unless people took deliberate steps to curb births, population would grow faster than the food supply.[6] He judged that this tendency had occurred in the past and that the rise in people relative to food caused a gradual decline in wages toward, then below, the subsistence level. Then population is reduced by famine, disease, and/or wars, leaving a lower ratio of people to food and higher wages, only to be followed by another cycle of rising population relative to food, lowering wages to below subsistence level, and again decimation through famine, disease, and/or war.

[6] He stated that population grows at a geometric rate, food at an arithmetic rate, and, therefore, the ratio of people to food becomes larger over time, without population checks.

It is from such forecasts that economics acquired the reputation as a "dismal science."

Let us reformulate Malthus' theory in terms of the principle of diminishing returns. If labor increases relative to land, the MPP and hence wages of labor will gradually decline to below subsistence level. At that point, if population is decreased by disaster, the ratio of labor to land will be smaller, the MPP of the remaining labor will be higher (we move up Table 5-1), and wages will be high enough to live and reproduce on. Then, the labor/land ratio begins to rise again by population growth.

Since things have not worked out as Malthus predicted, has the principle of diminishing returns been shown invalid? No. While population has been expanding in the Western world, the conditions which must be held constant for the MPP of labor to decline have not been constant. Also expanding greatly for the past 150 years have been the quality of labor (through education), technology, and capital per worker. In effect, we have experienced a movement to the right in Table 5-2, so that subsistence wages would not be reached (for most occupations) unless population were much higher than it is. Still, Malthus's predictions seem unfortunately correct for China, India, Indonesia, and parts of Latin America—over three-fifths of the world's population.



"Listen to this. 'At the present population growth rate, soon every square mile on earth will be inhabited by an average of 683.2 people'."

Summary

The principle of diminishing returns states that as additional units of a variable input are added to a fixed quantity of other inputs, the increments to output will decline after some quantity of the variable input. These increments to output caused by the variable input are called the marginal physical product, MPP. The principle applies to all productive processes and to all inputs, human and nonhuman. The demand for an input is derived from its MPP's and the price of the product. Firms will always hire inputs under conditions of diminishing returns.

The principle operates under these assumptions: (1) the quantity of inputs other than the variable is (relatively) fixed; (2) all units of the variable input are of equal competence; (3) a given state of technological knowledge; and (4) the proportions in which inputs are combined can usefully be varied. An increase in the quantity of the "fixed" input or a technological improvement will bring about both higher total output and higher MPP's of the variable input for all quantities of the variable input. This means that the higher is the ratio of nonhuman to human inputs, the higher will be the productivity and hence the wages of labor.

Malthus predicted population would grow relative to all other things. By the principle of diminishing returns, this implies a rise in labor relative to other inputs and, therefore, by diminishing returns to labor, lower wages. The main reason why real wages have risen despite population rise is that technological advance, improved education, and increased capital per worker have more than offset the downward pressure on wages of rising population.

Study Questions Chapter 5

1. What in general does the principle of diminishing returns describe?
2. State the principle of diminishing returns.
3. Illustrate it with a hypothetical example.
4. Define "marginal physical produce"—MPP.
5. What are the five stages which MPP may go through?
6. Give a numerical example showing all five stages.
7. Does the principle of diminishing returns say that MPP *will* go through all stages from increasing returns to negative returns? Which?
8. Explain how there could be diminishing returns as the variable input increases without there ever being zero or negative returns.
9. Explain why diminishing returns will always exist in a productive activity.

10. Phrase the principle of diminishing returns so that the variable input is nonhuman.

11. Reason out why the principle will apply from increasing nonhuman relative to human inputs (as well as human relative to nonhuman).

12. Explain the quantity of laborers to hire from the table you made for #3.

13. What general rule is used to determine the quantity to hire?*

14. Why would a firm never operate in negative returns?

15. What strange condition would make a firm willing to operate in negative returns?*

16. Explain with a hypothetical example why a firm will never operate in increasing returns. (The next three questions lead to the answer.)

17. If A and B are types of inputs, and if there are increasing returns to input A, what can be said about the MPP of input B?*

18. What key assumption underlies this proof?*

19. From the following numbers, show that increasing returns from more of input A implies negative returns from input B.*

Row	A	B	MPP_A	TP
a	0	1	—	0
b	1	1	10	10
c	2	1	12	22

20. What assumptions underlie the principle of diminishing returns?

21. What does it mean to "vary input proportions?"*

22. What numerical effect on the MPP's results from raising the "fixed" inputs or from technological advance?*

23. What does this imply about the standard of living over time as both technology and capital per worker rise? Explain.

24. Is the same method of production employed as input proportions are varied (as one moves down Table 5-1)?*

25. What is the law of variable proportions?

26. Explain why the principle of diminishing returns is a special case of the law of variable proportions.

27. Explain the Malthusian population theory. Phrase this theory in terms of the principle of diminishing returns.

28. Explain why population growth has not caused living standards to fall in the Western World over the past 200 years.

29. Does the principle of diminishing returns tell which quantity of inputs is most profitable to hire?*

30. What additional information besides that of Table 5-1 would be needed to determine the most profitable quantity to hire?*

31. Given Table 5-2, what more information would you need to pick the most profitable input combination?*

Answers to starred questions.

13. Add another worker as long as the value of its MPP exceeds the wage rate, because this difference adds to profits (or to the money available to pay the fixed inputs).

15. Negative wages—workers pay the employer.

17. It is negative.

18. If *all* inputs are doubled, output will be doubled.

19. Double row b to get row d:

Row	A	B	TP
d	2	2	20

Compare rows d and c: both have two A's, but d has 2 B's and c has 1 B; yet d's output is less than c's, so MPP_B is -2.

21. To change the quantity of one input relative to another (or others); or, stated differently, to change one input without changing all others by the same proportion.

22. They are raised, as shown by moving across the rows of Table 5-2.

24. No. While the state of technological knowledge is unchanged or given (as one moves down Table 5-1), the actual method of production used will vary with changes in input proportions.

29. No. The principle relates to units of output from units of input. It is not in dollars and says nothing specific about profits. "Returns" does not mean profits in "diminishing returns."

30. Price of the output and price of the variable input.

31. Same as #30, plus the price of land.

6

Who Gets What Is Produced

There are many ways in which the output of society could be divided up among the population. The private enterprise system receives much criticism for the unequal and, some say, unfair distribution of society's output, especially from the "have-nots" but also from others who sympathize with low-income groups.[1] How is this division determined under private enterprise? Is there any rhyme or reason to it? We turn now to the third basic economic decision: who gets what is produced.

Distribution To Highest Bidders

In effect, goods and services are auctioned off to the highest bidders. This has two tendencies: (1) things go to those with the most dollars; (2) things go to those with the greatest desire for them. Each tendency prevents the other from being fulfilled. Obviously, even if everyone had the same tastes, the inequality of purchasing power would cause those with more dollars to get more of society's output than those with less. The second tendency is less obvious. To appreciate it, assume that dollars were distributed equally. Would everyone then receive the same goods and services? No. Because people have different tastes, the bidding process would still operate. Individual items (golf balls) would still go to those with the greatest desire for these items relative to their desire for other things (say, mystery books).

It is important to look further into the basis by which goods and services are distributed. We have said so far that goods and services go to those who will pay the most. But what determines the distribution of the ability to pay? This depends mainly on the distribution of income. Some

[1] However, there are many who generally approve of this distribution and still sympathize with low-income people.

people may draw on savings or borrow, but these possibilities reflect past or expected income, so it is still income which determines the possession of purchasing power.

Income Depends On Contribution To Production

In this section, we show that each input's contribution to production can be isolated from the contribution of other inputs, and that, under competition, each input receives the money value of his contribution to production.

How to measure an input's effect on output. Is it really possible to ascertain the contribution to output of a typist in an auto company, a janitor in a shoe manufacturing firm, or the contribution of a typewriter, or of 100 square feet of storeroom space for cleaning equipment? The answer is yes, for all practical purposes. In all cases, this contribution is the marginal physical product, MPP, discussed in connection with the principle of diminishing returns.

A firm could measure the MPP of any input by the following experiment. First, measure the output of the firm before adding an additional unit of the input. Then measure the output after the input has been added. The change in output after the additional unit of the input is the MPP of that input. For each measurement, all inputs are assigned duties so they produce as much as possible. Thus, there may be a reassignment of duties. For example, an additional clerk-typist may free some accountants from clerical work they were doing and enable them to do quicker and better accounting, which in turn enables the plant manager to make more effective decisions. This in turn may mean the workers and machines produce more or better outputs. Of course, one clerk-typist in a large company won't make much difference to final output. But, there must be some difference or it was not worthwhile to hire the typist.

It is not enlightening to identify the MPP of an input from the specific tasks of that input. Consider the operator of a machine that stamps holes in the front of radio cabinets. He performs this operation hundreds of times a day. How much of each radio did this operative make? How much did the machine make? There is no useful answer to either question, except to describe the task, which provides no clue to the percentage of the radio made by the operative or the machine. The only way to measure the contribution of either in terms of whole radios is to perform the hypothetical experiment described above. In the case of the laborer, think not of one who operates a particular machine, but of a certain quality of labor abilities which could be trained and assigned to many different tasks (including the operation of the

hole-stamping machine). The MPP of this machine operator is the MPP of any worker of that general ability no matter what his task (as long as he works steadily) and this *is* so many radios per hour or per day, because a change in the quantity of such labor (with *appropriate* rearrangement of tasks) will affect whole radio output. The added laborer will not result in a lot of radio frames without holes for the dials or a lot of tubes and wires without frames to put them in, if tasks are reassigned sensibly.

These points also apply for identifying the MPP of a unit of capital. If capital in the form of a particular machine is added, its MPP is calculated only on the assumption that other inputs (mainly labor) are reassigned appropriately (so the machine is not idle). Moreover, an increment of capital may take the form of a better machine replacing a poorer one. More or less labor of a given quality means more or fewer hours of labor service performed, however assigned. More or less capital means more or fewer dollars worth of capital equipment used per hour (assuming no changes in the prices of capital equipment).

Two incorrect measures of MPP. To avoid confusion, let us describe two other experiments which do *not* identify the MPP of an input, but which sound quite similar to the one which does. Suppose we wish to identify the MPP of farm laborers on a 5000-acre farm which has 10 laborers and some capital equipment. First measure the output of the farm *with the 10 laborers.* Then measure the output of the farm *without any laborers.* This difference in output is *not* the MPP of the 10 laborers. Rather, the MPP of *all 10* of the laborers is *10 times* the MPP of the 10th laborer, ten times the change in output which occurs between the 9th laborer and the 10th. If it were the difference in output between zero laborers and 10 laborers, then the MPP of the 10 laborers would amount to almost the entire output (assuming there are no other kinds of laborers used and that the output would be about zero without any labor).

If we calculated the MPP of capital the same way—measure the difference in output with no equipment and with whatever equipment is actually used—the MPP of capital would also amount to almost the entire output under modern farm technology. And by this incorrect method, we would calculate the MPP of land as the difference in total output with no land and with all 5000 acres, and again attribute the entire output to land, since without land there would be no output. More correctly, the total contribution of land is 5000 times the MPP of the 5000th acre. And 10,000 times the MPP of the 10,000th half-acre would be a better measure of the total contribution of the land. In general, the MPP of any input is found by observing the output change from a small increment of the variable input. That change in output is the MPP of all such units of the variable input (all 10,000 half-acres), since any one of these units could be the marginal unit

added. In this way, we avoid the absurd result of this incorrect experiment, namely that the sum of the outputs ascribed to each of the inputs exceeds the total output.

A second incorrect experiment is to change the quantity of a variable input without reassigning other inputs. For example, suppose we are to measure the MPP of a particular laborer who is a night guard and whose final duty is to unlock the plant entrance in the morning. If we assume (absurdly) that without this particular input, no one else would be assigned this task, and, therefore, the plant would remain locked and nothing would be produced, the MPP of this person becomes the whole output. In fact, however, if the company employed all other inputs except this guard, it would reassign others so the entrance would be unlocked, while some other less important things would not be done (as effectively). To repeat, the MPP of any input is the change in output when a small increment of that input is added to a given quantity of other inputs and where, both before and after the addition, all inputs are assigned to be used as effectively as possible.

With the correct experiment in mind, one should have no difficulty understanding that output is affected by inputs like janitors, typists, engineers, and plant managers who do not work directly on the final product. A janitor whose cleaning causes others to work more effectively has an MPP equal to the added effectiveness (added output) caused by his services. An industrial engineer whose ideas reduce the inputs required to produce a given output has an MPP whose value is the savings in costs caused by his services.

However, one might question whether inputs devoted to sales and advertising contribute toward output. They certainly would not affect the number of radios a factory could produce, though they would presumably affect the price and quantity that can be sold. Several approaches are possible regarding sales inputs. Sales efforts provide information. It could be argued that the company is selling information as well as product (radios). The MPP of salesmen would be the value of this information. Alternatively, sales and advertising may add to the value of a product (in consumers' eyes). One might argue that the radio company is really selling radio services and, having enhanced their value by advertising, they are selling more services per radio. Some would regard this as stretching the notion of radio production rather thin. Finally, one may acknowledge that, except as it does provide information, advertising is indeed no part of production of the radio company. Still, advertising inputs do add to the revenue of the company and their marginal units will be paid the value of their contribution to company income just as are all other inputs, as we shall see shortly. (The services of wholesalers, retailers, and transporters from the factory *are* part of radio production, since the consumer prefers radios at the store when he wants them, rather than more cumbersome alternatives, such as a trip to the factory to buy a radio.)

MPP and VMP: VMP = MPP × Product Price. The marginal physical product, MPP, is the addition to output from another unit of a variable input. It is stated in units of output, not dollars. *The value of the marginal product,* VMP, is the *revenue* the company takes in from the sale of the MPP, or stated differently, the VMP is the additional revenue from an additional unit of a variable input. It is in dollars. If the company can sell the MPP without lowering the product price, the VMP equals the MPP times the price of the product. For example, the MPP of the 7th laborer in Table 5-1 (on diminishing returns) is 4000 bushels of corn per year. With the price of corn $1 a bushel, the VMP of the 7th laborer is $4000. If corn sold for $1.50 a bushel, his VMP would be $6000.[2]

Proof that inputs are paid the value of their contribution to production. This outcome occurs only under *competitive* private enterprise. In this proof, we assume the firm can acquire additional inputs of a given kind without changing the price of the input. This is part of "competition." This means, for example, that if the wage rate for farm laborers is, say, $4000 per worker per year, the firm can hire as many workers as it wants at $4000 per worker.

1. As successive units of a given kind of input are added to a fixed quantity of other inputs, output rises and so, therefore, does revenue. That is, the input has a positive MPP, so MPP times product price is positive. (If product price itself declines as output rises, the wording is altered, but the conclusions are the same.)

2. By the principle of diminishing returns, these additions to output become successively smaller as additional units of the variable input are added. Therefore, the additions to revenue also become smaller. (As we move down Table 5-1, of Chapter 5, both the MPP and the VMP are decreasing).

3. To maximize profits, the firm will hire additional units of the variable input as long as the revenue gained (the VMP) exceeds the cost of the inputs (the wage).

4. Since the VMP gradually declines with additional units of the variable input and the wage per input stays the same (by the competitive assumption), if the firm can vary the inputs gradually, it will hire up to but not past the quantity of the input where the wage equals the VMP, the value of the input's contribution. If the firm stopped hiring before this, it could gain by hiring a little more, because the VMP, the increase in revenue, would exceed the wage, the addition to cost. If the firm hired past this quantity, it would lose on the added unit of labor, because the VMP would be less than

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[2] If the product price falls as more output is sold, the added revenue from an additional unit of input is called the marginal revenue product, MRP, and equals the MPP times the "marginal revenue."

the wage rate. So it hires exactly the quantity at which the wage equals the value of the worker's contribution to production, the VMP, q.e.d.

In the case of an input owned by the company and not hired, the same principle applies but the wording is different. The firm would purchase such an input as long as its VMP over the life of the input exceeds the cost of the input, prorated over its life.

We do not allege that firms in fact hire inputs one by one. But whatever quantity they do hire they can vary slightly relative to other inputs. In so doing, they end up with wage equal VMP; for, if not, a firm can raise its profits by changing the quantity it hires, as point 4 shows.

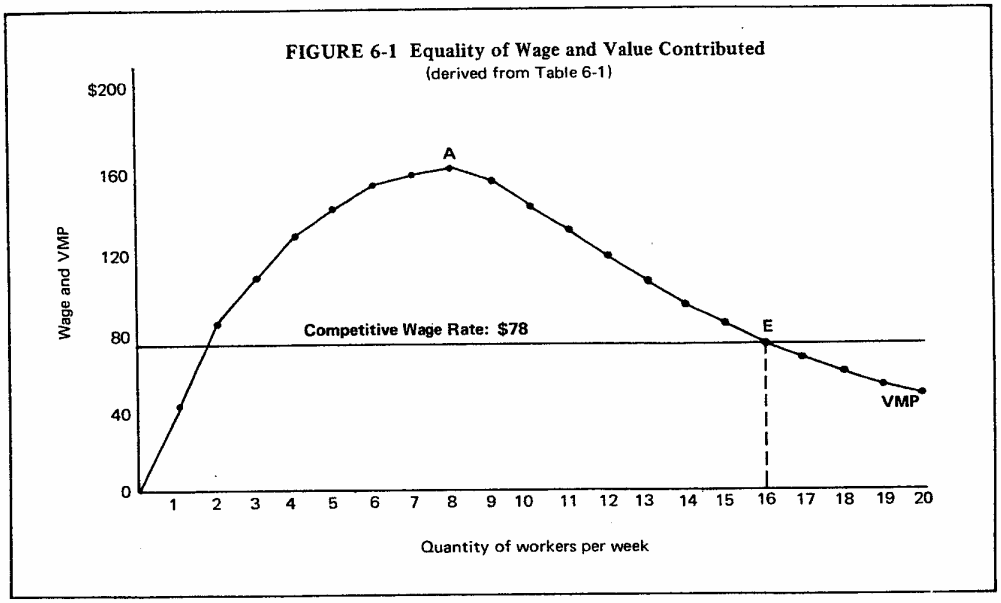
This proof can be illustrated with a diagram. In Table 6-1, the VMP is derived from the MPP by the formula VMP = MPP times product price. In Fig. 6-1, columns (1) and (4) from the table are plotted and the points connected to get the VMP curve, which is the firm's demand for labor. Point A is the point of diminishing returns. Suppose the competitive wage is $78 per week (for the type of labor in the diagram). How this wage is determined is discussed later in this chapter. We want to show that this wage will equal the value of each worker's contribution to production. Since the VMP measures this value and the wage equals the VMP at quantity 16 (point E), we need to explain therefore why the firm will want to employ 16 workers, no more and no fewer.

Suppose it hired fewer than 16, say 12. Then by adding a 13th worker

Table 6-1. Derivation of the value of the marginal product from the marginal physical product

(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Quantity of Labor	Marginal Physical Product	Product Price	Value of Marginal Product (2)x(3)	Quantity of Labor	Marginal Physical Product	Product Price	Value of Marginal Product (2)x(3)
0	–	$2	$ 0	11	67	$2	$134
1	22	2	44	12	60	2	120
2	42	2	84	13	54	2	108
3	54	2	108	14	48	2	96
4	65	2	130	15	43	2	86
5	72	2	144				
6	78	2	156	16	38	2	76
7	81	2	162	17	34	2	68
8*	82	2	164	18	31	2	62
9	79	2	158	19	27	2	54
10	73	2	146	20	25	2	50

* Point of diminishing returns



it would raise revenue by $108 while costs rose by only $78. The firm would be better off by $30. Such a gain is true for any quantity back of 16. On the other hand, if it hired 20 workers, the added cost of the 20th, $78, would exceed the added revenue therefrom, $50, causing a loss of $28 on this worker. Similar statements apply to all quantities over 16. For quantities under 16, the *vertical gap* between the VMP and the wage line measures the gain derived from hiring another. Beyond 16, this vertical gap is the loss from each additional worker.

Why not stop at 15, since #16 adds the same in revenue and costs? If the firm could hire fractional workers (perhaps part-time), it would gain by hiring beyond 15 toward 16. If not, the 16th would be a matter of indifference. Exact equality between wage and VMP presumes an ability to move continuously along the curve. In the real world of finite (rather than infinitesimal) adjustments, the firm would come as close as possible to equality between wage and VMP. Furthermore, if the equilibrium quantity of workers is 50 or more where VMP equals the wage, then one may expect that the VMP for just one worker before the intersection of VMP and the wage line would be very little different from that at the intersection. Imagine all the quantities in Fig. 6-1 multiplied by 10. Equilibrium would be 160. Obviously, the VMP for #159 would not be noticeably different from that at 160. This adds to the expectation that equality between VMP and wage is virtually achieved under competitive conditions.[3]

[3] Similar reasoning was used in Chapter 5 to determine the quantity to hire in Table 5-1 on diminishing returns, except that this time, the product price and wage rate are given. Suppose the wage were $120 per week. What

Motives Of Employers And Workers

The equality of wage with value contributed does not result from any deliberate efforts by the firm (or workers) to arrive at "fair" wages. It results from efforts of firms to maximize profits—to hire when it pays and not when it doesn't—under these conditions (1) input proportions can be varied; (2) increments from a variable input are subject to diminishing returns; and (3) for reasons the firm cannot control, the firm hires inputs competitively. If the firm does not have to compete with other employers to get its workers, the same efforts at profit maximization will result in wages that are below the value contributed by workers, and one might say the workers will be "exploited" as explained under "monopsony" in Chapter 7. To reiterate, the forces that bring about equality between wage and value contributed are the variability of input proportions, diminishing returns, competition among employers to get workers, and employer efforts to maximize profits. The main condition acting against this result is employer monopoly power in hiring workers. Employer motivation is the same in either case—profits.

Can Input Proportions Be Varied So Finely? [4]

The above discussion assumed that if VMP exceeded the wage by a small amount, the company could add a small quantity of the variable input (or reduce the other inputs by a small quantity) and thereby raise profits. Otherwise, it would not end up precisely where wage = VMP. But can this be done? Or are not most inputs "lumpy" so they cannot be varied by small amounts? To some extent, lumpiness does preclude perfect adjustment. But remember, by the law of variable proportions, the effect of raising input A keeping B constant is also achieved by reducing B keeping A constant, which adds to the possibility of fine variations.

Also, are there not frequently input combinations which cannot be varied at all? One typist to one typewriter; one machinist to one machine. Again yes and no. Since what is desired from both typist and typewriter is certain services, the inputs can be defined in terms of the ability to provide these services. In this way the company can in effect raise the ratio of typist to typewriter by hiring a more skilled typist, or raise the ratio of typewriter to typist by acquiring a better typewriter (on which any typist could do

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would be the quantity employed? (Answer: 12) If wage = $50, how many? (Answer: 20) The lower the wage, the more it is worth hiring. Total profits cannot be determined from the diagram because the costs of hiring other inputs besides the variable labor are not given. Some of these other inputs are presumably other types of labor.

[4] This section is more difficult and of lesser importance than others.

better work). Furthermore, depending upon the cost of typewriters, it might be worthwhile to have extra typewriters on hand for other employees' occasional use or in case of breakdown, thereby altering the one to one ratio of typist to typewriter.

One might expect that if the proportions between inputs A and B really cannot be varied, then it would not be possible to isolate the MPP of A from that of B. But advanced theory shows that, even if inputs must be combined in fixed proportions within each company, if these proportions are different from one product to another (1A + 1B produce 1X, while 1A + 2B produce 1Y), there may still be a VMP for each input which declines gradually as the quantity of one input rises relative to others.[5] This possibility adds to the expectation that input proportions can be changed by small amounts and that firms reach a profit maximizing position where each input payment equals VMP.

All Incomes Are Value Contributed

Consider the following equation:

$$(1)\ MPP_a Q_a + MPP_b Q_b + \ldots + MPP_n Q_n = \text{Total Product.}$$

"a" is a kind of input (such as a typist, or a lathe operator, or a square-foot of floorspace). MPP_a is the marginal physical product of input "a" and Q_a is the quantity of the "a"s employed. As described above (p. 129), $MPP_a Q_a$ is the total contribution to output of all the "a"s employed. Similarly for "b" and the other inputs. Equation (1) says that the total output of a firm is the sum of the contributions to output of each input, where an input's contribution is defined as its MPP.[6]

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[5] See *Price Theory*, Chapter 8, by Milton Friedman, Aldine Publishing Co., 1962, or *Economic Theory*, pp. 144-154, by Gary S. Becker, Alfred A. Knopf, 1971. Neither is a book for beginners.

[6] Equation (1) does not state an obvious truth, even though it may seem obvious that the total output is the sum of contributions of each input. Equation (1) holds only under the production conditions that if the quantity of all inputs is increased by any proportion, then output will expand by that same proportion. This means, for instance, if all inputs were doubled, output would be twice as great (an assumption we used on p. 118). While these production conditions are plausible, others could prevail and then the sum of MPP's of all inputs might not equal total product. These mathematical relationships are discussed in advanced texts where MPP_a is expressed as a partial derivative, $\frac{\partial \text{ output}}{\partial \text{ input a}}$, of a "production function" relating output to the quantities of inputs, output = $f(Q_a, Q_b, \ldots, Q_n)$.

Now let us multiply each side of equation (1) by the price of the product,

(product price) $\times$ ($MPP_aQ_a + MPP_bQ_b + \ldots + MPP_nQ_n$) = (product price) $\times$ (output) to get:

(2) $VMP_aQ_a + VMP_bQ_b + \ldots + VMP_nQ_n$ = total company revenue.

(Remember, VMP = MPP $\times$ product price.) The term VMP_aQ_a is the *money value* of the contribution to production of all the "a"s hired. We explained earlier that under competition each input is hired until its VMP equals its wage. (Note, however, that equation (2) does not show or prove this.) It follows from equation (2) that, *if* each input is paid its VMP (the value of its contribution to production), then the sum of all these input payments (equal to inputs' VMP's) exactly equals the firm's total revenue.

One may wonder then—where are the firm's profits? The answer is that if the firm owns any inputs—most companies do own their plant facilities and machinery—it will have left over, after paying each hired input its VMP, an amount equal to the VMP's of these owned inputs. Thus, profits are the value contributed to production by the inputs owned by the firm.[7]

This equation tends to refute a cornerstone of Marxian economic theory. Marx held that under capitalism, after wages are paid, there is left a "surplus value" which the workers created but which they are cheated out of. But we see that this "surplus value" is really the contribution of nonhuman inputs, not of labor. Marx failed to recognize that capital also contributes to production and that the contributions of labor and capital can be separated. The "marginal productivity theory" which underlies this chapter had not been developed during Marx's lifetime. To justify their contention that labor creates all value and should receive all income, some Marxists claim that capital equipment is really "embodied labor" having been produced by prior labor. This is discussed in Chapter 12.

Are all expenses for inputs? One implication of equation (2) is that all the company's income is used up paying inputs for their contribution to production. But are there not some payments which are not for inputs? If so, where does this money come from? The money would come from the company's profits, which are the payment for the contributions of the inputs owned by the company. Some examples of such expenditures are: (1) the

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[7] In some cases where the firm's owners also work for the firm (a family-owned store or law firm) the salaries paid to the owners may be less than the VMP's of these worker-owners. Then, profits will be partly the contribution of owned nonhuman inputs and partly the contribution of underpaid worker-owners, who for various reasons (such as tax considerations) might prefer low salaries and higher profits to higher salaries and lower profits. (The opposite could also be true.)

purchase of goods and services for the direct use by the owners, such as "free" dinners at stockholders' meetings, (2) deliberate subsidies by the firm to others—employment of friends or relatives of the owners at wages above their value to the company, or donations to charity (where a gain in sales is not the primary objective). These two items are generally a very small part of most firms' expenses. (3) Another expense, quite large, for which the company usually receives nothing that contributes to production, is taxes. But if taxes were repealed, all of the former taxes would not go to the owners for long. Rather, competition for the higher profits would increase investment and force prices down, reducing profits.

Finally, there are many expenses which seem to have no relation to production, but which really are wage payments to inputs. We refer to the purchase of goods and services which make working conditions more pleasant (air conditioned offices). These may increase the productivity of workers. Or they may simply make the job more pleasant, thereby enabling the company to pay lower wages than without these conditions. Other examples are expenditures for some safety features, landscaping, comfortable rest rooms, nurses in attendance, company parking lots, company athletic facilities, and luxurious executive suites. The cost of these would come from the VMP's of the workers who benefit from them. And the same is true of other fringe benefits such as paid vacation, holidays, pension funds, social security taxes, jury pay, and paid sick leave—they are all part of wages. If workers did not receive these fringe benefits, their money incomes would be higher by the cost of the fringe benefits.

Do Companies Perform The Relevant Experiment?

We have explained that wages equal value contributed because firms hire additional workers until the value of their MPP's falls to the wage rate. And we explained how the MPP is measured in principle by comparing output before and after hiring a unit of the input, with appropriate reassignment of tasks. Now we suggest that companies really do not hire inputs one by one nor perform this experiment when hiring inputs. Have we then failed to show that wages tend to equal the value of the MPP's of workers? No.

All the company need do to bring about the equality between wage and value contributed is to ask, when deciding the quantity of any input to hire, "Will it pay to hire another?" True, to answer this question perfectly, the relevant experiment is necessary. But, without it, the employer (who can survive in business) undoubtedly can estimate with reasonable accuracy whether another janitor or typist or 1000 square feet of floor space will be worth the cost. Whether it is "worth the cost" means whether the added revenue, the VMP, exceeds the input cost. The employer need not be familiar

with our economic jargon—diminishing returns, MPP, VMP—to act as economists, using these terms, predict.

Wage Determination By Demand And Supply

A wage is the price of a labor service. Like other prices it is determined by demand and supply. If you have mastered the appendix on demand and supply (don't worry about elasticity), this part should be easy. If not, a review of that might help before proceeding.

Figure 6-2 shows the demand for and supply of labor for a given occupation and degree of skill and in a given geographical area. Suppose it refers to 80-word-a-minute typists in Chicago. The demand curve shows the quantities employers would like to hire at various wage rates. It refers to a labor market with many employers, not just to one company. Its slope follows the law of demand—the lower is the wage, the more workers employers will want to hire. The main reason for the downward slope is our old friend diminishing returns—as more typists are added relative to other inputs, their MPP's and hence VMP's decrease, so it won't pay to hire more workers unless wages are lowered. The supply curve shows the quantities of labor offered at various wages. The higher are the wages of typists in Chicago, the more people will seek jobs there as typists, hence the upward slope.

Just as with product demand and supply, labor demand and supply have "determinants," forces other than wage which determine the quantity demanded or supplied, forces which are held constant along the curves, and forces changes in which cause the whole curves to shift. The demand for labor by *a* firm is the VMP and that by all firms in an area is (with some technical qualifications) a sum of firms' VMP's. Thus, three of the five determinants listed are directly derived from the relationship, VMP = MPP X Product price.

The determinants of the demand for labor are:

1. The price of the product (or products) produced by the labor.
2. Technology. How MPP changes as the quantity of labor changes. In other words, what the numbers are in Table 6-1.
3. The quantity of other inputs used along with the given input. The more other inputs used, the higher generally will be the MPP or productivity of the given type of input.
4. Prices of other inputs: substitutes and complements. The effect here is the same as for product demand.
5. Employer tastes (if any) for discrimination. If employers prefer blue-eyed blonds, they may pay a bit extra for them and the blond's productivity will include good looks as well as typing. Of course, the stockholders or top officials of a company would rather not waste money catering to such preferences of their subordinates. An employer

discriminates *against* a group if he fails to hire them even though their productivity would justify doing so. Stockholders lose from that too. If most employers discriminate against a group (by race, sex, religion), then demand will be less for that group and their equilibrium wage will be lower. What appears as employer discrimination is often worker discrimination. If employers hire those with whom other employees dislike working, they may have to pay more to get their other workers, unless the discriminating employees have virtually no alternatives where they can avoid the disfavored group. Rather than offend the discriminating employees (or pay them more), the employer may refuse to hire the disfavored group, unless their supply price is low enough.

The determinants of the supply of labor to a given occupation and area are:

1. Worker tastes for the occupation. This includes all the non-wage aspects such as danger, excitement, interest, glamour, status, marriage prospects, personalities of fellow workers, their race and religion, if relevant to the worker, character of the neighborhood, etc.
2. Wages in alternative occupations. A rise in wages elsewhere causes the whole supply curve to decrease and conversely. The alternatives must be relevant. For most typists, wages in sales, modeling, and bookkeeping are relevant; those of airline pilots, quarterbacks, or operatic tenors are not.
3. Costs of entry. This is mainly the time and expense of training required. The supply is affected by the extent of subsidization of such training, as by free tuition or living expenses (for students at West Point or Annapolis).
4. The overall price level. An inflation of 25% means workers will demand 25% higher wages (supply will decrease), since people work for command over goods and services, not for money per se—they work for real wages rather than for money wages.

Now let's turn to Fig. 6-2. As you might guess by now, the wage and quantity employed will be w_1 and q_1 where the lines intersect. But let's see why. In 6a we show why the wage could not be *above* w_1 and in 6b why it could not be *below* w_1, proving that it must be *at* w_1.[8] For this we must assume that no unions or minimum wage laws hold wages up and no wage ceilings hold them down. These are covered later.

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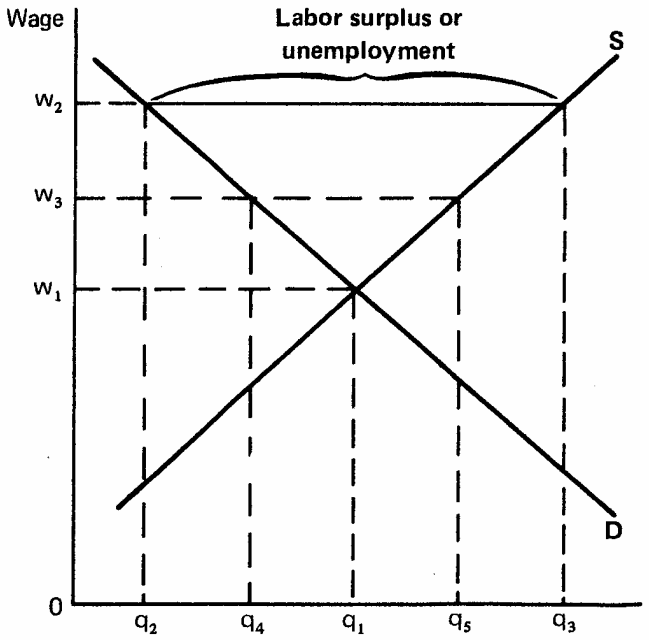
[8] We have used this technique several times. So we'll give it a name: the equilibrium explanation technique, EET. To explain why a given outcome is an equilibrium, show why, if the price or quantity were on one side of the equilibrium, there would be a tendency to move toward equilibrium. Then take a point on the other side of the equilibrium and explain again the forces that would push toward the equilibrium.

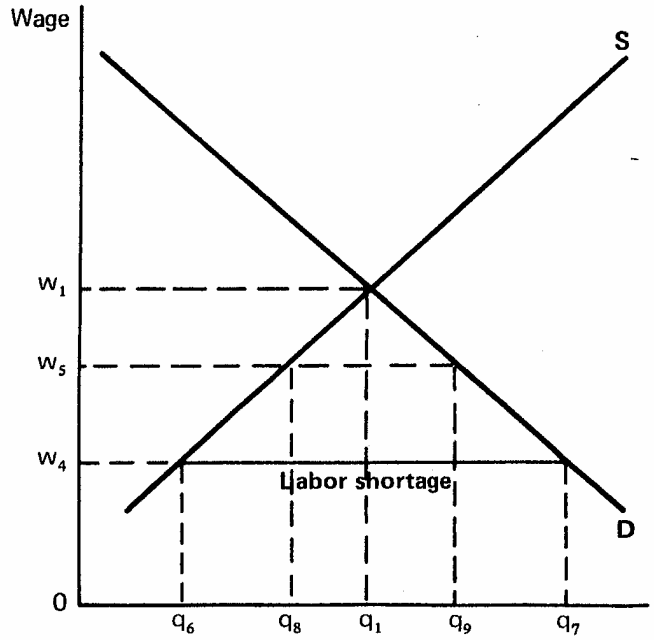
FIGURE 6-2 Wage Determination by Demand and Supply

6-2a Wages above equilibrium



Equilibrium wage and employment: w_1 and q_1
Wage above equilibrium, w_2, causes labor surplus or unemployment, $q_3 - q_2$
Competition among workers for jobs drives wage down to w_1, eliminating unemployment

6-2b Wages below equilibrium



Wage below equilibrium, w_4, causes a labor shortage of $q_7 - q_6$
Competition among employers for workers pulls wage up to w_1, eliminating labor shortage

First, Fig. 6-2a. If the wage were at w_2, then according to the supply curve q_3 would want to work in the occupation and area. But the demand curve shows that employers only want to hire q_2 and wage w_2. So there will *be a labor surplus* of q_3-q_2. Either or both of two results will follow: (1) some of those not employed will offer to work for less than w_2 and employers will then lower the wage (for them *and* those already employed); or more likely (2) employers, noting an excess of applicants for jobs, will reduce wages, since employers, we'll assume, aren't going to pay any more than they have to. They're not in business to play Santa Claus. At a lower wage than w_2, say w_3, the quantity demanded (not the demand) rises to q_4, while the quantity supplied would be less, q_5. But there would still be a labor surplus, q_5-q_4; the same pressure to reduce the wage exists for any wage above w_1. Thus, no wage above w_1 will prevail.

Now turn to Fig. 6-2b. Our Simon Legree employers are free to push the wage down as much as they like. Will they pay starvation wages then? Not if there is competition among employers for workers. If the wage is below w_1 at w_4, then employers will want to hire q_7. But only q_6 are willing to work at this low wage. (What happened to the others who were available at higher wages? Some left the labor force for school, housework, and retirement. Others seek jobs in alternative occupations. Remember, on a supply curve, wages elsewhere are given; so high typist wages relative to wages in other occupations attract workers from elsewhere and low wages induce some Chicago typists to seek other jobs.) At wage w_4 there is a labor *shortage* of q_7-q_6. Employers want more workers than they can get at w_4. So some employers who would rather have more than do without (as the demand curve shows) will raise the wage to get more workers. Others will have to follow suit or lose workers to those who pay more. Suppose the wage rises to w_5. Then q_9 are demanded but only q_8 supplied; there's still a shortage which will induce employers to raise wages again, until the wage reaches w_1; q.e.d.

Thus, w_1 is the only wage compatible with the forces underlying demand and supply—the determinants of demand and supply. This is brought about because competition among workers for jobs prevents the wage from remaining above w_1 and competition among employers for workers prevents the wage from remaining below w_1. There is no effort to be fair or reasonable or altruistic, even though as explained earlier, the wage does equal the workers' contribution to production. It's the invisible hand again.[9]

One should appreciate the connection between Fig. 6-2 and Fig. 6-1. The wage w_1 determined in Fig. 6-2 is the competitive wage line of Fig. 6-1.

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[9] Some people rebel at the fact that wages are determined by demand and supply like product prices. Others choose to deny it. In fact, in 1965, the Secretary of Labor, Willard Wirtz, prohibited the use of the term "labor market" in any Labor Department speech or publication.

The equality of wage with value contributed is seen from Fig. 6-1; it cannot be seen from Fig. 6-2.

Unemployment. Who are the unemployed? Not housewives, children, retired people, or society's drop-outs, who are neither employed nor looking for work. The unemployed are those without jobs who are seeking work and are willing to work for the going wage or less. At w_1, everyone who wants a job has one: quantity demanded equals quantity supplied. Only if the wage is *above* the competitive level is there unemployment. Unemployment is synonymous with labor surplus. Any unemployment in an occupation or area can be eliminated by wage reductions to the competitive level. However, even in prosperous times unemployment is normally about 4% of the labor force, because there are always people changing jobs and entering the labor force from school or housework. And while the widespread unemployment of a recession would be reduced by wage cuts, most economists also recommend expanding total spending power through monetary-fiscal policy. However, monetary-fiscal policy is not useful against localized unemployment covering only one or a few industries, localities, skills, occupations, or one broad category like young unskilled people ages 15-21, where unemployment is often several times the level of the whole economy. A rise in total spending through monetary-fiscal policy when unemployment is 15% among teenagers and 3% among others would only create inflation. If teenage unemployment were reduced at all, it would be only because prices and others' wages rose relative to teenage wages, which, in terms of unskilled teenagers' real wages, is the same as if their wages were reduced without the inflation. Thus, the solution to localized unemployment is wage reduction. For unskilled teenagers, improvements in skills would help, but for those who don't benefit from high school or college this improvement comes mainly through work experience, which requires a start at a low wage.

One competitive wage? The equilibrium just described and the earlier reasoning about real cost and wage payments in alternative uses has implied that for a *given skill and area,* all employers pay the same wage. Many people reject all of economic wage theory because they are sure that even for the same occupation and area different employers do pay different wages and in fact some individual employers pay different wages to workers doing the same thing. First, some apparent wage differences are deceiving. People in the same occupational title—typist—have great variations in skills, duties, knowledge of the job, potential for advancement, ability to get along with others, absenteeism, honesty, dependability, etc. All these factors affect one's economic worth, hence one's MPP. Also, fringe benefits, such as paid vacations, sick leave, and employers' social security and pension contributions, have to be counted in with wages. So part of what looks like different pay for the same work is not.

But some is. In part, such differences may reflect poor knowledge of alternatives by workers and employers. They may also reflect the effects of labor unions (discussed in the next chapter). More to the point, however, a uniform competitive wage for a given skill and area is something, like profit equalization among industries, that *tends* to be brought about by people acting freely under competitive conditions. At any given time, there will be differences. But over time, lower paying employers will have to pay more or they will lose employees. Higher-paying firms will slow down the normal rate of wage rise or lose business to lower-paying, lower-price competitors. And before this works out, changes in consumer tastes, technology, worker supply, and nonhuman input supply will cause shifts in the labor demand and supply curves, calling for a new set of equilibrium wages in various occupations and shifts of employment among workers. Thus, at any time, there are movements toward equilibrium wages, but before one equilibrium configuration is attained, changes call for different movements. Declining industries may pay lower wages as some workers prefer not to switch to other areas; expanding industries or employers may pay premium wages for a time to expand rapidly.

Without claiming to explain all of the variations in wages within occupation and area, a recent study has shown that these variations *are* affected by productivity-related forces, such as seniority, prior experience, and education, as well as taste factors such as discrimination by race and sex, and location of employer.[10] The study covered plants in the Chicago metropolitan area and workers in 12 occupations including accountant, typist, janitor, punch press operator, truck driver, and tool and die maker. The authors conclude with this comment:

> . . . employers and workers seem to pursue reasonable goals in appropriate ways. If at first their behavior does not appear to make sense, it may be simply because the employment of a worker is a much more complicated transaction, and one with many more dimensions, than the purchase of a contract in the wheat futures market. Perhaps, despite the large body of sound research in labor markets of the postwar period, economists and other social scientists have not yet tried hard enough to understand this behavior fully.

Evaluation Of The Competitively Determined Distribution Of Income

Under competitive private enterprise, incomes are distributed in accordance with contribution to production. Is this socially good, bad, or

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[10] Albert Rees and George P. Shultz, *Wages and Workers in an Urban Labor Market,* University of Chicago Press, 1970. The quotation is from p. 222.

neutral? Certainly, the fact that it occurs does not make it good or bad. We shall evaluate this basis of payment—contribution to production—by four criteria: (1) efficiency, (2) fairness or justice, (3) the standard of living of income recipients, and (4) individual freedom.

Efficiency of input utilization. Efficiency is a comparison of output to input. An input is used more efficiently in use X than in use Y if it produces more value in X than in Y per unit of time. Payment according to value contributed plays a vital role in achieving efficiency of input utilization. Owners of inputs, human and nonhuman, want higher standards of living and therefore higher incomes. To achieve this, they will generally sell their input services for the best price. Thus, in serving their personal interests for higher living standards, they will seek out the careers and employments where their inputs contribute the most.[11]

The employer or businessman, serving his interest to maximize profits, will, as we discussed earlier, use the input combination which costs the least. This cost minimization serves to minimize the goods and services society sacrifices to get given items produced *only because* input prices do reflect the value inputs contribute in alternative uses. Thus, payment according to contribution serves a double role in efficiency: (1) it gets input owners seeking higher pay to produce more rather than less, and (2) it shows input organizers how to select the method of production which costs the least in terms of things sacrificed.

The efficiency of competitively determined input prices (and income distribution) and the less efficient results of departures from these prices are reasons for accepting this method of income distribution. Even one who has misgivings as to the fairness of competitive income determination should consider whether any proposed alternative basis of distribution will have an adverse effect on allocative efficiency and so reduce incentives that the total output and economic growth will be held down.

For example, the Marxist rule of income distribution is: *to* each according to his needs, *from* each according to his ability. Since needs have virtually nothing to do with value contributed to production, income payments would be unrelated to production. But would people really contribute according to their ability then? Would they undertake difficult and expensive training, would they strive for promotion, or shift employers

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[11] Even altruistic input owners seeking society's interest rather than their own would need the guide of input payments related to value contributed—unless (as usually the case among altruists) they chose to do what *they* felt society needed rather than what consumers apparently want. An altruist who did not want to impose his values on others should maximize his personal contribution and income, then give away as much as possible to the general public.

or occupations to contribute more, though receiving no more pay? And, without payment equal to contribution, how would the workers or planners or commissars know where input contributions are the most? This Marxist rule has never worked and has been quickly abandoned where tried, to be replaced by incentive pay systems in which more and better work means more pay. Even an avowed Marxist like Mao Tse-Tung has reiterated: those who don't work don't eat—a far cry from the Marxist rule.[12]

Fairness. What is fair is a matter of individual judgment, unless one accepts the determination of another, such as church, family, majority rule, or political leaders. It seems a widely held view that it is fair for an individual to receive from society as much as he gives. In fact, some socialists base their opposition to private enterprise on the claim that workers are "exploited," get paid less than what they produce, thus implying that workers ought to receive the value of their contribution.

If this outcome is not fair, then what is? Who should receive more than his contribution and who less? Remember, by equation (2), since the sum of values contributed equals total income, if anyone receives more than his contribution, this addition must come from the contribution of someone else who will then receive less than his contribution. If one insists that wages should not be below a certain level, say, $2 an hour or $100 a week, but the employer is still allowed the freedom to hire or not, then the employer will simply not hire those whose VMP is less than the minimum wage, which leaves these people with no wage instead of a "substandard" one. Therefore, it is probably better, if someone is to receive more than his contribution, that

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[12] Consider this analogy: suppose a teacher, after grading test papers, in order "to equalize things," took 10 or 20 points off the grades in the 80's and 90's and "gave" them to those with grades in the 50's and 60's. Aside from fairness, what would be the effect on incentives of both high and low grade students? Do the same effects arise with income redistribution?

While we're on the question of incentives, perhaps the following sentiments are appropriate. Though some may agree with George Sand that "Work is not man's punishment. It is his reward and his strength, his glory and his pleasure," more would probably join with Honore de Balzac who said "Where will you find a man who is in love with his means of earning a livelihood? For it is with a profession as with marriage; in the long run you are sensible of nothing but the annoyances," or Aldous Huxley, "Like every man of sense and good feeling, I abominate work." (Taken from "Quotes: Labor" compiled by E. F. Murphy, *New York Times Sunday Magazine,* September 6, 1964.)

Back to education—In St. Louis, experimentors have raised the achievement of grade-school pupils by paying them in play money for good academic and personal performance. The children use the money to purchase privileges, such as to play checkers during class time. *New York Times,* April 26, 1970. Will the wonders of the price system never cease! In a similar vein, see footnote 18 of Chapter 11.

the government make the payment from tax proceeds rather than to expect the employer to make the payment.

One need not make a categorical judgment on the question of fairness. One might say everyone should receive the value of his contribution except that_____. The possible exceptions are limitless. Most people agree that dependent children, the physically handicapped, and aged people with little or no savings should be supported by society without having to rely (entirely) on their own earnings. Another exception might be to say that incomes above a certain level should not be allowed or should be taxed heavily. But how would this affect incentives? Actually, very high incomes do not amount to enough in total to affect average incomes much anyway. Or, one might say let labor be paid the value of its contribution, but not nonhuman inputs. Those who advocate this often feel that property owners do not deserve their income because they do not put forth effort as do workers, or because they feel most property is owned through inheritance. But if property was not acquired through gift or inheritance (or fraud), then it came from saving and investment out of labor income. The property exists because its owner refrained from consuming as much as he could and released productive capacity from consumption to investment.

Even property which came from inheritance was created by some abstention from consumption, but by someone else who chose to give it to its present owner. It is true that inherited property gives some people a better chance to enjoy goods and services than others. But so do inherited beauty, athletic ability, health, intelligence, and so do vast differences in the competence of parents and teachers to develop the potentialities of their children. Our guess is that these aspects of "undeserved" benefits, stemming from one's "choice" of parents, create far more income inequality than does inherited property. (But perhaps nothing can be done about any of these except property inheritance.)

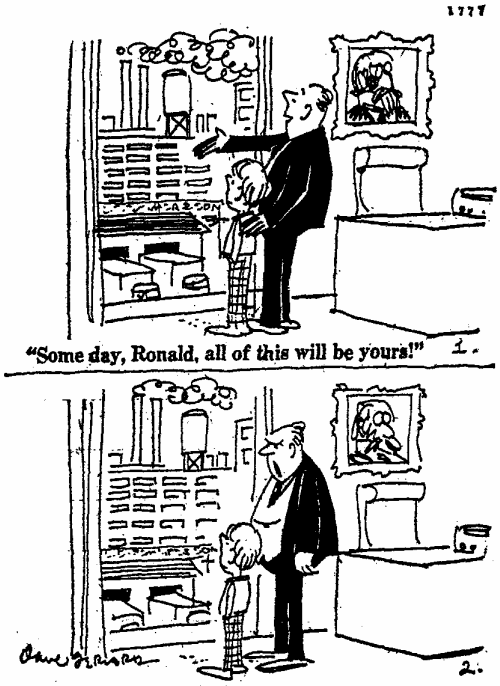
We are led to this question: Is inequality of income and of living conditions something to be avoided? Or is it sufficient that each individual be assured opportunity through education to develop his potentialities and that society provides some minimum standard of living to those who cannot work? Should inequality be reduced in addition to these measures? One must weigh the costs and benefits of various interferences with competitive income determination. Not only may one inequity replace another, but interference may seriously affect incentives to work and produce, lowering society's total output and making even more difficult a permanent alleviation of poverty.

If redistribution policies impair incentives to produce and especially to invest, then we may have to choose between (a) dividing a smaller and stagnant pie more evenly (through redistribution policies) and (b) dividing a larger and growing pie less evenly (with less deliberate redistribution of income). It is entirely possible that while (a) could raise the lowest incomes

more within a given year or two, (b) would raise them more over the long run, as well as allowing incomes of everyone else to rise more. For example, if (because of impaired incentives to work and invest) the economy's per capita growth rate were reduced by one percentage point, say from 2% per year to 1% a year, then an income level which would have grown in 20 years from $3600 to $5400 at 2% per year would only grow to $4400 at 1% per year. Over 50 years a $3000 income level would rise by 64% at 1% per year, against 169% at 2% per year. (The average annual rise in real income per person is 2%.)

The fairness of non-input payments. Besides input payments, other forms of income which may occur in a competitive economy are gifts, inheritances, and government transfer payments—welfare payments, subsidies—which are also essentially gifts. Another is interest on loans. The interest rate (such as 6% per year) is determined basically by how much is earned by money invested in nonhuman inputs, because those who receive interest could have invested in such inputs instead of lending money to others. Gambling earnings are transfers from losers to winners and represent no contribution to production.They are paid out of the incomes or wealth of the losers.

Finally, there is income (or loss) which results from unexpected changes in tastes or technology and occurs largely in the form of increased (or



"Some day, Ronald, all of this will be yours!" 1.

"What do you mean you want it now?" 2.

decreased) property values. Suppose you purchase some land or shares of stock in a company. The purchase price reflects the *then* expected productivity of this land or company. But afterward an unexpected change in tastes (including a government decision to build a research complex near your land) causes the value of the property to rise—because its productivity has now increased. As owner, when you sell the land, you would receive a windfall gain which represents no contribution by you or your property. Another kind of change—say cancellation of a development which was expected when you purchased the property—could cause a windfall loss. Such gains and losses result from sheer luck (good or bad) or from making good or bad guesses that the future will be different from what most people expect (which expectations determine the market price of the property). This income (or loss) is generally a minor part of incomes to most people, though, to the very lucky or shrewd, it might be substantial.

All increases in property value, especially of stock prices, are not of this nature. If the owners of a company reinvest part of their earnings in the company (as is quite common), a share of stock in the company will then represent ownership of more income-earning equipment than before, so its price will rise. During inflation, when prices are rising, VMP's (MPP's times product prices) are rising; therefore, property incomes rise and so do property values and thus stock prices. If property incomes and stock prices rise by the same proportion that prices have risen throughout the economy, stockholders are no better off than before the inflation. In fact, during the past decade, stock prices have lagged behind the rate of inflation as have corporate profits.

Our discussion of competitive income determination based on value contributed to production does not apply to gifts and inheritances (except that the donor probably acquired the property through contributions to production) and does not apply to changes in property values caused by unexpected events (except that property values reflect expected productivity of property). We leave to the reader to think through the fairness, efficiency, and freedom aspect of gifts, inheritances, and windfalls.[13]

Worker satisfaction and payment equal to value contributed. Would we find under competitive conditions that workers are satisfied with their wages

[13] Concerning the fairness of high incomes, consider this comment in a letter to the editor of the *New York Times,* April 18, 1969. Responding to an article on pampered pets of wealthy owners, a reader wrote indignantly: "When one well-heeled dog eats more meat in one day than some poor large families consume in one week, it is time to change the tax system which permits this hideous injustice."

Well, what kind of change? Eliminate all high incomes? Allow high incomes, but regulate the consumption choices of the rich? What about the consumption choices of the non-rich who spend on cigarettes, liquor, drugs, and gambling, not to mention family pets? At least one should think through the consequences of his plans to eliminate alleged social injustice.

because they see that the wages equal value contributed? Definitely not. Even if a person knew he was being paid the value of his contribution, he might still not be satisfied, though instead of feeling he should be paid more for his work, he might feel the way to higher pay lies in his doing better work or acquiring more skills and seeking another job.

However, more fundamentally, workers are not able to measure their value to production. It takes considerable knowledge of a company's operations even to guess how output will be affected if another typist or another janitor is hired. The employer has a feel for whether another is worthwhile, but in many cases it is not precise. The worker with less knowledge has even less idea of his worth. He will be inclined to exaggerate his contribution because he does not allow for the contribution of other inputs with which he works and does not visualize how tasks could be assigned to minimize the effects of his departure, other things the same. The worker is also apt to exaggerate his contribution by incorrectly considering what would happen to output and revenue if not only he were not there, but if all workers in his occupation left, and to feel he should receive his share of that difference. But, as we pointed out earlier, this method of calculating input contribution is wrong and ends up with all inputs "contributing" more than the total output.

Payment equal to contribution is a result of the competitive process, the invisible hand; it is not something that is consciously observed or sought or even realized by workers or employers. The worker seeks to maximize his income, the employer to minimize the cost of producing a given output and to maximize profits. Whether or not anyone is aware of it, the equality of wage and VMP is an outcome which must occur if employers do maximize profits and acquire inputs under competitive conditions. In fact, no one consciously seeks competitive conditions. Quite the contrary. Workers, employers, and sellers all strive for monopoly advantages. It is up to government to make sure that competitive conditions prevail.

Furthermore, even if workers knew they were being paid according to contribution, they would still stand to gain by restricting the entry and employment of people in their occupation, thereby reducing the ratio of themselves to other inputs and thereby raising their MPP's and wages. (See the discussion of collective bargaining in Chapter 7.)

Value contributed and a person's worth. Let it be stated emphatically that the value of an input's contribution is a value placed by consumers through dollar votes (the VMP is the MPP times the product price). There is no implication that he who contributes more value than another is morally or intrinsically better or superior to the other. Indeed, it may be quite the contrary, depending on one's personal values as contrasted with the more impersonal market. The market may rate the services of a liquor salesman at

$30,000 a year, while a preacher's services are worth only $8000, a heavyweight champion's services at one million dollars a fight, a nurse at $8500 a year. But complaints should be directed at consumers, not to the employer and not to the private enterprise system, unless it is the freedom of producers to do what consumers want that is judged a fault.

The standard of living of income recipients. Under competitive private enterprise the standard of living families will have depends on the incomes earned within the family and this in turn depends on the contributions made by the workers and their property. There is no assurance that everyone will have a "decent" standard of living or will receive at least "subsistence" wages. It depends on value contributed to production.

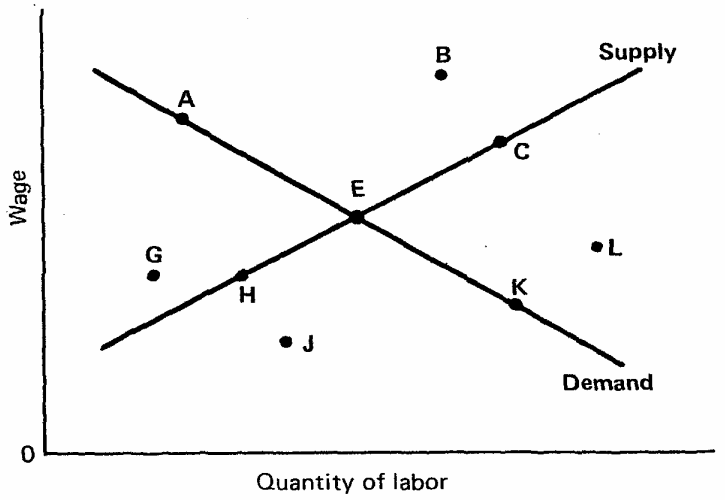
The reason for listing this as a separate criterion for evaluating wages is that many people rather inconsistently say it's fair that people be paid the value of their contribution to production, but it's not fair for people to be paid less than enough to live on. If payment equal to contribution is fair, then the level of living has nothing to do with the fairness of wages. Mr. Jones and Mr. Smith who contribute the same get paid the same, even though Smith is a bachelor and Jones has ten children to support. It is unfortunate that some people are unable (or unwilling) to contribute enough to earn enough to live adequately. But it serves no useful purpose to deny this and say everyone who works one hour does at least $2 worth of production when that is not so. This is not to say that society should ignore the problem of low incomes. But the basic remedy is to raise the productivity of people in low-income families.

Freedom. Competitive wage determination is compatible with the freedom of each individual to pursue the occupation of his choice, to seek employment where he wishes, to change jobs as he wishes, and with the freedom of employers to hire and fire as they wish. Indeed, any departure from the competitive determination necessarily infringes on employer and employee freedom.

This is seen in Fig. 6-3. Any point in the diagram, such as A, refers to the wage and quantity of labor directly to the left and below it. We shall go through every possible wage-quantity combination and show that the *only* combination compatible with personal freedom is E, the competitive equilibrium, which will naturally prevail in a competitive market. For this discussion, we assume that "freedom" does *not* include the freedom of workers or employers to collude monopolistically. Such collusion is covered in the next chapter. This means no third party, such as a union or government, interferes with the freedom of a worker and an employer to get together on mutually agreeable terms.

In all, besides the equilibrium, E, eight points are designated on the

FIGURE 6-3 Personal Freedom
And the Competitive Wage



diagram, two on the demand curve above and below E, two on the supply curve above and below E, and one in each space bounded by the intersecting lines. These eight points represent every possible wage-quantity pair except E. To follow this, you must understand clearly what each curve shows: Demand is the quantity of workers employers want to hire at various wages; Supply is the quantities of workers seeking jobs in the occupation at various wages. For each point, assume the outcome is ordained by law. Then ask: whose freedom must the law conflict with? Employers'? Workers'?

Consider Point A (and any point on the demand curve above E):

1. Employers can hire all they want at this wage, since it is on their demand curve.
2. But workers want more jobs than employers provide.
3. A can be maintained only if the unemployed workers are prevented from offering to work for less and if employers are prevented from hiring them for less. Thus both employer and worker freedom are abridged.

Point B (and any point above E bounded by demand and supply):

4. Employers are forced to hire more workers than they want to hire at this wage.
5. Repeat #2.

6. B can be maintained only by forcing employers to hire and preventing workers from competing.

Point C (and any point on the supply curve above E):

7. Repeat #4.

Point G (and any point back of both demand and supply curves):

8. Here employers are prevented from hiring workers who are willing to work for them at wages employers are willing to pay.

Point H (and any point on the supply curve below E):

9. Here all the workers who want work are employed.
10. But employers are prevented from bidding up the wage and hiring others who would like to work at the higher wages.

Point J (and any point below E between the demand and supply curves):

11. Here workers are forced to work involuntarily—any point to the right of the supply curve must involve forced labor.
12. Repeat #10.

Point K (and any point on the demand curve below E):

13. Employers get all the workers they want, but only by forced, involuntary labor. Not anything that would exist in America. Right? Wrong! Suppose the demand is that by the U.S. Army for soldiers; the supply curve shows those willing to volunteer for Army jobs. At K, a wage below E, the horizontal distance between demand and supply is the quantity drafted against their choice into the army.

Point L (and any point beyond both demand and supply curves):

14. Here employers are forced to hire workers they don't want and workers are forced to work involuntarily.

Thus, no outcome except E is consistent with employer and worker freedom. At E, employers can hire all they want and are not forced to hire more and all workers who want work at the going wage can get jobs—no forced labor and no labor surplus.[14]

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[14] An analogous discussion could show that the competitive price and quantity of a product is the only outcome compatible with consumer and producer freedom, again disallowing monopolistic collusion. You might try going through it. This could also be done with the usury law diagram determining the interest rate. The non-equilibrium quantities of Fig. 6-3 could be brought about through taxes and/or subsidies on particular occupations similar to commodity taxes and subsidies discussed in Chapter 2. But these would still involve infringements of freedom, including that of taxpayers. While the discussion concentrated on the parties to the wage agreement, one could also point to infringements of consumers' freedom to bid inputs into preferred uses. This would be particularly true if non-E outcomes were achieved through tax-subsidy means.

Freedom and efficiency. When input payment equals value contributed, the individual has *incentive* to use his inputs where they contribute as much as possible, because the individual prefers more goods for himself. But suppose the individual prefers a lower-paying occupation or prefers to work less than he could so he can have more leisure? Under private enterprise, the individual is free to choose among jobs and to take leisure instead of work. Is this a fault which causes inefficiency? If personal freedom and satisfaction are the basic ends of conduct, and if production is only a means to satisfy these ends, then there is no presumption that the individual should produce as much as possible. Efficient production means getting as much as possible from inputs, subject to the freedom of input owners and employers to choose between monetary and nonmonetary personal goals.

Thus, it is consistent with efficiency so defined for a bank vice-president in a large city to quit and become a groundskeeper for a small college (as did happen), or for an individual to prefer teaching math at $7500 to working for IBM at $12,000, or to prefer housekeeping to a career.[15] In spite of the ubiquity of these preferences—hardly anyone works as long hours as he could—payment by contribution does play a vital role in allocating people

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[15] The pursuit of non-monetary aims (along with monetary) comes up continuously: (1) A school janitor in Akron, after graduating from night school at the University of Akron, quit his janitorial job at $6000 a year to teach in the same school for $5650. (*New York Times,* November 1, 1965.) (2) The owner of a laundry in Bournemouth, England had difficulty recruiting women employees until he advertised: "Strong fat women who wish to lose weight wanted for hard but well-paid work." His recruiting problems were over. (*Reader's Digest,* May, 1968, p. 106.) (3) Starting in 1958, a young California couple would buy a run-down house, fix it up in their spare time, sell for a profit, move to another house, and start over again. Objective: to save enough money to retire for five years at age 30 in the Canary Islands. (*Reader's Digest,* December, 1966.) Fans of Mr. Tinguely, no doubt. And here are others. (4) Frederick Loewe, composer of "My Fair Lady," "Camelot," "Brigadoon," and other hits, said: "I haven't the slightest intention to write another note. . . . I'm having a wonderful time and writing a show is no fun. There is no reason for me to work now. I don't need glory. I don't need money. I can use the time better. . . . This after all is what we're striving for . . . to be happy." (*New York Times,* Oct. 1, 1964.) Nevertheless, in 1971 Lerner and Lowe did start collaborating on a new musical, their first since 1960. (5) Jack Fuller quit as a $30,000 salesman of caps and gowns in Akron to work for less than half that above the Arctic Circle in Alaska. (6) Iver Brook quit as a stockbroker in his 40's to study and work in ecology. (7) Mike Mitchell, former $35,000-a-year Wall Street insurance broker makes under $10,000 operating a lodge in Maine. (The last three are from "Beginning Again In The Middle," *Life,* Jan. 12, 1970.) None of this is incompatible with economic efficiency or with economic theory. But neither is the pursuit of careers in sales or brokerage lines. Other accounts of people who have left the corporate "rat race" are in the *Wall Street Journal,* Feb. 19 and 21, 1971.

among jobs. People do want money and what it buys. *Other things the same about jobs,* they will select the occupation or employer who pays the most.[16]

Summary

Under private enterprise, goods and services are distributed to the highest bidders, to those with the most money and with the greatest desires.

This distribution depends on the distribution of income.

Income depends on value contributed to production.

(a) The amount contributed by each input is its MPP.
(b) Distinguish correct and incorrect measurements of MPP.
(c) The *output* contributed by all q_a units of input A is MPP_a times q_a.
(d) The *value* contributed by an input is its VMP, where VMP = MPP times product price.

The quantity employed of any input is such that its wage equals its VMP, which means each input is paid the value of its contribution to production.

A company's sales revenue equals the sum of input payments and equals the sum of values contributed: $TR = \Sigma VMP_i Q_i$.

Therefore, when wages equal value contributed, profits are the value contributed by the firm's nonhuman inputs.

Under competition, there is no "surplus value" contributed by workers but not paid to them.

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[16] If a person chooses a lower-paying occupation than another he could succeed in, and thus contributes less, does he have a valid claim for a subsidy from his employer or from society because his standard of living is too low? Who does this? How about people in Appalachia who refuse to move to where jobs are available? Or many farmers? How about some artists, musicians, writers, and actors who seek Federal support for their professions, pointing to their low incomes? Teachers too. If their claims are just, it must be that consumers err in not valuing their output highly enough. But raise their incomes by subsidy, and won't a lot more people select these relatively pleasant occupations and drive down prices and incomes in them again, requiring even larger subsidies for adequate living standards? Then to avoid this, the government may establish artificial barriers to entry into the occupations or deny subsidies to some who are just as qualified as others who receive subsidy, or set up standards independent of consumer choice as to whose past or potential performance seems more deserving. It is not unusual that one interference with the workings of the price system leads to consequences which "justify" additional regulations and which impinge further on personal freedom.

Neither companies nor workers need know economic theory for the results described here to prevail.

Under competition, wages are determined by demand and supply and more fundamentally by the forces or determinants underlying demand and supply.

The demand for labor in a given occupation and area is determined by (1) product price, (2) technology, (3) quantity of other inputs employed, (4) prices of other inputs, (5) employer tastes for discrimination.

The supply of labor is a given occupation and area is determined by (1) worker tastes, (2) wages elsewhere, (3) costs of entry, (4) the general price level.

Wages above equilibrium cause unemployment.

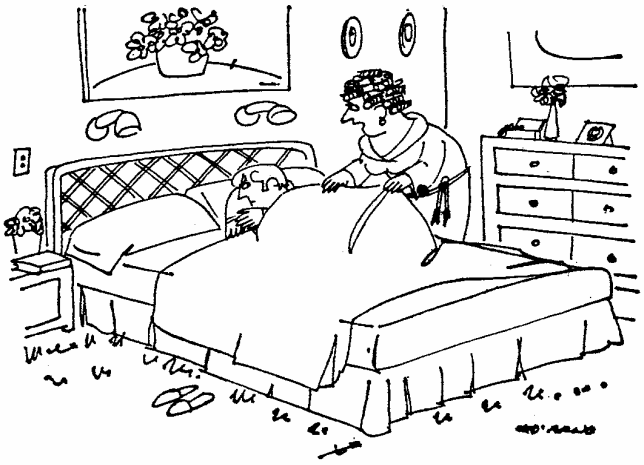
Wages below equilibrium cause labor shortages.

Wage differentials within an occupation and area occur despite the theory's prediction that they should not. Some reasons are: (1) productivity differences within occupational titles, (2) worker and employer ignorance of alternatives, (3) labor unions, (4) temporary movements toward equilibrium, (5) continual shifts in the equilibrium.

Evaluation of the competitively determined distribution of income—payment equal to value contributed—as to efficiency.

(a) Payment equal to contribution gives input owners incentive to employ their inputs (themselves) where they contribute the most.

(b) Payment equal to contribution means that when input organizers choose the method of production which costs the least money, they will minimize the real cost of production.



"The Establishment awaits."

Evaluation as to fairness.

(a) Should people receive the value they contribute to production?
(b) Who should receive more, or less? Why?
(c) Is inequality of income undesirable?
(d) The justice of incomes which are not income payments–inheritances, gifts, windfalls.

Worker satisfaction and payment equal to contribution.

(a) Workers and employers cannot tell when payment equals value contributed.
(b) In any case, workers could gain by restricting entry and raising the wage.
(c) Payment equal to contribution is an incidental outcome of competition, not a consciously sought objective.

The standard of living of income recipients depends on value contributed. There is no guarantee that competitive income will be at least some minimum or at least at subsistence level.

Evaluation as to freedom: the competitive wage and quantity employed is the only outcome compatible with worker and employer freedom, disallowing freedom to monopolize.

Freedom and efficiency. The situation that input owners have incentive to contribute as much as possible in order to get higher incomes than otherwise does not imply that they *should* pursue monetary objectives, ignoring leisure or the nonmonetary aspects of different jobs.

Study Questions Chapter 6

1. What two tendencies follow from the distribution of goods to the highest bidders?
2. Explain thoroughly the hypothetical experiment by which an input's contribution to production is measured.
3. Why *not* identify a riveter's MPP as so many rivets or a typist's as so many pages typed?*
4. In what units are the MPP's of such inputs defined?*
5. How are activities like riveting and typing converted into units which can be valued?*
6. Explain the two incorrect measures of identifying the MPP of an input. Why are they incorrect?
7. Suppose, with 200 workers of a given occupation, output is 4000 per month, and with none of these workers, output would be only 150 per

month. The MPP of the 200th worker is 8. What is the contribution to output of all 200?*

8. Why not 3850?*

9. Is the method of production changed as the variable input is changed in quantity?*

10. Explain in words how a typewriter or an additional 500 square feet of office space has an identifiable MPP.

11. Define VMP. Relate it to MPP in both words and with an equation.*

12. Prove that inputs are paid their value contributed to production.

13. Illustrate this proof with a diagram.

14. In the diagram, why does the curve slope upward over a range?*

15. What is its maximum?*

16. What does the downward slope represent?*

17. In the diagram, how is the height of the wage line determined?*

18. Why not hire more than E in Fig. 6-1?*

19. Why not hire less?*

20. When quantity E is hired, what is true?*

21. On the diagram, what area represents wages paid to the variable input under consideration?*

22. On the diagram, what area represents profits?*

23. (The next two questions are relatively technical and unimportant.) What does the area bounded by the VMP above the wage line show?*

24. What area represents the total revenue of the firm?*

25. Are workers paid value contributed because employers try to be fair? If not, then why?*

26. What is the main point of the discussion entitled "Can Input Proportions Be Varied So Finely?"*

27. Explain the meaning of the equation:

$$MPP_a Q_a + MPP_b Q_b + \ldots + MPP_n Q_n = TP.*$$

28. What does "a" represent?*

29. What does Q_a represent?*

30. What does $MPP_a Q_a$ represent?*

31. Under what assumed production conditions does this equation hold true?*

32. Explain the equation:

$$VMP_a Q_a + VMP_b Q_b + \ldots + VMP_n Q_n = TR.*$$

33. What does VMP_aQ_a represent?*

34. Where are the firm's profits in this equation and what do they represent?*

35. How does this equation relate to the Marxian theory of surplus value?*

36. Does the equation say or prove that wages equal value contributed?*

37. Must companies hire one by one to bring about the result that W = VMP? If not, explain.*

38. What does the demand for labor show?

39. What follows from its downward slope?*

40. Why does it slope downward?*

41. What does the supply of labor show?

42. What is meant by a "determinant" of the demand for or supply of labor?

43. What are the determinants of the demand for labor?

44. What are the determinants of the supply of labor to an occupation?

45. What happens to which curve if most employers discriminate against a group?*

46. If employees discriminate?*

47. Describe the equilibrium explanation technique, EET.

48. Relate it to the equilibrium of Figs. 2-3 (why output should be 15,000), 2-4, and 6-2.

49. Using the EET, explain how wages and the quantity employed are determined by demand and supply, giving detailed explanations of why wages could not be other than equilibrium and what actions people would take if wages were above or below equilibrium.

50. With a diagram, show a labor surplus.

51. What is another name for labor surplus? What causes it?*

52. Is everyone without a job considered unemployed? Who is? Who isn't?*

53. Distinguish the remedy for widespread unemployment in a major recession and for local unemployment in a few occupations or industries.*

54. Why the distinction?*

55. How can wage differences within a given skill and area be reconciled with the theory which says they should not exist?*

56. Give two reasons why competitive income distribution (W = VMP) contributes toward economic efficiency.*

57. Discuss the fairness of competitively determined income distribution.

58. Should different criteria be applied in evaluating the fairness of wage income and property income? Why or why not?

59. What are the various sources of income inequality?

60. Is income equality a reasonable goal? Why or why not?

61. Will workers be satisfied to receive the competitive wage? Explain.*

62. Contrast wage or VMP with the moral worth of a person.

63. Whose fault is it if the average liquor salesman earns three times as much as the average nurse?*

64. Evaluate the competitive income distribution by the standard of living competitive income recipients will have.*

65. Evaluate competitive income distribution as it relates to individual freedom.

66. Using a diagram, explain why the only wage-employment combination compatible with worker-employer freedom is the competitive equilibrium.

67. With a diagram, show the quantity drafted into the armed forces.

68. Does efficiency require that everyone maximize income? Explain.

Answers to starred questions.

3. Only units of output have ascertainable value; activities which contribute to output do not.

4. Units of output.

5. In principle by the correct experiment for determining the MPP: how revenue or output changes from a change in the quantity of the input, with all inputs optimally assigned before and after the change.

7. $8 \times 200 = 1600$; not $4000 - 150 = 3850$.

8. If all other human and nonhuman inputs' contribution were so calculated, the sum contributed by all would greatly exceed the actual output. By the correct method, $MPP_a Q_a$, the total contributions attributed to each input equal the total output, according to the equation of #27.

9. Yes, though perhaps slightly. Optimal reassignments are assumed.

11. VMP is the money value of the MPP. VMP is in dollars; MPP is in units of output. VMP = MPP times produce price.

14. Increasing returns.

15. The point of diminishing returns.

16. Diminishing returns.

17. The wage line is the competitive wage determined outside the firm by demand and supply, Fig. 6-2.

18. The cost of another worker (wage line) exceeds the revenue (VMP).

19. The revenue from hiring another worker (VMP) exceeds the cost (wage line), so profits (revenue less costs) are raised by adding another.

20. Profits are maximized and wage equals VMP; each worker is paid the value of his contribution to production.

21. Wage times quantity hired: the area of a rectangle formed by the height of the wage line and the distance on the quantity axis up to E.

22. No area shows this.

23. This area, minus the triangular area between W and VMP before W cuts VMP, equals profits plus the value contributed by other hired inputs. (This point was not explained in the text.)

24. The area under the VMP, between VMP and the quantity axis up to the quantity employed, E. This is another way of saying that total output is the sum of the MPP's up to any given quantity of the inputs. You can see this from Table 5-1. Derive column (2) by adding up the numbers in column (3).

25. No. Because employers must compete for workers and they maximize profits where W = VMP.

26. That a VMP can be derived and W = VMP even if input proportions could not be varied in producing individual products, as long as input proportions differ from one product to another. The proof is not given in this book.

27. The total product (TP) exactly equals the sum of the MPP's of each input, where for any type of input, a, the MPP of every "a" is viewed as the MPP of the last "a" employed.

28. A type of input like typists or unskilled labor or accountants.

29. The quantity of the "a"s employed.

30. The total contribution to output of all the "a"s employed.

31. Production technology is such that if all inputs are increased or decreased by the same proportion, output will change by this proportion. (Mathematically, this implies that a production function, relating output to quantity of inputs, is homogeneous of the first degree.)

32. The sum of values contributed by each input exactly equals total revenue of the firm, where each input's contribution is measured by its VMP.

33. The value contributed by all the "a"s employed.

34. The profits will be the value contributed by the inputs owned by the company (minus interest on loans used to purchase these inputs).

35. When, as under competition, each input is paid the value of its contribution to production, profits being value contributed by nonhuman inputs, no surplus is left which represents value workers contributed but did not receive.

36. No. This is reasoned separately and is true only if employers hire competitively, whereas the equation will be true anyway.

37. No. Companies merely have to follow the rule: hire inputs if it pays and don't if it doesn't pay. If they hire competitively, wage will equal VMP

without their being aware of it. Employers do not have to understand the economic theory explained here. In fact, few do.

39. The lower is the wage, the more employed.

40. Mainly diminishing returns.

45. The demand for the disfavored group declines, so their wage will be lower.

46. There will be a decrease in the supply of labor to the occupation or to the employers who hire the disfavored group.

51. Unemployment. The wage is above equilibrium.

52. No. Unemployed: without job and seeking work at the prevailing wage or less.

53. Monetary-fiscal policy for widespread unemployment to raise total spending; wage reductions for localized unemployment.

54. Wage rigidity makes overall deflation an impractical goal against a recession; monetary-fiscal policy against localized unemployment would cause inflation without reducing the unemployment much, if any.

55. Within-occupation differences in productivity, differences in fringe benefits, ignorance of alternatives by employers and workers, movements toward an equilibrium.

56. (1) Workers seeking higher income will contribute more; (2) Employers who minimize money cost will also minimize real cost.

61. No. Neither workers nor employers are aware that wage equals value contributed to production.

63. Consumers'.

64. Competitive income and the living standard provided depend on value contributed; they may be high or low.

7

Who Does What Jobs

The Meaning Of This Decision

So far, we have discussed three basic decisions of economic organization: what, how, and for whom to produce. Now we turn to "by whom," the problem of labor allocation. What determines the number of people who will be lathe operators in Cincinnati, fishermen in San Diego, metalworkers in Atlanta, or typists in Boston? What assures that there will be enough but not too many in each occupation, industry, and area? What brings about appropriate changes in input allocation and makes appropriate adjustments for retirements, migration, and changes in population size or age distribution? What determines the flow of nonhuman input services from owners to users? Again, under competitive private enterprise, important roles are played by the search for personal gain, guided by prices (including wages) and profits.

One might well ask whether this decision was not covered in who gets what is produced. However, "who is going to do what" and "who is going to get what" are separate questions. The answer to one need not depend on the answer to the other, though it does under private enterprise. Indeed, as we saw, the demand for and supply of labor determine both the wage rate and the quantity employed. And shifts in demand and supply cause shifts in both wages and employment.

In this chapter we explain further the role of worker preferences (labor supply) in affecting labor allocation and wages. Then we consider the effects on wages and labor allocation of occupational licensing, labor unions, and monopsony.

Worker Preferences And Labor Allocation

Occupational choice. Freedom of occupational choice is one of the basic libertarian developments which characterised the transition from the

feudal society of privilege, class, and status to the capitalist society of personal initiative, social mobility, and economic growth. Throughout much of recorded human history, one's occupation was determined by that of his parents—peasants remained peasants, slaves remained slaves, craftsmen's sons learned their fathers' skills, and the nobility's progeny remained noble. To aspire otherwise was often regarded as a blasphemous rejection of God's choice of one's station in life. An individual's freedom to improve his lot in life was largely denied.

The same suppression of initiative has occurred under the caste system of India, where occupations were alloted to certain castes. In modern times, occupational choice has been restricted in Communist nations, especially under Stalin and Mao, where the government allocated people in accordance with national objectives without regard for individual preference. And one aspect of South Africa's Apartheid policy is to preserve certain occupations as the privilege of white people only.

Since income depends on occupation and the standard of living depends on income, the freedom to select occupations, taken together with subsidized public education, provides one from a low-income family and with normal capabilities the opportunity through individual effort to improve his position in life. In an era of concern about eliminating poverty both in America and abroad, it is well to recall these past impediments to occupational choice and their negative effects on initiative and advancement. For there are indications today of increasing barriers to occupational choice in America.

Freedom of occupational choice, which is characteristic of competitive private enterprise, does not mean one is guaranteed a job or a particular salary in the occupation of one's choice. It means the freedom to make employment agreements with others. But with this freedom, anyone with the skills required in an occupation (and without severe personal shortcomings like an uncontrollable urge to punch the boss in the nose) will be able to find employment in the occupation of his choice at about the going wage.

Of course, worker preference is not the only determinant of labor allocation. As noted in Chapter 6, worker preference is one of the determinants of labor supply. But the quantity actually employed is determined by supply *and* demand, neither one alone.

Worker preference and wage differentials. Worker preference is frequently the cause of wage differences between occupations or areas, as between teaching (generally regarded by those in other occupations as a soft job with no ulcerating pressures) and work in private industry, or between working in a large city with high commuting and housing costs and work in a small town where inexpensive single-family houses are available on large lots only a 15-minute drive or walk from work. (Such pedestrian aspirations assume increasing importance with the disillusioning force of age and experience.)

The effects of worker preferences on labor allocation and wages are seen from Fig. 7-1. Suppose we start with accountants' wages the same in big cities and small towns, both w_1. Then there is a change in worker preference (which does not affect demand) against big city sophistication and for the simpler amenities of small towns. A movement of workers from the big cities to the small towns will cause shifts in supply. Supply decreases S_1 to S_3 in (a), the big cities, and increases, S_1 to S_2 in (b), the small towns. The resulting wage differential, w_3/w_2 now reflects workers' residential preferences. Given these preferences, any attempt to eliminate this differential, by law or by unions, would inevitably infringe on some workers' living and working where they prefer. That is, given the new supply curves, a forcible return to the original equilibria at w_1, q_1 would curtail personal freedom, as explained with Fig. 6-3. In both areas, workers will be paid their value contributed. Competing employers will still hire quantities up to where W = VMP, in big cities were VMP = w_3, in small towns to where VMP = w_2.

The same principles apply to wage differences by region. If everyone (or most everyone) wants to live in sunny Florida, supply will rise, driving wages down until an equilibrium is reached where there is no incentive to shift further. And between two occupations, such as science teacher and engineer (assuming the required abilities are the same), a differential w_3/w_2 would again reflect preferences for teaching. And an attempt to eliminate the differential by raising the wages of teachers relative to engineers would reduce the quantity of teachers employed (mainly by failures to replace those who quit) and deprive some prospective teachers of their freedom of occupational choice.

Another reflection of worker preference is the movement toward a four-day work week. TGIF, Thank God It's Friday, is giving way to TGITh. This is simply a continuation of the trend of over 100 years for people to take some of their higher real income in the form of leisure as well as more goods and services. In many companies, this trend now shows up as 4 days at 9 or 10 hours a day. This means fewer commuting trips and may also bypass the worst rush-hour traffic. In fact, some companies are trying three 12-hour days. As this catches on, it will expand rapidly. And so will "moonlighting" by those who prefer a second job on their long weekends. In West Germany, many firms, including the airline Lufthansa, allow some employees to set their own hours for arriving and leaving work (within reason). This is especially convenient for working mothers, but also for those with a strong preference for arising early or sleeping late.[1]

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[1] An article on the short work week is in the *New York Times Magazine,* May 16, 1971. For variable hours in West Germany, see the *New York Times,* July 12, 1971.

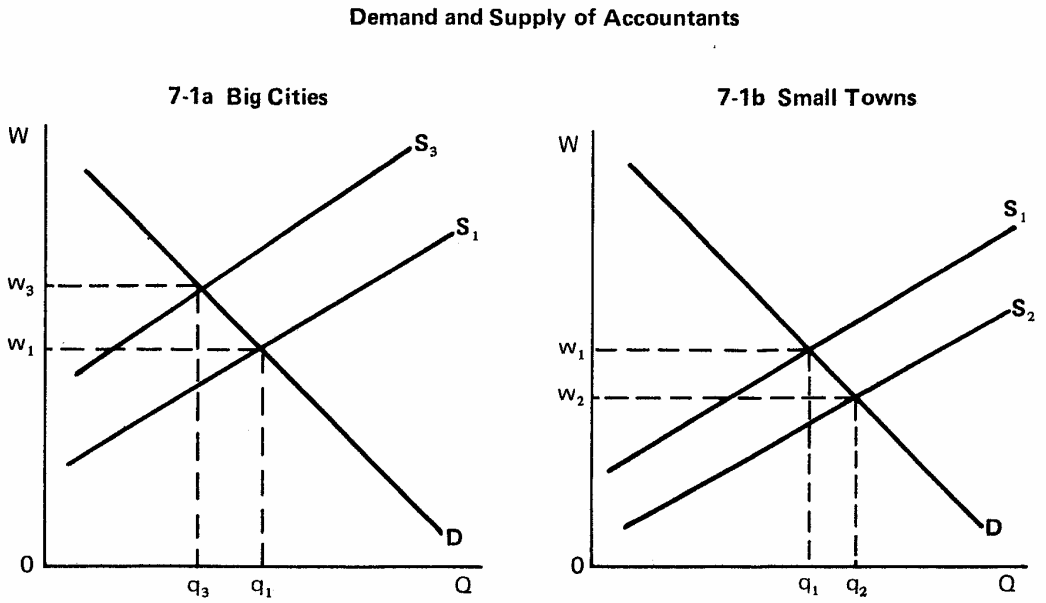
FIGURE 7-1 Worker Preferences Cause Wage Differentials

Initially big city wage equals small town wage: w_1

Worker preference for small-town living causes:

In big cities (a)
Decrease in labor supply, S_1 to S_3
Rise in wage, w_1 to w_3
Decrease in employment, q_1 to q_3

In small towns (b)
Increase in labor supply, S_1 to S_2
Reduction in wage, w_1 to w_2
Increase in employment, q_1 to q_2



The unpleasant jobs get done. If worker choice is important in determining labor allocation, why does anyone do the more unpleasant jobs—the physically hard, dirty, dangerous, and those at inconvenient places and hours? Because if "too many" entered the pleasant jobs and left the unpleasant ones, then from diminishing returns and declining product prices, wages would fall in the pleasant jobs and rise in those which workers abandoned. Eventually the wage difference between unpleasant and pleasant jobs would be great enough so some people would feel it worthwhile to do the unpleasant tasks. An equilibrium allocation occurs when the wage difference just compensates the least willing workers in the unpleasant jobs so they have no incentive to shift. Still, many of the unpleasant jobs seem to have low pay. This indicates that those in them have low productivity and are not qualified for many other occupations (or they just don't mind the conditions as much as others would).[2]

The Lump Of Labor Fallacy

There has been much concern whether "enough jobs will be created" to provide employment for the rising numbers of people reaching labor force age, 18-22, and for those displaced by automation. Some people apparently feel that at a given time there are just so many jobs to go around. In his *Economics,* Professor Samuelson calls this the "lump of labor fallacy." But as the downward-sloping demand curve shows clearly, the quantity of labor employers want to hire varies inversely with the wage rate; so the number of jobs depends on wage rates: the lower the wages, the more employers will hire. If the supply of labor in any occupation rises, there will be jobs for all at *some* wage.

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[2] Fortunately, everyone doesn't have the same tastes about non-monetary job conditions. For example, Tom West earns $8.40 an hour plus fringe benefits as a "top connector," doing the most difficult and dangerous work placing steel beams in the construction of high rise buildings. He says, "The money is pretty good, I'm out in the air and I like the guys I work with. I like being able to do something that scares the hell out of other people." Quoted from a *Wall Street Journal* article, March 4, 1971.

On the other hand, non-monetary job attractions are so great at Colorado ski resorts that college graduates are found washing dishes and sweeping floors at low wages. Even so, wages are above equilibrium and jobs are chaotically allocated, with over 20 applicants for each opening. Some unemployed people hang around restaurants and hotels and snap up the jobs of late or absent workers. (*Newsweek,* Dec. 20, 1971.)

Another *WSJ* article of July 22, 1971 describes the resigned acceptance of boring jobs like coin-changer in a subway booth, traffic monitor in a tunnel, charwoman, laundress, and seamstress. Some people prefer a simple routine without much responsibility.

However, this does not mean that wages will in fact have to fall as labor supply rises over the next decade, because other forces—better education, more capital per worker, and technological advances—are tending to raise worker productivity and wages, while increased labor supply tends to lower wages. Experience suggests that the forces pushing upward will predominate. Anyway, if wages are left to competitive market forces, there will automatically be "enough jobs."

The lump of labor fallacy crops up occasionally in proposals to compel students to remain in school and older workers to retire before they wish, in order to "preserve jobs" for people ages 20-65. Another target of this fallacy is "moonlighting"—holding a part-time job along with a full-time one. An AF of L convention in Washington, D.C. condemned teachers in nearby Maryland for helping paint schools, on the grounds that this deprived painters of work as well as having undercut union wage rates.

Adjustments in Input Allocation to Changes in Consumer Tastes[3]

The joint roles of consumer and worker choice as well as the signalling effect of wages in allocating labor can be seen in tracing the effects on input allocation of a change in consumer tastes. Suppose consumer preferences switch from guitars (G) to banjos (B). For simplicity, assume the same skills are employed in making each product and that companies which make one product don't make the other. The following sequence may occur to get labor shifted from G to B:

1. Consumer preferences shift from G to B.
2. The rise in the demand for B will raise B prices, thereby raising the VMP of labor in B, thereby raising the demand for labor in B.
3. The rise in the demand for labor in B will lead to a rise in wages in B.
4. Simultaneously, the decline in the demand for G results in a reduction in G prices, therefore a reduction in the VMP of labor in G and a reduction in the demand for labor in G.
5. The reduction in the demand for labor in G leads to a reduction in wages in G.
6. The rise in wages in B and decline in G gives workers incentive to shift from G to B.
7. As labor supply increases in B, wages there will start to fall (from the higher level of step 2) and so will prices of B.
8. As workers leave G, wages will start to rise from the lower level of step 5.

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[3] This elaborates on the seven steps of Chapter 2, depicting how price and profit changes lead to shifts in production when consumer tastes change.

9. An equilibrium will be reached when no one has incentive to shift further. If there are no nonmonetary preferences, wages will be the same in both G and B for a given occupation, as they were before the change in consumer demand.

Thus, through the forces of the "invisible hand," inputs are employed in accordance with consumer tastes, without central direction and even though input owners are seeking their own ends, not explicitly those of consumers. Any impediment to the above wage changes will thwart the adjustment of inputs and outputs based on consumer choice.

Actually, a shift of employment from G to B might occur with much less explicit movement from G to B and with less wage adjustment. Since well over 10% of production workers quit jobs every year anyway, and many people enter and leave the labor force every year, employment can contract simply because those leaving (from G) are not replaced and employment can expand (in B) from new entrants into the labor force and from those who have quit other jobs for various reasons.

Now let us expand the directional arrow technique to describe the adjustments in prices, wages, employment, and profits by which inputs and output adjust to a change in consumer tastes. This time we'll use ratios: $\frac{P_B}{P_G}$ refers to the price of banjos relative to the price of guitars. Therefore, $\uparrow\frac{P_B}{P_G}$ means P_B is rising *and/or* P_G is falling. Similarly, $\frac{Q_B}{Q_G}, \frac{W_B}{W_G}, \frac{E_B}{E_G}, \frac{D_{iB}}{D_{iG}}$ refer to respective banjo/guitar ratios of output, wages, employment, and demand for inputs, and $\left(\frac{Pr}{I}\right)_B \Big/ \left(\frac{Pr}{I}\right)_G$ denotes the ratio of respective investment returns (profits/investment) in making banjos and guitars.

We start at an equilibrium where $\left(\frac{Pr}{I}\right)_B = \left(\frac{Pr}{I}\right)_G$ = the competitive return on investment and $W_B = W_G$ equals the competitive payment for each kind of input (assuming there are no inputs completely specialized to B or G).

There is a rise in consumer preferences *from* guitars *to* banjos. The following will then occur to bring about a new equilibrium:

$$\uparrow\frac{D_B}{D_G} \rightarrow \uparrow\frac{P_B}{P_G} \rightarrow \uparrow\left[\left(\frac{Pr}{I}\right)_B \Big/ \left(\frac{Pr}{I}\right)_G\right] \rightarrow \uparrow\frac{D_{iB}}{D_{iG}}$$

$$\downarrow \frac{W_B}{W_G} \text{ until once again } W_B = W_G.$$

$$\rightarrow \uparrow \frac{W_B}{W_G} \text{ and } \uparrow \frac{E_B}{E_G} \nearrow \searrow \uparrow \frac{Q_B}{Q_G} \rightarrow \downarrow \frac{P_B}{P_G} \rightarrow \downarrow \left[\left(\frac{Pr}{I}\right)_B \Big/ \left(\frac{Pr}{I}\right)_G \right] \text{ until once again}$$

$$\left(\frac{Pr}{I}\right)_B = \left(\frac{Pr}{I}\right)_G.$$

When the process is complete, E_B and Q_B per year will be higher than before the taste change, while E_G and Q_G will be at lower rates. The price ratio, $\frac{P_B}{P_G}$, may end up higher, though not necessarily. The same qualifications mentioned on p. 26 apply in case investors correctly anticipate the change before it occurs or if they overestimate it or underestimate it. Of course, in the real economy, thousands of such changes, not only in consumer preferences, but also in worker preferences, technology, and availability of nonhuman resources, occur continuously. Ideally, changes in relative prices of inputs and outputs and in profits guide economic activity toward the equilibrium consistent with consumer, worker, and investor choice.[4]

Efficient input allocation does require knowledge of alternatives on the part of input owners. However, if in each occupation a core of workers are aware of a few alternatives, this diffused but overlapping knowledge may be sufficient. (See Chapter 10 on knowledge of alternatives.) One economist has stated that, except for choosing a spouse, the selection of an occupation is probably the single most important decision required of a free individual. But selecting an occupation is not quite as irrevocable as getting married, though both are becoming less so all the time. It is quite common for young people to shift jobs frequently in their first few working years, just as it is not unusual for college students to change "majors" once or twice. The past few years have seen greatly improved testing and counselling services to aid in occupational (as well as marital) choices.

Short Run, Long Run Adjustments

Another view of how changes in demand and wages redirect workers is seen in Fig. 7-2. $S_{Long\ run}$ is the long run supply curve of labor in the occupation. It is what heretofore has simply been *the* supply. But people can't conveniently change jobs on short notice, though some do. $S_{Short\ run}$ shows the quantities of labor willing to work at various wages with only a short time to adjust to a wage change and assuming that the wage starts at w_1 and the quantity employed at q_1. The steep slope of $S_{Short\ run}$ indicates

[4] It bears repeating that wage and price controls such as instituted in 1971 severely impede the changes in relative prices and wages which guide inputs and outputs to produce what consumers prefer.

FIGURE 7-2 Short-Run, Long-Run Adjustments

In (a) where labor demand rises

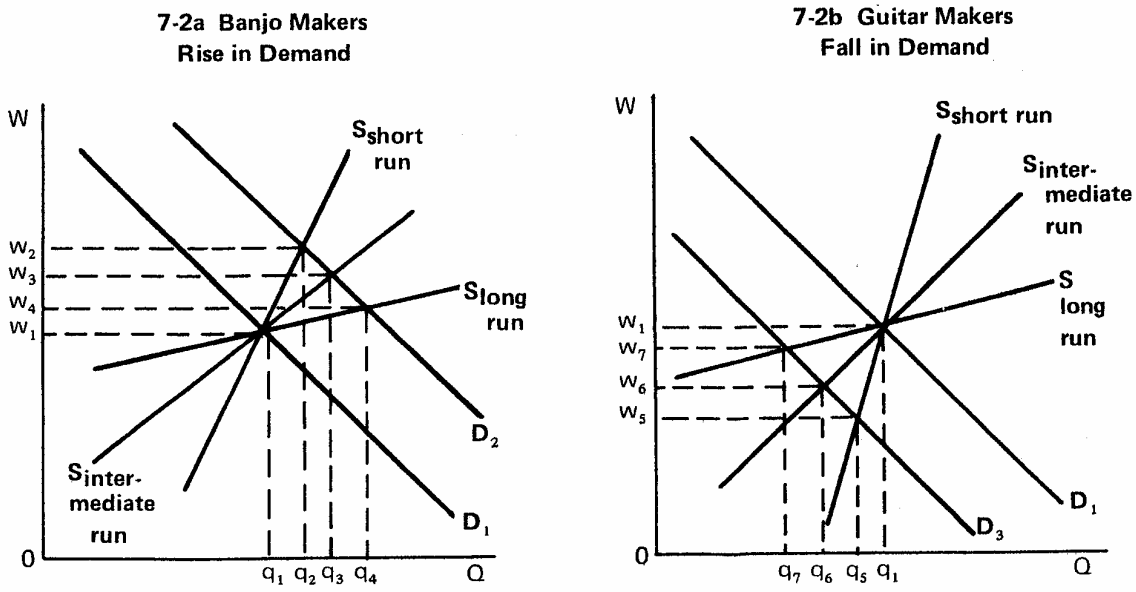
Short run { Wages rise w_1 to w_2
Employment rises q_1 to q_2

Long run { As more workers enter, wage falls w_2 to w_3 to w_4

In (b) where labor demand falls

Short run { Wages fall w_1 to w_5
Employment falls q_1 to q_5

Long run { As more workers leave, wage rises w_5 to w_6 to w_7



Workers move from guitar making to banjo making

that not many more people are available on short notice at greatly higher wages and not many leave on short notice if wages drop. $S_{Intermediate\ run}$ shows the same thing with a bit longer time for adjustment, say 6 months. $S_{Long\ run}$ is the supply curve with full time for adjustment. This may be a year in a job that requires little training or that is similar to other occupations. It may be 5 or 10 years in an occupation like medicine or college teaching, which requires 4 years of post-graduate training. Through *any point* on a long run supply curve, there is a family of short and intermediate run curves. Only that family at the starting wage-quantity point is relevant for a given problem.

When the demand for banjo makers rises, the wage rises to w_2 initially. Then as more workers enter, it falls gradually until the new equilibrium is reached at w_4, q_4. Meanwhile in guitars, the wage falls to w_5 when demand first drops to D_3. Then as workers leave the occupation, it rises to its new equilibrium at w_7. (This long-run, short-run discussion amplifies why at a given time there may be wage differences for given occupations because of temporary disequilibria.) If banjo making and guitar making are very similar, the long run supply curves in both will be flat (infinitely elastic) and $w_1 = w_4$ in banjos = $w_1 = w_7$ in guitars. The short run rise in banjo wages gives workers incentive to hurry there and the short run drop to w_5 in guitar wages gives incentive to move out of there.

This distinction between short run and long run adjustments applies throughout economics to changes in demand or supply or to the imposition or removal of commodity taxes, tariffs, price supports, or price ceilings. Elsewhere, we have concentrated on the long run equilibrium positions without diagramming the path of movement from one equilibrium to another. And other paths than the one described here are possible, especially if the change in demand itself is gradual and predictable, instead of sudden as assumed here.

Barriers To Occupational Freedom

Most people today would probably agree that freedom of occupational choice is the fairest arrangement for allocating people among occupations. Yet some people frequently support arrangements which impede occupational choice, partly because these arrangements promote other objectives, but also partly because people do not understand how some arrangements affect occupational choice. In this section, we consider two such restrictive arrangements: occupational licensure and collective bargaining.

Occupational licensure. This is a requirement by law that in order to enter some occupation, one must acquire a license from the government.

Licenses are required of the following: doctors, lawyers, barbers, plumbers, real estate salesmen, insurance agents, stock brokers, cab drivers, tree surgeons, potato growers, prizefight promoters, and egg graders, to name a few. Ostensibly set up to protect consumers from incompetent practitioners, occupational licensure is usually used to restrict entry into an occupation, so those in the occupation will receive higher incomes than if there were free entry. Licensing laws, enacted mainly by state and local governments, have these general characteristics: (1) promoted initially by those already in the occupation, not by dissatisfied customers, (2) establish training and/or apprenticeship requirements in excess of those met by many already in the occupation, (3) licensing boards to establish requirements and evaluate applicants are composed of those already in the occupation,[5] and (4) less frequently, requirements which have nothing to do with competence in the occupation, such as non-Communist loyalty oaths or a patriotic attitude.[6]

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[5] In some states to become a real estate salesman one must not only pass a state exam but to take the exam one must first be employed and sponsored by a licensed broker, and to become a licensed real estate broker, one must be a licensed real estate salesman for several years. Thus, the "ins" can restrict entry.

Another example of delegation of restrictive power to the "ins" is in the admission to America of performing artists—musicians, actors, and dancers. To compel American consumers to patronize American performers, foreigners may receive work visas only if they have "exceptional merit" and qualities not available in the U.S. The evaluation of the merit of pop singers is delegated by the immigration authorities to a union, usually the American Federation of Radio Artists, whose executive secretary decided in 1965, for example, that American consumers should not watch live performances of the Zombies and the Mindbenders, then two of the top recording groups in Britain and America. (*New York Times*, April 25, 1965.) Whether this argues for or against such restrictions we leave to the reader.

In the early 1970's, many states have enacted laws to license new-car dealers. Touted as protection for dealers from aggressive sales pressure by manufacturers and as protection for consumers' warranty rights (which separate laws could accomplish), these laws have restricted competition and freedom. In Texas, for example, the newly created commission has six members, four of them dealers. They denied two people permission to open Dallas dealerships (one Toyota, another Volkswagen) when the existing dealers of these cars protested that there was no public need for more dealers (even though the manufacturers and prospective dealers obviously thought otherwise). The burden of proving a public need is on the applicant and manufacturer, according to the GM dealer who heads the commission. (Reported in *Business Week*, Jan. 8, 1972.)

[6] Such irrelevancy is standard practice in boxing. Ernie Terrell was denied permission to box by the New York State Athletic Commission because he had associated with someone who in turn had associated with someone who in turn had associated with a reputed underworld figure. The commissioner intoned that it would be "detrimental to the best interest of

Occupational licensure clearly fits into our reasons for studying economics, discussed in Chapter 1. The group which benefits (those already in the occupation) is highly conscious of how legislators vote on occupational licensing, while the general public (which loses) is unconcerned and/or unaware, and a plausible argument (protecting consumers) is offered to justify the special interest legislation. The other losing group, people who would have entered the occupation under free entry, having sought employment in other occupations, are generally unaware of the reason why they were deterred.

On the whole, without licensure, incompetent people will fail because of employer or consumer rejection, though sometimes consumers may prefer low quality service for a low price. Without licensure, where customer evaluation of competence is difficult, a private association could form and establish stringent admission requirements. Those consumers wanting assurance of competence could patronize only members of the association. This occurs in real estate appraising, where several national associations exist. As long as nonmembers of the private association can legally practice in the occupation, this device cannot effectively restrict entry into the occupation. Also, the government could require practitioners to display their qualifications—diplomas, etc., without restricting the entry of those who lack such qualifications. Or, the government could give a certification test, but allow anyone to practice whether he passes the test or not. This occurs in accounting where one may be an accountant without passing the certified public accountant's exam. The consumer or employer can decide for himself whether he needs a C. P. A. We cannot pursue fully the question whether all licensing should be abolished, but only indicate that occupational licensing is

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professional boxing" to allow Mr. Terrell to engage in his chosen occupation. The same commission refused Sonny Liston permission to box because of Liston's prior criminal record—again "detrimental to the. . . ." In 1967, Muhammad Ali was prevented from boxing with Floyd Patterson in several cities (the bout eventually cancelled), because of Ali's opposition to the Vietnam War. Even closed circuit television of Ali's 1966 match with George Chuvalo was banned in Boston, Miami Beach, and San Antonio.

Why can't consumers decide whom they want to patronize? If proper patriotism is a reasonable prerequisite for boxing, why not for truck driving, accounting, barbering, and every other occupation? Then what's left of personal freedom, if a government official can arbitrarily pass on one's entitlement to enter an occupation on such grounds? Everyone would have to tailor his conduct to the whims of this official.

Sometimes licensors consider themselves guardians of the community's morals. Housewives of New York may oppose their husbands' long hair styles with the comforting assurance from the Secretary of State of New York that a woman barber may not wear a see-through uniform or serve cocktails. (*New York Times*, July 10, 1969.)

a growing phenomenon which as currently administered threatens freedom of occupational choice.[7]

Collective bargaining and occupational choice. Collective bargaining, through labor unions, is an arrangement whereby those in a particular

[7] Two critiques of occupational licensure are W. Gellhorn, *Individual Freedom and Government Restraints,* Louisiana State University Press, 1956 and M. Friedman, *Capitalism and Freedom,* Ch. 9, University of Chicago Press, 1962. Gellhorn favors reforming licensing procedures; Friedman, with extended attention to medical licensure where the case is strongest for licensing, favors abolition of all licensing.

A vast expansion of inexpensive medical services might result from altering laws to permit lesser-trained people to perform many routine functions now done by doctors, thereby conserving M.D.'s for more complex and critical medical problems. For example, eye-care is provided by lesser-trained optometrists as well as by ophthalmologists. On the growing use of "assistant doctors," see lengthy feature articles in the *New York Times* (11/30/69), *Wall Street Journal* (8/4/69 and 4/23/70) and *National Observer* (2/5/72). The last notes that many military medics retire after 20 years of medical experience, preceded by 600 to 2000 hours of training at a cost up to $25,000. Yet they enter such jobs as truck driver or insurance salesman because most state laws prevent them from performing responsible medical work. Where allowed (Washington is a pioneer state), assistant doctors working with regular M.D.'s have been the decisive factor enabling some small towns and rural areas to retain medical service. Twelve states have followed Washington's lead and others seem about to.

The licensing requirements for lawyers are used to suppress competition and to keep lawyers' income up. In 1965, William F. Dacey wrote a book pointing out exorbitant fees charged by lawyers in probating wills and

"Dissolve two aspirins in a pail of water, pour it around the roots and call me again in the morning."

employment situation (company, occupation, and/or industry) agree not to work for less than a particular wage. They expect that their employer(s), if faced with the sudden withdrawal of all workers in the bargaining unit and especially if unable to recruit replacements, will be induced to pay them a higher wage than if wage agreements were made individually and if the employer were free to hire other workers than those already working for him (or in the union). We shall assume that in fact collective bargaining does raise wages for those in the bargaining unit.

Now what has this to do with occupational choice? Remember that the market forces which determine wage rates simultaneously determine also the quantity employed. As noted already, because of diminishing returns and the possibilities of substituting one type of input for another, the employer's demand for labor is such that the higher is the wage he must pay, the smaller is the quantity of labor he will hire. Therefore, the result of any collusive agreement among workers which pushes the wage above what it would have been under competition is that employers hire fewer workers than they would have without the collusion.

This is illustrated in Fig. 7-3. Part (a) is a unionized occupation, say machinists, in which W_1 is the competitive wage that would exist without the union. Suppose the union forces the wage to W_2. If employers are free to hire as many as they wish as long as they pay the union scale, W_2 – and this is generally the case, they will hire Q_2. A lot more would like to work at W_2. This is shown by the supply curve at W_2, though the quantity is not marked off.

Thus, there will be a chronic labor surplus in the occupation.

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included sample legal forms so readers could avoid such expenses. In both New York and Connecticut, he was convicted of criminal contempt for practising law without a license and his book was banned (after sales of 750,000). The convictions were later overturned, but the efforts to prosecute initiated by the bar associations revealed their anti-competitive views. In 1969, two New York lawyers received court threats of disbarment (loss of license to practice) for unethical conduct for putting signs in their windows in large gold letters announcing their availability as lawyers and stating "Tax Returns Prepared. Notary Public." The court ruled: "Indubitably a lawyer has the right to place his name on the entrance to his office and to state that he is an attorney. The purpose is, however, to let those know who are seeking him where he is located, rather than to advise persons seeking a lawyer that one can be found within." Thus, only name and profession are permitted. Anything else is "unethical solicitation." Posting low fees to attract customers would be unthinkable. (*New York Times,* April 19, 1969.)

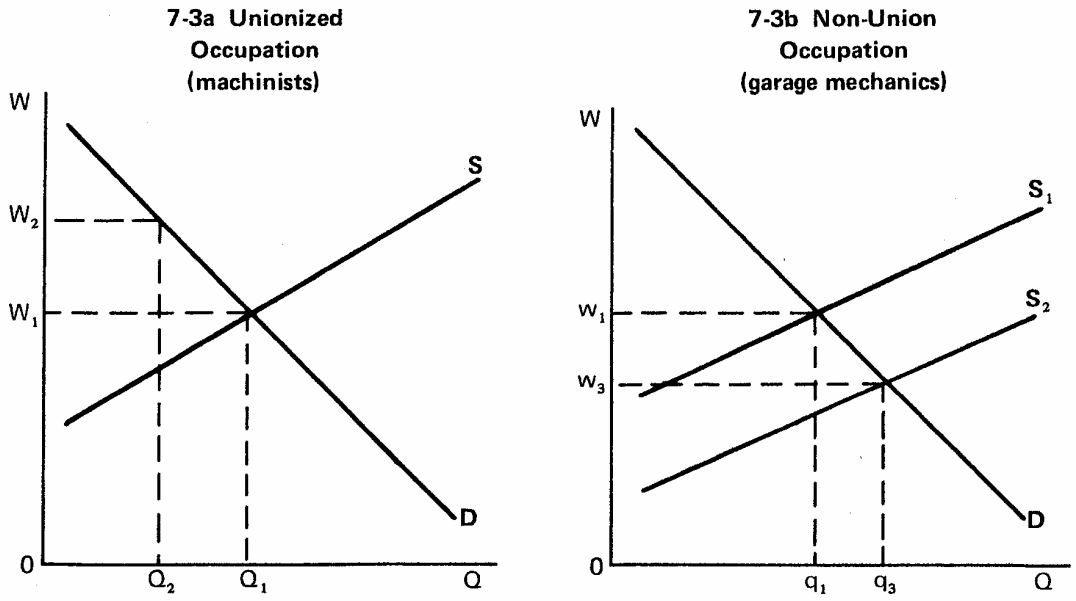
The legal profession is also resisting suggestions that lesser-trained people called "paralawyers" be allowed to practice narrow specialties like real property or family advocacy after a one year course. Many housewives and moonlighters could have such part-time practices, thereby greatly increasing the supply and reducing the prices of legal services. Such restrictions impair the freedom of both consumers and those who would serve them.

FIGURE 7-3 The Effects of Labor Unions on Wages and Employment

The competitive wage is:
W_1 in (a) and w_1 in (b)

In (a), the union causes:
A higher wage, W_1 to W_2
Reduced employment, Q_1 to Q_2
Chronic labor surplus
Non-price job rationing

In (b), because of the higher wage and reduced employment in (a),
Labor supply rises, S_1 to S_2,
as workers shift from (a) to (b)
Wage falls w_1 to w_3
Employment rises, q_1 to q_3
Freedom of occupational choice is curtailed for potential machinists



Eventually, most of these surplus workers will seek employment elsewhere. Since there are far more non-union than union occupations, we cannot say which occupations they will move to. And actually most won't "move" to any. If the union has existed for many years and kept wages above the competitive level all this time, this difference, Q_1 to Q_2, will never have been hired in the first place. Nevertheless, this difference, who would have been employed in the union occupation if not for the above-competitive wage, will seek employment elsewhere.

Now turn to Fig. 7-3b. S_1 shows what the labor supply would be if the wages in the unionized occupation(s) were at the competitive level. S_2 shows the increased supply which results from the influx of workers, Q_1 to Q_2 of Fig. 7-3a, who seek work in non-unionized employment, such as garage mechanics. Whether workers *move from* machinist to garage mechanic is irrelevant. The supply in (b) is greater than it otherwise would be because of the reduced employment in (a), in turn, because of the higher wage in (a). (We have not drawn a reduction in supply in Fig. 7-3a, even though employment is less, because the willingness to work there at various wages, which by definition *is* the supply, has not changed.) Clearly, with S_2 in the non-union occupation, the equilibrium wage is reduced in (b) from w_1 to w_3. (It is not necessary that $(Q_1\text{-}Q_2)$ in (a) equals $(q_3\text{-}q_1)$ in (b), since garage mechanics is one of many occupations that would-be machinists would enter.)

Union leaders often claim that wage increases won by them lead to higher wages for all labor and also to increased purchasing power which aids the economy. Well, it just isn't so. Both economic reasoning and available evidence suggests that (except for employers trying to stave off unionization) union wages cause reduced employment in the unionized industry or occupation, leading to greater labor supply in other occupations and lower wages there. The rise in general living conditions in America, both before and after unions became powerful, has resulted from the rising productivity of labor, caused in turn by education, technological change, and increased capital per worker.[8] Purchasing power or total spending can be maintained only through the government's monetary-fiscal policy (discussed in Chapter 9) and is not affected significantly by private wage settlements.

As a result of the higher wage level of machinists, the freedom of occupational choice of would-be machinists has been impaired. So has the freedom of employers who would like to hire more at lower wages. And indirectly consumer freedom is also reduced. For example, consumer preference for more housing at lower prices is thwarted by the higher housing

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[8] As shown in Ch. 12, fn 26, the main growth of unions in America occurred after the enactment of legislation in the 1930's requiring employers to bargain with unions. Union membership is currently slightly under one-fourth of the civilian labor force.

prices which follow from above-competitive union wages in the construction industry, where unions are very strong. These are the consequences of collusive arrangements among workers which raise wages above the competitive levels. A labor union is a monopoly collusion among sellers of labor services. Compare Fig. 7-3a with the monopoly diagram, Fig. 2-10 in Chapter 2. The only difference is W for wage here and P for price there.

Unions and value contributed. When a union raises the wage above the competitive level, do the employed workers receive more than their value contributed to production, if the competitive wage equaled value contributed? No. Not as long as employers are free to vary the quantity employed and remain on (not above) their demand curves. When the wage rises from W_1 to W_2 in Fig. 7-3a, then to an *individual firm,* the *wage line* of Fig. 6-1 rises from the competitive level, W_1, to the union level, W_2. The firm hires a smaller quantity, determined by where the higher wage line intersects its VMP. But *at* this intersection, those still employed have a VMP equal to this higher wage.

Wage increases and unemployment. Unions do frequently gain wage increases without there immediately following a cutback in employment. How is this compatible with the effects shown in Fig. 7-3? First, most wage increases occur because the demand for labor rose (from rises in VMP's) and would have occurred with or without the unions. Second, a substantial reduction in employment can occur through attrition—by just not replacing people who retire or quit for other personal reasons or by not expanding the work force as the output expands while introducing different technology. Third, the unemployment which results is often delayed, because of the time required to introduce labor-saving technology. In effect, this means there may be a short run demand curve for labor which goes through the starting wage-quantity point but which is steeper than the long run demand of Fig. 7-3a. Eventually, the long run forces will determine the effect of the wage increase.

Minimum wage laws. A minimum wage law prohibits employers from paying less than the legal minimum. Starting at 25c an hour in the 1930's, there is now pressure to set it around $2 an hour (which means $4000 a year for one who works a 40-hour week, 50 weeks a year). Mercifully, there is no need for another diagram, for the minimum wage law has the same effects as a labor union. Refer again to Fig. 7-3a. Suppose W_1 is $1.55 and W_2 is the legal minimum at $2. The lucky ones still at work will benefit from the minimum wage. But what about those, Q_1 to Q_2, who lose their jobs because of the law? They either have no jobs or are forced into occupations not covered by the minimum wage where supply rises and wages are pushed down

further. The minimum wage law harms the very people it is intended to help. Evidence is overwhelming that minimum wages cause unemployment and depressed wages in uncovered occupations for those at the lowest end of the wage scale.[9] What else could be expected? Wages reflect worker productivity. Congressional wage ukase does nothing to productivity. Some states have their own minimum wage statutes set at levels above the Federal level. Among the strongest proponents of Federal minimum wages are labor union leaders, who want to force out of business low-wage companies, especially in the relatively non-union South, and thereby eliminate competitors of the unionized companies elsewhere.

Among those most adversely affected by minimum wages are many teenage school dropouts with low skills, no work experience, and poor work motivation and discipline, whose productivity is just not worth the level set by the government. So they are unemployed, instead of working for a low wage, developing experience, skills, and work habits that would raise their productivity.[10]

Non-price job rationing: race discrimination. When a wage is above the competitive level, as when a union has raised wages, more people would like to work in the occupation than employers would like to hire (the supply of workers exceeds the demand). Who will be the lucky ones to get the jobs? Here again, we encounter non-price rationing. Typically, if wages are significantly above the equilibrium, and the union is a skilled occupation like plumbers, linotype operators, train engineers, or electricians, the union performs the rationing process by deciding who will be admitted to the union. Friends and relatives of those already in the occupation and union get the first preference. The rationing process is often simplified by blanket exclusions of such groups as women, Negroes, Jews, etc. For many years, one furriers' local in New York City admitted only persons of Greek ancestry, until ordered to change after a civil rights suit. Over most of this century Negroes were excluded by all skilled unions.

But if freedom of occupational choice is the objective, then the solution to this discrimination is not merely the admission of some Negroes

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[9] See J. Peterson and C. Stewart, Jr., *Employment Effects of Minimum Wage Rates*, American Enterprise Institute, 1969. Numerous studies are cited therein.

[10] See "The Effect of Statutory Minimum Wage Increases on Teen-age Employment," by Yale Brozen, *Journal of Law and Economics*, April, 1969. (This is the same issue recommended for the article on airport congestion. It also contains two articles on Soviet economic planning.) Some Congressmen have suggested a separate minimum wage for teenagers. But why any minimum at all? Since 1958, the unemployment rate of persons age 16-19 has been triple that of all other workers.

into the union, for if the wage remains above the competitive level as before, this only rations jobs differently, but still excludes just as many people from the occupation. Free occupational choice will prevail only if employers, without boycotts, picketing, or violence, are free to hire anyone able and willing to do a given job *at any wage acceptable to both parties* whether below the union rate or not. This freedom would open to Negroes vast employment opportunities in skilled occupations virtually closed to them throughout American history. Any real move in this direction would be strenuously resisted by union officials and would require a major revision of the nation's basic labor law, the Wagner Act, passed in 1935.

It is for each person to judge whether those in a given occupation should have a right and even government assistance, in order to get higher incomes for themselves, to prevent others from entering their occupation. For that is the primary effect of most occupational licensure and collective bargaining.[11]

Monopsony

One of the prime arguments in support of labor unions is that they counteract employer monopoly power in hiring workers. Monopoly power in *buying* (rather than selling) is called *monopsony*. Employers are buyers of labor services. Here, we shall describe the consequences of monopsony and how labor unions may eliminate it. In Chapter 12, we discuss whether monopsony power exists.

Monopsony power can exist if one or a few employers hire nearly all the workers in an area or if all the employers collude and agree on lower than competitive wages for given occupations. We shall concentrate on monopsony collusion, first because few employers do hire a large portion of their labor markets, second because the effects of monopsony are the same whether it is from collusion or sheer absence of competitors, and third collusion is a bit simpler to diagram than single-firm monopsony.

The effects of monopsony collusion are shown in Fig. 7-4. The competitive outcome would be E, wage w_1 and q_1 employed. If employers

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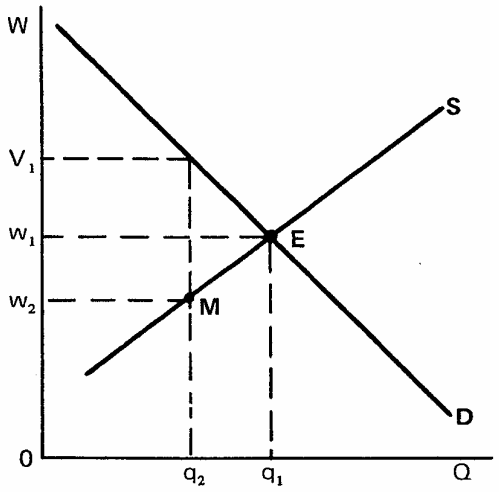
[11] The government assistance is two-fold: (1) laws requiring employers to bargain with unions if the employees want the union, and (2) lax enforcement of laws against violence, thereby rendering it unfeasible for most employers to operate with non-union workers when a strike is called (though such operation is entirely legal). This discussion does not constitute a full treatment of labor unions by any means. For an excellent readable presentation, generally sympathetic to unions, see Albert Rees, *The Economics of Trade Unions*, University of Chicago Press, 1962, available in paperback.

FIGURE 7-4 Wage Determination Under Monopsony



The competitive wage is w_1
The monopsony wage is w_2
The value contributed per worker is V_1
The exploitation of each worker is
$V_1 - w_2$ per wage period

agreed not to compete for workers (a violation of anti-trust laws), they would bring about a lower wage such as w_2 and employ fewer workers.[12] At M, the workers are "exploited." They are paid w_1 but their value contributed (VMP) is V_1 on the demand curve. Enter a labor union. The union may force the wage up to V_1 or somewhere between w_2 and V_1. The outcome compatible with employer and worker freedom (without collusion) is still E. It can be

[12] We shall not prove that M would be more profitable for employers than E, though it would be. (It is not obvious from the diagram.) However, at M, each employer is hiring fewer workers than he would prefer, given the wage, so each would have an interest in cheating on the agreement by paying a little more than w_2 and attracting workers from other employers, hoping the others don't do the same. If all try to hire more, the collusion collapses and E is established. With thousands of employers in any metropolitan area, such collusion is not feasible (or legal) in most occupations.

Incidentally monopsony and product monopoly are not related. A small firm in large city could have a monopoly selling some gadget but still compete for workers. An isolated coal mining company might have some monopsony power, but still sell his coal competitively.

shown that at any wage between w_2 and w_1 workers are paid less than value contributed, while at w_1 or higher wage equals VMP. But at wages above w_1, freedom of occupational choice is restricted because the labor surplus is not allowed to push the wage down to E. It can also be shown that at any union wage between w_2 and V_1 employment will actually be greater than at w_2, being the greatest at w_1, where it will be q_1. Thus, the union can bring about the competitive outcome, E, by setting the wage at w_1. But it has no incentive to do so, since wages above w_1 are possible without any loss of jobs from q_2 (unless the union wage goes above V_1) and these higher wages would naturally be preferred by the unionized workers. In conclusion, under monopsony, a union is likely to improve the situation by reducing or eliminating the exploitation of the workers, but it is not likely to bring about the competitive outcome.

Summary

Under competitive private enterprise, who does what jobs is determined simultaneously with who gets what: demand and supply determine both the wage and the quantity employed.

Historically, freedom of occupational choice has been denied to much of mankind and still is.

Wage differentials between occupations or areas may reflect worker preferences. Forcible elimination of such wage differences impairs worker preferences about occupation or residence.

Supply and demand will bring about wages which induce people into unpleasant jobs. Wage relationships between pleasant and unpleasant jobs adjust to compensate for the unpleasantness.

The lump of labor fallacy that there are just so many jobs to go around fails to recognize that the quantity hired is greater the lower is the wage rate.

When consumer tastes change, changes in relative prices, profits, and wages give people incentive to shift employment and output in accordance with these new tastes—the invisible hand at work again.

In the short run, workers do not shift as readily as with longer time for adjustment. Because of this, wages (and product prices) may change more in the short run than in the long run in response to sudden shifts in demand.

Freedom of occupational choice is threatened by spreading licensing requirements, where licensure is a device to restrict entry and to enhance the incomes of those in the occupation.

Alternatives to occupational licensure which still protect consumers from incompetence and fraud are: strengthened laws and more efficient courts, occupational registration, and occupational certification, as with accountants.

Freedom of occupational choice is also limited when wages are pushed above the competitive level through labor unions.

Union wage gains cause reduced employment in the unionized occupation and greater employment at lower wages elsewhere as workers who would have been employed where wages are pushed up seek employment elsewhere.

A labor union is a monopoly in the sale of labor services with effects similar to a product monopoly.

As long as employers can regulate the quantity employed, unions do not cause workers to be paid more than their value contributed.

Most wage increases are not followed by unemployment, because they resulted from increases in labor demand, not from above equilibrium wages.

Minimum wages tend to cause unemployment among the least skilled workers.

When wages are above equilibrium, there is non-price job rationing to determine which persons will get the limited jobs available.

This has often taken the form of race and sex exclusion from some occupations, especially high-skill unionized occupations.

It is for each reader to judge whether it is fair for those inside an occupation to prevent outsiders from entering or to hold wages above competitive levels so employers will not hire as many, in order to benefit themselves.

Monopsony exists when one or a few employers hire most of the workers in an occupation and area.

Under monopsony, wages are less than the competitive level, fewer people are hired, and workers receive less than the value they contribute to production.

Unions can eliminate monopsony power and cause both wages and employment to rise among the monopsonistic employers. However, unions are unlikely to bring about the "ideal" outcome which avoids both labor exploitation and labor surplus.

Study Questions Chapter 7

1. With diagrams, show a wage differential based on worker preferences.
2. Explain why artificial elimination of this differential would infringe on worker freedom.
3. Explain why the unpleasant jobs get done when no one is forced into them.
4. Explain the lump of labor fallacy.
5. What recommendations regarding compulsory education, retirement, and women's work are made by those who believe the fallacy?

6. Explain how changes in prices (including wages), following a change in consumer tastes, lead to reallocation of inputs based on consumer choice.
7. Explain this adjustment with directional arrows, using ratios of prices, wages, investment returns, employment, output, and input demand.
8. Explain, using diagrams, how wages and quantity adjust after a sudden rise or fall in labor demand, distinguishing short run and long run.
9. Which have demand and supply curves used up to now been, short run or long run?*
10. What is the rule for drawing short and intermediate run curves?*
11. What is the alleged justification for occupational licensure?
12. What is its frequent objective and result?
13. What government policies to protect consumers could replace occupational licensure?
14. Using two diagrams, show the effects of a union which raises wages in an occupation: the unionized occupation, nonunion occupations.
15. Union leaders claim that the more wage gains they get for their members, the higher will be wages for non-union workers also. Comment.
16. How does a labor union compare with a product monopoly? Show with diagrams of each.
17. How does collective bargaining relate to freedom of occupational choice?
18. Explain, with reference to Fig. 6-1, the effects of a union within a competitive firm.
19. Explain why, both before and after a union wage increase, wage can equal value contributed to production.
20. Does one always observe reductions in employment after unions raise wages? Why not?
21. What is a minimum wage law? Its objective?
22. With a diagram, show the effects of minimum wage laws.
23. Who are most adversely affected by minimum wages?
24. What is non-price job rationing?
25. What brings it about?
26. Explain why racial discrimination is a likely consequence of union wage determination.
27. Why would opening more unionized occupations to Negroes not eliminate the non-price job rationing?*
28. Define monopsony.
29. Show with a diagram the effects of employer monopsony.
30. What does "exploitation" mean, applied to wages and labor?

31. What is a measure of the degree of exploitation under monopsony? Show on diagram.*

32. Explain the effect of a union under monopsony: its effect on (a) the wage, (b) the quantity employed, (c) monopsony profits, (d) worker freedom of occupational choice.

33. What wage is most consistent with fairness and freedom?

34. Will a union likely bring about this ideal? Why or why not?*

Answers to starred questions.

9. Long run. However, most demand and supply curves, both product and labor, are probably much more elastic than in the diagrams used.

10. They should all pivot through the initial price-quantity of the problem.

27. If the wage is still as far above equilibrium as before admitting more Negroes, the same number of people will still be excluded, just different individuals.

31. At the quantity hired, q_2 in Fig. 7-4, it is the vertical distance between the wage paid (on the supply curve, w_2 in 7-4) and the demand curve (which indicates the value contributed, V_1 in the diagram).

33. The competitive wage where demand and supply intersect. At wages below this, workers receive less than value contributed and at wages above this there is surplus labor in the occupation.

34. No. It could and would likely get a higher wage, at which there would be labor surplus.

"I'm inoculating the females for a scientific reason . . . I'm not discriminating."