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Labor Markets

Tools: Labor supply and labor demand diagrams; simple model of unemployment dynamics.

Key Words: Labor force; employment; unemployment; vacancies; accessions and separations.

Big Ideas:

- Employment and unemployment rates summarize the labor market status of the adult population.
- Labor market institutions and policies affect employment, unemployment, and job creation.
- Unemployment and vacancy rates tell us about excess supply and demand in labor markets. Unemployment arises from the time it takes to match a worker and with an appropriate job and firm.

Some of the most important markets for aggregate economic performance are those for labor and (financial) capital, which affect every industry and product. Countries differ markedly in their treatment of both markets, with (evidently) different outcomes as a result.

Our focus here is on labor markets. We describe in broad terms what well-functioning markets might look like and compare them to the kinds of institutions and regulations we see around the world.

7.1 Indicators of labor-market “status”

Most countries collect extensive labor-market data. This includes measures of employment, unemployment, and, sometimes, detailed information about flows of workers in and out of jobs.

We'll start with what are called indicators of labor-market status: whether an individual is working, unemployed, or something else. The first such indicator is the *population*, a count of the total number of people in a given geographic area. Strangely enough, numbers like this are estimates: We don't know exactly how many people there are in the US, Canada, or China, but statistical agencies come up with estimates by a number of methods, typically based on surveys. For most labor-market statistics, the starting point is the *adult population*. Countries differ in their definitions of an adult. The US counts anyone 16 or over, the OECD counts people between the ages of 16 and 64 (“working age”).

The next step is to identify the labor-market status of everyone in the adult population: (i) employed (has a job), (ii) unemployed (not working but would like to), and (iii) inactive or not in the labor force (everyone else). Category (ii) is a little fuzzy: How do we know whether or not someone wants to work? In some countries, the answer comes from a survey in which the person is asked whether he or she is actively looking for a job. In others, only people claiming unemployment benefits are classified as such.

Information on the labor-market status of individuals leads to statistics on the *labor force*, the *employment rate*, the *participation rate*, and the *unemployment rate*. The employment rate is the ratio of employment to the adult population. The labor force is the number of people in categories (i) and (ii): either working or unemployed. The participation rate is the ratio of the labor force to the adult population. The unemployment rate is the ratio of the number of people who are unemployed to the labor force.

The details here are important. We see large differences, for example, in employment rates across countries. In Germany and Japan, for example, the employment rate has averaged about 71 percent over the last decade, and in Italy about 57 percent, according to the OECD. The source of this difference lies primarily in the number of inactive people, not the number of unemployed. For that reason, and because it's easier to measure, many of the experts focus on employment rather than unemployment. Newspapers, of course, tend to do the opposite.

In the US, employment data are collected and reported monthly by the Bureau of Labor Statistics. The BLS releases its closely-watched monthly

report, “The Employment Situation,” at 8:30 am on the first Friday of the month. It includes such indicators as employment (“nonfarm payroll”), the unemployment rate, and the size of the labor force. This release is based on two surveys, the Current Employment Statistics (CES) survey of firms’ payroll records and the Current Population Survey (CPS) of households. The CES covers 300,000+ businesses and provides detailed industry data on employment, hours, and earnings of workers on nonfarm payrolls. The most closely watched number in the US is probably the monthly estimate of the change in nonfarm employment, which comes from this survey. The CPS covers 60,000+ households and is conducted for the BLS by the Bureau of the Census. It provides a comprehensive body of data on labor-force status: employment, unemployment, and so on. Both sets of data are updated periodically as more information comes in. Since the two sources are radically different, they occasionally result in conflicting information about such basic indicators as the number of people employed.

Other countries collect similar data, but the sources and definitions vary.

7.2 Supply and demand for labor

Differences in the abilities and skills of individuals make labor markets incredibly complex, but we can get a sense of the impact of government regulation in a model in which there is a single market for a single kind of labor.

Demand for labor. The demand for labor comes from (typically) firms. The short version: The higher the wage, the fewer employees firms will hire.

A more complex version follows from thinking through a hypothetical firm’s decision-making process. Let us say our firm produces output using the production function $Y = AF(K, L) = AK^\alpha L^{1-\alpha}$ (“Cobb-Douglas”). Let us say, for the sake of simplicity, that the capital stock is some fixed number K . How does the firm’s profit depend on the choice of labor input L ? If p is the price of one unit of output and w is the price (wage) of one unit of labor, the firm’s profit is

$$\begin{aligned}\text{Profit} &= pY - wL - \text{Fixed Costs} \\ &= pAF(K, L) - wL - \text{Fixed Costs}.\end{aligned}$$

How does profit vary with L ? The fixed costs might be attributed to capital or other factors, but they do not vary with L . For this reason, they won’t affect the demand for labor. What is affected by L is output (which, in turn, affects sales revenue) and cost (the wage bill).

If the firm maximizes its profit, it will add labor as long as the marginal benefit is greater than the marginal cost. We learned earlier that we can characterize the solution to the firm's maximization problem by computing the derivative of the profit function and setting it equal to zero. After arranging terms, we see that maximum profit occurs when the marginal benefit of an additional unit of labor (more revenue) equals its marginal cost (the wage):

$$pA \frac{\partial F(K, L)}{\partial L} = w.$$

This is an equation we can solve for L and represents the amount of labor the firm will hire (demand) for any given values of p , w , and K . In the Cobb-Douglas case, $Y = AK^\alpha L^{1-\alpha}$, the demand function follows from

$$p(1 - \alpha)AK^\alpha L^{-\alpha} = w,$$

which implies (solve for L)

$$L = K \left[\frac{p(1 - \alpha)A}{w} \right]^{1/\alpha}. \quad (7.1)$$

The aggregate (total) demand for labor is the sum of demands across all firms. Its important feature, for our purposes, is that it falls when the wage rises, just as we assume most demand functions do. (This property follows from the diminishing marginal product of labor, one of the conditions we imposed on the production function.)

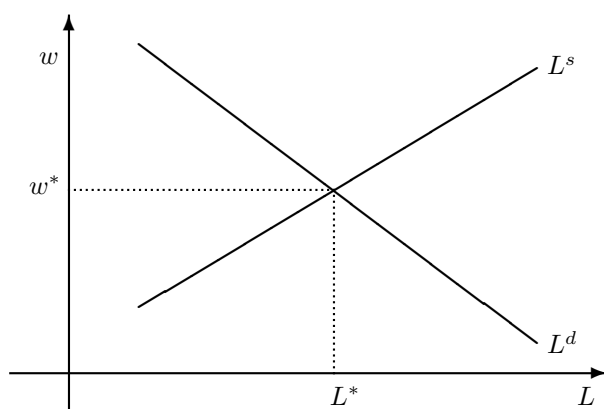
Supply of labor. Now let's turn to the supply of labor. The short version: Supply increases with the wage.

A more complete version goes like this. When selling their labor services, individuals make two decisions: whether to work at all and, if so, how much. Obviously, many jobs offer limited flexibility on the second dimension. For this reason, and also because it simplifies the analysis, we will ignore the second choice and consider the decision of an individual deciding whether or not to work a given number of hours h . What is the gain from working? The monetary gain is wh . However, what matters for the individual is the increase in happiness, or satisfaction, that such pay induces. This may vary across individuals. For example, the same pay may be more valuable to a poor individual than to a rich one. What is the loss from working? Simple! He has less time to dedicate to other activities, including playing bridge or football, cooking, reading economics books, or spending time with family. The value of these activities is what economists call the *reservation wage*. For any wage less than this, the benefits of not working are greater than the benefits of working. For the economy as a whole, the higher the wage, the

greater the number of people who decide to work. Thus, aggregate labor supply L^s increases with the wage rate w .

Labor-market equilibrium. We represent labor demand and supply with straight lines in Figure 7.1. The equilibrium wage rate w^* is the value at which demand and supply are equal. The number of workers employed at this wage defines the level of employment L^* . This kind of analysis should be familiar to anyone who has taken an economics course.

Figure 7.1: Equilibrium in the labor market.

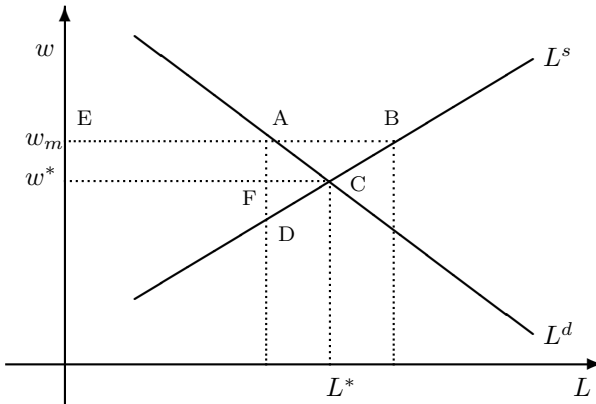


Where is unemployment in Figure 7.1? We might think of L^* as representing both employment (the number of people hired by firms, since the point is on their demand curve) and the labor force (the number of people who want to work at the going wage). Unemployment is the difference between these two numbers, so evidently there is none. There is an almost perfect analogy between this market and a dealer-type securities market such as the Nasdaq. At the Nasdaq, dealers post bid and ask prices and are committed to executing transactions at those prices. If you want to sell a given security, you just contact one of the dealers (or ask your broker to do this for you). If you'd like to sell at less than the bid, you have a deal. There are no "unemployed" securities.

7.3 Supply and demand with a minimum wage

There are many reasons that labor markets don't work quite like our frictionless market. Let's look at one: government policies and institutions. Examples include minimum wages, restrictions on wage adjustments, labor unions, limits on hiring and firing, and so on. We don't argue that these

Figure 7.2: The labor market with a minimum wage.



things are bad — they may very well have benefits — but they do have an impact on how the labor market works.

We'll look at the minimum wage since it's the simplest example. (Remember: Simple is a good thing.) If we prohibit purchases of labor services below a given wage, how does the market work? Figure 7.2 shows how the supply-and-demand analysis might be applied in this case. In the figure, the minimum wage (w_m) is higher than the equilibrium wage (w^*). At the minimum wage, the supply of labor (the line segment EB) is greater than the demand for labor (the line segment EA). Minimum wage laws don't force firms to hire, so employment is given by their demand function. The difference between supply and demand is unemployment (the line segment AB). In the figure, unemployment is represented by the line segment AB. The unemployment *rate* is the ratio of unemployment (AB) to the supply of labor (EB). As a practical matter, it's an open question whether the impact of the minimum wage on unemployment is large or small, but few economists doubt that it's there.

Who are the winners and losers from the minimum wage? The winners are the employed, who get a higher wage than they would otherwise. The losers are the unemployed (who would prefer to work) and firms (who must pay more for labor). Taken as a whole, the policy reduces welfare by an amount represented by the triangle ACD. This will seem clear if you recall how welfare triangles work, mysterious otherwise, but it's true in this setting that a minimum wage reduces overall welfare.

7.4 Labor-market institutions

The minimum wage is a useful illustration, but labor-market institutions and regulations differ dramatically across countries along many dimensions. Some of them have been collected and reported by the World Bank's Doing Business. They report, for most countries in the world, the flexibility an employer has over the terms of employment, including the employer's ability to vary hours, the cost and difficulty of dismissal, and whether workers can be hired under fixed-term (as opposed to permanent) contracts. Some countries also limit hours (no more than 25 hours a week!) or give unions more power over the terms of employment contracts.

The evidence suggests that many kinds of labor-market regulation have the ultimate effect of reducing employment. There is, of course, a useful role for laws that enforce fair dealing. Paying workers for fewer hours than they worked, for example, is impossible to justify. But many labor-market regulations seem to discourage firms from hiring, although their stated purpose is to "protect jobs." Restrictions on layoffs and mandatory severance payments seem to do this since they raise the long-term cost of hiring workers. In many countries, we've seen growth in the number of part-time and unofficial workers, precisely to get around this kind of regulation.

7.5 Labor-market flow indicators

The supply and demand diagram is indicative, but it can't address one of the most striking features of modern economies: the huge amount of turnover we see in labor markets. Economies create and destroy jobs at truly amazing rates. Even MBA graduates often find themselves changing jobs frequently, either by choice (they find jobs they like better) or by misfortune (economic downturns, mergers, and so on).

In the aggregate, we see this in data from both firms and households. At firms, new positions are created either because existing firms expand their operations or because new firms hire workers. We refer to this phenomenon as *job creation*. At the same time, existing firms sometimes eliminate positions. We refer to this process as *job destruction*. An establishment (a production unit, such as a factory or store) is said to create jobs if it increases the number of positions between one period and the next. The economy's overall job creation is the sum of the increases in positions across all the establishments that created jobs. Similarly, an establishment is said to destroy jobs if it decreases its number of positions from one period to the next. The economy's overall job destruction is the sum of the decreases in jobs across all establishments that destroyed jobs. The sum of job creation

and job destruction is referred to as *job reallocation* or *job turnover*. Job creation, destruction, and reallocation *rates* are ratios of job creation, destruction, and reallocation, respectively, to the total number of jobs in the economy. These rates vary greatly across countries, but their magnitudes are impressive everywhere.

We see similar turnover in household data, with individuals reporting frequent changes in jobs or employment status. An employed individual can stay in her job, move to another job, become unemployed (leave one job but look for another), or leave the labor force (leave one job without seeking another). Similarly, an unemployed person can become employed (get a job), stay unemployed (look for a job without taking one), or leave the labor force (stop looking for a job). Someone out of the labor force can become employed (take a job), become unemployed (look for a job without taking one), or remain out of the labor force. We have information from surveys on each of these possible changes.

Some summary measures will give you a sense of how this looks for a typical individual. *Accessions* occur when individuals take new jobs, regardless of their current status. *Separations* occur when individuals leave jobs, regardless of their reason. The accession and separation *rates* are ratios of accessions and separations, respectively, to total jobs. The sum of the two rates is referred to as the *worker reallocation rate*. In the late 1980s, the annual accession rate in the US was 45.2 percent and the annual separation rate was 46.0 percent. The worker reallocation rate was a staggering 91.2 percent! These numbers do not say why workers change jobs, merely that they do. Worker reallocation rates are generally lower in other countries, including France (59.6 percent) and Italy (68.1%). Apparently, it is more common in the US both to leave a job and to take a new job. You might ask yourself whether the factors that make the separation rate high also make the accession rate high, or whether they are influenced by different factors.

7.6 Virtues of flexible input markets

There's a big-picture point hidden here somewhere. In a modern economy, the mix of products is changing constantly. Many of the products and services we use today simply weren't available twenty years ago: high-speed internet access, iPods, databases, and so on. A successful economy needs a mechanism to shift capital and labor to these new uses and away from others. The evidence suggests that countries with labor and capital markets that do this well tend to perform well in the aggregate. The ability of an economy to reallocate jobs across firms, industries, and geographical areas is, perhaps, even more important than capital. Sometimes, labor-market

institutions are an obstacle to this reallocation process, reducing aggregate productivity and output.

Most developed economies have gone through at least one major reallocation in their history, as most people shifted from agriculture to industry. In the US, there's been a further shift from manufacturing to services. Services seem less vivid than physical goods to most of us, but the fact is that goods represent a smaller part of modern developed economies than services do. You might ask yourself what sector you're likely to go into. Past experience suggests that few of our students are targeting jobs in manufacturing, much less agriculture.

If reallocation is important, then labor-market institutions are central to aggregate performance. If people cannot be shifted quickly to more-productive sectors and firms, aggregate productivity will be lower. Consider the impact of an increase in productivity in a single industry. What is the impact on employment? The immediate effect is probably to throw some people out of work, since a smaller number of people can produce the same output. The employment impact depends on the elasticity of demand: If the elasticity is low, the increase in productivity reduces employment. The long-term effect is to reallocate these workers to other sectors. We would argue that this is good for the economy as a whole, even if it's painful for the people who had reallocation forced on them. Nevertheless, there's a long history of concern about reallocation, dating back at least to the machine-smashing "Luddites."

Deregulation is similar, in the sense that it often leads to reallocation of capital and labor. Consider an example from Europe. In recent years, the European airline market has gone through a deregulation process resembling that of the US in the 1980s. Before deregulation, every European country had its own national airline. The airline was typically a monopolist on internal routes and a (collusive) duopolist (with the other country's airline) on international routes. Like many monopolists, these airlines charged high prices and operated inefficiently. Now, any company can fly any route in the European Union. The entry of new carriers has meant big trouble for many of the incumbents. Sabena and Swissair went bust. Others (Alitalia?) may follow suit. It is clear that at the end of the reorganization of the industry, fares will be much lower (they are already, as a matter of fact). As a result, people will fly more often, and there may even be more jobs in the industry. Along the way, job destruction by the incumbents will be accompanied by job creation by the new entrants.

Who gains? Consumers and workers in new firms. Who loses? The workers and shareholders of incumbent firms. Traditional welfare analysis tells us

that the gains are greater than the losses, but the political process does not necessarily weight them equally. In fact, the costs are often concentrated, while the benefits are thinly spread over many individual consumers and firms, so the political process will tend to give greater weight to the former. Nevertheless, it's likely that such a reallocation is a net benefit to the society as a whole.

7.7 A model of unemployment dynamics

These flows suggest a more dynamic labor market than our supply-and-demand analysis. Where do they come from? You might consider your own case: What factors might cause you to leave a job? take a new one? A simple model can help us understand the overall impact of individual decisions like this on economy-wide employment and unemployment rates. To keep things simple, we will ignore transitions in and out of the labor force and focus on employment and unemployment.

To start, individuals may be either unemployed, U , or employed, E , with $U + E = L$ and L a fixed number. The unemployment and employment rates are then $u = U/L$ and $e = E/L$. Since the only states are U and E , the employment and unemployment rates sum to one: $u + e = 1$.

The unemployment rate can change over time if individuals change their labor-market status. Let us say that a constant fraction $0 < s < 1$ (s for separation) of employed people lose their jobs and become unemployed. Why might this be? Perhaps because their firms are doing poorly, and either shrink or go out of business altogether. Let us also say that a constant fraction $0 < a < 1$ (a for accession) of unemployed people find new jobs, as they find employers who need their skills. We've seen that this kind of reallocation is the norm for modern economies. With these two ingredients, the unemployment rate changes like this from one period to the next:

$$u_{t+1} = u_t + se_t - au_t$$

or

$$\Delta u_{t+1} = se_t - au_t.$$

Unemployment rises over time if more employed people lose their jobs than unemployed people find new jobs, and it falls over time if the reverse is true. (Formally, this should remind you of the dynamics of capital accumulation in the Solow model). Since $u_t + e_t = 1$, we can write this as

$$\Delta u_{t+1} = s(1 - u_t) - au_t. \quad (7.2)$$

This is useful because we have summarized the dynamics of unemployment in a single equation. If you were told that the unemployment rate was now

(say) u_0 , then repeated application of (7.2) would enable you to calculate the unemployment rate in future periods. It would be a very simple matter to do these calculations in Excel.

Using equation (7.2), we can compute both the period-by-period dynamics and the steady-state unemployment rate. We find steady-state unemployment (\bar{u} , say) by setting $\Delta u_{t+1} = 0$ so that

$$0 = s(1 - \bar{u}) - a\bar{u}.$$

Solving for \bar{u} gives

$$\bar{u} = \frac{s}{s + a},$$

a number between zero and one. Over time, the unemployment rate “gravitates” to this value, so we might also refer to it as the “long run” or “natural” unemployment rate. The idea is that we want a measure of the underlying unemployment rate that would prevail if it were not for temporary shocks that make $u_0 \neq \bar{u}$. Clearly, steady-state unemployment is higher when s , the separation rate, is higher and is lower when a , the accession rate, is higher. That is, if people lose jobs easily and have difficulty finding them, then the unemployment rate will be higher.

You should think of the parameters of this model, a and s , as standing in for various country-specific labor-market policies and institutional arrangements that affect the willingness of firms to hire and fire workers, the willingness of workers to take and quit jobs, and so on. Examples of such policies include: minimum wages; taxes on labor income; regulations that control the length of the working week (such as the 35-hour week in France); the size of severance payments for layoffs; the size of unemployment benefits; and so on. Which of these policies decrease a ? Which of these policies decrease s ?

Here is a different way to look at the steady-state calculation. With a little bit of statistics, one can show that an individual’s average duration of unemployment in this model is $1/a$, and an individual’s average duration of employment is $1/s$. Steady-state unemployment is given by

$$\bar{u} = \frac{s}{s + a} = \frac{\frac{1}{a}}{\frac{1}{a} + \frac{1}{s}} = \frac{\text{duration of } U}{\text{duration of } U + \text{duration of } E}.$$

So, to think about why European unemployment is relatively high compared to that of the US, we might begin with factors that either increase the duration of unemployment or reduce the duration of employment. Which of these factors do you think is more important for European unemployment?

7.8 Institutions and labor-market dynamics

We can get a sense of the dynamics of labor-market reallocation by putting our earlier labor-market analysis to work. In our model, the accession and separation rates also govern the response of the unemployment rate to a shock that pushes unemployment above (or below) its steady-state value. In particular, these rates govern the *speed of adjustment* back to the steady state. To see this, write the equation governing the dynamics of the unemployment rate as

$$u_{t+1} = s + [1 - (s + a)]u_t.$$

In order for the model to be empirically realistic, we need a worker reallocation rate, $s + a$, that satisfies

$$0 < s + a < 1.$$

With a little bit of algebra, the unemployment rate can be written in terms of deviations from its steady-state value

$$u_{t+1} - \bar{u} = \lambda(u_t - \bar{u}),$$

where $\lambda = 1 - (s + a)$ is the speed of adjustment of the unemployment rate to its steady-state value. The reason for this is that with a little bit more algebra one can show that if the unemployment rate is hit by a temporary shock (that does not affect a or s) that takes on the value u_0 , the adjustment back to steady state is given by the formula

$$u_t - \bar{u} = \lambda^t(u_0 - \bar{u})$$

or

$$u_t = (1 - \lambda^t)\bar{u} + \lambda^t u_0.$$

What's important is not the algebra but the idea: In economies with low values of s and a , worker reallocation is slow. Here, we see that this results in slow adjustment of the unemployment rate. But you can imagine, as well, slow reaction of producers to consumer preferences. The churning of the labor market implied by high values of s and a , thus, serves a purpose of shifting workers to jobs in which their value is the highest.

Numerical example. Suppose that in both Europe and the US, $s = 0.01$, and that accession is $a_{US} = 0.19$ in the US, but lower in Europe, $a_{EU} = 0.09$. Then, not only is European unemployment 10 percent as opposed to 5 percent in the US, but European unemployment also takes considerably longer to respond to shocks than does US unemployment ($\lambda_{EU} = 0.90$, $\lambda_{US} = 0.80$). Based on this example, can you imagine the economic consequences if, as recent evidence suggests, the US labor market has become less flexible?

Executive summary

1. Labor-market indicators include employment (the number of people working), unemployment (the number not working who would like to), the labor force (employment plus unemployment), and the unemployment rate (the ratio of unemployment to the labor force).
2. Measures to protect workers often have the opposite effect; that is, by making labor more expensive to firms, they may reduce employment.
3. Many developed economies are characterized by high rates of job and worker reallocation. People change jobs and firms change workers — frequently.
4. The efficiency of work reallocation affects the performance of the economy as a whole. In particular, flexible labor markets help an economy respond to the inevitable changes in products and industries that occur.

Review questions

1. Labor-market indicators. You are the mayor of a small village whose labor-market data are: adult population (100), employment (55), and unemployment (5).
 - (a) Draw a circle on a piece of paper corresponding to the population of your village. Divide it into sections corresponding to employment, unemployment, labor force, and not in the labor force.
 - (b) Compute the employment rate, the participation rate, and the unemployment rate.

Answer.

- (a) For you to do.
 - (b) The employment rate is 55 percent [= 55/100]. The participation rate is 60 percent [= (55 + 5)/100]. The unemployment rate is 8.3 percent [= 5/60].
2. Supply and demand. Consider an economy with one firm (which is nevertheless a price taker). It produces widgets according to the production function $Y = AK^{1/2}L^{1/2}$ and sells them for two dollars each. [Yes, we know we said α would always be one-third, but apparently we lied. Sorry.] For simplicity, assume that $A = K = 1$. The supply of labor in this economy is $L^s = w^{3/2}$.
 - (a) What is the demand for labor? How does it depend on the wage?
 - (b) What are the equilibrium values for the labor force, the wage, and employment? What is the unemployment rate?

- (c) Suppose the government imposes a minimum wage of \$1.1. What are the equilibrium values for the labor force, the wage, and employment? What is the unemployment rate?

Answer.

- (a) The demand for labor is given by $L^d(w) = 1[2 \times (1/2)]/w]^2 = w^{-2}$. This follows from the labor demand function, equation (7.1).
- (b) Equating demand and supply yields $L^* = w^* = 1$. The labor force is one and the unemployment rate is zero.
- (c) With a minimum wage of \$1.1, the supply of labor (the labor force) is $1.1^{3/2} = 1.15$. The demand for labor is $1.1^{-2} = 0.826$. Therefore, employment is 0.826 and the unemployment rate is $(1.15 - 0.826)/1.15 = .2817$ or 28.17 percent.
3. Minimum wage. Milton Friedman once suggested that the minimum wage discriminated against people with low skills. To see what he had in mind, consider an environment with two kinds of workers, high-skilled and low-skilled. Suppose each group has its own separate labor market, each subject to the same minimum wage.
- (a) Which kind of worker is most likely to be affected by a minimum wage? Why?
- (b) Who gains or loses from a minimum wage? Does this explain Friedman's comment?

Answer.

- (a) You might imagine that high-skilled workers will not be affected by a minimum wage, since their skill demands a wage well above it. But workers with low skill might find that no one is willing to hire them at the minimum: their skills don't justify it.
- (b) The winners are those with low skill who happen to find jobs. The losers are the firms that hire them and, more to the point, the low-skilled who can't find work. They might get jobs if we allowed the wage to fall. So they bear much of the cost of the system.
4. Taxing labor. Suppose we put a tax on labor, paid by firms. Use a supply and demand diagram in which the vertical axis is the pretax wage and the horizontal axis is the quantity of labor.
- (a) Draw a supply and demand diagram. What happens to the curves when you add the tax?
- (b) What is the impact on the pretax wage and quantity of labor?
- (a) Draw something like Figure 7.1. When you add the tax, the demand curve falls by the amount of the tax. The amount of the fall equals the tax per unit. [If you put the after-tax wage on the vertical axis,

the supply curve would shift, but that's another story. The point is to be careful about the pre- and post-tax wage.]

- (b) Since demand has fallen, so does the pretax wage and the quantity of labor. Put simply: if you tax labor, you would expect firms to buy less.

5. Layoffs. From the *New York Times*, March 6, 2009 (rough paraphrase): The WARN Act requires employers to give 60 days' notice if a plant is closed or 500 or more people are laid off at one location. Some wonder whether notice should be required for other job losses. A Berkeley professor says it's a matter of "transparency and decency." An IBM executive disagrees, noting that it's routine for the company to lay off some employees while hiring others. "This business is in a constant state of transformation." If you were asked to advise the government, how would you describe the costs and benefits of wider application of the WARN Act?

Answer. This is another cost of firing workers, and we know that higher firing costs tend to discourage firms from hiring workers in the first place. The question is how high the cost is. If we figure workers will keep producing, it may be small; if not, it's larger, especially if there's a chance of sabotage or other damaging behavior.

We asked two of our favorite management professors the same question. Professor Wiesenfeld said: "I think giving people advanced notice (not 60 days, but not escorting them to the door immediately) is generally beneficial, because it helps to retain the commitment and motivation of the person's former colleagues." Professor Freedman said: "It depends on the situation. I have encountered situations where people who are given notice act in a very destructive manner."

6. Income support systems. In the US and UK, flexible labor markets are accompanied by income support systems in which (for example) people with low incomes pay negative income tax; that is, they receive money. In the US, this is referred to as the Earned Income Tax Credit. In what ways is this better than direct intervention in labor markets? Worse?

Answer. Many see this as an effective way to reconcile the benefits of a flexible labor market with a safety net that protects workers from some of the challenges of losing one's job. Restrictions on firing, for example, help people with jobs keep them, but discourage firms from hiring more people. An income support system avoids the latter.

7. Labor-market dynamics. In our model of unemployment dynamics, suppose that the accession rate is $a = 0.2$ and the separation rate is $s = 0.01$.
 - (a) Compute the steady-state unemployment rate and the speed of adjustment parameter.

- (b) Suppose that a restriction on firing makes workers less attractive to firms. What effects might this have on long-run unemployment and the response of the economy to an increase in the unemployment rate?

Answer.

- (a) The steady-state unemployment rate is $\bar{u} = s/(s+a) = 0.048$ or 4.8 percent. The speed of adjustment parameter is $\lambda = 1-(s+a) = 0.79$.
- (b) This restriction is likely to lower the accession rate a , thereby increasing long-run unemployment and making periods of high unemployment last longer (i.e., making λ closer to one).

If you're looking for more

Labor data are less standardized across countries than national income and product accounts. The US Bureau of Labor Statistics has a nice collection (unfortunately being phased out) of international data constructed in roughly comparable ways across countries:

<http://www.bls.gov/fls/>.

Ditto the OECD:

<http://www.oecd.org/std/labourstatistics/>
<http://www.oecd.org/els/emp/keyemploymentstatistics.htm>.

Yes, two links! The second includes data on labor market policies and employment protection. The World Bank's Doing Business also has an extensive collection of indicators of labor-market institutions.

Finally, Denmark is a fascinating example when it comes to labor markets since it combines flexibility (it's easy to fire people, for example) with generous social support (unemployment insurance and training, for example). A nice overview is Jianping Zhou, [IMF working paper](#), "Danish for All? Balancing Flexibility with Security."

Symbols and data and used in this chapter

Table 7.1: Symbol table.

Symbol	Definition
p	Price of output
w	Wage of one unit of labor (say, one hour)
Y	Output
K	Stock of physical capital
L	Quantity of labor
A	Total factor productivity (TFP)
α	Exponent of K in Cobb-Douglas production function (= capital share of income)
$F(K, L)$	Production function of K and L
L^*	Equilibrium level of employment
w^*	Equilibrium wage
w_m	Minimum wage
L^s	Labor supply
L^d	Labor demand
U	Unemployed persons
E	Employed persons
u	Unemployment rate ($= U/L$)
e	Employment rate ($= E/L$)
s	Separation rate (share of people who lose a job)
a	accession rate (share of people who find a job)
Δx_{t+1}	Change of x_{t+1} ($= x_{t+1} - x_t$)
\bar{u}	Steady-state unemployment rate
u_0	Unemployment rate in start-period zero
λ	speed of adjustment of unemployment rate to steady state

Table 7.2: Data table.

Variable	Source
Nonfarm employment	PAYEMS
Unemployment rate	UNRATE
Employment ratio	EMRATIO
Nonfarm openings rate	JTSJOR
Duration of unemployment	UEMPMEAN
U6 unemployment rate	U6RATE
Civilian labor force	CLF16OV
Civilian participation rate	CIVPART

To retrieve the data online, add the identifier from the source column to <http://research.stlouisfed.org/fred2/series/>. For example, to retrieve nonfarm employment, point your browser to <http://research.stlouisfed.org/fred2/series/PAYEMS>

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