Macroeconomics Module 11: Practice Problems on unemployment

The practice problems on labor discuss the variables affecting change the labor supply curve, the quantity of labor supplied, the real wage rate, and the marginal product of labor.

Changes in the marginal tax rate, the capital per worker, human capital (education, health), and technique affect the supply curve for labor by the substitution effect. .

Changes in workers' wealth (from taxes, government services, or supply shocks) affect the labor supply curve by the income effect.

Changes in one industry (such as higher wages in factory work) change the labor supply curve for other industries (such as farm work).

Know how each item affects the supply and demand curves for labor. When one or both of the curves move, the equilibrium quantity of labor and real wage rate change, affecting the employment rate and the hours worked. The hours of leisure change, so the marginal value of leisure changes. The marginal product of labor changes, both pre- and after-tax. A change in the labor supply changes capital per worker and marginal product of capital.

The final exam problems test the mathematics of the natural unemployment rate. From the job finding and separation rates, calculate the natural unemployment rate. The homework assignment reviews the relations, and two exhibits in the textbook show the computations.

Quantitative problems may be asked various ways, such as

● From the natural unemployment and job finding rates, compute the job separation rate.
● Given changes in job finding and separation rates, compute the change in the natural unemployment rate.

Some exam problems test qualitative influences on the natural unemployment rate. For example, a higher minimum wage raises unemployment for unskilled workers and lower unemployment for skilled workers.

Some exam problems test relations among the real wage rate, marginal product of labor, nominal wage rate, price level, real demand for money, and nominal money supply. These questions combined several course modules. Focus on

● the equilibrium relations, such as real demand for money equals the real money supply, or the real wage rate equals the marginal product of labor
● the conversion of real values (real wage rate, real interest rate, real GDP) to nominal values (nominal wage rate, nominal interest rate, nominal GDP)

** Exercise 11.1: Unemployment rate

A. How does the technology level affect the marginal product of labor?
B. How does the technology level affect the demand curve for labor?
C. How does the technology level affect the real wage rate?
D. How does the technology level affect the amount of labor supplied?
E. Is the unemployment rate pro-cyclical, anti-cyclical, or a-cylical?
F. During recessions, more people give up looking for work and are not counted in the labor force. If these people were counted in the labor force, would the unemployment rate be more or less cyclical?

Part A: A higher technology level increases the marginal product of labor. If workers are more skilled (have higher technology), they can produce better products more efficiently.

Part B: A higher marginal product of labor shifts the demand curve for labor to the right (upward). For a given amount of labor, the marginal value of the last hour or work is higher.

Part C: The real wage rate equals the marginal product of labor, so a higher technology level increases the real wage rate.

Part D: The demand curve for labor shifts right and the supply curve for labor does not change, so the amount of labor supplied (the intersection of the two curves) increases.

Jacob: The real wage rate increases and the amount of labor supplied increases. Doesn't that mean that the supply curve for labor shifts right?

Rachel: The increase in the amount of labor supplied is a movement along the supply curve, not a shift of the supply curve.

Part E: The amount of labor supplied increases, so the unemployment rate decreases. The unemployment rate is anti-cyclical. (The employment rate is pro-cyclical.)

Part F: When unemployed people are too discouraged to look for work, they are removed from the numerator and denominator of the unemployment rate, so the unemployment rate decreases. If we do not remove them from the numerator and denominator of the unemployment rate, the unemployment rate would be higher in recessions – that is, even more anti-cyclical.

Illustration: Suppose the economy has 500 workers, of whom 450 have jobs in prosperous years and 400 have jobs in recessions. If 20 workers give up looking for work during recessions, they are not counted in the labor force. The unemployment rate is 450/500 = 90% in prosperous years and 400/(500 – 20) = 83.33% in recessions: it is anti-cyclical. If persons who stop looking for work were counted in the work force, the unemployment rate would be 400 / 500 = 80% in recessions – even more anti-cyclical.

Know also a second distortion in the reported unemployment rates. During recessions, more people do not have jobs but work in the black market. A person who loses his job as a janitor may work cleaning buildings without an official job. A nurse who loses her job may work as an aide to a disabled retiree. These persons continue to look for work in the regular economy, so they are counted an unemployed.

See Barro, Macroeconomics, chapter 9

** Exercise 11.2: Unemployment rate

How do each of the following affect the unemployment rate?

A.   The size of unemployment benefits.
B.   The duration of unemployment benefits.
C.   People who are discouraged and stop looking for work.
D.   People who want full time jobs but are working at part time job.
E.   People working in the black market.

Part A: Greater unemployment benefits make unemployed persons less inclined to accept job offers. The job finding rate decreases, and the unemployment rate increases.

Part B: Longer duration of unemployment benefits has the same effect as the size of unemployment benefits, though the timing of the effect differs. Larger unemployment benefits decrease the job finding rate right after workers lose their jobs. The duration of unemployment benefits decrease the job finding rate at later dates.

Part C: People not looking for work are not counted in the labor force. If people without jobs are discouraged and stop looking for work, the unemployment rate decreases.

Part D: People working part time are employed. If a person takes a part time job, the unemployment rate falls.

Part E: A person working in the black market is not employed. If the person is still looking for a regular job, he is unemployed.

** Exercise 11.3: Natural unemployment rate

In 20X4, the job separation rate for disabled persons is 0.5% a month and the job finding rate is 4.5% a month. In 20X5, the Congress adjusts the Americans with Disabilities Act, making it harder to fire disabled persons. The job separation rate declines to 0.25% a month. Employers are reluctant to hire disabled workers, so the job finding rate declines to 1.75% a month.

A. What is meant by the natural unemployment rate?
B. For a job finding rate of F and a job separation rate of S, what is the natural unemployment rate?
C. What is the natural unemployment rate for disabled persons in 20X4?
D. What is the natural unemployment rate for disabled persons in 20X5?
E. Will the unemployment rate change immediately in January 20X5?
F. What are good vs poor ways to reduce unemployment?

Part A: Unemployment stems from desires to find better jobs and lags in finding new jobs. At the natural unemployment rate, the number of workers leaving jobs equals the number of unemployed persons finding new jobs.

Part B: Let

● Z be the natural unemployment rate
● F be the monthly job finding rate
● S be the monthly job separation rate

● Workers finding jobs each month are F × Z.
● Workers leaving jobs each month are S × (1 – Z).

For example, a job separation rate for disabled persons is 0.5% a month means that 0.5% of disabled persons leave their jobs each month, and a job finding rate is 4.5% a month means that 4.5% of unemployed disabled persons find new jobs each month.

In equilibrium, workers finding jobs just offset workers leaving jobs: F × Z = S × (1 – Z).

Part C: Solve for the natural unemployment rate before the new legislation:

$$4.5 \times Z = 0.5 \times (1 - Z) \Rightarrow 5Z = 0.5 \Rightarrow Z = 10\%$$

The general formula is

$$F \times Z = S \times (1 - Z) \Rightarrow Z \times (F + S) = S \Rightarrow Z = S / (S + F)$$

Part D: Solve for the natural unemployment rate after the new legislation:

$$1.75 \times Z = 0.25 \times (1 - Z) \Rightarrow 2Z = 0.25 \Rightarrow Z = 12.5\%$$

Part E: The change in the unemployment rate is gradual. In January 20X5, 0.25% of disabled workers leave their jobs, or 0.25% × 90% = 0.225% of disabled persons, and 1.75% of unemployed disabled persons find new jobs, or 1.75% × 10% = 0.175% of disabled persons. The unemployment rate for disabled persons increases from 10% to 10% + 0.225% – 0.175% = 10.050%.

Part F: Economists speak of a *law of unintended consequences*. This phrase is used in many scenarios with no clear meaning, but the phrase is rigorous: Free markets are efficient, in that they maximize social welfare. Legislation that interferes with free markets to help one party may reduce total social welfare. People respond to the legislation to maximize their self-interest. The total pie gets smaller, and all parties may be worse off, including the party that the legislation was designed to help.

Jacob: Does this actually occur? And why would states pass laws that harm the public?

Rachel: Laws preventing employers from firing disabled workers have political appeal. France has laws protecting employees, and it has high unemployment. When France tried to repeal the worst of these laws, the political backlash – opposition from unions and other workers – prevented the repeal.

Jacob: How should states reduce unemployment?

Rachel: They should provide incentives to work and align workers' abilities with employers' demands.

- Unemployment compensation is often needed to help workers cope while looking for new jobs, but it may reduce incentives to take jobs. Similarly, laws that restrict free labor markets adversely affect workers in the long-run, though they may have short run benefits.
- In the United States, most young people go to liberal arts colleges and learn few skills that they will use in later life. The skills they need they often don't learn at all. Most people need job training, including basic math, computer, reading, writing, and technical skills (fixing cars and appliances, carpentry, plumbing). Few people use skills they learn in college courses (literature, sociology, political science).

** Exercise 11.4: Natural Unemployment Rate

The natural unemployment rate is now 20% per annum. A restriction on firing workers without cause reduces the job separation rate by 20% and the job finding rate by 40%.

A. What is the job finding rate as a function of the job separation rate before the new legislation?
B. What are the job finding rate and the job separation rate after the new legislation?
C. What is the natural unemployment rate after the new legislation?

Part A: Let F be the job finding rate and S be the job separation rate. We have

$$F \times 20\% = S \times (1 - 20\%) \Rightarrow F = 4 \times S.$$

Part B: The new job finding rate is 60% × F = 240% × S and the new job separation rate is 80% × S.

Part C: Let U be the new natural unemployment rate, so

$$60\% \times F \times U = 80\% \times S \times (1 - U)$$
$$60\% \times 4 \times S \times U = 80\% \times S \times (1 - U)$$
$$60\% \times 4 \times U = 80\% \times (1 - U)$$
$$240\% \times U = 80\% \times (1 - U)$$
$$U / (1 - U) = 80\% / 240\% = 33.3\%$$
$$3 \times U = 1 - U$$
$$4 \times U = 1$$
$$U = 25\%$$

[This solution is written out in long-hand; you can derive a one-line formula.]

** Exercise 11.5: Natural Unemployment Rate

In 20X7, the job finding rate is 20% a month and the job separation rate is 20% a month.

To reduce the natural unemployment rate, an 20X8 statute prohibits job termination (layoffs and firing) unless the employee transgresses a labor law.

- The job separation rate declines to 2% a month.
- Employers fear they will have workers they can't fire, and job finding rate declines to 2% a month as well.

A. What is the natural unemployment rate before the new (20X8) statute?
B. What is the natural unemployment rate after the new statute?
C. Do workers gain or lose from the new statute?
D. Do employers gain or lose from the new statute?

Part A: Before the new statute, the natural unemployment rate is

    job separation rate / (job finding rate + job separation rate) = 20% / (20% + 20%) = 50%.

Part B: After the new statute, the natural unemployment rate is

    job separation rate / (job finding rate + job separation rate) = 2% / (2% + 2%) = 50%.

The natural unemployment rate has not changed.

Parts C and D: The labor market is like other markets: both consumers and sellers gain. Workers search for the best jobs and firms search for the best workers. Everyone gains as

- Workers trade the costs of looking for jobs with the benefits of finding good jobs.
- Firms trade the costs of looking for workers with the benefits of finding good workers.

The new statute reduces job changes without changing the natural unemployment rate.

- Workers are more likely to be stuck in in jobs they don't like.
- Business firms are more likely to be stuck with workers they don't like.

Jacob: Does this mean that unemployment is good?

Rachel: Unemployment is no fun for workers who are fired or laid off, but natural unemployment is necessary for an efficient labor market. To help workers who are fired or laid off, countries should make job finding more efficient: give vocational training to workers who are laid off, use the internet to make job searches easier, simplify labor regulations to employers are not afraid to hire workers that they won't be able to fire. In many western European countries, labor regulations are so onerous that young people have trouble getting steady jobs. They may be offered temporary work, but not permanent positions.

** Exercise 11.6: Natural unemployment rate

If the job finding rate is 4 times as great as the job separation rate, what is the natural unemployment rate?

Solution 11.6: Let

- S = the job separation rate.
- F = the job finding rate.
- U = the natural unemployment rate.

We have two relations:

- $F = 4 \times S$
- $F \times U = S \times (1 - U)$

Solve for the natural unemployment rate as $4S \times U = S \times (1 - U) \Rightarrow 4U = 1 - U \Rightarrow U = 20\%$.

Using the formula in the textbook, the natural unemployment rate is $S / (S + F) = S / (S + 4S) = 20\%$.

** Exercise 11.7: Employment rate

Barro's macroeconomic model assumes that prices change so that markets clear. Prices change so that the quantity demanded equals the quantity supplied, and all units of the good are sold. But the unemployment rate is about 5% to 10% in many western countries. How do each of the following affect the unemployment rate?

A. Wages are set by multi-year labor contracts above market rates, so some workers (especially non-union workers) remain unemployed.
B. Some workers lack the strength for manufacturing jobs, so these workers remain unemployed.
C. Prejudice against minorities, women, and gay persons accounts for many workers not being hired.
D. The time needed by workers to search for good jobs and by firms to search for good workers leads to some workers being unemployed at any time.
E. Many workers do not seek employment because they have other income.

Part A: About 10% of the U.S. work force is unionized. Multi-year labor contracts has little effect on unemployment of non-union workers. If union wages are above market rates, unemployment of non-union workers should decrease. Even in European countries, only a small percentage of the labor force is unionized.

Part B: Workers who lack computer skills are less likely to be employed in some industries. Poor skills (poor human capital) reduces eligibility for high-tech jobs. But strength is no longer needed for most jobs. Even manufacturing jobs are changing from brute force to computer skills.

Jacob: Do skills affect the unemployment rate?

Rachel: Yes. China, South Korea, Taiwan, Singapore, and Hong Kong have good schools, with especially good training in math and sciences. For many reasons, these countries have low unemployment rates; one reason is the high marginal product of labor. In many British, U.S., and Portuguese schools, a high percentage of students don't finish high school or graduate with poor reading and math skills. These young people have high unemployment rates.

Part C: In the U.S., discrimination affects employment in a few industries, such as religious elementary schools which don't hire gay teachers. These practices are not material; not many gay people apply for jobs as teachers in religious schools. The effect of prejudice against minority groups is slight.

Part E: The most common *other income* is unemployment benefits. In the U.S., state unemployment benefits last at most 26 weeks, though federal extensions may extend the payment to 52 weeks. Generous benefits lengthen durations of unemployment, but they are not the major cause of unemployment.

Part D: The time needed by workers to search for good jobs and by firms to search for good workers is the major reason that about 5% of workers are unemployed at any time.

Jacob: In Chapter 6, Barro says that commodities markets clear: the price changes so that all goods are sold. Why doesn't the same occur for labor markets?

Rachel: The difference between commodities markets and labor markets is illustrated below.

● A firm that imports copper and sells it in the United States raises or lowers its prices so that all its copper is sold. It has no place to store large quantities of copper. It the firm has an extra thousand tons of copper that can not be sold at the current price of $500 a ton, it reduces the price to sell the inventory.

● An auto manufacturer sets a price of $25,000 each for its stock of 100,000 cars. If it can sell only 80,000 cars at that price, it offers rebates and discounts to sell the remaining 20,000 cars. The net price for these cars may be $22,500 each.

- The wage rate for underwriters is $40 an hour. If demand for insurance is weak, 10% of underwriters may be unemployed. The wage rate does *not* decline to $35 an hour so that all underwriters find jobs.

Economists offer many explanations. The real wage rate may change as supply and demand change. For example, if insurers in Chicago want 500 actuaries, but only 400 actuaries want to work in Chicago, insurers will offer higher salaries to attract more actuaries. But fluctuating wage rates are hard to implement.

Illustration: Strawberries cost more in the winter than in the summer. Consumer who want strawberries are not much concerned about the price fluctuations. Contrast the market for actuarial labor. Suppose demand for reserving actuaries is higher in December and January than in July and August.

- Insurer Y pays actuaries $10,000 a month for all month.
- Insurer Z pays actuaries between $5,000 and $15,000 a month, with an average of $10,000 a month. It has many actuaries when it pays $15,000 a month and few actuaries when it pays $5,000 a month.

Many actuaries want stable employment. They prefer to remain with Insurer Y all year. The cost of changing jobs every few months makes the wages from Insurer Z equal to $8,000 a month. Insurer Z finds that it spends so much on recruiting and training that its actual cost is $12,000 a month.

** Exercise 11.8: Unemployment rate

How do each of the following affect the unemployment rate?

A. A change in the expected inflation rate.
B. A change in the unexpected inflation rate.
C. A change in the real interest rate.
D. A change in the job finding rate.
E. A change in the job separation rate.

Part A: Economists once thought that a higher inflation rate caused a lower unemployment rate. This relation was referred to a Phillips curve. It dominated macroeconomic thought in the 1960's and 1970's, and if affected U.S. law: Congress promoted higher inflation to reduce unemployment.

It was all an error. By the late 1970s's, the U.S. had stagflation: high inflation plus high unemployment. Barro shows that money is neutral: inflation doesn't cause higher or lower unemployment. Some minor effects are ignored here; for instance, high inflation may cause firms to be unsure of future economic prospects and reduce their hiring.

Part B: Barro discusses several other macroeconomic models in Chapter 15 where unexpected inflation may reduce the unemployment rate. Barro does not think these models are correct; in his macroeconomic model, money is neutral, with no effect on unemployment.

Part C: The real interest rate has no direct effect on unemployment. Some indirect effects exist. For example, the real interest rate reflects the marginal product of capital. More capital reduces unemployment and also reduces the real interest rate. This effect is slight and is not relevant for Barro's macroeconomic model.

Part D: The best way to reduce unemployment is to give people incentives to find jobs and the ability to find jobs. Overly generous unemployment benefits give disincentives to find jobs and increase unemployment. Job training programs give people abilities to find jobs.

Jacob: what makes unemployment benefits "overly-generous"?

Rachel: People who lose their jobs need several weeks or months to find a new job. During that period, they may have trouble paying bills. If they have to search for a new job in a different city, bills may be especially high during a job transfer. Unemployment benefits cover these expenses and help people transfer jobs.

If unemployment benefits are too high, people lose interest in finding new jobs. Some people prefer to collect benefits and not look seriously for a new job until benefits stop.

Part E: A decrease in the job separation rate reduces unemployment.

Jacob: How might governments reduce the job separation rate?

Rachel: If firms don't want to lose workers, they pay them enough to keep the job separation rate low.

** Exercise 11.9: Job Separation and Finding Rates

In 20X6, the job separation rate is 10% per annum and the job finding rate is 15% per annum, and the labor market is in equilibrium. All hiring and firing occurs on December 30.

Because of terrorist attacks in 20X7, the job separation rate temporarily rises from 10% to 15% and the job finding rate temporarily falls from 15% to 10%. On January 1, 20X8, these rates return to their original values of 10% job separation rate and 15% job finding rate.

A. What is the unemployment rate on December 31, 20X6?
B. What is the unemployment rate on December 31, 20X7?
C. What is the unemployment rate on December 31, 20X8?

Part A: The labor market is in equilibrium, so the natural unemployment rate is 10% / (10% + 15%) = 40%.

Part B: All hiring and firing occurs on December 30.

In 20X7, 15% or employed workers lose their jobs and 10% of unemployed workers find jobs.

On December 31, 20X7, the unemployment rate =

$$40\% + (1 - 40\%) \times 15\% - 40\% \times 10\% = 40\% + 9\% - 4\% = 45\%.$$

Part C: In 20X8, (1 − 45%) × 9% = 5.5% of people lose jobs and 15% × 45% = 6.75% of people find jobs, so the unemployment rate is 45% + 5.5% − 6.75% = 43.75%. (*People* means people in the labor force.)

** Exercise 11.10: Job Separation and Finding Rates

In 20X6, the job separation rate is 1% a month and the natural unemployment rate is 40%.

In 20X7, the country institutes a labor training program that doubles the job finding rate and doesn't change the job separation rate.

A. What is the job finding rate in 20X6?
B. What is the natural unemployment rate in 20X8?

Part A: Let the 20X6 job finding rate be Z. The natural unemployment rate 40% = 1% / (1% + Z) ⇒ Z = 1.5%.

Part B: The new job finding rate is 2 × 1.5% = 3%.

The new natural unemployment rate is 1% / (1% + 3%) = 25%.

** Exercise 11.11: Marginal Product of Labor

- In 20X4, real GDP = $400, the price level = 100, and the nominal wage rate = $20 / hour
- In 20X5, real GDP = $500, the price level = 120, and the nominal wage rate = $30 / hour

The real interest rate, inflation rate, and bank transaction costs do not change.
The real demand for money is proportional to real GDP.

A. What is the percentage change in the real demand for money?
B. What is the percentage change in the real money supply?
C. What is the percentage change in the nominal money supply?
D. What is the percentage change in the real wage rate?
E. What is the percentage change in the marginal product of labor?

Part A: The real demand for money is proportional to real GDP. Real GDP increases 25% (from $400 to $500), so the real demand for money increases 25%.

Part B: In equilibrium, the real money supply equals the real demand for money, so it also increases 25%.

Part C: The price level increases 20%, so the nominal money supply increases 1.25 × 1.20 – 1 = 50.00%.

Jacob: Doesn't the nominal money supply vary with inflation? In this exercise, inflation is 20%, not 50.

Rachel: If real GDP does not change, the nominal money supply varies with inflation. If real GDP changes, the nominal money supply varies with inflation and real GDP.

Part D: The nominal wage rate increases 50% and the price level increases 20%, so the real wage rate increases 1.500 / 1.200 – 1 = 25.00%

Part E: If the labor market is in equilibrium, the real wage rate equals the marginal product of labor. The real wage rate increases 25%, so the marginal product of labor increases 25%.

** Exercise 11.12: Accepting job offers

Two actuarial candidates, Y and Z, receive job offers.

How do each of the items in the table below affect the likelihood of accepting a job offer? Which candidate is more likely to accept the job offer? Assume other parts of the scenario are the same for the two candidates,

	Candidate Y	*Candidate Z*
A. Job duration	offered a temporary job	offered a permanent job
B. Marginal product of labor	has no actuarial experience	has much actuarial experience
C. Income from not working (ω)	recent college graduate	getting unemployment benefits
D. Non-work income / wealth	has much investment income	has no investment income
E. Value of leisure time	not studying for exams	studying for exams

Part A: Persons are more likely to accept permanent jobs than temporary jobs. A temporary job requires another job search in a few months. Candidate Z is more likely to accept the job offer.

Jacob: If so, why are so many new jobs temporary, especially in some European countries?

Rachel: Employment laws in some countries require costly benefits for permanent workers, such as medical benefits, maternity benefits, vacations, and pensions. In some countries, permanent workers can not be easily fired, so employers are reluctant to offer permanent positions.

Part B: The education and experience of the job candidate are human capital. Higher human capital means a higher marginal product of labor. A new college graduate needs much training and does not contribute much to an actuarial department. A candidate with much experience works more efficiently.

The candidate with a higher marginal product of labor (more human capital) expects a better job offer. For a given real wage rate, Candidate Y (with the lower human capital) is more likely to accept the job offer.

Part C: Persons who are recently unemployed receive unemployment benefits, which reduce the net value of the job offer. For a given real wage rate, the recent college graduate, Candidate Y, who is not receiving unemployment benefits, is more likely to accept the job offer.

Part D: The income effect says that a person receiving other income needs money less and is less likely to accept a job offer. Candidate Z is more likely to accept the job offer.

Part E: The net benefit of a job is the real wage rate minus the value of leisure time. Higher value of leisure time, such as the value of study time, reduces the net benefit of a job and makes it less likely that the person will accept the job offer. Candidate Y is more likely to accept the job offer.

** Exercise 11.13: Unemployment rate

- The labor market is at the natural unemployment rate in December 20X2, with a job finding rate of 0.45 per month and a job separation rate of 0.05 per month.
- On January 1, 20X3, with the onset of a recession, the job finding rate changes to 0.35 per month, and the job separation rate does not change.

A. What is the natural unemployment rate in December 20X2?
B. What is unemployment rate on February 1, 20X3, after one month of the 0.35 job finding rate?
C. What is the natural unemployment rate in February 20X3?

Part A: The natural unemployment rate in December 20X2 is 0.05 / (0.45 + 0.05) = 10%.

Illustration: Assume the labor force has 1 million workers: 900,000 workers are employed and 100,000 are unemployed. To verify that the natural unemployment rate is 10%: 0.05 × 900,000 = 45,000 = 0.45 × 100,000

Part B: Between January 1, 20X3, and February 1, 20X3, 5% × 900,000 = 45,000 workers leave their jobs and 35% × 100,000 = 35,000 find jobs. Unemployed workers rise to 110,000, and the unemployment rate is 11%.

Part C: The natural unemployment rate in February 20X3 is 0.05 / (0.35 + 0.05) = 12.5%.

The actual unemployment rate moves toward the natural unemployment rate month by month.

** Exercise 11.14: Job vacancies

A. How does the marginal product of labor (MPL) affect the number of job vacancies?
B. How does the real wage rate affect the number of job vacancies?
C. How does the cost of interviewing candidates affect the number of job vacancies?
D. How does the technology level affect the number of job vacancies?
E. Are job vacancies pro-cyclical, anti-cyclical, or a-cyclical?

Part A: If the marginal product of labor rises, workers provide more value for employers, so more jobs are offered and the number of job vacancies increases.

Part B: If the real wage rate required to induce workers to accept a job increases, fewer jobs are offered, and the number of job vacancies decreases.

Part C: If the costs of interviewing candidates increases, fewer jobs are offered, and the number of job vacancies decreases.

Jacob: What affects the costs of interviewing candidates?

Rachel: Lower transportation costs, phone interviews, and internet job-search sites lower the costs of interviewing job candidates.

Jacob: In a recession, there are fewer employed workers; doesn't that mean there are more vacancies?

Rachel: Job vacancies decline in recessions for two reasons: First, there is less work to be done and so fewer jobs. Second, workers still employed are working less (κ is lower). Business have their current employees work more; they don't advertize for new workers.

Part D: An increase in the technology level raises the marginal product of labor, so it raises the number of job vacancies.

Part E: Real GDP reflects the technology level in the equilibrium business cycle model, so job vacancies are pro-cyclical.