

LECTURE 10: CAPITAL UTILIZATION AND UNEMPLOYMENT

See Barro Ch. 9

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Spring, 2016

WHERE ARE WE? TAKING STOCK

1. Chapter 1: we should care about Macro variables
2. Chapter 2: what are the Macro variables
3. Chapter 3-5: the Solow Growth model
 - ▶ How we think about production, savings responses, and capital
4. Chapter 6: The SGM implies supply and demand for capital, labor, and consumption
 - ▶ Now we can talk about how productivity impacts
 - ▶ Wages, interest rates
5. Chapter 7: How do people react to changes in the interest rate
6. Chapter 8: Move from growth, explain business cycles using productivity
 - ▶ Use what we learned in (3)-(7) to talk about comovements btw GDP & interest rates, wages, etc.
 - ▶ Start talking about how labor responds to (temporarily) higher wages
7. Chapter 9 (now): We freed up labor supply last chapter now we free up capital supply too.
8. Chapter 9 (now): We will also talk about a form of labor utilization (unemployment)

SUPPLY AND DEMAND FOR CAPITAL

- ▶ Before, we could derive that the interest rate must be equal to the marginal product of capital:

$$\pi_t = A_t K_t^\alpha L_t^{1-\alpha} - w_t L_t - r_t K_t$$

Maximizing,

$$r_t = \alpha A_t K_t^\alpha L_t^{1-\alpha}$$

So if $A_t \uparrow$ and K_t and L_t fixed, then $r_t \uparrow$.

- ▶ K_t was fixed.
- ▶ Now, let's assume it can vary
- ▶ But how?

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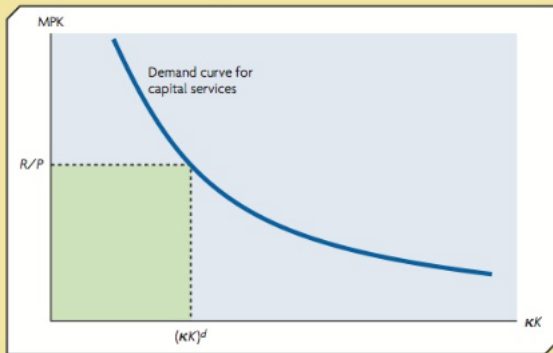
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- ▶ We can work this same room's capital more or less hard...currently our capital utilization rate is around 20%
- ▶ Result: current capital is variable

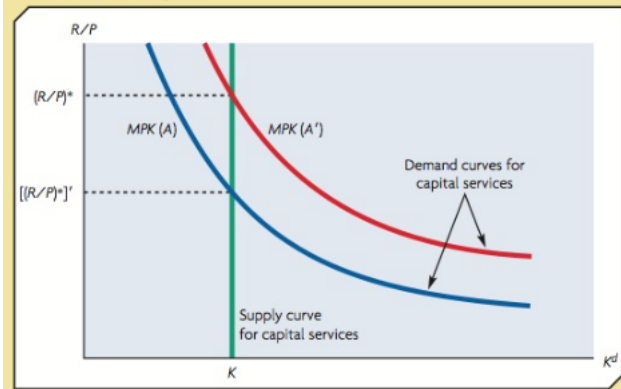
BEFORE: DEMAND FOR CAPITAL

Figure 9.1 Demand for Capital Services



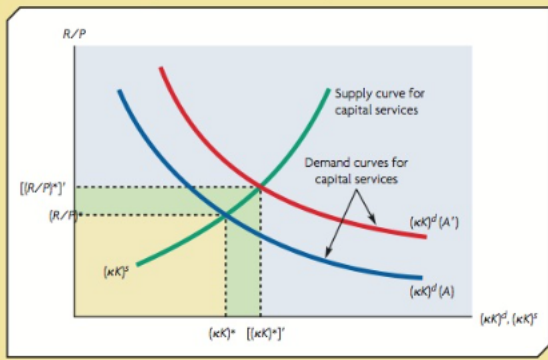
BEFORE: DEMAND AND “SUPPLY” FOR CAPITAL

Figure 8.8 Effect of an Increase in the Technology Level on the Real Rental Price of Capital



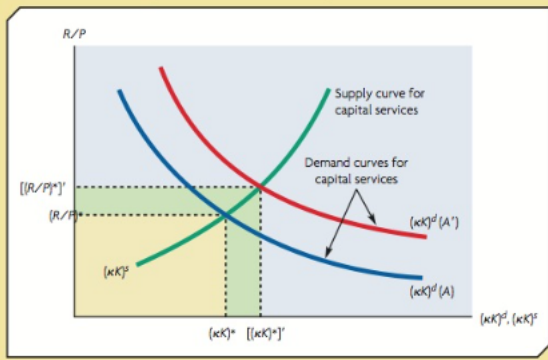
Now: SUPPLY AND DEMAND FOR CAPITAL

Figure 9.5 *Clearing of the Market for Capital Services*



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- ▶ This changes your maximization calculations

CAPITAL UTILIZATION-II

▶ Now, your net income from renting capital is:

1. What you get times all your capital, $\frac{R}{P}\kappa K$

2. What you lose because your capital falls apart: $\delta(\kappa)K$

▶ So,

$$\text{Net income from capital} = \frac{R}{P}\kappa K - \delta(\kappa)K$$

▶ Or,

$$\text{Net income from capital} = K \left(\frac{R}{P}\kappa - \delta(\kappa) \right)$$

▶ There's a clear tradeoff here

▶ More κ , more revenue

▶ More κ , more falls apart

▶ Conclusion: only use κ if the return is worth more than the loss!

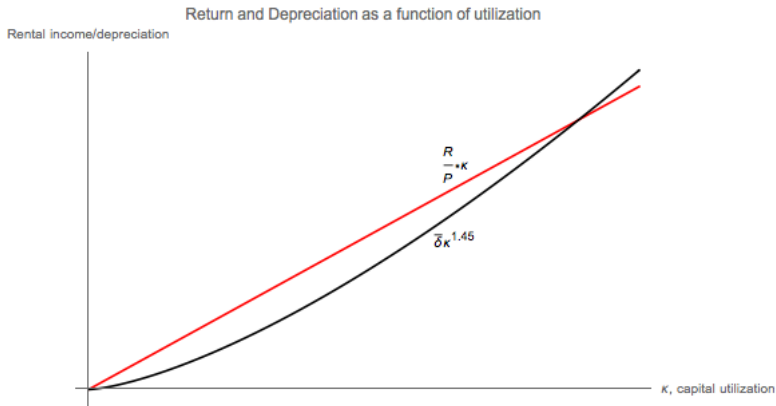
CAPITAL UTILIZATION-III

- ▶ We just need to focus on the κ tradeoff here
- ▶ Write the rate of return on capital as:

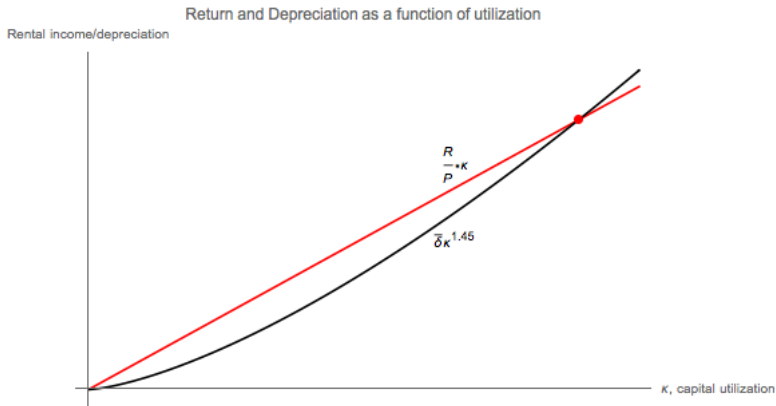
$$\text{Rate of return on capital} = \frac{R}{P}\kappa - \delta(\kappa)$$

- ▶ All we need to do is to choose κ to maximize the above object.
- ▶ Let's say that $\delta(\kappa) = \bar{\delta} * \kappa^\omega$ where $\omega = 1.45$ or so ($\bar{\delta}$ some constant).
- ▶ How do our tradeoffs work?
- ▶ Let's graph this

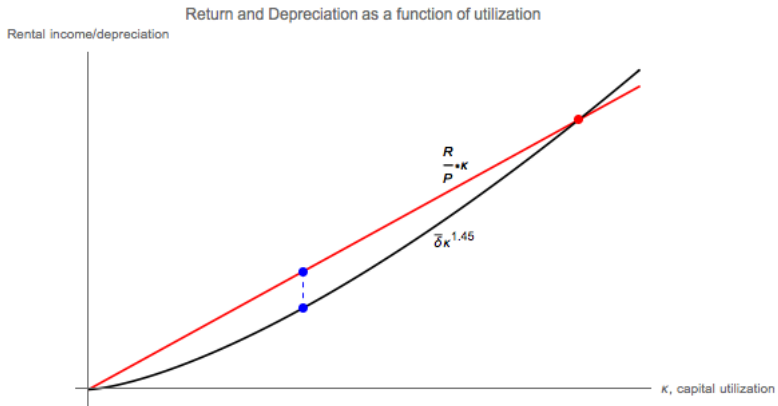
UTILIZATION TRADEOFFS



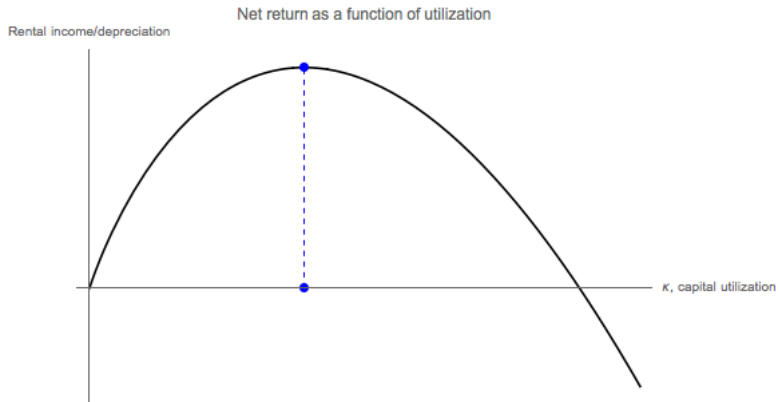
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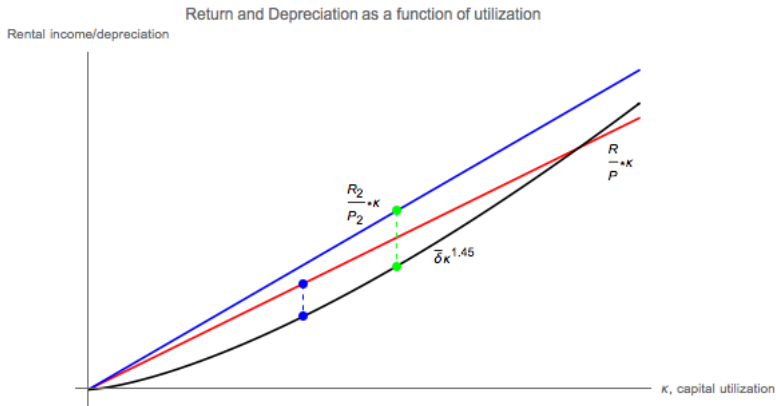
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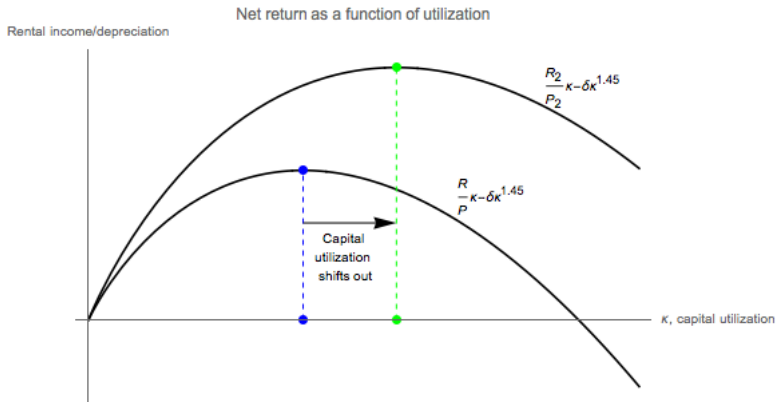
CAPITAL UTILIZATION-IV

- ▶ What about when $\frac{R}{P}$ goes up?

UTILIZATION TRADEOFFS

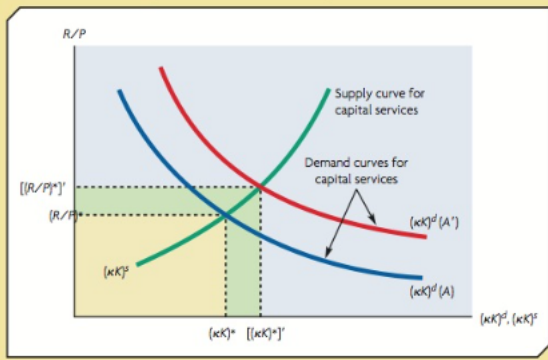


UTILIZATION TRADEOFFS



SUPPLY AND DEMAND FOR CAPITAL

Figure 9.5 *Clearing of the Market for Capital Services*



SUPPLY AND DEMAND FOR BONDS

- ▶ Remember, if people hold physical capital (factories, stock) and financial capital (bonds, derivatives), then the (risk adjusted) interest rate must be the same.

$$i_t = \frac{R_t}{P_t} - \delta$$

- ▶ Becomes, with $\bar{\delta}$ some constant and $\omega > 1$,

$$i_t = \frac{R_t}{P_t} \kappa - \bar{\delta} \kappa^\omega$$

A NEW PREDICTION

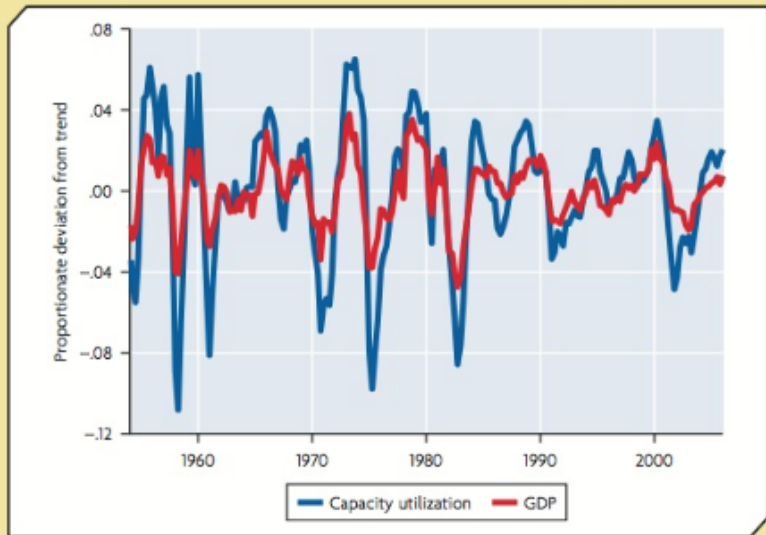
- ▶ We've increased the richness of our model
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- ▶ Utilization should be procyclical. (Why?)

CAPITAL UTILIZATION IS PROCYCLICAL

Figure 9.6 *Cyclical Behavior of U.S. Real GDP and Capacity Utilization*



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- ▶ Why did I say "when considering a year?"

$$\text{Total Hours} = \frac{\text{Hours Weeks}}{\text{Week Person}} \cdot \# \text{ persons}$$

UNEMPLOYMENT AND VACANCIES

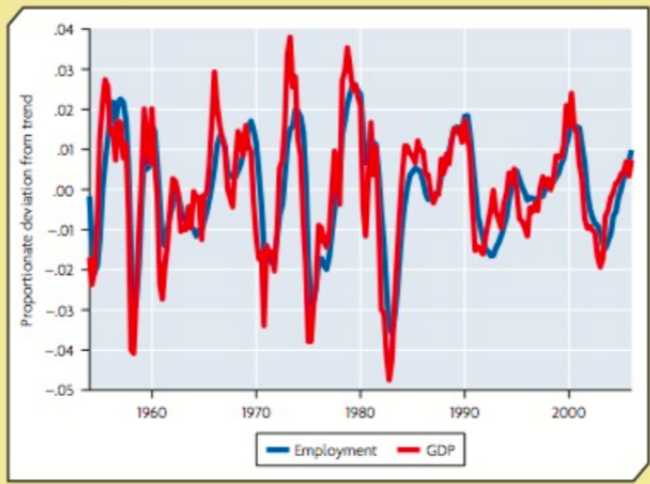
- ▶ And up until now we've been thinking that labor markets clear
- ▶ Everyone who wants a job can get it, every job that wants a person can get it
- ▶ In reality, neither is the case:
 - ▶ Some people want jobs at the prevailing wage but can't find them (unemployed people)
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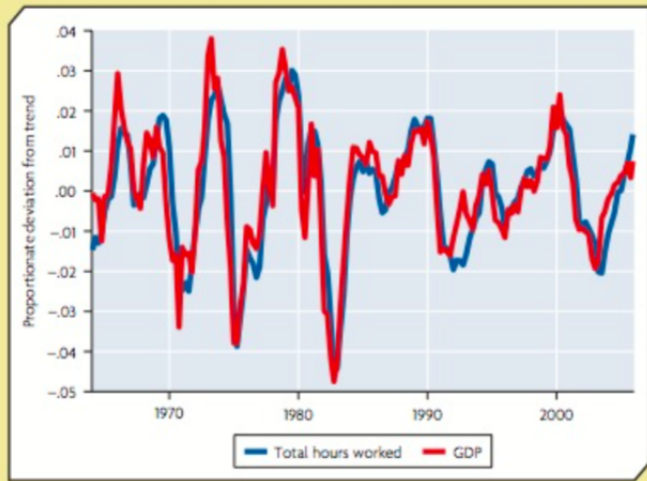
EMPLOYMENT IS VERY VOLATILE

Figure 8.13 *Cyclical Behavior of U.S. Real GDP and Employment*



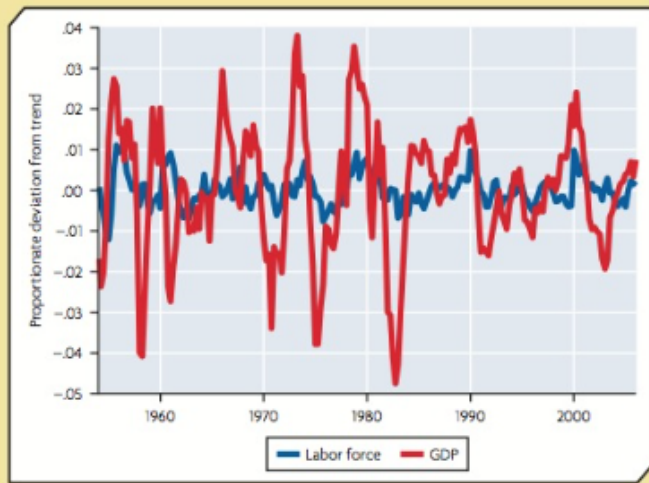
...AND HOURS ARE VOLATILE...

Figure 8.14 *Cyclical Behavior of U.S. Real GDP and Total Hours Worked*



...BUT THE LABOR FORCE ISN'T TOO VOLATILE

Figure 9.7 Cyclical Behavior of U.S. Real GDP and the Labor Force

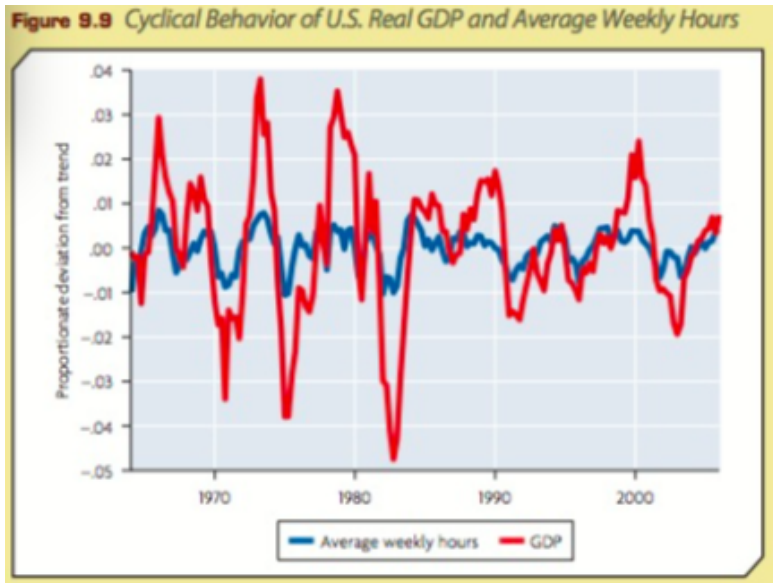


...THE EMPLOYMENT RATE IS PRETTY VOLATILE...

Figure 9.8 Cyclical Behavior of U.S. Real GDP and the Employment Rate



...AVERAGE WEEKLY HOURS ARE MILDLY VOLATILE...



RECAP

- ▶ We've seen total hours are as volatile as GDP
- ▶ This can come from:
 - ▶ Fewer people interested in work (labor force decline)
 - ▶ Fewer people able to find work (employment rate decrease)
 - ▶ Fewer hours among those working (hours/worker decline)
- ▶ All three are important. Recall a 1.5% standard deviation in total hours worked
 - ▶ 0.4% standard deviation of labor force
 - ▶ 0.7% standard deviation of employment rate
 - ▶ 0.4% standard deviation of hours/worker
- ▶ Some think the second category is hard to reconcile with markets clearing
- ▶ It's about half of the volatility in total hours!

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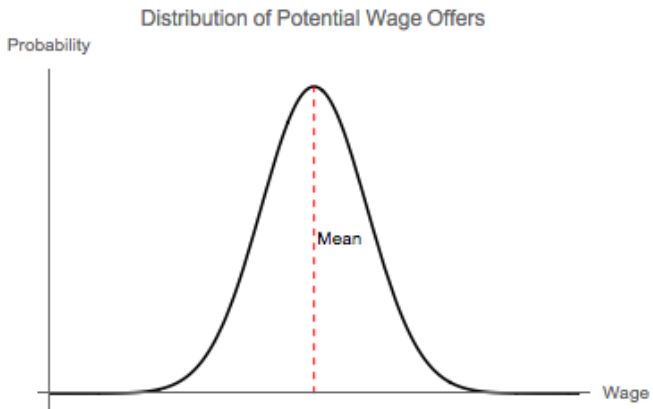
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- ▶ We have to think about the tradeoff between accepting a wage now or staying unemployed and continuing to search
- ▶ Think about the distribution of possible wage offers

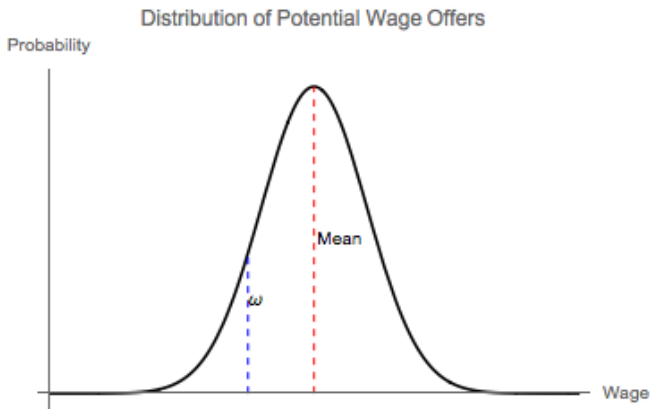
WAGE OFFER DISTRIBUTION



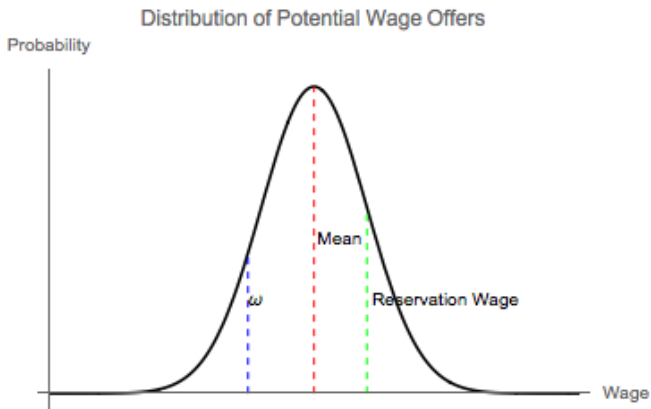
WAGE OFFER DISTRIBUTION



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WAGE OFFER DISTRIBUTION



WHAT HAPPENS NOW, WHEN $\frac{w}{P}$ RISES?

- ▶ First, note that when Unemployment Benefits/ ω rise, your reservation wage will rise and job finding rate falls
- ▶ What if the whole distribution improves?
 - ▶ If $\frac{w}{P}$ rises by 10% and reservation wage doesn't change, job finding would increase
 - ▶ But people anticipate better offers if they keep searching...so reservation wage will rise
 - ▶ The reservation wage typically rises by less than the increase in $\frac{w}{P}/\text{MPL}$. Why?
 - ▶ The rise is temporary
 - ▶ Only part of the reason for waiting increased (the ω component might not)

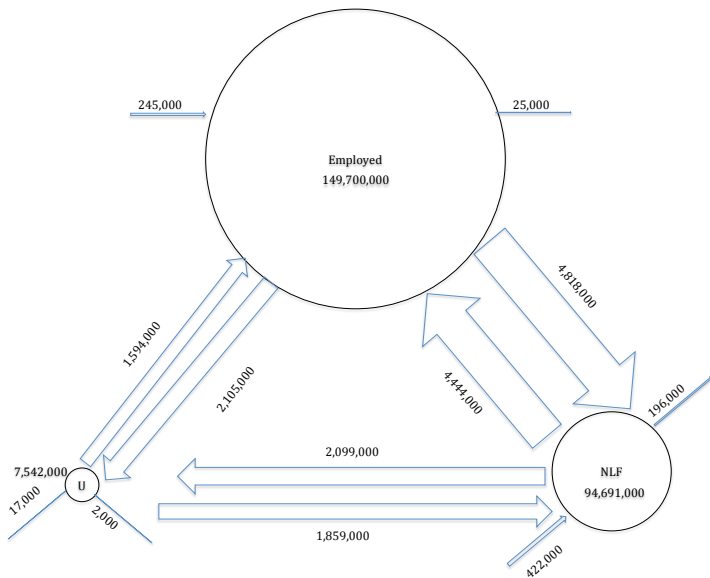
Flows... (HOTSEAT!)

- ▶ In the U.S., there are $\tilde{150}$ million employed workers in the U.S., 7.8 million unemployed
- ▶ Last month, there were about 151,000 workers hired on net
- ▶ Approximately how many people were hired by a firm last month?
 1. 20,000
 2. 200,000
 3. 500,000
 4. 2,000,000
 5. 5,000,000

WHAT ABOUT FIRMS?

- ▶ They're going through an analogous problem, but without the unemployment insurance type benefits
- ▶ People have a view of firms having all the power in the employer-employee scenario
- ▶ This is (clearly) totally wrong but it persists
- ▶ Let me try to stake it here
 - ▶ In December 2015, there were 5.1 million worker-employer separations
 - ▶ 3.1 million of these were quits
 - ▶ 1.6 million were layoffs/discharges
 - ▶ 0.4 million were "other" (transfers, deaths, disability)
 - ▶ About 2.6% of all workers earn the minimum wage
 - ▶ Workers get 70% of product, capital 30%
 - ▶ Or take Purdue as an example...
 - ▶ Or think about flows...

FLows. ARE. ENORMOUS!!!



These are monthly! Arrow width and areas are proportional.

MATCHING LABOR MARKETS

- ▶ We can think about labor markets as slowly equilibrating
- ▶ A recession jolts down A_t , productivity
- ▶ Suddenly more matches aren't worth it and dissolve: employment to unemployment flow goes up for a time
- ▶ Then, slowly, A_t goes up, more and more matches are made (slowed by people waiting for higher wages)
- ▶ The job finding rate increases and the job separations rate decreases. Over time, we go back to normal.

NATURAL UNEMPLOYMENT RATE

- ▶ Let ΔL be the change in employment/month, ϕ be the job finding rate, σ be the job separations rate, U be unemployed persons and L be employed persons. Then:

$$\Delta L = \phi U - \sigma L$$

- ▶ The economy is at equilibrium when: $\Delta L = 0$

$$\phi U = \sigma L$$

- ▶ Assuming the labor force is constant at 1 (for example)

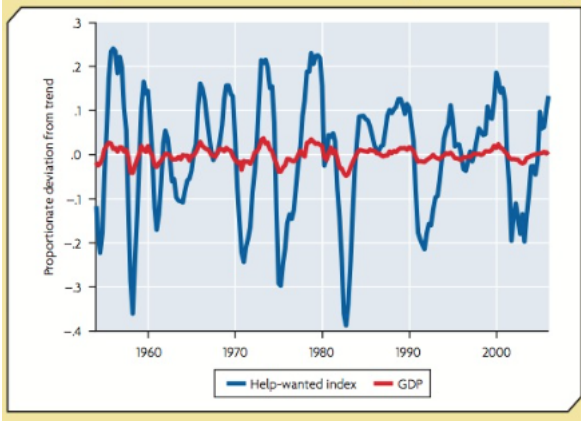
$$\phi U = \sigma(1 - U)$$

$$U = \frac{\sigma}{\phi + \sigma}$$

- ▶ Two things impact the “natural” unemployment rate: the job separations rate and the job finding rate,

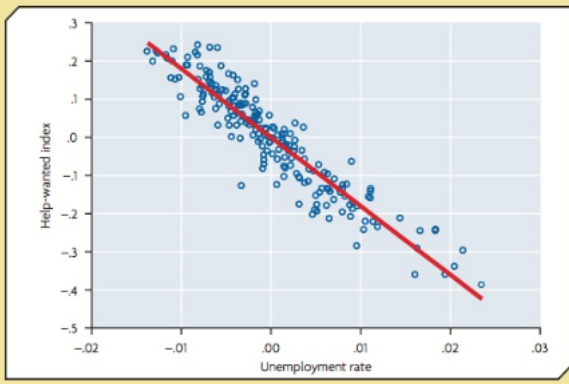
THE FIRM SIDE

Figure 9.14 Cyclical Behavior of U.S. Real GDP and Help-Wanted Advertising



THE FIRM SIDE

Figure 9.15 *The Unemployment Rate and Help-Wanted Advertising: A Beveridge Curve*



THE STORY

- ▶ A_t gets shocked down
- ▶ Suddenly where there was a surplus between employers and employees, there isn't anymore
- ▶ The match dissolves (separations rate spikes, then falls)
- ▶ In addition, knowing wages will go up as A_t increases, my reservation wage doesn't decline much even as there's less surplus in all jobs: job finding rate falls
- ▶ As productivity increases, the separations rate falls, wages increase, and the job finding rate increases
- ▶ Slowly the labor market moves to its long-run equilibrium

SUMMING UP

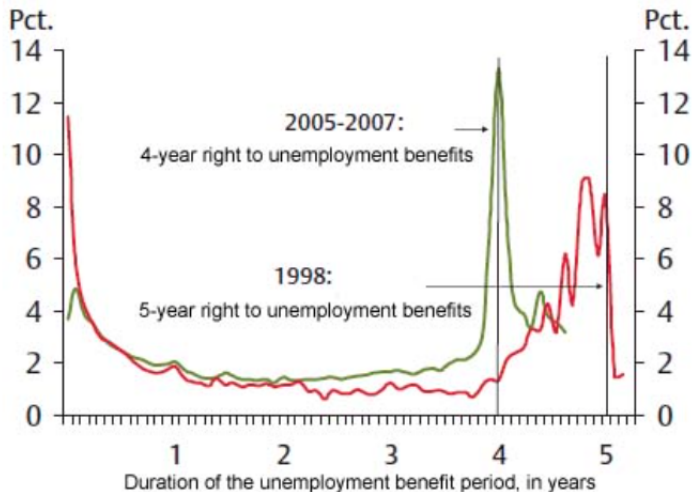
- ▶ I may be a little biased against thinking recessions are big
- ▶ But note that the trend totally dominates the deviations
- ▶ Alternatively, roughly 60%-80% of quarterly fluctuations in GDP are seasonal factors
- ▶ We ordinarily have a monthly job-finding rate of above 50% (this is tricky, because how do you count NLF flows)?
- ▶ Monthly $U - > E$ flows even in the depths of the recession were around 17-20%....after 3 months, 50% of people should have found jobs
- ▶ It's hard to stack up enormous gross flows with small net flows, and the profession is still working on that.

EVIDENCE ON UNEMPLOYMENT INSURANCE-I

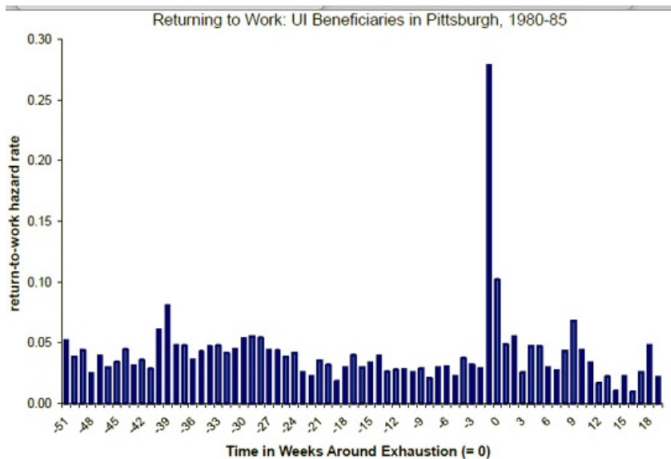
- ▶ I noted that unemployment insurance raises your reservation wage
- ▶ Raising your reservation wage means you shouldn't find a job as quickly.
- ▶ You might be dubious: tell a story about people desperate for jobs and accept the first one they get
- ▶ Testable implication that UI matters: how does behavior change when it runs out?

EVIDENCE ON UNEMPLOYMENT INSURANCE-II

Transition from unemployment benefits to work/self-support, 1998 and 2005-2007



EVIDENCE ON UNEMPLOYMENT INSURANCE-II



Jurajda and Tannery, 2003