Topic for Today

1.) Search and Unemployment

Search + Unemployment

- We have talked a lot about what determines employment (N). However, our model viewed fluctuations in N as fluctuations in the hours worked by a "representative household". In the real world, most cyclical variation in hours worked represents changes in the number of people who have jobs.

- A complete picture of the labor market requires an understanding of unemployment. Why is it that some people want to work, but cannot find jobs?

Definitions

1.) Unemployment Rate $= \dfrac{U}{E+U}$

2.) Participation Rate $= \dfrac{E+U}{E+U+NL}$

- The unemployment rate exhibits both slowly evolving trends, and sharp cyclical changes. It is a highly countercyclical and lagging variable.

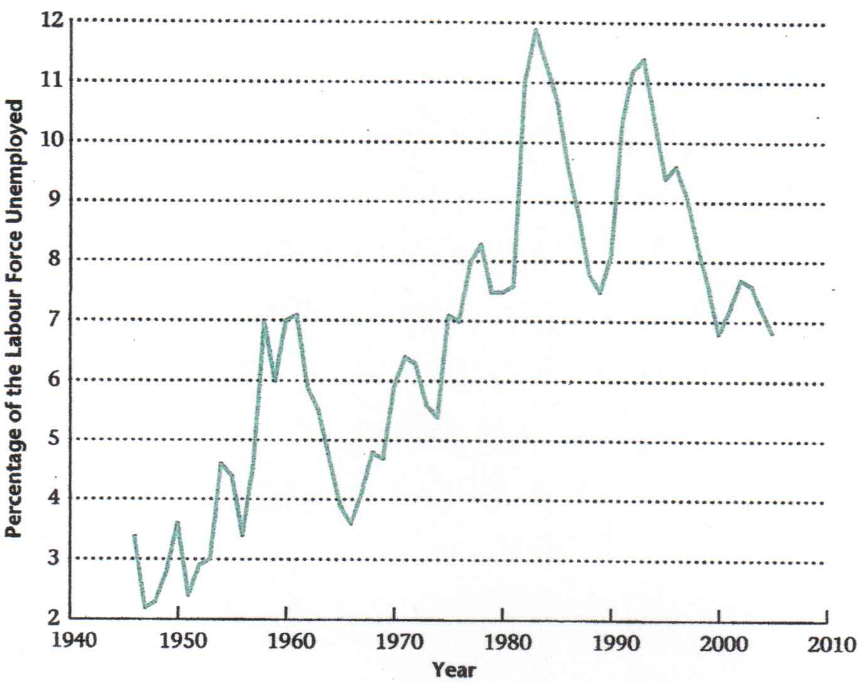


FIGURE 16.1

The Canadian Unemployment Rate, 1946–2005

The unemployment rate shows considerable cyclical volatility. In Canada, there was also a trend increase in the unemployment rate from the late 1960s until the mid-1980s, and a small trend decrease from the mid-1980s through the 1990s.

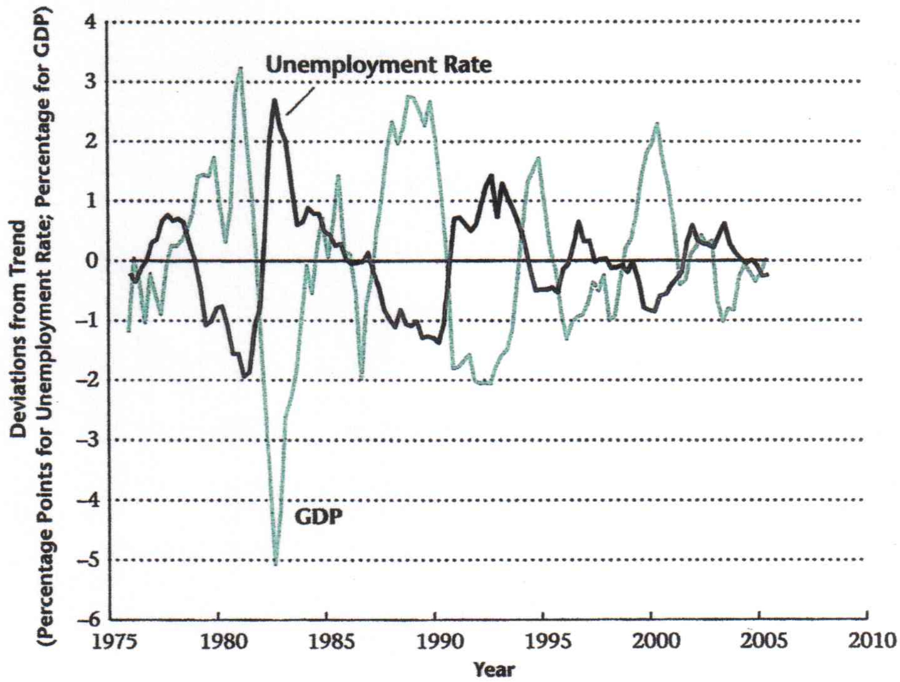
Source: Adapted from the Statistics Canada CANSIM database, Series v2461224, and from the Statistics Canada publication *Historical Statistics of Canada*, Catalogue 11-516, 1983, Series D491.

FIGURE 16.2

Deviations from Trend in the Unemployment Rate, and Percentage Deviations from Trend in Real GDP for 1976–2005

The unemployment rate is countercyclical, as it tends to be above (below) trend when real GDP is below (above) trend.

Source: Adapted from the Statistics Canada CANSIM database, Series v2062815, v1992067.



- There are two main theories of unemployment:

1.) Wage Rigidity - The idea here is that for some reason the market wage is above the market-clearing level. The resulting excess supply of labor is a form of unemployment. In Keynesian models, wages are thought to be slow to adjust, so that unemployment is temporary. In more recent models of "efficiency wages", based on asymmetric information, wages can be persistently above the market-clearing level.

2.) Search Frictions - In the real world, there is heterogeneity on both sides of the labor market. Individuals have different skills and preferences, while firms require different kinds of workers. As a result, it often takes time for workers to find jobs and for firms to fill vacancies. While this search + matching process takes place there is unemployment. Note that search models regard unemployment as an activity.

A Simple Search Model

- Way back in Lecture 4 we developed a so-called "bathtub model" of unemployment:

$$\boxed{U = \frac{s}{s+f}}$$

where s = the separation rate, and f = the job finding rate. That analysis assumed s and f were both exogenous. Now we try to endogenize f, while continuing to treat s as exogenous.

Assumptions

1.) Individuals are always in the labor force. They are either working or looking for a job.

2.) Jobs differ according to the wages, w, they pay.

3.) With probability, s, each employed person loses their job. The separation rate, s, is the same for all jobs.

4.) With probability, p, each unemployed person receives a job offer that pays a wage that is drawn randomly from the distribution, $F(w)$, where $F(w) = \text{prob}[\text{wage} \leq w]$. The wage distribution is exogenous and constant over time.

5.) While unemployed, a person receives a constant 'unemployment benefit' of b per period.

6.) Workers have an infinite planning horizon, and want to maximize their expected utility. Workers can neither save nor borrow, so they simply consume their wages + benefits.

Analysis

- Given the above assumptions, we can think of each individual as maximizing

$$E_0 \sum_{t=0}^{\infty} \left(\frac{1}{1+r}\right)^t U(c_t)$$

where r is the interest rate. Note that c_t is random. It depends on whether the person has a job in period t, and if so, what kind of job he has. Therefore, a person can only maximize expected utility.

- Note that with all the assumptions we've made the only real decision a person has is whether to accept a given job offer. (If you accept a job, you must stop looking for other jobs, i.e., there is no "on the job search".

Let,

$V_e(w)$: Present Discounted Value of being employed at wage w

V_u = Present Discounted Value of being Unemployed

They have the following recursive representations,

$$\boxed{V_e(w) = \frac{1}{1+r}\left[U(w) + sV_u + (1-s)V_e(w)\right]}$$

$$\boxed{V_u = \frac{1}{1+r}\left[U(b) + (1-p)V_u + p\int_0^{\bar{w}} \max\left[V_u, V_e(w)\right] f(w)\,dw\right]}$$

where $w \in [0, \bar{w}]$ and $f(\cdot)$ is the density associated with $F(\cdot)$

Notice 4 things here:

1.) V_u is independent of w.

2.) V_e depends on V_u, and V_u depends on V_e. They are interdependent.

3.) Since preferences & the wage distribution are constant, a person never quits a job.

4.) The $\max[V_u, V_e(w)]$ term reflects the fact that when a person gets a job offer, accepting the offer is an option. Lousy job offers can be rejected.

- Multiplying both sides of the previous equations by $1+r$ and collecting terms gives us:

$$rV_e(w) = u(w) + s[V_u - V_e(w)]$$

$$rV_u = u(b) + p\int_0^{\bar{w}} \max[0, V_e(w) - V_u] f(w)\,dw$$

We can solve the first eq. for $V_e(w)$ to get:

$$V_e(w) = \frac{u(w) + sV_u}{r+s}$$

Notice that since V_u is independent of w, the $V_e(w)$ function inherits the same properties as the utility function, $u(w)$ [e.g., it is increasing and concave].

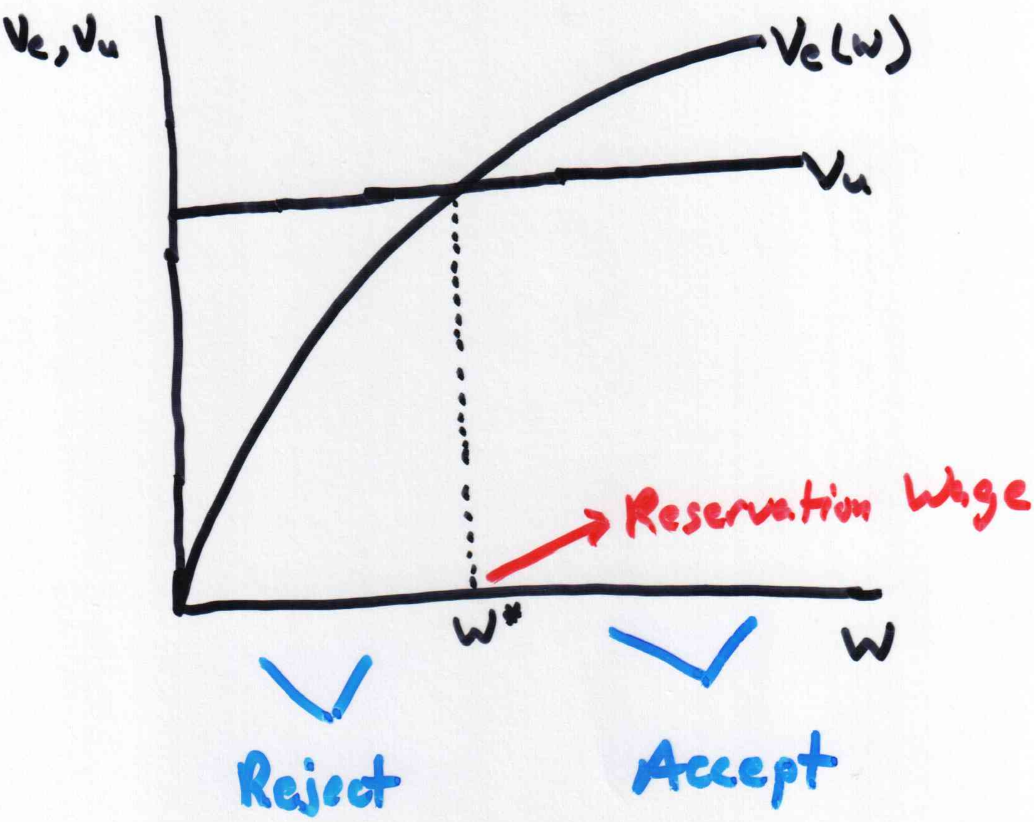
The optimal policy clearly has the following form:

1.) Accept if $w \geq w^*$

2.) Reject if $w < w^*$

where $V_e(w^*) = V_u$. The threshold wage offer, w^*, is called the "reservation wage".

Determination of the reservation wage can be visualized as follows:



The Equilibrium Unemployment Rate

The reservation wage is the key endogenous variable in this model. It determines how selective workers are when looking for a job, and therefore determines the average duration of job search. As discussed earlier in the "bathtub model", the equilibrium unemployment rate is such that the flow of people into unemployment exactly matches the flow of people out of unemployment:

$$\boxed{s(1-u) = p[1-F(w^*)]\,u}$$

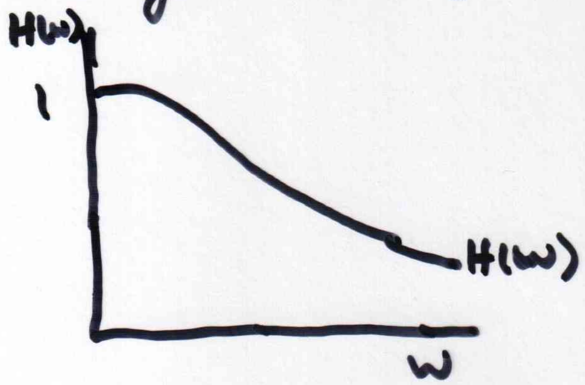
Solving for u then gives

$$\boxed{u = \frac{s}{s + p[1 - F(w^*)]}}$$

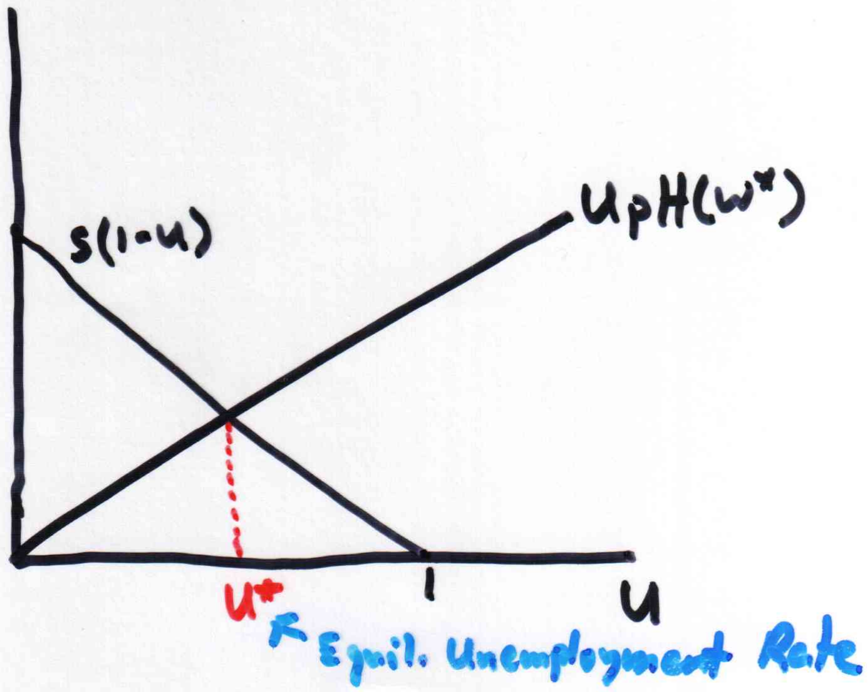
From the definition of w^*, note that

$1 - F(w^*)$ = Probability that a job offer is accepted.

Notice that since $F(w)$ is increasing, $1 - F(w)$ is decreasing. Defining $H(w) = 1 - F(w)$ we have



This allows us to depict the equilibrium unemployment rate as follows:



An Example

Suppose the wage distribution has just 2 values:

$$w = w_1 \quad \text{with prob. } \pi$$
$$= 0 \quad \text{with prob. } 1-\pi$$

Assume for the moment that $w = w_1$ is accepted and $w = 0$ is rejected. Then the two value functions take the form:

$$rV_e = U(w_1) + s(V_u - V_e)$$
$$rV_u = U(b) + p\pi(V_e - V_u)$$

Solving,

$$\boxed{\begin{aligned} V_e &= \frac{(p\pi + r)U(w_1) + sU(b)}{r(s + p\pi + r)} \\ V_u &= \frac{(s+r)U(w_1) + p\pi U(b)}{r(s + p\pi + r)} \end{aligned}}$$

Notice $V_u > 0$ so $w = 0$ will indeed by rejected. It can also be shown that w_1 is accepted if and only if $w_1 \geq b$.

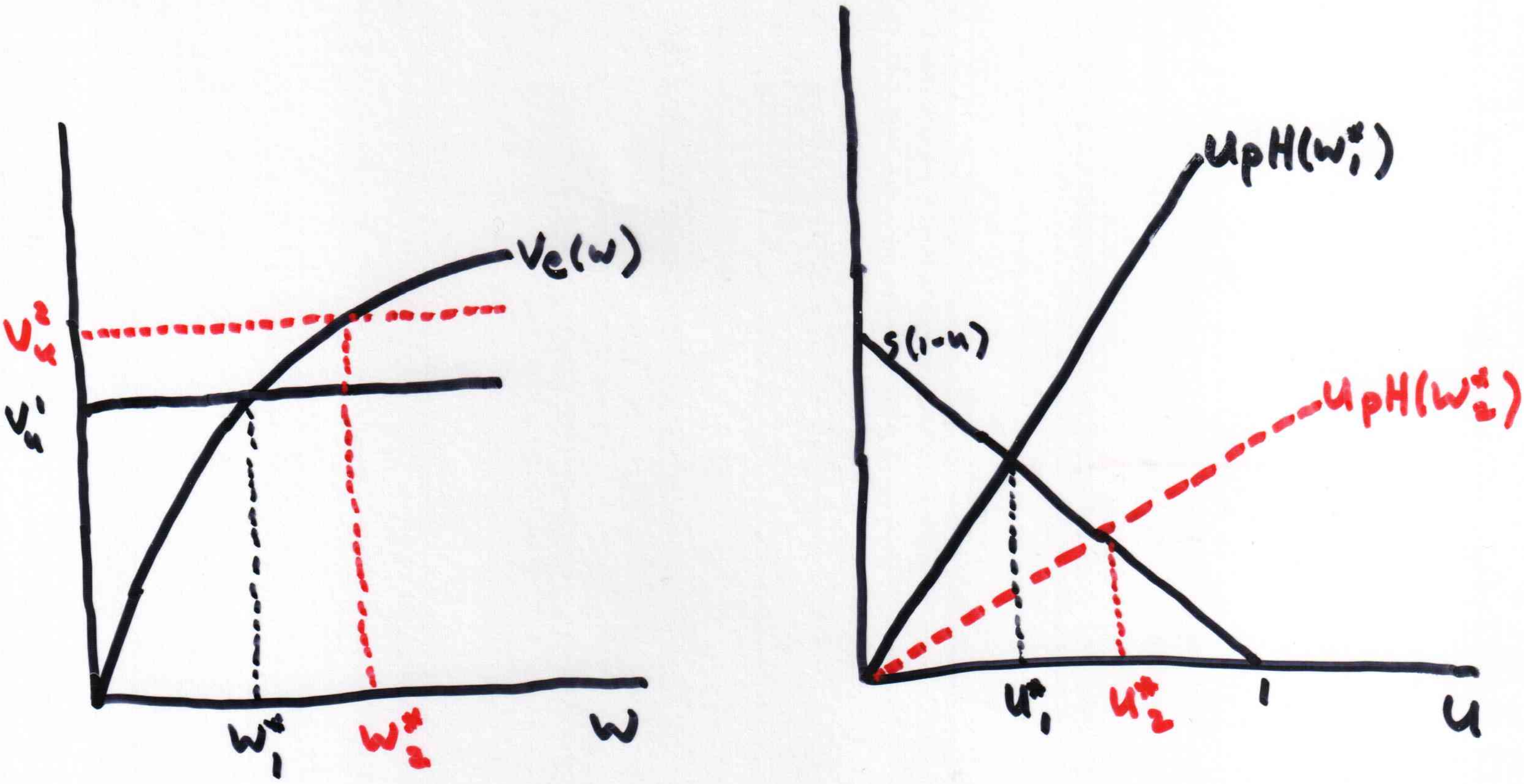
The equilibrium unemployment rate will clearly be:

$$\boxed{u = \frac{s}{s + p\pi}}$$

Comparative Statics

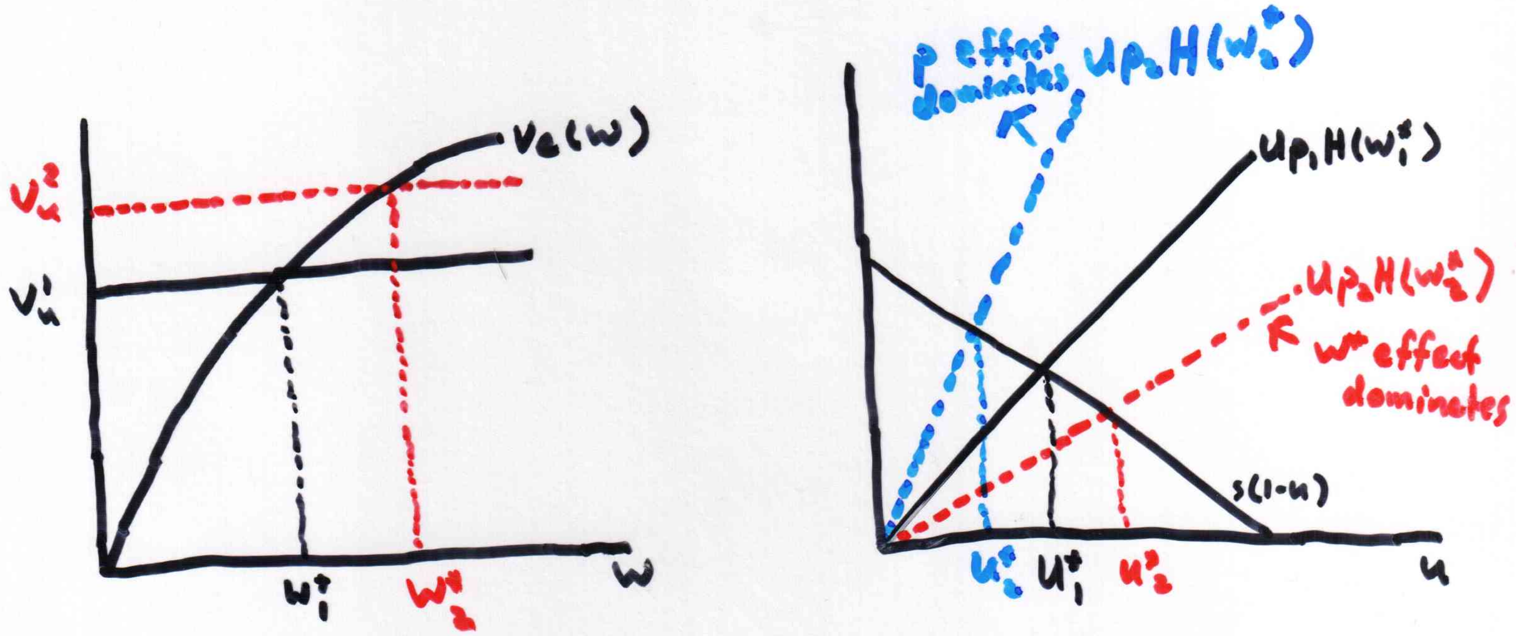
The whole point of developing a model is that it allows us to predict how the economy responds to changes. Let's consider a few examples:

Example 1: An Increase in Unemployment Benefits, b



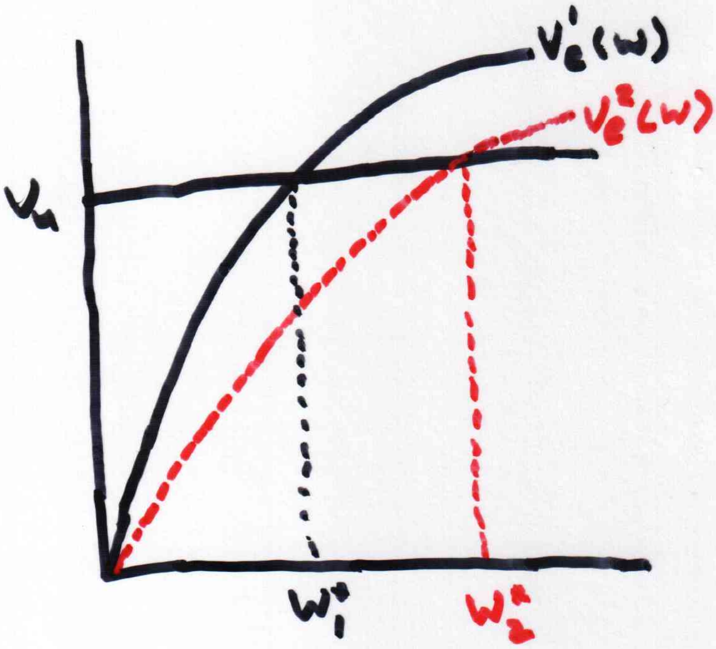
An increase in Unemployment Benefits increases the reservation wage and the equilibrium unemployment rate.

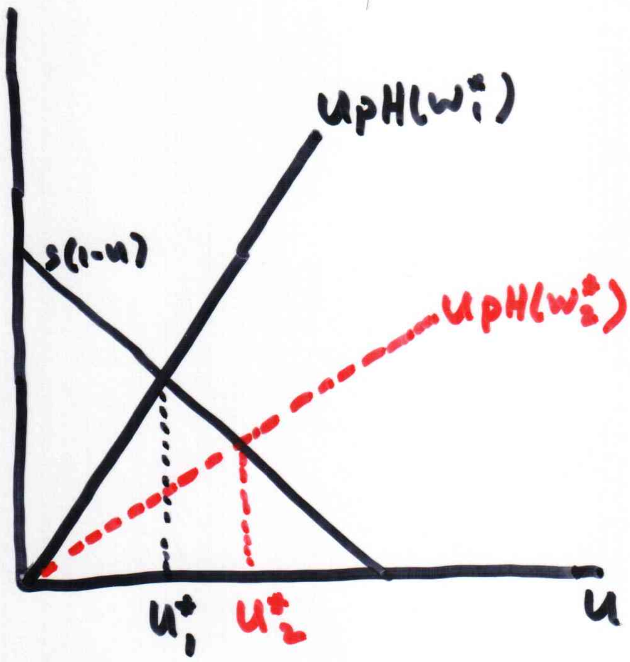
Example 2: Increase in the Job Offer rate, p.



An increase in the Job offer rate increases the reservation wage. It has an ambiguous effect on the equilibrium unemployment rate. The direct effect of $p\uparrow$ reduces u^*, but the indirect effect on $w^*\uparrow$ increases u^*.

Example 3: Increased Taxes on Labor Income





An increase in Labor Income taxes increases the reservation wage and the equilibrium unemployment rate.