

---

2014/2015, week 2

**Investment and the labour market**

---

Mankiw, Chapter 17.1, 17.4, 7, 14.2,14.3

Version April 9 2015

---

## Outline this week's lecture

- Firms
  - demand for capital
  - demand for labour
- The labour-leisure choice of households
- Classical view of labour market equilibrium
  - minimum wages, trade unions, efficiency wages, taxes (on employers and employees)

---

## Outline this week's lecture

- ❑ Modern view of labour market equilibrium
  - ❑ Natural unemployment, unemployment insurance
- ❑ Cyclical unemployment
  - ❑ Phillips curve
  - ❑ Adaptive and rational expectations

---

## Investment

- ❑ As important as consumption, but less controversial
- ❑ Investment more pro-cyclical than consumption
- ❑ Investment links current economy to the future economy, just like saving
  - ❑ In a closed economy, saving equals investment

---

## Investment

- Keynesian investment function:

$$I = I(r) \quad I'(r) < 0$$

- Classical investment theory assumes that the demand for capital by firms derives from optimization under constraints
  - In particular, the firm maximizes its profits, given the production function

---

## Investment

- Profits are defined as revenues minus costs:

$$\begin{aligned}\pi &= PY(K) - \left( i - \frac{\Delta P_{+1}}{P} + \delta \right) PK \\ &= PY(K) - (r + \delta)PK\end{aligned}$$

- P is the price of output (and capital), K the capital stock, Y output, i the nominal interest rate, r the real interest rate and  $\delta$  the depreciation rate

---

## Investment

- Profits are maximized when marginal profits equal zero

$$\frac{\partial \pi}{\partial K} = 0 \quad \rightarrow \quad PY'(K) - (r + \delta)P = 0$$

- Mankiw uses MPK to denote  $Y'(K)$ :

$$MPK = r + \delta$$

- Firms demand capital up to the point where marginal revenues equal marginal costs

---

## Investment policies

- ❑ Corporate income tax
  - ❑ In principle, this exerts a zero effect upon investment (affects both marginal revenues and marginal costs)
  - ❑ Under legal rules, the tax reduces investment as it has less effect upon marginal costs
- Investment tax credit
  - ❑ This policy instrument only affects marginal costs, so increases investment



---

## Theory of Tobin's $q$

- Investment is increasing in  $q$ :

$$I = I(q) \quad I'(q) > 0$$

- $q$  defined as market value divided by replacement cost of installed capital
- Theory is related to the classical theory, but stresses more that investment is driven by expectations about the future

---

## Is the stock market an indicator of future economic developments?

- ❑ In 2013, Fama, Shiller and Hansen received the Nobel Prize Economics
- ❑ Fama is founder of the efficient market hypothesis
  - ❑ The market incorporates all available information about the profitability of a firm in the stock price
  - ❑ Evidence that it is not possible to beat the market

---

## Is the stock market an indicator of future economic developments?

- ❑ Keynes viewed the stock market as a beauty contest
- ❑ Shiller explored the volatility of stock prices:
  - ❑ If the efficient market hypothesis is true, this volatility has an upper bound
  - ❑ He found that empirical data reject this condition

---

## Labour demand

- Profits are maximized when marginal profits equal zero

$$\partial\pi / \partial L = 0 \quad \rightarrow \quad PY'(L) - w = 0$$

- Firms demand labour up to the point where marginal revenues equal marginal costs

---

## Classical model of labour supply

- The classical model of labour supply can be set up analogous to the Fisher model of intertemporal choice
- In particular, take the two-period version of the latter, change period-1 consumption and period-2 consumption into consumption and leisure

---

## Classical model of labour supply

- Again, we have indifference curves and a budget constraint
- We find the optimal choice as the combination of  $C$  and  $v$  for which the indifference curve and the budget constraint are tangent to one another

---

## Classical model of labour supply

- The budget constraint of the model is static. It starts with the equality of consumption and income:

$$C = wL_s + Y_{nl}$$

- Here,  $C$  denotes consumption,  $w$  the wage rate,  $L_s$  labour supply and  $Y_{nl}$  non-labour income

---

## Classical model of labour supply

- Next, we have a time constraint:

$$L_s = T - v$$

- Here,  $T$  denotes available time and  $v$  denotes leisure.
- Combined, we have

$$C = (wT + Y_{nl}) - wv$$



---

## Classical model of labour supply

- The slope of the budget constraint (BC) follows upon derivation:

$$C = (wT + Y_{nl}) - wv \quad \rightarrow \quad dC / dv = -w$$

- Note that the wage rate enters twice!

---

## Classical model of labour supply

- The slope of the indifference curve can be derived similarly
- Define the utility function:

$$U \equiv U(C, v)$$

- Along the indifference curve, utility is a constant:

$$dU = U_c dC + U_v dv = 0 \quad \rightarrow$$

$$dC / dv = -U_v / U_c$$

---

## Classical model of labour supply

- Combining, we have the optimality condition:

$$U_v / U_c = MRS = w$$

- Technically, this is one equation with two unknowns, C and v
- The BC is a second equation in terms of C and v

---

## Classical model of labour supply

- ❑ Combining the two equations gives equations for consumption and leisure, all in terms of non-labour income and the wage rate
- ❑ Upon invoking the time constraint, we derive the corresponding equation for labour supply, also in terms of non-labour income and the wage rate

---

## Classical model of labour supply

- Above, we have seen that the wage rate has a dual role
  - Price of leisure
  - Element of fulltime income,  $(wT + Y_{nl})$
- Increase in the wage rate thus has
  - Substitution effect (increases labour supply)
  - Income effect (decreases labour supply)

---

## Classical model of labour supply

- Theoretically, total effect may be zero or negative
- Empirically, the labour supply elasticity is estimated
  - about 0 to 0,4 for males
  - about 0,5 to 1 for females

---

## Equilibrium on the labour market – classical view

- ❑ In the classical view, the real wage adjusts instantaneously so as to clear the labour market at all times
  - ❑ Everyone who wants to sell labour at the prevailing real wage can do so
  - ❑ Everyone who wants to buy labour at the prevailing wage can do so
  - ❑ Those who want to work do work; unemployment is voluntary

---

## Trade unions

- ❑ Trade unions remove competition and may be viewed as monopolists
- ❑ They set wages higher than the equilibrium rate, which decreases employment (like the minimum wage)
- ❑ Conflict between insiders (workers) and outsiders (the unemployed)
- ❑ The benefit of centralized wage bargaining



---

## Efficiency wages

- ❑ Firms may set the wage rate at a higher level than that which corresponds to labour market equilibrium
- ❑ The theory of efficiency wages assumes that higher wages increase productivity
  - ❑ By reducing labour turnover
  - ❑ By adverse selection
  - ❑ By reducing shirking behaviour

---

## Taxes on employers and workers

- How do a tax on workers or a tax on the labour costs paid by firms affect the labour market?
- What are the effects upon the wage rate, labour supply and demand, voluntary and involuntary unemployment?

---

## Labour market distortions 2: tax wedge

- A tax on workers
  - shifts the labour supply curve to the left
  - given the (gross) wage  $w$ , a tax reduces the incentive to work
- A tax on labour costs of firms
  - shifts the labour demand curve to the left
  - given the (gross) wage  $w$ , the tax reduces the incentive to demand labour
- Social security contributions
- The two types of taxes cause unemployment:
  - voluntary unemployment

---

## Equilibrium on the labour market – modern view

- ❑ Modern view: the labour market is different from other markets
  - ❑ Labour is very heterogeneous; large productivity differences between workers
  - ❑ Large productivity differences between jobs
  - ❑ Lack of information about productivity of workers and jobs
  - ❑ Vacancies and unemployed workers can match only after a search process

---

## Mismatch

- Hence, in the modern view equilibrium on the labour market means a stable rate of unemployment
  - Natural rate of unemployment
- Natural unemployment consists of
  - Frictional unemployment (impact of labour market frictions)
  - Structural unemployment (impact of taxes and social security institutions)
- Watch out:
  - distinction is blurred
  - natural does not mean natural

---

## Labour market equilibrium – modern view

- ❑ Decompose the part of the population that is willing to work into employment and unemployment,  $L = E + U$
- ❑ Job separation:  $sE$
- ❑ Job finding:  $fU$
- ❑ Labour market equilibrium:  $fU = sE = s(L - U)$
- ❑  $U/L = s/(s + f)$

---

## Unemployment insurance

- Katz and Meyer (1990): study with individual data on unemployment spells and eligibility for unemployment insurance
  - Probability to move into employment higher in case person is not eligible for unemployment insurance
    - More intense search for vacancies
    - More likely to accept a job offer
- Woodbury and Spiegelman (1987): experiment in Illinois with a treatment and a control group
  - Eligibility lengthens unemployment spell
    - More intense search for vacancies
    - More likely to accept a job offer

---

## US versus Europe

- Europe features lower labour participation
  - Workers work less hours per year than in the US
  - A smaller fraction of the population is employed
- Prescott: this is due to taxes in the US and Europe
  - However, think about labour supply elasticities
- Other potential factors:
  - Underground economy
  - Trade unions
  - Preferences



---

## Cyclical unemployment

- ❑ Deviations between actual and structural unemployment attributed to business cycle:
  - ❑ cyclical unemployment
- ❑ Phillips curve:
  - ❑ inflation relates to cyclical unemployment
- ❑ Negative relationship (1958, UK data) between rate of wage inflation and rate of unemployment
  - ❑  $\pi = E\pi - \beta (u - u^n) + v$

---

## Cyclical unemployment

- $\pi = E\pi + \left(\frac{1}{\alpha}\right) (Y - \bar{Y}) + \nu$ 
  - $\bar{Y}$  natural level of output
- Okun's law:  $\left(\frac{1}{\alpha}\right) (Y - \bar{Y}) = -\beta(u - u^n)$ 
  - $u^n$  natural rate of unemployment
- Combined:  $\pi = E\pi - \beta(u - u^n) + \nu$

---

## Okun's law and the sacrifice ratio

- ❑ Sacrifice ratio:
  - ❑ How much percent of GDP must be foregone to reduce inflation by 1 percentage point
  - ❑ Typical estimate is 5 ( $\alpha$ )
  - ❑ Given that  $\alpha\beta$  in Okun's law is estimated at 2, we can also calculate that the corresponding sacrifice ratio for unemployment:
  - ❑ How much percentage point should unemployment increase to reduce inflation by 1 percentage point
  - ❑ The above implies an estimate for  $1/\beta$  of 2,5

---

## Adaptive expectations

- ❑ Expectations of inflation driven by lagged inflation rates
- ❑ Monetarists (Milton Friedman) pointed to the non-constancy of expected inflation
- ❑ Consequence:
  - ❑ The Phillips curve moves through time

---

## Adaptive expectations

- ❑ Consequence of anti-cyclical policies:
  - ❑ After a transition process, unemployment equals its natural rate, whereas inflation is higher than before
  - ❑ Trade-off between inflation and unemployment exists only in the short run
  - ❑ Long-run Phillips curve is vertical

---

## Rational expectations

- ❑ People generally realize immediately the consequences of anti-cyclical policies:
  - ❑ There is no transition process
  - ❑ Anti-cyclical policies will be unable to reduce unemployment below the natural rate
  - ❑ Trade-off between inflation and unemployment does not exist, not in the long run and not in the short run
  - ❑ Only surprise inflation will have the claimed effect