

Session 1: The Current Consensus in Macroeconomics

Distribution and Growth Workshop
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Outline

Introduction

The 3 Equation Model

Shifts in Aggregate Demand

Aggregate Supply Shifts

- Deriving the Phillips curve

- Accelerating inflation out of equilibrium

- Supply Side Reforms

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Introduction

Intro I

This session:

- ▶ detailed discussion of the baseline "mainstream" macroeconomic model (New Keynesian DSGE)
- ▶ motivated by two important questions:
 - ▶ Why do some people/economists believe austerity works?
 - ▶ Why do some people/economists argue that weaker unions or self-restraining unions reduce unemployment?

Next session:

- ▶ fundamental Post-Keynesian critique
- ▶ motivated by the question: Why do some economists believe recessions can cause long term damage?

Intro II

How?

- ▶ Present model building blocks
- ▶ Discuss key mechanisms
- ▶ Provide extensive references. Not all is lost!
Often political propaganda not even supported by mainstream macroeconomists.

Intro III

- ▶ Why models?
 - ▶ Economies are dynamic (i.e. evolve through time) systems (i.e. several relates parts influencing each other)
 - ▶ Thinking about fiscal or monetary policy, wage policies, income distribution etc., it get's complicated very quickly!
 - ▶ Models allow us to "think through" what happens if "X" happens or changes without forgetting any interaction or indirect effect.
 - ▶ And while all models are wrong, some are useful!

Why using Carlin and Soskice (2014)?

- ▶ First two sessions heavily based on Carlin and Soskice (2014).
- ▶ Accessible presentation of the currently most widely accepted macroeconomic model: the New Keynesian Dynamic Stochastic General Equilibrium Model (DSGE).
- ▶ For a literature survey see Clarida, Galí, and Gertler (1999) and for the standard (advanced) textbook see Woodford (2003).
- ▶ Carlin and Soskice (2014) provide introduction with much lower math requirements while retaining the main mechanisms and conclusions.

The 3 Equation Model

The structure of the model

- ▶ Carlin and Soskice (2014) call it "3 equation model"
- ▶ One equation for each main building blocks
- ▶ 1): demand side (IS equation)
- ▶ 2): supply side (Philips curve)
- ▶ 3): monetary policy (central bank reaction function)

The demand side: IS equation

- ▶ "IS" refers to investment and saving
(goods market equilibrium in closed economy)

$$Y_t = A - cr_{t-1} \quad (1)$$

- ▶ A represents all factors which affect aggregate demand other than the interest rate
- ▶ c : the interest rate sensitivity of consumption and investment and depends on size of multiplier (larger multiplier, larger c , economy more interest sensitive)
- ▶ time lag: households and firms need time to react

New Keynesian IS curve and old IS-LM IS curve

- ▶ Motivating negative relationship between Y and r :
 - ▶ IS-LM model: purely via investment function
 - ▶ New Keynesian DSGE models (Clarida et al., 1999): inter-temporal consumption smoothing of households
- underlying logic very different; similar aggregate relationship
- empirical support for inter-temporal consumption smoothing weak

The supply side: The Philips curve

Carlin and Soskice (2014) specify the Phillips curve with adaptive expectations as:

$$\Pi_t = \Pi_{t-1} + \alpha(y_t - y^n) \quad (2)$$

- ▶ The **change** in inflation depends on the output gap
- ▶ As long as actual output (y_t) is above natural output (y^n) inflation will increase each period!

The wage price spiral

What is the economic mechanism underlying the Phillips curve?

- ▶ If output is above natural output ($y_t > y^n$) workers demand real wage increases
- ▶ Firms set prices and offset higher nominal wages by higher prices (i.e. real wage constant)
- ▶ If economy is still at $y_t > y^n$ workers will demand even higher nominal wage increase
- ▶ Firms will offset it by increasing prices
- ▶ etc.

Monetary Policy: The CB reaction function

The central bank sets interest rates according to:

$$r_t = r^n + \frac{\alpha\beta}{c} \left(E[\pi_{t+1}] - \pi^T \right) \quad (3)$$

and $E[\pi_{t+1}] = \pi_{t+1}$

- ▶ The CB has rational expectations
- ▶ It sets interest rates based on deviation of future inflation from target (π^T)
- ▶ due to rational expectations it correctly anticipates future inflation
- ▶ r^n is the real interest rate compatible with natural output y^n

The Central Bank's objectives

- ▶ Importantly, equation (3) does not imply the CB only cares about inflation
- ▶ Inflation automatically (via the Phillips curve) reveals the output disequilibrium
- ▶ In equilibrium $r_t = r^n$
- ▶ Parameter β reflects how much the CB focusses on inflation vs output (employment) stabilization
($\beta < 1$ means more weight on output and employment, $\beta = 0$ means only output, $\beta > 1$ means more weight on inflation)

Summing Up

- ▶ Output is negatively affected by the real interest rate
- ▶ The inflation rate will increase as long as actual output is above natural output
- ▶ The central bank is focussed on keeping inflation and the output gap in check

Let's use this model to analyse our first two questions:

- ▶ Why do some people/economists believe austerity works?
- ▶ Why do some people/economists argue that weaker unions or self-restraining unions reduce unemployment?

Solving the Model: Equilibrium

- ▶ The model can be solved by substitution or by matrix algebra
- ▶ The model is stable by design (no unit roots) which means the equilibrium values Y^* , Π^* and r^* do not change
- ▶ We obtain:

$$\Pi^* = (A - Y^n - c \cdot r^n + \alpha\beta\Pi^T)/(\alpha\beta)$$

$$Y^* = Y^n$$

$$r^* = r^n$$

From here we can already see that neither fiscal nor monetary policy can affect equilibrium output or equilibrium interest rates! Let's explore that in detail!

Shifts in Aggregate Demand

Shifts in Aggregate Demand: Fiscal Policy

"In the short run, shifts in aggregate demand affect output. [...]"

In the medium run, output returns to the natural level of output. This natural level depends on the natural rate of unemployment, the capital stock and on the state of technology.

Fiscal policy has short-run, medium-run and long-run effects on output. Higher budget deficits are likely to increase output in the short run. They leave output unaffected in the medium run. And, they are likely to decrease capital accumulation and output in the long run."

Olivier Blanchard (former IMF chief economist)
(Blanchard, 2006)

Shifts in Aggregate Demand: Fiscal Policy

- ▶ We will focus on fiscal policy as example of aggregate demand shift
- ▶ Mainstream economists (especially before 2008/2009) extremely sceptical

Understanding mainstream reasoning important when:

- ▶ commenting on gov policies
- ▶ campaigning and training members

Scenario I: A temporary increase in gov spending

What happens if government increases spending for one period: one-off increase of autonomous demand from A to A'

- ▶ We start from equilibrium: Y^* , Π^* and r^*
- ▶ Government increases its expenditures for 1 period and returns to previous level afterwards
- ▶ Let's see how the economy reacts

Scenario I: Dynamic adjustment to temporary demand shock

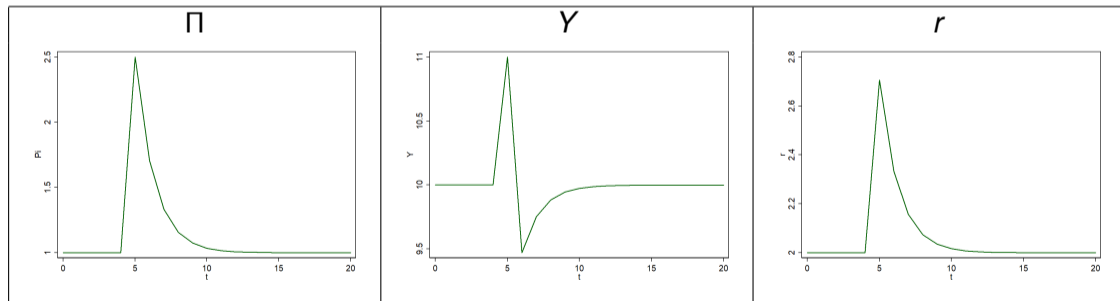
We start from equilibrium: $Y^* = 10$, $\Pi^* = 1$ and $r^* = 2$:

Government expenditure increase in period 5 by 1 unit:

| period | Y_t | Π_t | r_t |
|-----------|-------|---------|-------|
| period 1 | 10 | 1 | 2 |
| period 4 | 10 | 1 | 2 |
| period 5 | 11 | 2.5 | 2.7 |
| period 6 | 9.47 | 1.7 | 2.3 |
| period 7 | 9.75 | 1.3 | 2.15 |
| period 10 | 9.97 | 1.03 | 2.02 |
| period 15 | 10 | 1 | 2 |

Scenario I: Dynamic adjustment to temporary demand shock

A temporary positive demand shock hits the economy in period 5:



Scenario I: Interpretation

- ▶ Expansion of gov expenditures creates short (1 period boom),
- ▶ Inflation goes up due to boom,
- ▶ Central bank reacts and triggers a recession to get inflation down
- ▶ Economy gradually adjusts back to equilibrium.

Scenario I: Interpretation

- ▶ Fiscal policy (demand management) only effective in short run (fight recessions).
- ▶ In addition temporarily reducing gov expenditures, only has temporary effects as well!

Scenario II: A permanent increase in gov spending

What happens if government increases spending permanently: permanent increase of autonomous demand from A to A'

- ▶ We start from equilibrium: Y^* , Π^* and r^*
- ▶ Government increases its expenditures permanently
- ▶ Let's see how the economy reacts

Scenario II: Dynamic adjustment to permanent demand shock

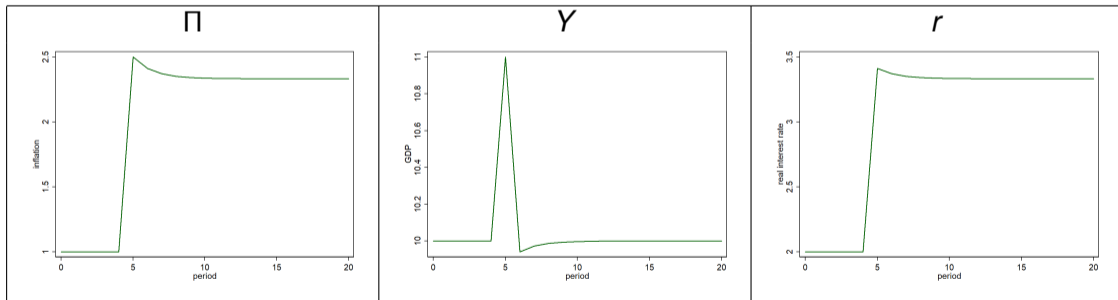
We start from equilibrium: $Y^* = 10$, $\Pi^* = 1$ and $r^* = 2$:

Government expenditure increase permanently from period 5 onwards by 1 unit:

| period | Y_t | Π_t | r_t |
|-----------------|-------|---------|-------|
| period 1 | 10 | 1 | 2 |
| period 4 | 10 | 1 | 2 |
| period 5 | 11 | 2.5 | 3.41 |
| period 6 | 9.94 | 2.41 | 3.37 |
| period 7 | 9.97 | 2.37 | 3.35 |
| period 10 | 10 | 2.33 | 3.33 |

Scenario II: Dynamic adjustment to permanent demand shock

A permanent positive demand shock hits the economy in period 5:



Scenario II: Interpretation

- ▶ Expansion of gov expenditures creates short (1 period boom),
- ▶ Inflation goes up due to boom,
- ▶ Central bank reacts and triggers a recession to get inflation down
- ▶ CB reaction is stronger (r increases to 3.41 vs 2.7 because it anticipates permanent nature of shock and thus more persistent inflation)
- ▶ Economy gradually adjusts back to natural output equilibrium, BUT
- ▶ inflation remains higher
(unless the CB adjusts its natural interest rate estimate to $r^n = 3.33$)

Scenario I: Interpretation

- ▶ Fiscal policy (demand management) only effective in short run (fight recessions).
- ▶ Even permanent increases or reductions in government spending would not affect equilibrium output!
- ▶ Permanent reductions in gov spending do not harm the economy!
- ▶ Permanent increases in gov spending do not benefit the economy.
- ▶ Fundamental reason: y^n is purely supply determined!

Aggregate Supply Shifts

What determines natural output y^n ?

- ▶ Policy is ineffective because economy always returns to equilibrium y^n
- ▶ Why is that?
- ▶ As soon as $y_t > y^n$, inflation increases (and CB will increase interest rates until $y_t = y^n$)
- ▶ Three questions:
 - ▶ Why does inflation increase if $y_t > y^n$?
 - ▶ What determines natural output y^n ?
 - ▶ How can policy makers increase y^n ?
- ▶ In order to answer that, need to derive Phillips curve in detail

Aggregate Supply Shifts

Deriving the Phillips curve

The supply side: the Philips curve

- ▶ The supply side focuses on the labour market
- ▶ Idea is to look at production decisions rather than spending (demand side)
- ▶ It is not a growth model, so capital stock is exogenous and thus only labour input is analysed

Why are weaker unions "good" for the economy?

- ▶ Let's look in more detail at the supply side in order to understand the mechanisms leading to this conclusion
- ▶ That requires us to derive the Phillips curve in detail

Deriving the Phillips curve: wage setting I

How are wages set?

- ▶ Employers bargain with unions and set efficiency wages
- ▶ Employers cannot perfectly monitor workers → they pay more than market wage to make sure workers don't shirk
- ▶ Efficiency wages discipline workers^a by increasing cost of job loss
- ▶ This cost decreases as employment goes up (unemployment is low)

^aThe title of the original paper is "Equilibrium Unemployment as a Worker Discipline Device" (Shapiro & Stiglitz, 1984)

Deriving the Phillips curve: wage setting I

Overall Carlin and Soskice (2014) interpret the WS curve as representing workers' wage claims based on the tightness of the labour market and the "generosity" of the social security system.

Deriving the Phillips curve: wage setting II

► So we have:

► $w^{WS} = \frac{W}{P} = f(N, z_w)$

► This is our wage-setting (WS) curve

► in linear form:

► $\frac{W}{P} = B + \gamma N + z_w$

► B are unemployment benefits, z are other wage push factors

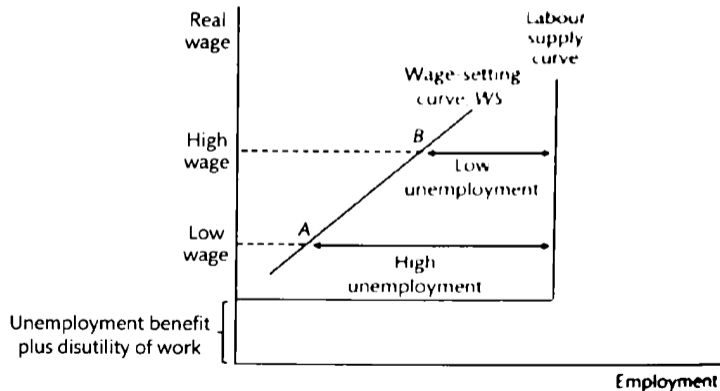


Figure 2.2 The wage-setting curve, WS

Deriving the Phillips curve: price setting I

How are prices set?

- ▶ Firms operate under monopolistic competition and maximize profits
- ▶ which allows them to set prices
- ▶ as a markup over marginal labour cost (i.e. over $\frac{W}{MPL}$)
- ▶ (under imperfect competition $MC=MR$ is profit maximizing; see Carlin and Soskice (2014, p. 75) for detailed derivation)

Deriving the Phillips curve: price setting II

This gives us the price setting equation (PS):

$$P = (1 + \mu) \frac{W}{MPL} \quad (4)$$

where μ represents the market power of firms (price in-elasticity of demand). So if price is perfectly elastic (i.e. perfect competition) we have $\mu = 0$ and $\frac{W}{P} = MPL$.

We will rewrite equation (4) as

$$w^{PS} = \frac{W}{P} \approx (1 - \mu)\lambda \quad (5)$$

where $\lambda = MPL$ represents the state of technology.

Deriving the Phillips curve: price setting II

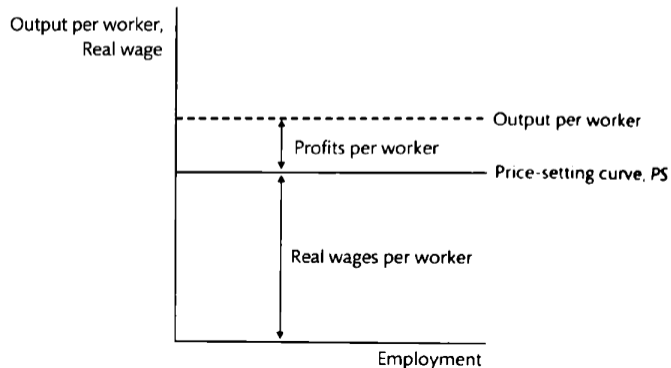
Carlin and Soskice (2014) interpret the PS curve as firms' demands on the real wage which allows them to maximize profits.

It is based on technology (λ) and market power (μ)

Deriving the Phillips curve: price setting III

Which means the price setting curve is flat in the real-wage-employment diagram

and since the real wage on the w^{PS} curve is less than MPL, firms do make a profit.



Deriving the Philips curve: putting PS and WS together

The labour market is in equilibrium when price and wage setting considerations are compatible (intersection of w^{PS} and w^{PS} curves):

$$w^{PS} = w^{PS} \quad (6)$$

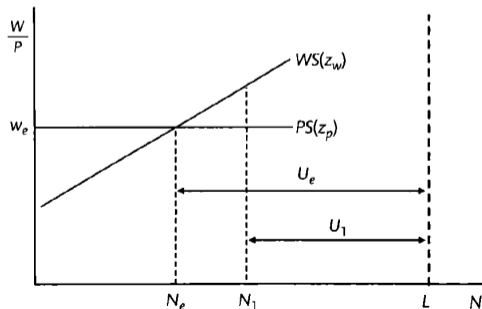


Figure 2.13 Equilibrium employment and unemployment: N_e and U_e .

Deriving the Philips curve: putting PS and WS together

What happens to wages and prices if the economy is not in equilibrium (i.e. not at N^e or Y^e)?

- ▶ Let's suppose an increase in demand shifts the economy from N^e to $N_1 > N^e$
- ▶ Prices are sticky and firms will respond by changing output and employment
- ▶ Next wage round nominal wages are adjusted
- ▶ Immediately after wages are adjusted, prices adjust as well
- ▶ The economy is (temporarily) at a point of higher output and higher inflation

This reaction of the economy to changes in output is modelled by the Phillips curve

The Philips curve I

If we have a linear WS curve expressed in the output gap instead of employment:

$$\frac{W}{P} = w = B + \alpha(y_t - y^e) + z_w \quad (7)$$

In equilibrium ($y_t = y^e$ we have): $w^e = B + z_w$

If we are out of equilibrium (due to a demand shock), first wages will change:

$$w_t - w_{t-1} = w_t - w^e = B + \alpha(y_t - y^e) + z_w - B - z_w = \alpha(y_t - y^e)$$

then if firms expect prices to increase by $\frac{\Delta P_{t-1}}{P_{t-1}}$ we can use the approximation

$$\Delta w_t \approx \frac{\Delta W_t}{W_t} - \frac{\Delta P_{t-1}}{P_{t-1}}$$

The Philips curve II

with $\Delta w_t \approx \frac{\Delta W_t}{W_t} - \frac{\Delta P_{t-1}}{P_{t-1}}$ and

$$w_t - w_{t-1} = \Delta w_t = \alpha(y_t - y^e)$$

we obtain:

$$\frac{\Delta W_t}{W_t} - \frac{\Delta P_{t-1}}{P_{t-1}} \approx \alpha(y_t - y^e) \quad \text{or} \quad \frac{\Delta W_t}{W_t} \approx \frac{\Delta P_{t-1}}{P_{t-1}} + \alpha(y_t - y^e) \quad (8)$$

The Philips curve III

Then since our price setting equation states that: $P = (1 + \mu) \frac{W}{\lambda}$ we can express that as:

$$\frac{\Delta P_t}{P_t} = \frac{\Delta W_t}{W_t} - \frac{\Delta \lambda_t}{\lambda_t}$$

and assuming productivity to be constant (i.e. $\frac{\Delta \lambda_t}{\lambda_t} = 0$) yields $\frac{\Delta P_t}{P_t} = \frac{\Delta W_t}{W_t}$

Combining this last result with equation (8) yields the Phillips curve:

$$\frac{\Delta P_t}{P_t} \approx \frac{\Delta P_{t-1}}{P_{t-1}} + \alpha(y_t - y^e) \quad (9)$$

$$\Pi_t = \Pi_{t-1} + \alpha(y_t - y^e) \quad (10)$$

Aggregate Supply Shifts

Accelerating inflation out of equilibrium

Putting things together

Why does inflation increase if $y_t > y_n$?

- ▶ Let's look at the scenario of a permanent increase in autonomous demand:
- ▶ We begin in equilibrium ($y_0 = y^e$, $r_0 = r^e$, $\Pi_0 = \Pi^T$)
- ▶ Then the government decides to increase government expenditures: A increases to A'
- ▶ (We will assume that there is no central bank reaction)

Putting things together

- ▶ Period 1:
output increases to $y_1 = A' - c \cdot r^n$ (by A')
and inflation increases to $\Pi_1 = \Pi_0 + \alpha A'$ (by $\alpha A'$)
- ▶ Period 2:
output does not change because government does not change G: $y_2 = y_1$
inflation increases further to $\Pi_2 = \Pi_1 + \alpha A'$ (by $\alpha A'$)
- ▶ From here on inflation (i.e. not the price level but inflation) will increase each period by $\alpha A'$
- ▶ This is why the model needs the CB to stabilize inflation!

How does the underlying mechanism work?

The increase in demand means cost of job loss declines and thus in:

- ▶ Period 1: workers demand real wage increase
(i.e. nominal wage increase above target inflation: $3\% > \pi^T = 2\%$)
- ▶ Period 1: firms react and adjust prices by 3%

In the next period unemployment is still above equilibrium unemployment and thus

- ▶ Period 2: Workers demand a real wage increase
(last period inflation was 3% so nominal wages need to rise by 4%))
- ▶ Period 2: firms react and adjust prices by 4%

The result is a wage-price spiral!

Aggregate Supply Shifts

Supply Side Reforms

Interpretation I

- ▶ PS and WS curve define output level (and thus unemployment) compatible with stable inflation
- ▶ only policies which shift PS and/or WS curve will change natural output/employment equilibrium
- ▶ Which are those?

Interpretation II

Factors shifting the WS curve (to the right; i.e. higher y^n / u^n)

- ▶ A fall in unemployment benefits and/or their duration
- ▶ Improving working conditions
(increases the cost of job loss and thus reduces wage which has to be paid to prevent shirking)
- ▶ Less legal protection to unions or weaker unions.
- ▶ Unions exercise bargaining restraint

Interpretation III

Factors shifting the PS curve (up; i.e. higher y^n / u^n)

- ▶ Tax wedge: income tax, VAT, employer contribution to social security increase cost of labour. Workers care about net wage. These taxes represent "mark up" on wages and make labour more expensive.
- ▶ Tax wedge: reducing direct and/or indirect labour taxes shifts PS curve up.
- ▶ Fall in mark up: More competition force firms to accept lower prices, i.e. real wages can be higher
- ▶ Rise in productivity

Interpretation IV

- ▶ These are "structural" or "supply side" reforms!
- ▶ In the current model the only way to influence y^n
- ▶ On which points the New Keynesian framework can be useful:
 - ▶ Fight monopolies and ensure "enough" competition
 - ▶ Promote productivity (via infrastructure investment?)
 - ▶ Improve working conditions (if we believe in efficiency wages)

Conclusion

Summing up

- ▶ The natural equilibrium is purely supply determined, which means by labour market institutions.
- ▶ There is no feedback from the labour market to the goods market.
- ▶ Monetary and fiscal policy is only effective in the short run (cannot affect the natural equilibrium)
- ▶ Weakening labour is mostly good in order to increase natural level of output / employment

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