The Labor Market With Frictions

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Introduction

We studied the **Walrasian labor market**.

Labor supply is determined by

- wages
- UI benefits (income when not working)
- preferences

Labor demand is the marginal product of labor

Key assumption:

- Wages are fully flexible.
- There is no unemployment.
- AD does not affect employment.

Introduction

We now introduce **sticky wages**.

Key implication: AD now affects employment.

Basic intuition:

- Nominal AD rises
- Prices rises
- Wages are sticky
- Real wages fall
- ~~Firms hire more labor~~

w/p

Now the model is suitable for analyzing business cycle frequency events.

The Idea

The basic idea we want to capture:

Unexpected inflation increases output

- either by increasing labor supply or labor demand
- monetary policy has real effects in the short run
- but they wear off as expectations adjust

Anticipated inflation just increases prices.

- this is why money is neutral in the long run

We can tell that story in various ways

- sticky wages $\rightarrow$ labor demand story
- sticky price expectations $\rightarrow$ labor supply story
- sticky prices ...

The Labor Demand Story

The story in a nutshell

1. Wages are sticky (require time to adjust to shocks)
2. Inflation erodes the real wage.
3. At lower real wages, firms hire more labor.
4. Hence, employment is higher when inflation is higher

The Labor Demand Story

Wage bargaining sets **nominal wages** W for a period of time.

Workers aim for a certain **real wage** $W/P = w$.

- If "economic conditions" are good, the target W/P is high.
- w could be the outcome of wage bargaining.

Workers have price expectation P^e and set $W = wP^e$.

Firms set employment based on the true W/P.

- labor demand $= MPL$

After W is fixed, shocks are realized

- including government policy surprises

The Labor Demand Story

Labor market outcomes depend on whether price expectations are too high or too low.

If price expectations are correct:

- $P^e = P \implies W/P = w$
- workers get the target real wage
- we call that outcome "full employment"
  even though not everyone will work
  full employment = work hours are what workers want this period
- that's the Walrasian outcome

The Labor Demand Story

If workers get P^e wrong, the real wage deviates from w.

Notably: **unexpected inflation** implies $P > P^e$

$W = w \cdot P^e$

- but anticipated inflation doesn't matter

The real wage is eroded

$$
\begin{aligned}
W/P &= (W/P^e)(P^e/P) && (1)\\
&= w(P^e/P) && (2)\\
&< w && (3)
\end{aligned}
$$

That induces firms to hire more (cheap) workers.

Result: Unexpected inflation stimulates the economy.

This is a good story – but not the one we are modeling.

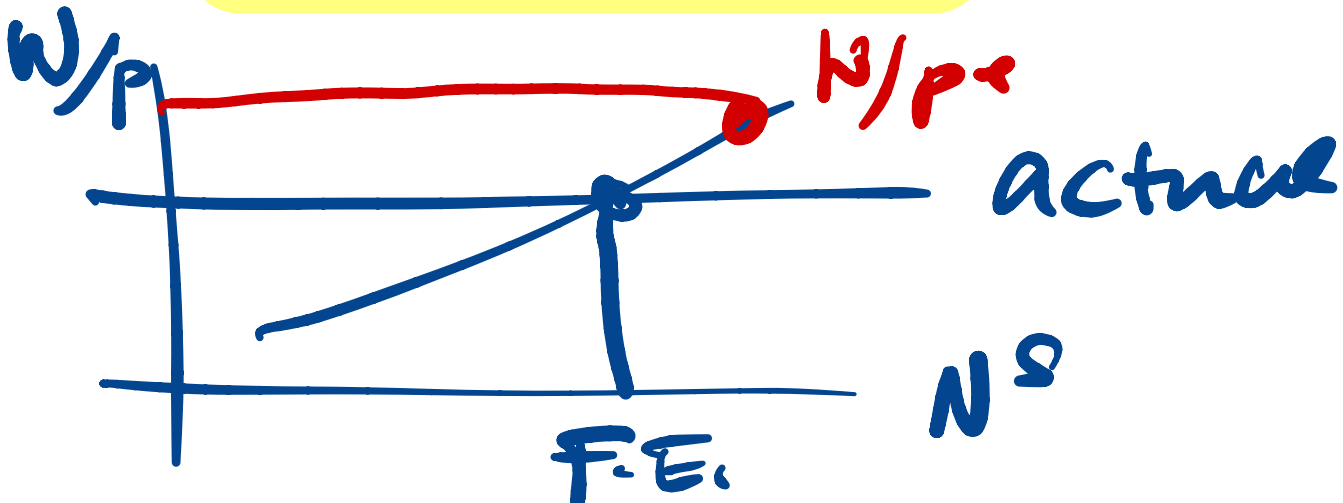
The Labor Supply Story

We model a simpler version of the story (with similar outcomes).

At the start of the period, workers form price expectations P^e.

Labor supply:

- Workers see W and think the real wage is W/P^e
- How much they want to work is given by $N^s(W/P)$.
- How much they actually work is $N^s(W/P^e)$.



The Labor Supply Story

Labor demand:

Firms set prices as a constant markup m over wages

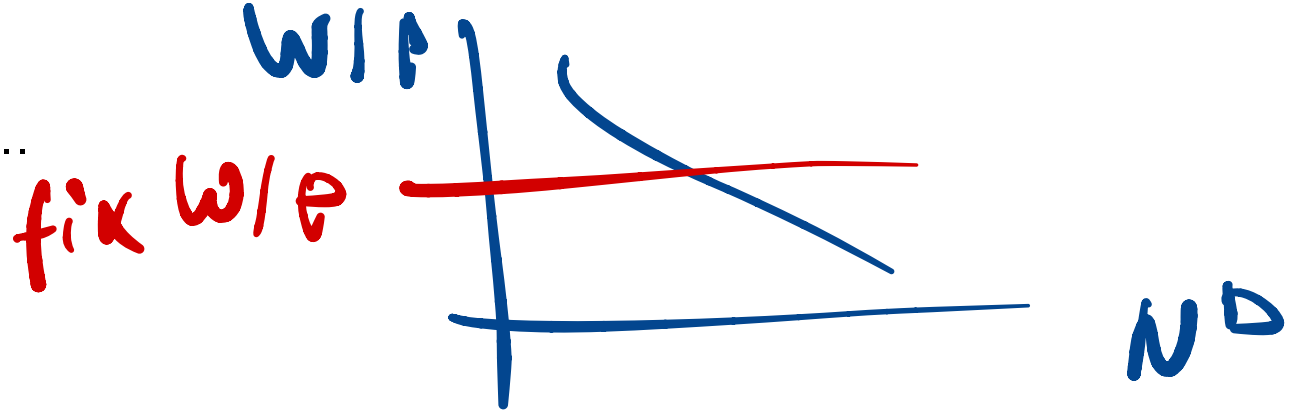
$P = (1+m)W$ or

$$W = P/(1+m) \tag{4}$$

The real wage is always

$$W/P = 1/(1+m) \tag{5}$$

Details below ...



The Labor Supply Story

If inflation expectations are **correct**:

- workers work as much as they want at the market clearing real wage
- full employment

Unexpected inflation $(P > P^e)$ implies high W/P^e. $> \frac{1}{1+m} = \frac{W}{P}$

- Workers think the real wage is high
  - even though it's always $1/(1+m)$.
- They supply more labor and employment rises.

Unexpected inflation stimulates the economy

- by tricking workers into working too much

Labor Supply

perceived

Labor supply:

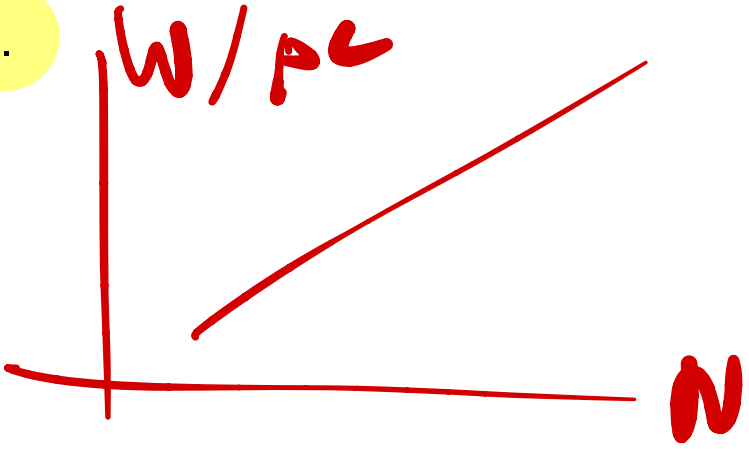
$$N^s = \hat{F}\left(W/P^e, z\right) \tag{6}$$

z: labor market conditions

- unemployment benefits, taxes, etc

Key: N^s depends on the real wage evaluated at P^e (not P).

We assume that N^s is increasing in W/P^e.



Labor Demand

$Y = K^{\alpha} L^{1-\alpha}$

In general: MPL is decreasing in N

- Firms hire labor up to the point where $MPL = W/P$

We simplify and assume:

- Output is produced from labor only: $Y = N$
- $MPL = dY/dN = 1$
- Marginal cost $MC = W$ $= P$ $\Rightarrow$ $W/P = 1$

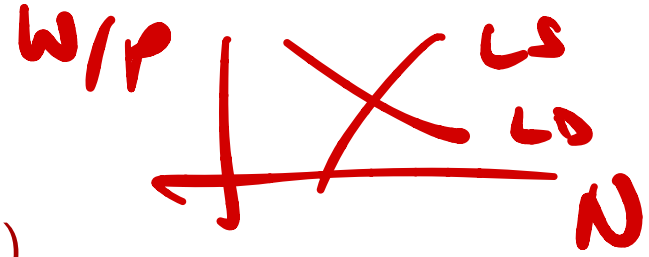
Firms charge a markup m over marginal cost

$$P = (1+m)W \tag{7}$$

Labor demand is perfectly elastic at **fixed real wage**

$$W/P = \frac{1}{1+m} \tag{8}$$

Labor Market Clearing



In general we would set $N^S(W/P) = N^D(W/P)$.

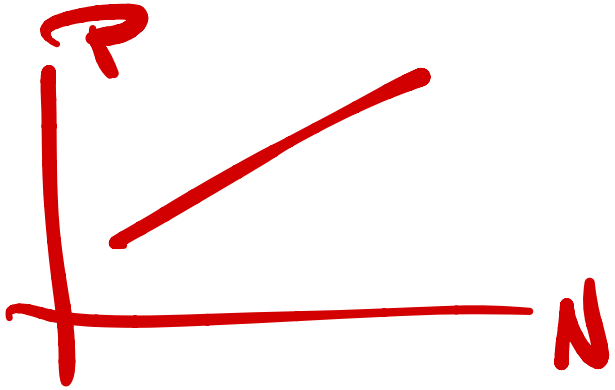
But here N^S is horizontal at the fixed real wage $1/(1+m)$.

So we sub that real wage into labor supply to get market clearing.

$$N = \hat{F}(W/P^e, z) \tag{9}$$

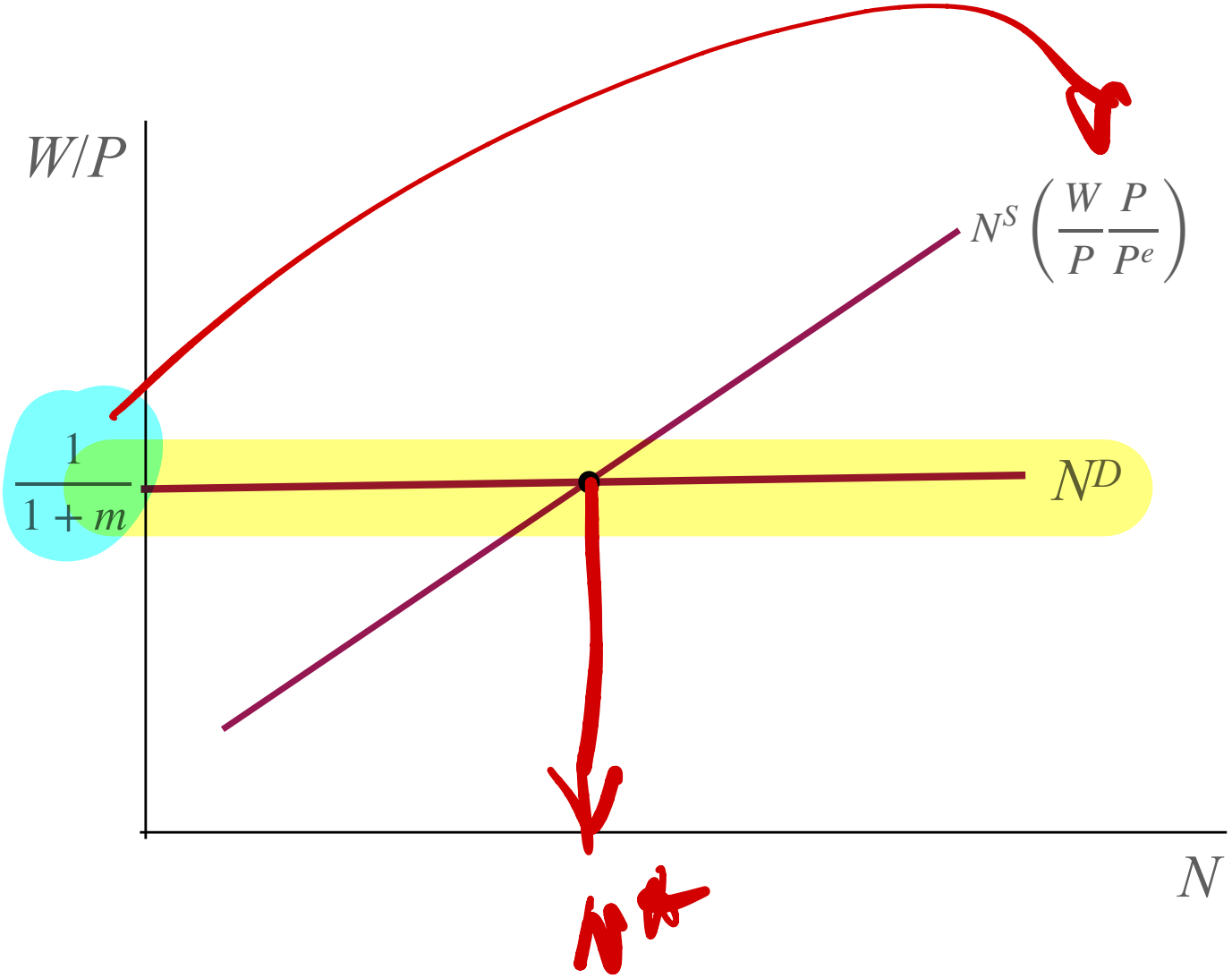
$$= \hat{F}\left(\frac{P}{P^e}\frac{W}{P}, z\right) \tag{10}$$

$$= \hat{F}(\underbrace{\frac{P}{P^e}}_{\text{mistake}} \underbrace{\frac{1}{1+m}}_{\text{real wage}}, z) \tag{11}$$



Employment is increasing in P/P^e and z.

Labor Market Clearing



Model Summary

Production function

$$Y = N \tag{12}$$

Labor demand:

$$W/P = 1/(1+m) \tag{13}$$

Labor supply:

$$N^S = \hat{F}(W/P^e, z) \tag{14}$$

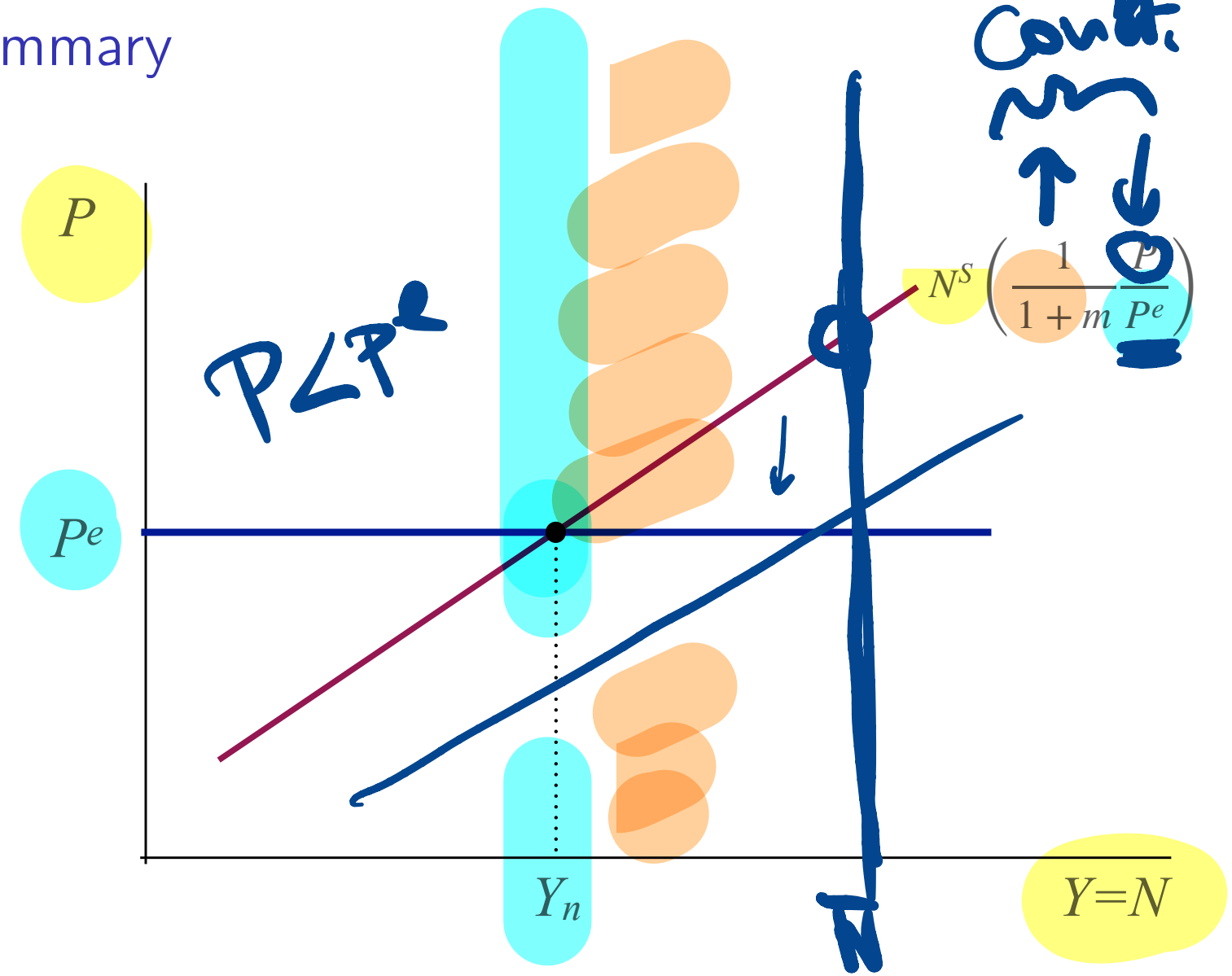
Labor market clearing:

$$Y = N = \hat{F}(W/P^e, z) \tag{15}$$

AS

$$\boxed{Y = \hat{F}\left(\frac{P}{P^e}\frac{1}{1+m}, z\right)} \tag{16}$$

Summary



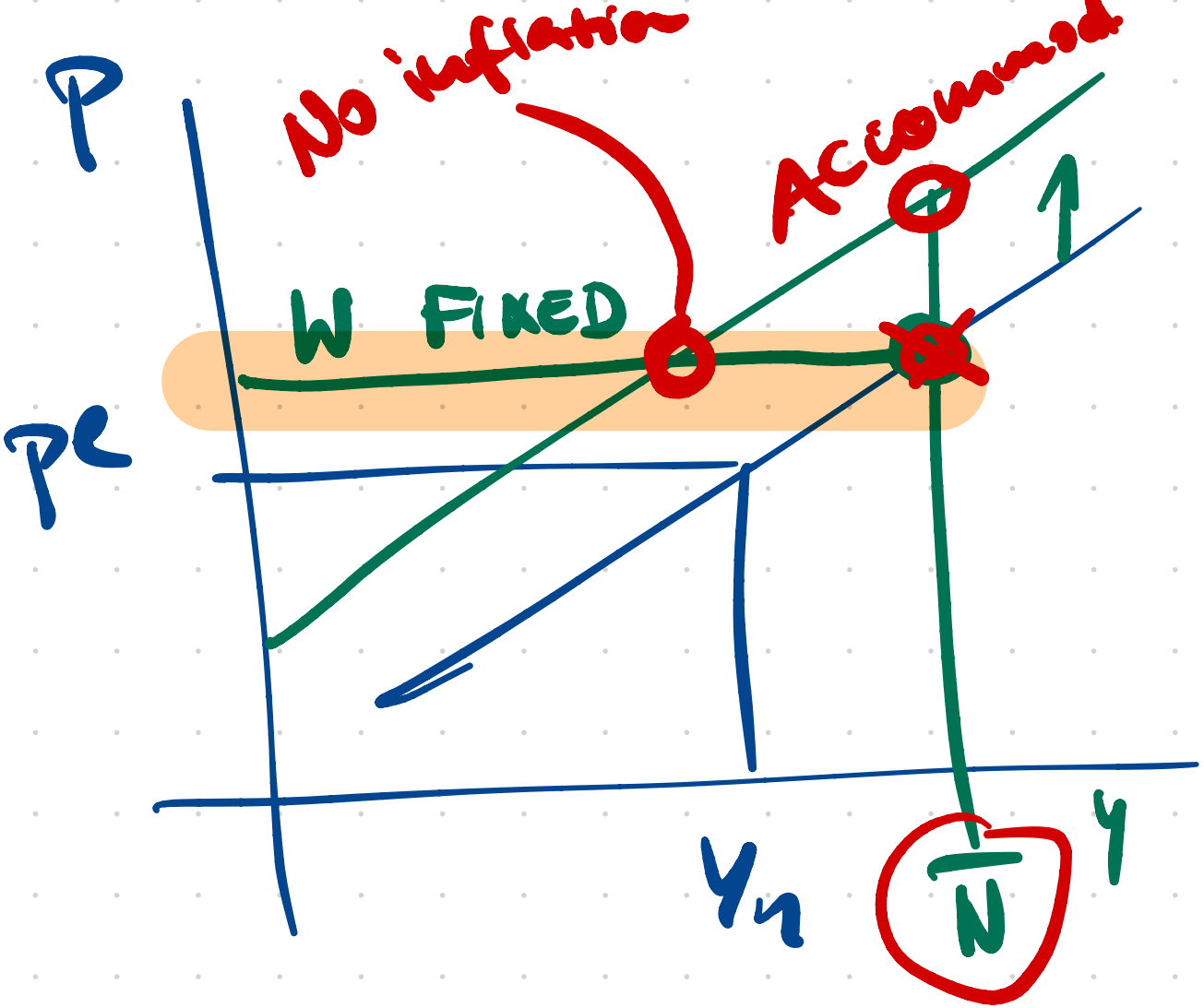
Const.

$\frac{W}{P}\uparrow$

$\frac{1}{1+m}\uparrow$

$N^S\uparrow$

Higher (unexpected) prices $\Longrightarrow$ higher employment.



$N^s\left(\frac{1}{1+m}, \frac{P}{P^e}\right)$

const

W/P^e ?

Given P

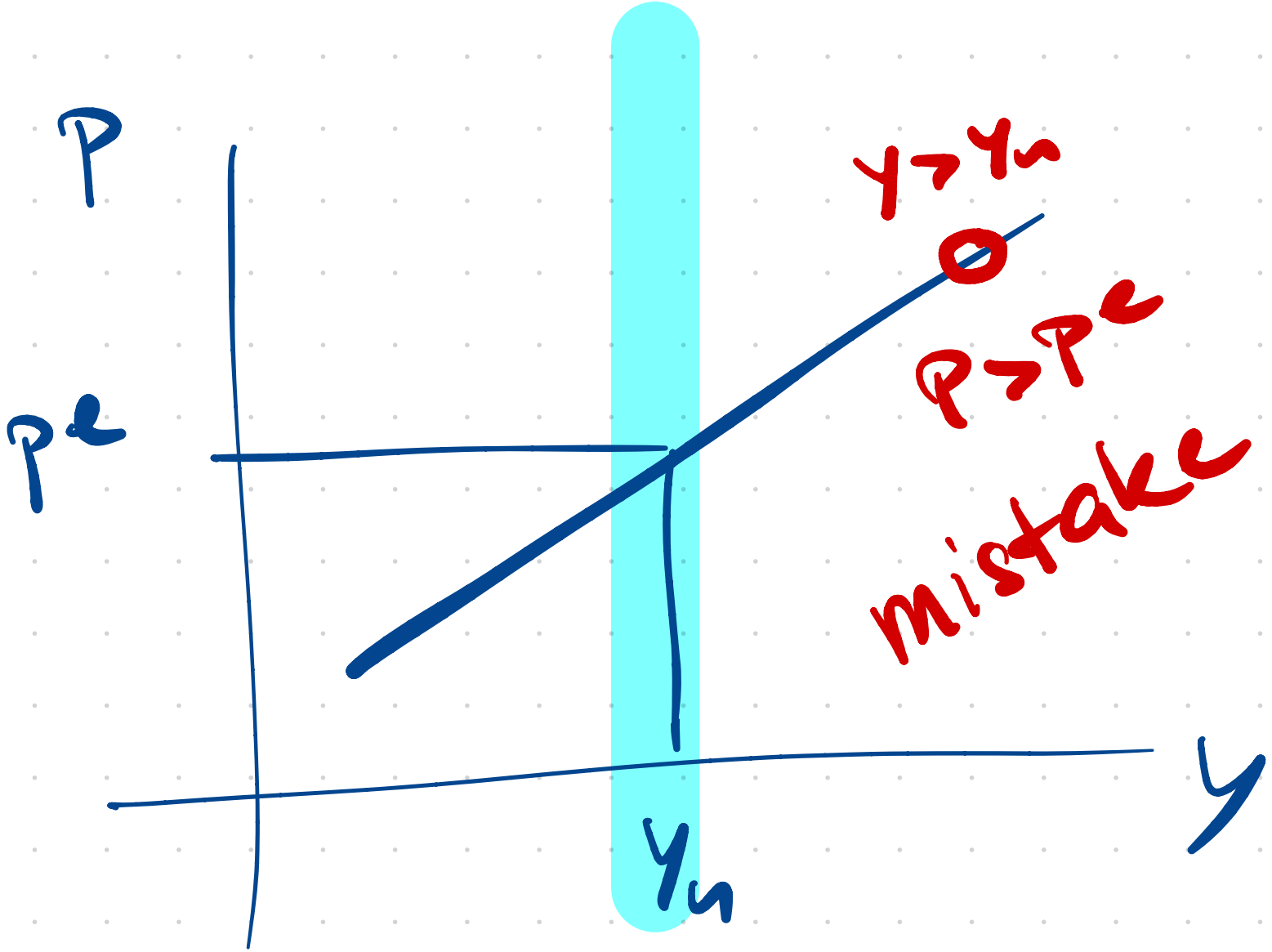
↓

W given

$\frac{W}{P^e}\downarrow$

$P^e \uparrow$

$$W = P\,\frac{1}{1+m}$$


P
P^e
$y > y_n$
$P > P^e$
mistake
y_n
y

Higher $P \Rightarrow$ Higher NS

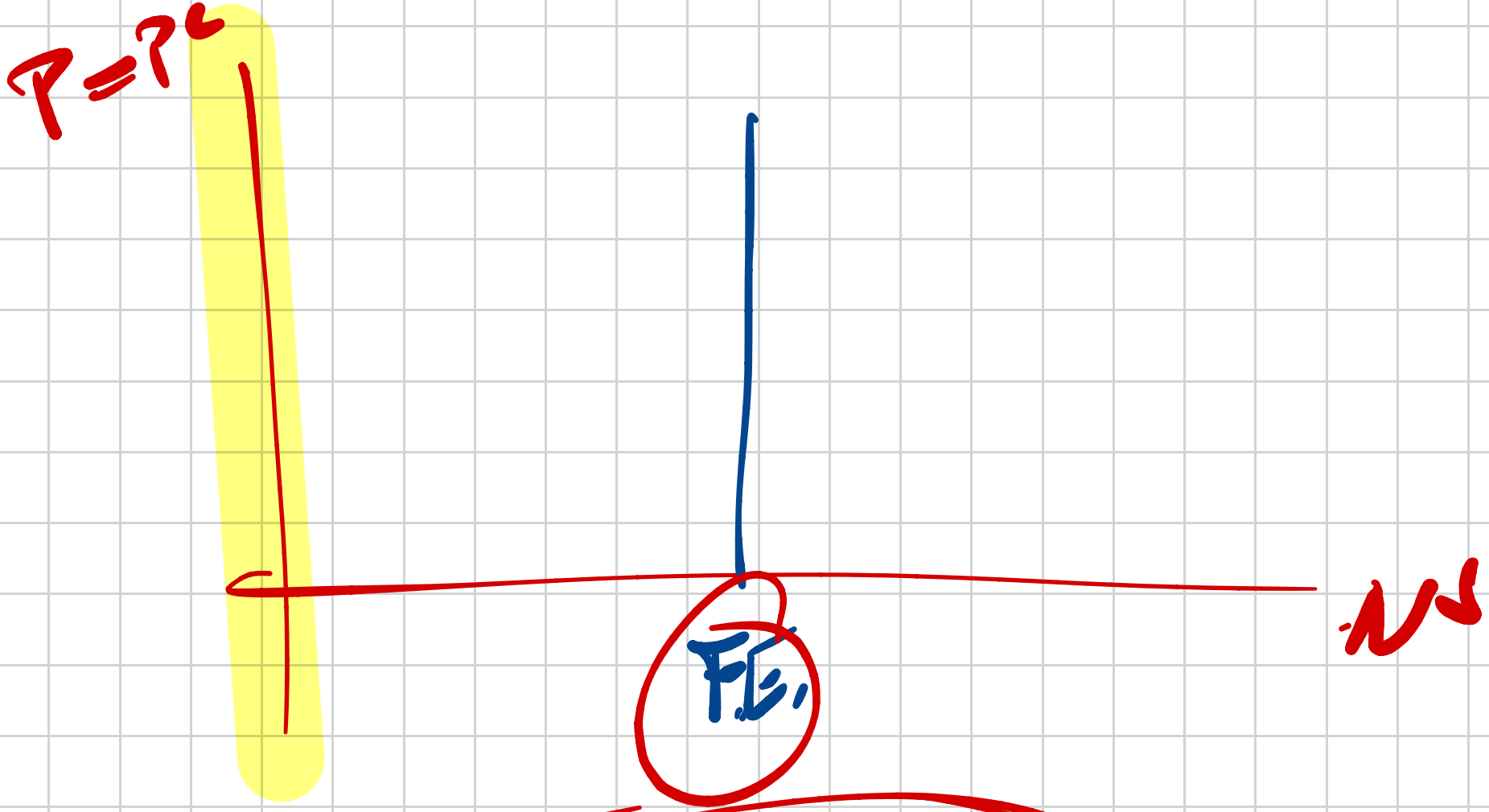
b/c ---

$P\uparrow \longrightarrow W\uparrow \Rightarrow \frac{W}{P^c}\uparrow$ higher $\frac{W}{P^c}$

Firm: $P = (1+m)W$

P^c is ~~fixed~~ given

(shifter of NS)



$$\frac{W}{P_c} = \frac{W}{P} = \frac{1}{1+m} \text{ fixed}$$

Intuition

Workers see a high nominal wage and think they see a high real wage.

So they supply more labor.

In reality, price setting by firms fixes the real wage

- Workers are wrong every time.

Until worker's price expectations adjust $(P^e \to P)$, inflation affects employment.

Exercises

What happens to $Y = N$ when (holding P fixed)

1. price expectations are higher?
2. markups rise?
3. unemployment benefits improve?

Natural Rate of Unemployment

When price expectations are correct:

$$Y_n = N_n = F(\underbrace{\cancel{\frac{P}{P^e}}}_{=1} \frac{1}{1+m}, z) \tag{17}$$

This is the medium-run outcome.

- The medium-run supply curve is **vertical.**
- The price level does not matter.

Full employment should really be called "normal employment" or "trend employment."

- Not everyone works.
- But those who want to work do.

What affects "full employment?"

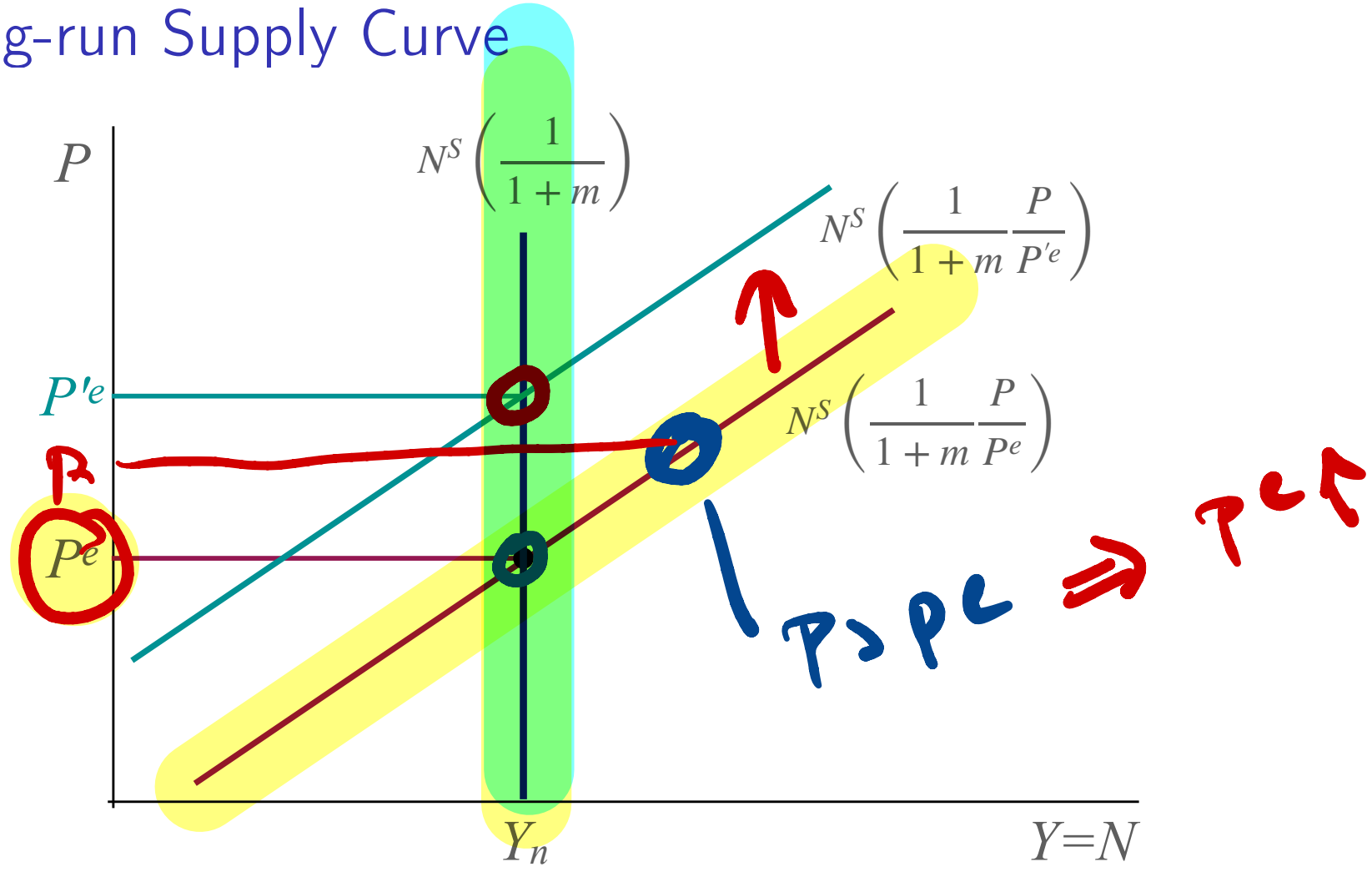
$$Y_n = N_n = F(\underbrace{\frac{P}{P^e}}_{=1} \frac{1}{1+m}, z) \tag{18}$$

From the equation:

- F → preferences
- m → $w/p = \frac{1}{1+m}$
- z → UE, welfare, SS

$Y = AK^{\alpha}L^{1-\alpha} \Rightarrow MPL = (1-\alpha)AK^{\alpha}L^{-\alpha}$

Long-run Supply Curve



If price expectations eventually catch up with prices $(P^e = P)$, we get $Y_n = F\left(\frac{1}{1+m}, z\right)$.

The price level does not matter for employment / output.

What's Next?

- If price expectations were always correct, we would be done:
  - markups and labor productivity determine the real wage
  - the real wage determines (un)employment
  - employment determines output
- This is what happens in the long run
  - only the supply side matters
- But what happens when $P^e \neq P$?
  - the AS/AD model answers that question

Does Gov't Spending Create Jobs?

A bipartisan infrastructure deal ... could create roughly half a million new manufacturing jobs by 2024 ... an analysis conducted on behalf of the trade group Association of Equipment Manufacturers found. ...

[T]he manufacturing jobs would come from $1.1 trillion spent over eight years ...

CBS New, July 27, 2021

Destroying Jobs

The same logic applies to measures that raise the cost of doing business:

> *Michele Bachmann, the congresswoman from Minnesota, in 2011 said she wanted to rename the Environmental Protection Agency "the job-killing organization of America" and Mitt Romney lamented that "Day by day, job-killing regulation by job-killing regulation, bureaucrat by bureaucrat, this president is crushing the dream."*
>
> *The Atlantic, Jan 19, 2017*

What is the link between regulation and long-run employment?

Reading

Blanchard / Johnson, Macroeconomics, 7th ed, ch. 7 "The Labor Market"

Further Reading:

- Jones, *Macroeconomics*, ch. 7.