

# Econ 330: Urban Economics

## Lecture 07

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Andrew Dickinson

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# Lecture 07: Urban Labor Markets

# Schedule

## Today:

### (i). Urban labor markets

- Urban labor demand
- Urban labor supply
- Urban labor EQ

## Upcoming:

- **Reading** (Chapter 5)
- **Problem set 02 due on Tuesday, Nov 02 at Midnight**

# Housekeeping

MT material is up to the first half of this **labor market lecture**

PS02 is due Tuesday, Nov 02

Office hours tomorrow is cancelled

Expect an announcement with details about the midterm this weekend

# Urban labor markets

# Urban labor markets

## Why care about labor markets in urban economics?

David Card:

| A city *is* a labor market

Cities provide incentives for firms and workers to locate close to each other

Density of a city is generated entirely by incentives in the labor market

Q: Modeling **individual** location decisions, what should we consider?

# Urban labor markets

## What are the most important features in location decisions?

- Wages
- Rents
- Amenities (catch all)
- Birthplace
- Distance to birthplace

**Wages** are significant factor of individual/household location choices

**Imagine** if Amazon/Google/Microsoft opens a campus in Portland

- What would happen to rents? Gentrification? Commute times?

**Introducing large amounts of high paying jobs + capital changes a city**

# Urban labor markets

## A labor market consists of:

(i). Firms that buy labor. Generate labor demand

(ii). HH's who sell labor. Generate labor supply

Labor and urban economist model labor markets (supply) differently

**Labor:** Discuss labor supply as being generated from labor-leisure trade off

- Model: Rational agents making optimal choices over leisure/education

**Urban:** Discuss labor supply as being generated from *location choices*

- Assume people work fixed hours but choose where to work



# Urban labor markets: Labor demand

# Urban labor markets: Labor demand

What do both fields have (somewhat) in common?

## Labor demand

### Definition: Labor Demand

- Set of quantities of labor demanded corresponding to a *set* of wages

Q: What's the difference between changes in:

- *labor demand*
- *quantity of labor demanded*

Δ Labor demand: Shift in the demand curve

Δ Quantity of labor demanded: Movement along a demand curve

# Urban labor markets: Labor demand

We will start with the **competitive** model:

## Assumptions:

(i). Firms seek to maximize profits

(ii). Markets are perfectly competitive (in **both** inputs and output)

⇒ No individual firm can influence the price of labor (or other inputs)

⇒ No individual firm can influence the output price

Are these assumptions reasonable? Discuss

# Urban labor markets: Labor demand

Derive a condition for EQ labor the firm will hire in the competitive model?

$$\pi = P * Q - TC$$

# Urban labor markets: Labor demand

Derive a condition for EQ labor the firm will hire in the competitive model?

$$\begin{aligned}\pi &= P * Q - TC \\ \pi &= \underbrace{P * F(L, K)}_{\text{TR}} - \underbrace{w * L - r * K}_{\text{TC}}\end{aligned}$$

where:

- $P$ : Output price
- $F(L, K) = Q$ : Quantity produced (function of labor and capital)
  - $Q = F(L, K)$
- $w$ : Wage rate;  $L$ : total labor employed  $\Rightarrow w * L = \text{cost of labor}$
- $r$ : rental rate;  $K$ : capital  $\Rightarrow r * K = \text{cost of capital}$

# Urban labor markets: Labor demand

**Claim:** Firm hires labor **if and only if** the *marginal profit* w.r.t to labor is positive.

**Definition: Marginal Profit w.r.t to labor** (  $\frac{\Delta\pi}{\Delta L}$  )

- The change in profit from hiring an additional unit of labor

**"Proof":** (Too many cooks)

- If  $\frac{\Delta\pi}{\Delta L} < 0$ , added profit from an additional unit of labor is negative (ie. a loss), so the firm *should not* hire the next unit
- If  $\frac{\Delta\pi}{\Delta L} > 0$ , added profit from an additional unit of labor is positive (ie. a gain), so the firm *should* hire the next unit
- If  $\frac{\Delta\pi}{\Delta L} = 0$  Optimal allocation for the firm. Can't do better

# Urban labor markets: Labor demand

## Definitions:

- **Marginal Product of Labor:** Change in output from an additional unit of labor employed

- $MP_L = \frac{\Delta F(L,K)}{\Delta L}$

- **Marginal Revenue Product of Labor:** Value of the change in output from an additional unit of labor employed

- $MRP_L = P * \frac{\Delta F(L,K)}{\Delta L}$

# Urban labor markets: Labor demand

So what is  $\frac{\Delta\pi}{\Delta L}$ ?

$$\frac{\Delta\pi}{\Delta L} = P * \frac{\Delta F(L, K)}{\Delta L} - w * \frac{\Delta L}{\Delta L}$$



# Urban labor markets: Labor demand

So what is  $\frac{\Delta\pi}{\Delta L}$ ?

$$\begin{aligned}\frac{\Delta\pi}{\Delta L} &= P * \frac{\Delta F(L, K)}{\Delta L} - w * \frac{\Delta L}{\Delta L} \\ &= P * MP_L - w \\ &= MRP_L - w\end{aligned}$$

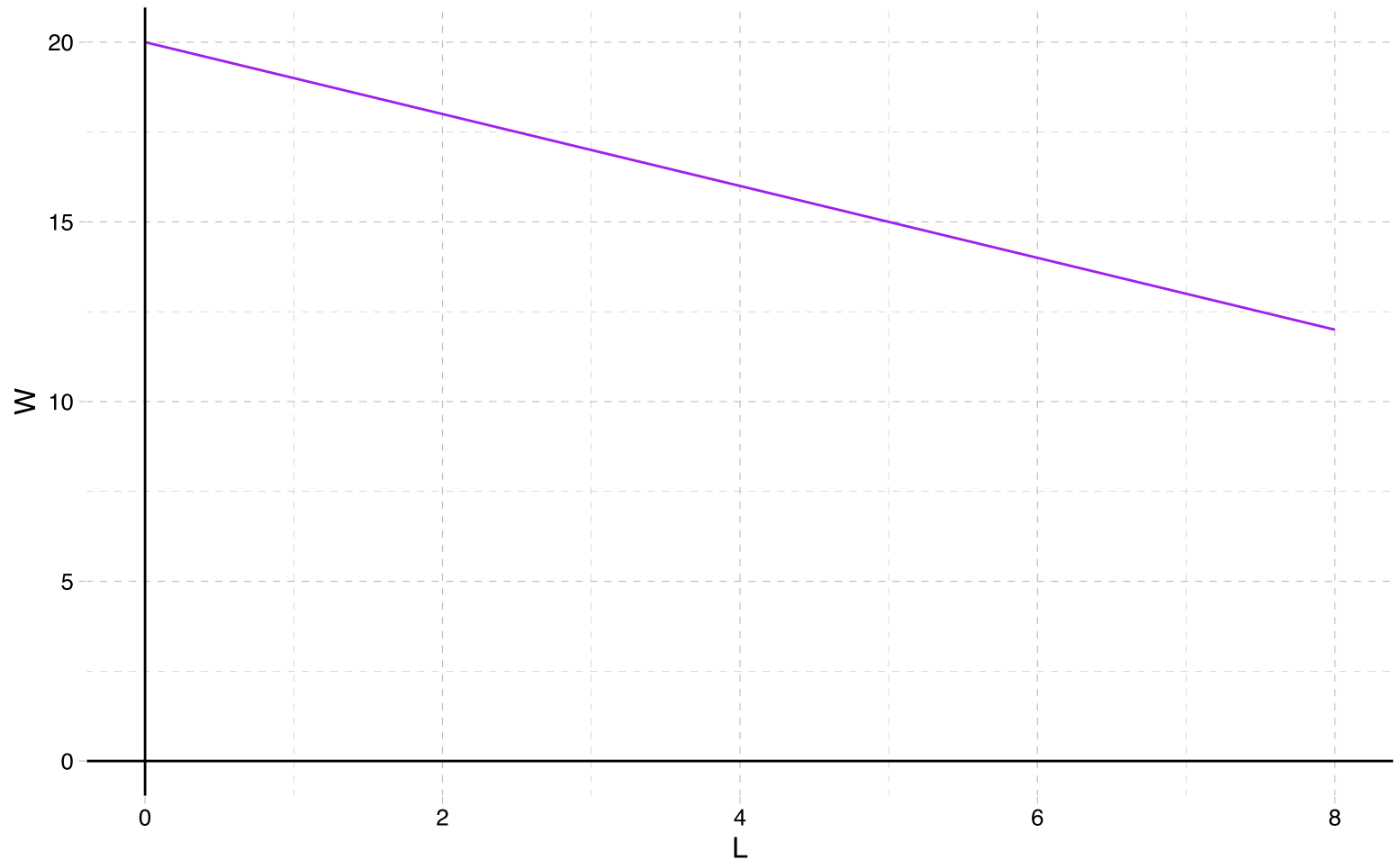
Now, set  $\frac{\Delta\pi}{\Delta L} = 0$  to get the labor demand curve:

$$MRP_L - w = 0 \implies MRP_L = w$$

**What does this mean in words?**

**A firm will hire labor until labor costs (wage) exactly offsets the marginal revenue product of labor**

# Urban labor markets: Labor demand



# Urban labor markets: Labor demand

Why might **labor demand** curves vary across cities?

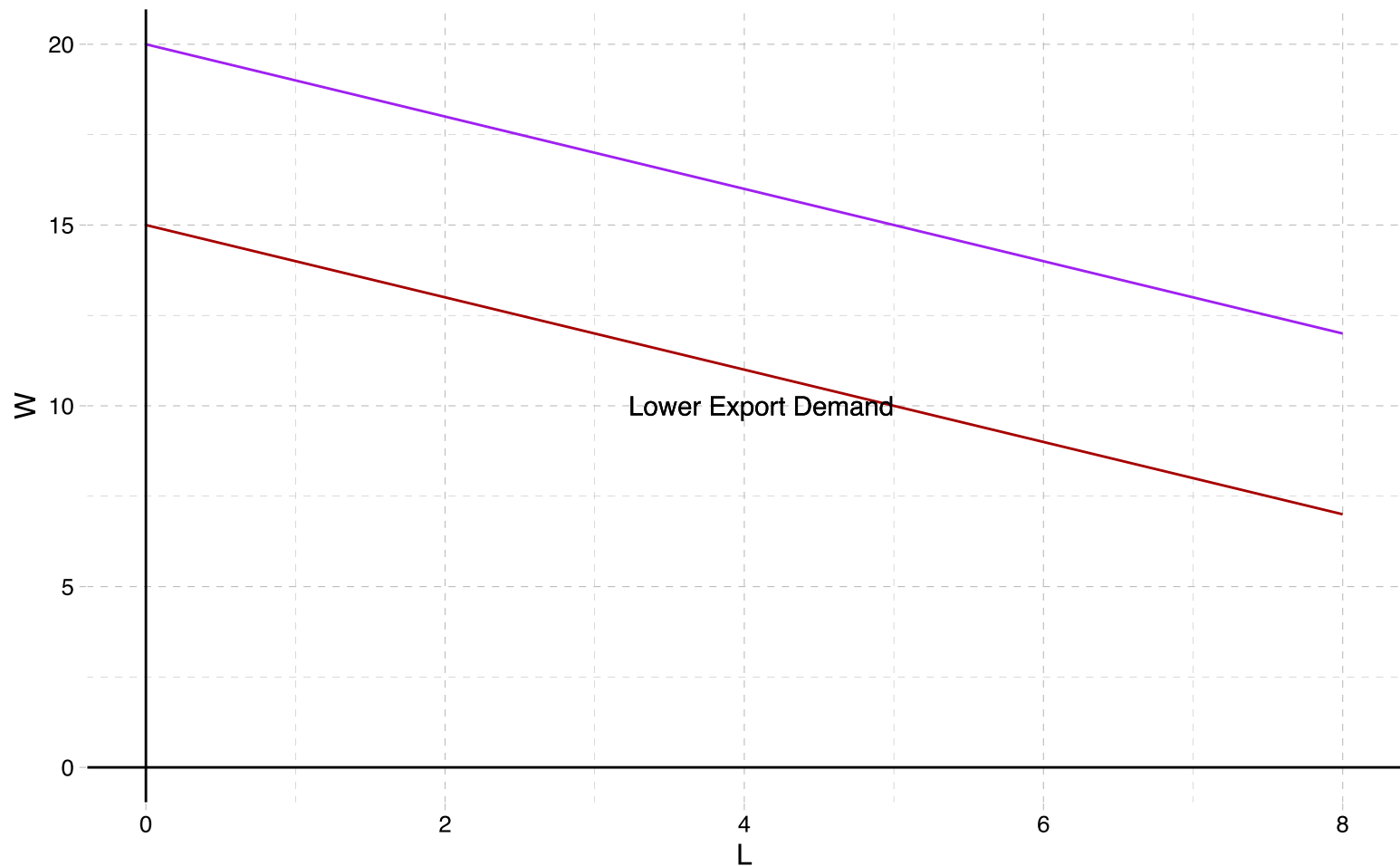
- (i). Differences in productivity across cities (agglomeration)
- (ii). Variation in (business) taxes across cities
- (iii). Industrial public service infrastructure (electricity, water, gas pipelines)
- (iv). Land use policies
  - stricter zoning  $\implies$  higher land price  $\implies$  less money for other inputs
- (v). Demand for a city's exported goods

# Urban labor markets: Labor demand

Q: What would two cities where everything is equal except one has a higher productivity of labor look like?

# Urban labor markets: Labor demand

Q: What about a city with lower export demand?



# Urban labor markets: Supply

# Labor Supply

Labor supply is driven from location decisions of individuals

## What generates location choices?

(i.) **Wages**

(ii.) **Rents**

(iii.) **Amenities**

(iv.) **Other** (birth location, family ties)

# Labor Supply

A set of quantities of labor supplied corresponding to a set of wages.

Q1: What causes *movement along* the labor supply curve?

- A change in wages. That's it!

Q2: What causes a *shift* of the labor supply curve?

- Changes in amenities (building of a nicer school, eroding of air quality)
- Changes in residential government expenditures (increase in taxes drives people away, increases in govt spending brings people in)



# Labor Supply

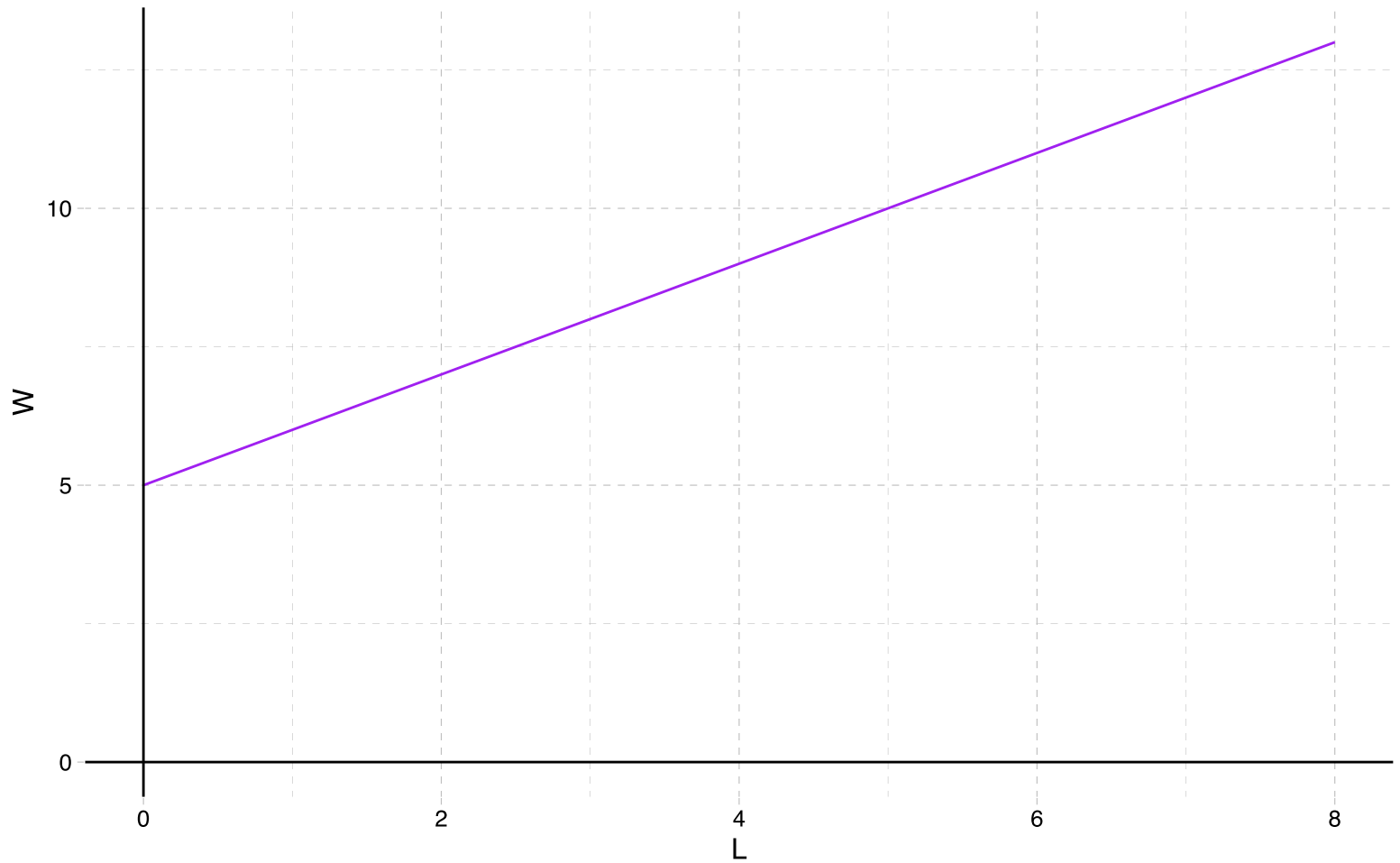
Knowing how responsive workers are to changes in wages is key for vast swaths of policies

- Estimates for labor supply elasticities are pretty big
- If  $\epsilon_{\text{workforce}, \text{wage}} = 2$ , what does this mean?

**In general** estimated labor supply elasticities are higher for workers with a college degree than without a college degree. What does this mean?

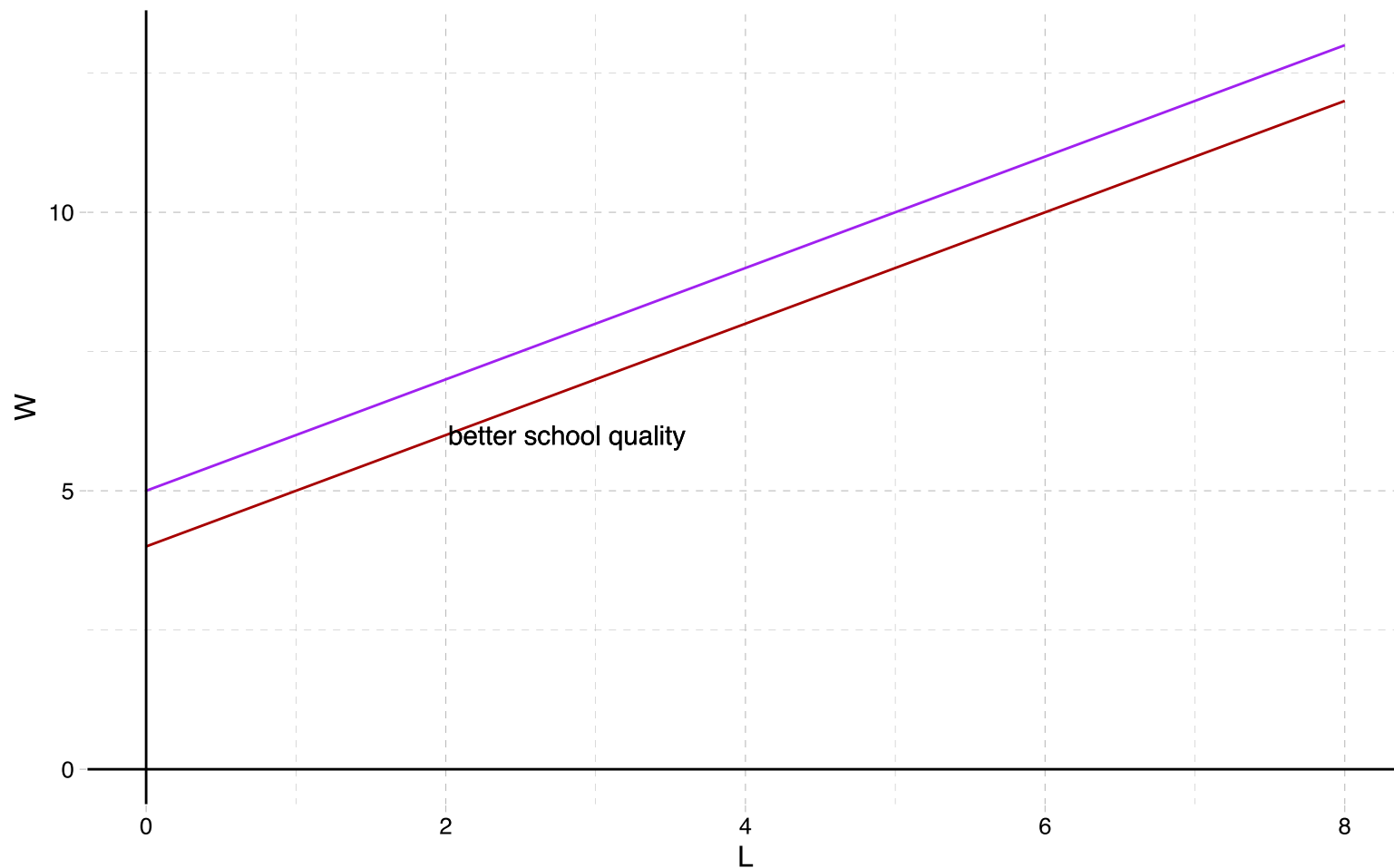
- College educated individuals are more responsive to changes in wages w.r.t to their location decisions

# Labor Supply Example



# Labor Supply

Question: What happens when a city improves its school quality?



# Equilibrium

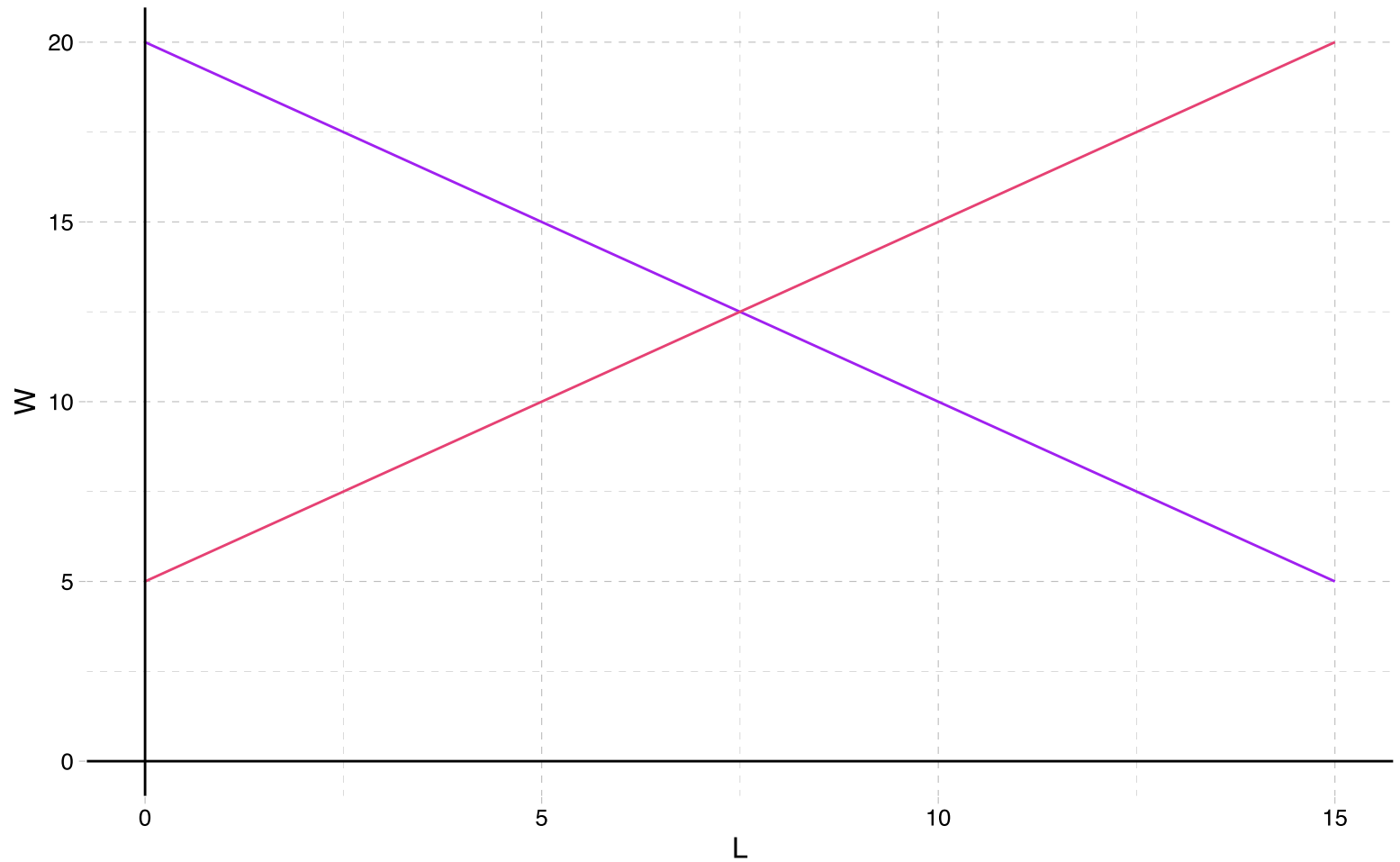
# Equilibrium

## Defn

- A **labor market equilibrium** is a pair of points  $(L^*, W^*)$  such that:
  - labor supply = labor demand
- IE: a labor market eq is where there is no excess supply or demand

We usually think of cities as being "separate" labor markets, so the equilibria can be different across cities

# Equilibrium: Example



End of MT material

# Competitive labor markets



# Characteristics of a competitive market

To start we will look at an extreme market structure

**Competitive labor market:** Industry structure in which there are many workers supplying (homogeneous) labor to many firms

- (i).** Many potential buyers and sellers of labor
- (ii).** Labor is homogeneous; same human capital across workers
- (iii).** Perfect information; workers know the going wage  $w$
- (iv).** Firms take wages as given; no incentive to offer above or below  $w^*$
- (v).** No barriers to entry/exit;  $\Pi \rightarrow 0$

# Competitive model: Example

**Recall our assumptions for the competitive model:**

- (i). Firms seek to maximize profits
- (ii). Markets are perfectly competitive (in both inputs and output)

Suppose we have the following linear  $L_D$  and  $L_S$  curves:

$$W_D = 40 - 5L_D$$

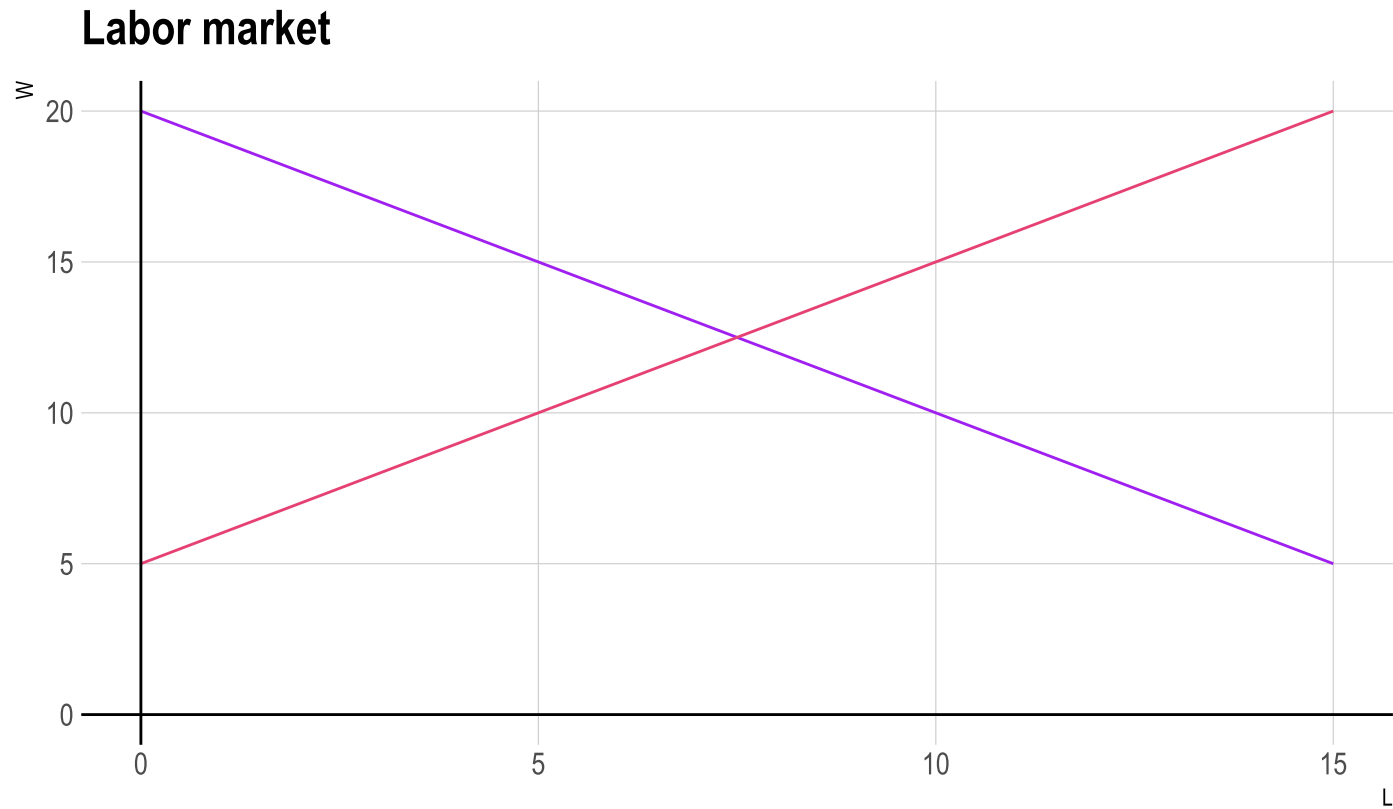
$$W_S = 5 + 2L_S$$

Solve for equilibrium  $W^*, L^*$

# Competitive model: Example

$$W_D = 40 - 5L_D$$

$$W_S = 5 + 2L_S$$



# Competitive model

We built up labor **supply** and **demand**. Where do these come from?

- Firms demand and households supply

Recall our result about labor demand from earlier:

**A firm will hire labor until labor costs (wage) exactly offsets the marginal revenue product of labor**

Summing each firm's  $MRP_L$  curve across the entire market generates the market labor demand curve

# Competitive model

Perfectly competitive markets are not super realistic; **extreme** outcome

Labor market structures share many of the **same characteristics**

Understanding the **extreme outcomes** inform us of the spectrum of labor markets in between

Perfectly competitive is one extreme; what is the market structure on the other side of the spectrum?

**Monopsony**

# Monopsony

# Monopsony

## Definition: Monopsony

- A labor market situation which there is only **one buyer**

A firm is a **monopsonist** if they are **the only employer** of labor in the area

A firm has **monopsony power** if they have influence on the market wage

Not to be confused with **monopoly** (only one **seller** of a good)

## Can you think of any examples?

- Coal towns
- Amazon / Walmart Towns?
- Universities (go GTFF!)

*I owe my soul to the company store* - 16 Tons

# Monopsony

So what are the main consequence(s) of **monopsony**?

**Monopsonists have the ability to pay a wage below the marginal value**

The consequences?

- **Higher profit** for the firms
- Deadweight loss; inefficient outcomes (ie less surplus)

Lets formalize monopsonies in a labor market model

**Recall:** In the competitive model, the firm pays the worker  $w = MRP_l$ .

- Is this what the monopsonist would do?



# Monopsony

Competitive model: Firms seek to maximize profits but can't influence wages

The competitive firm hires labor until the marginal profit w.r.t to labor is zero

$$\pi = TR - TC$$

$$\pi = TR - wL - rK$$

Profit maxing cond:  $\frac{\Delta\pi}{\Delta L} = 0 \implies MRP_L - w = 0 \implies w = MRP_L$

# Monopsony: Formalizing the Result

Monopsonist can influence wages by the amount of labor they hire

Now

$$\pi = TR - w(L)L - rK$$

where  $w(L)$  is an increasing function of the amount of labor hired

Firm will hire labor until marginal cost is equalized to marginal benefit

- or: *marginal profit* wrt labor is equal to zero

$$\frac{\Delta\pi}{\Delta L} = 0$$

# Monopsony: Formalizing the Result

So the monoposonist hires until:

$$MRP_L = MC_L$$

Compared to the competitive outcome:

$$MRP_L = W$$

**Important:** In the competitive model, marginal cost of labor was constant (equal to wage)

# An Example:

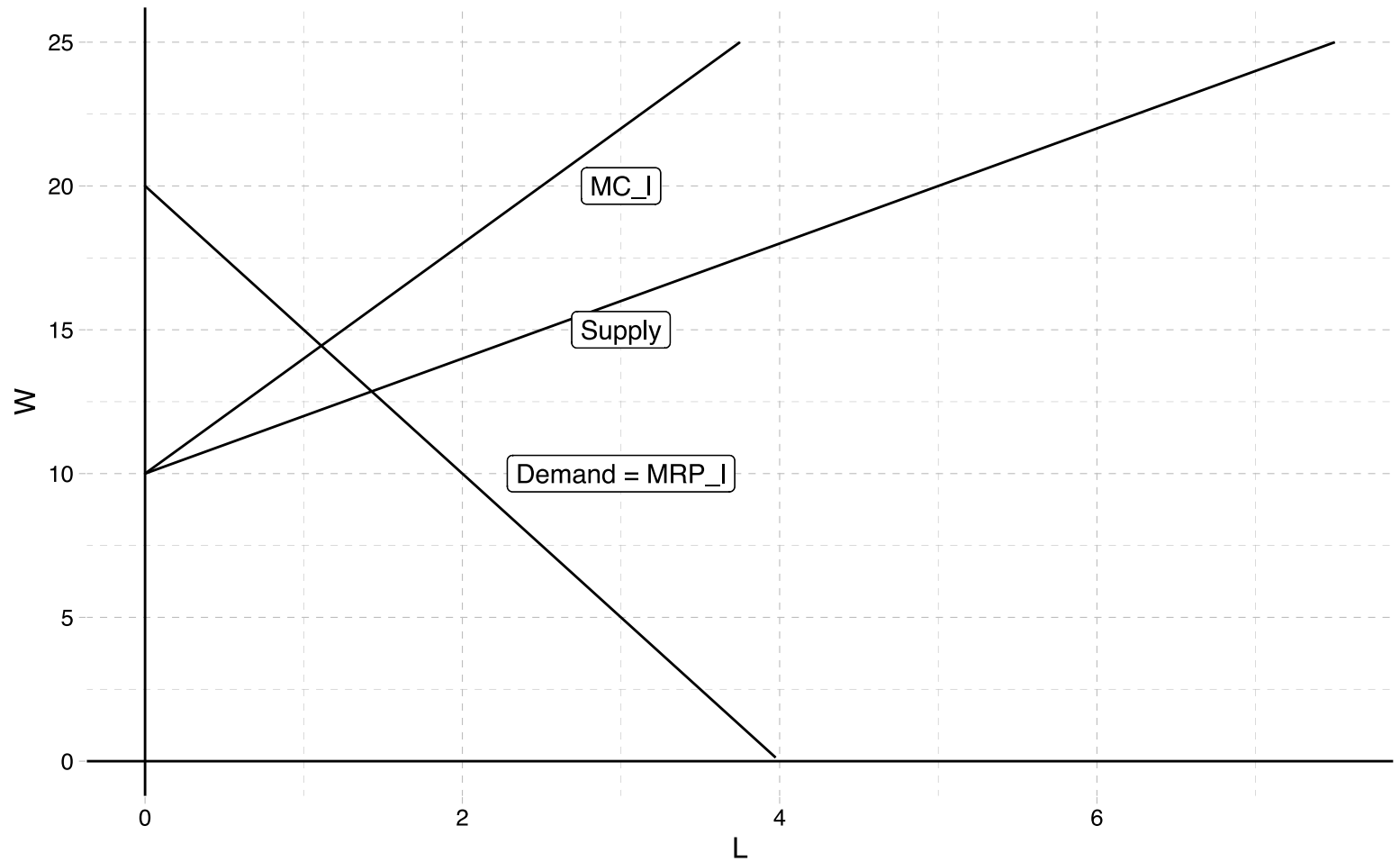
## Monopsonist Wage Schedule

Wage	Labor	TC	MC
1	1	1	1
2	2	4	3
3	3	9	5
4	4	16	7
5	5	25	9

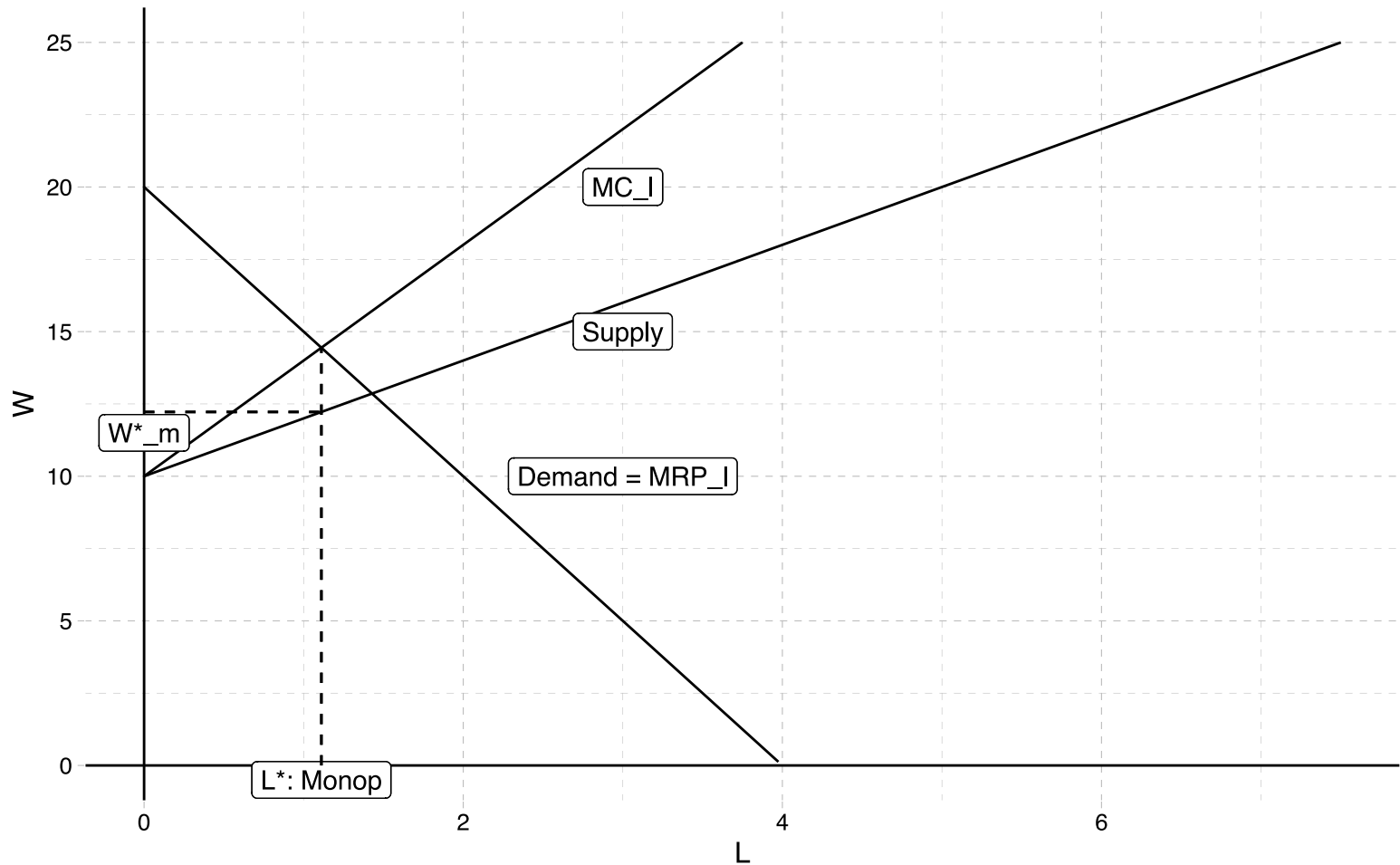
Let's fill in the table. What do you notice?

At every level of labor, the marginal cost of labor exceeds the wage

# Graph of Monopsony



# Graph of Monopsony



# Monopsony: Example

Suppose a firms  $L_D$  and  $L_S$  are described by the following functions:

$$W_D = 40 - 2 * L$$

$$W_L = 4 + 2x$$

- (i). What is the  $MC_L$  curve for the firm?
- (ii). What is the EQ wage  $w^*$  and quantity of Labor  $L^*$ ?

# Monopsony: Example

$$W_D = 40 - 2 * L$$

$$W_L = 4 + 2x$$



# Minimum wage

# Minimum wage

Minimum wages are a form of **price controls**.

Specifically, a minimum wage is a **price floor**

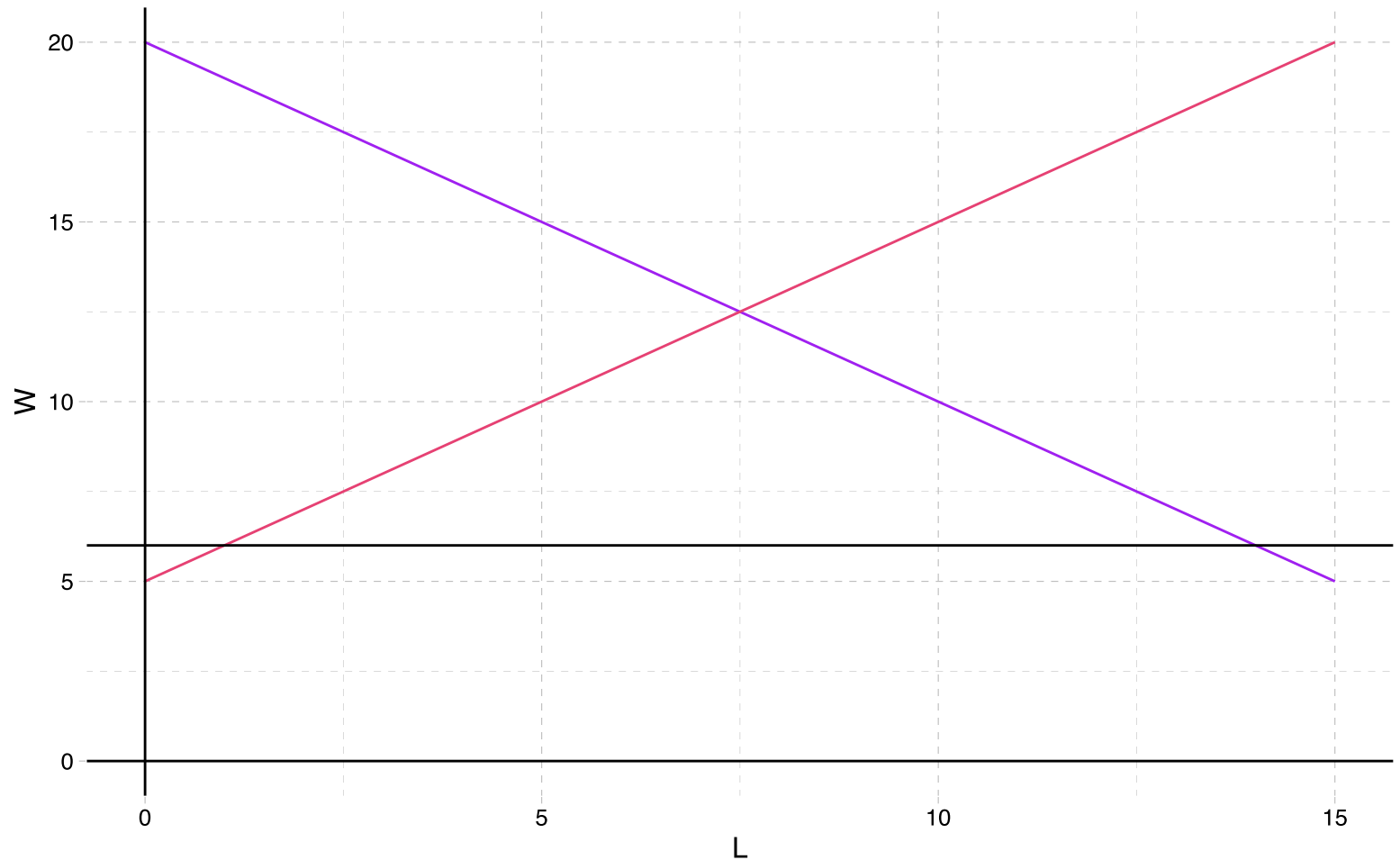
- **Price floor:** Dictates the **minimum** allowed price for transactions in a marketplace

A price floor is **binding** if it has an impact on the market equilibrium

A price floor that is below the market price is **nonbinding**

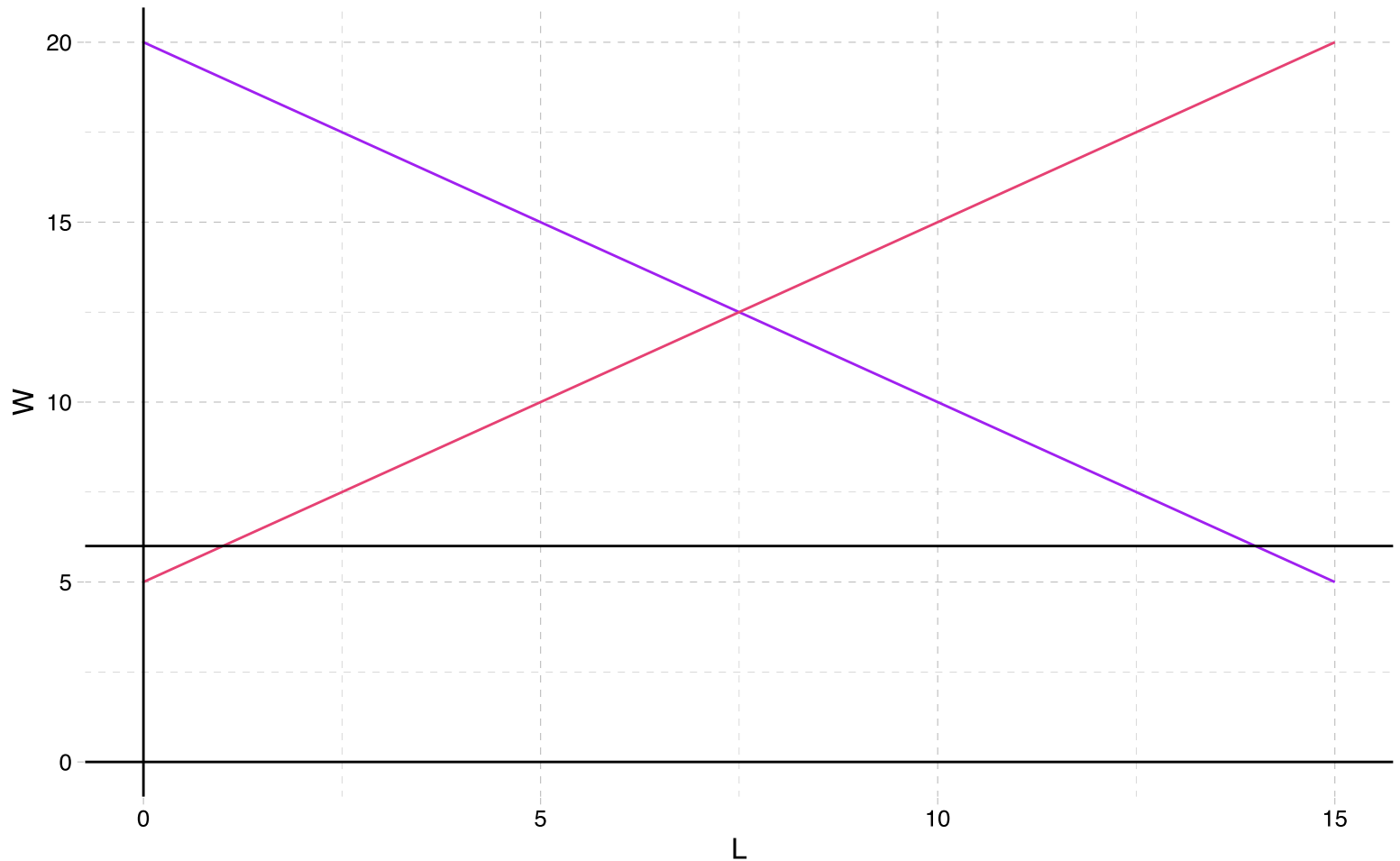
# Minimum wage

Is the following price floor binding?



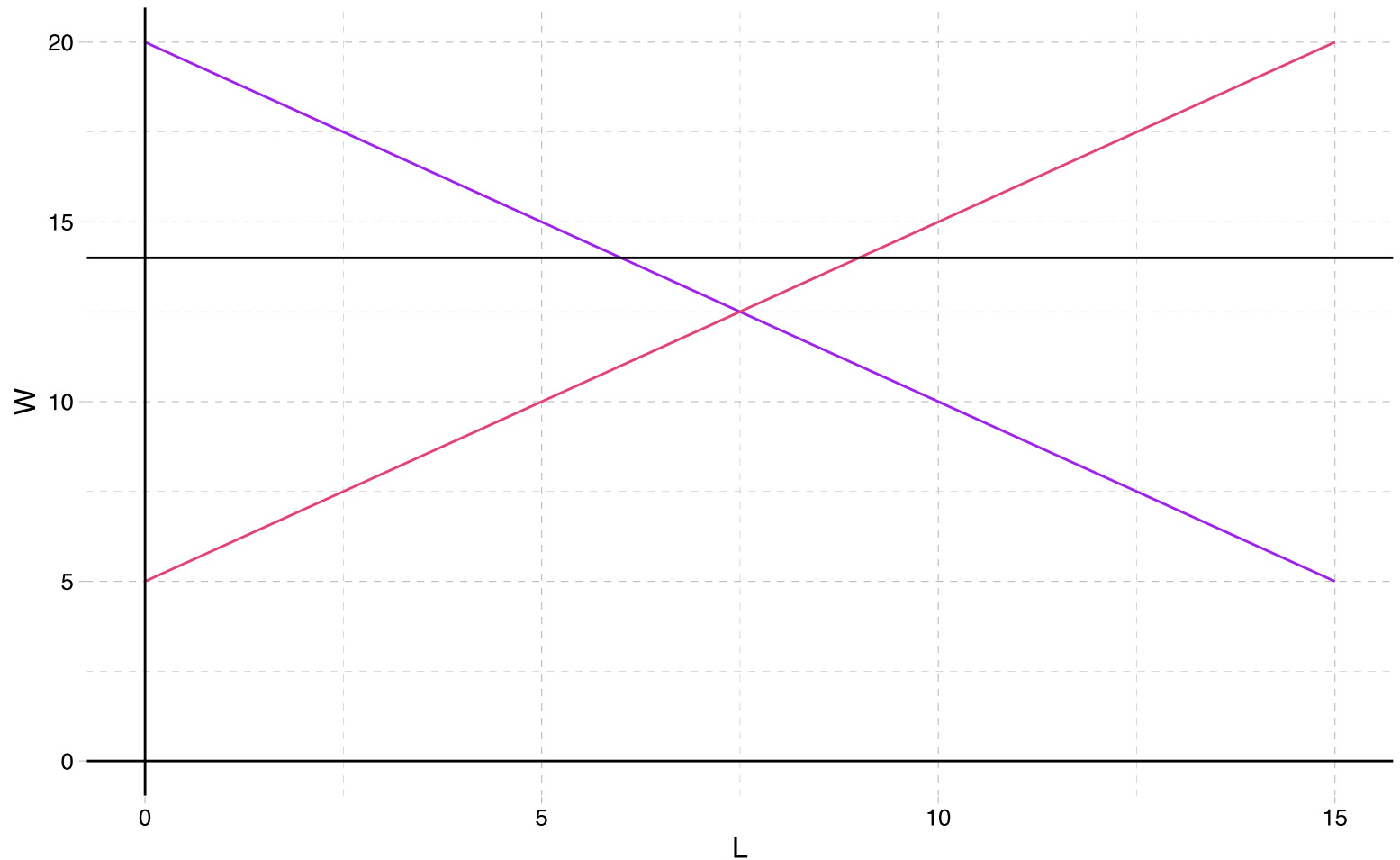
# Minimum wage

The following is **nonbinding**



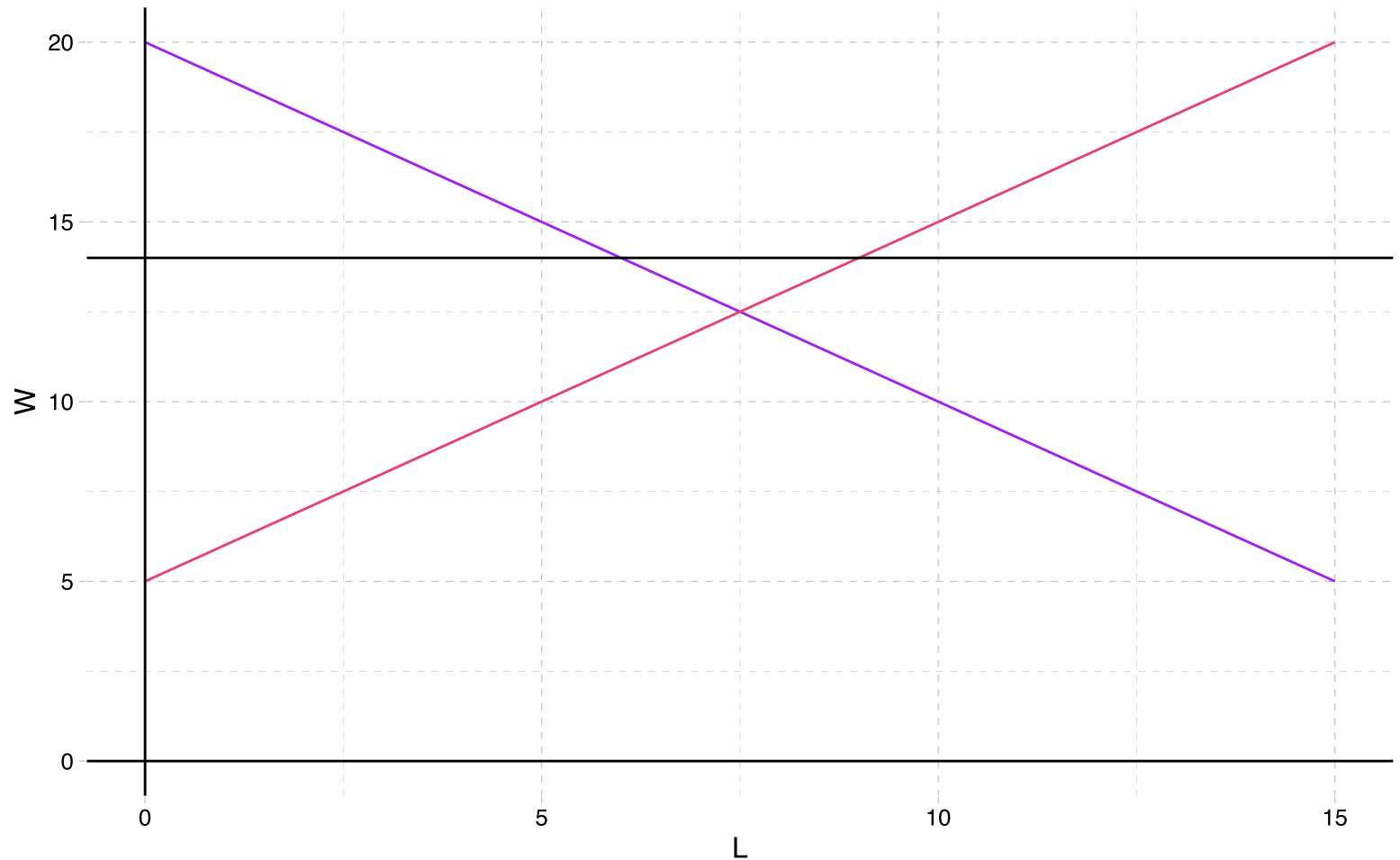
# Minimum wage

Is the following binding?

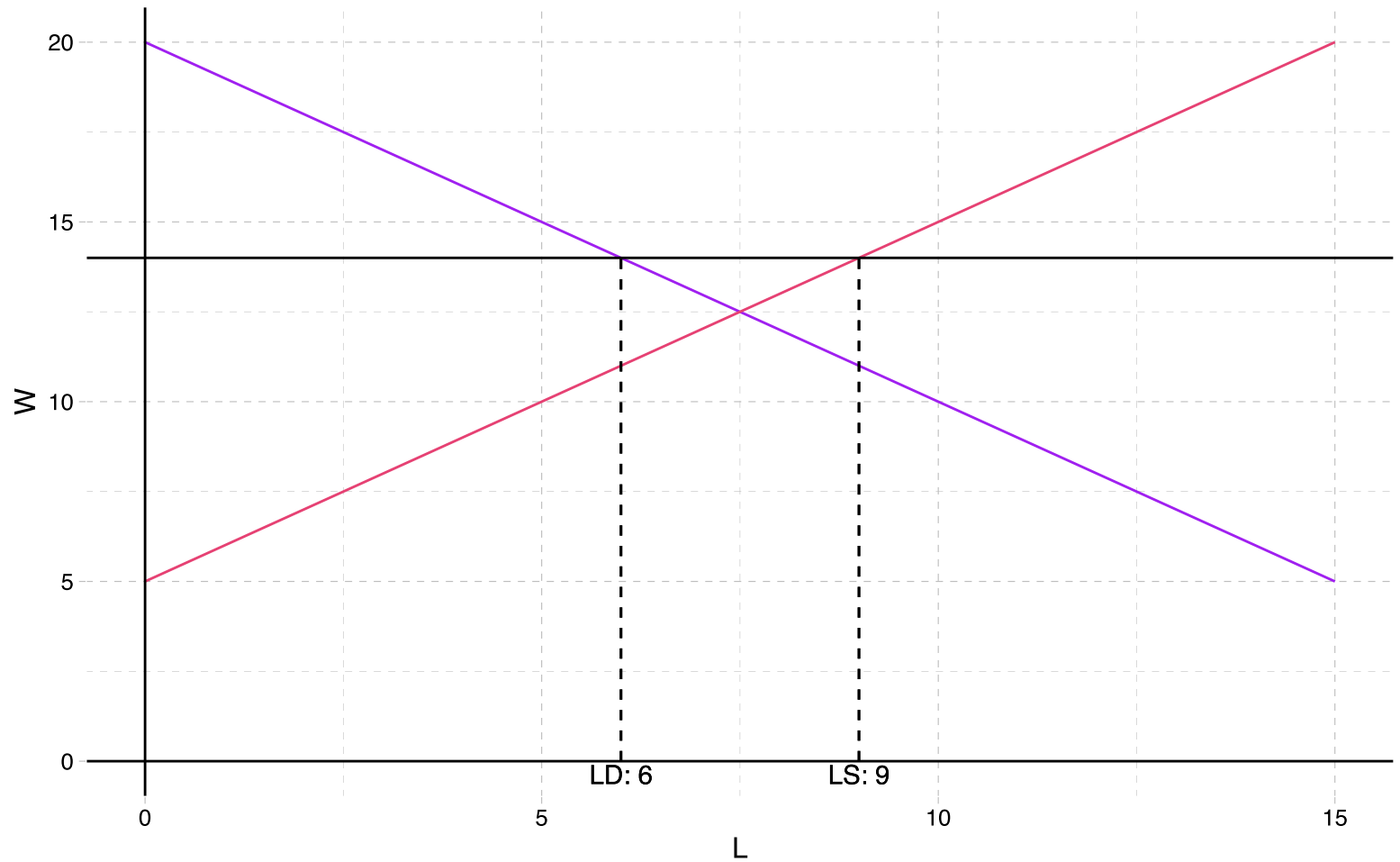


# Minimum wage

The following is **binding**



# Minimum wage



# Monopsony and Minimum Wage

- So we saw the **monopsonist** outcome leads to **lower employment and wages** than the **competitive outcome**.
- In perfect competition, what happens to unemployment with a minimum wage?
- Is it the same with a monopsony? No!



# Minimum wage: Example

Let's compare the effect of a minimum wage on both market structures:

- Competitive market
- Monopsony

Suppose we have two cities (A and B). City A follows the following  $L_D$  and  $L_S$

$$W_D^A = 25 - 5 \cdot L_D^A$$

$$W_S^A = 3 + 3 \cdot L_S^A$$

And city B follows the following  $L_D$  and  $L_S$

$$W_D^A = 25 - L_D^A$$

$$W_S^A = 1 + 3 \cdot L_S^A$$

# Minimum wage: Example

# Minimum Wage: Monopsony

