1.8 — Factor Markets

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Outline

Returning to Firms

- Recall a firm uses technology that buys inputs, transforms them, and sells output

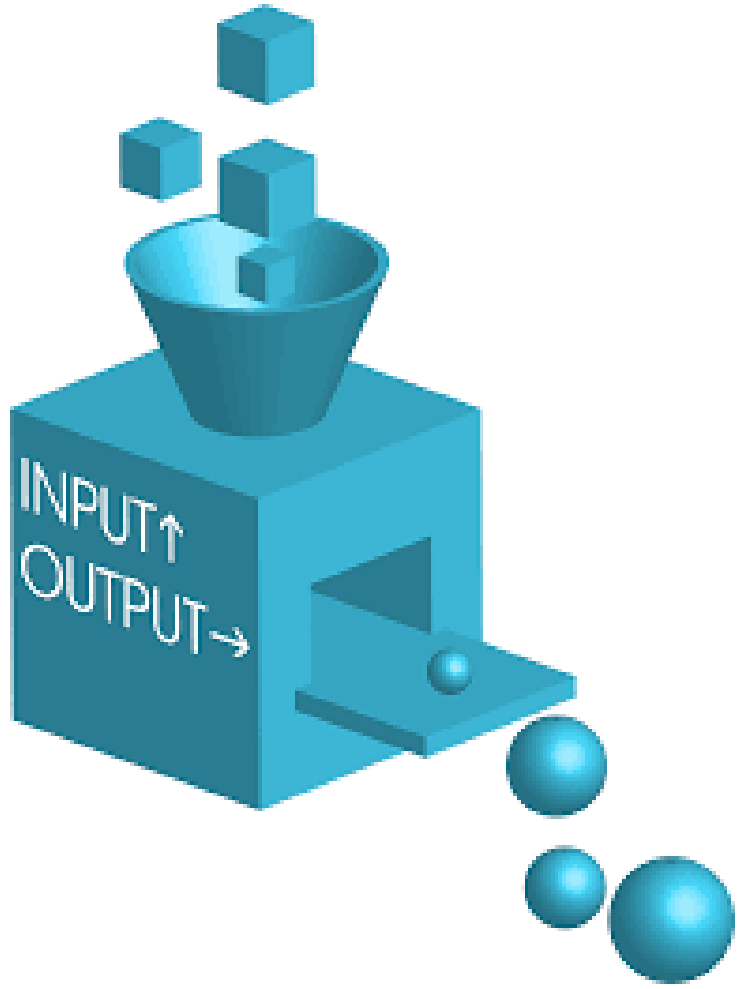
$$q = f(k, l)$$

  - We classified inputs into the **factors of production**: land, labor, capital

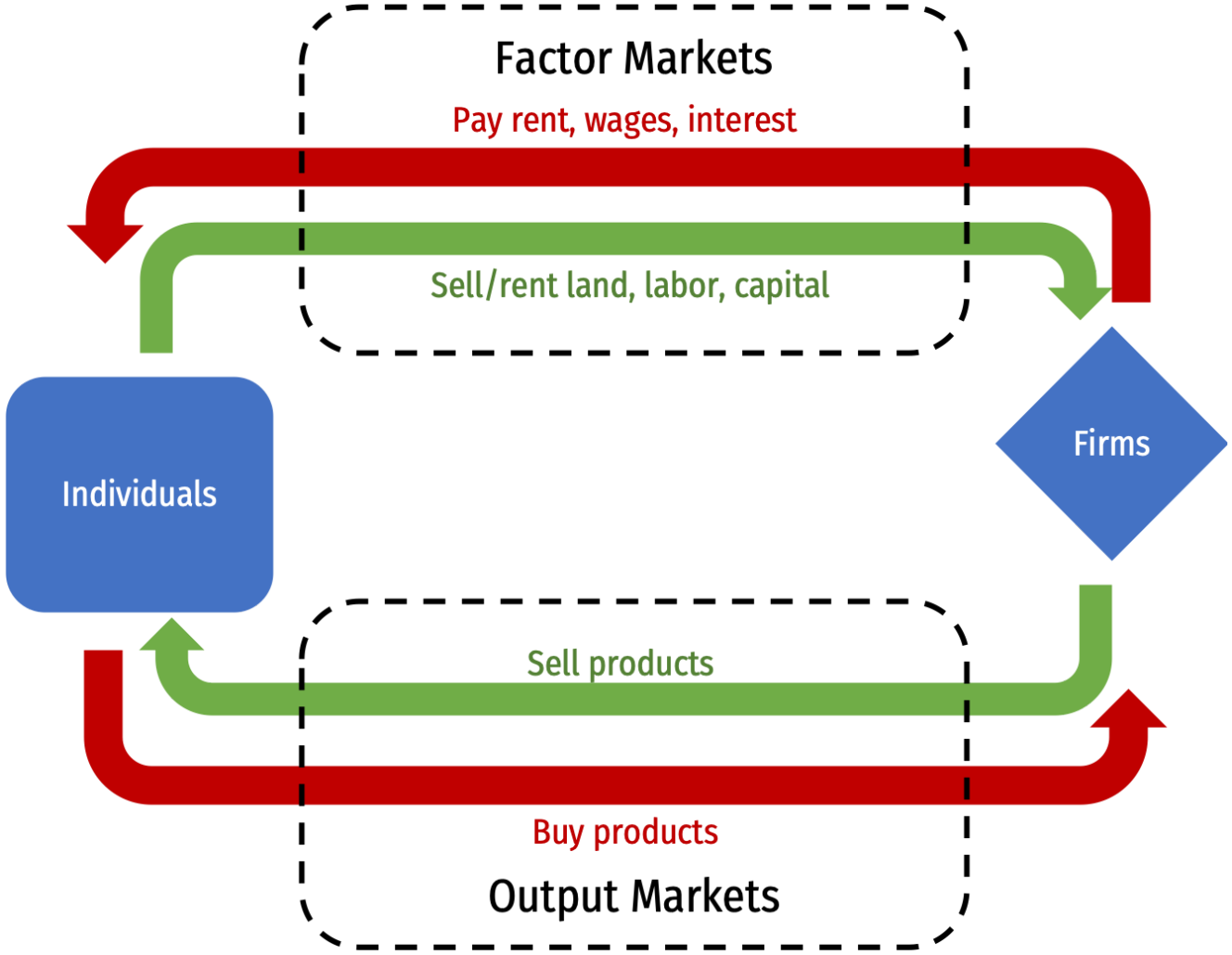
- We *assumed* fixed factor prices

  - show up in total cost $= wL + rK$

- Where do they come from? **Factor markets**



Circular Flow

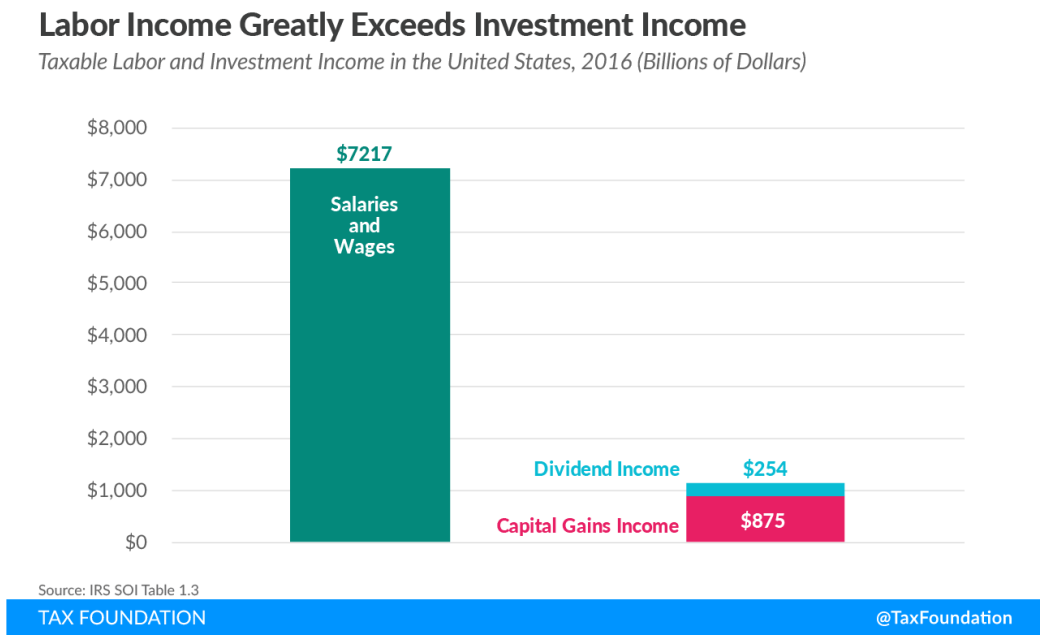


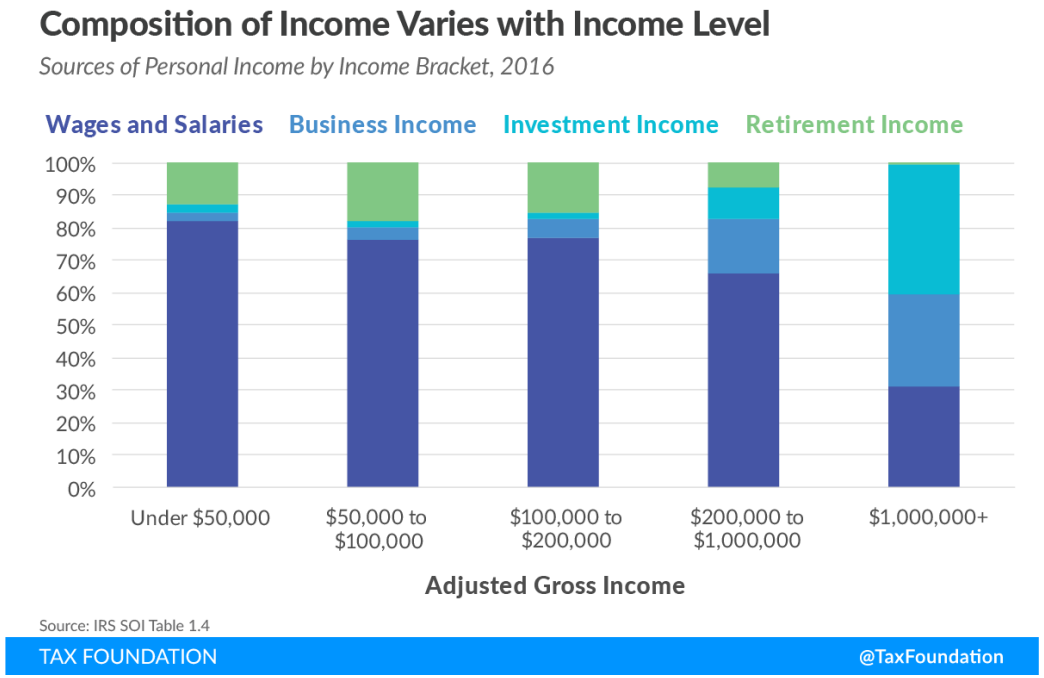
Firms' Payments to Factors are Income To Households

Income Type	Amount (2016)	Percent
Salaries and wages	$7217 Bn	68.45%
Taxable pensions and annuities	$694 Bn	6.58%
Partnership and S corporation net income	$629 Bn	5.97%
Capital gains less losses	$621 Bn	5.89%
Business net income	$389 Bn	3.69%
Taxable Social Security benefits	$286 Bn	2.71%
Taxable IRA distributions	$258 Bn	2.45%
Ordinary dividends	$254 Bn	2.41%
Total rental and royalty net income	$98 Bn	0.93%
Taxable interest	$97 Bn	0.92%

Source: Tax Foundation, 2018

Firms' Payments to Factors are Income To Households

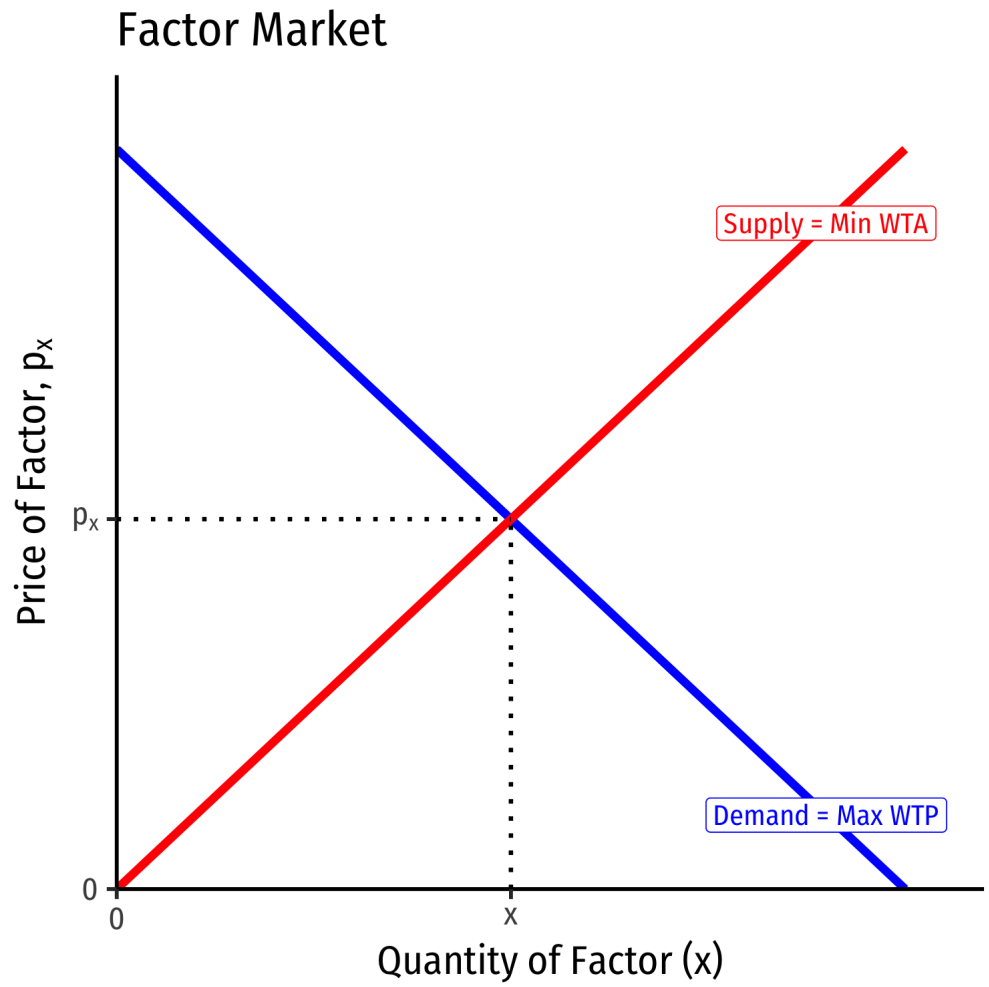




Source: Tax Foundation, 2018

Supply and Demand in Factor Markets

- The price of a factor is governed by the same market forces as output:
- **Supply of Factor**: willingness of factor owners to accept and sell/rent their services to firms
    - landowners, workers, capitalists, resource owners, suppliers
- **Demand for Factor**: willingness of firms to pay for/hire factor services



Factor Market Prices and Opportunity Costs

- **Factor price represents opportunity cost of hiring a factor for an alternative use**
  - Firms not only pay for direct use of a factor, but also indirectly for *not using* it in an alternate process!

Factor Market Prices and Opportunity Costs

- **Example**: a producer of hammers buys steel, pays (the opportunity cost) for "taking" the steel away from alternative uses

Factor Market Prices and Opportunity Costs

- **Example**: e.g. salary for a skilled worker must be high enough to keep them at their current firm, and not be attracted to other firms/industries

Example Factor Market: Labor Markets

- Empirically, about 70% of total cost of production comes from labor
- We'll focus just on the **market for labor** as an example factor market
- Can do the same for *any* factor market
  - (e.g. capital, land, materials, etc.)

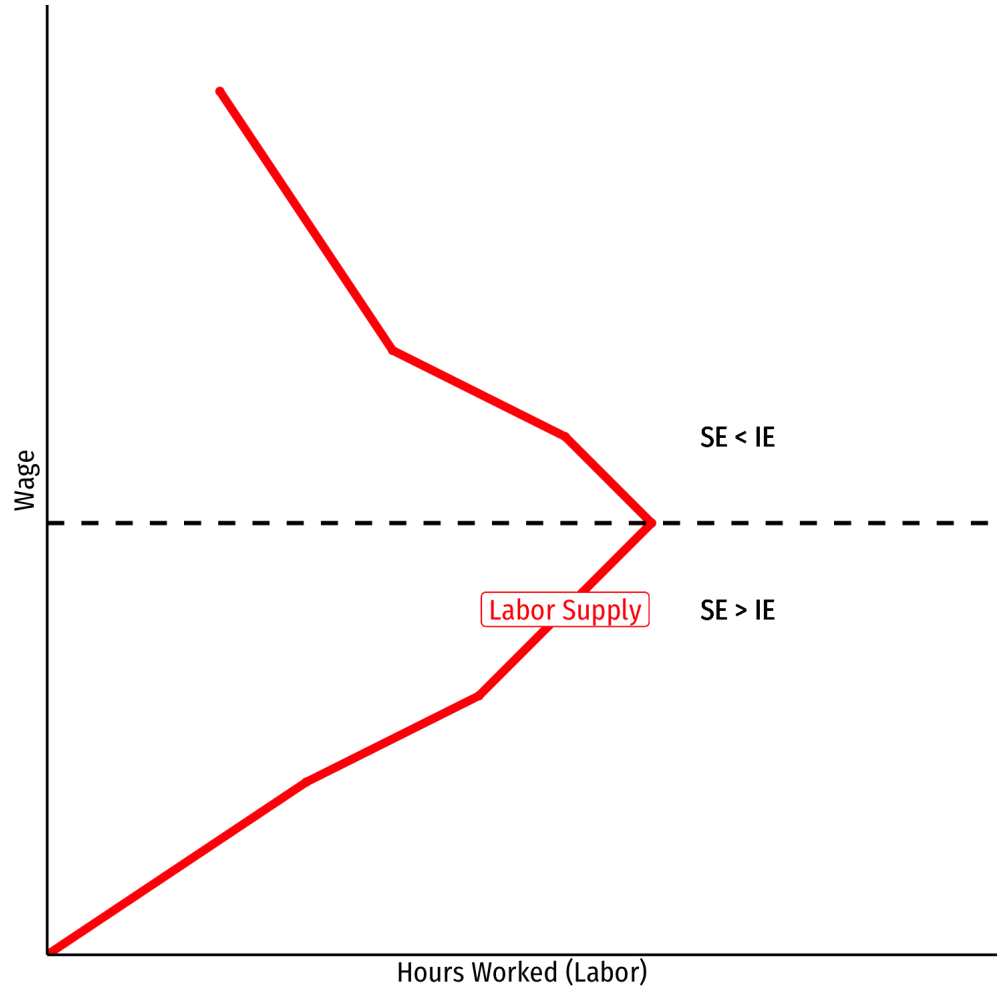
Labor Supply Decisions

Labor Supply Decisions

- The Supply of Labor comes from **individual decisions to work**
- Labor is considered a **disutility** (a **bad**)
    - **Opportunity cost** of labor is **leisure**
    - But, labor generates **income** for **consumption** (a good)
- Tradeoff: if you work more, you get more income, but less leisure

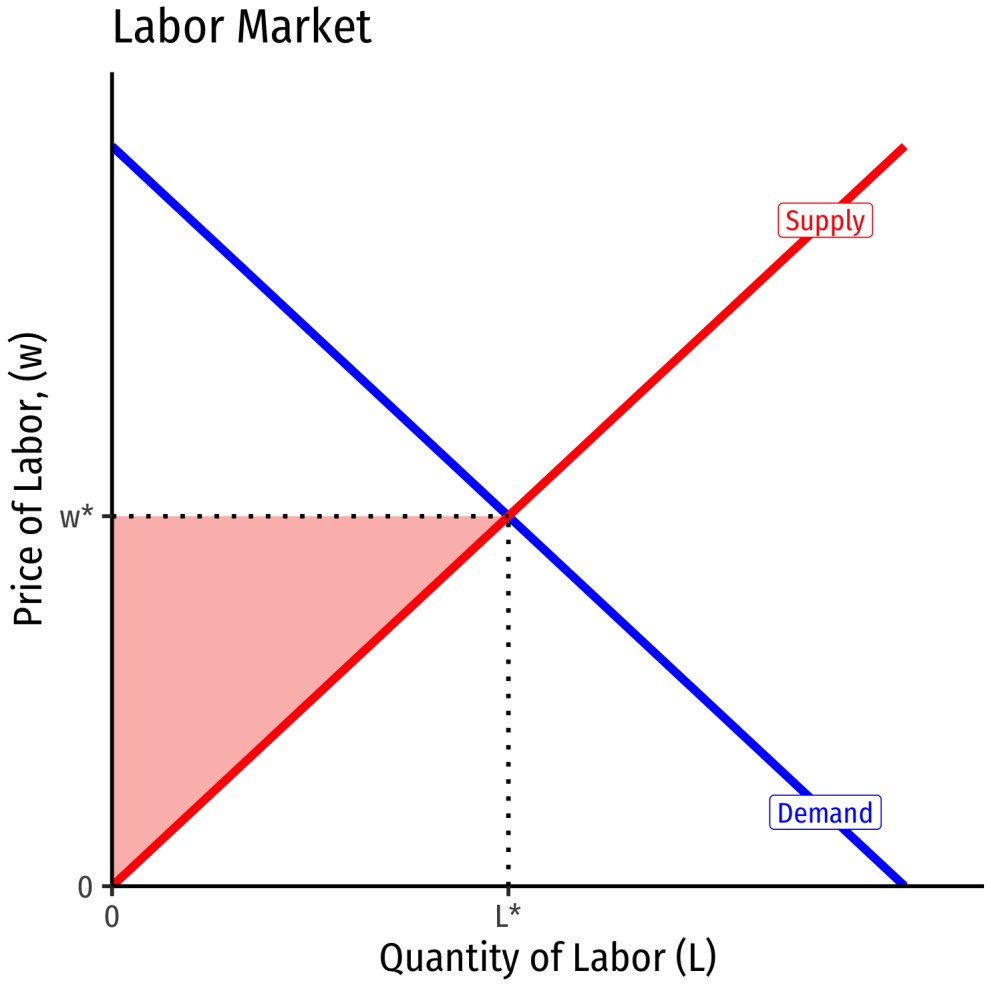
Modeling Labor Supply Decisions: A Change In Wages

- We often see “backward-bending” labor supply curves
- Depends on whether income or substitution effect dominates



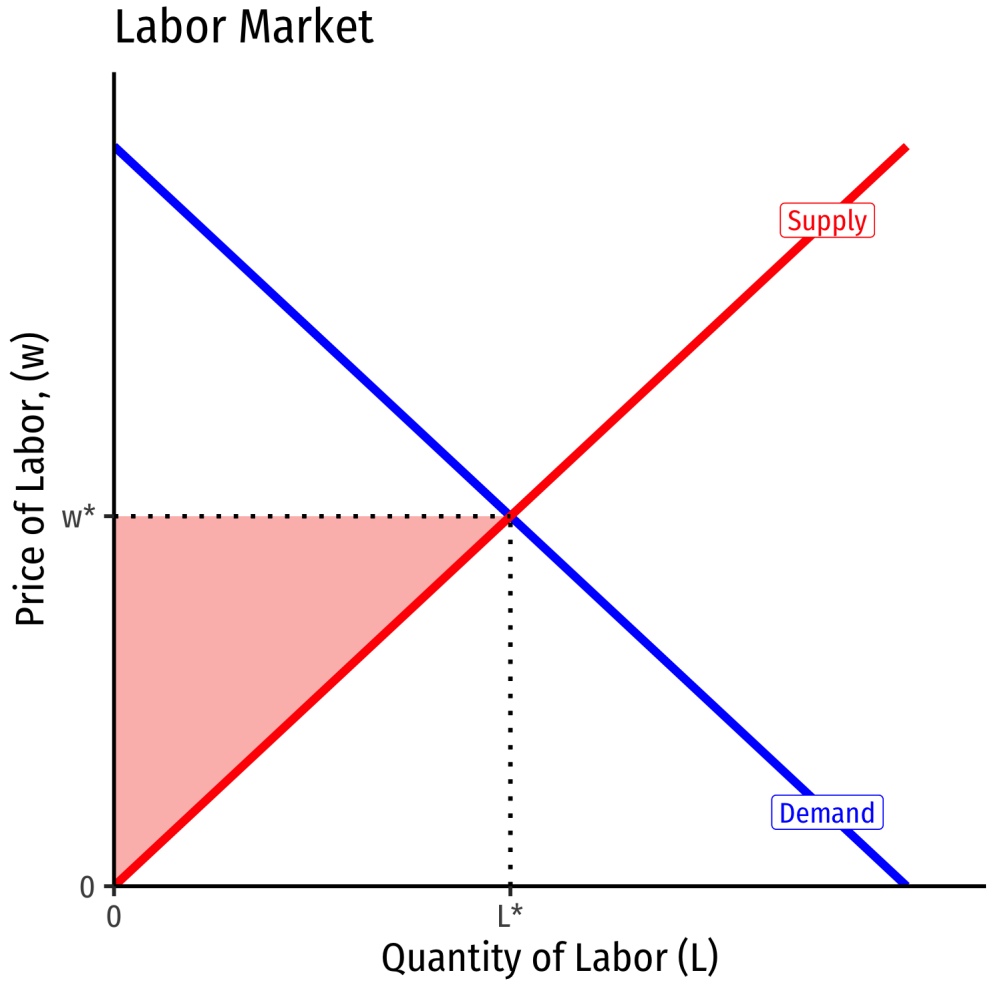
A Brief Digression on Economic Rents I

- Recall **market supply** is the **minimum willingness to accept**, the minimum price necessary to bring a resource to market (its opportunity cost)
- But all (equivalent) labor is paid the *market wage*, w^* determined by market labor supply and labor demand



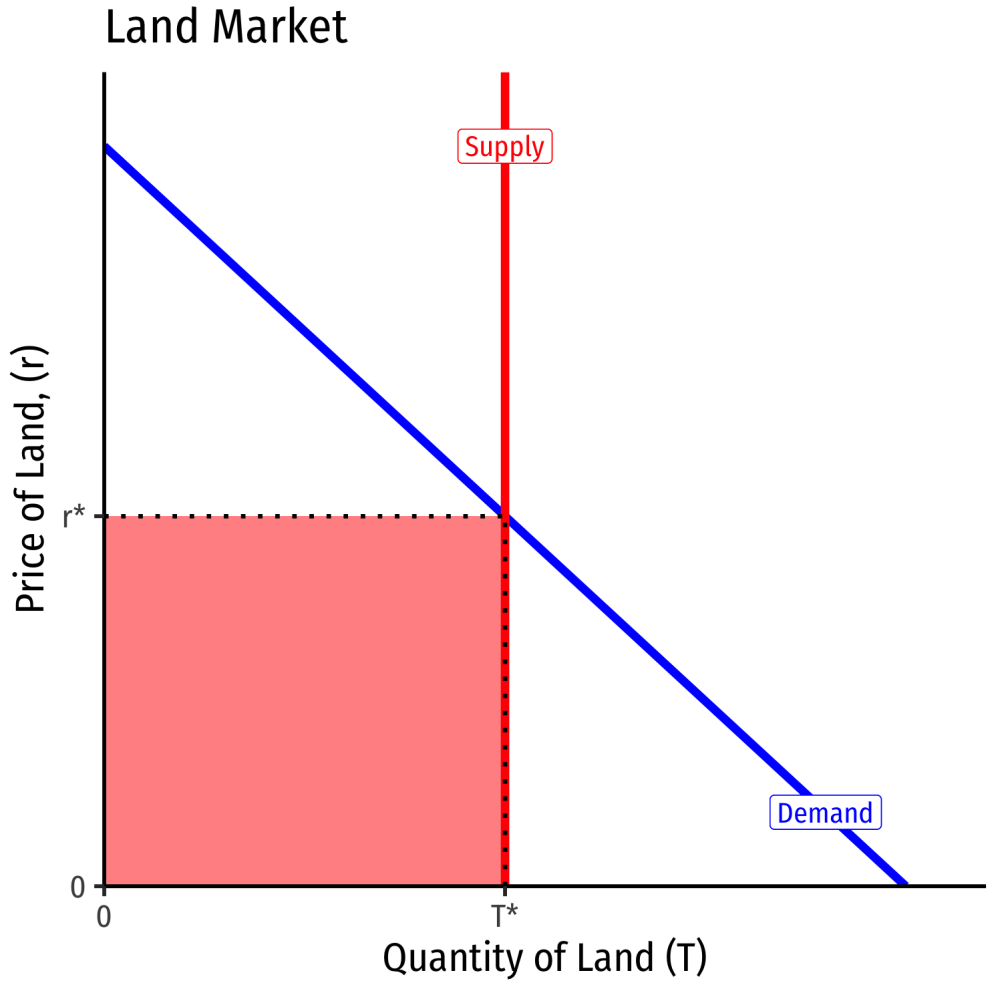
A Brief Digression on Economic Rents II

- Some workers would have accepted a job for less than w^*
- These inframarginal workers earn **economic rent** in excess of what is needed to bring them into the market (their opportunity cost)



A Brief Digression on Economic Rents III

- Consider a factor (such as land) for which the supply is perfectly inelastic (e.g. a fixed supply)
- Then the **entire value of the land is economic rent**!
- **The *less* elastic the supply of a factor, the *more* economic rent it generates!**

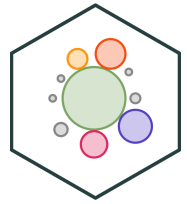


Labor Market for a Competitive Firm

Derived Demand in Factor Markets

- Demand for factors is a **"derived demand"**:
    - Firm only demands inputs to the extent they **contribute to producing sellable output**
- Firm faces a **tradeoff** when **hiring more labor**, as more labor ΔL creates:
    1. **Marginal Benefit**: Increases output and thus revenue
    2. **Marginal Cost**: Increases costs

Marginal Revenue Product (of Labor)



- Hiring more labor increases new output (i.e. labor's MP_L)
  - Recall: $MP_L = \frac{\Delta q}{\Delta L}$, where q is units of output
- Additional output generates new revenues (i.e. labor's $MR(q)$)
  - Recall: $MR(q) = \frac{\Delta R(q)}{\Delta q}$, where $R(q)$ is total revenue
- Hiring more labor, on the **margin**, generates a **benefit**, called the **marginal revenue product of labor,** MRP_L:

$$MRP_L = MP_L * MR(q)$$

  - i.e. the number of new products a new worker makes times the revenue earned by selling the new products

Marginal Revenue Product for *Competitive* Firms

- This is the **Firm's Demand for Labor**:

$$MRP_L = MP_L * MR(q)$$

- For a firm in a **competitive (output) market**, firm's $MR(q) = p$, hence:

$$MRP_L = MP_L * p$$

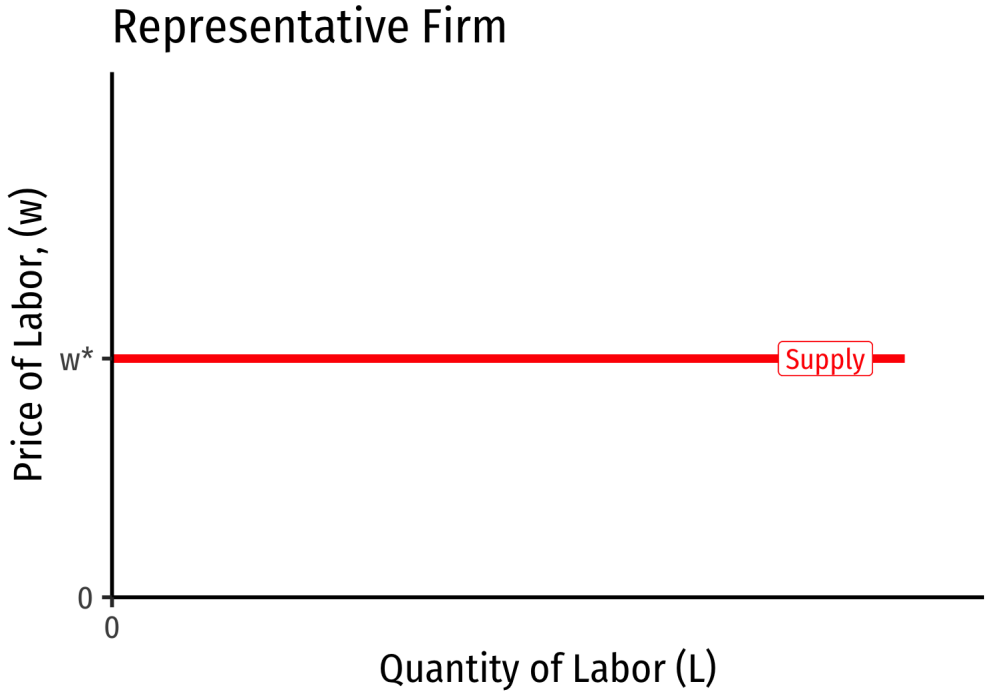
where p is the price of the firm's *output*

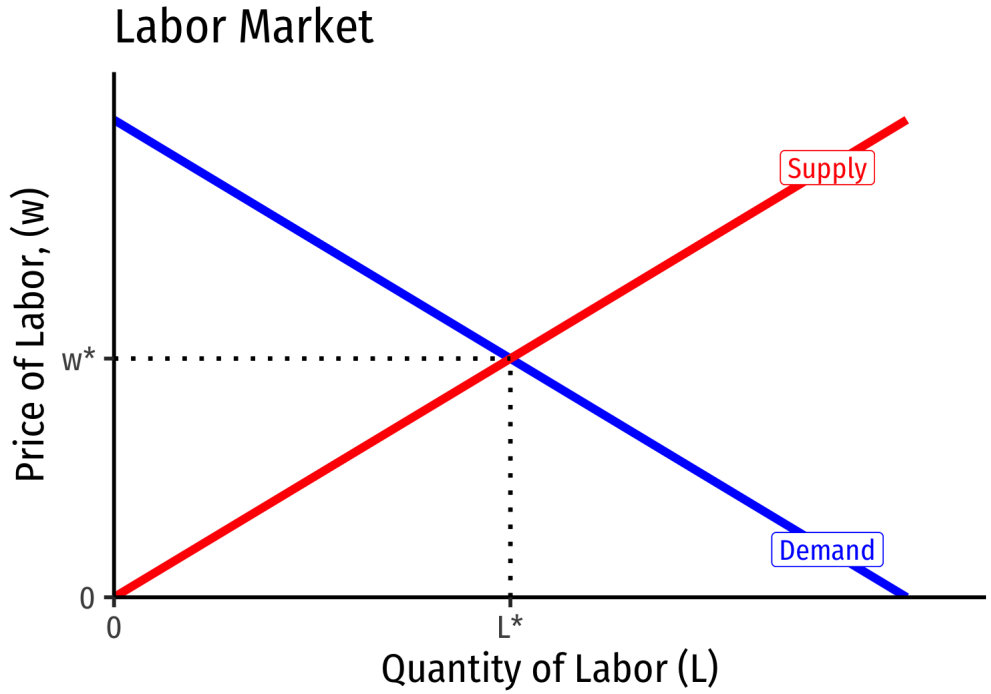
Marginal Revenue Product for *Competitive* Firms

$$MRP_L = MP_L * p$$

- Marginal benefit of hiring labor, MRP_L **falls** with more labor used
    - production exhibits **diminishing marginal returns to labor**!
- **Choke price for labor demand**: price too high for firm to purchase any labor

A Competitive *Factor* Market

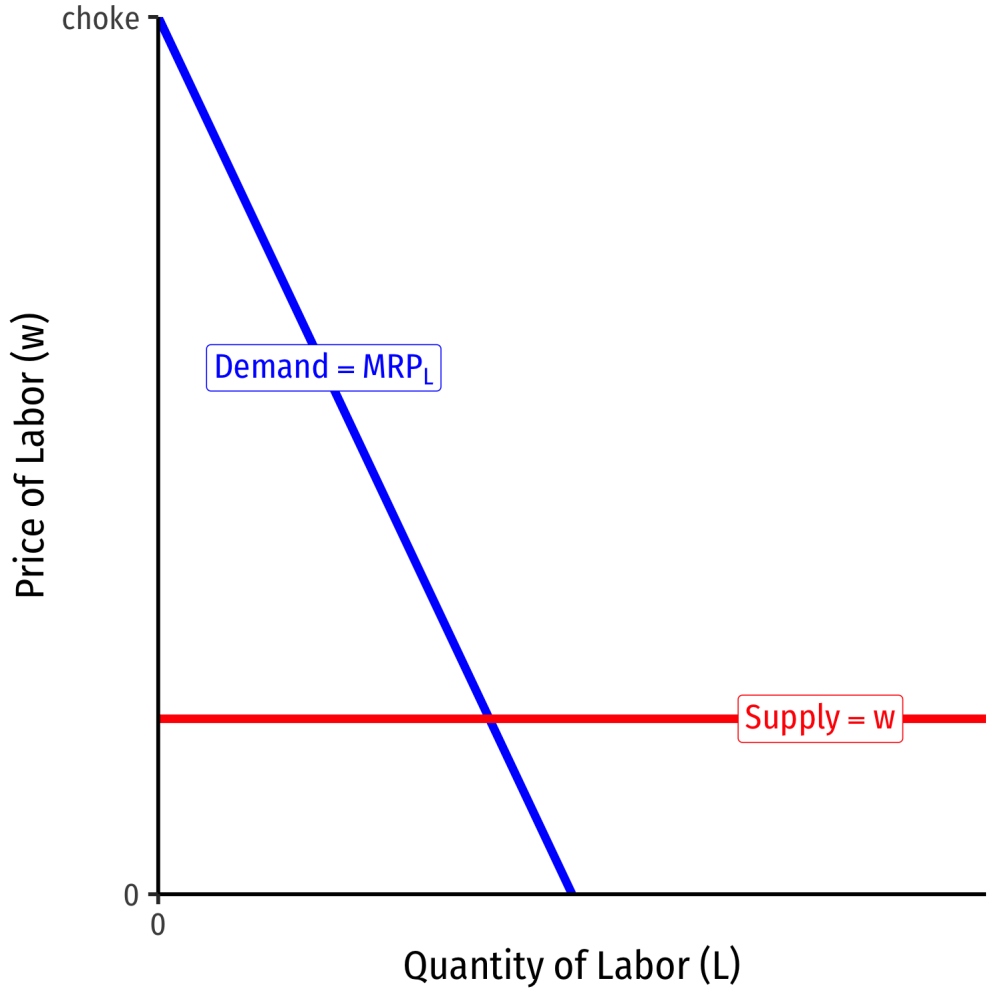




- If the ***factor* market is competitive**, labor supply available to an individual firm is *perfectly elastic* at the market price of labor (w^*)

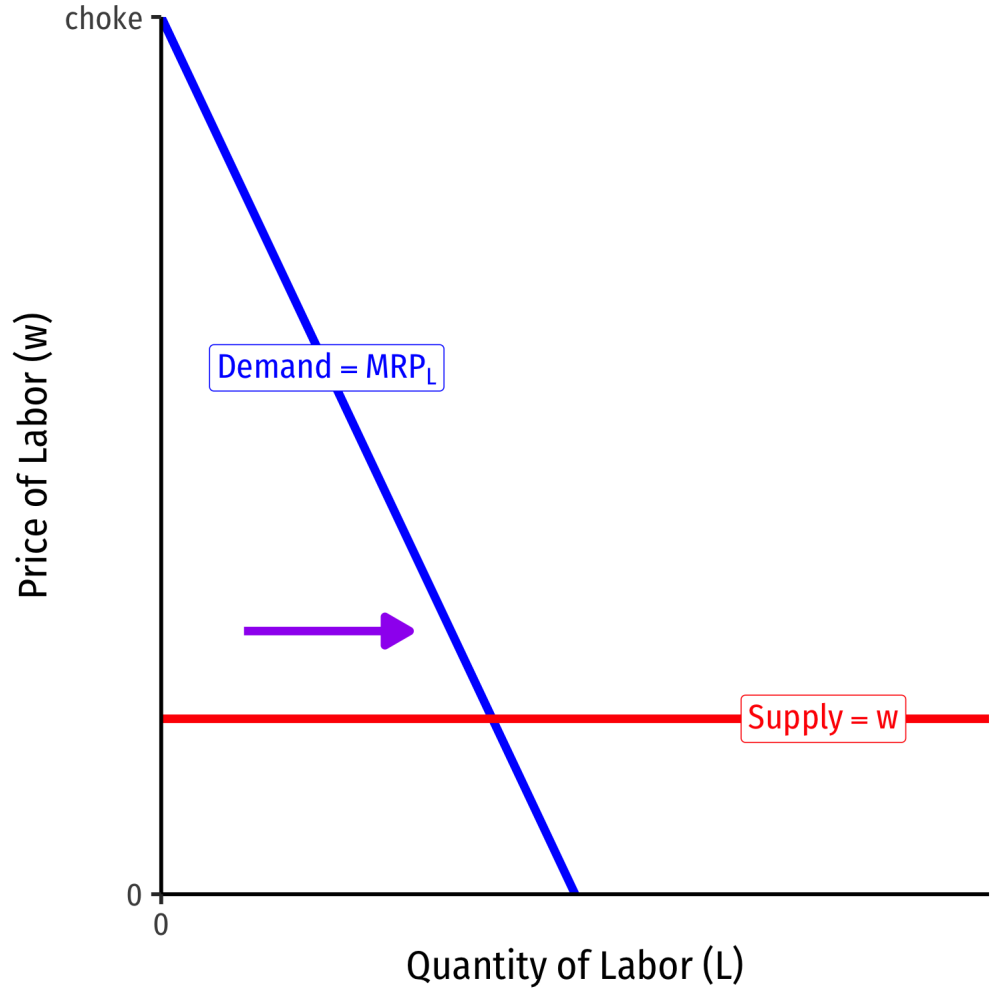
Labor Supply and Firm's Demand for Labor

- We've seen a falling MRP_L, the marginal benefit of hiring labor
- **Marginal cost of hiring labor**, w, remains constant
    - so long as firm is not a big purchaser (has no market power) in the labor market



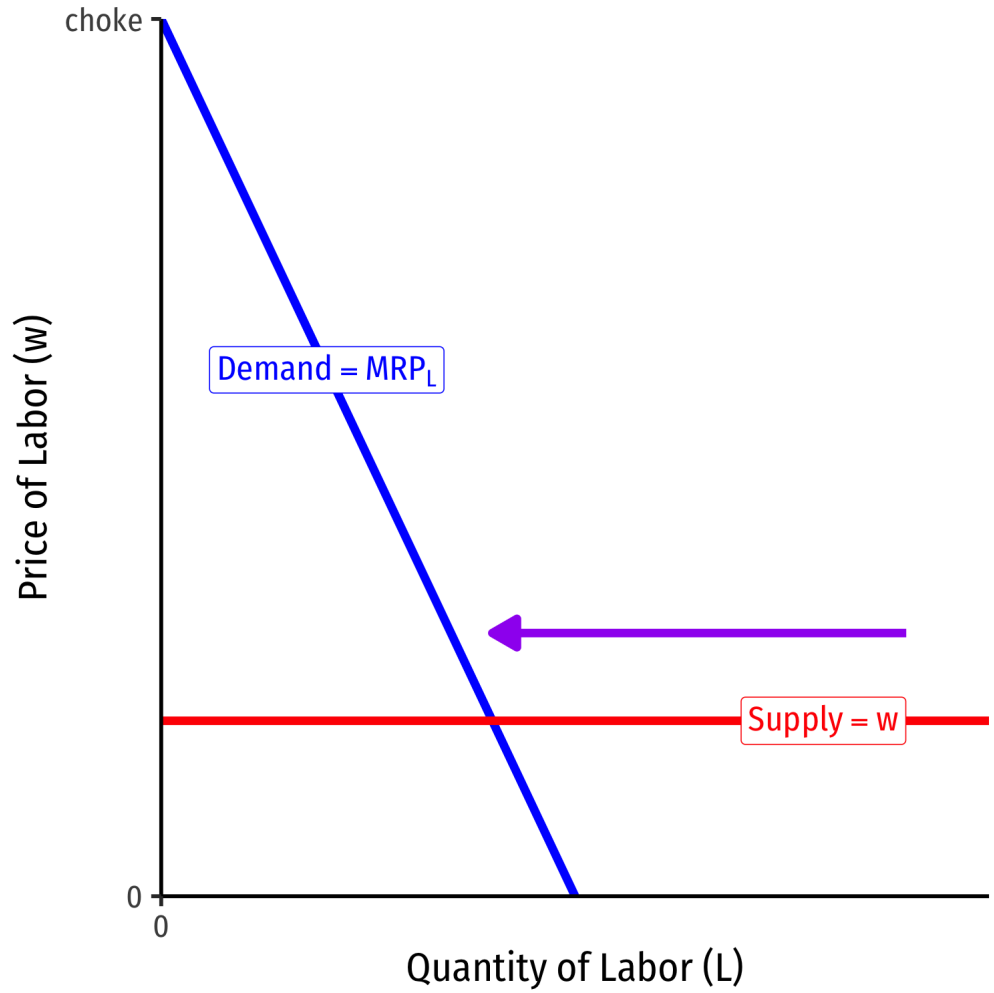
Labor Supply and Firm's Demand for Labor

- At low amounts of labor, marginal benefit $MRP_L > w$ marginal cost
- Firm will hire more labor



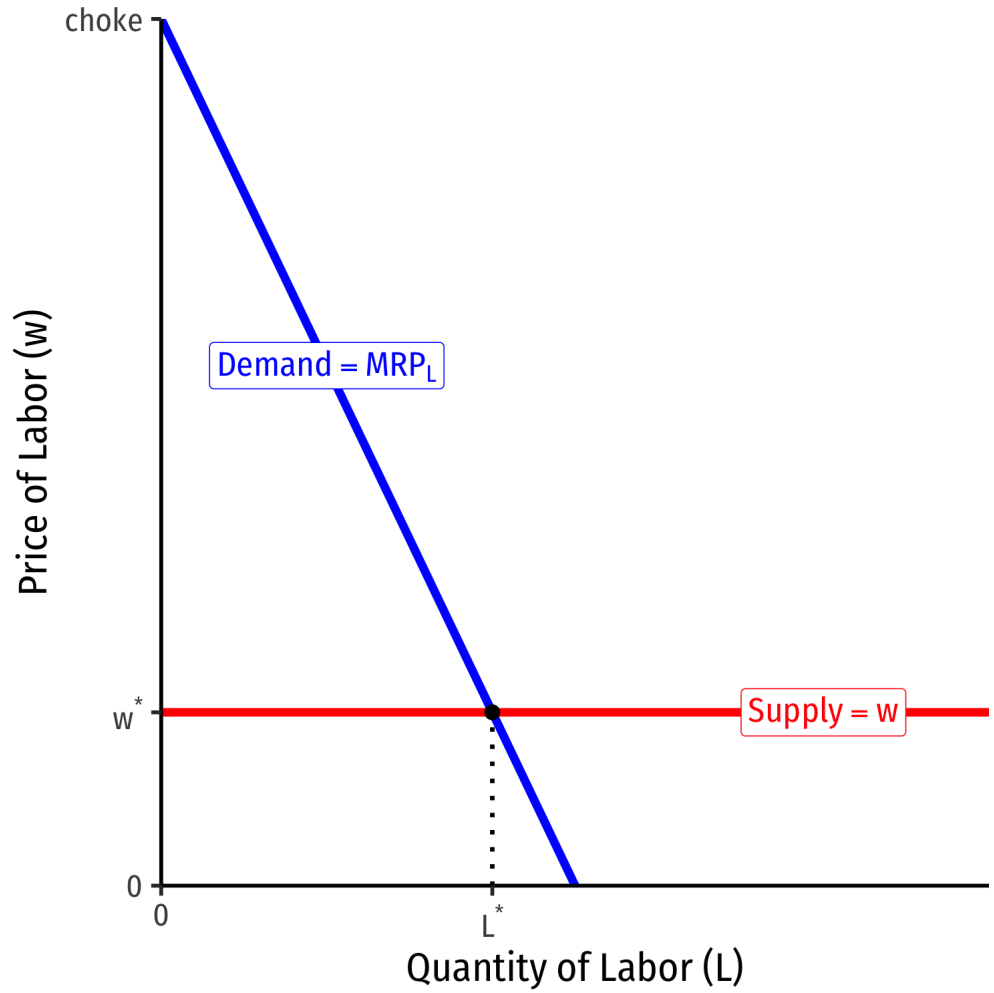
Labor Supply and Firm's Demand for Labor

- At high amounts of labor, marginal benefit $MRP_L < w$ marginal cost
- Firm will hire less labor

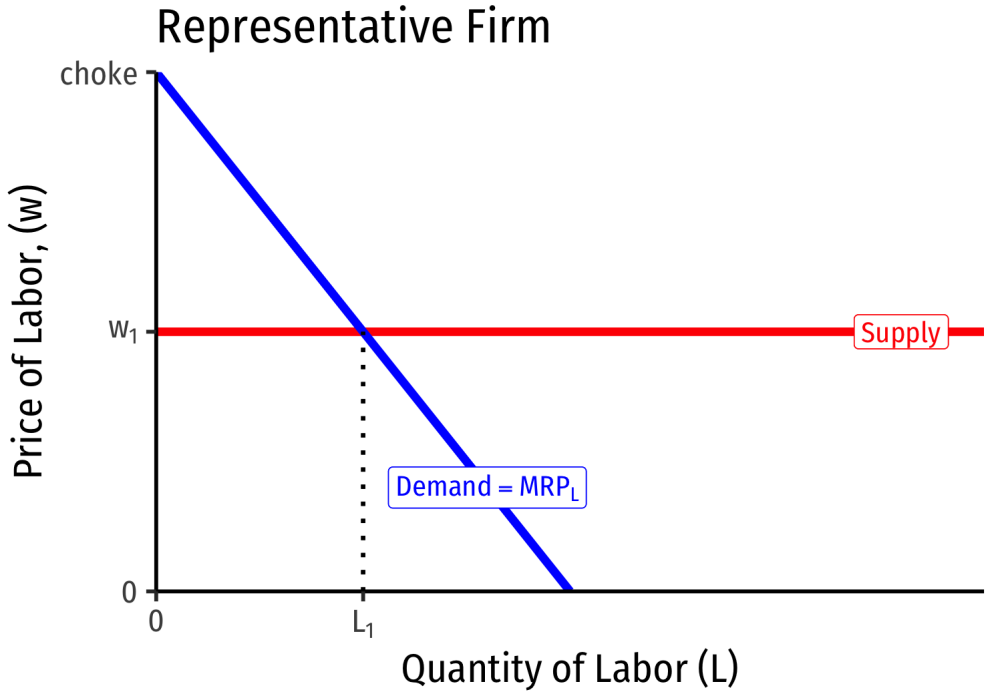


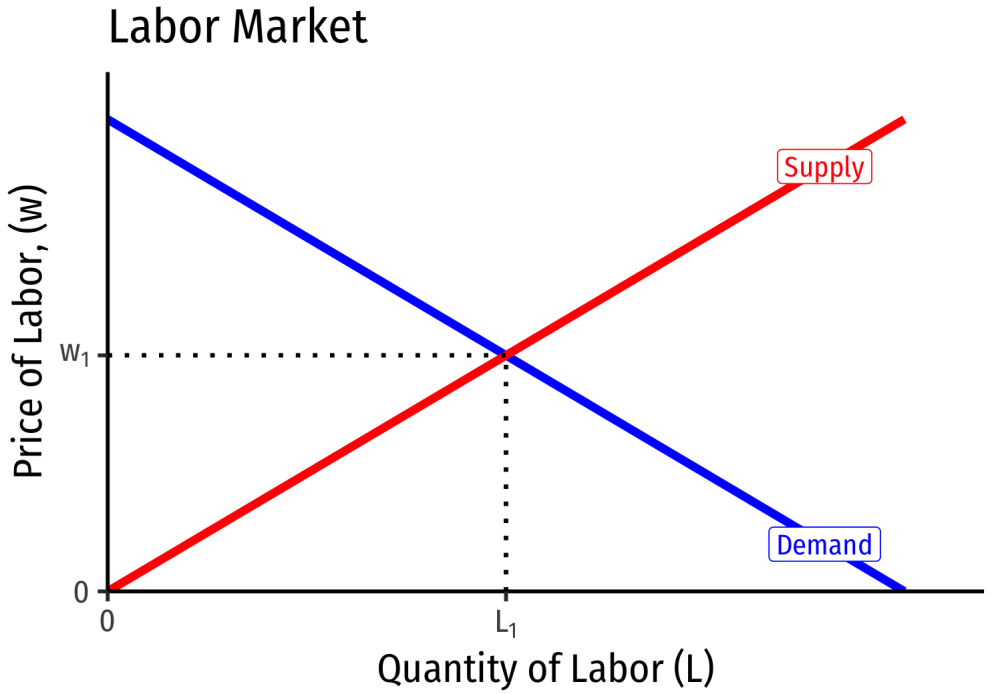
Labor Supply and Firm's Demand for Labor

- Firm hires L^* optimal amount of labor where $w = MRP_L$
- i.e. marginal cost of labor $=$ marginal benefit of labor

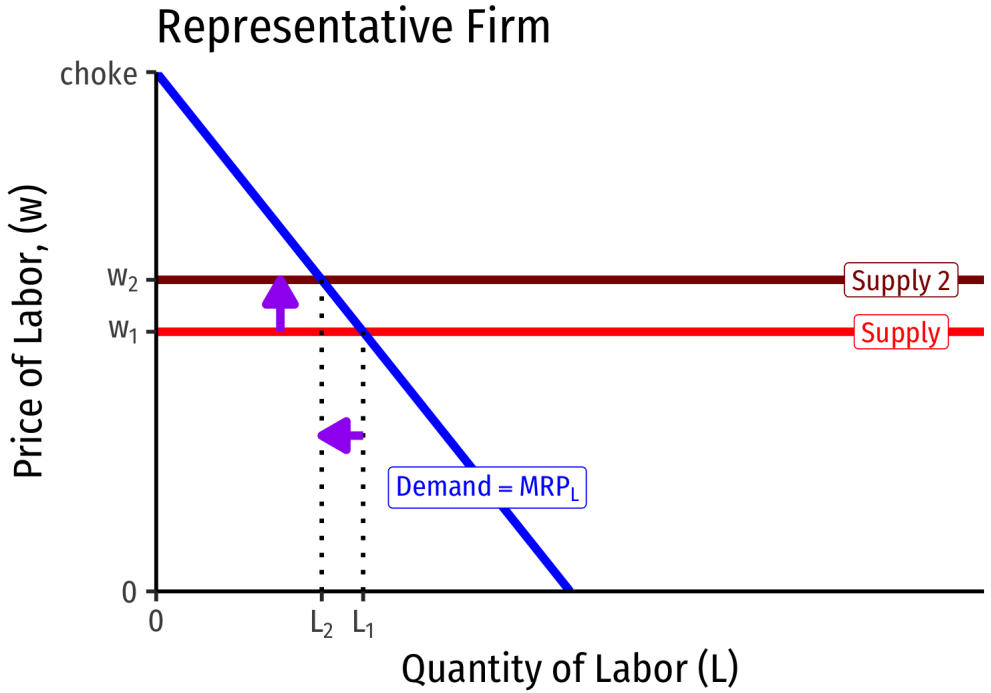


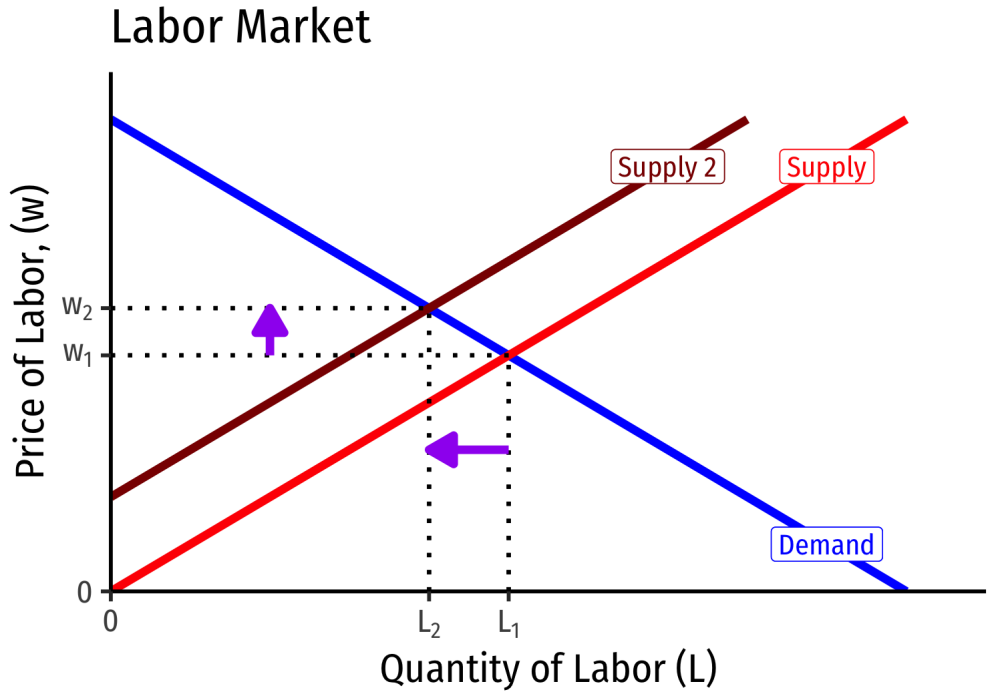
Labor Supply and Firm's Demand for Labor





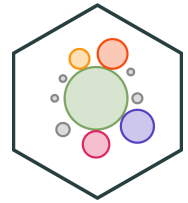
Labor Supply and Firm's Demand for Labor





- If market supply of labor decreases (increases), wages increase (decrease) & firms hire fewer (more) workers

Example



Example: Victoria's Tours is a travel company that offers guided tours of nearby mountain biking trails. Its marginal revenue product of labor is given by

$$MRP_L = 1,000 - 40L$$

where L is the number of tour-guide weeks it hires and MRP_L is measured in dollars per tour-guide week. The going market wage for tour guides is $600 per tour-guide week.

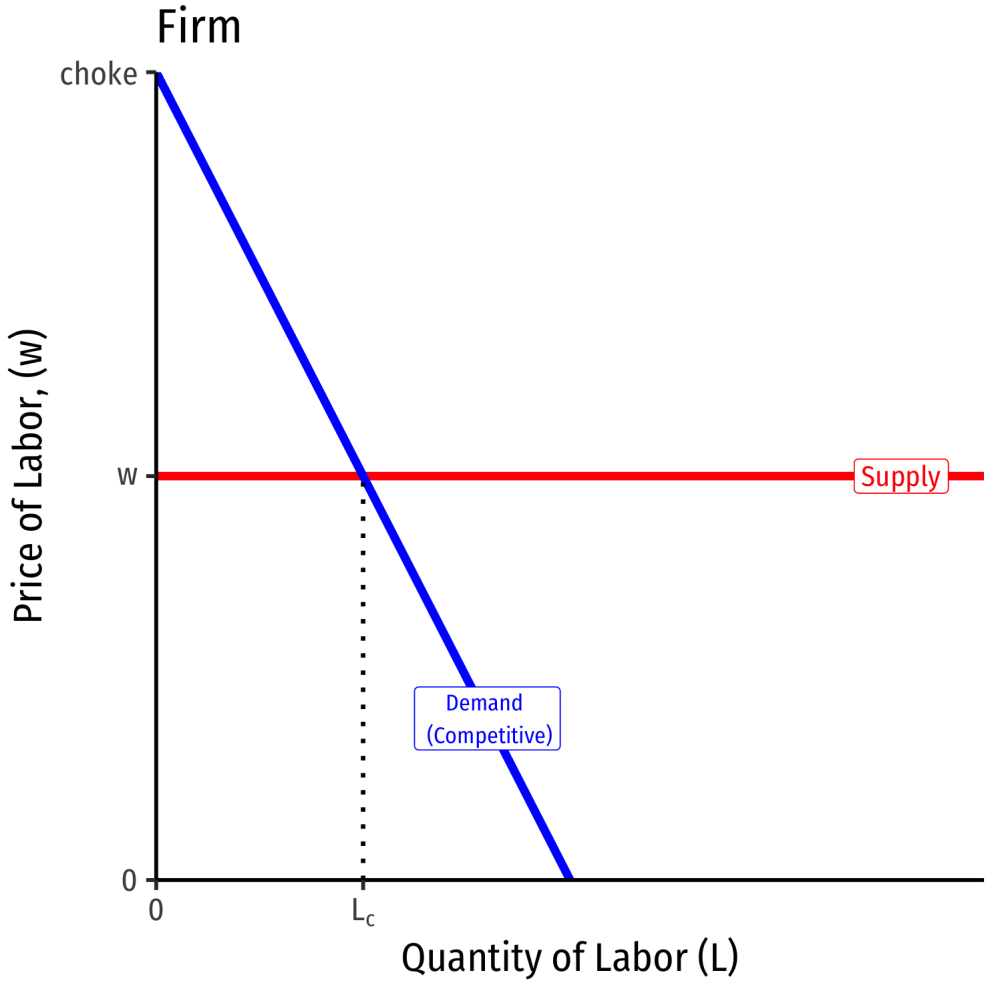
1. What is the optimal amount of labor for Victoria's Tours to hire?

2. At and above what market wage would Victoria's Tours not want to hire *any* labor?

3. What is the *most* labor Victoria's Tours would ever hire, given its marginal revenue product?

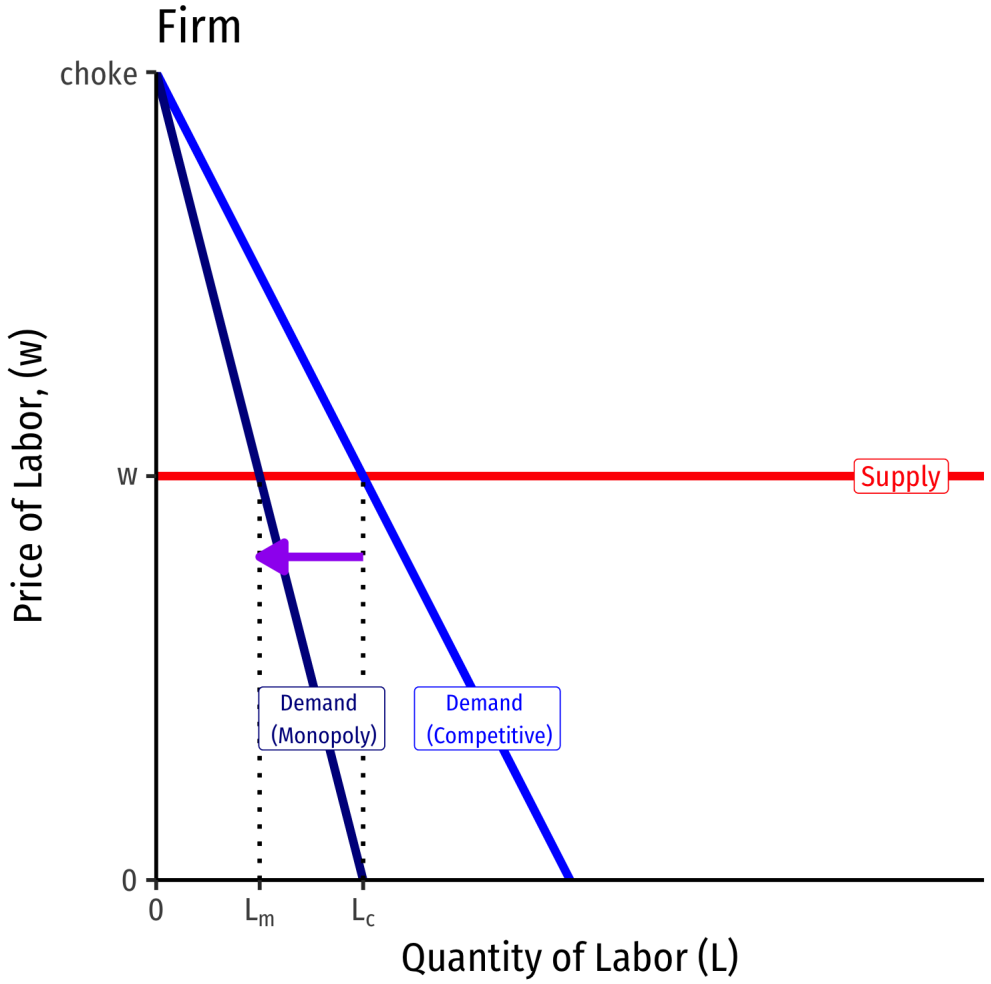
Labor Demand for a Monopoly

Labor Demand for Competitive vs. Monopolist Firm



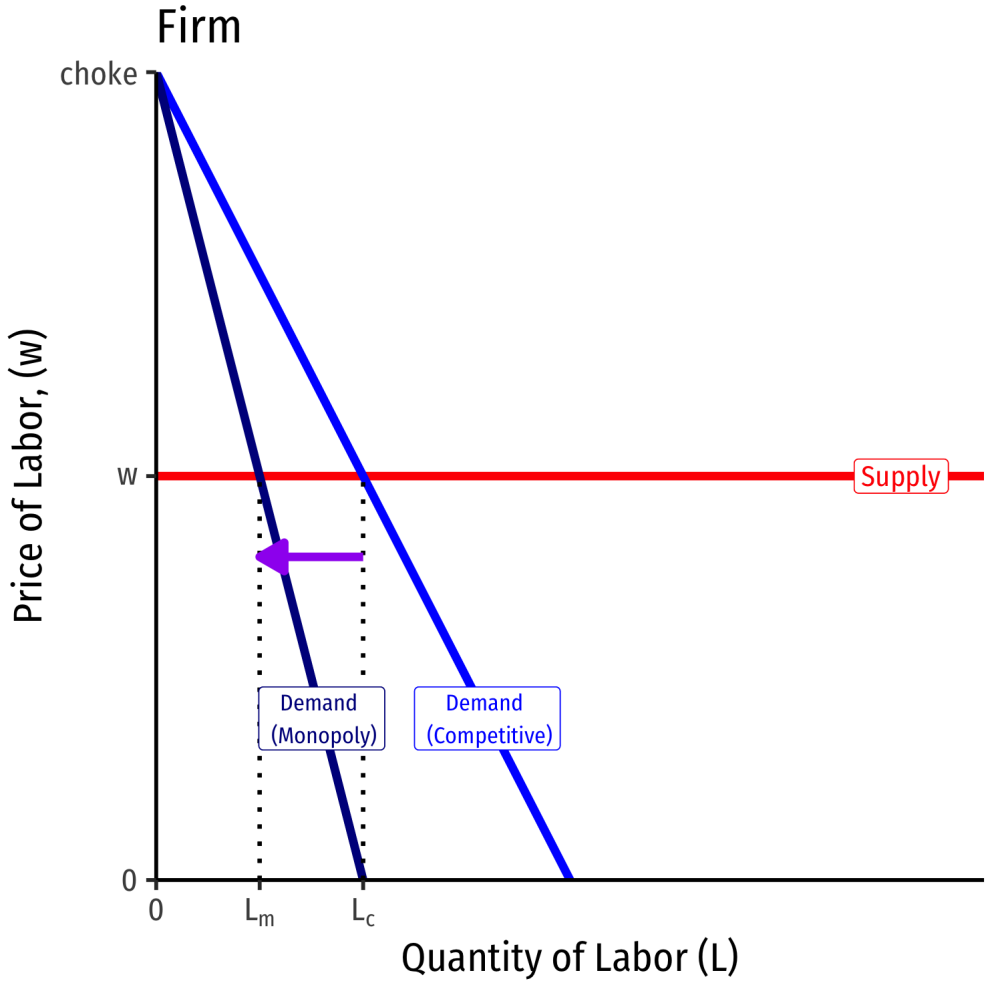
- Recall a firm's demand for labor:
  $MRP_L = MP_L * MR(q)$
- A firm in a **competitive *output* industry** has its $MR(q) = p$
  - So we saw its **Labor Demand**,
    $MRP_L = MP_L * p$

Labor Demand for Competitive vs. Monopolist Firm



- Recall if firm is a **monopolist** in its **output** industry, its $MR(q) < p$
  - So its **Labor Demand**, $MRP_L = MRP_L * MR(q)$
- Since $MR(q) < p$, **a monopoly in its output industry will always have lower demand for labor**, and thus, **hire less labor than a competitive firm**
  - Monopoly produces less output, so wants fewer inputs!

Labor Demand for Competitive vs. Monopolist Firm



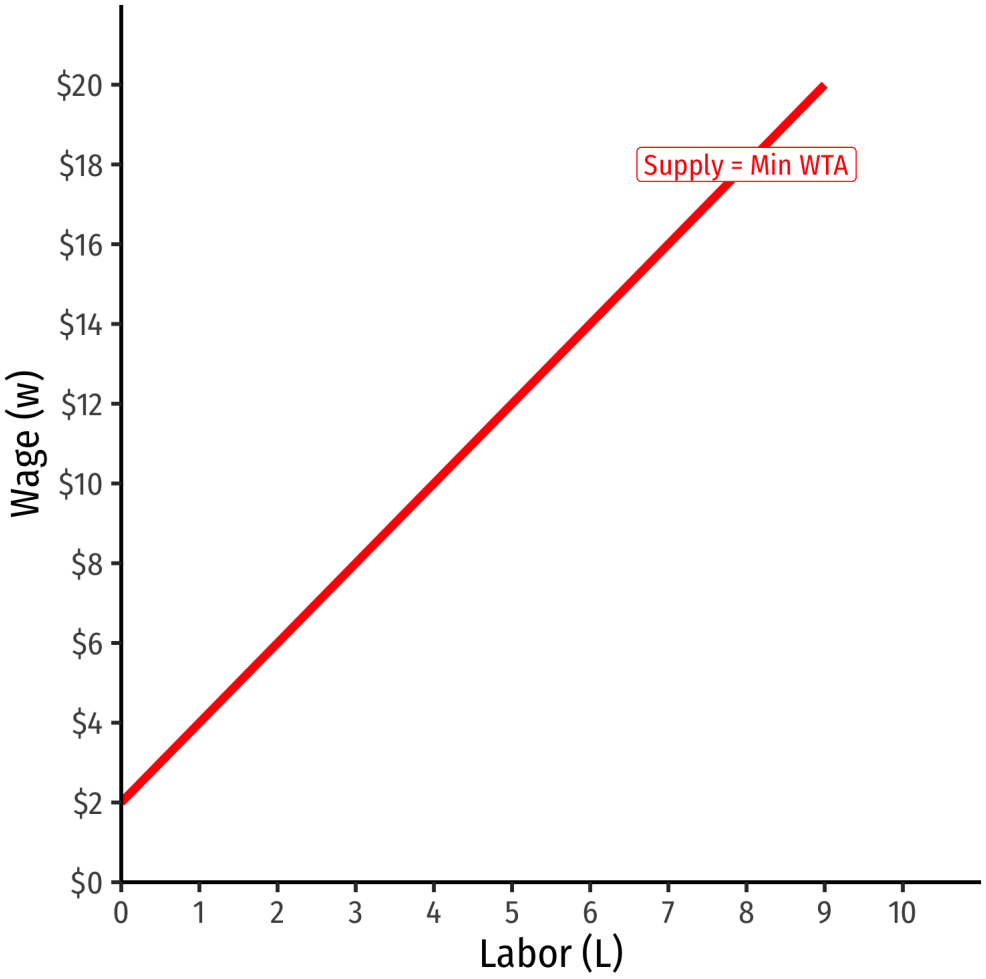
- This is about the competitiveness of the **output** or **"downstream"** market
- Here, both competitive firm and monopolist in downstream markets face the same perfectly elastic **labor supply**
  - We've assumed no market power in the **input** or **"upstream"** market (for labor)
- We next consider market power in the upstream (labor) market...

Monopsony Power

Monopsony

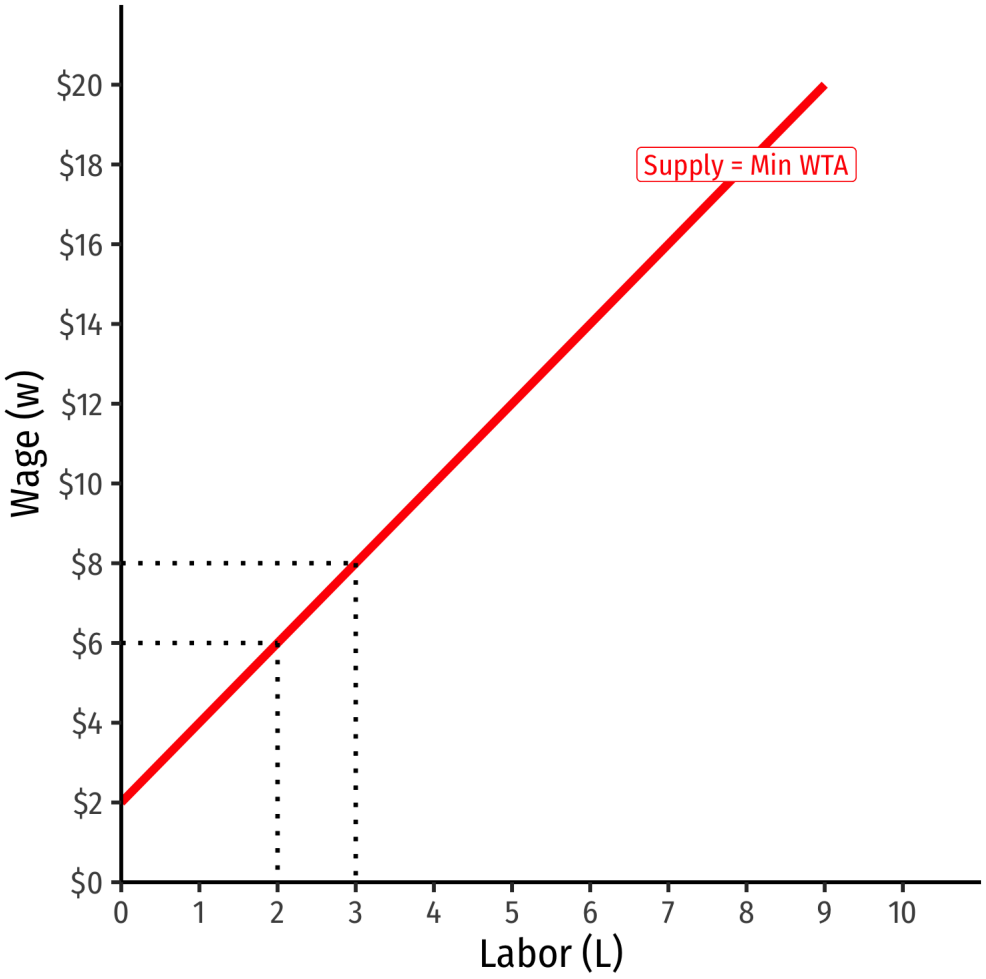
- What if the firm has **market power in a factor market**?
- Consider extreme example: **monopsony**: a factor market with a **single buyer**

Monopsony and Market Supply of Labor



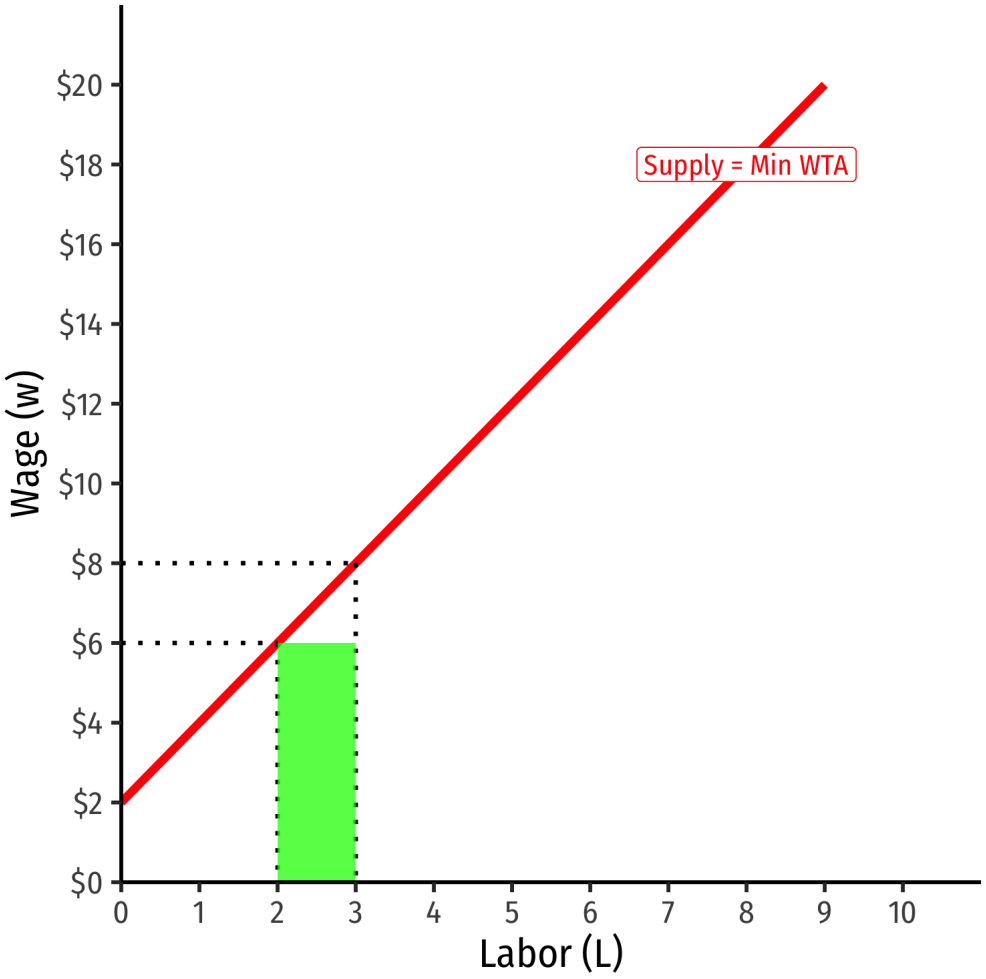
- Market power in *hiring* labor implies that the firm faces the **whole market factor supply curve** for labor
- Market supply is upward sloping
- **Factor (inverse) supply** describes minimum price workers are willing to accept to work

Monopsony and Market Supply of Labor



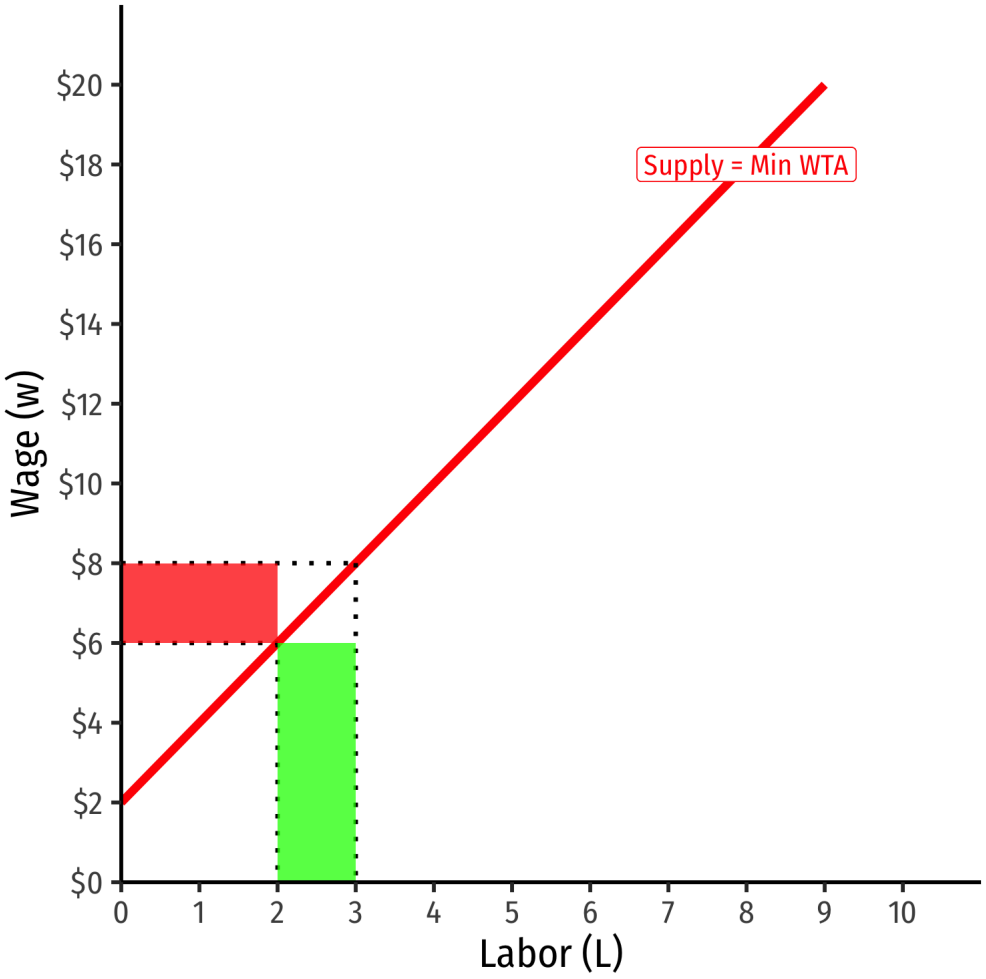
- As firm chooses to hire more L, must raise wages on *all* workers to hire them

Monopsony and Market Supply of Labor



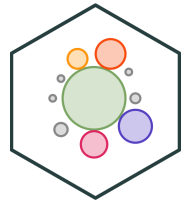
- As firm chooses to hire more L, must raise wages on *all* workers to hire them
- Output effect: increased cost from increased number of workers

Monopsony and Market Supply of Labor



- As firm chooses to hire more L, must raise wages on *all* workers to hire them
- Output effect: increased cost from increased number of workers
- Price effect: increased cost from raising wage for all workers

Monopsony and Marginal Cost of Labor I



- If monopsonist wants to hire more labor, ΔL, its labor cost $C(L)$ would change by:

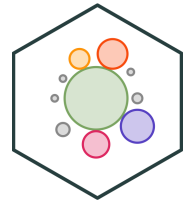
$$\Delta C(L) = w\Delta L + L\Delta w$$

- Output effect: increases number of labor hired (ΔL) times wage w per worker
- Price effect: raises wage per worker (Δw) on *all* workers hired (L)
- Divide both sides by ΔL to get **Marginal Cost of Labor,** $MC(L)$:

$$\frac{\Delta C(L)}{\Delta L} = MC(L) = w + \frac{\Delta w}{\Delta L} L$$

- Compare: supply for a **price-taking** firm is perfectly elastic: $\frac{\Delta w}{\Delta L} = 0$, so we saw $MC(L) = w$!

Monopsony and Marginal Cost of Labor II



- If we have a linear inverse supply function for labor of the form

$$w = a + bL$$

  - a is the choke price (intercept)
  - b is the slope

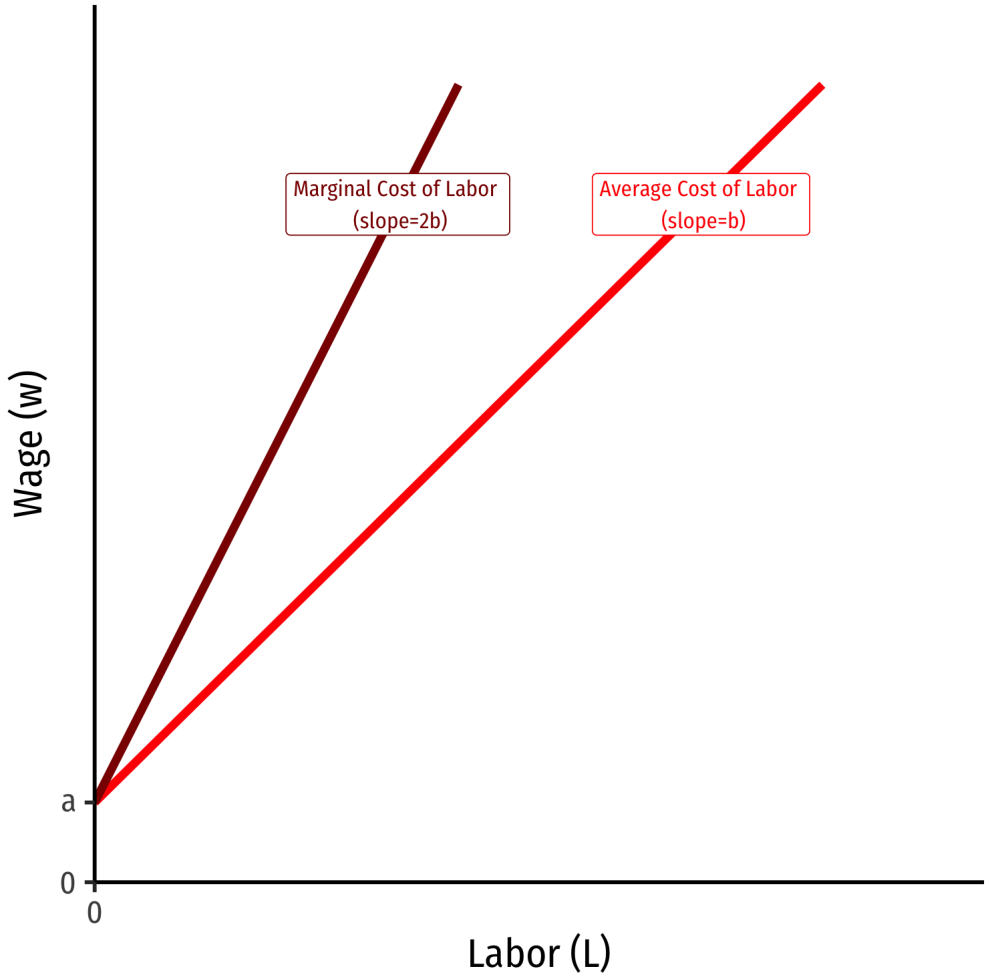
- Marginal cost of labor again is defined as:

$$MC(L) = w + \frac{\Delta w}{\Delta L} L$$

- Recognize that $\frac{\Delta w}{\Delta L}$ is the slope, b, $\left(\frac{rise}{run}\right)$

$$MC(L) = w + (b)L$$
$$MC(L) = (a + bL) + bL$$
$$MC(L) = a + 2bL$$

Monopsony and Marginal Cost of Labor IV

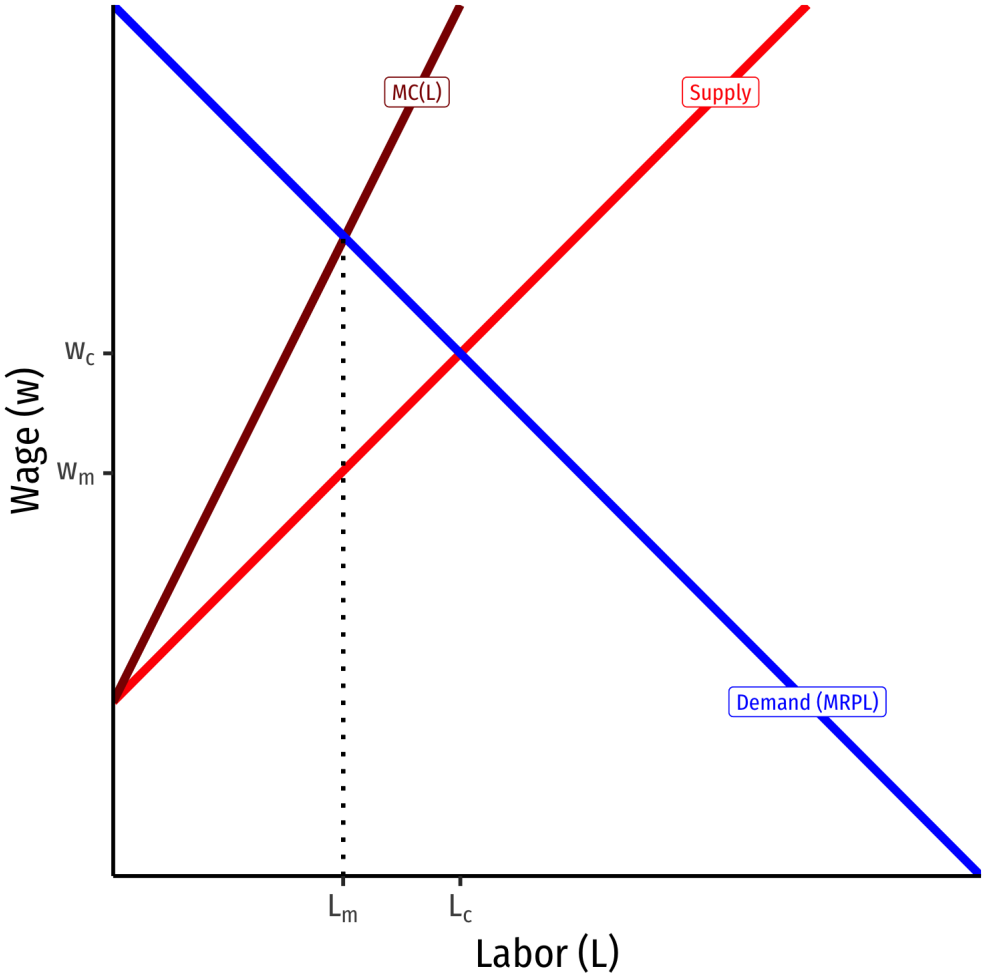


$$w(L) = a + bL$$
$$MC(L) = a + 2bL$$

- Marginal cost of labor starts at same intercept as Supply (average cost of labor) (a) with twice the slope $(2b)$

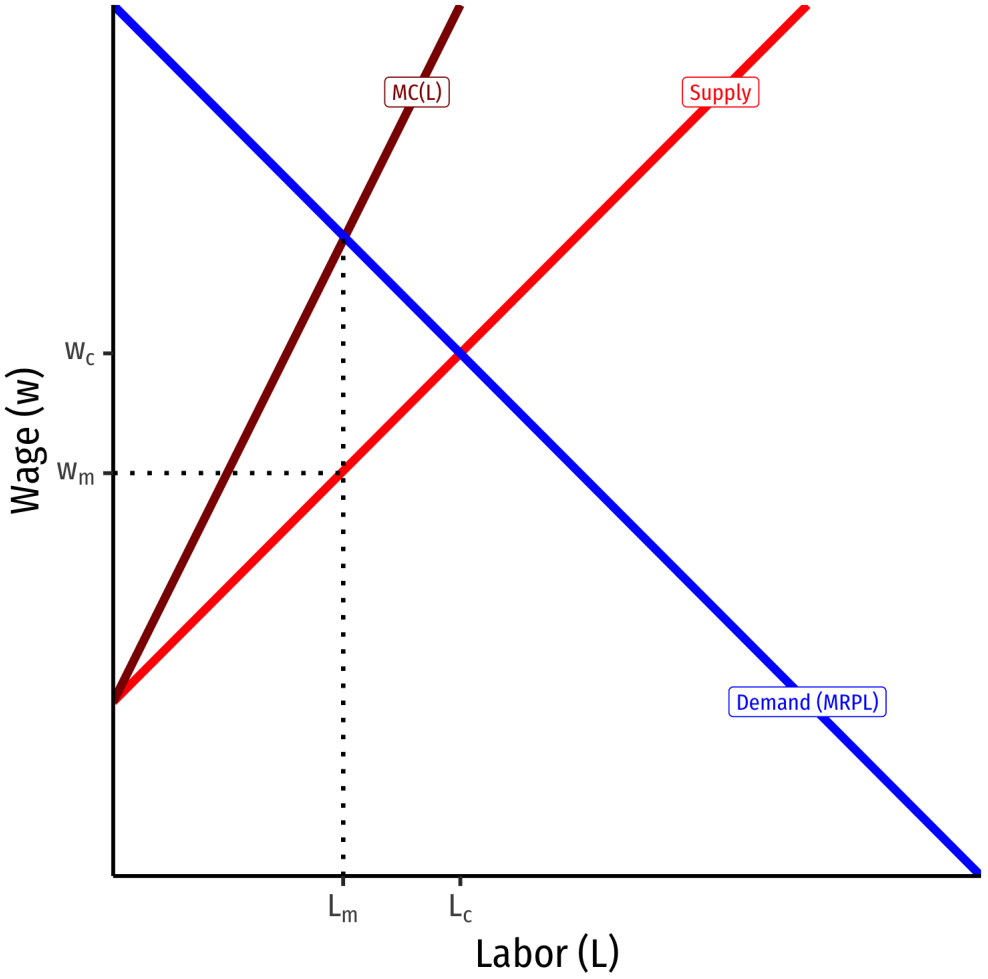
Note: If these past few slides have sounded familiar, this is the exact same process by which we derived a *monopolist*'s marginal *revenue* curve!

Monopsony's Hiring Decisions



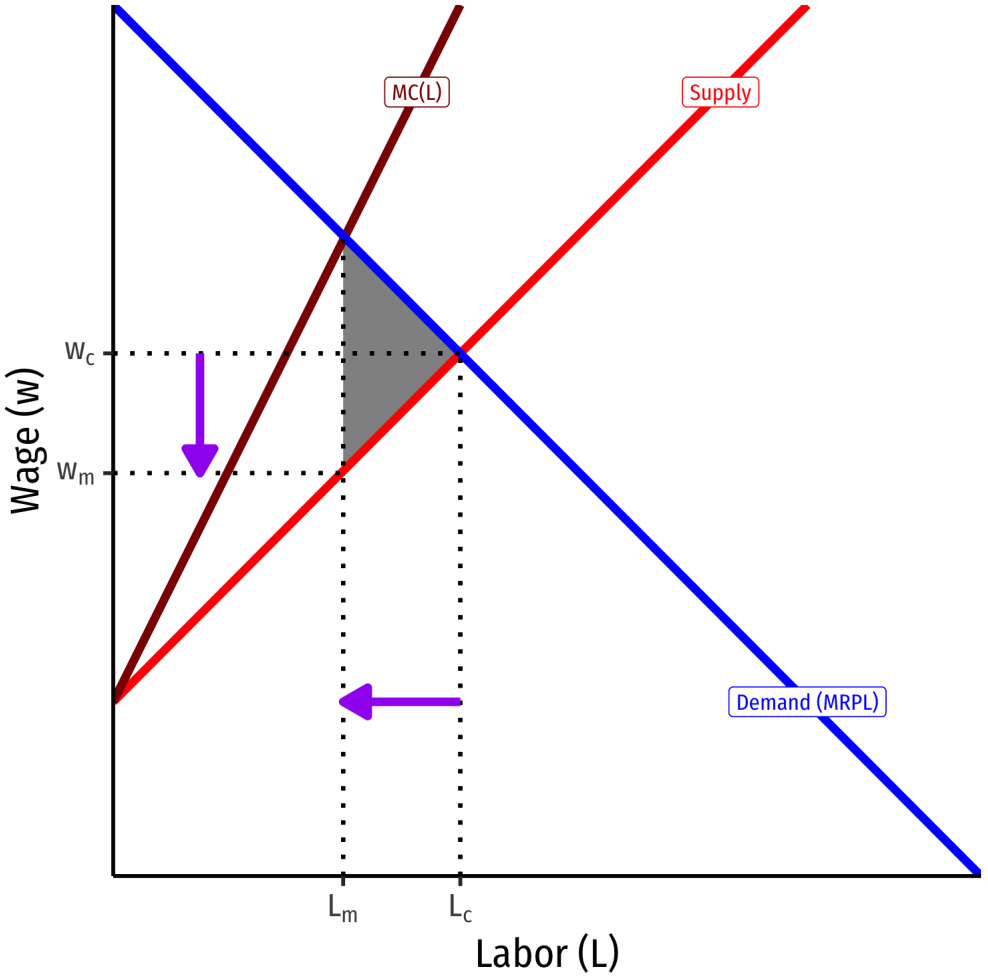
- Optimal quantity is where $MC = MR$
  - Firm's $MC(L) = MRP_L$

Monopsony's Hiring Decisions



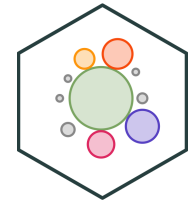
- Optimal quantity is where $MC = MR$
  - Firm's $MC(L) = MRP_L$
- Monopsonist faces *entire* **market supply**
  - Can lower wages as low as workers' minimum WTA (Supply)

Monopsonist's Hiring Decisions



- Optimal quantity is where $MC = MR$
  - Firm's $MC(L) = MRP_L$
- Monopsonist faces *entire* **market supply**
  - Can lower wages as low as workers' minimum WTA (Supply)
- Compared to a competitive labor market (L_c, w_c), **monopsonist hires fewer workers and pays them lower wages** (L_m, w_m); creates **deadweight loss**

Monopsony Example II



Example: Now suppose that Victoria's Tours is the *only* travel company that offers guided tours in the broader region. Its marginal revenue product of labor over the whole region, is given by

$$MRP_L = 1,000 - 4L$$

where L is the number of tour-guide weeks it hires and MRP_L is measured in dollars per tour-guide week.

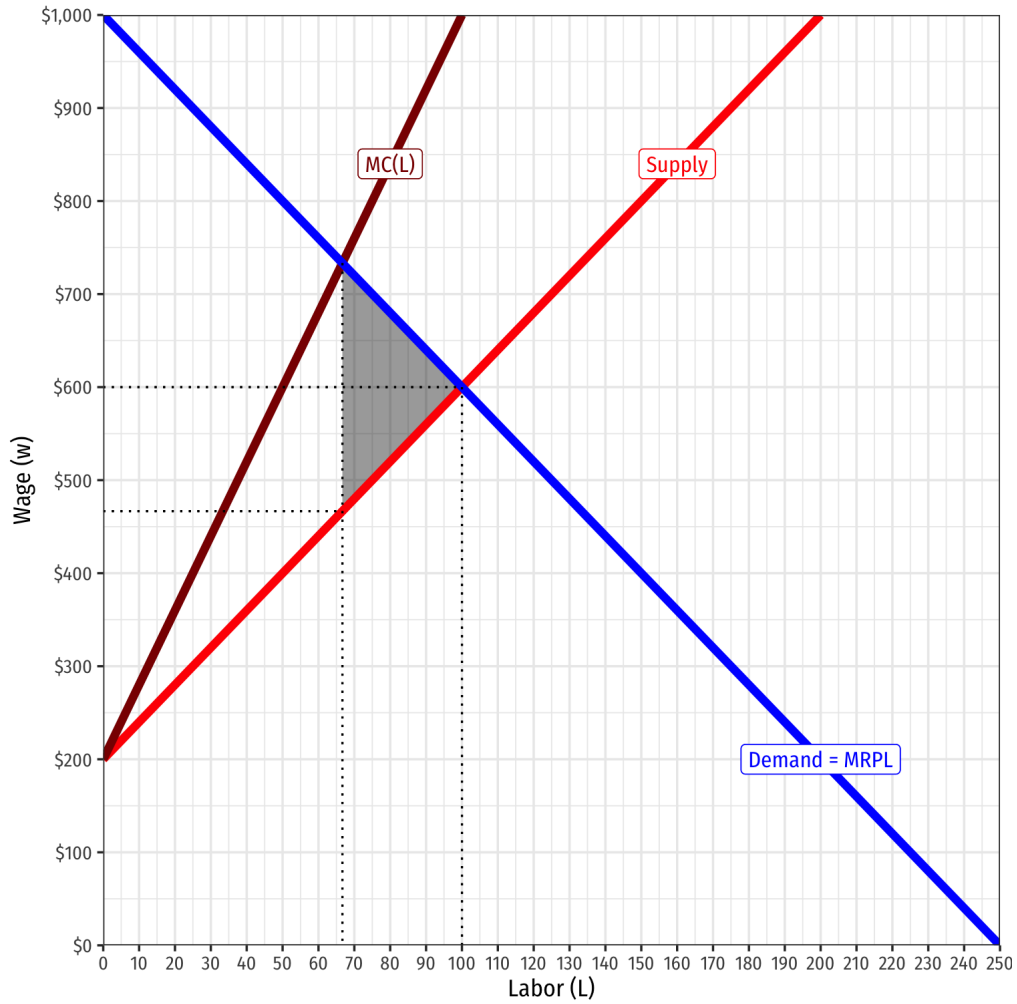
The market (inverse) supply of local tour guide labor is equal to

$$w = 200 + 4L$$

1. If this market were competitive, what would the equilibrium number of workers and the market wage be?

2. As a monopsonist, how many workers will Victoria's Tours hire, and what will they pay them?

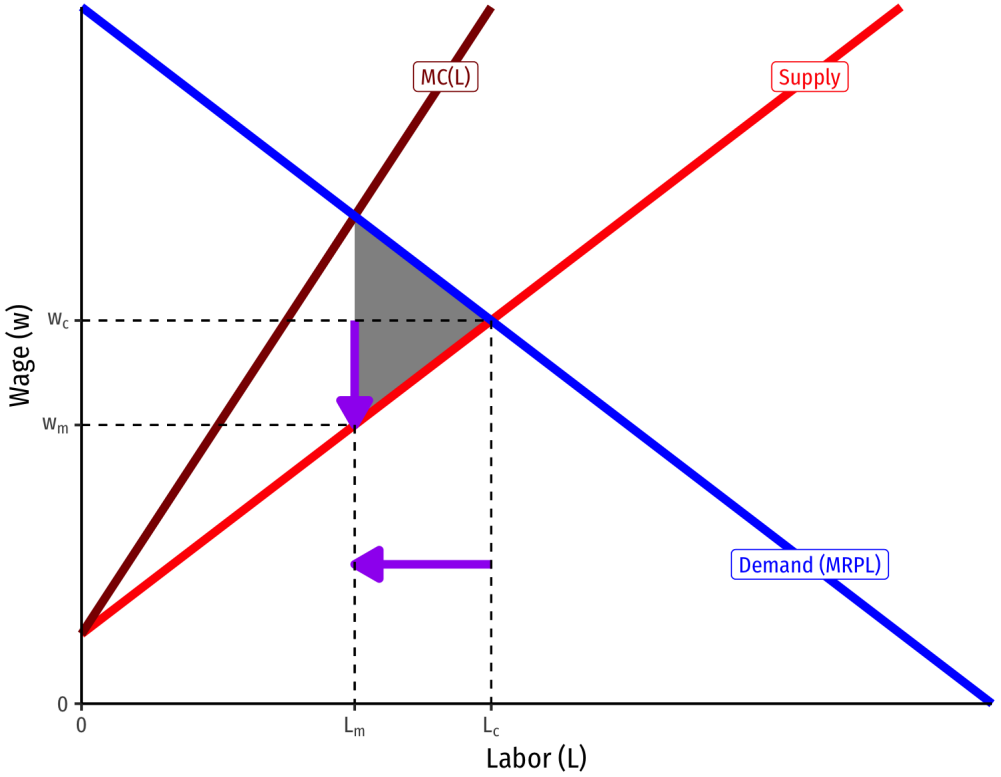
Monopsony Example II



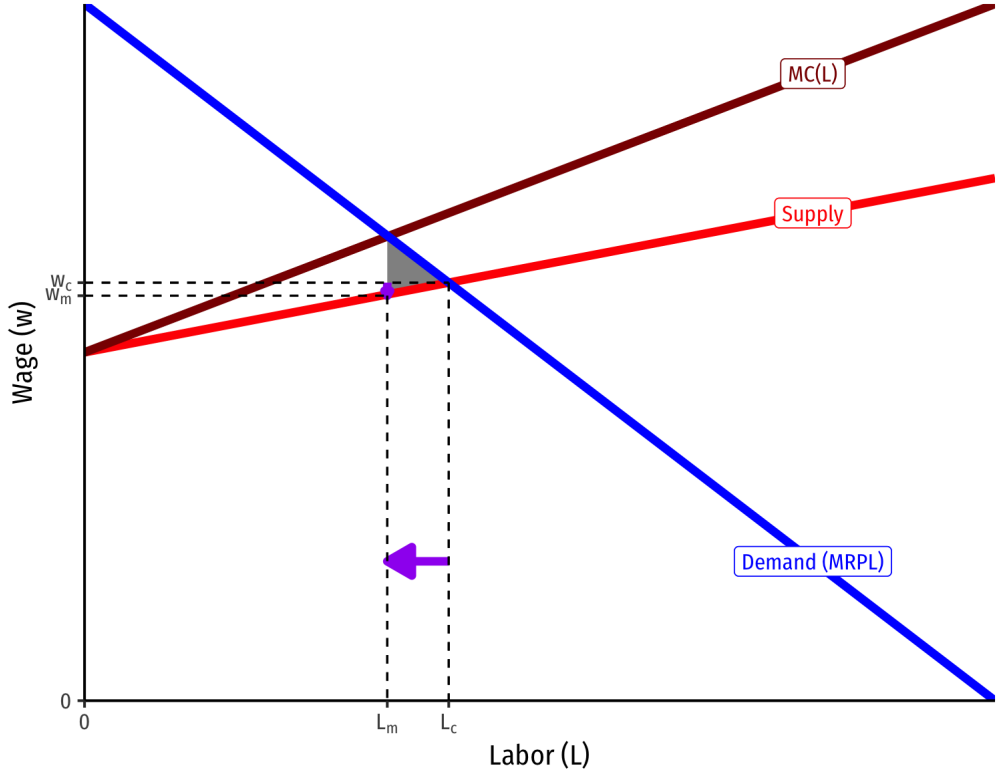
Monopsony Power Depends on Price Elasticity

The more (less) elastic labor *supply*, the less (more) monopsony power (and DWL)

Less Elastic Labor Supply Curve



More Elastic Labor Supply Curve



Monopoly Power in Labor Markets: Unions

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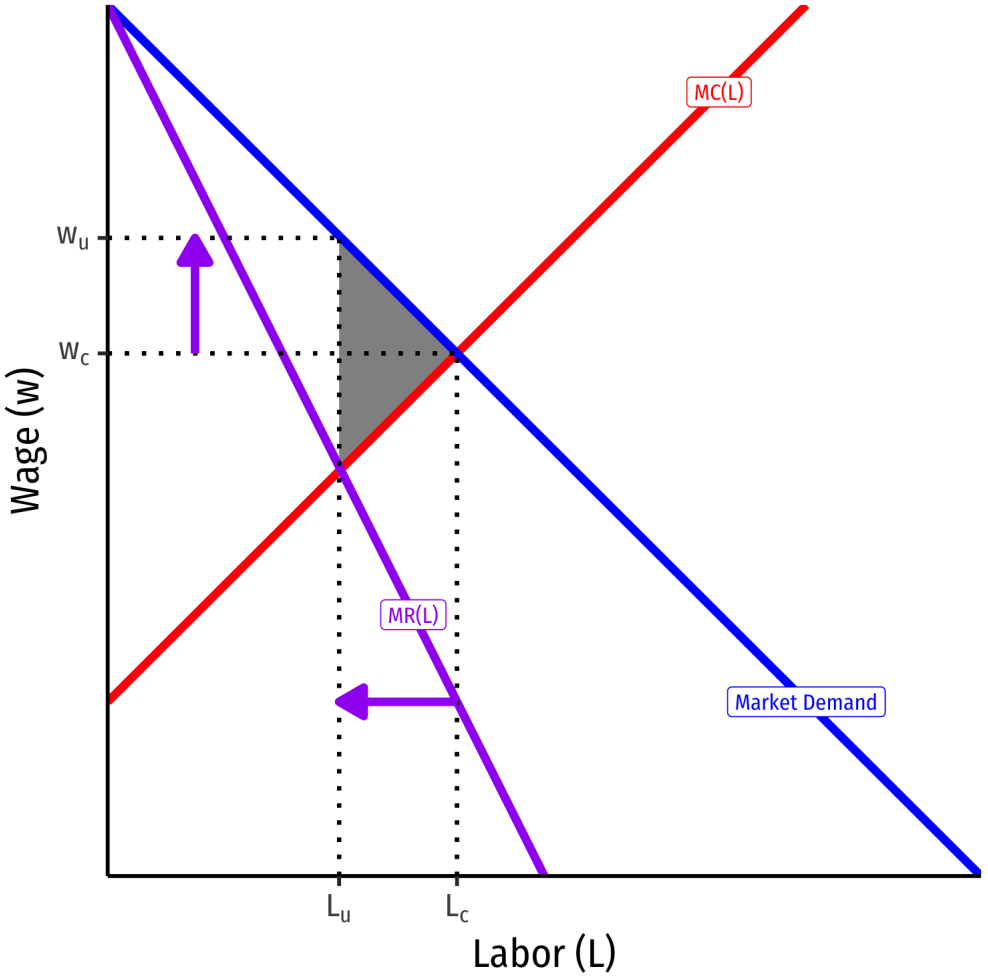

- If **seller**/s of labor (workers) has market power, can act like a **monopolist** on the labor market
- **Example**: A labor union
- Faces entire market demand for labor, and thus its marginal revenue curve too
- Acts like a monopolist, restricts $L_u < L_c$ to push up $w_u > w_c$

The Problem of Bilateral Monopoly

- What if **both** sides of the market **have market power**?
  - A downstream **monopsonist buyer** vs. an upstream **monopolist seller**
- This is the problem of **bilateral monopoly**
  - We'll examine later this semester
  - One solution is **vertical integration**: merge into a single firm across both markets