Econ 201: Introduction to Economic Analysis

October 16 Lecture: Demand for Factors of Production

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Daily dose of The Far Side

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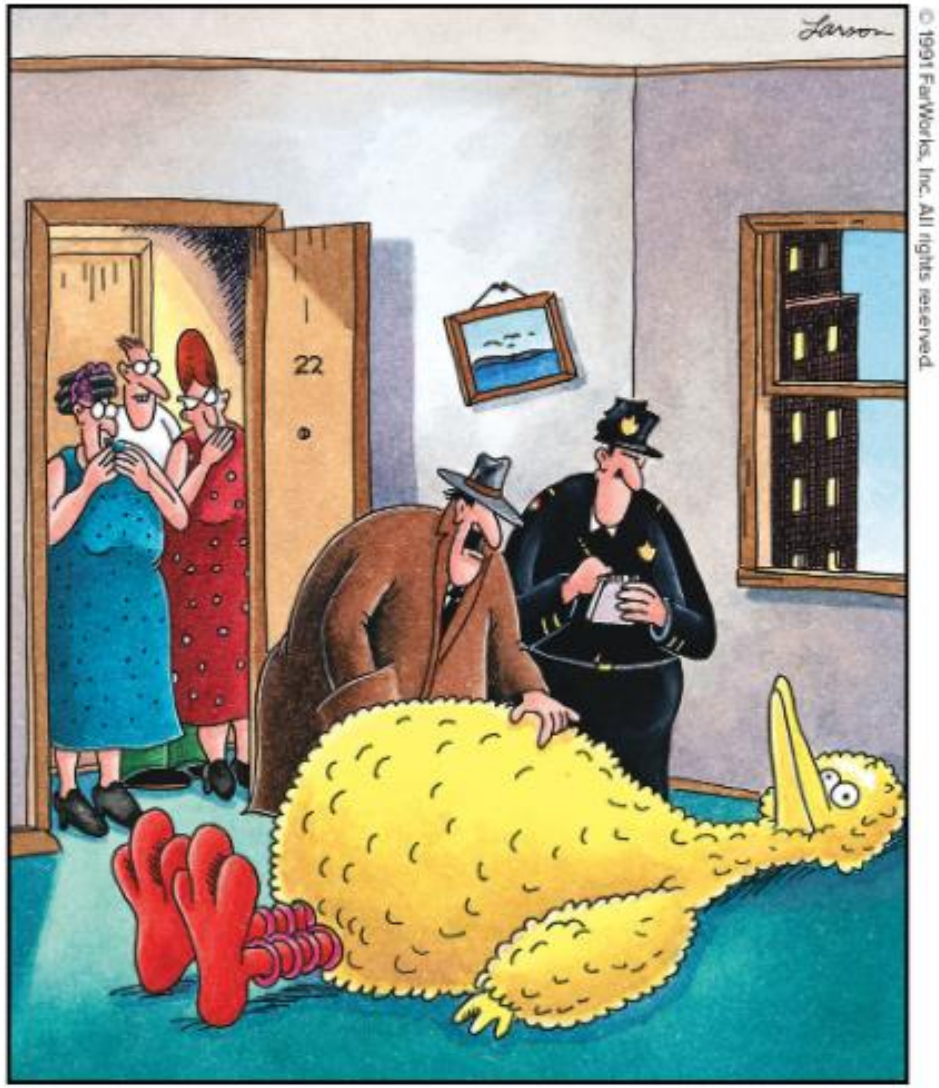


"Make a note of this, Muldoon. ... The wounds seem to be caused by bird shot ... big bird shot."

Preview of this class session

- Factor markets: The other side of firms and households
- Marginal revenue product vs. social value of marginal product
- Profit maximization on input side
- Firm and industry demand for input in short run and long run
- Monopsony
- Economic rent

Nature of factor demand

- Firms demand inputs for same reason they supply output: profit maximization
- Factor demand is "**derived demand**"
  - Inputs are demanded because they produce outputs that are demanded
  - Great baseball pitchers make high salaries because of high demand to watch baseball games
  - Great horseshoe pitchers … not so much
- Firms decide how much inputs to demand by evaluating how much an additional unit of input adds to revenue (through increased output) and to cost
  - Keep adding more input if addition to revenue > addition to cost

Marginal revenue product (MRP)

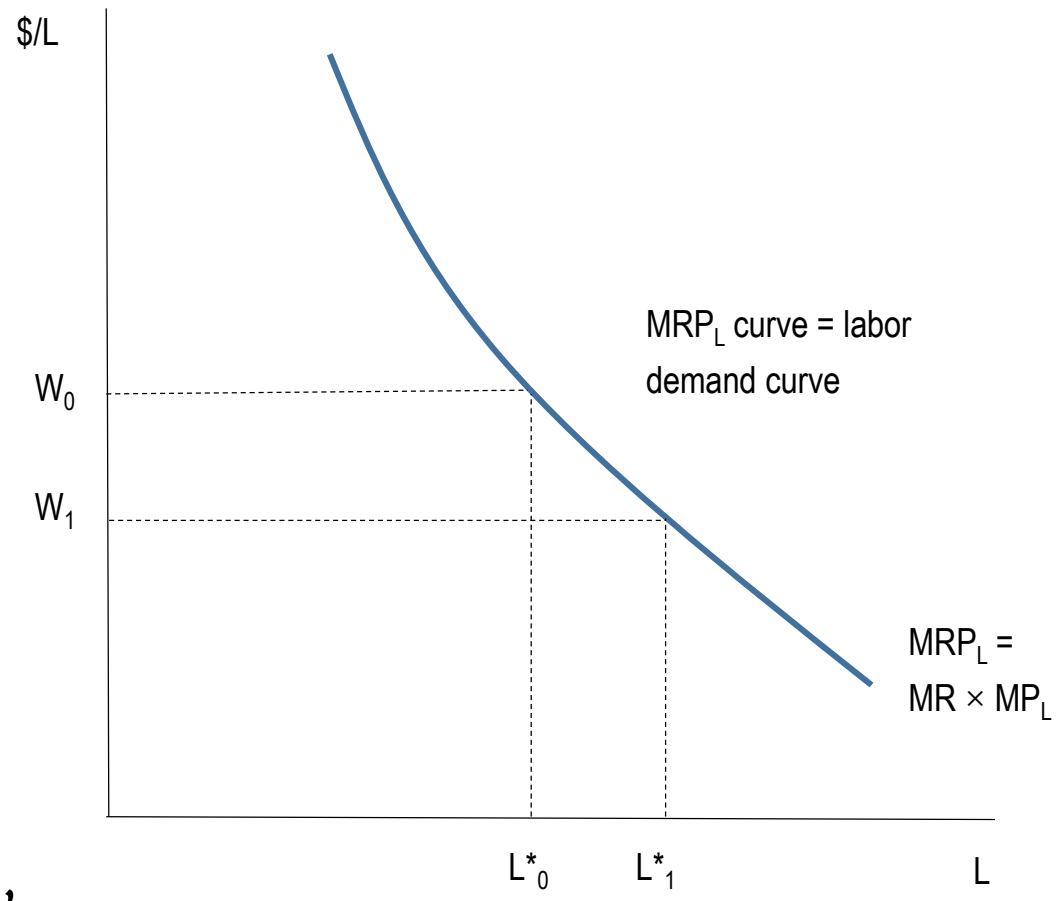
- **Marginal revenue product** = additional revenue to firm from employing one addition unit of factor (*e.g.*, labor)
  - $\text{MRP}_\text{L} = \text{MR} \times \text{MP}_\text{L}$
  - $\dfrac{\Delta TR}{\Delta L} = \dfrac{\Delta TR}{\Delta Q}\dfrac{\Delta Q}{\Delta L}$
- Price taker in output market: $\text{MR} = P$, $\text{MRP}_\text{L} = P \times \text{MP}_\text{L} = \text{VMP}_\text{L}$ = **value of labor's marginal product** (to society)
- Non-price taker: $\text{MR} < P$, $\text{MRP}_\text{L} < \text{VMP}_\text{L}$ $(= P \times \text{MP}_\text{L})$
  - This is the other side of contrived scarcity of monopoly
  - Firm that produced too little output uses too little input

Profit maximization

- Assume that firm is price taker in labor market
  - This is much more common than in output market
  - Monopsony power is uncommon
- **Marginal factor cost** or **marginal expenditure** $= \Delta TC/\Delta L = W$
- Profit-maximization rule for inputs: **MRP = ME**
  - Identically analogous to MR = MC
- MRP_L $(= MR \times MP_L) = W$
  - So $MR = W/MP_L$
  - But recall that $MC = W/MP_L$, so this is equivalent to MC = MR in product market!

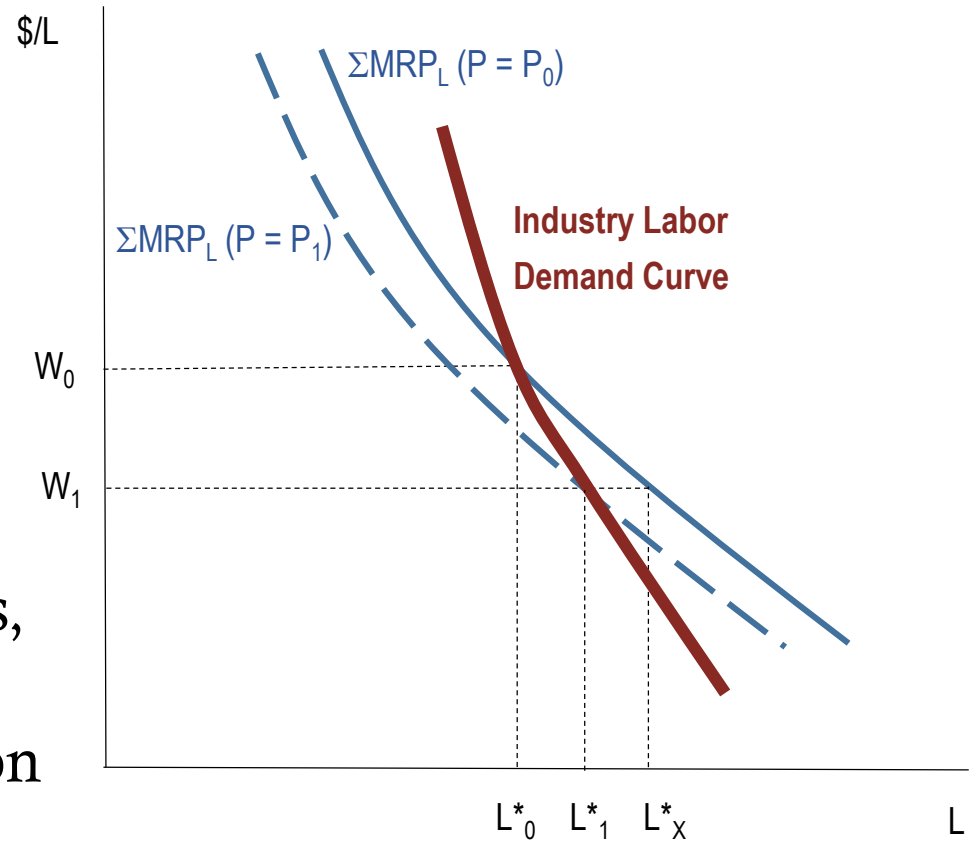
Firm's demand curve for labor

- Firm hires to where $MRP_L = W$, so **MRP_L is firm's labor demand curve**
- As wage changes, firm hires labor up to where $MRP_L = W$
  - Less elastic for monopoly: MR slopes down
- Competitive industry: $MP_L = W/P$
- Other variables are held constant:
  - Output price
  - Other inputs
  - Production function
- This is important in assessing *industry* demand for labor



Industry's demand curve for labor

- Is **industry labor demand curve** = ΣMRP_L of individual firms?
  - For pure monopoly: Firm = industry
  - For competitive firm: This curve holds price of firm's output constant
- Wage falls, each firm hires more, and output increases
  - As industry expands, its output price falls, so each firm's MRP_L falls
  - So ΣMRP_L shifts left and positive effect on L is somewhat offset
  - Industry demand for labor is less elastic than ΣMRP



More about the industry demand for labor

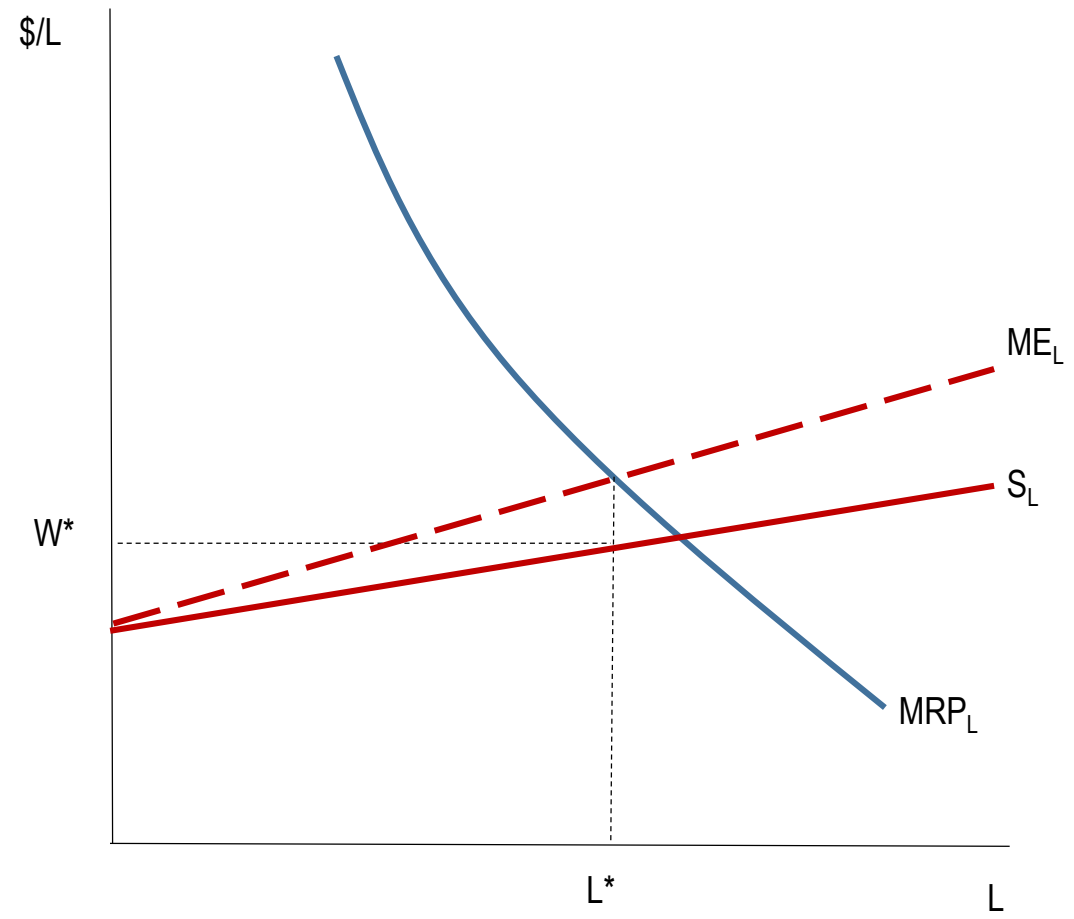
- Industry demand for labor is less elastic than individual firms' just as monopoly's demand for labor is less elastic … for same reason
- Size of offsetting leftward shift in ΣMRP_L curve depends on elasticity of demand for product
- Low product demand elasticity → large decline in price as *W* falls
  - Industry demand curve is much steeper than ΣMRP_L curves
- Derived demand for labor is less elastic if demand for the product is less elastic
  - If industry can raise price without losing demand, then inputs can raise their prices without losing demand
  - Labor unions should focus on inelastic industries?

Short-run and long-run factor demand

- In long run, firms can **change input mix** as well as changing output with variable factor
- More ways to substitute for expensive factor → **more elastic factor demand** in long run
- MP_L depends positively on K
- Suppose that wage decreases
  - Short run: Shift down along MRP_L to hire more labor
  - Long run: Hiring more L increases MP_K and MRP_K, so more K is hired and MP_L and MRP_L shift to the right, increasing L again
  - Greater effect on L in long run than in short run
- Long-run factor demand curves are more elastic than short run

Monopsony: Single buyer of input

- Labor supply curve for firm slopes upward
- ME_L curve lies above supply curve
  - Just as MR was below demand
- Maximize profit: Choose L where **$MRP_L = ME_L > W$**
  - Pay wage from labor supply curve at this quantity
  - Inefficient (even if MRP = VMP) because $MRP_L > W$
- No demand curve for labor, (monopoly has no supply curve for output): chooses point on its labor supply curve



Economic rent

- We have used term "rent" to apply to excess returns to special resources and even to economic profits
- **Economic rent** is payment to factor or resource in excess of minimum required to induce input to work at this job = payments in excess of opportunity cost
  - Example: You love your job and would work for $15/hour, but get paid $25/hour → you get $10/hour in economic rent
  - Another example: You are paid $20/hour in your current industry, but could only earn $16 in the next-best alternative
- "Producer surplus" triangle in factor markets is economic rent
- Unimproved land is in perfectly inelastic supply: all payments are rent

Review

- Factor demand is derived from the demand for the products they produce
- Firms maximize profit by choosing input to set factor's MRP = ME
  - MRP = MR × MP
  - Competitive in product market: MRP = P × MP = VMP
  - Competitive in factor market: ME = factor price
- Industry input demand is less elastic than firms'
- Long-run input demand is more elastic than in short run
- Monopsony (one buyer) means ME > factor price
- Economic rent is payment above minimum to elicit use

Daily diversion

Yet one more bad economist joke:

"Let us remember the unfortunate econometrician who, in one of the major functions of his system, had to use a proxy for risk and a dummy for sex."

-- Fritz Machlup

(Note: Proxy variables and dummy variables figure prominently in econometric models)

Quoted in Caroline Postelle Clotfelter, *On the Third Hand*

What comes next?

- Monday is labor markets; Wednesday is capital markets
- Case study for Monday examines wage differentials associated with different levels of education in the United States
- Next major assignment is economic naturalist assignment, due Wednesday