# Review Notes – The Demand for Labor

- Why do firms hire labor?

  - Derived demand for labor

    - $Q = f(K, L, N, E)$
    - Therefore us labor to produce output
    - Output produces revenue which makes profit for the firm.

  - When does a profit maximizing firm change its output levels?

    1. If $MR > MC$ => $Q \uparrow$ (why?)
    2. If $MR < MC$ => $Q \downarrow$ (why?)
    3. If $MR = MC$ => $Q \rightarrow$ (why?)

    - What is marginal revenue (MR) and marginal cost (MC)? MR differs dependent upon whether or not the output market is perfectly competitive or not.

  - If a firm $\uparrow$ or $\downarrow$ Q then they must also change inputs like L => 1, 2, and 3 become:

    1a. If extra revenue gained by hiring L > extra cost => $\uparrow$ L
    2a. If extra revenue gained by hiring L < extra cost => $\downarrow$ L
    3a. If extra revenue gained by hiring L = extra cost => $\rightarrow$ L

  - Where does a firm get extra revenue from hiring L?

    - From the extra output that labor produces.

    - Define marginal products

      - Marginal product of Labor = MP_L?
      - Marginal product of Capital = MP_K?
      - What is the law of diminishing returns?
      - Marginal revenue product of L = $MRP_L = MR*MP_L$

  - What is the firm's demand for labor?

    - MRP_L = the firm's nominal demand for labor (why?)

      - Why is this downward sloping? (diminishing returns)

    - MFC_L = marginal factor cost of labor (the book calls this marginal expense of labor).

    - All firms hire labor where $MRP_L = MFC_L$ (why?)

      - Assume perfectly competitive markets => $MRP_L = P*MP_L$ and MFC_L = wage (w)
      - => $P*MP_L = w$ or
      - $MP_L = w/P$ – MP_L is the real demand for labor with w/P = the real wage why?

      - Market demand for labor is equal to…?

- Demand for labor in the long-run
  - Define the short-run and the long-run (assume initially only labor and capital)
  - Recall that profit max. requires that
    1. $MP_L * P = w$ but also requires that
    2. $MP_K * P = C$ (C= the price of capital)
    - Rewrite (1) and (2) to get:

      1a. $P = w/MP_L$
      2a. $P = C/MP_K$

    - (1) and (2) and (1a) and (2a) simply mean that in the long-run the two inputs, labor and capital are chosen to maximize profits or minimize costs, according to those equations. Since P is on the left side of both equations then it must be the case that:

      3. $w/MP_L = C/MP_K$ – make sure that you can clearly understand what this means.
      3a. $MP_L/w = MP_K/C$ – make sure that you also understand it this way.

    - (3) and (3a) relate to profit maximization via cost minimization – how are they related?
  - Suppose that (3) and (3a) are true and then the wage rises. What happens?
    - **The scale effect** (make sure you know what it is)
      - First, (1a) above says that when w ↑ then $P < w/MPL$ => ↓ L to ↑ MPL (why?)
      - Second, as L ↓ this causes MP_K to also ↓ (why?) => $P<C/MP_K$ =>↓ K to ↑ MP_K (why?)
      - Essentially the above two things simply say that when the wage rises, this increases costs, which decreases the supply of the good, which decreases output of the good. Lower output means that the firm reduces both labor and capital.
    - **The substitution effect** (make sure you know what it is)
      - In the long-run if labor remains more costly then $w/MP_L > C/MP_K$ and the firm will reduce its costs by substituting capital for the more costly labor.
  - Now with more inputs – say with multiple types of labor – L_1, L_2, L_3, …., K
    - Must choose inputs such that: $$\frac{W_1}{MP_1} = \frac{W_2}{MP_2} = \frac{W_3}{MP_3} = ... = \frac{C}{MP_K}$$
    - In other words, the demand for any of the different types of labor are a function of all of the wages (w_1, w_2, w_3, …) and the price of capital (C).
    - Suppose that w_1 increases => what happens to Demand for the second type of labor – D_L^2
      - Assume that the two inputs (L_1 and L_2) are <u>actual</u> substitutes. Then, we still have <u>both</u> a substitution and a scale effect has discussed above only now between two different types of labor
        - Scale effect: if w_1 ↑ => D_L^2 ↓
        - Substitution effect: if w_1 ↑ => D_L^2 ↑

- Therefore, the overall impact depends upon which is larger

  - If the scale effect is larger => when $w_1 \uparrow$ => $D_L^2 \downarrow$ and the two inputs are <u>gross</u> complements.

  - If the substitution effect is larger => when $w_1 \uparrow$ => $D_L^2 \uparrow$ and the two inputs are <u>gross</u> substitutes.

  - Assume that the two inputs (L_1 and L_2) are <u>actual</u> complements.

    - In this case no substitution effect because they are actual complements.

    - Thus, we know that when $w_1 \uparrow$ => $D_L^2 \downarrow$ and the two inputs are gross complements.

  - Under what conditions can the two inputs (L1 and L2) be identified as actual substitutes or actual complements?

- Demand for Labor when the output market is not competitive
  - Before P=MR and now P>MR

    - so for profit maximization MRP (= $MR*MP_L$) = w or the real wage W/P = $(MR/P)*MP_L$
    - Because P>MR => MR/P < 1 => D_L for a monopolist is smaller than for a competitive firm. That is, as graph 1 shows, with a smaller D for labor, monopolists will end up hiring less labor for a given MFC_L. Notice that this finding is consistent with the micro principles finding that monopolists produce less than competitive industry => use less labor and other inputs as well.

Real Wage - Q

MFC

D-mon

D-comp

Graph 1   L
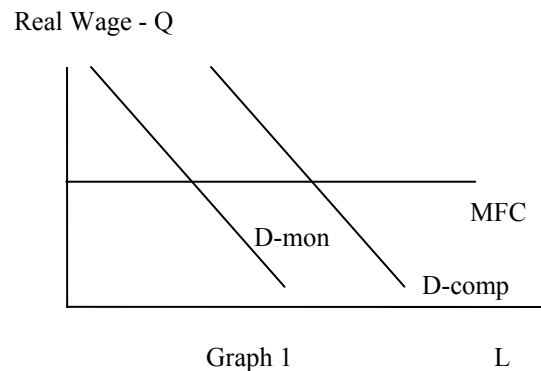
  - Does monopoly power affect wages? Know the argument for and against.

- Monopsony in the labor market
  - Define monopsony (single buyer in the market)

  - Why is S_L upward sloping?

  - Why is MFC_L > wage (S_L) in monopsony?

  - Where do profit maximizing firms hire labor?

    - Where $MRP_L = MFC_L$.

W

MFC

W_C

W_M

S_L

MRP_L

L_M L_C

L
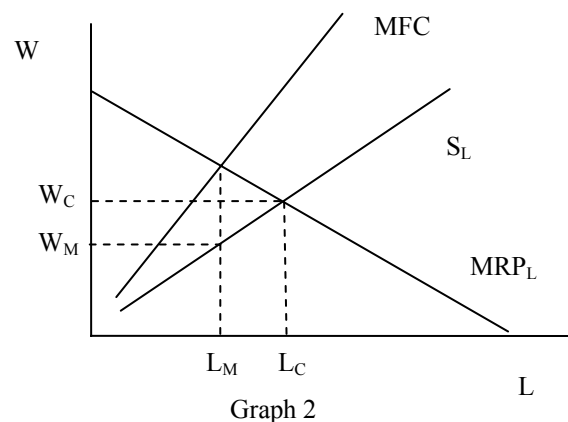
Graph 2

- In Graph 2, the monopsonist hires labor where $L = L_M$ and set the wage at that level of labor at W_M. W_C, L_C is the wage and employment in a competitive labor market. (How do we know this?) Therefore, a monopsonist hires less labor and pays a lower wage than does a competitive market.

  ▪ How do monopsonists respond (differently than competitive firms?) to S_L and wage changes?

  - If the labor market is competitive => $D_L = MRP_L$, which is downward sloping => a decrease in S_L (shift left) will increase wages and decrease employment.

    - Does the same impact happen with monopsony? How does the graph look different? Are the results the same?

  - Suppose that there is a mandated wage increase (*i.e.* a minimum wage)

    - What is the impact if the market is competitive?

      - Wage increases, employment falls, and unemployment is created – why? Make sure you know the graph that shows this.

    - What is the impact if the market is monopsonistic?

      - The wage always increases (what must we assume for this to be true?)
      - Under what conditions will employment rise? Show on a graph.
      - Under what conditions will employment fall? Again, graphically.

- Who pays for payroll taxes?

  ▪ What is a payroll tax?

  ▪ Doesn't the party who pays for the tax directly simply pay for the tax?

  - Suppose the worker pays the tax directly => the firm would pay the tax in that case if the market equilibrium after the tax caused workers' wages to rise.
  - Suppose the firm pays the tax directly => workers would pay the tax in that case if the market equilibrium after the tax caused workers' wages to fall.

  ▪ Know how to do the standard tax analysis with D/S curves in a labor market that shows the following:

  - Both parties will share tax with lower levels of employment.
  - How much each party pays depends upon the relative wage elasticities of demand and supply of labor.

    - As D_L becomes more inelastic => firms pay more of the tax and workers less (and the reverse.)

    - As S_L becomes more inelastic => workers pay more of the tax and firms less (and the reverse.)

      - What is the empirical evidence on who pays?