Economics 101A
Section Notes
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Labor Markets and Monopsony

1 The Competitive Model

1.1 Aggregation

Assume there are N workers indexed by $i = 1, ..., N$, and M firms indexed by $j = 1, ..., M$, in a given industry. The standard utility maximization and profit maximization problems yield individual labor supply functions $h_i(w)$ and labor demand functions $E_j(w)$ for labor which are functions of the wage w - ignoring the influences of other prices and incomes. To get the industry labor supply and labor demand functions these must be added.

$$\text{Industry Labor Supply} = H(w) = h_1(w) + h_2(w) + ... + h_N(w)$$
$$\text{Industry Labor Demand} = E(w) = E_1(w) + E_2(w) + ... + E_M(w)$$

Graphically this amounts to adding up the individual labor supply and labor demand curves **horizontally**. In the case with identical workers and identical firms $H(w) = N \cdot h_i(w)$ and $E(w) = M \cdot E_j(w)$.

Example 1 *In section we go over the case with10 firms, each with production function $f_j(E) = E^{1/2}$ and output price $p = 20$ so that $E_j(w) = \frac{100}{w^2}$, and 1,000 workers, each with utility $U(C, L) = CL$, consumption price equal to one, and non-labor income equal to one so $h_i(w) = \frac{1}{2} - \frac{1}{2w}$.*

1.2 Inverse Supply and Demand

The supply curve $H(w)$ can be inverted to yield a function of w in terms of H known as the **inverse supply function** $w^S\left(\tilde{H}\right) = H^{-1}\left(\tilde{H}\right)$, where I use $\tilde{H}$ to not get confused the quantity of labor supplied with the labor supply function $H()$. Similarly the demand curve can be inverted to yield the **inverse demand function** $w^D\left(\tilde{E}\right) = E^{-1}(\tilde{E})$. While graphically the functions look identical to the regular supply and demand curves, adding these functions up amounts to a vertical addition of the curves which is not the right way to aggregate demand.

1.3 Equilibrium

Equilibrium is achieved at the **equilibrium wage** $w^*$where supply equals demand, i.e.

$$H(w^*) = E(w^*) \qquad \text{(Equilibrium Condition)}$$

This equation can be solved to yield w^* and then equilibrium employment $E^* = E(w^*)$. Note that this problem could also be solved using the inverse functions by solving for E^* first as $w^S(E^*) = w^D(E^*)$ and then finding $w^* = w^D(E^*)$.

1.4 Welfare

The gains to trade can be divided into two by drawing a horizontal line at $w = w^*$ although way to E^*. The area above this line and below the demand curve is the **producer surplus**, while the area below the line above the supply curve is the **worker surplus**. The areas combined are known collectively as the **total surplus**.

1.5 Two Simple Policy Applications

1.5.1 Minimum Wage

Suppose the government sets a minimum wage $\underline{w}$. In the competitive model only two things can happen: (1) if $\underline{w} \leq w^*$ then the minimum wage has no effect (it does not bind) and employment stays at E^* or (2) $\underline{w} > w^*$ in which case the minimum wage will bind and employment will be at a lower level, namely $\underline{E} = E(\underline{w})$, as firms will cut down on labor inputs. This second case usually results in a loss of producer surplus, a gain in worker surplus, and a loss in total surplus known as **deadweight loss**.

1.5.2 Payroll Tax

Say workers are required to give up a fraction τ of their earnings in taxes so that they take $(1-\tau)\,wh$ home to spend.Then each worker is effectively paid a wage of $(1-\tau)\,w$, implying that the supply function is now given by $H[(1-\tau)\,w]$, causing it to rotate inwards. The firm still pays w and so the new equilibrium will be at where $H[(1-\tau)\,w] = E(w)$. Like other taxes, this typically results in a dead-weight loss.

2 Monopsony

2.1 Setup

Assume that there is a single firm that has no control over the price of its product, but faces no competition in the labor market, allowing it to set wages w, making it a **monopsonist** (single buyer) in the labor market. Assume further that the monopsonist is **non-discriminating** so that it only sets a single w for all workers and it has production function $f(E)$. Note that if the monopsonist has control over M identical plants with decreasing returns to scale in E, then it will divide total employment equally amongst all plants so that total production is given by $f(E) = M \cdot f_j\left(\frac{E}{M}\right)$, and the value of marginal product curve VMP_E will be identical to the inverse industry supply curve.

The monopsonist, being the only employer, does not take wages as given but understands that by hiring more labor it will effect the wage it has to pay. This relationship is given by the inverse supply curve $w^S(E)$. The change in the total wage bill $E \cdot w^S(E)$ when E changes is given by the **marginal cost of employment**

$$MC_E = \frac{d}{dE}\left[E \cdot w^S(E)\right] = w^S(E) + E \cdot \frac{dw^S(E)}{dE}$$

Note that with competitive firms the second term does not exist and MC_E is a flat line.

2.2 Profit Maximization

The profit maximization problem of the monopsonist is given by

$$\max_E pf(E) - E \cdot w^S(E)$$

Taking the FOC gives

$$p\frac{df(E_M)}{dE} - w^S(E_M) - E_M \cdot \frac{dw^S(E_M)}{dE} = 0$$

or rearranging just $VMP_E = MC_E$. The monopsonist wage paid is $w_M = w^S(E_M)$. Graphically we can show that $w_M < w^*$, $E_M < E^*$, producer surplus is higher and worker surplus is lower than in the competitive case, and deadweight loss arises.

2.3 Minimum Wage

Where the minimum wage is binding, i.e. where $H(w) < H(\underline{w})$, then $MC_E = \underline{w}$ and is constant. At $H(\underline{w})$, MC_E jumps vertically back up to the original MC_E curve. Graphically we can show $w_M \leq \underline{w} \leq w^*$ then $E_M = H(\underline{w})$ while if $\underline{w} > w^*$ then employment will be set where $VMP_E = \underline{w}$. The minimum wage can actually increase employment, especially if $\underline{w}$ is set between w_M and w^*, and will increase worker surplus and decrease producer surplus, while the amount of deadweight loss will depend on how far $\underline{w}$ is from w^*.