

## Labor Matching

Clustering of firms in the same location can improve the matching of workers and firms, decreasing training costs and increasing productivity. Take the case of software firms hiring computer programmers with different skill sets depending on their knowledge of different programming languages and different programming tasks. Firms have different skill requirements and hire workers with the best skill matches.

### Labor Matching Model Assumptions

1. Variation in worker skills—each worker has a unique skill described by a position or “address” on a circle with a one unit circumference. Assume four workers with skills evenly spaced on the circle. The address of a worker is the distance between the worker’s skill position and the north pole of the circle. The addresses of the 4 workers  $0, \frac{2}{8}, \frac{4}{8}, \frac{6}{8}$ . See Panel A, Figure 3-3.
2. Firm entry—each firm enters the market by picking a good to produce with an associated skill requirement. Suppose Firm A enters with skill requirement  $S = \frac{1}{8}$ , and the other (B) enters with  $S = \frac{5}{8}$ .
3. Training costs—workers incur a cost associated with closing the gap between the worker’s skills and the skills required by a firm.
4. Competition for workers—each firm offers a wage payable to any worker who meets its skill requirement, and each worker accepts the offer with the highest net income (wage – training cost required to close the skills gap).
5. Scale economies—require each firm to hire 2 workers.
6. Firms enter the market until economic profit = 0.

In Fig. 3-3, panel A, the equilibrium mismatch per worker is  $\frac{1}{8}$ . Workers at  $S = 0$  and  $S = \frac{2}{8}$  work in Firm A with  $S = \frac{1}{8}$ , so each worker has a skill gap of  $\frac{1}{8}$ . Workers at  $\frac{4}{8}, \frac{6}{8}$  also have an equilibrium skills gap of  $\frac{1}{8}$  since Firm B has  $S = \frac{5}{8}$ .

Each firm pays a gross wage equal to the value of output produced by the perfectly matched worker. The net wage earned by the worker equals the gross wage minus training costs.

$$\text{Net Wage} = \text{Gross Wage} - (\text{Skills Gap} \bullet \text{Unit Training Cost})$$

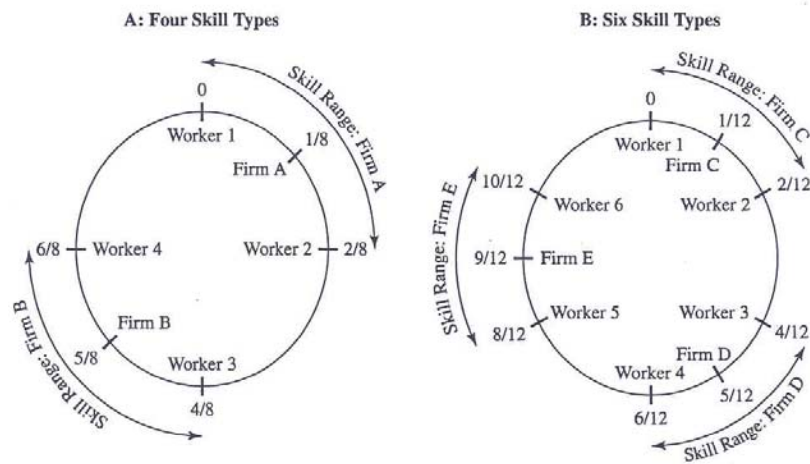
Suppose the Gross Wage is \$12 and the unit training cost is \$24. Since the skill gap is  $\frac{1}{8}$ , the net wage is:  $\$12 - \frac{1}{8} \cdot \$24 = \$9$ .

As more workers and firms come into the urban economy, there are better skill matches and higher net wages. In Panel B of Figure 3-3, the number of workers increases from 4 to 6. Since each firm hires two workers, three firms will enter the market. The six workers are equally spaced with skill addresses of  $0, \frac{2}{12}, \frac{4}{12}, \frac{6}{12}, \frac{8}{12}$ , and  $\frac{10}{12}$ . The three firms enter the market with skill requirements of  $\frac{1}{12}, \frac{5}{12}$ , and  $\frac{9}{12}$ . Thus the skill mismatch falls from  $\frac{1}{8}$  to  $\frac{1}{12}$ . Workers incur lower training costs since the skill mismatch is lower. Thus the net wage would rise to \$10, i.e., Net Wage =  $\$12 - \frac{1}{12} \cdot \$24 = \$10$ .

In general, an increase in the number of workers reduces the skill mismatch and training cost, and raises the net wage.

The clustering of firms and workers benefits both firms and workers. The firms get better skill matches and the workers get higher net wages.

FIGURE 3-3 Skills Matching



With four skill types, worker addresses are  $\{0, 2/8, 4/8, 6/8\}$ . There are two workers per firm, so two firms will enter with skill requirements  $\{1/8, 5/8\}$ , and the mismatch per worker is  $1/8$ .

With six skill types, worker addresses are  $\{0, 2/12, 4/12, 6/12, 8/12, 10/12\}$ . There are two workers per firm, so three firms will enter the market with skill requirements  $\{1/12, 5/12, 9/12\}$ , and the mismatch per worker is  $1/12$ .