The optimal price is

$$p_{ni}(j) = \frac{\sigma}{\sigma-1}\frac{w_i d_{ni}}{A_i}.$$

Let $p_i(j)$ be the "common" part of the optimal prices:

$$p_i(j) = \frac{\sigma}{\sigma-1}\frac{w_i}{A_i}.$$

Obviously,

$$p_{ni}(j) = d_{ni} \cdot p_i(j).$$

Then the profit is written as

$$\pi_i(j) = \sum_n p_i(j) d_{ni} \cdot c_{ni}(j)$$

$$- w_i F - \frac{w_i}{A_i} \sum_n d_{ni} c_{ni}(j)$$

$$= p_i(j) \underbrace{\sum_n d_{ni} c_{ni}(j)}_{x_i(j)}$$

$$- w_i F - \frac{w_i}{A_i} \underbrace{\sum_n d_{ni} c_{ni}(j)}_{x_i(j)}$$

$$= \frac{\sigma}{\sigma-1}\frac{w_i}{A_i} x_i(j)$$

$$- w_i F - \frac{w_i}{A_i} x_i(j)$$

$$= \frac{1}{\sigma-1}\frac{\cancel{w_i}}{A_i} x_i(j) - \cancel{w_i}F = 0,$$

where the last equality follows from free entry.

Then we have

$$x_i(j) = (\sigma-1)A_i F. \quad //$$

The real labor demand from a firm is

$$F + \frac{x_i(j)}{A_i}$$

$$= F + (\sigma - 1)F = \sigma F.$$

There are M_i measure of firms, so the labor market clearing condition is

$$L_i = M_i \cdot \sigma F.$$

$$\therefore M_i = \frac{L_i}{\sigma F}.$$

//.