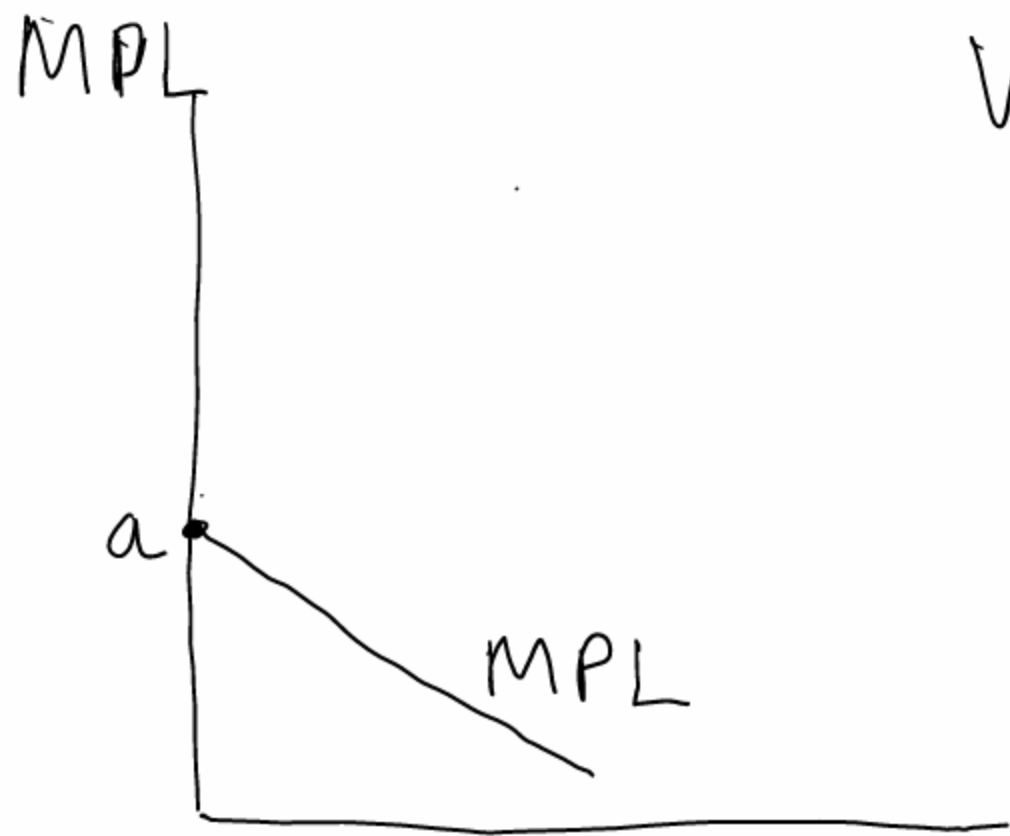
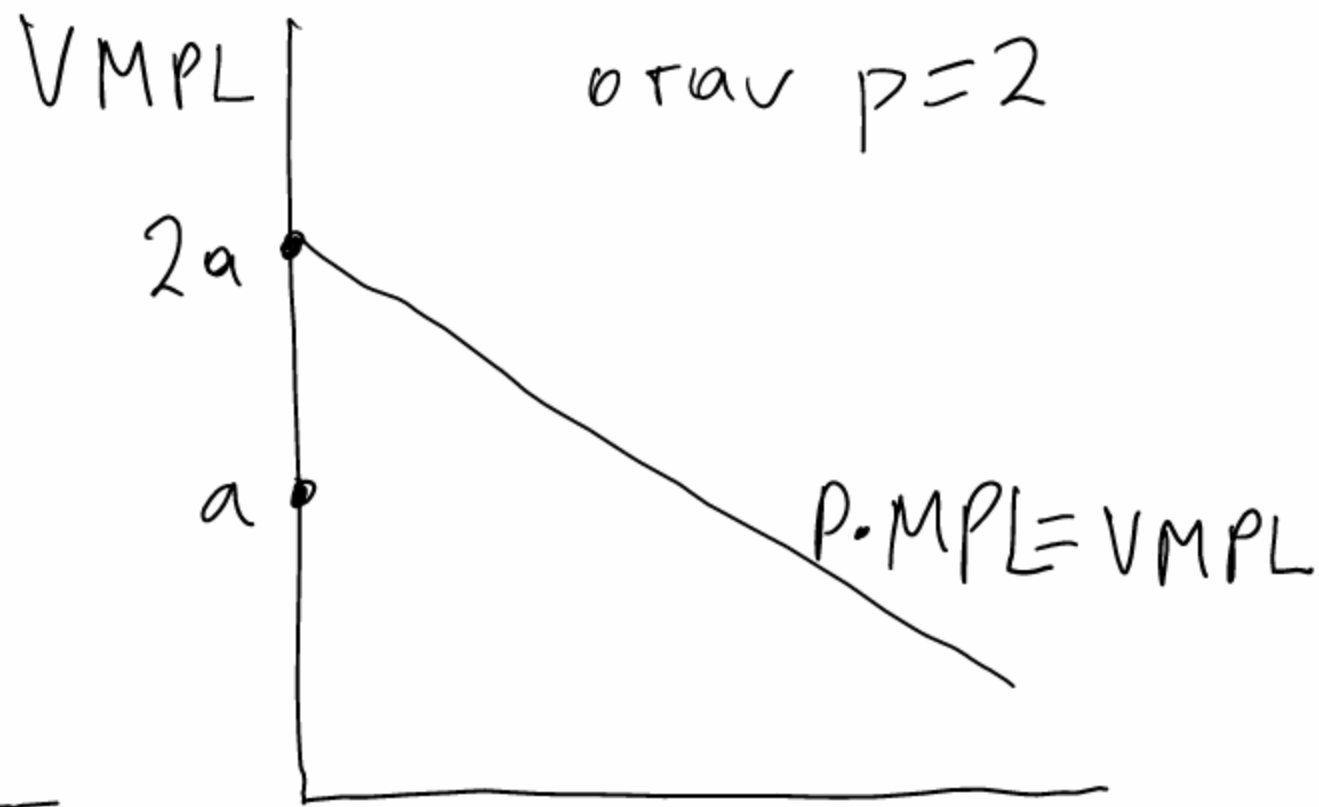
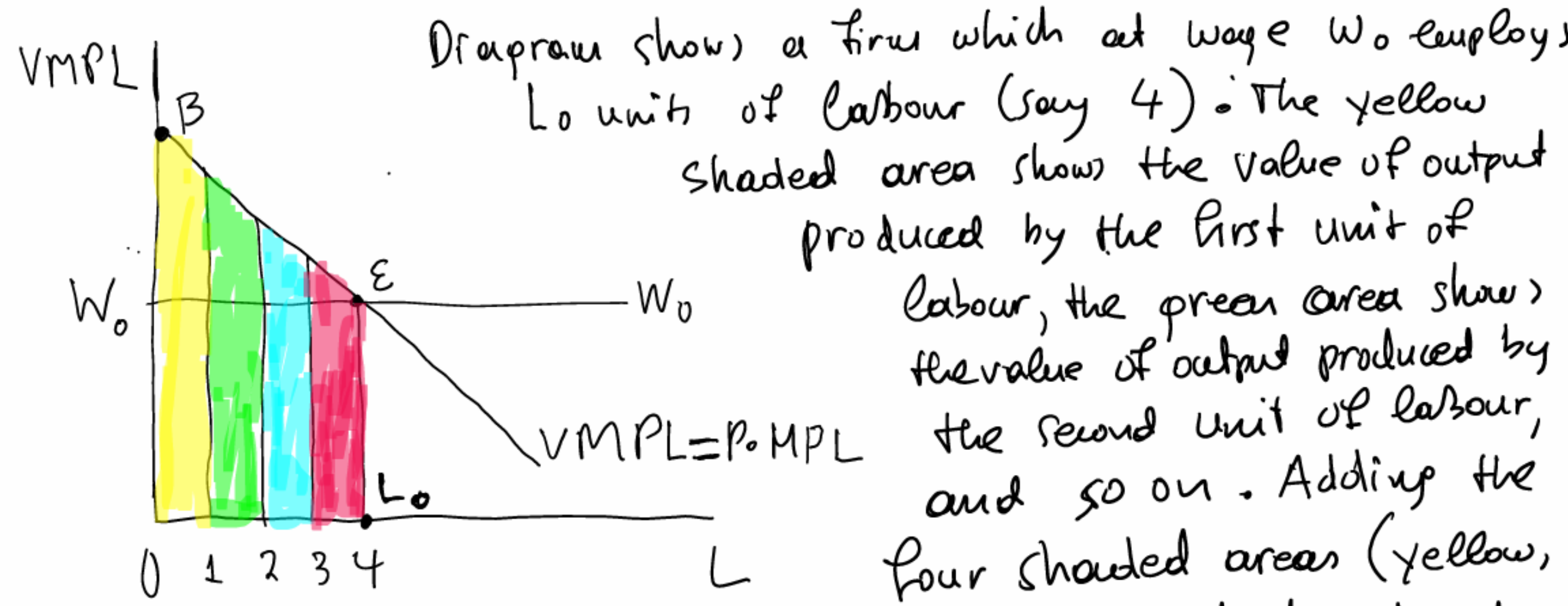




This diagram shows the (physical) marginal product of labour (MPL)



This diagram shows the value of the MPL (VMPL), which is equal to $P \cdot MPL$.



green, blue, red) we get the total value of output produced by the four units of labour. This is equivalent to the total revenue of the firm, i.e. the area $OBE L_0$.

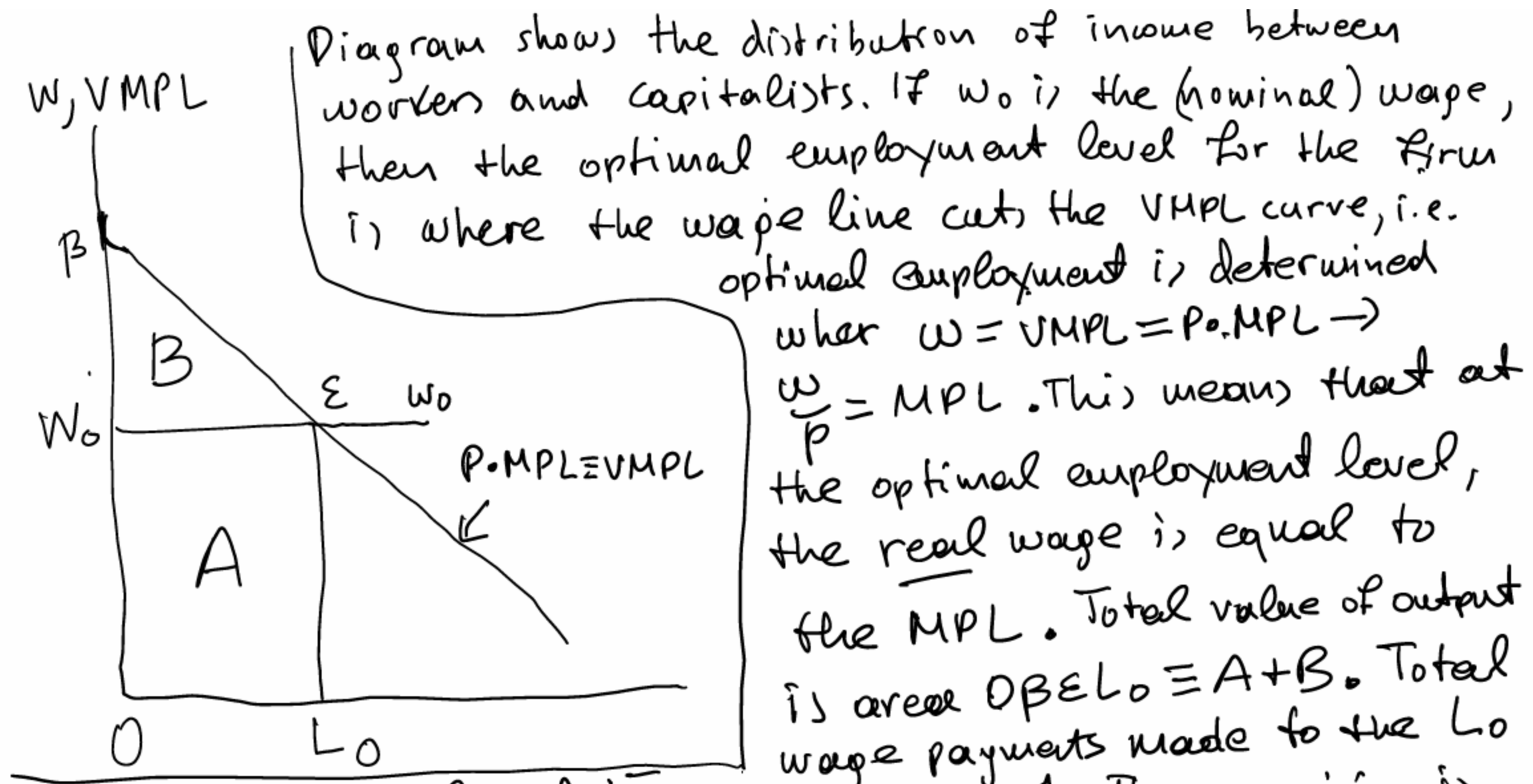
Production Functions

Assume that output is produced using labour (L) and capital (K). We write this as $Q = F(L, K)$, which is a production function. A widely used production function takes the form $Q = L^b K^{1-b}$, where b is a parameter, $0 < b < 1$.

$$MPL \equiv \frac{dQ}{dL} = b L^{b-1} K^{1-b} = b \left(\frac{K}{L} \right)^{1-b} \quad (1)$$

$$MPK \equiv \frac{dQ}{dK} = (1-b) L^b K^{-b} = (1-b) \left(\frac{L}{K} \right)^b \quad (2)$$

If output is produced by L and K , then the value of output produced will be shared (not necessarily equally) between the owners of the two factors of production, i.e. the owners of labor (workers), and the owners of capital (capitalists). The following diagram shows how we can depict the distribution of income between labour (workers) and capital (capitalists).



$w, P \cdot MPL$

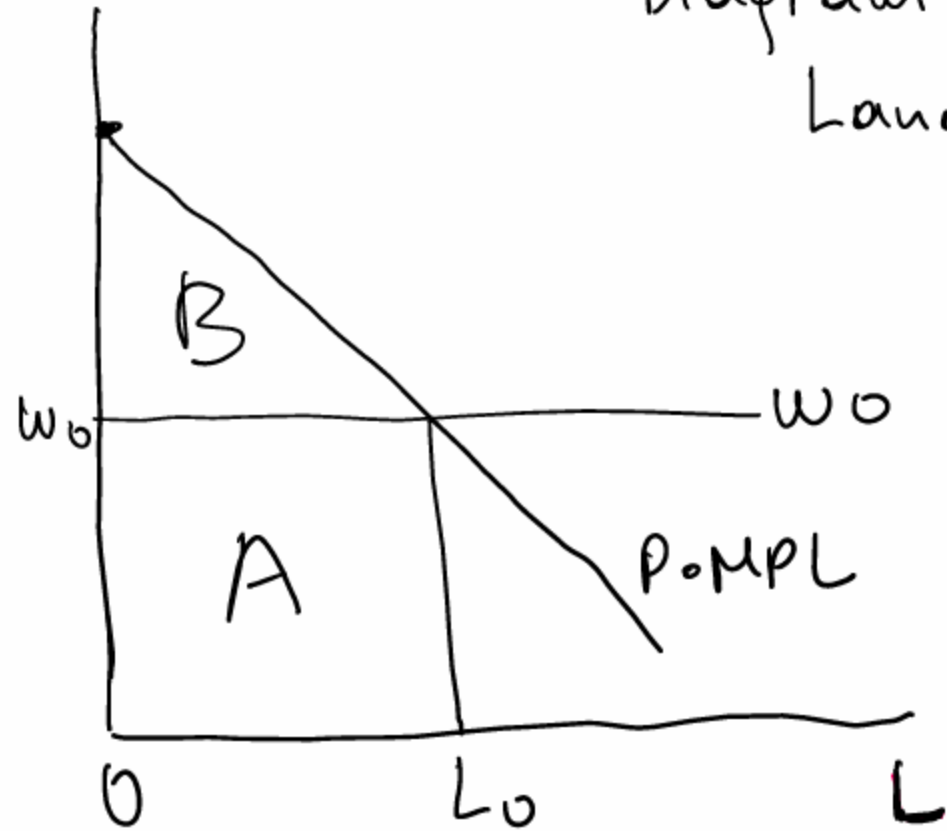


Diagram shows the case that Labour (L) and Land (T) are used to produce output.

Total value (i.e. total revenue) are equal to areas A and B , total wage payments are equal to A , thus the profits of landowners are equal to B (income of landowners).

Note: If the amount of land which is used for producing the good increases, the $P \cdot MPL$ curve will shift to the right.

Under perfect competition, the same way that at the optimal employment level $MPL = W/p$ (the marginal product of labour is equal to the real wage), we have also $MPK = \frac{r_K}{p}$ (the marginal product of capital is equal to the real reward $(\frac{r_K}{p})$ per unit of capital), and $MPT = \frac{r_T}{p}$ (the marginal product of land is equal to the real reward $(\frac{r_T}{p})$ per unit of land). Here, r_K and r_T are the nominal rental rates per unit of capital and land (respectively). Thus, if MPK or MPT change, so will be their real rewards.

- The above imply that if the MPL is higher, then the MPK (or MPT) will be lower, which implies that a higher real wage will be associated with a lower real income per unit of capital (or land).
- Thus a rise in K/L implies a higher MPL, a higher real wage (w/p), a lower MPK and a lower income for capitalists per unit of capital.
- Similarly, a rise in T/L implies a higher MPL, a higher real wage (w/p), a lower MPT and a lower income for landowners per unit of land.
- All of the above hold if there is perfect competition, and the production function is like the one we used in slide 3.