EE211
PRINCIPLES OF MICROECONOMICS

Topic 9:

Factor Markets

Topics

- Demand for factor as a derived demand
- The firm's demand for a factor
- The supply of a factor
- Determination of factor prices

Introduction

- Recall that a firm's objective is to maximize its profit:

$$\pi = TR - TC = PQ - (wL + rK)$$

- We've talked about the output markets, and how the output price is determined in the previous lecture.
- This lecture will focus on the factor market, and how the factor price is determined.
  (w)
- In this class, we only look at the competitive factor market in the short run under 2 scenarios:
  - Competitive output market
  - Monopoly output market

The Demand for Factors

- In previous topics, we talked about the demand for goods – this is the demand by consumers for their own consumption.
- Producers also have a demand for the goods for their production. This producer's demand is a result of consumer's demand for goods, and is called "derived demand".

- **Derived demand** is the **demand for a factor of production** that results from the demand for the products that it is used to make.
- E.g. Demand for wood by carpenters

COMPETITIVE FACTOR MARKET & COMPETITIVE OUTPUT MARKET

Assumptions (for competitive factor market)

firms workers

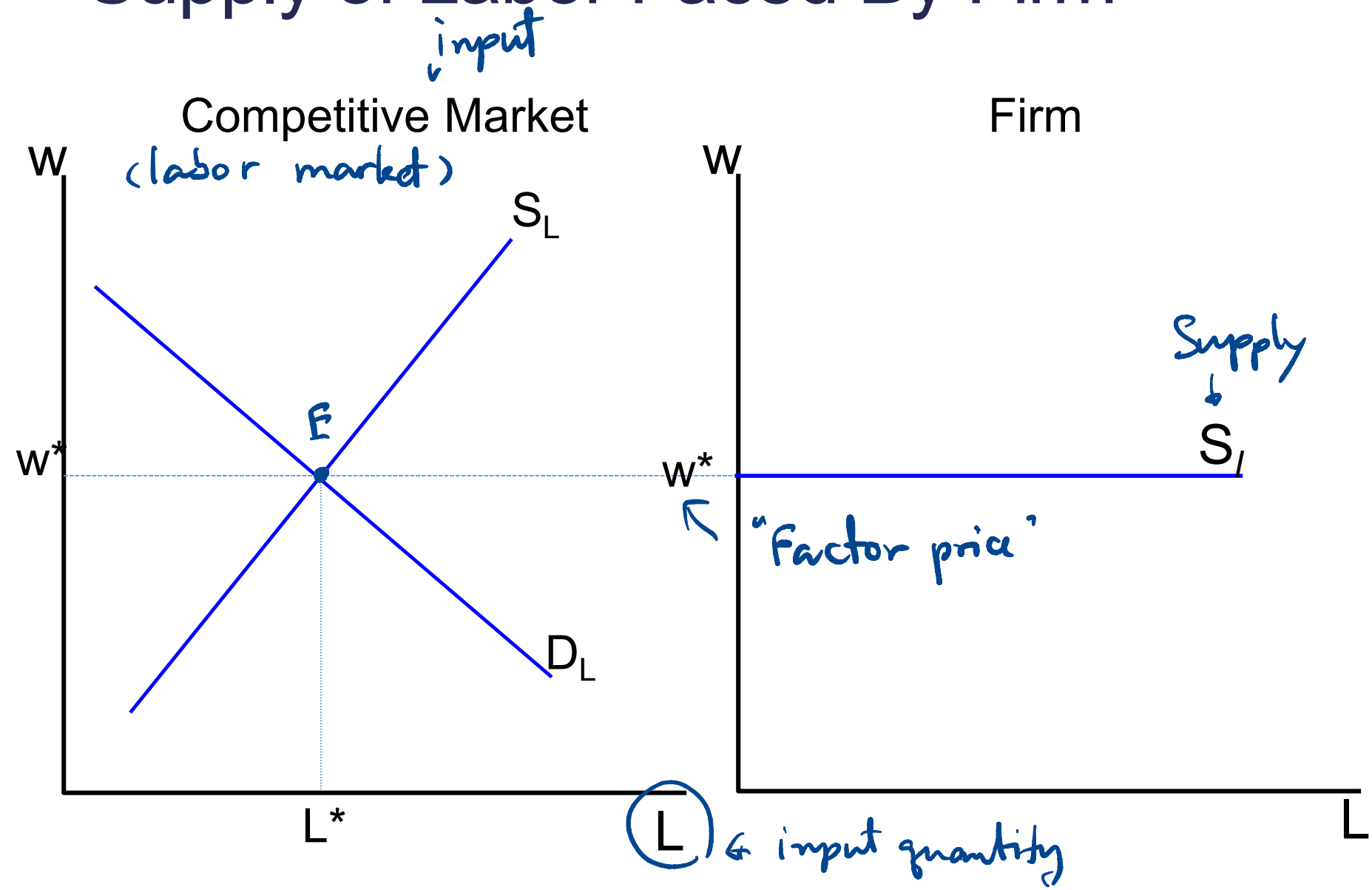
- There are many buyers and sellers in both factor market and output market.
- In both markets, buyers and sellers are price takers.

output input

- In the short-run production, labor is the only variable input, where capital is fixed.
  - Wage (input price) is determined by the labor market.
  - Producers in the output market take wage as given.

(ie. Firms who produce output and demand labor.)

Supply of Labor Faced By Firm

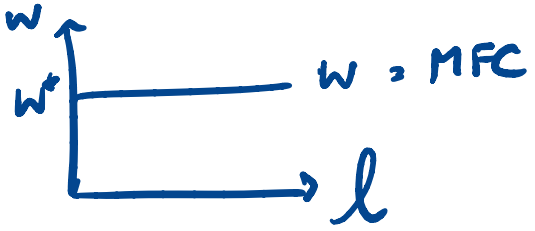


Firm's Demand for a Factor

- Firm will hire an additional worker as long as:

the additional cost (paid to additional worker) < the additional revenue (received from additional worker).

- The additional cost for one extra unit of factor is called **"marginal factor cost (MFC)".**
- In this case, MFC is wage (w).



- The additional revenue received from one extra unit of factor is called **"marginal revenue product (MRP)"**:

$$MRP_L = MR \times MP_L. \quad = \frac{\Delta(TR)}{\Delta Q} \times \frac{\Delta Q}{\Delta L} = \frac{\Delta TR}{\Delta L}$$

Firm's Demand for a Factor (Cont'd)

- **Value of marginal product (VMP)** of labor is the marginal product of labor multiplied by the output price (P):

  $VMP_L = P \times MP_L$.

- In perfectly competitive market, P = MR. = AR
- Hence,

  $MRP_L = MR \times MP_L = P \times MP_L = VMP_L$

Example (Assume P = 10)

output price

competitive output mkt: P = MR

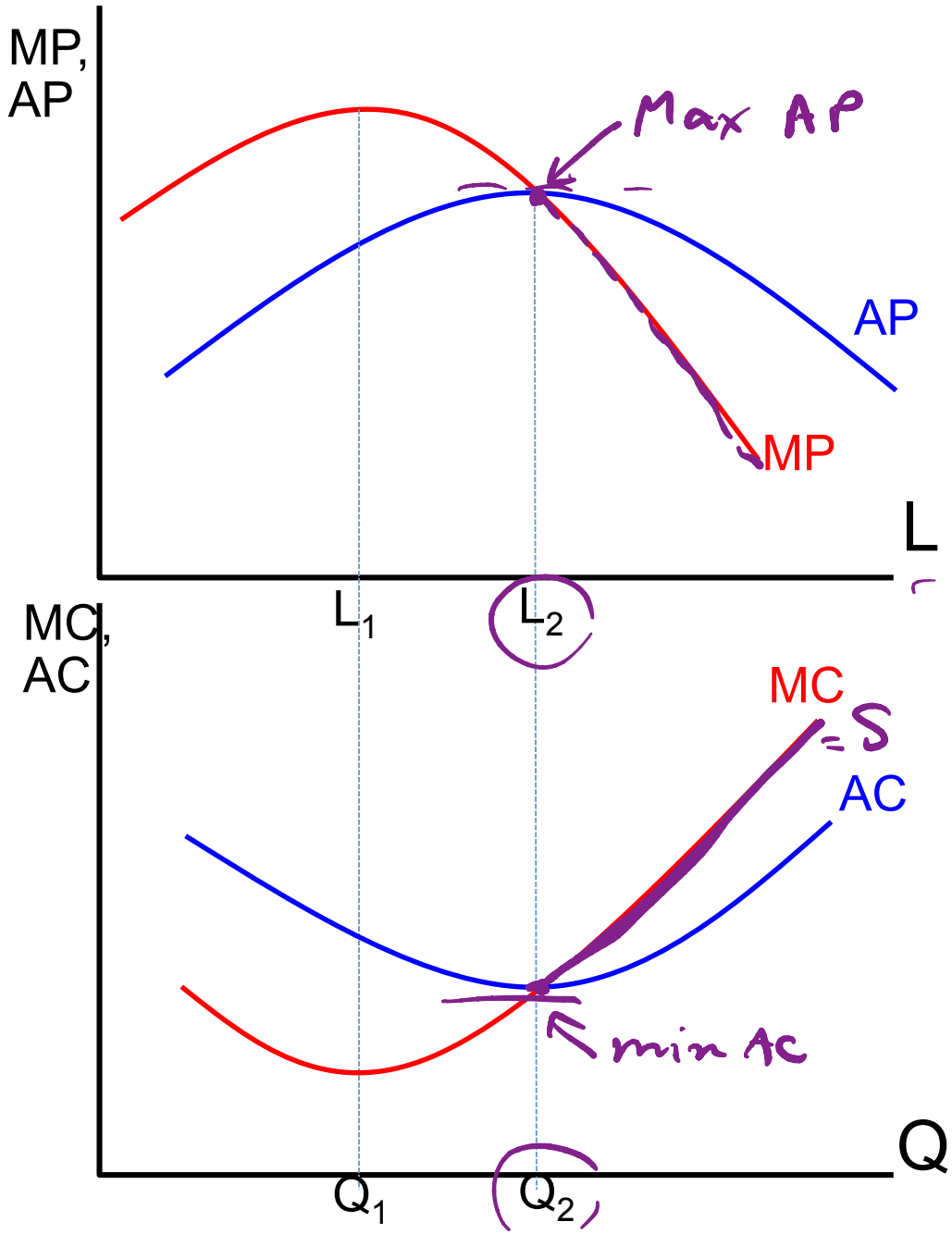
L input	Q output	$MP_L = \frac{\Delta Q}{\Delta L}$	MR $= \Delta TR / \Delta Q$	TR=PxQ	MRP $= \Delta TR / \Delta L$ = PxMP
0	25	-		250	= MR x MP_L
1	40	15	10	400	150
2	75	35	10	750	350
3	100	25	10	1,000	250
4	120	20	10	1,200	200
5	130	10	10	1,300	100

x =

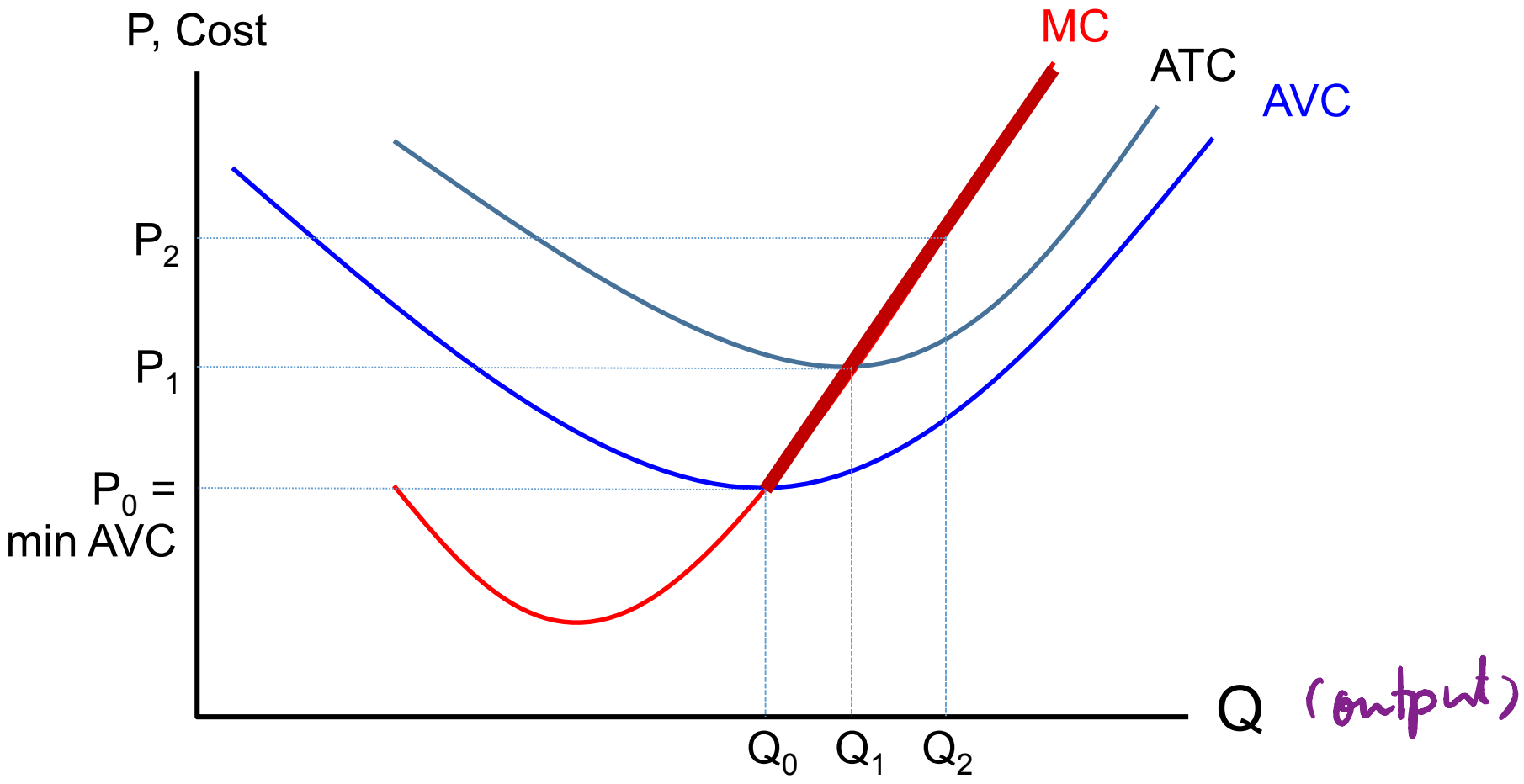
Recall :

Relationship between MP&AP and MC&AC

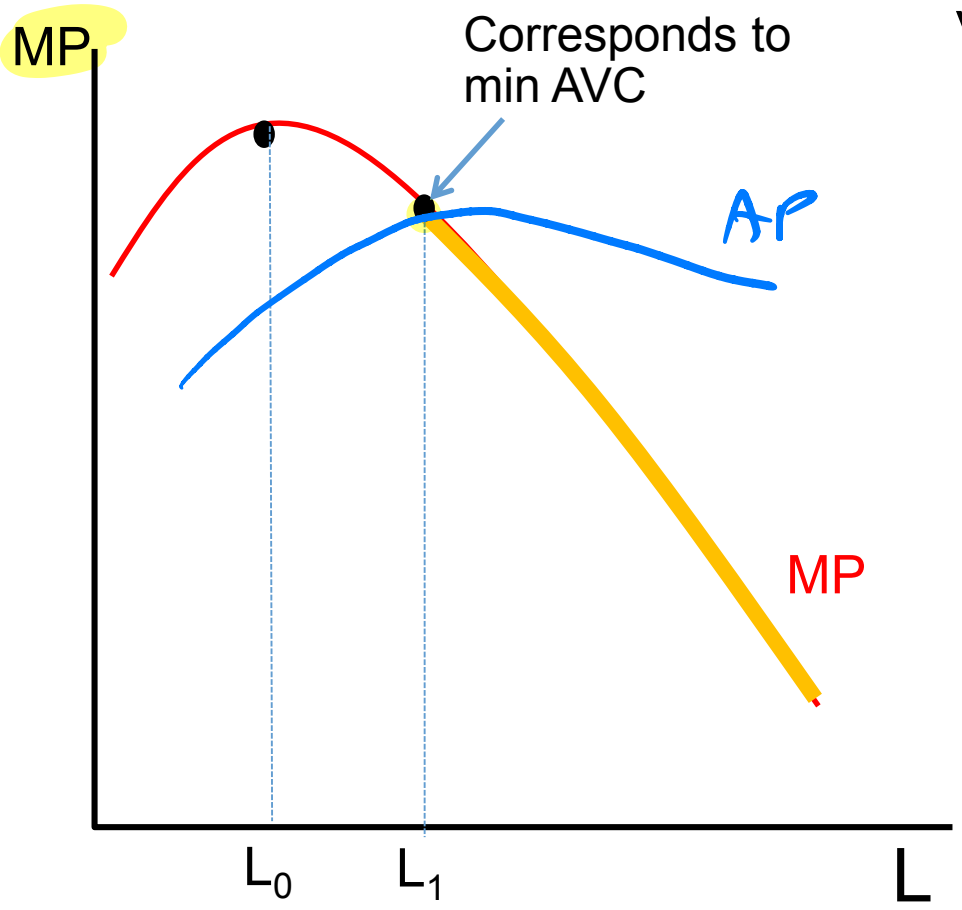
(in output markets)

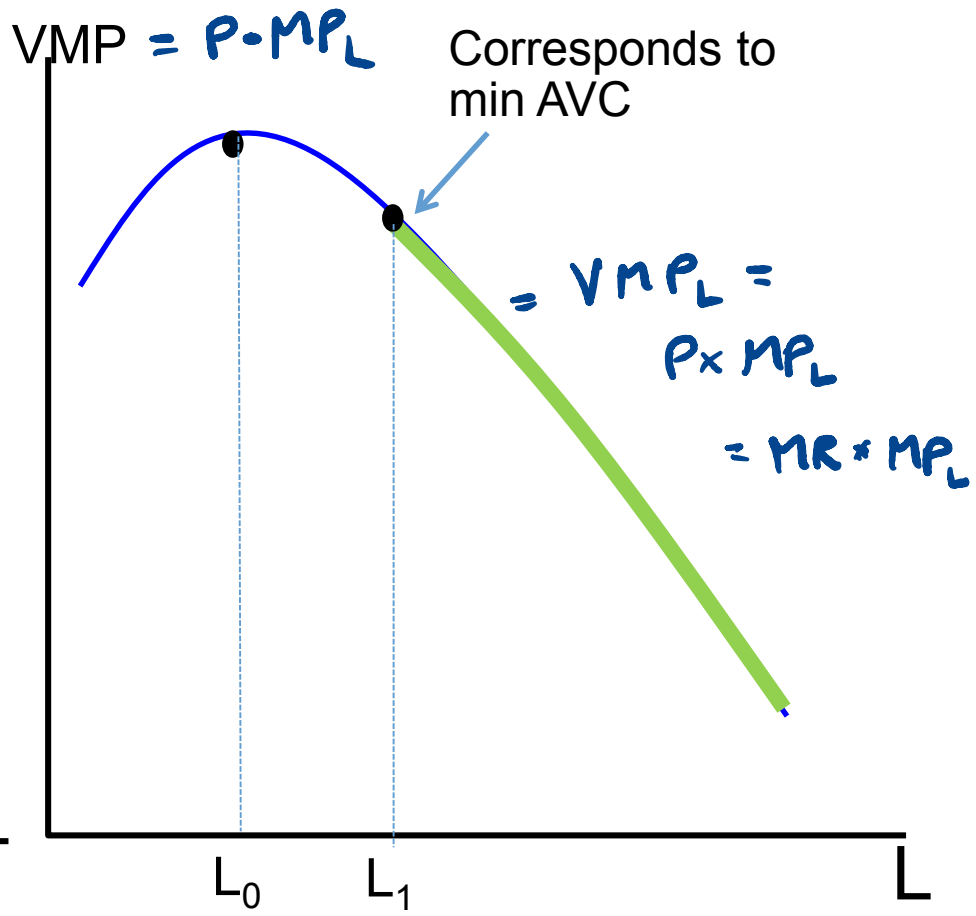


Firm's Short-Run Supply Curve in Perfect Competition

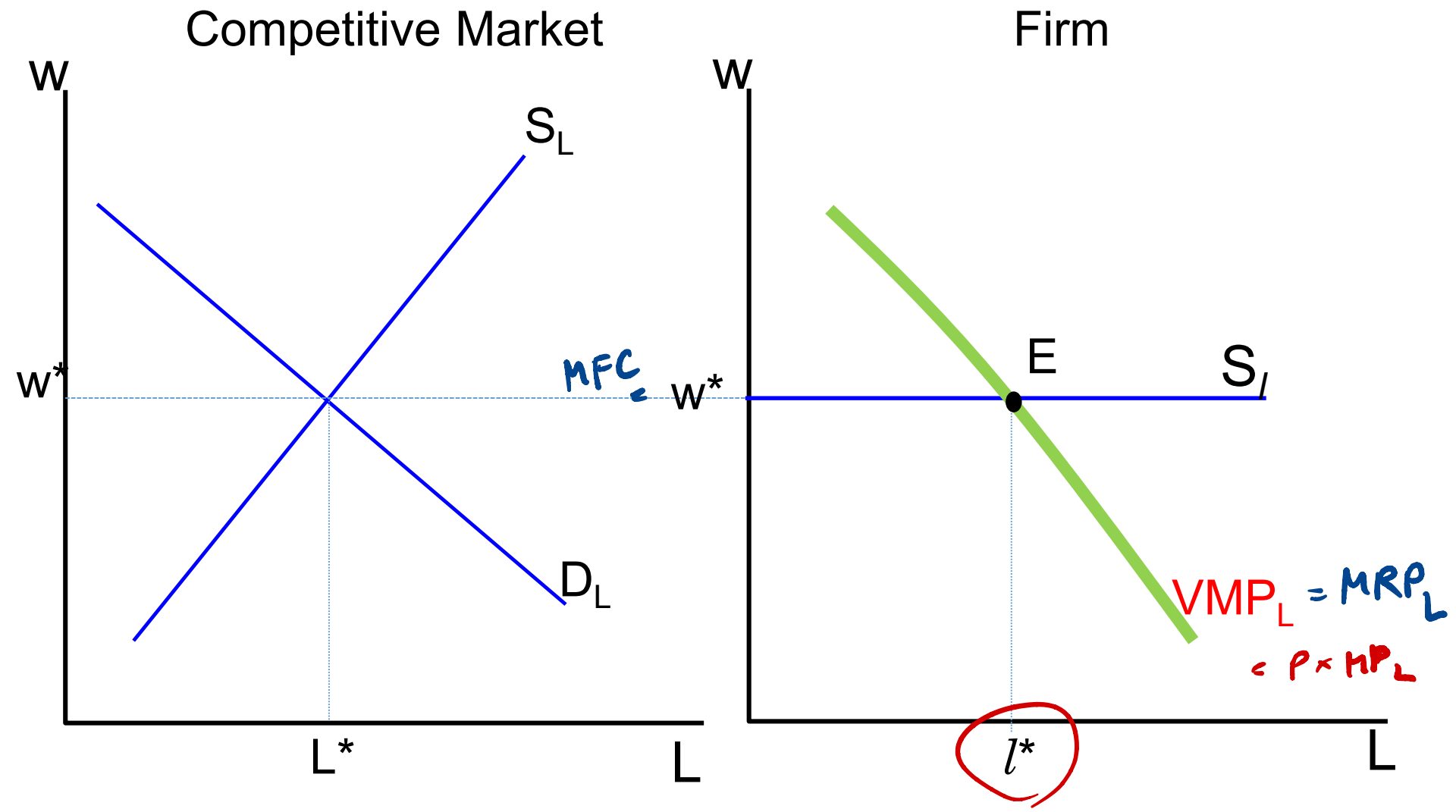


The Firm's Demand Curve for a Factor

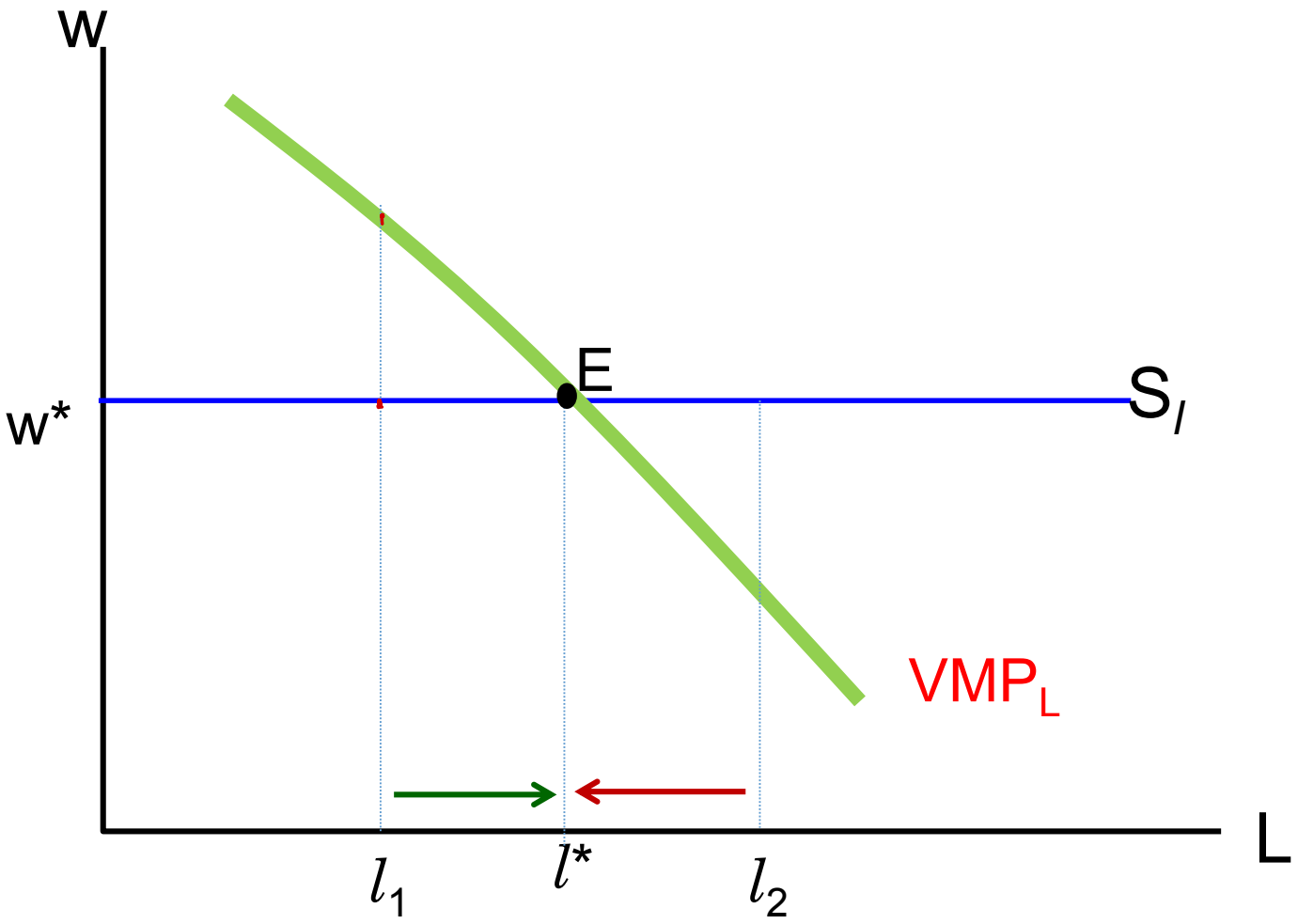




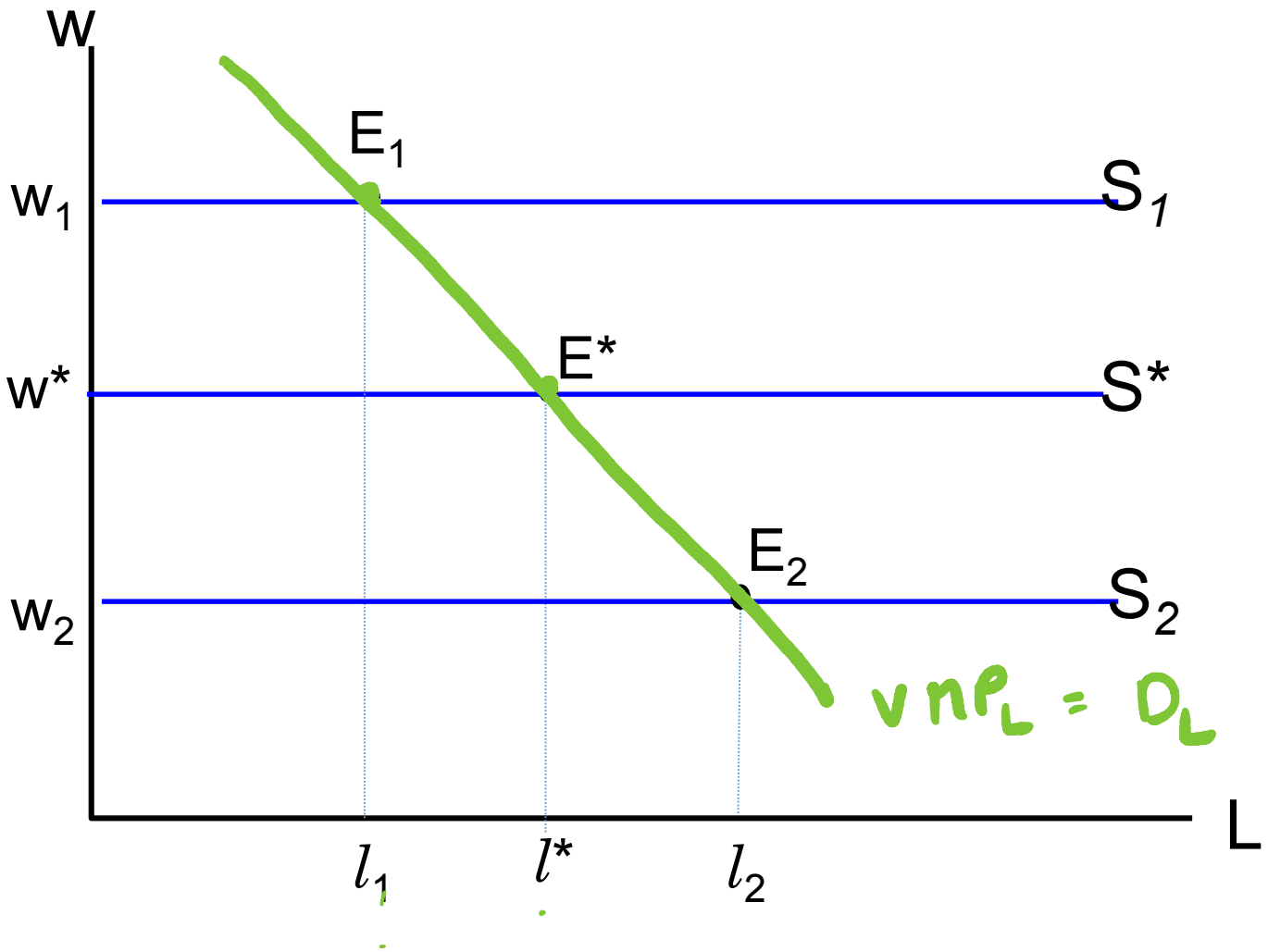
Equilibrium in the Labor Market



Firm's Decision in Hiring Labor



Firm's Derived Demand for Labor



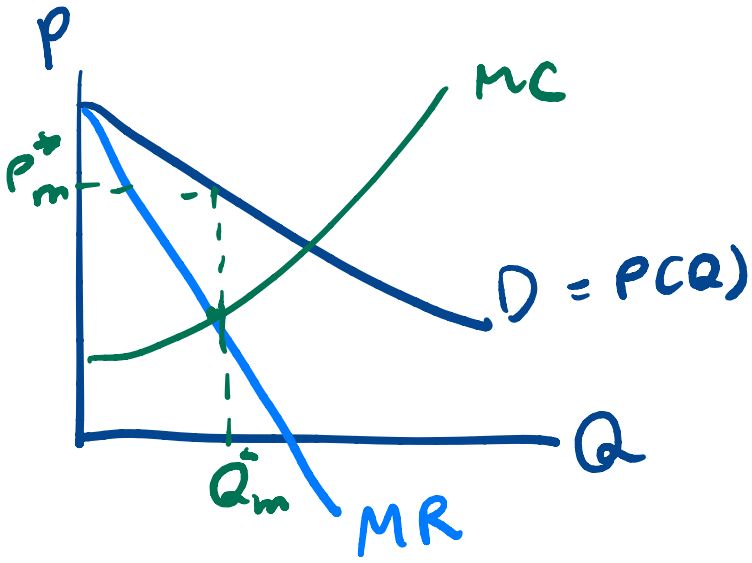
COMPETITIVE FACTOR MARKET & MONOPOLY OUTPUT MARKET

Assumptions

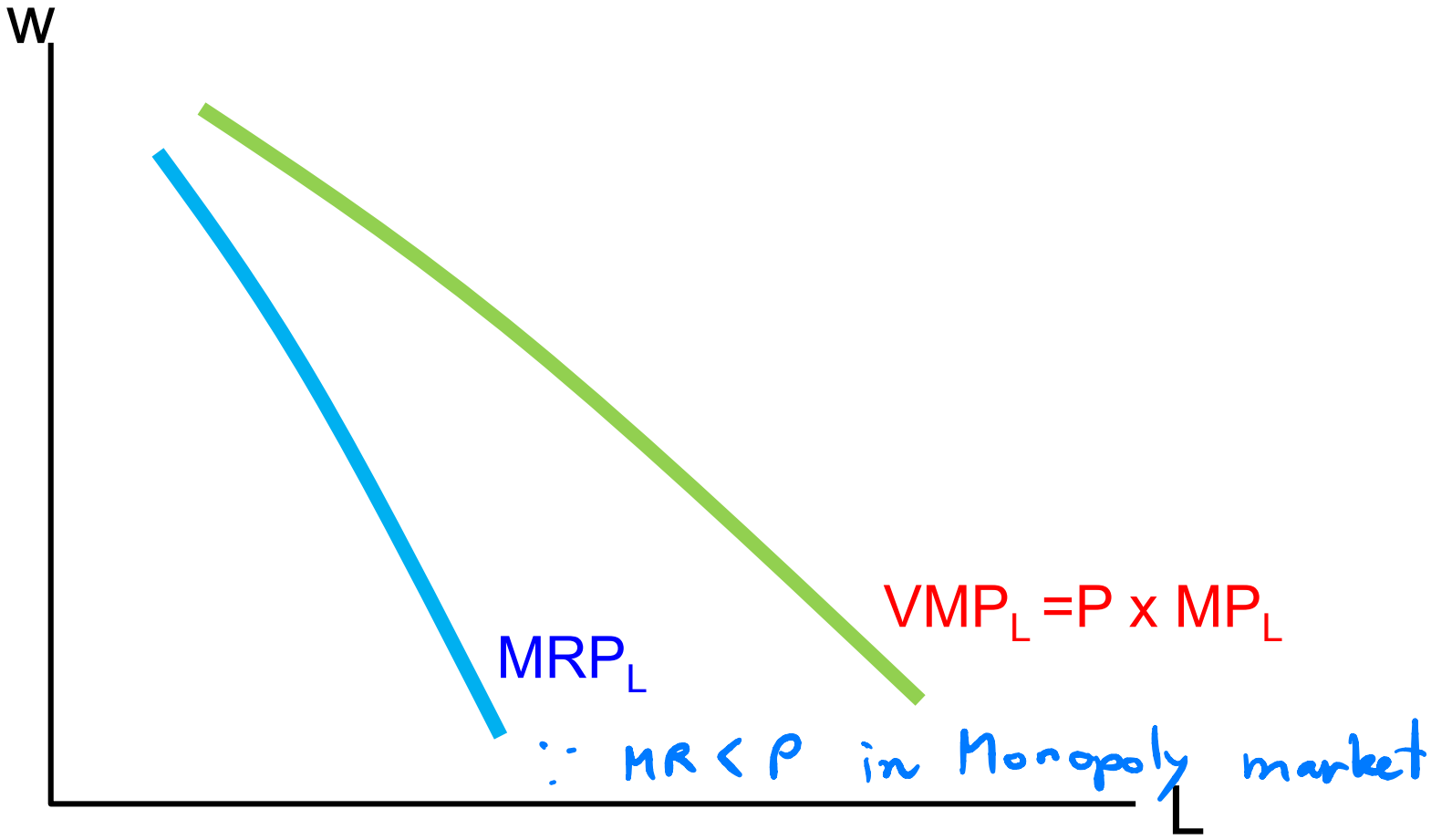
- There are many buyers and sellers in the factor market, but there is only seller in the output market.
- In factor markets, buyers and sellers are price takers.
- In output market, seller is the price setter.
  - Set price where MR = MC.
- In this case, $MRP_L = MR \times MP_L$.

$MRP_L \neq P \times MP_L$

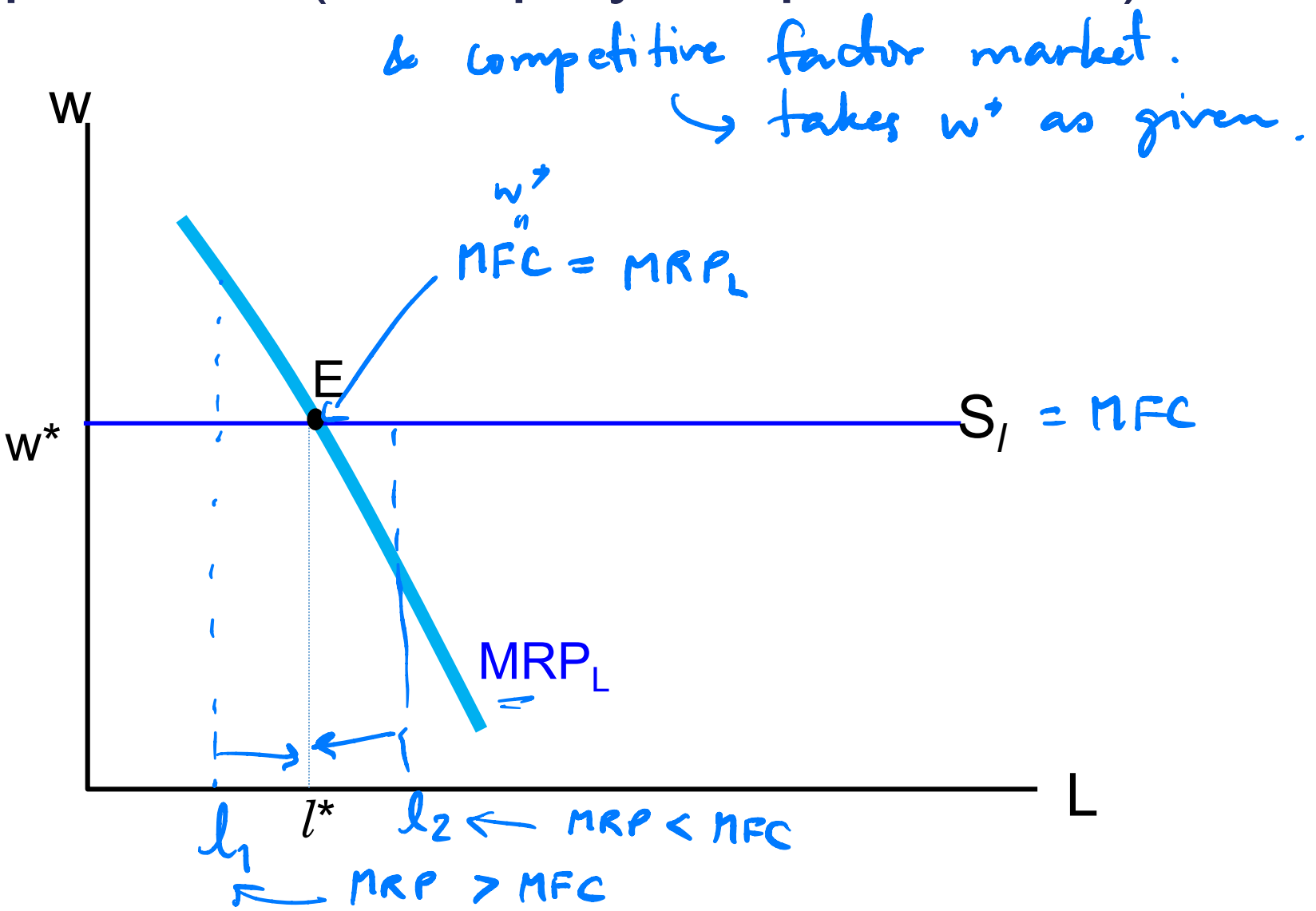
$P^* > MC$



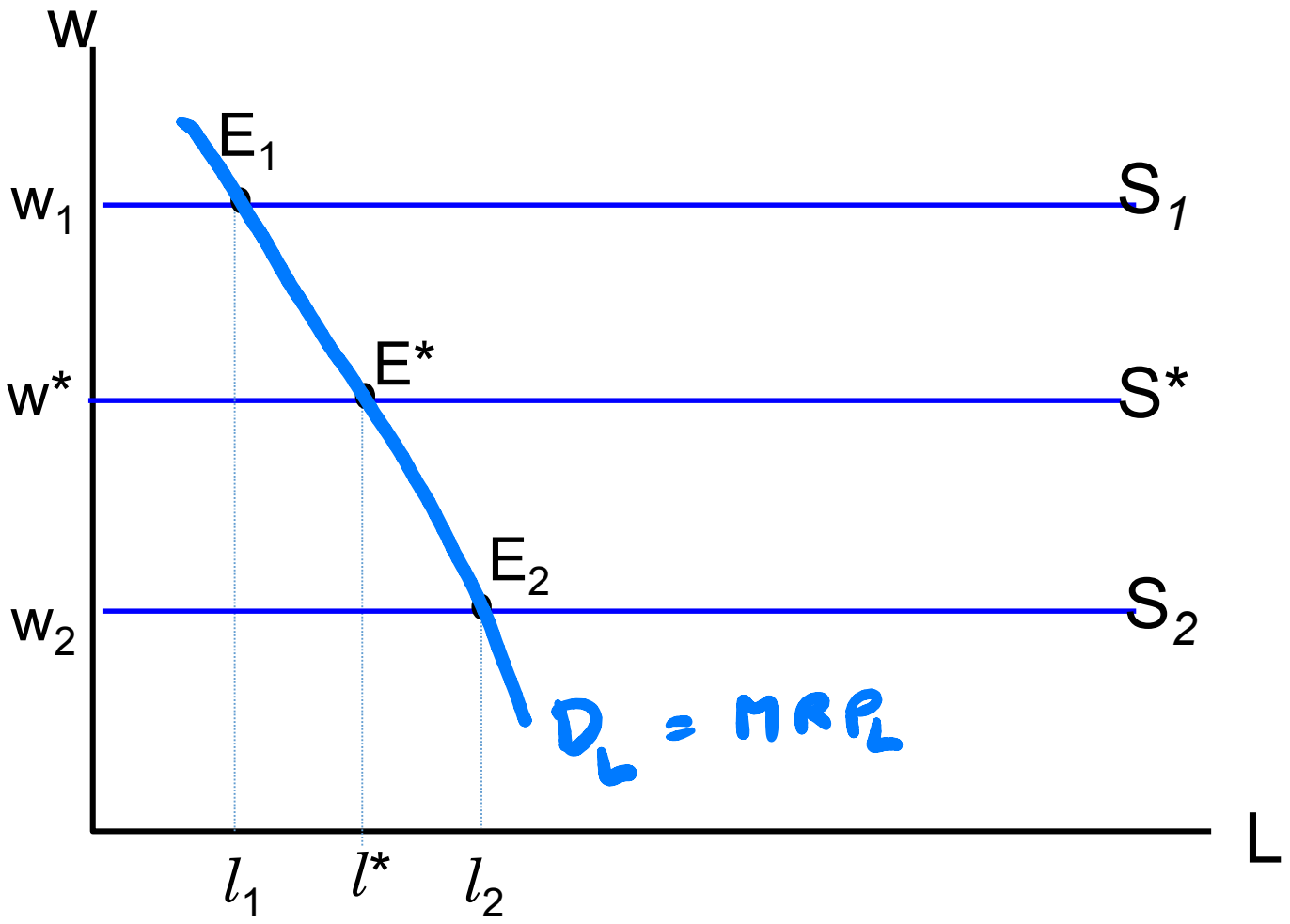
VMP and MRP in the Case of Monopoly Output Market



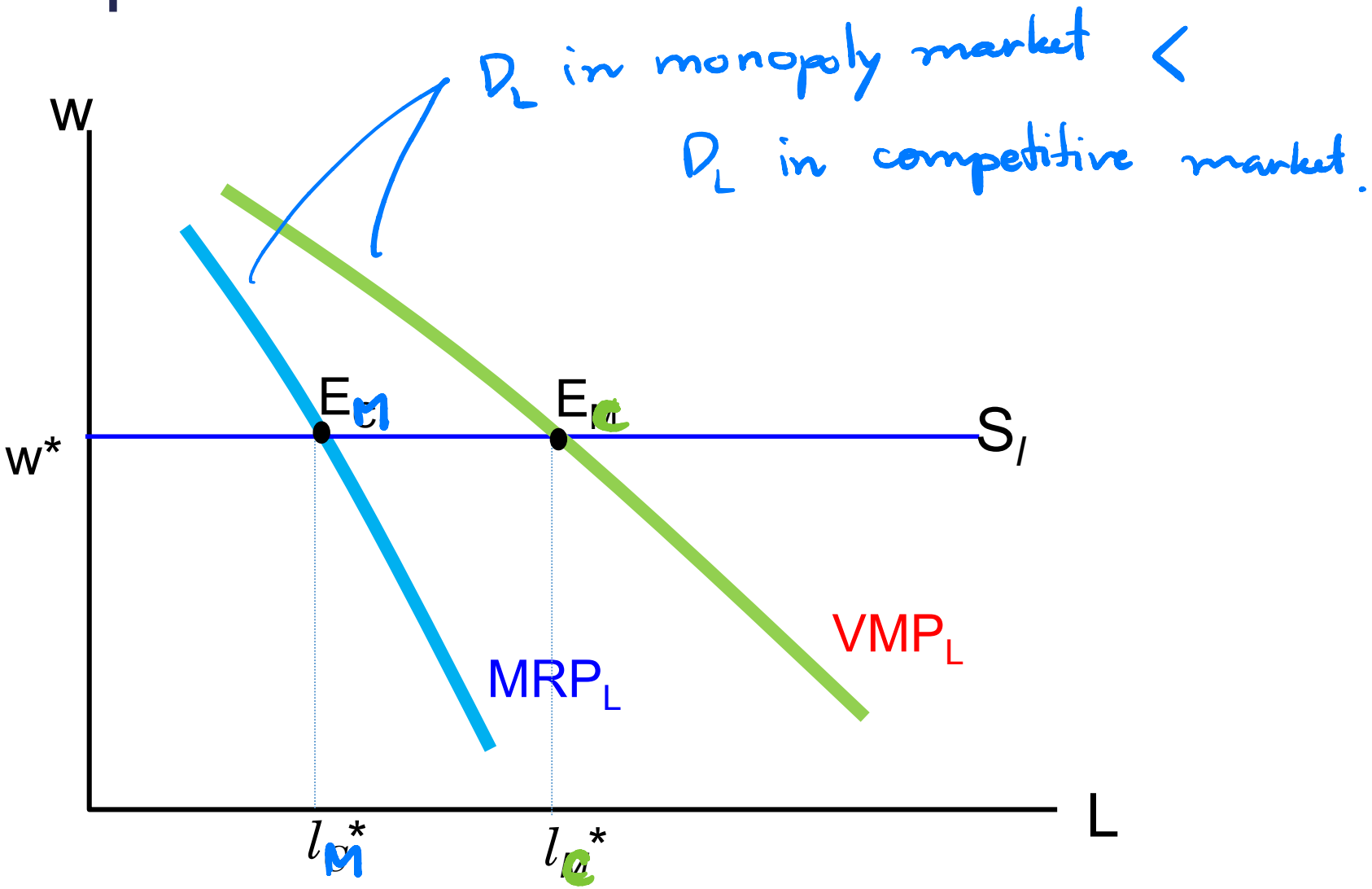
Equilibrium (Monopoly Output Market)



Firm's Derived Demand for Labor



Comparison


D_L in monopoly market <
D_L in competitive market.
w
w^*
E_m
E_c
S_l
VMP_L
MRP_L
L
l_m^*
l_c^*

Comparison