

MC MPL Explained Simply



In the short run, how are marginal cost and the marginal product of inputs related?
(Select each correct answer.)

☐ $MC = w \cdot MP_L$

☒ $MC = \frac{w}{MP_L}$

☒ $MP_L = \frac{w}{MC}$

☐ $MC = r \cdot MP_K$

☐ $MC = \frac{r}{MP_K}$

☐ $MP_K = \frac{r}{MC}$

✓

Explanation
We defined $MP_L = \frac{\Delta q}{\Delta L}$. So $MC = w \frac{\Delta L}{\Delta q} = \frac{w}{MP_L}$. Algebraically, this is also $MP_L = \frac{w}{MC}$. We can't adjust capital in the short run, so the marginal product of capital is unrelated to marginal cost of production.

You are an expert in microeconomics. I have a problem with the solution as shown in the picture. However, I feel the solution explanation is difficult. I feel unfamiliar with the core concepts behind it, the terms, and the math. Please help to re-explain it in beginner-friendly style and include some humor.



Alright, let's break this down in a super-simple, friendly, and even a bit humorous way—like we're chatting over coffee!

Question:

How are marginal cost (MC) and marginal product of labor (MPL) related in the short run?

Key Background Stuff:

1. Marginal Cost (MC):

Think of this as the “extra cost” for making one more unit of something. For example, if you're making pizzas, how much extra does it cost to make the next pizza? That's your MC.

2. Marginal Product of Labor (MPL):

This is the “extra output” one more worker brings. Like hiring another pizza chef: how many more pizzas can they crank out in an hour? That's your MPL.

3. Wage (w):

This is how much you pay your worker per unit of time. Like, “Hey Chef Bob, here's \$20/hour.”

4. Capital (K):

These are fixed things like ovens and pizza cutters that you can't change in the short run. Short run = you can't just go out and buy more ovens overnight.

How They Relate:

Imagine you're running your pizza shop. The relationship between **MC** and **MPL** is like saying, "How hard is Chef Bob working vs. how much I'm paying him?"

The math behind this is:

- $MC = \frac{w}{MPL}$

Translation?

Your cost for one more pizza depends on (a) how much you're paying Chef Bob (w) and (b) how productive he is (MPL).

Fun thought:

If Chef Bob is super slow (low MPL), your costs skyrocket because you're paying a lot for very little pizza. Bob might be better off as a delivery guy.

Why Is This True?

1. If you pay your worker a fixed wage (w):

More productive workers (higher MPL) = cheaper costs per pizza (lower MC).

Less productive workers (lower MPL) = expensive pizzas (higher MC).

2. Why Capital (K) doesn't matter in the short run:

You're stuck with whatever ovens and tools you already have, so this question focuses only on labor.

The Wrong Options:

- $MC = w \cdot MPL$:

This is like saying, "The more productive my worker, the more I spend per pizza." Not true—you spend less, not more!

- Stuff about capital (r and MPK):

In the short run, you can't change your ovens (capital), so this is just noise.

Bottom Line:

If your chef is a pizza-making machine (high MPL), you save money on every pizza (low MC). If they're slacking or just not great (low MPL), every pizza costs you a fortune (high MC).

Think of it this way:

Hiring Bob to make pizzas is only worth it if he doesn't spend half his time texting his girlfriend or staring at TikToks while you're paying him.

Hope this makes sense! Let me know if Chef Bob still confuses you, and we'll re-hire someone else for the example. 😊



can you explain the fancy math notations in the existing solution?



Of course! Let's break down those **fancy math notations** in the existing solution step by step. I'll keep it light and beginner-friendly, so they feel less like aliens and more like friendly neighbors.

The Notations and Their Meanings:

1. $MPL = \frac{\Delta q}{\Delta L}$

- **What it means:**

The **marginal product of labor (MPL)** tells you how much extra output (let's call it **q**, like pizzas or widgets) you get when you add one more unit of labor (**L**, like one more hour of work or one more worker).

- **Fancy math decoded:**

- Δq : The change (extra) in output.
- ΔL : The change (extra) in labor.

- Think of this as: "How much more pizza can Chef Bob make if I add him to the team?"

Example:

If adding Bob makes you 5 extra pizzas in an hour, $MPL = \frac{5}{1} = 5$.

2. $MC = w \frac{\Delta L}{\Delta q} \rightarrow MC = \frac{w}{MPL}$

- **What it means:**

Marginal cost (**MC**) is how much it costs to produce **one more unit** of output. The cost depends on:

- w : Wage rate (how much you pay per worker per hour).
- MPL : How productive the worker is.

- **Why divide w by MPL ?**

- If Bob can make **5 pizzas per hour** ($MPL = 5$) and you pay him \$10 an hour, the cost per pizza is:

$$MC = \frac{\text{Wage}}{\text{Productivity}} = \frac{10}{5} = 2$$

So each pizza costs **\$2** in labor.

- **The logic:**

Higher productivity (bigger MPL) = lower cost per pizza.

Lower productivity (smaller MPL) = higher cost per pizza.

3. $MPL = \frac{w}{MC}$

- **What it means:**

Rearranging the earlier formula ($MC = \frac{w}{MPL}$) gives us this.

It says: If you know the wage rate and the marginal cost, you can figure out how productive labor is.

- **Example:**

If the cost per pizza is \$2 ($MC = 2$) and you pay Chef Bob \$10 an hour, then:

$$MPL = \frac{10}{2} = 5$$

This means Bob cranks out **5 pizzas per hour**.

4. Why Ignore Capital Terms (r , MP_K)?

- In the short run, you can't change capital (like ovens or machines). It's stuck.
- Therefore, capital-related terms like $MC = r \cdot MP_K$ or $MC = \frac{r}{MP_K}$ aren't relevant here. You're only looking at labor.

Summary of the Math Relationships:

- $MPL = \frac{\Delta q}{\Delta L}$: **Extra output per extra worker.**
- $MC = \frac{w}{MPL}$: **Cost of one more output based on wage and productivity.**
- $MPL = \frac{w}{MC}$: **Productivity based on wage and cost per unit.**

Why Does This Matter?

The math is just a fancy way of saying:

- If workers are more productive (MPL goes up), your costs go down (MC goes down).
- If workers are less productive, costs go up.

So when you see these formulas, just remember:

Wage ÷ Productivity = Cost of Extra Output.

Let me know if Chef Bob and his pizzas still leave any questions! 🍕



What does "r" represent?



Great question! Let's clear up what "**r**" represents in the context of these economic equations.

What is "r"?

- **r** stands for the **rental rate of capital**.
- It is the cost of using one unit of **capital** (like machinery, tools, buildings, or equipment) for a specific period of time.

Why "r" Matters:

- Just like workers are paid a wage (w) for their time, **capital** (like machines or ovens) also has a cost associated with using it.
- For example:
 - If you **rent an oven** for \$10 per hour, that \$10 is the "rental rate" of the oven.
 - Similarly, if you own the oven, you might think of its depreciation (wear and tear) and interest cost as the "rental rate."

In the Formulas:

When you see terms like $MC = r \cdot MP_K$ or r , here's what they mean:

1. **r**: Cost of using capital (rental rate).
 - Think of it as the "wage for machines" or the cost per hour for using one unit of capital.
2. **MP_K**: Marginal Product of Capital.
 - This is the extra output you get from using one more unit of capital.
 - For example, adding another pizza oven might let you bake 10 more pizzas per hour.
3. Combined:
 - $MC = \frac{r}{MP_K}$:
This tells you the cost of producing one more unit of output **using capital**.

Why Ignore "r" in the Short Run?

In the **short run**, capital (like ovens or machines) is **fixed**. You can't just go out and rent more ovens overnight. That's why we ignore "r" and MP_K when discussing marginal cost in the short run.

We focus only on **labor** because hiring more workers is usually the easiest adjustment you can make.

Summary:

- "r" = Rental rate of capital (cost to use machines, equipment, etc.).
- In the short run, capital is fixed, so we ignore **r** and focus only on wages (w) and labor productivity (MPL).

If you're still curious, just imagine Chef Bob trying to argue: "Why are you only talking about me? What about the oven? It's working hard too!" 🍕😂