# A Competitive Firm Sells Its Output For $30 Per Unit. The Marginal Product Of The 10th Worker Is 20 Units

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### Introduction

The scenario presents a competitive firm operating in a perfectly competitive market, where the selling price per unit of output is fixed at $30. Additionally, the productivity of the firm's workforce is highlighted through the marginal product (MP) of the 10th worker, which is 20 units. Understanding these data points is essential for analyzing the firm's production decisions, cost structure, and profit-maximizing strategies. This article delves into the implications of these figures, exploring concepts such as marginal revenue, marginal cost, labor productivity, and the firm's optimal employment level.

## Fundamental Concepts in Perfect Competition

### Price Taker Nature of the Firm

In perfect competition, firms are price takers, meaning they accept the market price as given. They have no power to influence the market price through their own production decisions. The key characteristics include:

- Homogeneous products
- Large number of buyers and sellers
- Free entry and exit in the market
- Perfect information among participants

Given these features, the firm's revenue per unit sold is constant at $30, regardless of the quantity produced.

### Revenue and Profit Maximization

In perfect competition, the firm's total revenue (TR) is calculated as:

- TR = Price × Quantity (Q)

Since the price is fixed at $30, the marginal revenue (MR) for each additional unit is also $30, a key consideration in production decisions.

## Analyzing Marginal Product and Its Significance

### Understanding Marginal Product (MP)

The marginal product of a worker is the additional output produced by employing one more worker. For the 10th worker, MP is given as 20 units, which indicates:

- Adding the 10th worker increases total output by 20 units

- This productivity level influences the firm's decisions on whether to hire additional labor

### Implications of the 10th Worker's MP

The figure of 20 units per worker provides insights into the firm's marginal productivity, which is crucial when calculating marginal costs and determining optimal employment levels. Notably, the law of diminishing returns suggests that beyond a certain point, each additional worker adds less to total output, but in this case, a MP of 20 units indicates a relatively productive workforce at that stage.

## Calculating Marginal Cost (MC) and Its Role

### From Marginal Product to Marginal Cost

The marginal cost of production is the additional cost incurred by producing one more unit of output. It is related to the marginal product of labor through the following relationship:

- $MC = w / MP$

where w is the wage rate (the cost of hiring one worker). To analyze the firm's decision-making, the wage rate is necessary, but it is not specified in the scenario. Nonetheless, understanding the relationship allows us to see how productivity impacts costs.

## Impact of MP on Cost Efficiency

- If MP is high, the cost per additional unit (MC) is lower, making production more profitable
- If MP is low, MC increases, reducing profit margins

Thus, the 20-unit MP at the 10th worker suggests a certain level of efficiency in labor productivity, affecting cost calculations and output decisions.

# Determining the Optimal Level of Employment

## Profit-Maximizing Condition

In perfect competition, the firm maximizes profit where marginal revenue equals marginal cost (MR = MC). Given MR is $30, the firm will hire workers until:

- MC = MR = $30

Using the relationship MC = w / MP, the firm's employment decision hinges on the wage rate w and the MP of the workers at different levels.

## Applying the Data to Find the Wages or Employment Level

Suppose the wage (w) is known or can be estimated, then the firm can determine whether hiring the 10th worker is profitable:

- If w / 20 $\leq$ $30, hiring the 10th worker is profitable

- If w / 20 > $30, then it is not profitable to hire the 10th worker

This decision rule helps to identify the optimal number of workers to employ, considering diminishing or increasing returns.

# Economic Interpretation and Broader Implications

## Marginal Productivity and Efficiency

The MP of 20 units for the 10th worker indicates that the firm is relatively efficient at this stage of production. If marginal product were decreasing significantly beyond this point, the firm might face diminishing returns and need to reassess its employment level.

## Cost-Benefit Analysis of Hiring Additional Workers

- The firm compares the value of output produced per worker ($30 × MP) to the wage rate
- Optimal employment occurs when the additional revenue from the worker equals the additional cost

For example, if the wage rate is $600, then hiring the 10th worker (with MP of 20 units) is profitable only if:

- 20 units × $30 = $600 □ wage (w)

### Impacts of Changing Market Conditions

Market fluctuations that alter the selling price or wages can significantly influence employment decisions. A rise in the market price would increase MR, encouraging more hiring, while an increase in wages could discourage employment if the cost outweighs the revenue generated.

## Conclusion

The scenario of a competitive firm selling its output at $30 per unit with a marginal product of 20 units for the 10th worker encapsulates fundamental principles of microeconomics. The firm’s production and employment decisions are guided by the interplay between marginal revenue, marginal cost, and marginal product. Recognizing the significance of productivity levels helps the firm optimize its employment level to maximize profits. Ultimately, understanding these core concepts enables firms to adapt efficiently to changing market conditions, maintain competitiveness, and ensure sustainable profitability in a perfectly competitive environment.

## Frequently Asked Questions

### What is the selling price per unit for the competitive firm?

The firm sells its output at $30 per unit.

### What is the marginal product of the 10th worker?

The marginal product of the 10th worker is 20 units.

### How can the firm determine the value of the 10th worker's output?

By multiplying the marginal product (20 units) by the selling price ($30), the value of the 10th worker's output is $600.

## What does the marginal product of 20 units imply about the 10th worker's contribution?

It indicates that the 10th worker adds 20 additional units to the total output.

## How should the firm decide whether to hire the 10th worker?

The firm should compare the value of the 10th worker's marginal product ($600) to the worker's wage; if the wage is less than $600, hiring is profitable.

## If the firm's marginal revenue equals the price in perfect competition, what is the marginal revenue per unit?

The marginal revenue per unit is $30, which is equal to the selling price.

## What is the marginal revenue product (MRP) of the 10th worker?

The MRP of the 10th worker is $600, calculated as marginal product (20 units) times price ($30).

## In a perfectly competitive market, how does the firm decide the optimal number of workers to hire?

The firm hires workers up to the point where the marginal revenue product equals the wage rate.

## If the wage rate increases beyond $600, what effect does it have on hiring the 10th worker?

If wages exceed $600, hiring the 10th worker becomes unprofitable, and the firm would likely not hire or retain that worker.

### What economic principle is illustrated by comparing the marginal product and the price in this scenario?

It illustrates the principle of marginal analysis, where firms hire workers up to the point where the value of their marginal product equals the wage rate to maximize profit.

## Additional Resources

A Competitive Firm Sells Its Output For $30 Per Unit. The Marginal Product Of The 10th Worker Is 20 Units

In the realm of microeconomics, understanding how firms make production and employment decisions is crucial. This is especially true for perfectly competitive firms operating in markets where prices are determined by supply and demand, and firms are price takers. Recently, attention has been drawn to a particular firm that sells its output at a fixed price of $30 per unit. Its production process involves labor input, and the marginal product of the 10th worker is identified as 20 units. This scenario offers a valuable opportunity to explore the concepts of marginal revenue, marginal cost, and optimal employment in perfect competition.

In this article, we will dissect the economic implications of such a firm’s output and employment decisions, examining how the marginal product influences labor employment, the role of marginal revenue in profit maximization, and the broader insights into firm behavior in a perfectly competitive environment.

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## Understanding the Basic Framework: Perfect Competition and

# Firm Behavior

## The Nature of Perfect Competition

In a perfectly competitive market, numerous small firms sell identical products, and no single firm has the power to influence the market price. Prices are determined by overall market supply and demand, and individual firms are price takers.

Key characteristics include:

- Homogeneous products
- Free entry and exit
- Perfect information
- No individual firm can set prices above the market equilibrium

Because of these features, the firm's revenue per unit sold is constant, equal to the market price, regardless of the quantity sold.

## Profit Maximization in Perfect Competition

The fundamental goal of a firm is to maximize profits, which are calculated as total revenue minus total cost:

$$ \text{Profit} = \text{Total Revenue} - \text{Total Cost} $$

Given the market price (P), total revenue (TR) for a quantity (Q) is:

$$ TR = P \times Q $$

To determine the optimal level of output and employment, firms compare the marginal revenue (MR) and marginal cost (MC):

- Marginal Revenue (MR): The additional revenue earned from selling one more unit. In perfect competition, MR equals the market price, i.e., MR = P.
- Marginal Cost (MC): The additional cost of producing one more unit of output.

The profit-maximizing rule is to produce up to the point where MR = MC. If MR > MC, increasing output adds more to revenue than to costs, so production should be increased. Conversely, if MR < MC, reducing output increases profit.

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# Analyzing the Firm's Output and Employment Decisions

## Given Data and Its Significance

- Market Price (P): $30 per unit
- Marginal Product of 10th Worker (MP□□): 20 units

The marginal product (MP) of the 10th worker indicates that adding this worker increases total output by 20 units. This information is critical for assessing the contribution of labor to production and helps determine whether hiring this worker is profitable.

## The Role of Marginal Product in Employment Decisions

In a competitive environment, a firm will continue to hire additional workers as long as the marginal

revenue generated by the last worker exceeds or equals the marginal cost of hiring that worker, which is typically the worker's wage (W).

The profit-maximizing condition in terms of labor is:

$$ MP_L \times P \geq W $$

Where:
- $MP_L$ is the marginal product of labor
- P is the market price
- W is the wage rate

Given the market price of $30 per unit, the additional revenue generated by the 10th worker, who produces 20 units, is:

$$ 20 \times \$30 = \$600 $$

If the wage W per worker is less than or equal to $600, hiring the 10th worker increases profit; if W exceeds $600, then hiring this worker would decrease profit.

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# Calculating Marginal Revenue and Marginal Cost

## Marginal Revenue in a Perfectly Competitive Market

Since the firm operates in perfect competition, the marginal revenue from selling additional units remains constant at the market price:

$$ MR = P = \$30 $$

No matter how much the firm produces, the revenue gained from selling an extra unit remains $30, because the firm can sell all it wants at this price.

## Estimating Marginal Cost and Its Connection to Marginal Product

To analyze the firm’s employment decision, it's essential to understand the marginal cost curve, which is derived from the marginal product of labor and the wage rate.

The marginal cost of producing additional units can be expressed as:

$$ MC = \frac{W}{MP_L} $$

This formula indicates that the cost of producing one more unit depends on the wage paid to labor and the current marginal product.

Suppose the wage rate W is known; then, the firm will hire workers until:

$$ MR = MC $$

or equivalently,

$$ P = \frac{W}{MP_L} $$

Given the data:
- $P = \$30$
- $MP_{10} = 20$ units

The condition for hiring the 10th worker becomes:

$$ W = P \times MP_{10} = \$30 \times 20 = \$600 $$

This means that if the wage W is less than or equal to $600, hiring the 10th worker will be profitable; if W exceeds $600, the firm will refrain from hiring that worker.

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# Implications for the Firm's Employment and Output Level

## Determining Optimal Employment Level

The decision to hire additional workers hinges on comparing the marginal revenue product (MRP) with the wage W:

$$ MRP = P \times MP_L $$

The firm will hire workers up to the point where:

$$ MRP \geq W $$

or equivalently,

$$ MP_L \geq \frac{W}{P} $$

Using the given data:
- $ MP_{10} = 20 $ units
- $ P = \$30 $

The marginal revenue product of the 10th worker is:

$$ MRP_{10} = 20 \times \$30 = \$600 $$

Thus, the firm will continue hiring workers as long as their MRP exceeds their wage W. If the wage W is less than or equal to $600, hiring the 10th worker is profitable.

This analysis indicates that:

- The optimal number of workers depends on the wage rate W.
- For wages less than or equal to $600, hiring the 10th worker increases profit.
- If wages are higher than $600, the firm will not hire the 10th worker.

## Effect on Output and Revenue

The firm's total output increases with additional workers, but the rate of increase depends on the marginal product of each worker and their associated MRP.

- At 10 workers, the output increases by 20 units per worker.
- Total output at 10 workers (assuming previous workers produce less or similar amounts):

$$ Q_{10} = \text{Sum of individual MP} $$

- Total revenue at this level:

$$ TR_{10} = P \times Q_{10} $$

- Marginal revenue from the 10th worker:

$$ MR_{10} = P \times MP_{10} = \$600 $$

This high MR suggests that each additional worker can significantly contribute to revenue, provided

wages are not prohibitively high.

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# Broader Economic Insights and Practical Considerations

## Importance of Marginal Product and Marginal Revenue

The scenario emphasizes the importance of marginal product and marginal revenue in making employment decisions. Firms aim to hire workers as long as the value of their output (in terms of revenue) exceeds the cost of their labor.

Key takeaways include:
- Marginal product directly influences the marginal revenue product.
- Marginal revenue remains constant in perfect competition, simplifying decision-making.
- Efficient employment hinges on the relationship between the wage rate and the MRP.

## Impact of Wages and Market Conditions

Wages play a critical role in determining employment levels:
- High wages can restrict employment, reducing output but increasing costs.
- Low wages encourage higher employment and output, boosting revenue.

Market fluctuations affecting wages or the price of output can significantly alter the firm's optimal employment level.

## Limitations and Real-World Considerations

While the theoretical framework provides clarity, real-world firms face additional complexities:

- Diminishing marginal returns: As more workers are hired, MP tends to decrease, impacting MRP.
- Fixed costs and other inputs: Not all costs are variable; fixed costs affect overall profitability.
- External factors: Market demand, technological changes, and labor regulations influence decision-making.

Firms must adapt their strategies based on these factors, balancing marginal analysis with broader operational considerations.

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# Conclusion: Strategic Implications for Firms in Perfect Competition

The scenario of a competitive firm selling its output at $30 per unit, with the marginal product of the 10th worker being 20 units, encapsulates core principles of microeconomic theory. It underscores the fundamental role of marginal analysis—specifically, how marginal revenue and marginal product guide employment and production decisions.

By understanding the relationship between output, revenue, and costs, firms can

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