13   **26.982**
Al
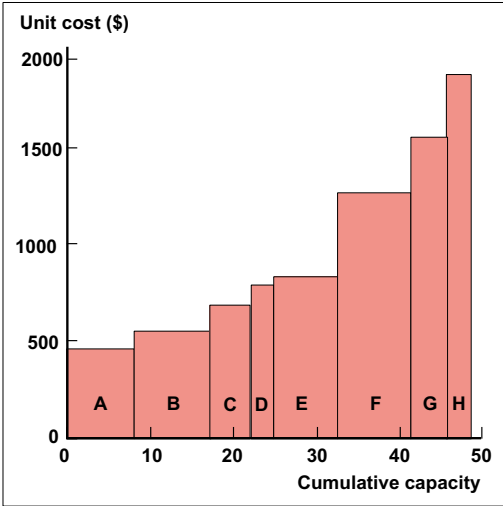**Aluminum**
[Ne]3s²3p¹
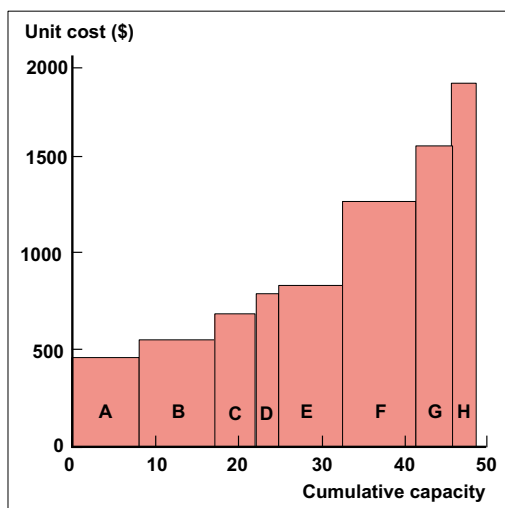Post-Transition Metal

YANHAI ALUMINUM: BUILDING AN INDUSTRY SUPPLY CURVE

RC STRATEGY

SECTIONS B & C

FALL 2025

Industry Supply Curve

- An industry supply curve represents the relationship between the price of a good and the quantity of that good that all the producers in the industry are willing to supply at that price over a specific time period

- Blocks of industry capacity are disaggregated to the extent possible
  - Usually, this disaggregation is done to the plant level. Thus, the same company may have several blocks of capacity on the supply curve, if it is producing the good at multiple locations.
  - The horizontal axis denotes the capacity contributed by the production facility.
  - The vertical axis denotes average unit cost for producing that quantity.

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FALL 2025   2

Industry Supply Curve: Relevant Costs

Unit cost ($)

(Chart: bars A–H showing increasing unit cost vs. Cumulative capacity, y-axis 0 to 2000, x-axis 0 to 50)

- <u>Relevant costs</u>:
  - For *new* plants: the decision is whether to build a new plant; Price > Average Total Cost
  - For *active* plants: the decision is whether to continue operating; Price > Average Non-Sunk Cost (ANSC)
  - For *inactive* plants: the decision is whether to restart production; Price > Average Total Reactivation Costs
- Construct the supply curve, arranging the producers from lowest to highest unit cost
- <u>Equilibrium price for a commodity</u>: Price adjusts until the quantity supplied equals the quantity demanded
  - The resulting price equals the unit cost of the marginal producer (the highest-cost producer needed to meet demand)

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Taxonomy of costs for Aluminum Smelters

	Sunk	**Non-sunk**
Fixed	• Indirect labor (staff) • Rent • Capital costs	• Direct labor (hourly) • Marketing • Maintenance and other • Plant closing costs (negative!)
Marginal	N/A	• Electricity • Alumina • Plant fuel • Consumables • Freight • Financing

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FALL 2025   4

Yanhai Plants' Performance

	Yunnan	Binzhou	Huimin	Zouping
Price ($/T)	1811	1811	1811	1811
Average Total Cost ($/T)	2147	1885	1904	1808
Profit Margin ($/T)	(336)	(74)	(93)	3

Shut down all but Zouping?

No. For plants in operation, the relevant cost is ANSC, not ATC.

	Yunnan	Binzhou	Huimin	Zouping
Price ($/T)	1811	1811	1811	1811
Average Non-Sunk Cost ($/T)	1857	1685	1688	1635
P - ANSC ($/T)	(46)	126	123	176

Shut down Yunnan?

No. If shutdown is contemplated, we must take closing cost into consideration as well.

	Yunnan	Binzhou	Huimin	Zouping
Price ($/T)	1811	1811	1811	1811
Average Non-Sunk Cost ($/T)	1857	1685	1688	1635
Closing Cost ($/T)	250	322		
P-ANSC+CC ($/T)	204	448		

Industry Supply Curve: Limitations and Extensions of the Model

- We made some simplifying assumptions in developing the supply curve:
  - We assumed the average unit cost is the same within each block of capacity.
    If it varies, we will have right angled trapezoids, rather than rectangles, as the components of the supply curve.
  - We assumed suppliers don't incur any additional costs beyond the production cost.
    Typically, for voluminous and heavy materials, transport costs are also a significant component of total cost.
  - We assumed closing cost to be an annual expense.
    If we expect the smelter to be closed over multiple years, we should distribute the closing cost over time
  - We assumed a global market.
    However, different geographies may have distinct markets.
    Movement of goods across geographical borders incurs costs, including transportation cost and tariffs.
  - We assumed that the market comprises only buyers and sellers.
    However, there often are intermediaries, who take on activities, such as transportation, stocking, value addition, etc.
    They charge a margin for these activities, creating a gap between the price the consumer pays and the price the supplier receives.
  - We assumed that the markets for new and recycled aluminum are distinct.
    However, both new and recycled aluminum can be used in several applications.
    Often, a major competitor to a durable good manufacturer is the past output of the same durable good (Coase conjecture, 1972).