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Lecture 3: Supply

September 10, 2024

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- 1. Administrative Notes
- 2. Ripped from headlines
- 3. Chapter 3: Supply
 - 3.1 Individual supply
 - 3.2 Decisions and supply
 - 3.3 Market supply
 - 3.4 What shifts supply?
 - 3.5 Shifts vs movements along supply curves

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Course Administration

1. Ripped from Headlines sign-up

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- You are responsible for being on the schedule
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- 2. Final exam: December 17, times should be same as class
- 3. If you didn't respond to poll, please send email

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• Annie Tuttle: great student from last year

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- 8. Problem Set 3 posted as an assignment

Decisions and S

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- 8. Problem Set 3 posted as an assignment
- 9. Any other questions or outstanding issues?



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Sunk Cost Fallacy Examples from PS 1

Reminder: What is the sunk cost fallacy?

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Sunk Cost Fallacy Examples from PS 1

Reminder: What is the sunk cost fallacy? Clear and popular examples

- We need to keep investing in CA's high speed rail because we have already spent so much on it
- It was wrong to cancel congestion pricing in NYC, because the MTA had already spent so much on setting up the monitoring system

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- Better if the article does not have the words "sunk cost fallacy"

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More ambiguous examples

• Keeping JD Vance on Republican ticket despite Trump regrets

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More ambiguous examples

- Keeping JD Vance on Republican ticket despite Trump regrets
- Further investment in Purple Line in Maryland, despite huge cost overruns

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More ambiguous examples

- Keeping JD Vance on Republican ticket despite Trump regrets
- Further investment in Purple Line in Maryland, despite huge cost overruns
- "continued reliance on fossil fuels by the Biden Administration in order to keep swing voters happy at the gas pumps."

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How What You're Learning is Policy-Relevant

Ripped from Headlines presentation(s)

As a reminder, next week Send the article by Wednesday midnight for approval

Afternoon, joint presentation

Finder	Presenter	
Riddhi P.	Matt W.	
Emma D.	Laiba	

Evening, individual presentations

Finder	Presenter
Sydney M.	Elizabeth A.
Baylee W.	Joseph F.

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Today's Ripped from the Headlines

Afternoon		
Finder	Presenter	
Katya	Max	
Evening		
Finder	Presenter	
Max S.	Katya F.	
Rimsha A.	Yemi Fadahunsi	
	Amanda K.	





- 1. Individual supply
- 2. Decisions and supply
- 3. Market supply
- 4. What shifts supply?
- 5. Shifts vs movements along supply curves

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Ch. 3: 1. Individual Supply

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Where We're Going

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- Want to understand the role of policy tools to impact
 - individual behavior
 - prices
 - firm behavior
- To do this, we need a theory to predict how consumers and firms will respond
- $\bullet\,\rightarrow$ Describe actions in terms of demand and supply
- · Assumptions and framework give us ability to make predictions



Where We're Going

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- Want to understand the role of policy tools to impact
 - individual behavior
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- To do this, we need a theory to predict how consumers and firms will respond
- ullet ightarrow Describe actions in terms of demand and supply
- Assumptions and framework give us ability to make predictions
- Last lecture was demand
- Today is supply
- Lecture 4 is how they interact



Demand

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Demand

- price
- income
- prices of other goods
- your preferences or tastes
- network or congestion effects
- number of consumers in the market
- expectations

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- costs
- costs

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You as a Supplier of Market Labor

What determines how many hours you are willing to supply?





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You as a Supplier of Market Labor

What determines how many hours you are willing to supply?

- wage you are offered
- opportunity costs of your time: friends, family, netflix, etc
- future benefit from position
- and others I am sure you'll tell me

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Goal: Describe Supply

How many apples do you want to sell as price changes? Apples store well!





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Goal: Describe Supply

How many apples do you want to sell as price changes? Apples store well!

We hold **everything else** constant. What is everything else?



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Goal: Describe Supply

How many apples do you want to sell as price changes? Apples store well!

We hold **everything else** constant. What is everything else?

- wages of apple pickers
- cost of apple storage
- cost of getting apples to final sales point
- price of apple cider

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Making a supply o	curve for apples
P: Price of apples/lb	Q: Lbs of apples
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Goal: Describe Supply

	Making a supply curve for apples	
How many apples do you want to sell as price changes? Apples store well!	P: Price of apples/lb	Q: Lbs of apples
We hold everything else constant. What is everything else?	\$5 \$4.50	5
 wages of apple pickers 		
 cost of apple storage 		
 cost of getting apples to final sales point 		

• price of apple cider

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	Making a supply curve for apples	
How many apples do you want to sell as price changes? Apples store well!	P: Price of apples/lb	Q: Lbs of apples
We hold everything else constant. What is everything else?	\$5 \$4.50	5 4.58
 wages of apple pickers 		
 cost of apple storage 		
 cost of getting apples to final sales point 		
 price of apple cider 		

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We hold everything else constant. What is everything else?	\$5 \$4.50 \$4	5 4.58
 wages of apple pickers cost of apple storage cost of apple storage 		

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 1: Indiv. Supply
 2: Decisions

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point

• price of apple cider

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	Making a supply curve for apples	
How many apples do you want to sell as price changes? Apples store well!	P: Price of apples/lb	Q: Lbs of apples
We hold everything else constant. What is everything else?	\$5 \$4.50	5 4.58
 wages of apple pickers 	54	4.17
 cost of apple storage 		
 cost of getting apples to final sales 		

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	Making a supply curve for apples	
How many apples do you want to sell as price changes? Apples store well!	P: Price of apples/lb	Q: Lbs of apples
 We hold everything else constant. What is everything else? wages of apple pickers cost of apple storage 	\$5 \$4.50 \$4 \$3.50	5 4.58 4.17

- cost of getting apples to final sales point
- price of apple cider

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	Making a supply curve for apples	
How many apples do you want to sell as price changes? Apples store well!	P: Price of apples/lb	Q: Lbs of apples
We hold everything else constant. What is everything else?	\$5 \$4.50	5 4.58
wages of apple pickerscost of apple storage	\$4 \$3.50	4.17 3.75

- cost of getting apples to final sales point
- price of apple cider
1: Indiv. Supply

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• price of apple cider

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Goal: Describe Supply

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How many apples do you want to sell as price changes? Apples store well!	P: Price of apples/lb	Q: Lbs of apples
We hold everything else constant. What is everything else?	\$5 \$4.50	5 4.58
wages of apple pickerscost of apple storage	\$4 \$3.50 \$3	4.17 3.75
 cost of getting apples to final sales 		

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How many apples do you want to sell as price changes? Apples store well!	P: Price of apples/lb	Q: Lbs of apples
We hold everything else constant. What is everything else?	\$5 \$4.50	5 4.58
• wages of apple pickers	\$4 \$3.50	4.17 3.75
 cost of apple storage cost of getting apples to final sales 	\$3	3.33

• price of apple cider

point

1: Indiv. Supply

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	Making a supply curve for apples	
How many apples do you want to sell as price changes? Apples store well!	P: Price of apples/lb	Q: Lbs of apples
We hold everything else constant. What is everything else?	\$5	5
	\$4.50	4.58
• wages of apple pickers	\$4	4.17
wages of apple pickerscost of apple storage	\$3.50	3.75
	\$3	3.33
 cost of getting apples to final sales 	\$2.50	2.91
point	\$2	2.5
 price of apple cider 	\$1.50	don't sell
	\$1	don't sell



Graphing Individual Supply

- Put *P* on the y axis
- Put Q on the x axis
- No reason, just a rule



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Graphing Individual Supply

Supply curve for apples		
P: Price of apples/lb	Q: Lbs of apples	
\$5	5	
\$4.50	4.58	
\$4	4.17	
\$3.50	3.75	
\$3	3.33	
\$2.50	2.91	
\$2	2.5	
\$1.50	don't sell	
\$1	don't sell	

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Graphing Individual Supply

Supply curve for app	les	6
P: Price of apples/lb	Q: Lbs of apples	5
\$5	5	4
\$4.50	4.58	
\$4	4.17	- <u>8</u> 3
\$3.50	3.75	ā
\$3	3.33	2
\$2.50	2.91	
\$2	2.5	1
\$1.50	don't sell	
\$1	don't sell	
		quantity

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Shape of Supply Curves

- 1. Supply curves report on firm choice as price changes, all else held constant
- 2. Supply curves may be flat or slope upward
- 3. They **never** slope downward
 - why?



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Ch. 3: 2. Individual Firm Decisions and the Supply Curve

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What Price Does a Firm Charge?

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- We assume a perfectly competitive market
 - Not because this is realistic, but because it is a clear baseline
 - Almost all markets have some competition and understanding its role is crucial

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- Perfectly competitive market
 - 1. All businesses selling an identical good
 - 2. Many sellers and buyers, each of whom is small relative to the market

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- Perfectly competitive firms are price takers why?
 - price taker \equiv firm takes market price as given
- Price taking firm has no power to determine the market price

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 - firm charges \$3.25 what happens?

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 - why can't firm charge \$2.75?

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 - suppose the market price is \$3/pound of apple
 - firm charges \$3.25 what happens?
 - why can't firm charge \$2.75?
- \rightarrow Competitive firm charges the market price



How Much Does the Firm Choose to Supply?

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• Just like consumers, firms want to supply until

marginal benefit of supplying = marginal cost of supplying

- What is a firm's marginal cost?
 - additional cost to produce one additional unit
 - Example, please!

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How Much Does the Firm Choose to Supply?

• Just like consumers, firms want to supply until

marginal benefit of supplying = marginal cost of supplying

- What is a firm's marginal cost?
 - additional cost to produce one additional unit
 - Example, please!
- What is the firm's marginal benefit of supplying?
 - revenue it gets from selling one additional unit



Total Costs = Fixed Costs + Variable Costs

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Fixed costs

- Costs the firm incurs to produce just the first unit
- Examples, please!



Total Costs = Fixed Costs + Variable Costs

Fixed costs

- Costs the firm incurs to produce just the first unit
- Examples, please!
- Can fixed costs be marginal costs?



Total Costs = Fixed Costs + Variable Costs

Fixed costs

- Costs the firm incurs to produce just the first unit
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All Kinds of Costs

Total Costs = Fixed Costs + Variable Costs

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Variable costs

- Costs that change as the number of units produced changes
- Examples, please!

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All Kinds of Costs

Total Costs = Fixed Costs + Variable Costs

Fixed costs

- Costs the firm incurs to produce just the first unit
- Examples, please!
- Can fixed costs be marginal costs? No

Variable costs

- Costs that change as the number of units produced changes
- Examples, please!
- Can variable costs be marginal costs?

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All Kinds of Costs

Total Costs = Fixed Costs + Variable Costs

Fixed costs

- Costs the firm incurs to produce just the first unit
- Examples, please!
- Can fixed costs be marginal costs? No

Variable costs

- Costs that change as the number of units produced changes
- Examples, please!
- Can variable costs be marginal costs? Yes

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How Much Should Firms Sell to Maximize Profits?



Marginal benefits and costs in a figure

• for which Q are MB > MC?

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Marginal benefits and costs in a figure

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• should the firm sell more?

How Much Should Firms Sell to Maximize Profits?



Marginal benefits and costs in a figure

• for which Q are MB > MC?

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- should the firm sell more?
- for which Q are MB = MC?

How Much Should Firms Sell to Maximize Profits?



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How Much Should Firms Sell to Maximize Profits?



Marginal benefits and costs in a figure

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4: S Shift

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- for which Q are MB = MC?
- should the firm sell more?
- for which Q are MB < MC?

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How Much Should Firms Sell to Maximize Profits?



Marginal benefits and costs in a figure

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How Much Should Firms Sell to Maximize Profits?



Marginal benefits and costs in a figure

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4: S Shift

- should the firm sell more?
- for which Q are MB = MC?
- should the firm sell more?
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- should the firm sell more?

Firm maximizes profits where MB = MC

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Explaining Firm's Maximization in a Different Way

• What is the marginal benefit to the firm of producing one extra unit?



Explaining Firm's Maximization in a Different Way

- What is the marginal benefit to the firm of producing one extra unit?
 - what it gets for selling that unit: the price of that last unit
 - \rightarrow firm's marginal benefit = price



Explaining Firm's Maximization in a Different Way

- What is the marginal benefit to the firm of producing one extra unit?
 - what it gets for selling that unit: the price of that last unit
 - \rightarrow firm's marginal benefit = price
- \rightarrow Perfectly competitive firm sells until marginal cost = marginal benefit (= price)



Supply Curve Defined by Marginal Costs

- Supply curve is willingness to sell
- Moving up and down supply curve shows willingness to sell
- If supply is upward sloping, firms' willingness to sell more units requires more per unit compensation
- If market is competitive, this is because as firms produce more, marginal cost increases

What Makes Marginal Costs Increase as Output Increases?

- 1. Diminishing marginal product \rightarrow rising marginal costs
 - Marginal product
 - marginal product \equiv additional output from an additional unit of input

- hold all other inputs constant
- example of marginal product?

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4: S Shift

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4: S Shift

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 - hold all other inputs constant
 - example of marginal product?
 - Diminishing marginal product \equiv marginal product that decreases for each additional unit of input
 - Why might this happen?
 - short run: inputs are fixed
 - long run: hard to find enough of the good inputs
- 2. Rising input costs \rightarrow rising marginal costs
 - intuition is that supply of good inputs is limited
 - you may need to increase price you pay for these inputs if you purchase more

4. S Shift

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Policy Aside: Costs Drive Behavior

Firms' behavior driven by costs

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Policy Aside: Costs Drive Behavior

What tools does government have to modify firm costs?

Firms' behavior driven by costs

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Policy Aside: Costs Drive Behavior

What tools does government have to modify firm costs?

- subsidies
- taxes
- infrastructure
- regulation

Firms' behavior driven by costs

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Policy Aside: Costs Drive Behavior

What tools does government have to modify firm costs?

subsidies

regulation

- taxes
- infrastructure

- Firms' behavior driven by costs
 - supply curve defined by costs

How may government indirectly modify firm costs?

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Policy Aside: Costs Drive Behavior

What tools does government have to modify firm costs?

- subsidies
- taxes
- infrastructure
- regulation

How may government indirectly modify firm costs?

- subsidy in one market spills over
- US anti-Russian oil embargo changes input costs for Indian manufacturers
- Google antitrust lawsuit helps Google competitors

Firms' behavior driven by costs

Ch. 3: 3. Market Supply

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	Firm 1	Firm 2	Firm 3	Total
P: Price of apples/lb	Q_1	<i>Q</i> ₂	Q_3	Q_T
\$5	5	4.0	5.5	
\$4.50	4.58	3.9	5.2	
\$4	4.17	3.7	4.9	
\$3.50	3.75	3.4	4.5	
\$3	3.33	3.3	4.2	
\$2.50	2.9	3	3.7	
\$2	2.5	2.7	3.3	
\$1.50	2.1	2.4	2.6	
\$1	1.7	2.1	1	

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	Firm 1	Firm 2	Firm 3	Total
P: Price of apples/lb	Q_1	Q_2	Q_3	Q_T
\$5	5	4.0	5.5	

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	Firm 1	Firm 2	Firm 3	Total
P: Price of apples/lb	Q_1	Q_2	Q_3	Q_T
\$5	5	4.0	5.5	14.5

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	Firm 1	Firm 2	Firm 3	Total
P: Price of apples/lb	Q_1	<i>Q</i> ₂	Q_3	Q_T
\$5	5	4.0	5.5	14.5
\$4.50	4.58	3.9	5.2	

	Firm 1	Firm 2	Firm 3	Total
P: Price of apples/lb	Q_1	<i>Q</i> ₂	Q_3	Q_T
\$5	5	4.0	5.5	14.5
\$4.50	4.58	3.9	5.2	13.6

	Firm 1	Firm 2	Firm 3	Total
P: Price of apples/lb	Q_1	Q_2	Q_3	Q_T
\$5	5	4.0	5.5	14.5
\$4.50	4.58	3.9	5.2	13.6
\$4	4.17	3.7	4.9	12.7

Admin	RFH	1: Indiv. Supply	2: Decisions and S	3: Market S	4: S Shift	4: S Shift
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	Firm 1	Firm 2	Firm 3	Total
P: Price of apples/lb	Q_1	Q_2	Q_3	Q_T
\$5	5	4.0	5.5	14.5
\$4.50	4.58	3.9	5.2	13.6
\$4	4.17	3.7	4.9	12.7
\$3.50	3.75	3.4	4.5	11.7

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	Firm 1	Firm 2	Firm 3	Total
P: Price of apples/lb	Q_1	<i>Q</i> ₂	Q_3	Q_T
\$5	5	4.0	5.5	14.5
\$4.50	4.58	3.9	5.2	13.6
\$4	4.17	3.7	4.9	12.7
\$3.50	3.75	3.4	4.5	11.7
\$3	3.33	3.3	4.2	10.7

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	Firm 1	Firm 2	Firm 3	Total
P: Price of apples/lb	Q_1	Q_2	Q_3	$Q_{\mathcal{T}}$
\$5	5	4.0	5.5	14.5
\$4.50	4.58	3.9	5.2	13.6
\$4	4.17	3.7	4.9	12.7
\$3.50	3.75	3.4	4.5	11.7
\$3	3.33	3.3	4.2	10.7
\$2.50	2.9	3	3.7	9.7
\$2	2.5	2.7	3.3	8.5
\$1.50	2.1	2.4	2.6	7.1
\$1	1.7	2.1	1	4.7

Market Supply

					Firm 1, Firm 2, Firm 3 and market supply
	F 1	F 2	F 3	Total	5
<i>P</i> : Price/lb	Q_1	Q_2	Q_3	Q_{T}	4
\$5	5	4.0	5.5	14.5	8 2
\$4.50	4.58	3.9	5.2	13.6	ie s
\$4	4.17	3.7	4.9	12.7	2
\$3.50	3.75	3.4	4.5	11.7	
\$3	3.33	3.3	4.2	10.7	1
\$2.50	2.9	3	3.7	9.7	
\$2	2.5	2.7	3.3	8.5	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
\$1.50	2.1	2.4	2.6	7.1	quantity
\$1	1.7	2.1	1	4.7	Where is Firm 2's supply?

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					Firm 1. Firm 2. Firm 3 and market supply
	F 1	F 2	F 3	Total	5
<i>P</i> : Price/lb	Q_1	Q_2	Q_3	Q_{T}	4
\$5	5.5	1.66	2.5	9.66	8.
\$4.50	5.1	1.5	2.25	8.85	E S
\$4	4.6	1.33	2	7.93	2
\$3.50	4.2	1.17	1.75	7.12	4
\$3	3.5	1	1.5	6	1
\$2.50	2.8	0.83	1.25	4.88	
\$2	5	0.66	1	6.66	
\$1.50	2.1	2.4	2.6	7.1	quantity
\$1	1.7	2.1	1	4.7	Where is Firm 3's supply?

					Firm 1, Firm 2, Firm 3 and market supply
	F 1	F 2	F 3	Total	5
<i>P</i> : Price/lb	Q_1	Q_2	Q_3	Q_T	4
\$5	5.5	1.66	2.5	9.66	8.
\$4.50	5.1	1.5	2.25	8.85	ie s
\$4	4.6	1.33	2	7.93	2
\$3.50	4.2	1.17	1.75	7.12	
\$3	3.5	1	1.5	6	1
\$2.50	2.8	0.83	1.25	4.88	
\$2	5	0.66	1	6.66	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
\$1.50	2.1	2.4	2.6	7.1	quantity
\$1	1.7	2.1	1	4.7	Where will the market supply go?

	F 1	F 2	F 3	Total	Firm 1, Firm 2, Firm 3 and market supply
<i>P</i> : Price/lb	Q_1	Q_2	Q_3	Qτ	5
\$5	5.5	1.66	2.5	9.66	- 4
\$4.50	5.1	1.5	2.25	8.85	. <u>8</u> 3.
\$4	4.6	1.33	2	7.93	
\$3.50	4.2	1.17	1.75	7.12	2
\$3	3.5	1	1.5	6	
\$2.50	2.8	0.83	1.25	4.88	1
\$2	5	0.66	1	6.66	
\$1.50	2.1	2.4	2.6	7.1	
\$1	1.7	2.1	1	4.7	quantity



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4: S Shift

Market Supply Curve is Upward Sloping: Why?

- 1. Higher prices cause existing firms to supply more
- 2. Higher prices invite firms into an industry



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4: S Shift

Market Supply Curve is Upward Sloping: Why?

- 1. Higher prices cause existing firms to supply more
- 2. Higher prices invite firms into an industry

Can you think of any examples of high prices luring firms into a market?

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What Causes Movement Along the Supply Curve?

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What Causes Movement Along the Supply Curve?

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What Causes Movement Along the Supply Curve?



A change in price causes a **movement** along the supply curve, yielding a change in the quantity supplied.

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Ch. 2: 4. What Shifts Supply Curves?

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Before Shifting the Supply Curve

Until now

- We held everything else constant
- We asked what happened when price changes
- This is a movement **along** the supply curve



4: S Shift

What Shifts Supply Curves?

Now: what shifts the supply curve?



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What Shifts Supply Curves?

What if we don't hold everything else constant? What might change your firm's supply of apples?



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4: S Shift

What Shifts Supply Curves?

What if we don't hold everything else constant? What might change your firm's supply of apples?

- 1. input prices
- 2. productivity and technology
- 3. prices of related outputs

- 4. expectations
- 5. type and number of other sellers

1. Change in Input Prices

Which curve has higher input prices?



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2. Which Firm Has Better Technology?

Which curve has better technology?



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3. What Happens When Related Market Changes?

Price of apple cider collapses. What happens to supply curve for apples?





4. What Happens When Expectations Change?

Very bad rain this year, suggesting bad apple crop next year. How does supply this year respond?



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4: S Shift



5. What if the Number of Sellers Declines?

Number of apple sellers declines. What happens?



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Ch. 2: 5. Recap: Shifts vs. Movements Along the Supply Curve

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Recap: Shifts vs Movements

Change in Quantity Supplied

Change in Supply Itself

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Recap: Shifts vs Movements

Change in Quantity Supplied

Changes in price cause changes in quantity supplied.



Change in Supply Itself

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Recap: Shifts vs Movements

Change in Quantity Supplied

Changes in price cause changes in quantity supplied.





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For Next Class

- Do problem set 3
- Work with classmates, me or TA on problems
- Check Ripped from Headlines assignments
- Article finders email me by Wednesday midnight
- Read Chapter 4



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l will

- post these lecture notes on my webpage
- post link to lecture recording on Blackbolard
- anything else?