Announcements

Aplia experiments this week.
Times for large lectures:
001AL Fri 9:05-9:30 am
001MZ Fri 9:30-9:55 am
017AL Fri 10:10-10:35 am
017MZ Fri 10:35-11:00 am
Times for small lectures announced in class.

Note: just go to Aplia.com at the scheduled time. You can log on from anywhere on campus.

Or off campus, anywhere you can get internet!

Lecture

1. Excess Demand and Supply Again

2. Shifting Supply and Demand Curves
(In equilibrium to start. But then S or D shifts, or both. What happens?)
Suppose $P=\$3$:
- $Q$ supplied = 6
- $Q$ demanded = 2
Excess Supply = $6 - 2 = 4$

Suppose $P=\$1$:
- $Q_d = 6$
- $Q_s = 2$
Excess Demand = $6 - 2 = 4$
From now on **assume** the market is in equilibrium.

Look for how the **market price** and quantity change when the market fundamentals change.

Learn about **shifting** demand curve from change in own price.

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**Determinants of Demand**

1. **Price**
   - A movement along a demand curve (not a shift!!)
   - $P \downarrow$ implies $Q^D \uparrow$ **(law of demand)**

2. Prices of other goods

3. Income

4. Number of Buyers

5. Consumer tastes
Look at 2: Price of other goods
Back to Demand For Corn

<table>
<thead>
<tr>
<th>Price of corn</th>
<th>$Q^D_{\text{corn}}$ (Oil $40$)</th>
<th>$Q^D_{\text{corn}}$ (Oil $80$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>.50</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>1.00</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>1.50</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>2.00</td>
<td>4</td>
<td>8</td>
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<tr>
<td>2.50</td>
<td>3</td>
<td>7</td>
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<tr>
<td>3.00</td>
<td>2</td>
<td>6</td>
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<tr>
<td>3.50</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>4.00</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

Corn and Oil are **Substitutes**
($P_{\text{Oil}} \uparrow$ implies $Q^D_{\text{corn}} \uparrow$)
Both can be used to fuel cars.
Go back to initial equilibrium in market for corn

(With Supply Curve from earlier in class)

Equilibrium when Oil Price = $40

\[ P_{\text{corn}} = 2, \quad Q_{\text{corn}} = 4 \]

Equilibrium when Oil Price = $80

\[ P_{\text{corn}} = 3, \quad Q_{\text{corn}} = 6 \]

Effect of increase in Oil Price?

Price up, quantity up
### Facts: Avg Prices in June by Year

<table>
<thead>
<tr>
<th>Year</th>
<th>$ Price Barrel of Oil (WTI)</th>
<th>$ Price Bushel of Corn</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>38</td>
<td>2.79</td>
</tr>
<tr>
<td>2005</td>
<td>56</td>
<td>2.03</td>
</tr>
<tr>
<td>2006</td>
<td>71</td>
<td>2.14</td>
</tr>
<tr>
<td>2007</td>
<td>67</td>
<td>3.53</td>
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<tr>
<td>2008</td>
<td>134</td>
<td>5.47</td>
</tr>
<tr>
<td>2009</td>
<td>70</td>
<td>4.01</td>
</tr>
<tr>
<td>2010</td>
<td>75</td>
<td>3.41</td>
</tr>
<tr>
<td>2011</td>
<td>96</td>
<td>6.38</td>
</tr>
<tr>
<td>2012</td>
<td>82</td>
<td>6.37</td>
</tr>
<tr>
<td>2013</td>
<td>96</td>
<td>6.97</td>
</tr>
<tr>
<td>2014</td>
<td>106</td>
<td>4.50</td>
</tr>
<tr>
<td>2015</td>
<td>60</td>
<td>3.58</td>
</tr>
</tbody>
</table>

**Recent Prices of Oil and Corn (August 2004-2015)**

- Compare 2004 and 2008
- Then the crisis 2009
- Then 2014
- Then 2015.
Of course the price of corn depends upon many things besides the price of a substitute good (oil).

**Like supply!**
- 2014 had great corn weather, so no surprising corn price below regression line

**Like income!**
- In June 2008 income growth of developing countries (particularly China) was driving up commodity prices like oil and corn.

What happens to price of corn in US when income of China goes up?
1. Richer China demands more meat, which drives up corn price (feed)
2. Richer China demands more oil, which drives up corn price (for fuel)
What happens when decrease the price of substitute?

Other Substitutes For Corn?

Wheat is a substitute for corn's use as a food.

Sugar is a substitute for corn in two ways.

As food: In U.S. high fructose corn syrup is used to sweeten Coke and Pepsi. In other countries, cane sugar is used instead.

As fuel: In Brazil, sugar is used to make ethanol.
1. **Own Price** (A movement **along** a demand curve)

**Shifters:**

2. **Prices of other goods**
   - \(P_{\text{Substitute}} \uparrow\) implies \(Q^D \uparrow\)
   - \(P_{\text{Complement}} \uparrow\) implies \(Q^D \downarrow\)

Substitute: Use in place of.

Complement: Use together with.

Complements for Corn?
---Butter
---More interesting (and more important): Cars that use ethanol.

3. **Income**

   **Normal Good**
   - Income up, demand more
   - Meat, housing,... (most goods normal)

   **Inferior Good**
   - Income up, demand less. peanut better (cheap way to get calories).
   - Higher income, eat meat instead
   - Note: Goods can be normal for some ranges of income and inferior for other ranges.
   - If really poor, maybe peanut butter is too expensive. Get a little income, start eating peanut butter. Even more income than forget peanut butter and eat something better.
4 Number of Buyers
If the number of potential buyers increases, everything else the same, then the quantity demanded goes up.

5. Consumer tastes
If consumer tastes change in favor of a good, then quantity demanded goes up.

Supply: Depends upon

Own Price (Movement along the Supply Curve)

Shifters:
Prices of the everything used to produce the good (the inputs)---Labor, Materials, Equipment
Example: If immigration cuts price of farm labor $\rightarrow Q^S \uparrow$

Number of sellers
Example: Wheat farmers switching to corn $\rightarrow Q^S \uparrow$

Technology (Example: New seeds or fertilizer invented $\rightarrow Q^S \uparrow$)
When 2 things shift

The Market for Corn

Suppose price of oil goes up.

i) Oil and Corn are substitutes,
so:
Demand shifts up and to the right.

ii) Oil is an input into the production of corn (farmers need it for tractors)
so:
Supply shifts up and to the left
If Just Demand Shifts...

$\uparrow\downarrow$

Just Supply Shifts...

Price of substitute up

$\uparrow\downarrow$

Price of input up
Both Demand and Supply Shift
supply shifts a little

Another Possibility with 2 shifts...
supply shifts a lot
Put this all together:

<table>
<thead>
<tr>
<th></th>
<th>Shifts</th>
<th>$\Delta P_{\text{corn}}$</th>
<th>$\Delta Q_{\text{corn}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price of Substitute</td>
<td>$Q^D$</td>
<td>$\uparrow$</td>
<td>$\uparrow$</td>
</tr>
<tr>
<td></td>
<td>$Q^S$</td>
<td>$\downarrow$</td>
<td>$\downarrow$</td>
</tr>
<tr>
<td>Price of Input</td>
<td>$Q^S$</td>
<td>$\uparrow$</td>
<td>$\downarrow$</td>
</tr>
<tr>
<td>Combined:</td>
<td>$Q^D$, $Q^S$</td>
<td>$\uparrow$</td>
<td>$?$</td>
</tr>
</tbody>
</table>
