AGEC321, Fall 2011

Exam 1: Review

Review Session: September 28, 2011. Linfield Hall 109 – 5:30 p.m. - 7:00 p.m.

1. Supply and Demand Concepts

   In analyzing the following scenarios, be sure to carefully explain and delineate among the following:

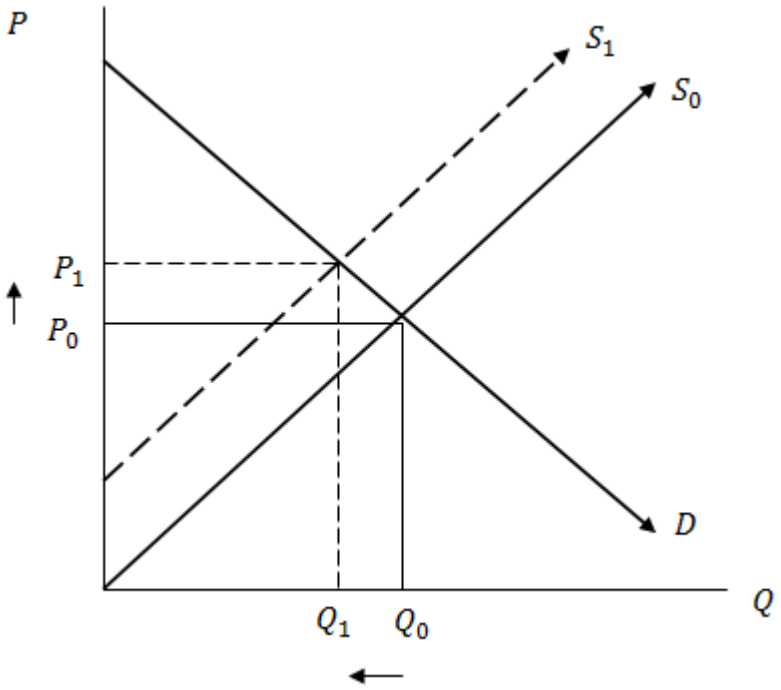
   - Change in supply or demand.
   - Change in quantity supplied or quantity demanded.
   - Change in prices.

   (a) Infestation of the wheat stem sawfly has caused major disruption to the Montana wheat industry. Perform the following:

      i. Using a basic supply and demand diagram, illustrate the effects of the wheat steam sawfly on the Montana wheat markets.

      ii. Show and explain how these effects would be different if the demand for wheat was (i) elastic or (ii) inelastic.

      This is a supply shock caused by a major invasive species outbreak. The supply curve shifts back, causing prices to rise and quantity demanded to decrease.

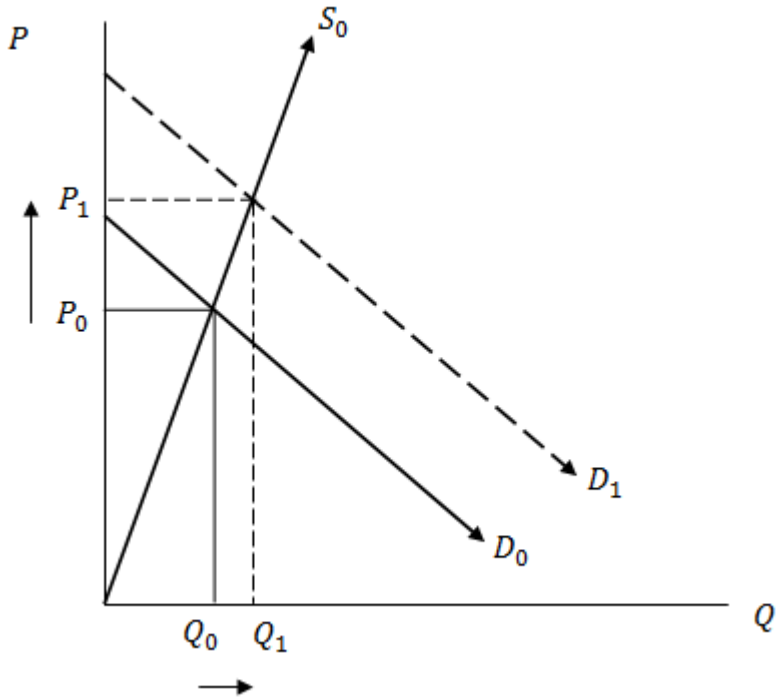


(b) Consumers realize that grass fed cattle is tastier. Perform the following:

i. Using a basic supply and demand diagram, illustrate the effects of consumers' realization on the grass fed cattle market.

ii. Assume that the supply of grass fed cattle is highly inelastic. Illustrate this scenario and explain how the change in consumers' preferences will affect the price and quantity supplied of grass fed cattle.

The change in consumers' tastes and preferences leads to an outward shift of the demand curve. The associated rise in prices leads to a rise in the quantity supplied of grass fed cattle. The inelastic supply of grass fed cattle implies that the rise in price will be greater than the rise in quantity supplied.



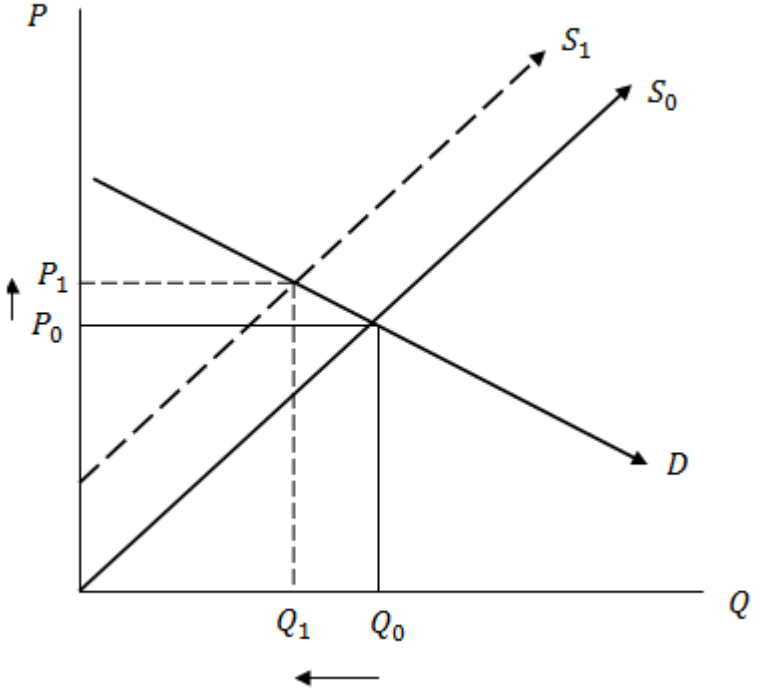
(c) The federal government has ended a subsidy to biodiesel producers.

i. Using a basic supply and demand diagram, illustrate the effects of the subsidy removal on the biodiesel market.

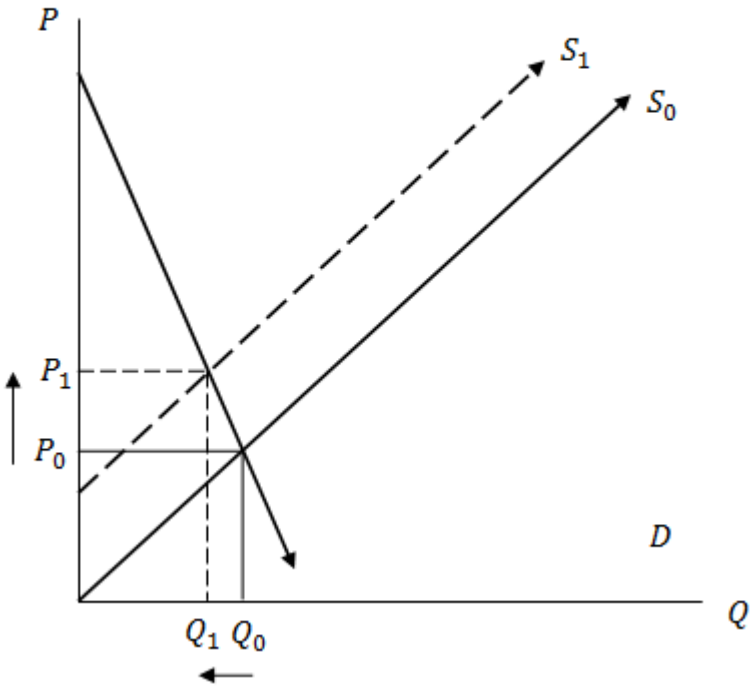
ii. How would the subsidy effects differ depending the elasticity of demand? That is, what would be the magnitude of impacts if the demand for biodiesel was inelastic? What if it's elastic?

The end of the biodiesel subsidy leads to increased costs to biodiesel producers. This causes a shift back of the supply curve, which generally leads to higher prices and a decrease in quantity demanded. If the demand for biodiesel is inelastic (steep), then the consumers will take on most of the price increase because they are willing to pay the higher price. So, the increase in price will be greater than the decrease in quantity. However, an elastic demand curve would imply that the price increase would be substantially less than the decrease in quantity demanded.

Elastic Demand



Inelastic Demand



2. Solving for equilibrium

(a) Suppose that you own a vineyard and produce wine. In order to produce wine, you require grapes, of course. To make one batch of wine, you must incur \$100 worth of costs for growing grapes. In addition, you will need to hire labor to hand-pick the grapes. The labor supply function is $Q_L^S = -50 + P_L$. Also, you need oak barrels in order to store and age the wine. Each barrel is enough to make one batch of wine, and it costs \$200. Lastly, you know that the demand for wine follows the function: $Q_W^D = 250 - \frac{1}{2}P_W$. Solve for the following:

i. Equilibrium quantity of wine.

$$Q^*_{wine} = 50$$

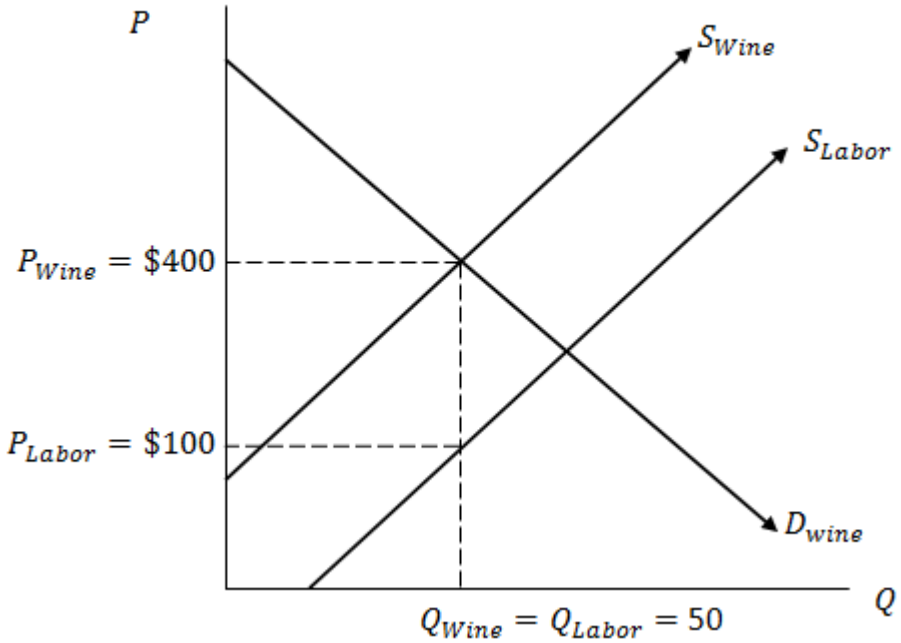
ii. Equilibrium price of wine.

$$P^*_{wine} = \$400$$

iii. Equilibrium price and quantity of labor.

$$Q^*_{labor} = 50, \qquad P^*_{labor} = \$100$$

iv. Illustrate the demand and supply of wine *and* the supply of labor on a single supply and demand diagram. Then, mark the equilibrium quantities and prices of wine and labor.



(b) Suppose that you produce alfalfa hay. To produce a load of hay, you need to grow the alfalfa, collect it using a combine, and bind it using wire. Fertilizer price depends on how much fertilizer you wish to purchase: $P_F = Q_F + 50$. Furthermore, combine costs for each load of hay are \$500 and wire costs are \$50. Lastly, you know that the demand for alfalfa hay follows the function: $Q_H^D = 240 - \frac{1}{5}P_H$.
Solve for the following:

i. Equilibrium quantity of hay.

$$Q^*_{hay} = 100$$

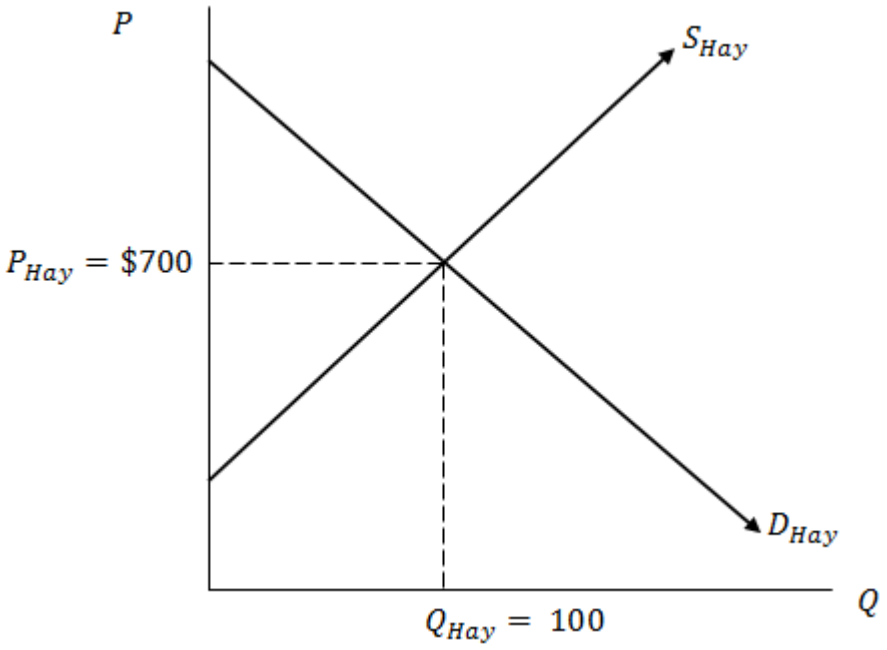
ii. Equilibrium price of hay.

$$P^*_{hay} = \$700$$

iii. Equilibrium price and quantity of labor.

$$Q^*_{labor} = 0, \qquad P^*_{labor} = \$0$$

iv. Illustrate the demand and supply of hay *and* the supply of labor on a single supply and demand diagram. Then, mark the equilibrium quantities and prices of hay and labor.



(c) Suppose that you produce soybean meal. In order to produce one batch of soybean meal, you require 10 bushels of soybeans, which you can purchase at \$10.00 per bushel. Furthermore, you must incur \$100 worth of crushing (machinery) costs and hire labor to operate the machinery. The labor supply function is $Q_L^S = -100 + 2P_L$. Lastly, you know that the demand for soybean meal follows the function: $Q_{SM}^D = 250 - \frac{1}{2}P_{SM}$.

Solve for the following:

i. Equilibrium quantity of soybean meal.

$$Q_{sm}^* = 100$$

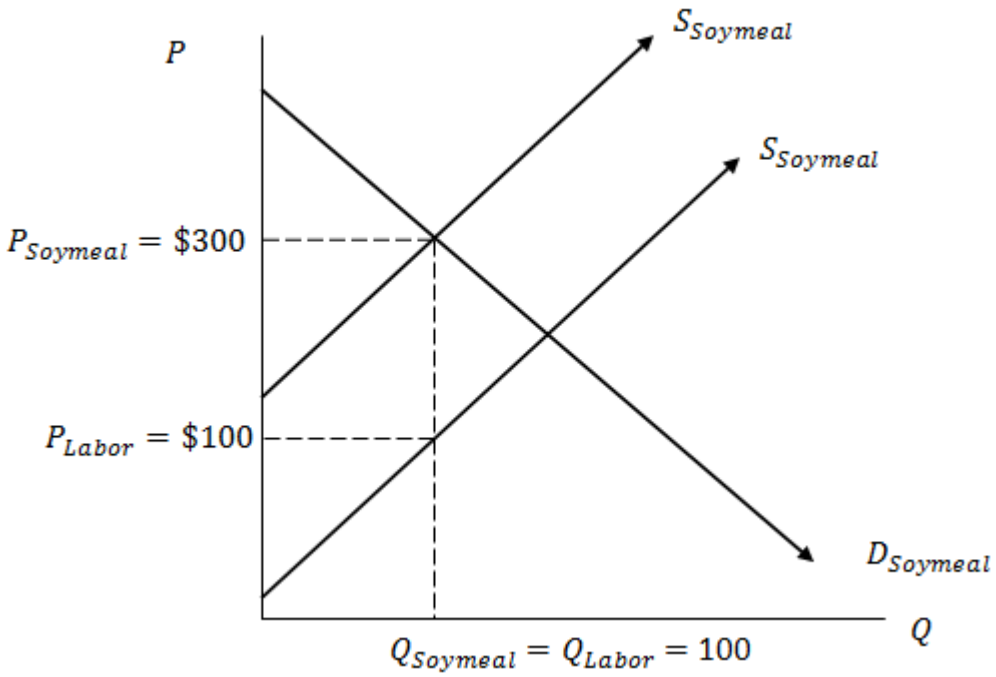
ii. Equilibrium price of soybean meal.

$$P_{sm}^* = \$300$$

iii. Equilibrium price and quantity of labor.

$$Q^*_{labor} = 100, \qquad P^*_{labor} = \$100$$

iv. Illustrate the demand and supply of soybean meal *and* the supply of labor on a single supply and demand diagram. Then, mark the equilibrium quantities and prices of soybean meal and labor.



3. Elasticities of Demand and Supply

In each part, perform the following:

(a) Solve for the quantity demanded or quantity supplied (depending on whether you are given a supply or demand function).

(b) Solve for the own-price elasticity.

(c) Solve for all cross-price/cross-factor elasticities.

(d) Interpret the elasticities in (a) and (b). That is, tell me how you would interpret your result (be specific and use the value you calculated).

- Does the own-price elasticity reveal the demand/supply elastic or inelastic? Why?

- Does the cross-price/cross-factor elasticity reveal the a product is a substitute or complement? Why?

(a) Demand for soda:

$$Q^D_{soda} = 100 - 10P_{soda} - 2P_{pizza} + 2P_{juice} + 0.01 \cdot Income$$

$$P_{soda} = \$2.00, \qquad P_{pizza} = \$10, \qquad P_{juice} = \$5.00, \qquad Income = \$5,000$$

- $\varepsilon^D_{Q_{soda},P_{soda}} = -\frac{1}{6}$

  The elasticity implies that a 1% rise in P_{soda} will lead to a $\frac{1}{6}$% decrease in the quantity demanded of soda. This elasticity of demand is *inelastic*, implying that a change in quantity demanded will change less than the change in price.

- $\varepsilon^D_{Q_{soda},P_{pizza}} = -\frac{1}{6}$

  The elasticity implies that a 1% rise in P_{pizza} will lead to a $\frac{1}{6}$% decrease in the quantity demanded of soda. This elasticity of demand is *inelastic*, implying that a change in quantity demanded will change less than the change in price.

- $\varepsilon^D_{Q_{soda},P_{juice}} = \frac{1}{12}$

  The elasticity implies that a 1% rise in P_{juice} will lead to a $\frac{1}{12}$% increase in the quantity demanded of soda. This elasticity of demand is *inelastic*, implying that a change in quantity demanded will change less than the change in price.

- $\varepsilon^D_{Q_{soda},Income} = \frac{5}{12}$

  The elasticity implies that a 1% rise in $Income$ will lead to a $\frac{5}{12}$% increase in the quantity demanded of soda. This elasticity of demand is *inelastic*, implying that a change in quantity demanded will change less than the change in price.

(b) Supply of cotton:

$$Q^S_{cotton} = 400 + 250P_{cotton} - 50P_{polyester} - 50P_{corn} + Rain$$

$$P_{cotton} = \$1.00, \qquad P_{polyester} = \$10, \qquad P_{corn} = \$4, \qquad Rain = 100\ cm.$$

- $\varepsilon^S_{Q_{cotton},P_{cotton}} = 5$

  The elasticity implies that a 1% rise in P_{cotton} will lead to a 5% increase in the quantity supplied of cotton. This elasticity of supply is *elastic*, implying that a change in quantity supplied will change more than the change in price.

- $\varepsilon^S_{Q_{cotton},P_{poly}} = -10$

  The elasticity implies that a 1% rise in P_{poly} will lead to a 10% decrease in the quantity supplied of cotton. This elasticity of supply is *elastic*, implying that a change in quantity supplied will change more than the change in price.

- $\varepsilon^S_{Q_{cotton},P_{corn}} = -4$

  The elasticity implies that a 1% rise in P_{corn} will lead to a 4% decrease in the quantity supplied of cotton. This elasticity of supply is *elastic*, implying that a change in quantity supplied will change more than the change in price.

- $\varepsilon^S_{Q_{cotton},Rain} = 2$

  The elasticity implies that a 1% rise in $Rain$ will lead to a 2% increase in the quantity supplied of cotton. This elasticity of supply is *elastic*, implying that a change in quantity supplied will change more than the change in price.

(c) Demand for sugar beets:

$$Q^D_{beets} = 250 - 2P_{beets} + 4P_{cane\ sugar} + 1.5P_{honey}$$

$$P_{beets} = \$100, \qquad P_{cane\ sugar} = \$25, \qquad P_{honey} = \$100$$

- $\varepsilon^D_{Q_{beets},P_{beets}} = -\frac{1}{6}$

The elasticity implies that a 1% rise in P_{beets} will lead to a $\frac{2}{3}$% decrease in the quantity demanded of beets. This elasticity of demand is *inelastic*, implying that a change in quantity demanded will change less than the change in price.

- $\varepsilon^{D}_{Q_{beets},P_{sugar}} = \frac{1}{3}$

  The elasticity implies that a 1% rise in P_{sugar} will lead to a $\frac{1}{3}$% increase in the quantity demanded of beets. This elasticity of demand is *inelastic*, implying that a change in quantity demanded will change less than the change in price.

- $\varepsilon^{D}_{Q_{beets},P_{honey}} = \frac{1}{2}$

  The elasticity implies that a 1% rise in P_{honey} will lead to a $\frac{1}{2}$% increase in the quantity demanded of beets. This elasticity of demand is *inelastic*, implying that a change in quantity demanded will change less than the change in price.

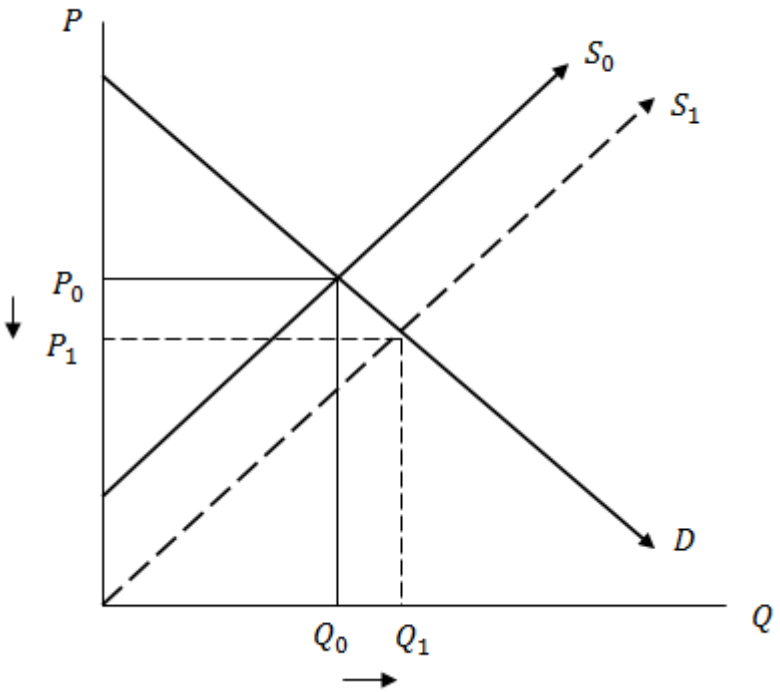
4. Putting it all together

   On September 22, 2010, Bruce Blythe of Vance Publishing reported that "Wal-Mart Stores, Inc., will step up expansion efforts in large U.S. cities, adding smaller 'neighborhood' stores offering fresh meats, dairy products and produce as the world's biggest retailer tries to prop up sagging sales. Bill Simon, chief executive officer of Wal-Mart's U.S. operations, earlier this month said the retailer must be more 'creative' with its store formats as the company expands beyond rural and suburban areas into denser urban markets. Fresh groceries are expected to continue to be a key part of Wal-Mart's urban expansion."

   Wal-Mart is known for low prices on many of their products, often due to the economies of scale advantages the company enjoys.

   (a) Intuitively analyze the market condition described in the report. Using a basic supply and demand diagram, illustrate and explain what would happen to fresh meats, dairy products, etc. products in urban neighborhoods. What would happen to existing neighborhood stores if Wal-Mart enters the particular market.

Entrance of Wal-Mart stores into the market would increase the supply of meat available in the urban neighborhoods. This would shift the supply curve out, causing to a drop in the price of meat and other fresh products. If smaller "neighborhoods" can't compete with the lower prices, then they will be forced out of the market.



(b) Suppose that you are a producer of fresh meat. Reading this article, you believe that if Wal-Mart enters urban markets, then you will see an increased demand from Wal-Mart stores. Therefore, you need to quickly determine how these changes will affect how much meat you need to produce and what price to charge for the meat. After doing some market analysis, you've found that the demand for meat would likely be characterized by the function: $Q^D_{meat} = 300 - \frac{1}{3}P_M$. To produce one lot of fresh meat, you need feed, which costs you \$200. Additionally, you need workers to process cattle into meat. Labor follows the supply function: $Q^S_L = -200 + P_L$.

i. Determine the equilibrium quantity of meat.

$$Q^*_{meat} = 125$$

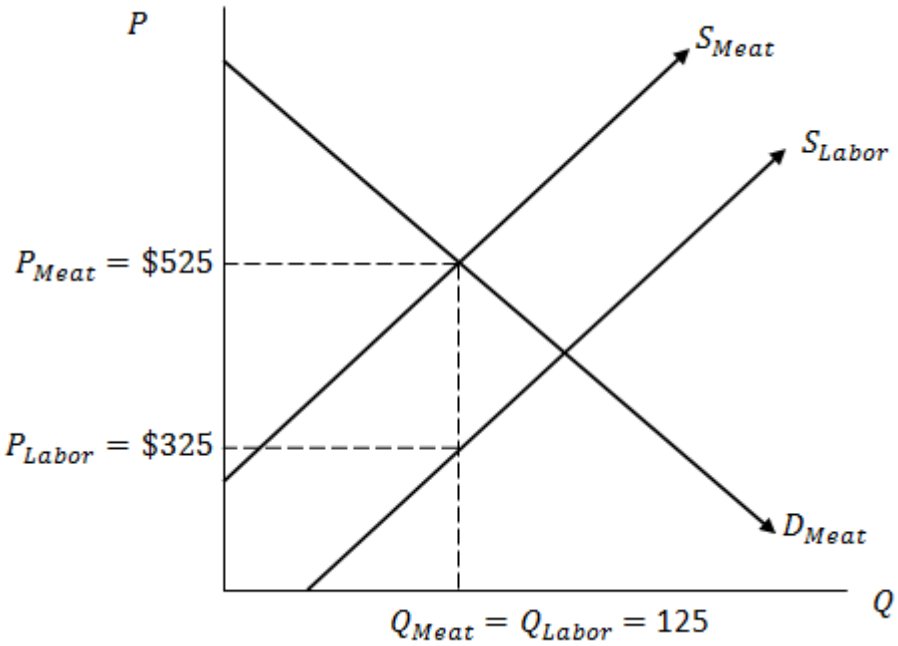
ii. Determine the equilibrium price at which meat will be sold/purchased.

$$P^*_{meat} = \$525$$

iii. Determine the equilibrium price of labor and quantity of labor.

$$Q^*_{labor} = 125, \qquad P^*_{labor} = \$325$$

iv. On a single supply and demand diagram, illustrate the demand and supply of meat, supply of labor, and the equilibrium prices and quantities of meat and labor.



(c) Now, suppose that you're interested in understanding how other market factors affect the supply of meat. Suppose that further analysis found that the supply function meat is actually:

$$Q^S_M = 600 + P_M - 50P_{Pork} - 5P_{Feed}$$

$$P_M = \$200, \qquad P_{Pork} = \$10\$, \qquad P_{Feed} = \$50$$

i. Solve for the supply of meat.

$$Q^S_{meat} = 50$$

ii. Solve for the own-price supply elasticity of meat. Tell me how you would interpret your result (be specific and use the value you calculated). Is the own-price elasticity of supply elastic or inelastic? Why?

$\varepsilon^S_{Q_{meat},P_{meat}} = 4$

The elasticity implies that a 1% rise in P_{meat} will lead to a 4% increase in the quantity supplied of meat. This elasticity of supply is *elastic*, implying that a change in quantity supplied will change more than the change in price.

iii. Find the cross-price elasticities of meat supply with respect to **pork** and **feed** prices. Then:

A. Interpret each of the results using the value that you've calculated.

B. Explain whether each product (pork and feed) is a substitute or complement in the production of meat. Why?

- $\varepsilon^S_{Q_{meat},P_{pork}} = -10$

  The elasticity implies that a 1% rise in P_{pork} will lead to a 10% decrease in the quantity supplied of meat. Therefore, pork is a substitute in the production of meat. This elasticity of supply is *elastic*, implying that a change in quantity supplied will change more than the change in price.

- $\varepsilon^S_{Q_{meat},P_{feed}} = -4$

  The elasticity implies that a 1% rise in P_{feed} will lead to a 5% decrease in the quantity supplied of meat. This elasticity of supply is *elastic*, implying that a change in quantity supplied will change more than the change in price.