Econ 250 HW 2

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September 14, 2022

Changes in market equilibria

Part A

Market Equilibrium Price and Quantity as a function of Income:

$$
\begin{aligned}
Q_s &= 1000 + P \\
Q_d &= 10000 - 2P - 6I \\
1000 + P &= 10000 - 2P - 6I \\
3P &= 9000 - 6I \\
P^* &= \boxed{3000 - I}
\end{aligned}
$$

$$
\begin{aligned}
Q^* &= 1000 + (3000 - I) \\
&= \boxed{4000 - I}
\end{aligned}
$$

Part B

Since the derivative of quantity with respect to income $\frac{dQ}{dI} = -1$, this means that as income rises, the quantity demanded will fall. This means that the good in question is an inferior good.

Elasticities

Suppose that a typical consumer has an inverse demand for frog legs given by $P = \frac{3}{Q}$.
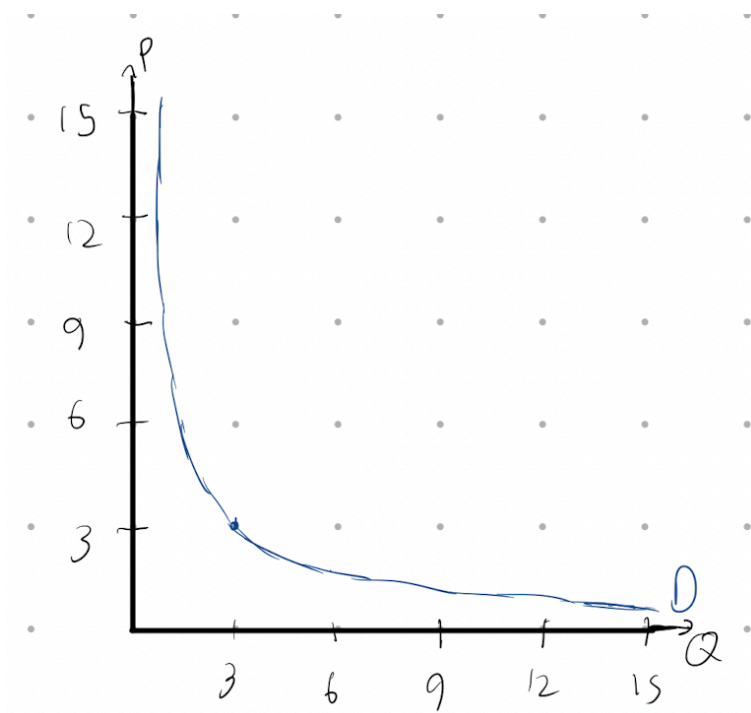
Part A

The own price elasticity of demand is given as follows:

$$
\begin{aligned}
P &= \frac{3}{Q} \\
Q &= \frac{3}{P} \\
\frac{dQ}{dP} &= -\frac{3}{P^2} \\
E_{\text{own}} &= \frac{dQ}{dP}\left(\frac{P}{Q}\right) \\
&= -\frac{3}{P^2}\left(\frac{P}{\frac{3}{P}}\right) \\
&= \boxed{-1}
\end{aligned}
$$

Part B

If price increases by 10%, the quantity demanded will decrease by exactly 10%. The demand for frog legs is unitary elastic.

Part C

Because this demand curve has a hyperbolic shape, the elasticity at each point in the curve is the same, namely that it is unitary elastic.

Elasticities, cont'd

Part A

$$P_G = \sqrt{\frac{5I}{Q}}$$

$$Q = \frac{5I}{P_G{}^2}$$

$$E_{\text{cross}} = \frac{dQ}{dP_G}\left(\frac{P_G}{Q}\right)$$

$$= -\frac{5I}{2P_G{}^3}\left(\frac{P_G}{\frac{5I}{P_G{}^2}}\right)$$

$$= \boxed{-\frac{1}{2}}$$

The magnitude of the cross price elasticity of demand is less than 1, meaning that lemonade and green tea are complements and that the demand for lemonade is inelastic with respect to a change in the price of green tea.

Part B

$$P_G = \sqrt{\frac{5I}{Q}}$$
$$Q = \frac{5I}{P_G{}^2}$$
$$E_{\text{income}} = \frac{dQ}{dI}\left(\frac{I}{Q}\right)$$
$$= \frac{5}{P_G{}^2}\left(\frac{I}{\frac{5I}{P_G{}^2}}\right)$$
$$= 1$$

The income elasticity of demand for green tea is positive, meaning that it is a normal good.

Taxes

Part A

$$Q_D = 1000 - 3P_c$$
$$Q_S = 6P_p - 800$$
$$P_p = P_c - 30$$
$$1000 - 3P_c = 6(P_c - 30) - 800$$
$$1800 + 180 = 9P_c$$
$$P_c = 220$$
$$P_p = 190$$
$$Q_D = 1000 - 3(220)$$
$$= \boxed{340}$$

Part B

It is not possible for the government to make the producer and consumer share the tax burden equally because the elasticities of demand and supply are different the consumer has a more inelastic demand than the producer has supply, so the consumer will bear more of the tax burden.

Subsidies

Part A

$$Q_D = 30 - P$$
$$Q_S = 3P - 10$$
$$30 - P = 3P - 10$$
$$P = \boxed{10}$$
$$Q = \boxed{20}$$

Part B

$$Q_D = 30 - P_c$$
$$Q_S = 3P_s - 10$$
$$P_s = P_c + 4$$
$$30 - P_c = 3(P_c + 4) - 10$$
$$40 - 12 = 4P_c$$
$$P_c = \boxed{7}$$
$$P_p = \boxed{11}$$
$$Q = \boxed{23}$$

Part C

75% of the subsidy is received by consumers (the drop in price they receive is \$3 of the \$4 spent on the subsidy). The producer only receives 25% of the subsidy, since the demand for quinoa is much more inelastic than the supply of quinoa, so subsidies to purchase quinoa are absorbed by the consumer much more than by the producer.

Part D

$$26 = 30 - P_c$$
$$P_c = 4$$
$$26 = 3P_p - 10$$
$$P_p = 12$$
$$S = P_p - P_c$$
$$S = \boxed{8}$$

Taxes, cont'd

$$P = 40 - 0.2Q_D$$
$$10 = 40 - 0.2Q_D$$
$$Q_D = 150$$
$$Q_D = 40 - 5P_c$$
$$P_t = 40 - 0.2(Q_D + 50) \qquad \text{(using rules from algebra, shift inverse } D \text{ curve 50 units left)}$$

The difference between this new demand curve and the existing demand curve is $t = 10$, meaning that the government should put a unit tax of 10 in order to achieve its desired outcome of 100 cheesecakes consumed instead of 150 cheesecakes.
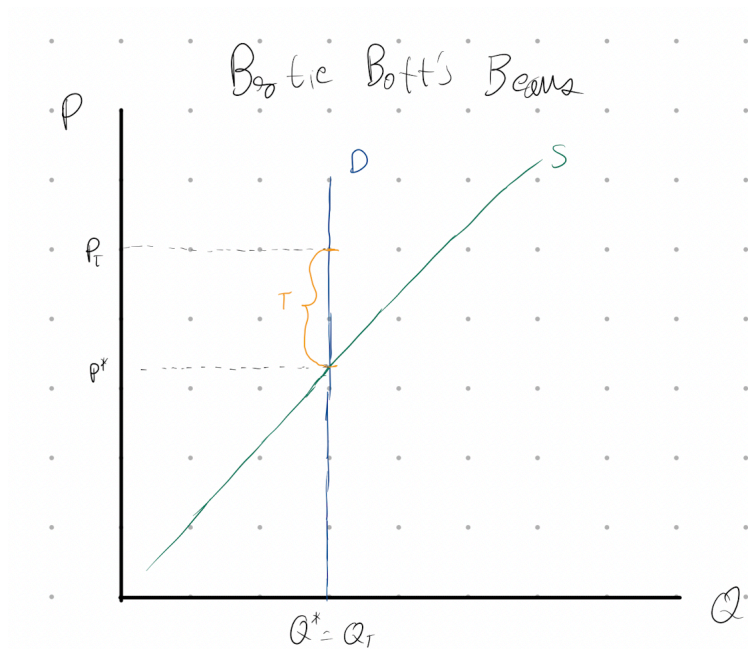
Elasticities and Tax Incidence

Part A

The demand for carrots is much more inelastic than the supply of carrots as 75% of the tax was absorbed by the consumer.

Part B

$$Q_D = 150 - p$$
$$Q_S = 20 + Mp$$
$$150 - p = 20 + Mp$$
$$Mp + p = 130$$
$$Q_D = 150 - (p + 1.5)$$
$$Q_S = 20 + M(p - 0.5)$$
$$150 - p - 1.5 = 20 + Mp - 0.5M$$
$$127.5 = Mp + p - 0.5M$$
$$127.5 = 130 - 0.5M$$
$$0.5M = 2.5$$
$$M = \boxed{5}$$

Elasticities and Tax Incidence, cont'd

Part A

Part B

Both Parvati and Padma are wrong because the demand for Bertie Bott's Beans is perfectly inelastic, any tax regardless of whether it is levied on the consumers or producers will have no effect on the amount of beans purchased.

Elasticities and Tax Incidence, cont'd 2

Part A

$$E_{\text{own}} = \frac{dK}{dP_K}\left(\frac{P_K}{K}\right)$$
$$= -\frac{15IP_C}{P_K{}^4}\left(\frac{P_K}{\frac{5IP_C}{P_K{}^3}}\right)$$
$$= -3$$

Part B

It is possible to calculate the incidence of the tax on consumers, and from there it is possible to calculate the size of the tax.

$$\frac{\Delta P_c}{T} = \frac{E_s}{E_s + |E_d|}$$
$$\frac{6}{T} = \frac{2}{2+3}$$
$$T = \boxed{15}$$

Preference Assumptions

Part A

This tentatively satisfies all the assumptions his preference for cronuts is zero, but he does have a preference for donuts over croissants, but it is not known whether he has a dislike for croissants.
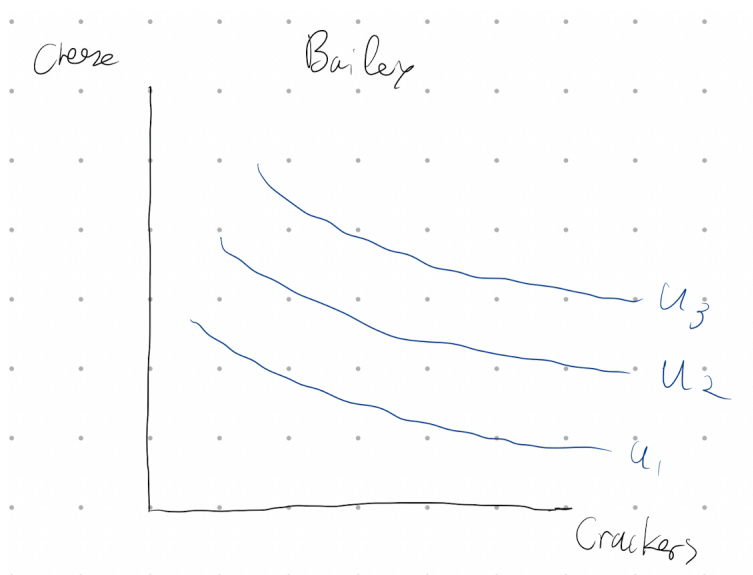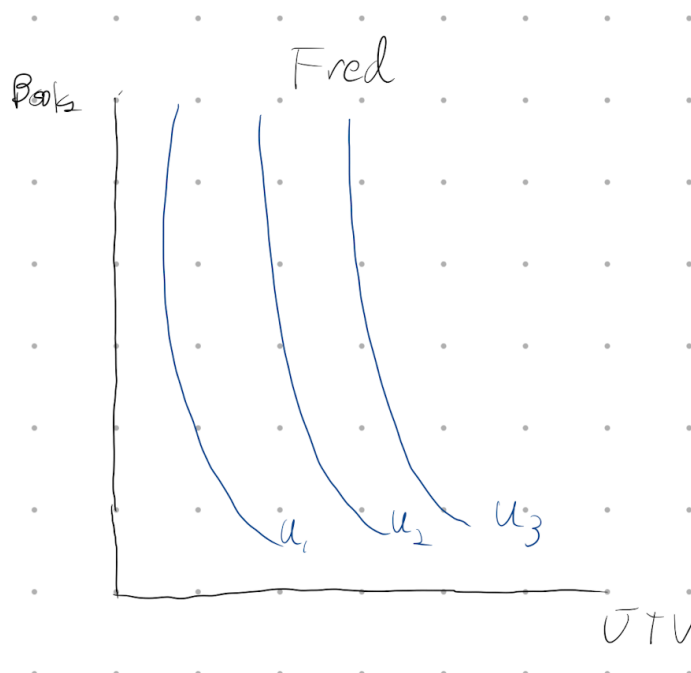
Part B

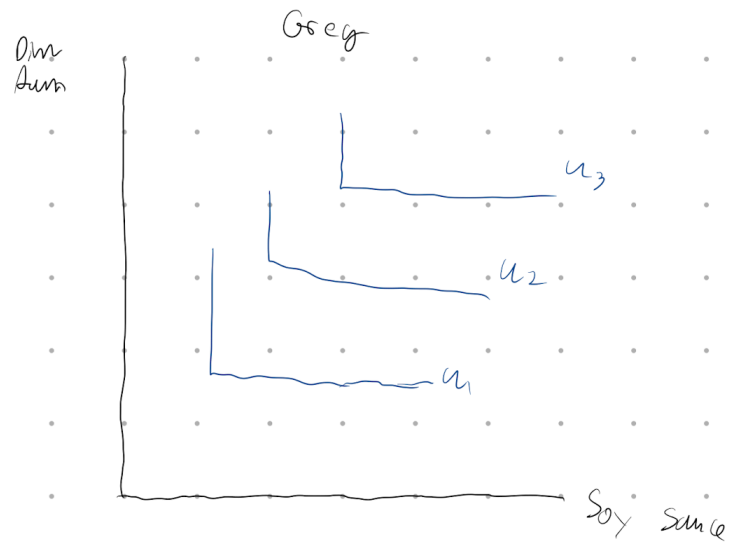Katye violates the "more is better" assumption.

Part C

This does not violate any of the assumptions of consumer preferences.

Part D

This does not violate any of the assumptions of consumer preferences.

Indifference Curves

Part A

Part B

Part C

Greg

Dim
Sum

u_3

u_2

u_1

Soy Sauce

Part D

Jen

Tea

u_1 u_2 u_3

Coffee