1. Consider the statutory incidence of the U.S. personal income tax and payroll taxes. Given what you know about these, say whether the statutory incidence of the tax is progressive or regressive? Why? How might the economic incidence differ?

- ANSWER: Given the increasing rate structure, the statutory incidence of the personal income tax is progressive, with higher income filers having higher average tax rates. However, payroll taxes have a flat rate structure and the earnings cap (earnings over a certain amount are not subject to these taxes). Thus these are regressive taxes. The economic incidence is generally thought to be similar to the statutory incidence, although it's at least slightly more regressive for each type of tax. This is because high income individuals generally have more options for employment and thus a higher labor supply elasticity. The economic incidence of a tax falls more upon those with relatively lower elasticities.

2. Consider the market for medical devices like MRI machines. As part of the Affordable Care Act, Congress passed a new excise taxes on such devices. The tax is an ad valorem tax equal to 2.3% of the sale price of the device. The tax is remitted by the importer or the manufacturer of the device. Assume that demand for medical devices is given by \( Q_D = 100,000 - 4.5P \) and supply is given by \( Q_S = \frac{P}{2} \).

(a) Find the equilibrium in the medical device market before the tax. What is the market price and quantity?

- ANSWER: Equilibrium is where \( Q_S = Q_D \). Solving this equation for \( P \) gives \( P^* = $20,000 \). Then plugging in \( P^* \) into either the supply or demand equation gives \( Q^* = 10,000 \).

(b) Find the equilibrium in the device market after the tax began on 1/1/2013. What is buyer’s after tax price? The producer’s tax-exclusive price? Draw the market equilibrium showing how the tax is represented.

- ANSWER: The equilibrium with the tax will be defined by the intersection of supply and demand: \( Q_S = Q_D \). But now the price the consumer pays and the price the producer receives will differ by the amount of the tax. Since the producer remits the tax, we’ll write \( Q_S = \frac{P^D}{2} \) and \( Q_D = 100,000 - 4.5P^D \), where \( P^D \) is the price the consumers pay and \( P^S \) is the price the producers receive. The tax is the wedge between the two. Since it’s an ad valorem tax, we’ll write \( P^D = P^S(1 + t) \), where \( t \) is the tax rate, in this case 2.3%. This means that \( P^S = \frac{P^D}{1 + t} \). We can then plug this into the supply equation and solve for \( P^D \) from the equilibrium condition that supply equal demand. Doing so gives us \( P^D = $20,045 \). Using this to solve for \( P^S \) gives \( P^S = $19,594 \). Plugging either price into the supply or demand equation gives \( Q^* = 9,797 \). When drawing the graph, you’ll have the tax inclusive supply curve lying above the supply curve - like the supply curve, it’ll come out of the origin, but it’s slope will be higher by the amount of the tax.

(c) What is the economic incidence of the tax? How much of the tax burden is borne by the consumer?

- ANSWER: The total burden of the tax is the distance between \( P^D \) and \( P^S \), which is 450. The producer’s burden of the tax is $405. The consumer’s burden is $45. Thus the producer bears 90% of the burden of the tax.
(d) Explain why the distribution of the burden is what you find it to be.

- **ANSWER:** The economic incidence of a tax is determined by the relative elasticities of the supply and demand curves. In this case, the demand elasticity is much higher than the supply elasticity at the pre-tax equilibrium (Demand elasticity of -9 and supply elasticity of 2). Thus the consumer’s bear less of the burden because demand is more elastic.

3. Assume that the Blue Agave, a monopolist in the tequila market in Murfreesboro, has a cost function of the form: 

\[ C(q) = 10 + 2q + 0.5q^2. \]

The (inverse) demand for the product is given by 

\[ P(q) = 47 - q. \]

The local government levies a tax of $9 per bottle, to be paid to the city of Murfreesboro by the monopolist. Use a partial equilibrium model to analyze:

(a) What is the market quantity and price?

- **ANSWER:** Setting \( MR = MC \), you get: \( q = 15, P = 32. \)

(b) The government levies a tax of $9 per unit, to be paid to the government by the monopolist. What is the new market price and quantity?

- **ANSWER:** Now set \( MR = MC + \text{tax}. \) Solving yields: \( q = 12 \) and \( P = 35. \)

(c) How much of the tax do the consumers bear? How much does the monopolist bear?

- **ANSWER:** Consumers bear the difference between \( P \) at - \( P \) before tax = 35 - 32 = 3. The monopolist bears the remainder of the tax = 9 - 3 = 6.

4. Suppose both supply and demand are linear: 

\[ Q^D = a - bp \] and \[ Q^S = c + dp. \]

(a) Find the equilibrium price (this will be a function of the parameters \( a, b, c, d \).)

- **ANSWER:** The equilibrium price if found by equating supply and demand: \( Q^D = Q^S. \) Solving this equation for \( p \), we find \( p = \frac{a-c}{d+b}. \)

(b) No suppose that a quantity tax with a constant rate for all units bought and sold is instituted in the market. Determine the new equilibrium prices \( p^s \) and \( p^d \) in the market.

- **ANSWER:** With a constant per unit tax, we can write \( p^d = p^s + t \), where \( t \) is the tax rate. Using this equation and setting supply equation to demand, we find that \( p^s = \frac{a-c+bt}{b+d} \) and \( p^d = \frac{a-c+dt}{b+d}. \)

(c) Solve for the amounts of the producer’s and consumer’s tax burdens.

- **ANSWER:** To find the economic incidence of the consumer, we solve \( p^d - p = \frac{bt}{b+d}. \) Likewise, to solve for the producer’s share of the tax, we solve: \( p - p^s = \frac{bt}{b+d}. \)

(d) When is the burden on the consumer larger than on the producer? What does this mean in economic terms (e.g. in terms of relative elasticities)?

- **ANSWER:** The burden on the consumer is larger when \( d > b. \) That is, when the change in supply for a change in price is larger than the change in demand for a change in price (i.e., the supply curve is more elastic), then the consumer will bear more of the burden.

5. Assume that labor supply is given by 

\[ L^S = aw^\alpha, \]

where \( a \) and \( \alpha \) are some constants and \( w \) is the real wage rate. Now assume that labor demand is given by 

\[ L^D = bw^{-\beta}, \]

where \( b \) and \( \beta \) are some constants. Using the partial equilibrium frame work, find what the burden of the tax is on those supplying and those demanding labor. You can assume that the tax is paid by employers, so that, in the case of the tax, labor demand is: 

\[ L^D = b(w + \tau)^{-\beta}, \]

where \( \tau \) is the tax rate on labor.

- **ANSWER:** The supply and demand curves have constant elasticities: \( \eta_S = \alpha \) and \( \eta_D = -\beta. \) Thus, putting these elasticities into the formula for incidence in partial equilibrium yields: 

\[ \frac{\% d}{\% t} = \frac{-\beta}{\alpha+\beta}. \]