Chapter 19 - Tax incidence. Who bears the burden of a tax on a good (including labor)?

The statutory incidence of a tax - who pays the tax to the government - is unrelated to the economic incidence of the tax. Economic incidence of a tax is the change in resources available to an agent due to a tax.

If a tax is imposed on producers in a competitive market, they will raise prices somewhat. Their per-unit income will not fall by the full amount of the tax unless their supply curve is perfectly inelastic. When a tax is imposed on consumers, they are willing to pay a lower price for each unit, so prices will fall.

The consumer tax burden equals (post-tax price - pre-tax price)+per-unit tax payments by consumers. The producer tax burden equals (pre-tax price - post-tax price)+per-unit tax payments by producers.

Graphically, when the statutory tax incidence of a tax $t$ per unit is on consumers, the demand curve shifts down by $t$. Consumers are willing to pay $t$ less for each unit, since whatever the price is they must pay $t$ more than the price per unit. Due to the downward shift of the demand curve, the price falls.

When the statutory tax incidence of a tax $t$ per unit is on producers, the supply curve shifts up by $t$. It is as if the marginal cost had increased by $t$ at each quantity. They require a price that is $t$ higher to sell the same amount. Due to the upward shift of the demand curve, the price rises.

The distribution of the tax burdens is the same no matter which side of the market the tax is imposed on.

Suppose the market for gasoline is initially in competitive equilibrium at a price of $1.50 per gallon and a quantity of 100 billion gallons. Then a tax of $0.50 per gallon is imposed on producers. The supply curve for gasoline shifts up by $0.50. At the initial equilibrium price of $1.50, there is excess demand for gasoline, so consumers bid the price up to something higher, suppose it’s $1.80.

The price has risen by $0.30, but producers must pay $0.50 to the government for each gallon, so they end up paying $0.20 of the tax. Producer burden is thus $1.50-1.80+0.50 =0.20.

Consumer burden is $1.80 - 1.50 + 0 =0.30. The sum of the two burdens is the total tax per unit.

Suppose the statutory tax of $0.50 was instead on the consumers. The demand curve shifts down by $0.50. At the old price of $1.50, there is excess supply, so the price gets reduced to $1.30.

The producer burden is $1.50-1.30 +0 =0.20. The consumer burden is $1.30-1.50+0.50=0.30, the same as before. The consumer pays the same amount 1.80 in either case, and the producer gets the same amount 1.30 in either case.
The tax incidence depends on the elasticity of supply and demand. The more inelastic side of the market bears more of the burden.

If a supply curve is perfectly inelastic and demand curve is not, the producer burden is the whole tax, and the consumer burden is zero. If the demand curve is perfectly inelastic and the supply curve is not, the consumer burden is the whole tax and the producer burden is zero.

If demand is perfectly elastic and supply is not, consumer burden is zero and producer burden is the full amount of the tax (the price doesn’t change, but producers have to pay the tax). If supply is perfectly elastic and demand is not, producer burden is zero and consumer burden is the full amount of the tax.

Demand for a good is more elastic if the good has many substitutes. Thus taxing a good with many substitutes would tend to put most of the burden on the producer. Supply of a good is more elastic if suppliers have more alternative uses to which their resources can be put, and when there was a high investment in those particular inputs.

**Tax incidence in factor markets, such as market for labor**

The analysis is the same as for goods market, except that now firms are the demanders and individuals are the suppliers of labor.

Impediments to wage adjustments - minimum wage. This is a case where it makes a difference whether the statutory tax is on workers or firms.

Current federal min wage is 5.15 per hour. Suppose labor market is initially in equilibrium at exactly 5.15 an hour. Suppose there is a minimum wage of 5.15 an hour, and the government imposes a payroll tax of $1 on each hour of labor on workers.

The labor supply curve shifts up by 1.00. The new equilibrium wage is (say) 5.65 and workers pay one dollar from that to the government, so they receive a net of tax payment of 4.65 per hour. This is allowed, because it is only the pretax wage that must be 5.15 or higher. Firms pay $0.50 in higher wages.

Now suppose the government imposes a $1 tax per hour of labor on firms. The demand curve for labor shifts down by $1. If there were no minimum wage, equilibrium wage would fall to 4.65. But the equilibrium wage cannot fall below 5.15. The firm bears all the burden of the tax, because wages don’t fall. And there is unemployment (excess supply of labor).

**Tax incidence in monopoly**

A unit tax on consumers causes the demand curve to shift down. There is a corresponding downward shift in the marginal revenue curve. The new quantity is where the new MR curve intersects the MC curve, and the new price is the height of the demand curve at that quantity. The price has fallen, so the monopolist bears some of the burden of the tax. The same sharing of the tax burden would result if the tax was on the firm.
General equilibrium tax incidence

Until now we have used a partial equilibrium model to analyze tax incidence. This analysis considers just one market in isolation from other markets. In reality a tax imposed on one market has effects on other markets. To study this, general equilibrium analysis is used.

Suppose initially the restaurant meals market in Lexington, Massachusetts (a small town in a large metropolitan area) is in equilibrium at a price of $20 per meal and a quantity of 1000 per day. The demand for restaurant meals is assumed to be perfectly elastic because there are many close substitutes for a meal from a restaurant in Lexington, such as going to a restaurant in any neighboring town.

Then the government imposes a $1 per meal tax. The supply curve shifts up by $1. since demand is perfectly elastic, price does not rise, but quantity decreases (to 950). The restaurants bear the whole burden of the tax, because there is no increase in price to offset this burden.

What does it mean for the restaurants to bear the burden? It means that the capital and labor used for the restaurant bear the burden. In what proportion do they bear the burden? This depends on the elasticities of supply of labor and capital, and the elasticities of demand for labor and capital.

Suppose that the supply of labor for restaurants is perfectly elastic, but the supply of capital is perfectly inelastic in the short run. A justification for the supply of labor being elastic is that workers have many alternate places they can go to work, for example they can work at a restaurant in a nearby town if their wages go down in Lexington. Or they can go work in another job. Supply being perfectly elastic at $8 per hour means that there are a lot of workers (maybe all of them) who would offer no labor at wages below $8, at $8 a large number are willing to work various amounts, and above $8 they want to work more than could possibly be demanded at that wage.

Consider the labor market. Before the tax, suppose the equilibrium is at $8 per hour and 1000 hours per year. The tax, which is borne entirely by restaurants, causes restaurants to reduce their demand for workers, to 900 hours per year. This is because the demand for labor is determined by its after-tax marginal value, which is the marginal product of the worker times the value of the goods produced by that worker net of taxes paid on those goods. Since each worker is now worth less to a restaurant (because the tax is higher), the demand for workers by the restaurant falls. Thus the demand curve for labor shifts down by $1.00 (It would shift down by less than that amount if consumers bore part of the burden of the tax. It shifts down by the full amount of the tax only because restaurants bear the full burden of the tax).

But because the supply of labor is perfectly elastic, wages do not fall. The wage remains at $8 per hour. The workers bear none of the tax. If restaurants offer
a lower wage, the workers will go somewhere else.

On the other hand, the supply of capital is perfectly inelastic (in the short run). Justification: Having invested in a restaurant in Lexington, the owner is stuck with the capital. In principle the owner could resell, but would only receive a fraction of the purchase price.

Suppose the initial equilibrium is at a rate of return on capital of 10% and the investment in restaurants is $50 million (capital is counted in value). The $1.00 tax on restaurants causes the demand curve for capital to fall by $1.00. Thus, $1 less of return is received for every (say) $100 of investment. (This number was chosen ad hoc). Then, if the return rate was 10% before, it changes to 9% after the tax. Because the capital supply curve is vertical, the entire burden of the tax is borne by capital. Thus the burden of the tax on restaurants in Lexington ultimately falls on capital invested in Lexington restaurants in the short run.

Long-run considerations

This analysis is valid for the short run, in which capital supply can be modeled as perfectly inelastic. In the long run, capital supply is more elastic. Because in the long run, investors can refuse to reinvest in the restaurant. They can take their money out of the restaurant and invest it somewhere else. Since there are many substitutes for investing in restaurants, we can model the long run capital supply curve as perfectly elastic.

In that case, capital does not bear any of the burden of the tax in the long run. So although initially after the tax is imposed, the return paid to capital-owners falls, over the course of time it will increase to equal the original 10% rate of return.

In the long run, labor supply should be even more elastic than in the short run, as workers can more easily move to another town. Since labor supply is already assumed to be perfectly elastic in the short run, it will be perfectly elastic in the long run as well. Thus in the long run, neither capital nor labor bear the burden of the tax. Who bears the burden then?

There is another factor - land. Land is in fixed supply, so the supply curve for land is perfectly inelastic, whether in the short or long run. Then land will bear the entire burden of the tax in the long run. Restaurants will pay lower rent on their land in the long run.

It is possible for every factor used in the production of a particular good to have perfectly elastic supply - for instance, if land is not an input to production. In that case, when a tax is raised on that good, some firms will drop out of the market if there were zero profits to begin with because they can’t pass on the burden to their inputs by lowering the price of inputs. If there were positive profits to begin with, the profits will be reduced due to the tax.

Effect of tax scope
Suppose all restaurants in the state of Massachusetts are taxed, rather than just all restaurants in Lexington. How does the short run distribution of the burden change?

The tax burden borne by the factors depends on how much of the burden is borne by restaurants as opposed to consumers. This in turn depends on how elastic the demand for the taxed restaurants is. If a broader category of restaurants is subject to the tax then the demand for the taxed restaurants becomes less elastic because there are fewer good substitutes. You can’t just go to a restaurant in the next town because they are taxed too. Then more of the tax will be borne by consumers and less by the restaurants. If some of the tax is borne by consumers, the demand curve for labor shifts down by less than when all of the tax is borne by restaurants. Thus, the demand curve for labor (or capital) shifts down by less than $1 when some of the tax is borne by consumers.

Also, there will be fewer possibilities for workers to switch to when their wages are lowered. Thus the supply of labor curve becomes less elastic. Labor will bear some of the tax, and the wages paid to restaurant workers will decrease somewhat.

Since capital continues to be inelastic in the short run, it will still bear much of the tax burden.

Now the short-run burden of the meal tax will be shared among consumers, labor and capital, not just borne by capital. The proportions in which it is shared depend on the elasticities of demand and supply in each of the markets.

**Spillovers between product markets**

The incidence of a tax can extend into other goods markets. If consumers bear a part of the tax burden, it causes their income to decline. Then they may choose a different distribution of goods than before the tax.

The tax on restaurant meals in the state of Massachusetts has three effects on other goods.

1. Due to decreased incomes, consumers will tend to purchase less of normal goods and more of inferior goods.
2. Consumers may increase consumption of substitutes to restaurant meals, which are now relatively less expensive.
3. Consumers may decrease their consumption of complements to restaurant meals because they now consume fewer restaurant meals.

Chapter 20.1 - **Taxation and Economic Efficiency**

When it is imposed on a complete competitive market in an economy that has no externalities or incomplete information (no distortions - differences between social marginal cost and social marginal benefit in equilibrium), a tax creates deadweight loss. Total surplus decreases by the deadweight loss plus government...
revenues. The effect of the tax on consumer and producer surplus is the same whether the tax is imposed on sellers or buyers (in the absence of effects such as the minimum wage).

The price elasticities of supply and demand determine the efficiency loss due to taxation. The more elastic demand and supply are, the greater the efficiency loss. Because more socially efficient trades are lost due to a tax when demand and supply are elastic than when they are inelastic (see graph).

Deadweight loss rises with the square of the tax rate for small tax rate changes (not exact because demand and supply curves need not be linear. But locally they are linear). So a 5c tax that is the last 5c of a 25c tax increase creates a greater efficiency loss than the first 5c of the tax increase.

A tax system’s efficiency is affected by a market’s preexisting distortions - such as externalities, imperfect competition or existing taxes.

If there are positive externalities on production of a good, imposing a tax on the good adds more to the deadweight loss. The added inefficiency is greater than the added inefficiency of a tax to a market that has no externality. The trades that are prevented from occurring due to the tax in the market with externality are ones for which marginal social benefits significantly exceed marginal social costs (see graphs).

If there are negative externalities in a market, then taxation by the right amount can eliminate the inefficiency.

In monopolies there is already underproduction relative to competitive equilibrium and socially optimal production. Taxing them can lead to a greater efficiency loss than the same tax on a market initially in competitive equilibrium.

**Governments should smooth tax rates over time** Because the marginal deadweight loss rises with the tax rate, governments should not raise and lower taxes as they need money (the loss due to additional tax is greater when tax is greater). Instead they should have a long run tax rate that meets budget needs on average, using deficits and surpluses to smooth short run fluctuations. This is a problem for states, which have budget balance written into their laws.

**skip Chapter 20.2**

Chapter 20.3

In designing optimal income taxes, government wants to meet its revenue requirements while minimizing distortions and also meeting vertical equity goals of the tax system. Government wants to raise revenue in such a way that it maximizes the country’s social welfare function - the function that maps individual utilities into an overall level of social well-being. The optimal income tax system consists of a set of tax and subsidy rates across income groups.

Example. Make the following assumptions:
1. Everyone in society has the same utility function.

2. This utility function has diminishing marginal utility of income.

3. The total amount of income in society is fixed (incomes are not determined by individual choices that might respond to tax rates).

4. Society has a utilitarian social welfare function $V = U_1 + U_2 + \ldots + U_n$, where $n$ is the number of members of society.

With these assumptions, the optimal income tax system is one that leaves everyone with the same level of post-tax income. Anyone with income below the average income would receive a transfer from the government that increases their income to the average amount. Anyone with income above the average amount would be taxed until the post-tax income equals the average amount.

With this tax system the marginal tax rate is 100%, as each additional dollar of earnings either decreases one’s transfer by $1 or increases one’s tax by $1. The average tax rate is negative below average income level, and positive above it. It is everywhere increasing with income, so it is a progressive tax system.

The most unrealistic assumption here is that the total amount of income in society is fixed. This implies that individuals work the same amount even though they face a marginal tax rate of 100%. This is not realistic.

In this example there is no equity-efficiency trade off, as it was assumed away - the total income assumed to be fixed. In reality it is possible that workers will decrease their labor supply as their after-tax income falls (how much is the subject of many studies, which get varying results). When designing an optimal income tax the government has to consider the effect of tax rates on the size of the tax base (the total amount of taxable income).

Consider a tax on labor income. Revenues from the tax equal the average tax rate times the tax base of labor earnings. Assume workers reduce labor supply as after-tax wage falls. Thus, increasing the tax rate has two effects on tax revenues: Revenues increase for a given level of labor income, but workers reduce their labor income and the tax base shrinks.

As tax rates rise, the second effect becomes more important, as the increase in deadweight loss becomes larger. At a 100% tax rate, no one would work and tax revenues would equal zero again.

This is the idea for the Laffer curve. It graphs tax revenues against the (average) tax rate. Tax revenues first rise from zero, then fall to zero as the average tax rate rises. The belief that we were on the wrong side of the Laffer curve was the basis for the tax cuts on high-income individuals in the early 80’s.