

Market Outcomes and Tax Incidence

Econ 304K: Chapter 5

Taxes on Firms Affect Consumers

Many people believe that when the government taxes businesses, consumers catch a break because firms pay the tax; if only life works that way...as this chapter explains, who actually pays the tax often is quite different from the party that is legally responsible for making the tax payment.

Gasoline prices are common and visible sign of the market at work; it is hard not notice when gasoline prices rise or fall, because every gas station posts its prices prominently [but] there are a few things that you might not know. First, in the United States, gasoline taxes are paid by the seller and not displayed at the pump; second, gasoline taxes vary wildly from country to country. For instance, residents of Saudi Arabia pay some of the lowest gasoline prices in the world, while the Netherlands (Dutch) have to put up with the world's third-highest gas prices. ***This occurs because the government of certain oil-rich countries, such as Saudi Arabia, subsidize gasoline so that their citizens pay less than the market price; furthermore, in countries where gasoline is subsidized, consumers drive their cars everywhere, mass transportation is largely unavailable, and there is less than the market price. The opposite is true in countries like the Netherlands, where consumers drive less and use public transportation more often, and tend to purchase fuel efficient cars.***

What do gasoline taxes and subsidies around the world have in common? They're all folded into price you see at the pump which might lead you to believe that the seller is paying all the tax or receiving the entire subsidy. (Nothing can be further from the truth) The firm will try to pass along the tax to consumers in the form of higher prices, likewise, in countries with subsidies — the firm must pass along lower prices to consumers. After reading this chapter, you will understand how this process works.

We begin this chapter by discussing consumer and producer surplus, two concepts that illustrate gains from trade. These concepts helps us measure the efficiency of markets and the effects of taxation. Then we examine how taxation creates distortions in economic behavior by altering the incentives people and firms face when consuming and producing goods that are taxes

Big Questions

- **What are consumer surplus and producer surplus?**
 - *Consumer surplus is the difference between the willingness to pay for a good or service and the price that is paid to get it. Producer surplus is the difference between the price the seller receives and the price at which the seller is willing to sell the good or service.*
 - *Total surplus (social welfare) is the sum of consumer and producer surplus that exists in a market.*
- **When is a market efficient?**
 - *Markets maximize consumer and producer surplus, provide goods and services to buyers who value them most, and reward sellers who can produce goods and services at the lowest cost. As a result, markets create the largest amount of total surplus possible.*
 - *Whenever an allocation of resources maximize total surplus, the result is said to be efficient. However, economists are also interested in the distribution of the surplus. Equity refers to the fairness of the distribution of the benefits within the society.*
- **Why do taxes create deadweight loss in otherwise efficient markets?**
 - *Deadweight loss occurs because taxes increase the purchase price, which causes consumers to buy less and producers to supply less. Deadweight loss can be lessened by taxing goods or services that have inelastic demand or supply.*
 - *Economists are also concerned about the incidence of taxation: incidence refers to the burden of taxation on the party who pays the tax through higher prices, regardless of whom the tax is actually levied on. The incidence is determined by the balance between the elasticity of supply and elasticity of demand.*

Willing to Pay for a New Economics Textbook	
Buyer	Willingness to pay
Sergio	\$200
Silene	\$150
Raquel	\$100

What are consumer and producer surplus?

Markets create value by bringing together buyers and sellers so that consumers and producers can mutually benefit from trade. Welfare economics is the branch of economics that studies how the allocation of resources affects economic well-being. In this section, we develop two concepts that helps us measure the value markets create: **consumer surplus** and **producer surplus**.

In competitive markets, the equilibrium price is simultaneously low enough to attract consumers and high enough to encourage producers. This balance between demand and supply enhances the *welfare* (well-being) of society; that is not to say that society's welfare depends solely on markets. People also find satisfaction in many non-market settings; we incorporate aspects of personal satisfaction into our economic models in Chapter 16.

Consumer Surplus

Consumer surplus is the difference between the willingness to pay for a good (or service) and that the price paid to get it; whenever the price is greater than the willingness to pay, a rational consumer will not decide to buy.

The willingness to pay is the maximum price a consumer will pay for a good or service; the willingness to pay is also know as **reservation price**. In an auction or negotiation, the willingness to pay or reservation price, is beyond which the consumer decides to walk away from the transaction.

Using demand curve to illustrate consumer surplus

In the previous section, we discussed consumer surplus as a dollar amount; we can illustrate it graphically with a demand curve. **Figure 5.1 shows the demand curve drawn from the data in Table 5.1.** Notice that the curve looks like a staircase with three steps — one for each additional market demand curve corresponds to a specific number of units sold.

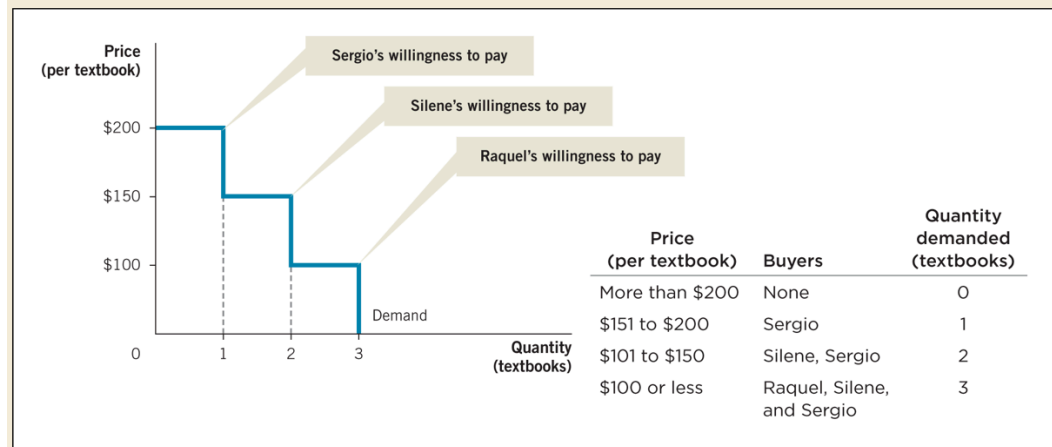
Producer Surplus

Producers surplus is the difference between the willingness to sell a good or service the seller receives. How do producers determine their willingness to sell? They must consider two factors: the direct costs of producing the good and the indirect costs, or opportunity costs.

FIGURE 5.1

Demand Curve for an Economics Textbook

The demand curve has a step for each additional textbook purchase. As the price goes down, more students buy the textbook.



Sellers also benefit from market transactions; ***the willingness to sell*** is the minimum price a seller will accept to sell a good or service.

Using supply curves to illustrate producer surplus

FIGURE 5.3

Supply Curve for Economics Tutoring

The supply curve has three steps, one for each additional coworker who is willing to tutor. Progressively higher prices will induce more coworkers to become tutors.

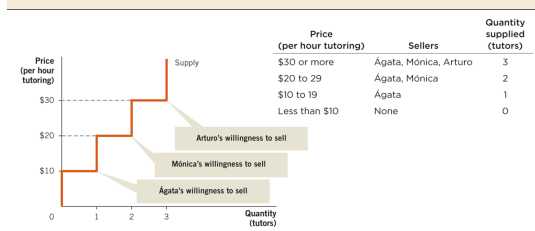
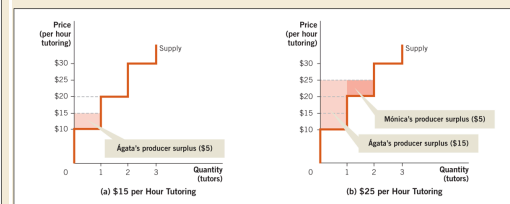


FIGURE 5.4

Determining Producer Surplus from a Supply Curve

(a) The price of an hour of tutoring is \$15. At this price, only Agata decides to tutor. (b) The price for tutoring is \$25 per hour. At this price, Mónica also decides to tutor.



When is a market efficient?

We have seen how consumers benefit from lower prices and how producers benefit from higher prices. When we combine the concepts of consumer and producer surplus, we can build a complete picture of the welfare of the buyers and sellers. Adding consumer and producer surplus gives us **total surplus**, also known as **social welfare**, because it measures the well-being of all participants in a market, absent any government intervention. Total surplus is the best way economists have to measure the benefits markets create. The demand and supply curves in this

section are drawn as straight lines (as opposed to the stair steps we have seen so far), since we will now assume there are a large number of buyers and sellers in each market.

When an allocation of resources maximizes total surplus, the result is said to be efficient. To think about why the market creates the largest possible total surplus or social welfare, it is important to recall how the market allocates resources. Consumers who are willing to pay more than the market equilibrium price will buy the good because they will enjoy the consumer surplus. Producers who are willing to sell the good for less than the market equilibrium price will enjoy the producer surplus.

The Efficiency-Equity Debate

When modeling behavior, economists assume that participants in a market are rational decision-makers. That is, we assume that producers will always operate in the region of the triangle representing producer surplus, and that consumers will always operate in the region of the triangle representing consumer surplus. In other words, for the market to work efficiently, voluntary instances of consumer loss must be rare; we assume that self-interest helps to ensure that all participants benefit from the exchange.

However, the fact that both parties benefit from an exchange does not mean that both parties benefit equally. Economists are also interested in the distribution of gains; equity refers to the fairness of the distribution of benefits among the member of a society. In a world where no one cared about equity, only efficiency would matter, and no particular division would be preferred.

Why do taxes create deadweight loss in otherwise efficient markets?

Taxes provide many benefits; taxes help to pay for many of society's needs — public transportation, schools, police, the court system, and the military. Most of us take these services for granted, but without taxes it would be impossible to pay for them; how much do all of these services cost? When you add all the federal, state, and local government budgets in the United States, you get over \$6 trillion a year in taxes!

Spending tax dollars incurs opportunity costs because the money could have been used in other ways. In this section, we use the concepts of consumer and producer surplus to explain the effect of taxation on social welfare and market efficiency. Taxes come in many sizes and shapes: there are taxes on personal income, payroll, property, corporate profits sales and inheritance... fortunately, we do not have to examine the entire tax code all at once. In the pages that follow, we explore the impact of taxes on social welfare by looking at one of the simplest taxes; **the excise tax**.

Tax incidence

Economists want to know how taxes affect the choices that consumers and producers make; when a tax is imposed on an item, do buyers switch to alternative goods that are not taxed? How do producers respond when the products they sell are taxed? Since taxes cause prices to rise, they can affect how much of a good or service is bought and sold. This outcome is especially evident with **excise taxes**, which are taxes levied on a particular good or service — but because we can isolate changes in consumer behavior that result from taxes on one item, excise taxes help us understand the overall effect of a tax.

In looking at the effect of a tax, economists are also interested in the **incidence** of taxation, which refers to the burden of taxation on the party who pays the tax. To understand this idea, consider a \$1.00 tax on milk purchases; we consider two cases: a tax placed directly on buyers and a tax placed directly on sellers.

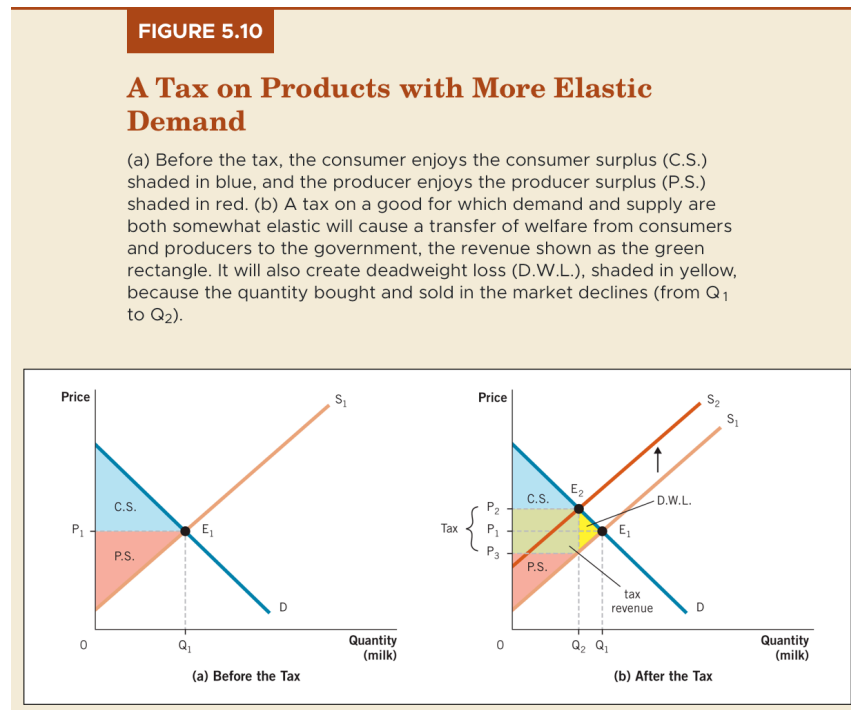
Deadweight Loss

Recall that economists measure economic efficiency by looking at total consumer and producer surplus. We have seen that a tax raises the total price consumers pay and lowers the net price producers receive. For this reason, taxes reduce the amount of economic activity. **Deadweight loss** is the decrease in economic activity by market distortions, such as taxes. In the next three sections, we examine how differences in the price elasticity of demand lead to varying amounts of deadweight loss; the tax is placed on the seller, and we evaluate what happens when the demand curve is perfectly inelastic, somewhat elastic, and perfectly elastic.

Tax Revenue and deadweight loss when demand is inelastic

In Chapter 4, we saw that necessary goods and services — for example, water, electricity, and phone service — have highly inelastic demand. These goods and services are often taxed. For example, consider all the taxes associated with your cell phone bill: sales tax, city tax, county tax, federal excise tax, and annual regulatory fees. In addition, many companies add surcharges, including activation fees, local-number portability fees, telephone number pooling charges, emergency 911 service, directory assistance, telecommunications relay service surcharges, and cancellation fees. Cell phone providers and government agencies take advantage of consumers' strongly inelastic demand by tacking on these extra charges.

There are two reasons why the government may favor excise taxes on

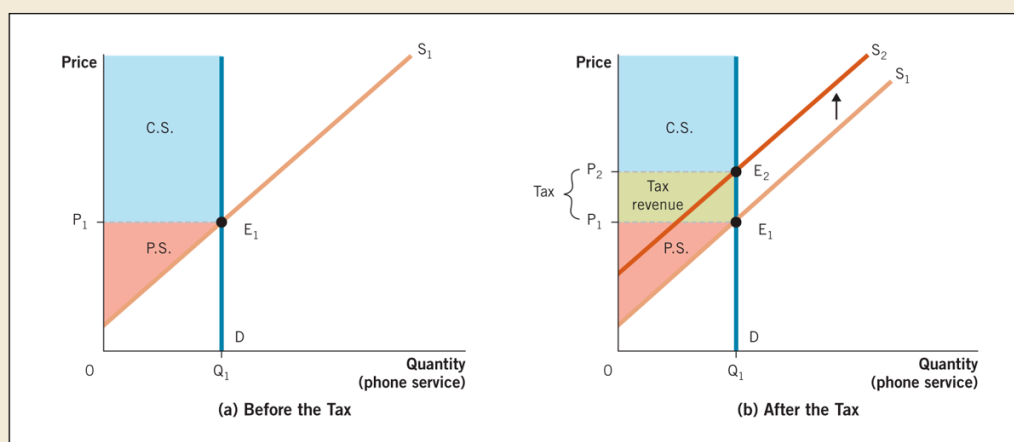


goods with almost perfectly (or highly) inelastic demand. One, because these goods do not have substitutes, the tax will not cause consumers to buy less; thus, the revenue from the tax will remain steady. Second, because the number of transactions or quantity demanded (Q_1) remains constant, there will be no deadweight loss.

FIGURE 5.9

A Tax on Products with Almost Perfectly Inelastic Demand

(a) Before the tax, the consumer enjoys the consumer surplus (C.S.) shaded in blue, and the producer enjoys the producer surplus (P.S.) shaded in red. (b) After the tax, the incidence, or the burden of taxation, is borne entirely by the consumer. A tax on a good with perfectly inelastic demand, such as phone service, represents a transfer of welfare from consumers to the government, as reflected by the reduced size of the blue rectangle in (b) and the creation of the green tax revenue rectangle between P_1 and P_2 .



Tax revenue and deadweight loss when demand is more elastic

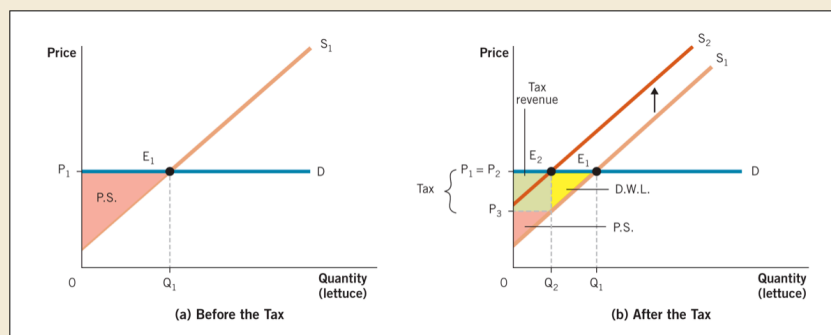
Tax revenue and deadweight loss when demand is more highly elastic

FIGURE 5.11

A Tax on Products with Highly Elastic Demand

area of a triangle = $\frac{1}{2} \times \text{base} \times \text{height}$

(a) Before the tax, the producer enjoys the producer surplus (P.S.) shaded in red. (b) When consumer demand is highly elastic, consumers pay the same price after the tax as before. But they are worse off because less is produced and sold; the quantity produced moves from Q_1 to Q_2 . The total surplus, or efficiency of the market, is much smaller than before. The size of the tax revenue (shaded in green) is also noticeably smaller in the market with highly elastic demand.



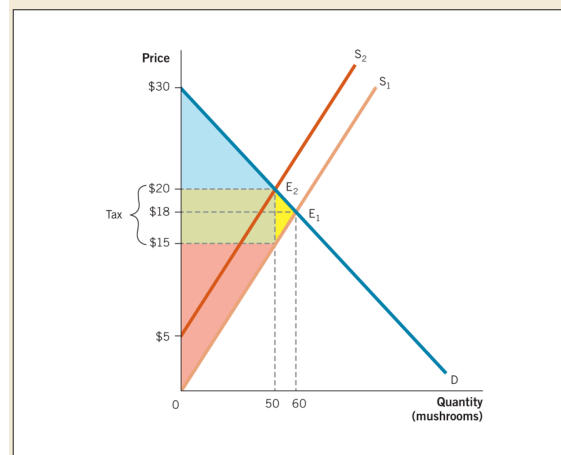
Interaction of demand elasticity and supply elasticity

The incidence of a tax is determined by the relative steepness of the demand curve compared with the supply curve. When the demand curve is steeper (more inelastic) than the supply curve, **consumers bear more of the incidence of the tax**. When the supply curve is steeper (more inelastic) than the demand curve, **suppliers bear more of the incidence of the tax**. Also, **whenever the supply and/or demand curves are relatively steep, deadweight loss is minimized**.

FIGURE 5.12

A Realistic Example

A \$5-per-pound tax is placed on mushroom suppliers, driving the equilibrium price up from E_1 (\$18) to E_2 (\$20). Notice that the price rises by only \$2. Consumers therefore pick up \$2 of the \$5 tax and the seller must pay the remaining \$3. Therefore, most of the incidence is borne by the seller.



TO DETERMINE THE AREA OF THE TRIANGLE FOR DEADWEIGHT LOSS:

TO DETERMINE THE AREA OF THE RECTANGLE FOR TAX REVENUE

Balancing Deadweight loss and Tax revenues

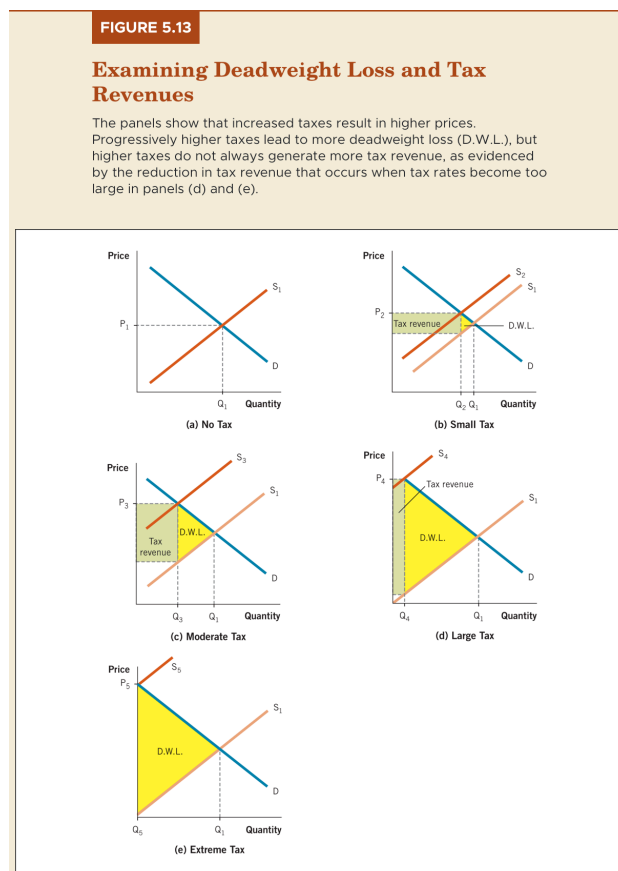
Up to this point, we have kept the size of the tax increase constant, doing so enabled us to examine the impact of the elasticity of demand and supply on deadweight loss and tax revenues — but what happens when a tax is high enough to significantly alter consumer or producer behavior? In this section, we consider how consumers responds to taxes of different sizes, and we determine the relationship between the size of a tax, the deadweight loss, and tax revenues.

Figure 5.13 shows the market response to a variety of tax increases; the five panels in the figure begin with a reference point, **panel (a)**, where no tax is levied, and

progress toward **panel (e)**, where the tax rate becomes so extreme that it curtails all economic activity

As taxes rise, so do prices — you can trace this price rise from **panel (a)**, where there is no tax and the price is P_1 , all the way to **panel (e)**, where the extreme tax causes the price to rise to P_5 . At the same time, deadweight loss (D.W.L.) also rises — you can see this increase by comparing the sizes of the yellow triangles — the trade-off is striking. Without any taxes, deadweight loss does not occur, but soon as taxes are in place; the market equilibrium quantity demanded begins to decline, moving from Q_1 to Q_5 . As the number of transactions (quantity demanded) declines, the area of deadweight loss rapidly expands.

When taxes are smaller, as in **panel (b)**, the tax revenue (green rectangle) is largely relative to the deadweight loss (yellow triangle). However, as we progress through the panels, this relationship slowly reverses. In **panel (c)**, the size of the tax revenue remains larger than the deadweight loss; in **panel (d)**, however, the magnitude of the deadweight loss is far greater than the tax revenue — the size of tax **panel (d)** is creating a



significant cost in terms of economic efficiency. Finally, **panel (e)**, shows an extreme case in which all market activity ceases as a result of the tax; because nothing is produced and sold, there is no tax revenue.

Conclusion

The government largely taxes goods that have inelastic demand, which means that firms are able to transfer most of the tax incidence to consumers through higher prices.

In the first part of this chapter, we learned that society benefits from unregulated markets because they generate the largest possible total surplus. However, society also needs the government to provide an infrastructure for the economy. The taxation of a specific goods and services gives rise to a form of market failure called deadweight loss, which reflects reduced economic activity. Thus, any intervention in the market requires a deep understanding of how society will respond to the incentives created by legislation; in addition, unintended consequences can affect the most well-intentioned tax legislation and, if the process is not well thought through, can cause inefficiencies with far-reaching consequences. None of this means that taxes are undesirable, rather, society must balance (1) the need for tax revenues and the programs those revenues help fund with (2) trade-offs in the market.