

## CHAPTER 8 --- Application: the costs of Taxation

### The Deadweight loss of Taxation

- when a tax is levied on buyers, the demand curve shifts downward by the size of the tax
- When it is levied on sellers, the supply curve shifts up that amount
- in either case, when the tax is enacted, the price paid by buyers rises and the price received by sellers falls
- in the end, buyers and sellers share the burden of the tax regardless of how it is levied

### How a Tax Affects Market Participants

- Let's use the tools of welfare economics to measure the gains and losses from a tax on a good.
- To do this, we must take into account how the tax affects buyers, sellers, and the government.
- The benefit received by buyers in a market is measured by consumer surplus.
- The benefit received by sellers in a market is measured by producer surplus.
- What about the third interested party, the government?
- If  $T$  is the size of the tax and  $Q$  is the quantity of the good sold, then the government gets total tax revenue of  $T \times Q$ . (FIGURE 8.2, PG. 173) + (FIGURE 8.1, PG 172)

### Welfare without a Tax

- To see how a tax affects welfare, we begin by considering welfare before the government has imposed a tax.
- Without a tax, the price and quantity are found at the intersection of the supply and demand curves.

### How a Tax Affects Welfare:

Consumer surplus:

- without tax =  $A+B+C$ , With Tax =  $A$

Producer Surplus:

- Without tax =  $D+E+F$ , With Tax =  $F$

Tax Revenue:

- Without tax = none, with tax =  $B+D$

Total Surplus

- without tax =  $A+B+C+D+E+F$ , with tax =  $A+B+D+F$

----- FIGURE 8.3 PG. 174

### **Welfare with a Tax (also Figure 8.3)**

- The price paid by buyers rises from  $P_1$  to  $P_B$ , so consumer surplus now equals only area A.
- The price received by sellers falls from  $P_1$  to  $P_S$ , so producer surplus now equals only area F.
- The quantity sold falls from  $Q_1$  to  $Q_2$ , and the government collects tax revenue equal to the area B + D.
- Total surplus with the tax, we add consumer surplus, producer surplus, and tax revenue.

### **Changes in Welfare (8.3)**

- We can now see the effects of the tax by comparing welfare before and after the tax is enacted.
- The change in total welfare includes the change in consumer surplus (which is negative), the change in producer surplus (which is also negative), and the change in tax revenue (which is positive).
- When we add these three pieces together, we find that total surplus in the market falls by the area C + E.
- Thus, the losses to buyers and sellers from a tax exceed the revenue raised by the government.
- The fall in total surplus that results when a tax distorts a market outcome is called the deadweight loss.
- The area C + E measures the size of the deadweight loss.

### **Deadweight Losses and the Gains from Trade (8.4, pg 176)**

- Taxes cause deadweight losses because they prevent buyers and sellers from realizing some of the gains from trade.
- The area of the triangle between the supply and demand curves (area C + E in Figure 8.3) measures these losses.
- This loss can be seen most easily in Figure 8.4.

### **Determinants of the Deadweight Loss (8.5, pg 178)**

- What determines whether the deadweight loss from a tax is large or small?
- The answer is the price elasticities of supply and demand, which measure how much the quantity supplied and quantity demanded respond to changes in the price.

### **Deadweight Loss and Tax Revenue as Taxes Vary (8.6 pg 182)**

- What happens to the deadweight loss and tax revenue when the size of a tax changes?

### **Practice Question: \*\*\*\* ?**

- Assume you are full-time workers earning \$10 per hour, \$80 per day, \$400 per week, \$20,000 per year?

- Would you quit your job or keep working if the tax rate was 10 percent, 20 percent, 30 percent, ... (up to 100 percent)?
- In your opinion, what is the "best" tax rate is?

## CHAPTER 14 FIRMS IN COMPETITIVE MARKETS

- A market is competitive if each buyer and seller is small compared to the size of the market and, therefore, has little ability to influence market prices.

### What is a Competitive Market?

#### Competitive market:

- a market in which there are many buyers and many sellers so that each has a negligible impact on the market price (price takers)

#### Three characteristics:

1. There are many buyers and many sellers in the market.
2. The goods offered by the various sellers are largely the same.
3. Firms can freely enter or exit the market.

### The Revenue of a Competitive Firm (Table 14.1, pg 297)

- A firm in a competitive market tries to maximize profit, which equals total revenue minus total cost
- $P =$  price
- $Q =$  quantity
- $TR =$  Total Revenue
- $TR = P \times Q$
- -the fourth column in the table shows average revenue
- Average Revenue-- tells us how much revenue a firm receives for the typical unit sold
- Average Revenue (AR)-- total revenue divided by the quantity sold
- $AR = (P \times Q)/Q = P$
- -The fifth column in the table shows marginal revenue
- Marginal Revenue (MR)--- the change in total revenue from an additional unit sold
- $MR = \text{Change in TR} / \text{Change in Q}$
- For competitive firm's, marginal revenue equals the price of the good

### Profit Maximization and the Competitive Firm's Supply Curve (14.2, pg 298)

- one of the ten principles of economics in Chapter 1 is that rational people think at the margin

- if  $MR > MC$ , then increase milk production
- If  $MR < MC$ , then decrease milk production
- If  $MR = MC$ , now the firm is maximizing profits

### **Marginal-Cost Curve and the Firm's Supply Decision (Figure 14.1 and 14.2, pg 300)**

- to extend this analysis of profit maximization consider the cost curves in figure 14.1
- the marginal-cost curve (MC) is upward sloping
- the average-total-cost curve (ATC) is U-shaped
- The marginal-cost curve crosses the average-total-cost curve at the minimum of average total cost
- the figure also shows a horizontal line at the market price (P)
- the price line is horizontal because the firm is a price taker
- for a competitive firm, the firm's price equals both its average revenue (AR) and its marginal revenue (MR)

### **Three rules that are key to rational decision making for profit maximization:**

1. if marginal revenue is greater than marginal cost, the firm should increase its output
2. if marginal cost is greater than marginal revenue, the firm should decrease its output
3. at the profit-maximizing level of output, marginal revenue and marginal cost are exactly equal

### **The Firm's Short-Run Decision to Shut Down**

#### Shutdown vs. Exit

- a Shutdown refers to a short-run decision not to produce anything during a specific period of time because of current market conditions
- an Exit refers to a long-run decision to leave the market
- The short-run and long-run decisions different because most firms cannot avoid their fixed costs in the short run but can do so in the long run

### **Short-Run decision to Shut Down (figure 14.3, pg 303)**

- if the firm shuts down, it loses all revenue from the sale of its product
- at the same time, it saves the variable costs of making its product (but must still pay the fixed costs)
- Thus, the firm shuts down if the revenue that it would earn from producing is less than its variable costs of production
- shut down if  $TR < VC$
- shut down if  $TR/Q < VC/Q$
- Shut down if  $P < AVC$
- if MC is below AVC it shuts down

### **Spilt Milk and Other Sunk Costs**

- Sunk Cost--- a cost that has already been committed and cannot be recovered

- because nothing can be done about sunk costs, they can be ignored when making decisions about various aspects of life, including business strategy

### **Long-Run Decisions to Exit or Enter the Market (Figure 14.4 pg 305)**

- if the firm exits, it again will lose all revenue from the sale of its product, but now it saves on both fixed and variable costs of production
- the firm exits the market if the revenue it would get from producing is less than its total costs
  - Exit if  $TR < VC$
  - Exit if  $TR/Q < TC/Q$
  - Exit if  $P < ATC$
- the exit price coincides with the minimum point on the average total cost curve
- the shutdown price coincides with the minimum point on the average-variable-cost curve
- the firm will enter the market if it is profitable, which occurs if the price of the good exceeds the average total cost of production----- enter if  $P > ATC$

### **Measuring Profit in Our Graph for the Competitive Firm (14.5, pg 306)**

$$\text{Profit} = TR - TC$$

$$\text{Profit} = (TR/Q - TC/Q) \times Q$$

$$\text{Profit} = (P - ATC) \times Q$$

### **Supply Curve in a Competitive Market**

There are two cases to consider:

1. A market with a fixed number of firms
2. a market in which the number of firms can change as old firms exit the market and new firms enter

### **Short Run: Market Supply with a Fixed Number of Firms (14.6, pg 308)**

- consider first a market with 1000 identical firms
- for any given price, each firm supplies a quantity of output so that its marginal costs equals the price

### **Long Run: Market Supply with Entry and Exit (14.7, pg 309)**

- if firms already in the market are profitable, then new firms will have an incentive to enter the market
- this entry will expand the number of firms, increase the quantity of the good supplied, and drive down prices and profits... and vice versa
- at the end of this process of entry and exit, firms that remain in the market must be making zero economic profit
- the long-run equilibrium of a competitive market with free entry and exit must have firms operating at their efficient scale

### **Why Do Competitive Firms Stay in Business If They Make Zero Profit?**

- in the zero-profit equilibrium, economic profit is zero, but accounting profit is positive

### **A Shift in Demand in the Short Run and Long Run (14.8, pg 311)**

- because firms can enter and exit a market in the long run but not in the short run, the response of a market to a change in demand depends on the time horizon

### **Why the Long-Run Supply Curve Might Slope Upward (14.9, pg 313)**

- there are two reasons that the long-run market supply curve might slope upward:
  - 1. some resources used in production may be available only in limited quantities
  - 2. Firms may have different costs

## **CHAPTER 15 MONOPOLY**

### Monopoly

- is a firm that is the sole seller of a product without close substitutes
- the fundamental cause of a monopoly is barriers to entry, which have three main sources
1. monopoly resources---- a key resource is owned by a single firm
  2. Government-created monopolies--- the government gives a single firm the exclusive right to produce some good or service
  3. Natural monopolies--- a single firm can produce output at a lower cost than can a larger number of producers

### Monopoly Resources

- the simplest way for a monopoly to arise is for a single firm to win a key resource
- although exclusive ownership of a key resource is a potential cause of monopoly, in practice, monopolies rarely arise for this reason

### Why Monopolies Arise

#### Government-Created Monopolies:

- in many cases, monopolies arise because the government has given one person or firm the exclusive right to sell some good or service
- patent and copyright laws are two important examples of how the government creates a monopoly to serve the public interest
- -- the benefit of the patent and copyright laws is the increased incentive for creative activity
- -- the cost of the patent and copyright laws is monopoly pricing

### Natural Monopoly (15.1, pg 322)

- a natural monopoly arises because a single firm can supply a good or service to an entire market at a smaller cost than could two or more firms
- a natural monopoly arises when there are economies of scale over the relevant range of output

### How Monopolies Make Production And Pricing Decisions

- how does a monopoly firm decide how much of its product to make and what price to charge for it?

#### Monopoly vs. Competition (15.2, pg 324)

- the key difference between a competitive firm and a monopoly is the monopoly's ability to influence the price of its output
- the market demand curve provides a constraint on a monopoly's ability to profit from its market power
- by adjusting the quantity produced (or, equivalently, the price charged), the monopolist can choose any point on the demand curve, but it cannot choose a point off the demand curve
- what point on the demand curve will the monopolist choose?

#### A Monopoly's Revenue (15.2, pg 325) (15.3, pg 326)

- The monopolist's goal is to maximize profit
- the firm's profit is total revenue minus total costs
- let's start by exploring the monopoly's revenue, which depends on the quantity produced
- Marginal revenue for monopolies is very different from marginal revenue for competitive firms
- when a monopoly increases the amount it sells, it has two effects on total revenue:
  1. the output effect -- more output is sold, so Q is higher, which tends to increase total revenue
  2. The price effect-- the price falls, so P is lower, which tends to decrease total revenue
- a monopolist's marginal revenue is always less than the price of its good\*\*\*

#### Profit Maximization (15.4, pg 327)

- the logic of marginal analysis is used to determine how much the monopolist should produce
- the monopolist's profit-maximizing quantity of output is determined by the intersection of the marginal-revenue curve and the marginal-cost curve
- Competitive firms -----  $P = MR = MC$
- Monopolist-----  $P > MR = MC$

#### A Monopoly's Profit (15.5, 329)

- how does the monopoly find the profit-maximizing price for its product?
  1. it chooses the quantity of output that equates MR and MC
  2. It uses the demand curve to find the highest price it can charge for that quantity

---- Profit = TR - TC

----- Profit =  $(TR/Q - TC/Q) \times Q$

----- Profit =  $(P - ATC) \times Q$

#### The Welfare Cost of Monopoly

- is monopoly a good way to organize a market?

- Is it possible that the benefits to the firm's owners exceed the costs imposed on consumers, making monopoly desirable from the standpoint of society as a whole?

#### The Deadweight Loss (15.7, pg 332)

- what would a monopoly firm do if it were run by a benevolent social planner?
- he tries to maximize total surplus, which equals producer surplus (profit) plus consumer surplus
- recall that total surplus equals the value of the good to consumers minus the costs of making the good incurred by the monopoly producer
- the welfare effects of a monopoly are measured by comparing the level of output that the monopolist chooses with the level of output that a social planner would choose
- the monopolist produces less than the socially efficient quantity of output
- note that a quantity that is inefficiently low is equivalent to a price that is inefficiently high
- the inefficiency of monopoly can be measured with a deadweight loss triangle, as illustrated in figure 15.8

#### Monopoly's profit: A Social Cost?

- the monopoly profit itself does not represent a shrinkage in the size of the economic pie; it merely represents a bigger slice for producers and a smaller slice for consumers
- the monopoly profit is not a social problem
- the problem in a monopolized market arises because the firm produces and sells a quantity of output below the level that maximizes total surplus
- the deadweight loss measures how much the economic pie shrinks as a result
- this inefficiency is connected to the monopoly's high price :
- ----- consumers buy fewer units when the firm raises its price above marginal cost

#### Price Discrimination

- so far we have been assuming that the monopoly firm charges the same price to all customers
- in many cases firms try to sell the same good to different customers for different prices
- Price Discrimination---- the business practice of selling the same good at different prices to different customers
- price discrimination is a rational strategy for a profit-maximizing monopolist
- price discrimination requires the ability to separate customers according to their willingness to pay
- Price discrimination can raise economic welfare
- ---- note that the increase in welfare from price discrimination shows up as higher producer surplus rather than higher consumer surplus
- (15.9) -- welfare with and without price discrimination
- (15.10) -- Third-Degree Price Discrimination

#### Public Policy Toward Monopolies

Policymakers in the government can respond to the problem of monopoly in one of four ways:

1. By trying to make monopolized industries more competitive

2. By regulating the behaviour of the monopolies
3. By turning some private monopolies into public enterprises
4. By doing nothing at all

#### Increasing Competition with Competition Law

- one way that the government can respond to the inefficiencies resulting from market power in general, and monopoly in particular, is through legislation designed to encourage competition and discourage the use of monopoly practices
- competition law in Canada is enforced by the competition bureau, a unit within the federal government's industry Canada.
- competition laws have costs as well as benefits
- ---- the benefits of greater efficiency as a result of mergers are called synergies

#### Regulation

- another way in which the government deals with the problem of monopoly is by regulating the behaviour of monopolists
- this solution is common in the case of natural monopolies, such as water and electric companies
- these companies are not allowed to charge any price they want
- government agencies regulate their prices
- What price should the government set for a natural monopoly? MC?
- Two practical problems with MC pricing (15.11)
  1. negative profits
  2. no incentive to reduce costs

#### Public Ownership

- rather than regulating a natural monopoly that is run by a private firm, the government can run the monopoly itself
- examples---- Canada Post, CBC, VIA Rail, Sasktel, Hydro-Quebec

#### Doing Nothing

- each of the foregoing policies aimed at reducing the problem of monopoly has drawbacks
- As a result, some economists argue that it is often best for the government NOT to try to remedy the inefficiencies of monopoly pricing
- -- "in my view (Stigler), however, the degree of "market failure" for the American economy is much smaller than the "political failure" arising from the imperfections of economic policies found in real political systems"

## Chapter 10 Externalities

### Externalities

- market failures examined in this chapter fall under a general category called externalities
- Externality---- the uncompensated impact of one person's actions on the well-being of a bystander
- the government responds by trying to influence this behaviour to protect the interests of bystanders

## Externalities and Market Inefficiency

### Welfare Economics: A Recap

- let's consider a specific market- the market for aluminium (Figure 10.1)
- as you should recall from chapter 7, the supply and demand curves contain important information about costs and benefits
- ---- the demand curve for aluminum reflects the value of aluminum to consumers
- ----- the supply curve reflects the costs of producing aluminum

### Negative Externalities

- suppose that aluminum factories emit pollution
- the smoke creates a health risk for those who breathe the air' it is a negative externality
- how does this externality affect the efficiency of the market outcome?
- because of the externality, the costs to society of producing aluminum is larger than the cost to the aluminum producers
- for each unit of aluminum produced, the social cost includes the private costs of the aluminum producers plus the costs to those bystanders affected adversely by the pollution
- (Figure 10.2)
- Note that the equilibrium quantity of aluminum,  $Q_{\text{market}}$ , is larger than the socially optimal quantity,  $Q_{\text{optimum}}$
- this inefficiency occurs because the market equilibrium reflects only the private costs of production
- in the market equilibrium, the marginal consumer values aluminum at less than the social cost of producing it
- At  $Q_{\text{market}}$  the demand curve lies below the social-cost curve
- thus, reducing aluminum production and consumption below the market equilibrium level raises total economic well-being
- the value of this increase in economic well-being can be measured using the concept of deadweight loss
- figure 10.3 shows how the concepts of consumer and producer surplus are used to determine the deadweight loss of the externality caused by the aluminum factory emitting pollution and Table 10.1
- how can the social planner achieve the socially optimal level of aluminum production and eliminate the deadweight loss associated with the externality?
- one way would be to tax aluminum producers for each tonne of aluminum sold
- Internalizing the externality----- altering incentives so that people take account of the external effects of their actions

## Positive Externalities

- although some activities impose costs on third parties, others yield benefits, for example, consider education
- beyond its private benefits, education also yields positive externalities (10.4)
- -- more informed voters
- -- less crime
- -- higher productivity and wages for everyone
- to move the market equilibrium closer to the social optimum, a positive externality requires a subsidy
- this explains why government subsidizes education through public schools and government scholarships
- negative externalities lead markets to produce a larger quantity than is socially desirable
- positive externalities lead markets to produce a smaller quantity than is socially desirable
- the government can internalize the externality by taxing goods that have negative externalities and subsidizing goods that have positive externalities

## Public Policies Toward Externalities

As a general matter, the government can respond to externalities in one of two ways

1. Command-and-control policies regulate behaviour directly
2. Market-based policies provide incentives so that private decision makers will choose to solve the problem on their own

## Command-and-Control Policies: Regulation

- the government can remedy an externality by making certain behaviours either required or forbidden
- ---- it is a crime to dump poisonous chemicals into the water supply
- in most cases of pollution, however, the situation is not this simple
- it would be impossible to prohibit all polluting activity

## Market-based policy 1: corrective taxes and Subsidies

- instead of regulating behaviour in response to an externality, the government can use market-based policies to align private incentives with social efficiency
- for instance, the government can internalize the externality by imposing taxes on activities that have negative externalities and subsidizing activities that have positive externalities
- Corrective (pigovian) taxes ----- taxes enacted to correct the effects of negative externalities
- an ideal corrective tax would equal the external cost from an activity with negative externalities, and an ideal corrective subsidy would equal the external benefit from an activity with positive externalities
- economists usually prefer corrective taxes over regulations as a way to deal with pollution because such taxes can reduce pollution at a lower cost to society

- ---- regulation dictates the level of pollution
- ----- a tax gives factory owners an economic incentive to reduce pollution
- Corrective taxes:
- ---- place a price on the right to pollute
- ----- are better for the environment
- ----- raise revenue for the government; enhance economic efficiency

#### Market-based policy 2: tradable pollution permits

- an advantage of allowing a market for pollution permits is that the initial allocation of pollution permits among firms does not matter from the standpoint of economic efficiency
- --- those firms that can reduce pollution most easily would be willing to sell whatever permits they get
- ---- those firms that can reduce pollution only at high cost would be willing to buy whatever permits they need
- as long as there is a free market for the pollution rights, the final allocation will be efficient whatever the initial allocation
- reducing pollution using pollution permits may seem very different from corrective taxes, but the two policies have much in common (figure 10.5)

#### Objections to the economic analysis of pollution

- some people object to the use of pollution permits and other market-based solutions to pollution on the grounds that it is simply not right to allow someone to pollute for a fee
- the environment is so important, they claim, that we should protect it as much as possible regardless of the cost
- people face tradeoffs
- the value of clean air and clean must be weighted against their opportunity cost
- eliminating all pollution would reverse many of the technological advances that allow us to enjoy a high standard of living

#### Private solutions to externalities

- although externalities to cause markets to be inefficient, government action is not always needed to solve the problem
- in some circumstances, people can develop private solutions

#### possible private solutions:

- moral codes and social sanctions
- charities
- the self-interest of the relevant parties
- contracts

#### The Coase Theorem

- how effective is the private market in dealing with externalities?

- a famous result, called the Coase theorem after economist Ronald Coase, suggests that it can be very effective in some circumstances
- Coase Theorem---- the proposition that if private parties can bargain without cost over the allocation of resources, they can solve the problem of externalities on their own
- the Coase theorem says that private economic actors can potentially solve the problem of externalities among themselves
- whatever the initial distribution of rights, the interested parties can reach a bargain in which everyone is better off and the outcome is efficient

Why private solutions do not always work

- in the real world, bargaining does not always work, even when a mutually beneficial agreement is possible
- --- transaction costs: the costs that parties incur in the process of agreeing and following through on a bargain
- bargaining simply breaks down
- the number of parties involved is large and coordination is costly

## Chapter 11-- PUBLIC GOODS AND COMMON RESOURCES

The different kinds of goods

- in thinking about the various goods in the economy, it is useful to group them according to two characteristics:
  1. is the good excludable?
  2. is the good rival in consumption?
- Excludability--- the property of a good whereby a person can be prevented from using it
- Rival in Consumption--- the property of a good whereby one person's use diminishes other people's use
- from these two characteristics, goods can be divided into four categories
  1. private goods- are both excludable and rival in consumption
  2. public goods- are neither excludable nor rival in consumption
  3. common resources- are rival in consumption but are not excludable
  4. club goods- are excludable but are not rival in consumption

(figure 11.1)

Public Goods

- to understand how public goods differ from other goods and why they present problems for society, let's consider an example:
  - a fireworks display (not excludable, nor rival in consumption))

Free-Rider Problem

- when the benefits of a product exceed its costs, it is efficient to produce it
- can we always rely on the private market to produce it?
- it depends, is it excludable?
- Free Rider--- a person who receives the benefit of a good but avoids paying for it

- because of the free rider problem, the market fails to produce an efficient outcome
- the market fails because of an externality
- the solution is simple however

#### Important public Goods

1. national defence
2. basic research (general knowledge is a public good, specific technological knowledge is not)
3. Fight poverty

#### The difficult job of cost-benefit analysis

- knowing that the government has a role to play in the provision of public goods is a first step
- the government must now decide what public goods to provide and in what quantities
- cost-benefit analysis will help answer these questions
- Cost-benefit analysis---- a study that compares the costs and benefits to society of providing a public good

#### Common resources

- common resources, like public goods, are not excludable
- common resources are, however, rival in consumption
- The Tragedy of the Commons---- a parable that illustrates why common resources get used more than is desirable from the standpoint of society as a whole

#### The tragedy of the commons

- when one person uses a common resource, that person diminishes other people's enjoyment of it
- because of this negative externality, common resources tend to be used excessively
- the government can solve the problem by:
  - ---- reducing use of the common resource through regulation or taxes
  - ---- turning the common resource into a private good

#### Some important Common resources:

1. clean air and water
2. congested roads
3. fish, whales, and other wildlife