Principles of Microeconomics

Econ 1201 - Saint Mary's University

Vincent Chandler

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Preface

The purpose of these notes is to accompany students enrolled in the course Principles of Microeconomics at Saint Mary's University, Halifax. It is not meant as a stand-alone textbook. A very intelligent and disciplined student could probably pass this course relying only on these notes, but it would difficult. These notes provide students a complement to the lectures.

These notes differ from most textbooks available, because they avoid the elegance of theoretical economics. After introducing demand and supply, traditional textbooks explain the micro-foundations of demand and supply through utility and profit maximization. They then move on to different market structures in the short- and long-run.

Even though this material is within the scope of microeconomics, there is a strong focus on industrial organization. Other fields of microeconomics are largely ignored (labour and public economics for example). In these notes, we try to cover microeconomics more broadly.

In these notes we tend to neglect the concept of optimality. Even though this concept is very elegant, it is not very useful for first-year students. Do students need to know precisely why demand decreases and supply increases

as the price increases? Is it not intuitive? The traditional approach is coherent, but it lacks relevance. In these notes, we jump from topic to topic sacrificing coherence for relevance. We tend to focus on real-life problems to guide our study of microeconomics. For example, we discuss the consequences of exempting certain products from HST? We try to start with a question that could turn into a conversation: Why are there sales? Why do cars lose so much value in their first year? These are observable events that can be - at least partially - explained by economics.

Utility and profit maximization are always there in the background, but there is no need to explicitly model the production or consumption decision for first year students. The microeconomics course in second year can take care of these issues using the necessary mathematics. Principles of microeconomics should give an overviews of microeconomics not provide a stepping stone for second-year microeconomics.

Introduction

Microeconomics is generally about the choices of consumers maximizing their well-being and firms maximizing profits. Governments intervene when the relationship between consumers and firms fails to maximize welfare.

Our discussion starts with the usual demand and supply setting. We present factors influencing demand and supply and explain the mechanisms generating an equilibrium. Finally, we focus on two typical policies (price ceiling and price floor) that affect the equilibrium of markets.

The second and third chapters describe and model the decision of firms. What is a firm? Why do they specialize? How to maximize profit when facing a downward sloping demand function? We introduce the concept of price elasticity to answer this question.

We then use elasticity in the third chapter to explain price discrimination. Differences in elasticities across the population lead to firms offering a variety of prices to maximize profit in different markets.

Not all products can be provided by firms. The government plays an important role in the economy. In chapter 5, we discuss public goods and

issues relating to externalities.

The intervention of the state must be financed through taxes. Consumption, income, asset and corporate taxes generate these revenues and impact decisions taken by economic agents. Chapter six is devoted to taxes.

In chapter seven, we leave the realm of developed countries and discuss issues surrounding developing countries where most of the world population lives. How are these countries different from developed countries?

Chapters eight and nine present special circumstances in which markets fail to reach optimality. Chapter eight discusses information asymmetry: a situation in which one party has more information than the other one. In such cases, principal-agent, adverse selection and moral hazard issues can arise and reduce the efficiency of the market allocation. Chapter nine presents evidence supporting bounded rationality. Economic agents may not be as rational as sometimes assumed.

In chapter ten, we present the challenges resulting from applied research in microeconomics. While most of this course is theoretical, most researchers in microeconomics work with data. In the last chapter, we discuss how theories can be assessed empirically.

In the conclusion, we discuss how these different chapters fit into a larger understanding of business that should be acquired by students enrolled in the bachelor of commerce.

1

When Supply Swiped Right to Meet Demand

"You match with a bunch of people,
no one ever messages each other,
and no one ever has sex", he responded.
Quote: On Tinder, Off Sex, NYT, Oct. 15 2015

Introduction

Supply and demand are two parts of a story explaining variations in prices. Since nobody knows the exact shape of the demand or supply curves for any given industry, it is impossible to predict with any precision the magnitude of the impact of an exogenous change on prices. We can only predict/explain

the direction of a price change. The objective of this chapter is to enable students to tell stories explaining variations in prices.

In this chapter, we discuss the demand and supply framework in a very general fashion and describe factors that influence both functions. We consider the repercussion of a shift in demand or supply on prices following an exogenous shock. Finally, we will consider the impact of different government policies on prices and on the equilibrium quantities.

1.1 Demand

Each individual has a demand function that arises from the utility maximization process. In other words, people try to generate as much pleasure as possible from the consumption of goods given a certain budget. When the price of good A increases, a consumer needs to forego consuming more of other goods to consume a unit of good A. A consumer may therefore choose to reduce his/her consumption of good A to consume more of other goods. In other words, as the price of good A increases, the quantity demanded of good A decreases.

If all individuals behave in this fashion, the sum of all individual quantity demanded (aggregated demand) will also decrease as the price of a good increases. The relationship between quantity demanded and price is therefore negative and is reflected in a typical downward sloping demand curve. Demand is a function that links the price with the quantity demanded. When

the price changes, demand does not change, but the quantity demanded changes.

The price of a good is not the only factor influencing the quantity demanded. Other factors also matter: income, the price of other goods and taste. When these factors change, the demand curve shifts to account for these changes. The next sections will explain how these variables affect the demand function.

Income

When my income increases, I have more money to spend, and I can therefore increase my consumption. Not surprisingly, the quantity demanded of most goods will increase as income increases. These goods are called **normal goods**.

There are, however, certain goods whose consumption will decrease as my income increases: **inferior goods**. The usual example of an inferior good is Kraft Dinner. It provides the calories to keep students on a low budget alive at a relatively low cost. As these students start earning money after graduation, they will probably replace Kraft Dinner by something more tasty/nutritious. They will therefore decide to reduce their consumption of Kraft Dinner. As their income increases, their consumption of Kraft Dinner therefore decreases. Kraft Dinner is therefore an inferior good[1].

[1]Except for the Barenaked Ladies

Price of other goods

Variations in the price of other goods also influence the quantity demanded of a given good. We will differentiate between two types of goods: **substitutes** and **complements**. First, consider Pepsi and Coca-Cola. If the price of Pepsi increases, what will happen to the quantity demanded of Coca-Cola? It will increase. Since Coca-Cola and Pepsi are substitutes, people will substitute away from Pepsi if its price increases. An increase in the price of a substitute of good A increases demand for good A.

Some goods are complements: a person needs one to make the other one more enjoyable. Consider a CD and a CD player. A CD without a CD player is fairly useless. So is a CD player without CDs. If the price of CDs increased, people would reconsider purchasing CD players, because they know they will need to buy CDs to use the CD player. Since the bundle CD and CD player becomes more expensive, the demand for both CDs and CD players decreases. An increase in the price of a complement of good A decreases demand for good A.

Taste

Finally, tastes can also change. There can be fashions in the consumption of goods. When all your friends have a cell phone, you also develop a taste for cell phones. New discoveries can make products more attractive (applications make smart phones more attractive) or less (new research showing a positive

relationship between cancer and cell phones probably decreases demand for cell phones). Changes in taste can change the quantity demanded of a given good in either directions depending on the situation.

1.2 Supply

The quantity supplied also depends on the price. When firms produce more, it becomes more costly to produce an extra good. Initially, it is relatively cheap to produce a good. The employees are focused and well-rested. As production increases, the number of hours of work increases and employees become tired. Their productivity decreases. Moreover, their wage increases if they work over-time. Overall, both factors lead to an increase in cost per extra unit produced. If producing an extra unit is very expensive, firms will only consider doing it if the price is high enough to compensate for the cost. The relationship between price and quantity supplied is therefore positive.

The only other factor that influences supply is the cost of production. When the cost of production increases, firms are less interested to produce a good and therefore reduce their production at a given price.

1.3 Equilibrium

Basic story

Demand and supply interact to determine the equilibrium price and quantity. The equilibrium price is defined as the price at which the quantity demanded equals the quantity supplied. At a price below the equilibrium, the quantity supplied is smaller than the quantity demanded. Consumers therefore overbid each other to obtain the good. As they do so, the price increases until the quantity supplied and demanded are equal. At a price above the equilibrium, the quantity supplied is greater than the quantity demanded. Suppliers are therefore competing to sell their goods by decreasing their price. This process continues until the quantity demanded equals the quantity supplied at which point, suppliers no longer feel they need to compete against each other. The equilibrium is a stable situation in which the price remains constant... until the next shock.

Shocks

An equilibrium persists until either demand or supply is hit by an exogenous shock. Consider for example an increase in income and the demand for cars. How could the demand for cars be affected by an increase in income? In other words, are cars inferior or normal goods? Since low-income households do not have cars, it could not be an inferior good. We can safely assume that the quantity of cars demanded would increase following an increase in income.

At the original equilibrium price, the quantity demanded is now above the quantity supplied following the positive income shock. Consumers over-bid each other to purchase the good: the price increases. As the price increases, the quantity supplied increases and the quantity demanded decreases until a new equilibrium has been found.

Example

Let us consider a real example of a change in price and then explain it using the demand and supply framework. While WTI crude oil was trading at $100 in June 2014, the price had fallen to $30 in February 2016. What happened? First, supply has been increasing steadily in the past years due to fracking. The US is now producing great quantities of natural gas and petroleum using this new method. The supply curve has shifted to the right. The world economy is now producing a greater quantity of oil and natural gas (a substitute for oil) than previously for any given price. Second, the Chinese economy has been slowing down in the last years leading to a decrease in demand. At all prices, the quantity demanded is smaller now that it was previously. An increase in supply combined with a decrease in demand will necessarily result in a decrease in price. The demand and supply framework can therefore explain the variation in the price of crude oil observed in the last two years.

1.4 Consumer and producer surplus

At equilibrium, consumers purchase all units at the same equilibrium price. However, consumers would have been ready to pay a higher per unit price for a lower quantity of this good. For example, a consumer is ready to pay $10 per unit to purchase 10 units, but would have been ready to pay $17 per unit to purchase 5 units. The more a consumer purchases, the less he/she cares about the marginal unit and therefore the less he/she is ready to pay for it, a phenomenon called **decreasing marginal utility**. The demand curve captures the willingness to pay as a function of the quantity demanded.

Consumers make a gain when the price they pay is smaller than their willingness to pay. A consumer will necessarily make a gain on the first units purchased, because his/her willingness to pay is greater than the price paid. The difference between the willingness to pay and the price paid is called the **consumer surplus**.

Consider the following example of a demand function to understand the concept of consumer surplus: a person will buy nothing if the price is above $25, 1 unit if the price is between $25 and $20, 2 units if the price is between $20 and $15 and 3 units if the price is below $15. Assume the equilibrium price is $12. The person therefore buys 3 units. This person generated a surplus on the first unit, because he/she was ready to pay up to $25 but only paid $12 (surplus of $13). The person also generated a surplus on the second unit, because he/she was ready to pay $20 to purchase the second item,

but he/she also only paid $12 (surplus of $8) for the second unit. Finally, the person even generated some surplus on the third item, because he/she was ready to pay $15, but only paid $12 (surplus $3). Overall, the person generated a consumer surplus of $24.

The same logic applies for the producer surplus. The producer would be ready to sell the first unit at a very low price, but the equilibrium price is much higher generating some producer surplus. The **producer surplus** is the difference between the equilibrium price and the willingness to sell of producers.

Consumer and producer surplus form together **total surplus**. One can see graphically that the market equilibrium maximizes total surplus.

1.5 Government intervention

The government can intervene on the free market and often does. We'll consider two cases of government interventions: a price floor and a price ceiling. Both interventions lead to some inefficiency, because some mutually beneficial transactions do not take place. In other words, it reduces total surplus. The rationale behind such policies is usually redistribution.

Price floor

When the government introduces a price floor, it forces the market price to stay above the equilibrium price. At such a price, the quantity demanded is

smaller than the quantity supplied. To address this problem, the government usually introduces quotas to limit the quantity supplied and avoid waste.

The markets for most agricultural products (like milk) are a good example of a price floor. The government wants to guarantee a certain price to farmers[2]. A comparison with the US shows the difference in price between a regulated an unregulated market. In Halifax, a liter of milk costs CAD 2.22. In Ithaca (New-York) where there is no price floor, the same liter costs CAD 1.14[3]. The price floor is approximately twice the equilibrium price. Unfortunately by supporting the price of milk, the government also increases the price of all dairy products that use milk as input.

There are some interesting initiatives to avoid this price floor and homogenized milk in general. Some farmers offer to purchase shares of a cow. The price floor only applies to milk that is sold to consumers. If a consumer owns a cow, he/she can consume this milk completely legally. This example shows that consumers and producers usually find ways to engage in mutually beneficial transactions in spite of the price floor.

Another important price floor is the minimum wage. Employers cannot hire employees at a price below the minimum wage. This law prohibits some transactions that could benefit both parties. Assume that a person is not very productive. No employer would pay this person $10.60 (minimum wage in NS) per hour, but maybe an employer would be interested in hiring this

[2]To have access to this price, farmers must purchase a quota at a price of approximately $25 000 per cow.

[3]Feel free to compare other prices.

person at a cost of $8.00 per hour. If the person, knowing he/she is not very productive, were willing to accept the job, the minimum wage is blocking a mutually beneficial transaction, and thus reducing welfare.

Is the minimum wage bad because it prohibits mutually beneficial transactions? The minimum wage has drawbacks but it also raises wages for those people who work. Many employees may be very productive but may have difficulties defending their interests. The minimum wage gives these people a higher wage. Findings by David Card have shown that very few jobs are lost when the minimum wage is increased suggesting that the social benefits of the minimum wage may outweigh its efficiency cost.

Price ceiling

When the government introduces a price ceiling, it forces the market to stay below the equilibrium price. At such a price, the quantity demanded exceeds the quantity supplied. There is therefore a shortage. Many cities, for example, put a ceiling on rents. Usually, a landlord cannot increase the rent by more than a fixed percentage every year. This type of policy reduces the incentives of landlords to build new buildings or renovate existing ones. Ultimately, it can create a shortage of housing.

Similarly, in many developing countries, banks cannot charge interest rates above the so-called usury rate[4]. Considering inflation, the cost of lending and default risk, banks may need to charge a high interest to break even.

[4]Each Canadian province has a price ceiling for payday loans.

If the price ceiling is below this interest rate, banks may simply not lend and therefore make it impossible for entrepreneurs to fund their projects. While the intention of a law against usury may be to make loans at low interest rates available, such laws could lead to an overall reduction in the availability of loans.

Whenever a price ceiling leads to a shortage, a black market can arise to provide the goods to those who can pay. The price on the black market is many times greater than the price ceiling ordered by the government, but at least the good is available. The price ceiling therefore leads to higher prices for the majority that cannot access the good at the price determined by the government.

Is a price ceiling bad? It depends who you are. If you can obtain the good at the low price ceiling, this policy is excellent. In the case of rent ceiling, people who have always lived in the city can enjoy the benefits of a low rent. Newcomers, however, must spend much effort trying to find housing and may need to pay a black market price to secure an apartment. For them, a price ceiling is bad. This policy impacts different types of people differently.

2

What are firms, why do they exist and why do they specialize?

Introduction

Firms are important actors in the supply and demand framework. They produce goods and services, and they provide employees a salary with which they can consume those goods and services. We'll first discuss how to define a firm. Second, we'll think about why firms specialize and how they interact with each other.

2.1 What is a firm?

In theory, firms are easily defined. They are legal entities that use capital and labour to transform some input into an output. Inputs and outputs are purchased/sold on a competitive market. The profits generated by these operations are either reinvested in the firm or distributed to its owners. Voilà!

Reality looks more complicated. Here's a description of the relationships of firm B. It produces good W by leasing capital from firm D and subcontracting labour from firm J. Only the management team is employed by firm B. Firm B owns the land and the building in which it produces. It was purchased with a loan from firm A, which also owns 50% of the shares of firm B. Firm B has a 10-year contract with firm C which provides input and sells its output at a fixed price to firm F which commercializes the good in country Z. Firm F is fully owned by firm A.

Firm G produces a product similar to the one produced by firm B (product W) and also hires the services of firm F to merchandise its products in country Z. Both firms agreed to collaborate and created firm E which develops R&D useful to the production of product W. Firm G and B each own 50% of firm E. And then there's firm H that actually owns the R&D developed by firm E. It's located in the Bahamas.

How many firms are there? Legally, there are 8 firms. Economically, the question should be restated as: how many independent firms are there? Few people would argue that firm G is real; it's just a shell to avoid corporate

tax. Then, there's firm F, which is fully-owned by firm A. Does that count? What about firm B? It's owned to 50% by another firm? By digging deeper, we are trying to figure out who is taking decisions.

Are firms B and G competitors? It depends on the situation. They produce goods that are substitutes so they are in competition, but they are working together to improve production processes. They are therefore collaborators. Numerous firms are competitors and collaborators at the same time. All restaurants in downtown Halifax are competitors, yet they are all members of the restaurant association of Nova Scotia. Similarly, airlines compete for passengers, yet they are all members of Star Alliance, SkyTeam or OneWorld.

Does firm B have any contact with the market? Not really. All the transactions undertaken by firm B are part of a contract. In the short-term, firm B is more or less immune to any economic shock. This situation has some advantages for firm B as it can plan ahead more easily. However, there are certain disadvantages: it cannot change easily. If firm B wants to change its input provider, firm C would require a compensation. Perhaps firm B could work together with firm C to change the input. Any relationship between seller and buyer is more complicated than the market relationships that we always assume.

Why would a firm engage in such complicated relationships? Because each type of relationship has a purpose. Firms B and C may have a long-term relationship, because producing the input may require firm C to invest

heavily in specialized equipment. Without a long-term contract, it would have been too risky for firm C to make this investment. Why didn't firm B invest itself? It may lack the expertise or access to the natural resources. Firm B may have engaged in a leasing contract, because it lacked financing to buy equipment or because it wanted to be sure someone could repair the machines quickly. Why doesn't firm B hire employees instead of relying on subcontracting? Perhaps it's very easy to find employees for this special task and make sure they are working hard. There is therefore no need to create long-term relationships. Why didn't firm B borrow money from a bank to purchase the land and the building? Perhaps firm A is much larger and could benefit from better conditions or maybe firm B is operating in a foreign country with a weaker financial system.

There are numerous ways to produce and numerous types of relationships a business can have. Each has its advantages and drawbacks. The objective of a firm is to find the relationships that best fit its short- and long-term goals.

2.2 Trade and specialization

In the previous section, each firm has a very clear purpose. In other words, they are highly specialized. Individuals are also highly specialized. When you look around, odds are that you did not produce anything you are wearing, eating or using. Just like firms, you produce only a few outputs. Why do

we and firms specialize? Consider the following example in which two firms produce outputs A and B. Firm 1 requires 5 units of input to produce output A and 10 units of input to produce output B. Firm 2 is exactly the opposite and requires 10 units of input to produce output A and 5 units of input to produce output B. Assume that each firm has 100 units of input.

In a world without trade, firm A would probably produce 10 units of output A and 5 units of output B, and firm 2 would produce 5 units of output A and 10 units of output B. Overall, 15 units of output A and 15 units of output B would be produced. Instead of being autarkic, both firms could specialize and trade. Since firm 1 has an **absolute advantage** in producing output A, it would specialize in output A. Similarly, firm 2 would specialize in output B. How much would they produce if they specialized? 20 units of output A and 20 units of output B. By specializing, firms can increase overall production.

There is a case for specialization even when a firm has no absolute advantage. Consider firm 1 which can produce output A at a cost of 10 units and output B at a cost of 20 units. Firm 2 is much more efficient and can produce output A at a cost of 5 units and output B at a cost of 2 units. In this setting, firm 1 would produce 6 units of output A and 2 units of output B with 100 units of input and firm 2 would produce 10 units of output A and 25 units of output B. Overall, there are 16 units of output A and 27 units of output B. Firm 1 could specialize in producing output A, because its relative cost (0.5 unit of output B) is lower than the relative cost of firm 2 (2.5 units

of output B). Similarly, firm 1 could specialize in producing output B. Under trade, firm 1 would produce 10 units of output A. Firm 2 would produce 8 units of output A and 30 units of output B. Overall, the firms are now producing 18 units of output A and 30 units of output B. Even when firms only have a **relative advantage**, specialization and trade increase overall production.

Unfortunately, trading usually involves a cost, so-called **transaction cost**. One must first find a trading partner. This search can be lengthy and costly when the product is very specialized or when the market is decentralized. Then, both parties need to agree on the terms of the transaction and respect them[1]. The trade-off between the advantages and disadvantages of trade explain the different types of relationships between firms. Sometimes you're better served by yourself and sometimes it's better to specialize.

[1]We'll discuss more issues concerning moral hazard in chapter 8.

3

Maximizing Profit One Unit at a Time

Introduction

Whatever the complicated interactions between firms, they end up producing some output and determining a price. In this chapter, we will consider the production and pricing decision of a single firm maximizing its profit.

3.1 Profit

Profit is the difference between revenues and cost. Revenue is simply the number of goods sold multiplied by their unit price. Cost, however, can be divided in two parts. First, there are explicit costs which correspond to the

amount of money spent to purchase a good or a service. Second, there are implicit costs which refer to the opportunity cost of not being able to use some resource for another purpose. If you go to the cinema, for example, the explicit cost is the price of the ticket. The implicit cost is the fact that while you're watching the film, you cannot do anything else. The two different types of cost are used when defining two types of profit: accounting and economic profit. **While the accounting profit only takes into account the explicit cost, the economic profit includes both the explicit and implicit costs**.

Consider Lucy who owns a truck to understand the two types of profit. She spends on average $100 for gas and $150 for maintenance per month. She generates $1,000 in revenue by delivering products. Her accounting profit per month is therefore $750 (1000 - 100 - 150). When operating her business, she is using up resources for which she does not need to pay explicitly: her truck and her time. Let us assume that she could rent her truck for $1,500 per month and she could work delivering products for another company and earn $1,000 per month. By operating her own business, she is foregoing both opportunities. Her economic profit is therefore -1 750 (1000 - 100 - 150 - 1500 - 1000).

The economic profit is the accounting profit minus the revenue she could generate if her resources were used in the most efficient way. A positive economic profit indicates that the business person is efficiently using resources; a negative economic profit shows that it would be a better idea to use the

resources differently to increase profit.

While the accounting profit determines what is, the economic profit makes a statement about what could be. To make a statement about what could be one requires assumptions. How much could Lucy charge to rent her truck? How much could Lucy earn if she worked for someone? Since Lucy is not renting her truck or working for someone right now, we do not know with certainty these amounts. We therefore need to make an educated guess considering the market for these goods or services.

3.2 Revenues

We defined the revenue of a firm above as the product of the quantity sold and the price paid by consumers. Both variables are negatively related, which makes the relationship between price and revenue more complicated. If a firm charges a high price, it will sell very few items, but it will generate a lot of revenues for each item sold. Conversely, if the firm charges a low price, quantity demanded will be very high but each unit sold will generate little in revenue. There is therefore a trade-off between the price and the quantity demanded stemming from the downward-sloping demand function.

This negative relationship is key to understand the relationship between the quantity produced and revenue. Consider the following demand function: P = 100 - 5Q. When the firm produces one unit, it can charge 95 (100-5) for this unit. Its revenue is therefore 95 (95*1). When the firm increases

its production to 2, it must reduce its price to 90 (100-2*5) to sell all its production. The revenue, however, increases to 180 (90*2). By decreasing the price the firm lost $5 on the first unit, because the price decreased from 95 to 90, but it gained $90 by producing an extra unit at a price of $90. Overall, the firm increased its revenue by $85 by producing an extra unit.

Increasing production does not always lead to an increase in revenue. Consider the same demand function. When the firm produces 18 units, it must charge a price of 10 (100 - 5*18) to sell all items. Overall, the firm is generating a revenue of 180 (10*18). If the firm increases production to 19, it must lower its price to 5 (100-5*19) to sell all items. The firm lost $5 per unit on the previous 18 units (overall loss of $90), and only gained $5 on the 19th unit sold. By producing this extra unit, the firm reduced its revenue by $85.

When the price is high, increasing production leads to an increase in revenue, but when the price is low, increasing production leads to a decrease in revenue. Differences in responsiveness of the quantity demanded through the demand function explains why a decrease in price sometimes leads to an increase in revenue and sometimes to a decrease.

Price elasticity of demand

The concept of **price elasticity of demand** explains why increasing quantity can increase or decrease revenue. The price elasticity of demand corresponds to the percentage change in quantity demanded divided by the

percentage change in price.[1]. In words, if the absolute value of the price elasticity of demand is large, a small change in price leads to a big change in quantity demanded. In such a case, demand is **elastic** at that price. Conversely, if the absolute value of the elasticity is small, a large change in price leads to a small change in quantity demanded. In such a case, demand is **inelastic** at that price.

Let us use this concept to better understand the example in the previous section, when the price goes from 95 to 90, it decreases by only 5.2% ((90-95)/90). However, this small decrease in price leads to a large increase in quantity demanded: it doubles from 1 to 2. Demand is therefore elastic. When the price goes from 2 to 1 (a decrease of 50%), the quantity demanded barely changes (increase of 5.5%). Demand at this price is therefore inelastic.

When demand is elastic, a decrease in price leads to an increase in revenue, because the increase in the quantity demanded compensates for the loss in revenue for the initial units. Similarly, an increase in price leads to a decrease in revenues. When demand is inelastic, however, a decrease in price leads to a decrease in revenue, because the small increase in quantity demanded does not compensate for the loss in revenue for the initial units. Similarly, an increase in price increases revenues.

Two special cases of price-demand elasticity are particularly interesting: perfectly inelastic demand and perfectly elastic demand. In the first case,

[1]It is always negative, because a decrease in price leads to an increase in quantity demanded. One generally thinks about this elasticity in absolute terms.

demand does not change when prices vary. Demand for medication, for example, is perfectly inelastic. If someone needs one pill to stay alive, this person will demand one pill whether the price is $1 or $1 000 000. The demand function is simply a vertical line. Quantity does not change when the price changes. How would a company optimize profit when facing an inelastic demand? Simple, raise the price as much possible, because it will not affect the quantity demanded. This type of behaviour is reminiscent of the price hike orchestrated by Martin Shkreli, also known as pharmabro.

In the second case, demand is perfectly elastic when there is a perfect substitute. Take, for example, a situation in which you can buy apples at two different stands in a market. Assume the prices at both stands are initially the same. What happens if one of the stands increases its price? It will lose all clients who will prefer to purchase apples from the other stand. A small increase in price reduces the quantity demanded to zero and therefore also the revenue. The demand function in this situation is a horizontal line. How to optimize revenue in such a setting? Charge the same price as competitors which will be very close to the average cost. It is very difficult to generate a profit in such a situation.

Factors influencing elasticity

Price-demand elasticity depends on the three following factors: availability of substitutes, time frame and the share of income involved in the purchase of the good.

We have seen that the presence of a perfect substitute leads to high elasticity. In reality, very few products have perfect substitutes, but most products are substitutable in some way. The closer is a substitute, the more elastic is demand. Coca-Cola and Pepsi, for example, are not exactly the same, but they are close substitute. If Coca-Cola increases its price, more and more people will switch to Pepsi thus reducing the revenues of Coca-Cola (elastic demand).

Having close substitutes is bad for any business. Product differentiation can be done for example through publicity. As long as consumers think two products are different, they will tolerate a price differential. In other words, publicity makes the demand of a product more inelastic making it possible for a firm to increase its revenues by increasing its price.

Location is another method to differentiate products. The same product can be sold at two different locations at different prices. Consider a convenience store. One could walk all the way to the supermarket to get the same bag of chip at a cheaper price, but the consumer wants the bag of chip now. A consumer is therefore ready to pay a bit more to purchase a bag of chips at the convenience store, because it's more convenient. The bag of chip at the convenience store and the bag of chips at the supermarket are therefore not perfect substitutes. Just like in the Coca-Cola example, if the price difference becomes too big, consumers will become less lazy and walk to the supermarket.

Time frame is another important factor affecting elasticity, because it

takes time to change established behaviours. In the short-run, the demand for gasoline for example is very inelastic. A driver needs to fill up his car to commute to work. An increase in price will therefore lead to an increase in revenue (inelastic demand). In the long-run, however, a driver facing high gasoline prices can decide to switch to public transportation or drive less. An increase in the price will then lead to a decrease in revenue, because drivers will ultimately react to a price increase by decreasing their consumption (elastic demand).

Finally, the share of income devoted to the product matters. Consider candies that cost 5 cents. Assume their price doubles to 10 cents. Would the consumption of these candies be affected by this 100% increase in price? Probably not. Since the share of income devoted to candies is very small, one probably would not even notice the price change. Demand is therefore inelastic when the share of the budget devoted to this product is small. Consider instead a car. If the price of a car went from $30,000 to $60,000, demand for this car would decrease substantially. Demand would be very responsive to changes in price or elastic, because the percentage change in price corresponds to a large amount.

3.3 Cost

Increasing production could increase revenue depending on the elasticity of demand, but it also increases production costs. A business requires more

input, employees and capital to increase production. If increasing production increases cost by more than it increases revenues, it decreases profit. The cost function of a firm will depend on its time frame. The more time a firm has, the more flexible it is in using resources.

Short-run

In the short-run, a firm can only vary its labour. It can either hire new employees or offer overtime pay to induce current employees to work longer hours. The cost of increasing production in the short-run therefore depends on the productivity of labour, which itself depends on the level production. The more labour is used for a given capital, the less productive will be the next unit of labour: **diminishing marginal return**.

To understand this concept, consider an employee who has already worked 60 hours to produce 100 items. If the firm wants to increase production by 1 unit, it may take 4 extra hours of labour, because the employee is tired and not very productive. Conversely, if an employee has only worked 40 hours to produce 60 items, the employee is still rested and may only take one extra hour to produce an extra item. If the wage per hour is the same in both scenarios, it will cost 4 hours of wage to increase production by one unit in the first case and 1 hour of wage to increase production by one unit in the second case. In other words, the more a firm produces, the more expensive it is to increase production due to diminishing marginal return.

Even if a firm is able to hire more employees, their productivity will

decrease as more employees are hired, because they will be sharing a fixed amount of capital in the short-run. In other words, each new hire will be less productive than the previously hired employee. If the cost of hiring each employee is the same, it will cost the firm more and more to increase production as it did in the previous case with the employees working over-time.

Long-run

In the long-run, a firm can increase both labour and capital. A firm can therefore increase production by keeping an optimal mix of capital and labour and avoid diminishing marginal return. A firm can actually decrease its cost per unit by increasing its size, so called **economies of scale**.

Specialization is one reason why economies of scale take place. As a firm grows, its employees can specialize and improve their skills. Compare an entrepreneur with a mid-sized firm. The entrepreneur must take care of finance, marketing, strategy, publicity, accounting etc. It is therefore very difficult for the entrepreneur to become very good at any of these tasks. By not being good at anything, the entrepreneur will spend more time and energy to complete a task than a specialist. In a mid-sized business, a person specializes in each of these tasks and becomes very good at it. Since a team of specialized people is more productive than a group of five generalists, the specialists will be able to produce more than the group of generalists. Since the cost is the same for both, the cost per unit will be lower for the specialists

than for the generalists.

Large fixed cost can also produce increasing returns to scale. Take, for example, the car industry. A firm needs very expensive machines to produce one car. It needs exactly the same machines to produce two cars. The total cost of production for two cars is very similar to the cost of production for one car (the cost of inputs will be higher), but the cost per unit is now much lower (about half). The company therefore experiences economies of scale, because the cost per unit produced decreases.

3.4 Maximizing profit

By producing an extra unit, the firm increases its cost (marginal cost) and may increase its revenue (marginal revenue). If the increase in revenue is greater than the increase in cost, the firm increased its profit by producing the extra unit. Otherwise, if the increase in cost is greater than the increase in revenue, the production of the extra unit decreases its profit. A firm should produce until the point where the extra revenue generated by an increase of unit equals the extra cost caused by the extra unit. In any other situation, a firm is not optimizing its profit.

3.5 Social enterprises

Not all firms maximize profits. Social enterprises aim at promoting the welfare of their stakeholders while remaining financially sustainable. Most day-care centres, for example, promote the development of the children using their services while covering their cost. These enterprises are usually controlled by their members using democratic means. Managing such enterprises can be very challenging, because they are pursuing numerous objectives simultaneously.

More traditional enterprises sometimes adopt corporate social responsibility as a process to take into consideration the by-products of their decisions on the well-being of stakeholders.

4

Why do firms offer sales?

Introduction

In the previous chapter, firms would maximize profit by choosing one price and one quantity. In the real-world, however, a firm can offer its products at multiple prices, so-called **price discrimination**. In this chapter, we explore how a firm can offer products at different prices to attract different types of consumers using concepts similar to the ones introduced in the previous chapter. The challenge faced by businesses is to identify groups with different elasticities. We then present two types of solutions to address the fact that personal demand is not observable: inferring elasticity from personal attributes and offering different products.

4.1 Problem

When a client enters a store, the store keeper's first thought is: "How much is this person ready to spend? What is this person's demand function?". This question is particularly relevant in developing countries where prices are rarely posted.

The consumer's demand function is probably not the nice linear downward sloping curve we have seen previously. In most cases, the consumer either buys something or not. The function therefore probably looks like a step function. The price at the step is known as the **reservation price**. It's the most amount of money the client is ready to pay. The storekeeper is very interested in knowing this information to maximize profit.

Unfortunately, the reservation price is not public information. Consumers don't enter a store saying that they are ready to pay at most $20 for a blue t-shirt. The consumer wants to pay as little as possible for a blue t-shirt. For the consumer, the difference between the reservation price and the price paid is a form of profit (consumer surplus). How can the shopkeeper make an informed guess about the reservation price and take advantage of this information?

4.2 Solution

To take advantage of differences in reservation prices, a firm must 1) be able to identify groups that have different demand functions and therefore

elasticity of demand, 2) have some market power enabling it to charge a price above cost and 3) be able to prevent consumers from reselling cheap goods to consumers facing the high price. Necessity 2) is rarely a problem, because reselling goods is generally difficult. In most normal situations, firms have some form of market power taking care of 3), because perfect substitutes are rare. The challenge is addressing 1). There are generally two possibilities: using their personal attributes or offering different products.

Personal attributes

The elasticity of demand of an individual could depend on certain personal attributes that are related to his/her willingness to pay. Since these attributes are observable, a firm can use them to discriminate between groups without actually observing the reservation price.

Gender is easily observable and could affect the reservation price. Consider hairdressing. Women pay systematically more than men. Why is there such a difference? One reason is the interest that both genders devote to their hair. As a kid, whenever I went to the barber I faced the same question: short or long? I always thought it was a weird question, because if I had wanted long, I wouldn't have been there. There was therefore just one possibility: short. Nowadays, there seems to be more possibilities. Anyway, most men don't seem to care as much about their hair as do women. They are therefore not ready to pay as much money to get a haircut. If barbers want to be competitive, they need to offer low prices for men. Since women

care about their hair, salons can compete on dimensions other than the price, like quality. In other words, the demand of men is very elastic (all salons are perfect substitutes), while the demand of women is inelastic (all salons are different). For this reason, women pay more than men. A similar story can be told about children who pay even less than men, even though they are clearly more trouble.

Skin colour is also very visible. In developing countries, Caucasians tend to be richer than the local population. In the previous section, we have discussed the fact that the share of the income devoted to the purchase of a good influenced elasticity. The smaller is the share of your income spent on a good, the more inelastic is your demand. In other words, if the share of your income spent on the product is small, you don't really care about the price. Since the prices in developing countries tend to be lower than at home, Caucasians spend a smaller fraction of their income on any good than do locals. In other words, they have a very inelastic demand and the seller takes advantage of this inelastic demand to ask for a high price.

A similar argument can be used to explain student and senior discount. Both categories are visible: they both have cards to prove their status. Moreover, both groups live on low income. The purchase of any good therefore takes a larger portion of their income, and their demand is more elastic. By offering lower prices for both groups, a firm can increase its revenues and profit.

Differences in goods

If a firm cannot distinguish between different types of consumers, it can still take advantage of the fact that preferences of consumers are related to their demand elasticity. By offering different products at different prices, the firm can appeal to different groups with different demand elasticities.

First, a firm can create a fake substitute for its product. No-name products, for example, usually contain the same content as brand name products. Why would a firm offer its products at a lower price in a different wrapping? To attract price-sensitive consumers. Some consumers will continue to purchase the brand name to avoid the stigma of purchasing no-name products (inelastic demand). Price-sensitive consumers, however, that may have previously shied away from the product due to its price may start purchasing the no name product. This strategy could increase profit by attracting new consumers as long as consumers with inelastic demand continue to buy the brand product.

Second, a firm can make a cheaper product more cumbersome to buy thus only attracting high elasticity clients. Coupons, fidelity cards and sales fall in this category. Consider the case of coupons. To take advantage of coupons, a person must go through the advertisements, cut out the useful coupons, keep them somewhere, remember to go to the store on the right day and make sure to have the coupon at the cash register. Who would go through this hassle to get a lower a price? A person who really cares about the price. In other words, a person whose demand is very elastic. Using

coupons and sales, a firm can offer a lower price to consumers with elastic demand and keep a high price for consumers with inelastic demand who are not ready to go through the hassle of coupons.

Third, a firm can also literally deteriorate a product. The Stata Corporation, for example, offers a student version of its statistical software product. Stata knows that the demand from students is more elastic than the demand from researchers. How can Stata take advantage of this difference not knowing who is a student and not wanting researchers to purchase the product at the student price? It created a version that only provides a limited number of observations and variables making it good enough for students but useless for researchers. Stata offers two different products at different prices. It offers a good-quality product at a high price to meet the demand of researchers whose demand is relatively inelastic. It also offers a low-quality product at a low price to satisfy the demand of student whose demand is relatively elastic. Out of one product, it created two products to maximize profit.

Airline companies are also famous for offering different products to distinguish between different types of demand. Some passengers are tourists whose demand is relatively elastic and some are business people whose demand is relatively inelastic. An airline company can distinguish between both groups using the reservation date. While a tourist can plan ahead and book a trip months in advance, a business person will decide to travel a few weeks before the departure date. Knowing the elasticity of both types of passengers, the airline company can charge lower prices to passengers booking months ahead

of time (tourists) and higher prices to passengers booking a few weeks before departure (business people). The length of stay can also be used by airline companies to distinguish between the types of passengers. While a tourist will probably stay a few weeks at a destination, business people will only spend a few days in a city coming back on a Friday to spend the weekend with their family. The airline company can charge a different price based on the length of stay. Since a trip can be defined by the reservation date and length, we can say that these are different products.

Finally, the entertainment industry also offers different products to be able to charge different prices. CDs and DVDs can only be played by a device that can read media with a certain regional code. A CD designed for the North American market only works in CD players sold to the North American market. The entertainment industry can therefore charge different prices to consumers of different continents without fearing that consumers from a rich region (inelastic demand) take advantage of low prices offered to poor regions (elastic demand).

5

Role of government: Roads, vaccines and pollution

Introduction

The private sector can provide a large number of goods, but in some cases, it fails to provide certain goods or it produces too much/too little of certain goods. In the first section of this chapter, we define public goods, show their importance, and discuss collective decision making to determine how should be provided. We then turn our attention to externalities: goods whose production/consumption affect by-standers. In their presence, the market allocation leads to inefficiencies. The government can help society by transforming social cost/benefit into private cost/benefit and increase social welfare.

5.1 Public goods: Street lighting and defense

Rationale behind public goods

The private sector supplies many goods and services, but it cannot provide all goods. The private sector can only provide goods that are easily excludable, meaning that a firm can prevent consumption of the good by someone who has not paid for it. If a firm cannot prevent someone who hasn't paid from consuming the good, who will decide to pay for the good? Moreover, it would be not be efficient for the private sector to provide non-rivalrous goods. For these goods, consumption by one person does not prevent consumption by another person. In such a case, as many people as possible should be able to consume the good to maximize welfare. Goods that are non-excludable and non-rivalrous are called **public goods**. Since it is not efficient for the private sector to provide these goods, the public sector should provide them.

Street light is a good example of a non-rivalrous and non-excludable good. Could street lighting be provided by the private sector? There could be somebody at the beginning of the street asking for $1 to turn on the light[1]. A passer-by would pay the fee and the light would be turned on. If someone else came at the same time, the light would be on. How could the firm ask the second person to pay? The firm would not be able to exclude the second passer-by from enjoying the light (non-excludable) and the fact that first passer-by enjoys the light does not prevent the second passer-by from

[1] Consider the cost of making this good excludable!

enjoying it too (non-rivalrous). Street lighting is therefore a public good.

Consider another problem with street lighting. Assume the first passer-by had seen the second person. Would he/she pay the $1 or would he/she wait for that person to pay and avoid the fee? He/she would probably wait. This type of behaviour is known as **free-riding**: taking advantage of something without paying for it. If everybody behaves that way, nobody ever turns on the light even though it would be beneficial for everybody if the lights were on. If we collectively pay for street lighting, we avoid the free-riding problem.

There are numerous examples of other public goods like defense, fresh air, clean water, knowledge or roads[2].

Collective decisions on public goods

Public goods must be provided by the government but how much should the government produce? An individual can determine how much of a good to consume, but how does a group of individuals take such a decision?

One solution is to survey people and ask them how much they value a certain good. If the sum of the valuations is greater than the cost of this good, the government should undertake the project. Let's consider the lighting of a street. A civil servant could ask the people living on the street how much they would be willing to pay to have lighting. If people are ready to pay more than the cost of lighting, the civil servant can conclude that the project

[2]Some roads like highways or bridges are easily excludable, while others like normal suburban would require tremendous effort to make them excludable.

should be undertaken. People, however, have no incentive to tell the truth. One can assume that the lighting project would be financed from a general municipal budget. Everybody would like to receive a good if it is paid by someone else. In such a setting, projects that are not beneficial will still be undertaken, because people receiving a good for free with exaggerate its benefit.

Perhaps changing the financing structure would solve this problem. The civil servant could survey people and ask them to contribute the amount at which they say they value the project. If the amount collected is greater than the cost, the project is undertaken. Otherwise, the project is not undertaken. Will people now tell the truth? Certainly not. Everybody will underestimate their benefit from the project in the hope that somebody else will pay, but that they will still get the project: another example of free-riding. People may want the project, but would prefer someone else paying for it. In this case, beneficial projects may not be undertaken.

Collective decision making is challenging and explains partially why the government often undertakes dubious projects.

Contracting out

Once the project for a public good is approved, the government often contracts it out to the private sector. Why? In some cases, the private sector has an expertise that does not exist in the public sector. Consider building an airport. Numerous engineers and architects are specialized in the building on

airports. Building this knowledge within the public sector would be wasteful, because provinces or cities rarely build many airports. It is therefore efficient to contract out certain projects that rarely take place to take advantage of the expertise of others.

Another argument that is often made is the flexibility provided by the private sector. Employees in the public sector have job security once hired. It would therefore be difficult to hire a few people for a short period of time and then let them go. Job security could also lead to lower productivity in the public sector since the employer could have a difficult time firing unproductive employees.

Unfortunately, contracting out also has a cost. While civil servants would not have any incentive to cut corners, contractors can increase their profit if they cut corners. The firm hired does not have the same objectives as the body that hires them. This phenomenon is called the principle-agent problem and will be discussed in more depth in chapter 7.

Tragedy of the commons

Once a public good is built, a final problem can occur. Due to their non-excludability, it is impossible for the government to restrain the use of public goods. Consider the choice of a driver considering going from town A to town B. When taking this decision, the driver considers the private costs (time and fuel) and personal benefits, but the driver does not consider the public cost. When the driver uses the road, he/she contributes to its deterioration and

creates congestion for other drivers. Since people usually only consider the private cost and not the public cost, there is an over-use of public goods: **tragedy of the commons**.

5.2 Pollution and vaccines

The difference between private and social cost/benefit not only affects public goods. Indeed, the consumption of certain goods can be a nuisance or a benefit to by-standers and create a social cost. This impact on by-standers is called an**externality**. Pollution is the usual example of an externality. A company pollutes and therefore harms people who live in the vicinity of the factory. When determining its production, the company does not take into consideration the cost of its production on the well-being of other people. In other words, the company does not take into the social cost of this activity, which is greater than the private production cost paid by the firm.

To improve efficiency, the government must force the company to incorporate the social costs of the externality into the private cost of the firm through taxation. In the presence of a well-priced pollution tax, for example, a company faces the true cost of its production and will produce a socially efficient level of pollution (less than before the tax) and will be incentivized to develop creative methods to reduce pollution. Efficient pollution seems like a strange concept. Consider instead a ban on pollution. What would we consume? Nothing, because pollution is a necessary by-product of most

human activities like production. If we want to enjoy consumption, we need to live with pollution, but we can limit pollution a socially optimal level.

Smoking also creates a negative externality. When a person smokes, it creates a bad smell for everybody else. In the past, it was normal to smoke inside and non-smokers had to suffer from the consequences. Progressively, smokers were forced outside. SMU went a step further and decided to completely remove smoking from the campus. Is this decision socially optimal? Smokers create harm onto non-smokers, but by banishing smokers outside of campus, non-smokers are also harming smokers. What is the right compromise? Difficult to say.

Externalities are not necessarily negative as in the case of smoking or pollution; they can also be positive. Consider a vaccine for example. If I protect myself against the flu, I also protect all the people that would have been infected by the flu had I been sick. My decision to be vaccinated helps hundreds of by-standers. Do people consider the positive social impact of their decision on others? Probably not, because this social benefit does not translate into any private benefit. I do not receive any payment from the people that I would have infected had I not been vaccinated. My private benefit is therefore lower than the social benefit. Even though it may be socially beneficial for me to be vaccinated, it may not be beneficial for me considering only my personal benefit, so I will not receive the vaccine. In such a case there is an under-consumption of goods that generate a positive externality. The role of the government is therefore to encourage people to

consume goods that have positive externalities to bring the consumption of these goods to a socially optimal level. The flu vaccine, for example, is free.

5.3 And subsidies to businesses...

Governments not only provide public goods or intervene in the presence of externalities, very often they help businesses. Atlantic Canada Opportunity Agency (ACOA), for example, provides subsidies to businesses to promote regional development. More recently, the elimination of the film tax credit caused a lot of discussion. Is there an argument to justify such subsidies?

The **infant industry hypothesis** provides a justification for such intervention. New businesses have difficulty competing with established companies[3]. The government can provide some support during the initial development phases of a company until it has reached a size at which it can compete with other businesses. Otherwise, the young business may never reach a size at which it can compete with established ones and offer its creative products to the market. Unfortunately, it is very difficult for the government to know when the firm has reached a size at which it can compete with larger players. There is therefore always a risk that companies are supported too long or willfully delay their development to benefit longer from public subsidies.

When firms are well-established, it is very difficult to argue why the government should subsidize them. If the company undertakes a profitable

[3]Remember the discussion of economies of scale in chapter 2.

project, it should simply borrow money from a bank. If the company is planning an unprofitable project, nobody should support this project. Usually, companies argue that the subsidy is important to create jobs. There is no doubt that subsidies create jobs, but at what cost? Lester (2013) shows that Canada as a whole transfers $500 million per year to the US film industry[4]. Jobs created in the film industry are therefore relatively expensive. Moreover, it is difficult to justify why a subsidy should exist in one industry and not in another one. Instead of subsidizing the film tax credit, the government could have subsidized hotel rooms. If hotel rooms are cheaper, more tourists will come and jobs will be created in the tourism industry. Why film and not tourism?

The infant industry hypothesis could have justified a film tax credit for 4 to 5 years. This tax credit would have encouraged producers to try film crews in Nova Scotia. Nova Scotians would then have been able to show their workmanship and establish a reputation. Once the film industry had gained a certain reputation, the film credit could have been gradually phased out. Such a subsidy makes sense if it is temporary. Permanent subsidies keep alive industries that should probably not exist.

[4]See this link

6

All about taxes

'If you drive a car, I'll tax the street

If you try to sit, I'll tax your seat

If you get too cold I'll tax the heat

If you take a walk, I'll tax your feet"

Taxman from the Beatles

Introduction

Public goods and subsidies for positive externalities must be financed through taxation. This chapter starts off discussing general issues relating to taxation. We then introduce different types of taxes (consumption, income, asset and corporate taxes), and present some issues relating to each of them.

6.1 General issues

Efficiency loss

Nobody likes taxes, because they raise the cost of goods and services. They create a wedge between the price paid by the buyer and the amount received by the seller. This wedge can be sufficient to discourage a party in the transaction. Consider a case where someone is ready to sell an object for $10 and someone is ready to purchase the object for $10. Without a consumption tax, the transaction would take place and both parties would benefit. With a consumption tax, the buyer must now pay $11.50 (assuming a tax of 15%) to purchase the item. This amount may be higher than the reservation price of the buyer, which means that the transaction does not take place due to the tax.

Not only can a tax influence whether a transaction takes place, it can also reduce the quantity consumed by raising the price. If the introduction of the tax reduces substantially the quantity demanded, it will cause an important loss in efficiency. In other words, if demand is very elastic, the tax will have an important adverse impact on welfare. Conversely, if demand is very inelastic, the quantity consumed will not be affected by the increase in price due to the tax, and the loss in efficiency will be minimal. One could therefore think that the government should levy taxes on products with inelastic demand. The problem is that these goods are often absolutely necessary (like medication) making it difficult to ethically justify such taxes.

Tax revenue

The revenue generated by a tax also depends on the elasticity of demand. If demand is very elastic, the introduction of a tax on a given good will lead to a large decrease in the demand for this good. Since the revenue generated by taxation is the tax rate multiplied by the quantity sold, the revenue generated will generally be lower if demand is elastic.

Tax avoidance and tax evasion also influence the revenue generated by a tax. While tax avoidance is a legal mean to avoid paying tax, tax evasion involves not paying tax by breaking the law. Taking advantage of a legal loophole to avoid taxation is an example of tax avoidance. Not reporting a transaction to taxation authorities to avoid paying a tax would be tax evasion.

Elasticity of demand, tax avoidance and tax evasion combined cause a downward opening parabola relationship between the tax rate and revenue generated: the so called Laffer curve. When the tax rate is low, increasing the tax rate leads to an increase in revenues, because consumers do not change their behaviour substantially. When the tax is high, increasing the tax rate leads to a decrease in revenues. At this point, it becomes profitable to avoid the tax through legal and illegal means. Defining precisely at which point a tax is low or high is empirically very difficult. Generally, people on the left of the political spectrum will argue that increasing taxes leads to an increase in revenues, while people on the right of the political spectrum believe the opposite.

Compliance cost

Compliance cost is an aspect of taxation that is often overlooked. Anybody who has completed a tax return knows that complying with taxation is not always easy. It takes time and energy to understand the law and provide the right documentation. Firms have entire departments devoted to tax compliance. Canada Revenue Agency (CRA) also employs numerous agents to answer questions and audit individuals and companies. The more sophisticated and targeted are the taxes, the more expensive is compliance. Taxing is expensive.

Overall effect

Taxes discourage transactions and raise the cost of doing business, but they also generate necessary revenues for the government. Are taxes overall good or bad? It depends. If a tax is simple and does not discourage too many transactions and if the revenue generated enables the government to build useful infrastructure, then the tax is useful. After all, the government must generate some revenue to fund its activities. In the next sections, we will discuss certain types of taxes and some issues pertaining them.

6.2 Consumption taxes

Nova Scotia charges an Harmonized Sales Tax (HST) of 15% on most consumption products. Some consumption goods are exempt of HST. Examples

of such goods are: food products, baby diapers and children clothing. By exempting such necessary products, the government reduces the tax burden for low-income households who consume such necessary products. In the next section, we will discuss issues relating to these exceptions and possible solutions.

Issues with HST exceptions

The first issue related to such exceptions is the concept of necessity. What is necessary? How to define necessary? If kids' clothing is necessary, why is adult clothing not necessary? Is a $100 shirt for a kid necessary? To separate between necessary and non-necessary consumption goods, it is necessary[1] to define some arbitrary concept of necessity, which is difficult to defend.

The second issue arises from competition between taxed and not-taxed products. Consider the case of pizza: frozen pizza is HST-free, but delivered pizza is taxed. One could say that frozen pizza is a good substitute for delivered pizza. In one case, the consumer must put the pizza in the oven for 20 minutes, while in the other, he/she must wait 20 minutes for delivery. By creating exceptions, the taxation authorities put taxed industries at a disadvantage. The government should not favour certain industries.

The third issue is the fact that numerous wealthy households also benefit from such exceptions. Consider the millionaire who purchases caviar at the

[1] Pun intended!

supermarket. Caviar is food and therefore not taxed[2]. Wealthy households benefit from a policy designed to help poor households. The government also foregoes income by not taxing these products when they are purchased by wealthy households who don't need such a tax break.

Solution

How can we address all three issues? By simply removing exceptions. If all products are subjected to HST, we will not need to define necessity, we will not impact competition between substitutes and we will increase taxation revenue by taxing wealthy households.

What about poor households? They already receive a HST credit[3] that depends on household income. That amount could simply be increased to compensate for the end of the HST exceptions, and the tax burden of low-income households would still be reduced.

If the solution is so simple, why is it not implemented? Raising taxes or applying taxes to a broader range of goods is unpopular. The average citizen would probably not see the economical advantage of removing exemption but would certainly see the tax increase. Since politicians appreciate popularity and reelections, they do not change the tax system even it means improving it.

[2]Since it is imported, there was probably some tariff levied on caviar when it was imported, but let us abstract from this issue.

[3]More information on the HST credit can be found on the CRA website.

6.3 Income tax

Progressive taxation and its rationale

Whenever an employee earns a dollar, a certain proportion of this dollar is paid to the government as income tax. This proportion increases as employees earn more. In other words, the marginal tax rate increases with income. Tax systems that share this attribute are called **progressive**. At the federal level, there are five levels of marginal tax rates[4] starting at 15% for a taxable income[5] up to $45 000 and ending at 33% for income above $200 000. The idea behind progressive taxation is that high-income individuals have a greater ability to pay.

Take person A with a taxable income of $100 000 and person B with a taxable income of $40 000 for example. Let us assume that a person needs $30 000 to cover necessary expenses (food, housing and clothing). Person A therefore has $70 000 for discretionary spending and person B, $10 000. If the taxation rate were the same for both, let's say 10%, person A would pay $10 000 (10% of 100 000) in income tax and person B, $4 000 (10% of 40 000). Person A would therefore pay 14.3% of his/her discretionary income for taxation, and person B, 40%. It does not seem fair to have such a large difference. By having high-income individuals pay a higher marginal tax rate, the share of discretionary income spent on taxes is more equal.

[4]More information on these levels can be found on the CRA website.

[5]Keep in mind that taxable income is total income minus personal exemptions like the personal amount of $11,327 (2016).

Drawbacks of progressive taxation

Progressive taxation increases fairness, but it also creates numerous issues related to timing of earnings, taxation unit and cost of living. The following section will expand on these ideas.

Since taxation is calculated per year, tax-payers with a volatile income pay more tax than those with a steady income. Consider person A who earns \$100,000 in year 1 and and nothing later on until year 10[6] and person B who earns \$10,000 per year from year 1 to year 10. Over 10 years, both earn as much (\$100,000). Now, assume a progressive taxation system where the first \$15 000 of income is not taxed, then taxation up to \$50,000 is taxed at a rate of 10% and from 50,000 to 100,000, it is a 20% tax rate. Person A will pay \$13,500 (3,500+10,000) in income tax and person B will pay nothing. Even though, both tax payers have the same income over 10 years, their yearly income is different and therefore the amount paid in taxation will differ.

The Registered Retirement Saving Plan (RRSP) partially addresses this issue by allowing a tax payer to defer income and to smooth his/her income stream[7]. Person A could therefore put \$18,000 in an RRSP and reduce his/her income to \$82,000 in the first year and only play \$9,900 (3,500 + 6,400) in income tax. Person A could then take out the \$18,000 in two payments of \$9,000 and stay below the income tax threshold in year 2 and 3. This type of strategy is a good example of tax avoidance. It is a legal

[6]Person A is a professional athlete who was injured in his first season.

[7]The RRSP does not completely solve the problem, because the maximum contribution is 18% of income (2016).

method to reduce taxes paid.

Large differences in income within a couple also pose a problem for taxation authorities. Consider couple A in which the wife earns $100 000 and the husband stays at home earning nothing. In couple B both partners earn $50,000. Both couples earn $100 000. Which couple will be taxed more heavily? Couple A pays more tax due to the progessivity of income tax.

One can either tax the individual and provide some credits for dependents as is done in Canada or one can tax the couple and allow income-splitting like in Germany[8].

A few arguments support the Canadian model. First, a couple where one partner works and the other one stays at home already receives a reward in the form of house production [9], because one partner can provide certain services to the household. In the couple in which both earn $50,000, the children may have to go to a costly daycare. The couple where one partner earns $100,000 and the other one stays at home, earns more (money and the house production) than the couple in which both partners work. In that sense, it is fair that the former couple pays more in tax.

Second, income-splitting can discourage labour force participation of the partner staying at home. Consider the couple in which one partner earns $100,000 and the other one stays at home. If the stay-at-home partner de-

[8]General income-splitting was partially introduced by the government led by Stephen Harper but repealed by the Liberals. Income-splitting is allowed for pensions.

[9]This term is used by economists to refer to the services provided by the partner staying at home in terms of cooking, child-rearing, cleaning etc.

cided to work, at which tax rate would the person be taxed? In a tax system where the individual is taxed, the person would be taxed at the lowest tax rate. In a tax rate in which the couple is taxed, the extra earnings would be taxed at the tax rate for income above $100,000, which is much higher. The partner would receive a smaller portion of his/her salary after tax under a couple taxation system than under an individual system, thus reducing the incentive to work.

Differences in the cost of living also has an impact on taxation under a progressive system. Consider person A who earns $100 000 in city 1 and person B who earns $50 000 in city 2. Assume furthermore that everything in city 1 costs twice as much as in city 2. The real wages of person A and B are the same, but they won't be taxed the same real amount due to progressive taxation. Progressive taxation therefore discourages people to move to expensive cities that tend to be more productive than cities with a low cost of living.

Other deductions

Income tax is not the only deduction taken from a paycheck. The government also deducts amounts for employment insurance (EI) and for the Canadian pension plan (CPP). Employment insurance contributions allow employees to receive a payment in case of unemployment depending on the number of weeks of contribution, the salary received by the employee and the region in which the employee lives.

The Canadian Pension Plan contributions fund payments to retired employees. An employee accumulates points based on years of work and contributions. These points determine how much this employee will receive once retired. In 2016, the maximum amount received under CPP was $1,092.

Why does the government force people to contribute to EI and CPP? After all, employees could contribute voluntarily to a private insurance in case of unemployment and save money for retirement on their own through an RRSP. The problem is that employees may not care sufficiently about the future (see section 8.2 of these notes) and have over-optimistic beliefs. Unfortunately, unemployment and retirement can hit everybody. Without sufficient savings, employees or retirees would become poor very quickly. The government would then intervene and provide them with some income support. To avoid this costly intervention, the government forces employees to contribute to EI and CPP and prevents senior poverty.

6.4 Taxes on assets

When income is saved, it becomes an asset. There are generally two methods to tax assets. First, you can simply tax a portion of the estimated value of an asset. If this tax is 1% and the person owns assets worth $1,000, they will owe $10 in tax every year. Municipal taxes are an example for this type of tax: the amount paid depends on the value of the property. The advantage of this type of tax is that it does not influence how a certain asset is used. In

the previous example, a person with $1,000 in cash is not influenced by the tax when investing this amount. This person can simply maximize return by purchasing stocks, land, art or any other form of assets. The major disadvantage of this type of taxation is the difficulty to assess the value of an assess. What may be relatively simple for a house, becomes very difficult for other assets like art. If certain assets are taxed (real estate) and others not (art), the tax authorities are implicitly encouraging people to purchase tax-free assets.

Second, one can tax the return of an asset. For example, if one buys a stock, one will pay taxes on dividends earned and on the difference between the price at which one purchased it and the price at which one sold it (return on capital). This type of taxation reduces the return of an asset and could discourage investors from taking risks.

With the introduction of the tax-free saving account (TFSA) in Canada, taxation of assets has decreased significantly. Following this new form of tax avoidance, each tax-payer can contribute up to $5,500 per year starting at age 18. The unused contribution room is transferred to the following year.

6.5 Corporate taxes

Households are not the only ones paying taxes, corporations also pay tax. At the federal level, corporations pay a 15% tax on their profit. Contrary to

households, the tax rate does not vary according to the level of profit[10].

Corporations operating in only one taxation jurisdiction can easily comply with such corporate taxes. International corporations, however, face a more difficult challenge. Consider firm A that cuts wood in country 1, transforms it into furniture in country 2 and sells it in country 3. In which of these countries should firm A pay its corporate taxes? All three countries will demand a share of the profit. How can firm A distribute its profit across the three countries?

Without any rules, firm A would prefer paying taxes in the country that has the lowest tax rate to maximize after tax profit. Consider the following example. Country 1 has a tax rate of 10%, country 2, 15% and country 3, 20%. Moreover, assume that the three activities (cutting the wood, transforming the wood into furniture and selling the furniture) each cost 1 mio and that the firm generates 6 mio in revenues. Firm A could naively distribute income and decide that the wood cut in country 1 is sold for 2 mio to the plant in country 2, that the furniture is sold for 4 mio to the distribution center in country 3. By doing so, it would split its profit evenly across all 3 countries and pay \$450,000 (1 mio*10% + 1 mio*15% + 1 mio*20%) in taxes. Firm A could be more clever and shift its profits to country 1 to minimize taxes paid. To do so, it would need to adjust prices paid by each establishment. The establishment in country 1 could sell the wood to the

[10]Some firms, however, can benefit from a reduction in their tax rate if they qualify as a small business.

manufacturing plant in country 2 for 4 mio that would sell the furniture for 5 mio to the distribution centre. Under this scheme, the establishment in country 1 would be the only one generating a profit. The two other ones would simply break even and not pay any corporate taxes. Overall, firm A would now pay $300,000 in taxes (10% of 3mio), and therefore reduce taxes paid by $150,000.

By adjusting the prices that subsidiaries charge to each other, multinationals could shift profits towards low-tax jurisdictions. This type of behaviour would severely undermine the tax base of countries charging high taxes. To prevent this type of behaviour, OECD countries introduced transfer pricing legislation. According to these rules, subsidiaries must charge each other prices that correspond to those charged to third-parties, so called arm's length transactions. The subsidiary in country 1, for example, would not be allowed to charge a price different than the one for similar wood charged by the company to a third party.

Determining the value of such arm's length transactions is easy when a market for such goods exists. Information on transactions for which there is no market is much more difficult to obtain. Consider intellectual property rights like a brand name. IKEA Canada must pay IKEA for the right to use the name IKEA. How much is the name IKEA worth? What would be the profits of IKEA Canada if it were not called IKEA? It's very difficult to answer this question. IKEA recognized this loophole and sold the rights to the name IKEA to a subsidiary in Luxembourg, which leases it to all other

subsidiary at a very high price. By doing so, IKEA transfers profits made in high-tax countries to Luxembourg which levies very low corporate taxes[11]. This type of tax avoidance schemes are certainly legal, but they undermine the governments providing goods that are used by these large corporations.

6.6 Which type of taxation is the best?

This question is very difficult. Ideally, taxation of factors of production like income (labour), corporate and asset (capital) taxes should be kept low to encourage production and growth. The bulk of taxation should therefore fall on consumption. Unfortunately, consumption tax is not progressive, and people living close to borders can easily avoid such taxes through cross-boundary shopping. If redistribution is one of the objectives of taxation, relying mostly on consumption taxes will produce unsatisfying results. One could, however, say that rich households consume more and therefore pay more in taxation. One could suggest taxing more heavily some consumption assets like houses. Using the value of a house as an indication of wealth, the taxation authority could tax more heavily richer households and achieve a progressive taxation system.

[11] More details on the tricks used by IKEA and other major corporations here.

7

Why are some countries richer than others?

Introduction

Subsidies to businesses are aimed at fostering regional development in Canada. In other parts of the world, much more needs to be accomplished to foster development. In this chapter, we discuss some basic issues in development economics.

7.1 Basic model

The basic model of development relies on a simple production function where output depends on capital and labour. Countries can then choose to consume

output or save it to transform it into more capital. To better understand the consumption-saving decision, consider the example of wood. One can either burn it now and receive an immediate benefit as warmth or one can build a machine with it to produce consumption goods in the future.

As countries accumulate capital, they grow their output. The extent to which an extra unit of capital increases output depends on the level of capital. Countries with a large amount of capital will not increase their output much by adding an extra unit of capital. Conversely, countries with a small amount of capital will increase their output substantially by adding an extra unit of capital. This result stems from the concept of decreasing marginal return discussed in chapter 2. Consequently, countries with different levels of capital should grow at different rates. Countries with little capital should grow faster than countries with much capital. This hypothesis of convergence predicted by economic theory has not been observed in the last 70 years. Some systematic differences between developed and developing countries could explain this lack of convergence.

7.2 Finance

When assuming that savings are transformed into capital, we are assuming a well-functioning financial sector. In developed countries, the financial sector directs the savings of the population to entrepreneurs who then purchase capital to produce goods and services. Without a well-functioning finan-

cial sector, wealthy individuals must match themselves with entrepreneurs to provide them financing. Since these individuals may lack the skills to properly screen and monitor entrepreneurs or may be unwilling to take on such risky activities, entrepreneurs never receive the financing necessary to purchase capital to start a business. In other words, savings never become capital.

How are the financial sectors of developed and developing countries different? Lack of information is an important difference. Banks in developed countries have access to much more information than do banks in developing countries. Using a social insurance number (SIN), a bank can easily perform a credit check in a few minutes and determine if a borrower is credit worthy. Most developing countries do not have an identification system making it impossible for banks to screen borrowers: to distinguish between safe and risky clients.

Moreover, it is costly for banks to monitor businesses that have borrowed money. Consider a firm operating in a remote area of a developing country. It is very expensive for the bank to send a credit officer to verify the operations of a creditor once a loan has been granted. Costly verification reduces the interest of banks to lend to small business.

To address these issues, banks in developing countries have developed creative solutions like group-lending. Groups borrow money and members are all liable for the loan. Such a procedure reduces the cost of lending and takes advantage of information available in the community.

7.3 Infrastructure

Having an entrepreneurial idea and financing it is the first step in the creation of a successful business. Once production starts, businesses must rely on the public infrastructure system to bring goods to the market. If roads are in a bad shape, transportation cost will reduce the profit margin and reduce the incentives to start a business.

Similarly, an unreliable electricity system makes it very difficult to run a business. When managers do not know when a factory will be supplied with electricity, they cannot efficiently plan shifts. Idle employees are costly. Purchasing a generator is a solution to this problem, but energy produced in this fashion is more expensive than if it were produced by a large power plant. There are important economies of scale in the production of energy.

Roads and the provision of power in developed countries is the responsibility of the state. If the state fails to provide these services, entrepreneurial activities become less profitable. As we have seen in the previous chapter, if the state does not provide public goods, nobody else will.

Why does the state not provide these goods in developing countries? One important issue is income. Governments of developed countries generate most of their income through taxation. Government of developing countries are unable to tax, because it requires a large infrastructure. We take many elements of this infrastructure structure for given: addresses and mail delivery. Without street addresses and mail delivery, a taxation authority is

unable to communicate with tax payers and cannot collect taxes. Without income from taxation, no government can build the infrastructure necessary for taxation. Development is often a vicious cycle.

7.4 Security

Security is also a public good generally provided by the state in developed countries. Security can take many forms. First, there is the basic protection. Human beings require some basic protection before they can be creative and think about the future. In numerous developing countries, civil wars or terrorist activities prevent anybody from thinking about the future. Before any development can occur, these conflicts must be resolved.

The prevalence of general criminality also affects entrepreneurial activities. Starting a business means incurring a cost now to reap a profit in the future. If a person thinks that there is a high risk of never reaping this profit due to criminality, there is no incentive to start a business.

Similarly, without well-defined property rights, entrepreneurs run a high risk of being expropriated. Legal security is an important issue. In numerous countries, the ownership of the land is unclear. People may have lived on a piece of land for decades without really knowing to whom it belongs. Even if they wanted to purchase the land, it would not be clear from whom they should buy it. Building a factory on land owned by no one is very risky due to the risk of expropriation. Even with the appropriate documentation,

someone may contest ownership. If the legal system is slow and the outcome of a trial depends on bribes, it is risky to invest even when a person owns the land.

7.5 Corruption

Corruption not only affects the legal system, it represents a major impediment for growth in developing countries. First, corruption creates incentives for civil servants to create unnecessary forms. If a bribe can be collected each time a person needs a form, multiplying the number of forms increases the potential for bribes and income. This unnecessary bureaucracy increases the cost of starting and managing a business.

Second, if civil servants can generate higher income, it encourages the best students to compete to become civil servants. If the best students want to become civil servants, they are not trying to create wealth through entrepreneurship. Corruption therefore affects the career decisions of students and channels talent towards the civil service.

Third, corruption forces firms to stay under the radar to avoid the visits of corrupt officials. Consider a talented individual who is producing some good. This individual could hire some employees, but by growing his/her business, he/she would attract the attention of the civil service and would need to pay bribes. It is therefore better to stay small thus foregoing growth opportunities.

8

What you don't know can't hurt you... not

Introduction

Google and Bloomberg earned billions of dollars taking advantage of the topic of this chapter: information. Information is fundamental in taking decisions, but more often than not we lack complete information. First, we will discuss a situation where a person (principal) hires somebody (agent) and lacks information about his/her work effort. Second, we will present a situation in which one party in an agreement has more information than the other. In such cases, the lack of information can prevent transactions from taking place. Finally, even when a contract is signed, some problems can occur when one of the parties undertakes the job: moral hazard. Information

asymmetry is very common and explains many economical phenomenons.

8.1 Why you should not trust your realtor

Principal-Agent problem

Nobody is excellent at everything: we have our strengths and weaknesses. We usually do the things at which we are good and hire people to take care of everything else. When we hire a specialist, we gain his/her expertise but we partially lose control. The specialist has an incentive to provide advice to further his interest and not ours.

Consider for example the relationship between someone selling a house and a realtor. Most people sell a house once or twice in their life. There is therefore no reason to invest a lot of time and energy to become good at it. Sellers (principal) therefore hire realtors (agent) to take care of the transaction. Realtors have your interest at heart, but they also care about themselves.

In the process of selling a house, offers are submitted by interested parties. Should the seller accept an offer or wait for a better offer? The seller relies on the advice of the realtor, but both parties have different objectives. Both parties want the house sold as quickly as possible, but at what cost? Assume that a party makes an offer at $200,000. Should the sellers accept the offer or wait? With a 2% commission, the realtor would earn $4,000 and the seller, $196,000 if the seller accepted. Assume the realtor expects an offer at

$210,000 a month later if the seller waits. With the same commission scheme, the realtor would increase his/her earnings by $200, but the seller would gain $9,800 if they waited the extra month. What do you think the realtor will recommend? Selling means $4,000 now, while waiting would force him/her to work an extra month to earn a meagre $200. It's not worth it. The realtor will probably recommend to sell now. Won't the sellers object? No, because only the realtor knows that there is a good probability that someone will make an offer at $210,000 in a month. The agent has information unavailable to the principal. It's the reason the principal hired the agent. The problem is that the agent can use his/her information to influence the principal to take decisions that are in the interest of the agent[1].

This type of issue happens whenever you are working with a specialist whether the person is a mechanics (do I really need this new part?), dentist (do I really need this new tooth?), doctor (do I need this new drug?), lawyer (do I really need to get as much as I can from my former wife?), politician (do we really need this new bridge?), economist (do we really need to privatize this state-owned enterprise?) etc. One hires an expert, because they are better, but precisely because of their expertise (and your lack thereof), they can easily convince you to behave in a way that is detrimental to you but good for them.

Not only does this problem affect people with a certain expertise, any employee-employer relationship also suffers from a principal-agent problem.

[1]Here's the story told from Levitt and Dubner themselves quoting empirical research.

Does the employer know how hard his employee is working? Probably not. If a salesperson has not reached his/her objective this month, was it because they slacked off or because demand decreased? Life is full of randomness, and it's very hard to distinguish between bad luck and effort.

The principal can certainly control the agent, because he/she knows that exerting effort is costly and that the employee would rather avoid it. Unfortunately, controlling the behaviour of the employee all the time is very costly for the employer. To address this issue, the employer must find methods to motivate employees at a low cost.

Incentives and their disadvantages

While it is impossible to align perfectly the interests of the agent with those of the principal, it is possible to incentivize the agent. The realtor in the previous example is incentivized to work hard by the commission. Without any effort, the house remains on the market, and the realtor does not earn any commission.

The most simple form of incentive is the threat to end a labour contract. If the employer discovers that the employee is not working hard, the employee can be dismissed. Unfortunately, terminating a contract is a costly punishment for both the employee and the employer. Indeed, the employer must complete numerous forms to terminate a contract and spend time and energy to find and hire a new employee. If an employee thinks that it's too expensive to terminate his/her contract, the threat loses credibility and

therefore clout.

Bonus and profit sharing are a less extreme form of incentive pay. The more an employee works, the greater should be his/her pay. The problem again is that since the employer cannot observe effort, the bonus depends on the outcome of work. In many cases, employees receive a bonus based on luck not on effort.

Such incentives can be detrimental to overall performance. Consider a call center providing incentives to agents to answer as many calls as possible. Under such a scheme, an agent has the incentive to terminate calls as quickly as possible to take a new one. The call center offers no incentive to be helpful to a client, and therefore encourages agents to neglect this aspect of their work. Incentive pay encourages agents to focus on the portion of the work that is evaluated and not care about unevaluated aspects that may be as important but harder to measure.

Stock-options are a common form of incentive pay for higher management. If the value of the company increases, the manager receives a portion of this value increase. By aligning the interests of the manager with those of the owners (stock holders), the manager should be induced to work towards increasing the value of the firm.

Such incentives are also potentially dangerous, because they encourage managers to delay certain announcements or disguise bad news through creative accounting. This type of fraud will keep the value of the stock high in the short-term until the manages cashes in his options, but in the long term,

this behaviour will hurt the company.

Finally, promotions can also be seen as an incentive. The best employee is chosen to become the manager of the team and receives a substantial pay increase. Even though such high-powered incentive can motivate some individuals, they can also easily create tensions in teams. Knowing that only one person will receive the promotion can turn employees against each other and destroy cooperation within teams. Moreover, some employees who have no chance of receiving the promotion can become disenfranchised and lose motivation.

The information asymmetry between employee and employer can lead to shirking on the side of the employee. Incentives solve this issue but only by creating other ones. In spite of the attractiveness of short-term incentives, it may be better for a firm to focus on long-term goals and simply trust its employees.

8.2 Why do cars lose much value in their first year?

Risk

Before thinking about cars, let's simply consider risk. Lotteries represent well the idea of risk: individuals pay for a ticket to have the chance to win something. At the time of purchase, the individual does not know whether

he/she will win. It's risky.

Consider this simple lottery. There is a 50% chance of winning \$2 and 50% chance of winning 0. How much are you ready to pay to play this lottery? If you play often enough, you would receive the following stream of payoffs: $2+2+0+0+2+0+0+0+2+2... = n_0 \cdot 0 + n_2 \cdot 2$ where n_0 and n_2 represent the number of times the person wins \$0 and \$2 respectively. On average, the person can expect to win $\frac{n_0 \cdot 0 + n_2 \cdot 2}{n} = \frac{n_0}{n}0 + \frac{n_2}{n}2$ where n is the total number of times played. Notice that if n is large enough, $\frac{n_0}{n}$ becomes the probability of winning \$0 and $\frac{n_2}{n}$ becomes the probability of winning \$2. To determine the **expected value** of a risky situation, we therefore multiply the probability of an event by the payoff if this event occurs. The expected value of the lottery introduced at the beginning of this paragraph is therefore: $0.5 * 0 + 0.5 * 2 = 1$.

Back to cars

Buying a used car is similar to playing a lottery. There is a probability that the car is good and a probability that the car is bad. Since most buyers cannot distinguish between both types of cars, it's a lottery. Only after a few months will the consumer know for sure the quality of the car and therefore know whether he/she won (good car) or lost (bad car). Since the purchase of such a car is similar to a lottery, a consumer will be ready to pay the expected value of a car knowing the probability that a car is good or bad.

Let's now consider the other side: sellers. Who would decide to sell a

used car? There are probably two types of sellers. First, there are sellers who simply want to change cars. Then, there are sellers who have noticed that their car is not working well and want to get rid of it before it becomes too obvious[2]. The first group of sellers therefore offers good cars, and the second group, bad cars.

Buyers are aware that there are two types of cars, but are unable to distinguish good from bad, because they lack the technical knowledge. Let's assume that they would be ready to pay $20,000 for good cars and $10,000 for bad cars. When buying a car, buyers are playing a lottery and are therefore ready to pay the expected value of an average car. If there are as many good cars as bad cars, an average buyer is ready to pay $15,000 (05*10,000+0.5*20,000) to buy the car.

Sellers are therefore offered $15,000. While the owners of bad cars would be very happy to take this amount for their car, the owners of good cars may not be ready to accept such a low amount for their car. Let's assume that owners of good cars want at least $18,000 for their good car. If buyers could distinguish between the types of cars, a transaction at a price of $19,000 would make both parties better off. However, since buyers cannot distinguish between cars, they are only ready to pay the expected value. At that price, sellers of good cars are unwilling to sell their car. In the end, only the sellers of bad cars remain on the market. The buyers predict the decision of the

[2]This problem was probably more important in the seventies when the initial paper was written discussing this issue.

sellers of good cars and are only ready to pay $10,000 for a bad car. This phenomenon is called **adverse selection**: only the low-quality sellers remain on the market.

Why do cars lose so much value in their first year? If the price of a new car is around $21,000 and the price of a one-year old car is $11,000 like in the example, a car would lose 50% of its value in the first year. This comparison, however, is wrong. An average one-year old car would cost $15,000. The true value loss is 30%. The remaining difference stems for the difference in price between an average and a bad car. Some of the difference in prices is due to age, and some of the difference is due to the selection process of cars being sold after one year.

Solutions

Two parties should engage in a mutually profitable transaction, but it does not take place due to information asymmetry. There are two possible solutions to this problem: reputation-building and guarantees.

Cars can be sold by an occasional seller or by a dealership. A dealer can examine the car, determine its quality, and then inform a potential buyer. Just like an occasional seller, the dealer has an incentive to lie and pretend that bad cars are good. The consumer will only realize months after the purchase that the car is actually bad and will be unable to claim any damage. The difference between the occasional seller and the dealer is that the angry consumer can only hurt the dealer. Once the consumer has realized

that he/she was fooled, he/she can then ruin the reputation of the dealer. Without his reputation, nobody will trust the dealer and nobody will believe his good cars are indeed good. The occasional seller has no reputation to lose if a consumer realizes he/she was fooled. The dealer is therefore more trustworthy, because lying would cost him/her more in the long-term than the short-term benefit of selling a bad car at a high price.

Offering guarantees is another solution to address the problem of adverse selection. A dealer can offer a 2-year guarantee with good cars, but not guarantee for bad cars. Since good cars never have problems, this guarantee is costless. An evil dealer could pretend that a bad car is good by offering a guarantee on it. This lie would reduce his/her profit if the cost of the guarantee is greater than the price difference between a good and a bad car. In such a situation, it is not in the interest of the dealer to pretend that bad cars are good by offering a guarantee. By offering guarantees, a dealer can therefore make it credible that a good car is indeed good.

8.3 Why signing the contract is just the beginning of trouble

Contracts are difficult to write, because it is impossible to cover all eventualities: many actions are unobservable and certain clauses are hard to enforce. Lawyers try to cover all corners, but the perfect contract has yet to be written. In this section we discuss issues that can arise after a contract is signed:

moral hazard.

In certain cases, a contract changes the incentives of the parties. Consider a consumer who has purchased complete insurance on a rental car. Does the driver have any incentive to drive carefully? No. If there is an accident, the insurance company covers the damage. Even if the insurance company were to require their clients to drive carefully, it would not be able to observe their behaviour and enforce this clause. How can the insurance company distinguish between reckless driving and bad luck? Moreover, the insurance company would need to define what is meant by careful driving. Even if the driver agrees to drive carefully, he/she has no incentive to keep his/her word after having signed the contract. Since this type of contract leads to bad behaviour, full insurance (no deductible) is either impossible or very expensive. Some very risk averse individuals may enjoy perfect insurance, but moral hazard would prevent an insurance company offering such a contract. There is a loss in efficiency.

Mora hazard not only affects individuals. Two companies signing a contract can also be affected by moral hazard. A company signing contract may never have had the intention to respect it. Consider a very big company (company A) that orders very specific parts from a smaller company (company B). Both companies agree on a price. Company B produces and ships the parts, and then sends a receipt to company A. Assume company A refuses to pay the original price. Instead, it suggests paying a lower price. What can company B do? First, it can accept the new price and reduce substantially

its profit margin. Second, it can try to sell the pieces to another company, but there is no market for them, because the parts are very specific. Finally, it can sue company A, and expect to win within 5 years. Unfortunately, company B is small, spent much money to produce the parts and needs cash to avoid bankruptcy. In most cases, company B will simply accept the new price to avoid bankruptcy. When companies of different sizes do business, moral hazard (in this case a special case called hold up) can create some issues for the smaller company that can easily become a victim. The risk of moral hazard can discourage small companies from doing business with larger companies.

Moral hazard is also blamed for the 2008 financial crisis. Consider the incentives of banks that generated sub-prime mortgages. Since they knew that these mortgages would be sold on to another party, what were their incentive to screen properly the households wanting a mortgage? None. Even if the banks promised their clients they would screen the borrowers properly, they had no incentive to fulfill this promise, and the clients were unable to verify whether the borrowers were screened properly. Loans were therefore granted to individuals who had a very high likelihood of default. Banks never suffered from this lack of screening, because the mortgages were sold before the borrowers defaulted.

Moral hazard also played another role in the 2008 financial crisis. Consider the banks and insurance companies who took large risks and were bailed by the federal government. Knowing that they would be saved if they went

bankrupt, do these financial institutions have incentives to be careful? No. The implicit insurance of the federal government is similar to the insurance of the rental company: it encourages risky behaviour.

9

Maybe not that rational after all

Introduction

Individuals may have enough information to make informed decisions, but they may lack the rationality that we generally assume in economics. In this chapter, we first discuss two strategic situations in which economic agents behave differently than what economists would expect. We then discuss a large body of well-known biases that affect decision-making: present-bias, inertia, representativeness/availability, anchoring, loss aversion and overconfidence. We will conclude with the implications of these issues on public policy.

9.1 Strategic interactions

Economists usually have very simple predictions concerning the strategic behaviour of humans. They should maximize their own well-being by being rational. In the following situations, we discuss two situations in which humans do not act rationally. In other words, these two games exemplify the differences between economic theory and reality.

Negotiation

Let's first consider a simple game of negotiation. Two people want to split \$1. Person 1 makes an offer to person 2. If person 2 accepts, the money is split based on person 1's suggestion. If person 2 refuses, both players get nothing. What should person 1 offer? Before answering this question, let's try try to predict how person 2 would behave given an offer from person 1. How will person 2 react to an offer from person 1? Person 2 has the choice between accepting the offer (receiving a positive amount of money) or refusing (receiving nothing). Since refusing always leads to a smaller payoff, one would always expect person 2 to accept the offer from person 1. If person 1 expects this behaviour from person 2, he will propose keeping \$0.99 an giving \$0.01 to person 2. If person 2 is rational, he/she will accept. Economic theory therefore predicts a very unequal distribution: \$0.99 to person 1 and \$0.01 to person 2.

How do normal people play this game? Usually, person 1 offers a 50/50

distribution and it is accepted by person 2. What happens if person 1 offers much less to person 2? Often, person 2 refuses even if it means foregoing a small amount of money. People not only care about their payoff, they care about their relative payoff. If person 1 receives more than person 2 even though there is no reason for this unequal treatment, person 2 is ready to refuse and forego a small amount to indicate his/her disagreement. There are numerous variations of this game that have been played in different cultures.

Beauty Contest

The beauty contest is another game that involves strategic interaction. People in a room are asked to guess a number between 0 and 100. The person who is closest to 2/3 of the average number guessed by all participants wins. What would you guess? Nobody would guess above 66, because if everybody guesses 100, 2/3 of 100 is 66. If nobody guesses above 66, one should not guess more than 2/3 of 66 (44). If nobody guesses above 44... Ultimately, one should guess 0.

How do normal people play this game? Very few people actually guess 0. When I played as an undergraduate, 2/3 of the average was 20[1]. Why do people guess a number higher than 0? There are two possibilities. First, people may not think through the game and reach 0. Second, people may think through the game, but expect other people not to think through the game. If I am very intelligent but surrounded by less intelligent people, I

[1]Play the game here with the Internet community to see.

may expect them not to understand the game and make irrational guesses. With those expectations, it is rational for me to guess a number other than 0. This result is interesting, because it shows that guessing the "rational number" (ie 0) is a guarantee to lose. Being rational in a group of irrational people is not rational.

This result can easily be applied to financial markets. Perhaps one knows the true value of a stock through fundamental analysis. If everybody else is irrational and thinks that the stock is worth much less, however, one will never make a gain by buying this asset. Financial markets just like the beauty contest are a competition about guessing what other people are guessing. This type of process explains partially the large fluctuations observed on the stock market.

9.2 Cognitive biases

In this section, we discuss how certain cognitive biases affect the way we think and act.

Present-bias

Investments are an important component of economics. Simply put an investment means incurring a cost now to receive a benefit later. Jogging, for example, involves spending painful time running in the rain now to be healthier later. Education is similar. Students spend four years of their life

foregoing income now to have the possibility to earn more later.

Even though investing is an important part of economic growth, humans tend to be impatient and invest too little. We tend to give too much importance to the present and not enough to the future. The cost is overestimated and the benefit, underestimated. Many profitable investments are therefore not undertaken, especially those with a benefit in the very long term.

Consider the following two situations in which payoffs take place in the future. First, you have the choice between receiving $200 in a year or $195 in 48 weeks. Which one do you choose? Second, you have the choice between receiving $195 now or $200 in a month. Which one do you choose?

In the first case, you have the choice between two amounts that you will receive in the future. You could receive the $195 in a nearer future than the $200, but the difference is hard to grasp. Most people would choose the bigger amount: $200 in a year. In the second case, you could have $195 now. It's very tempting. Most people would probably choose $195 now. Not choosing the same amount in both cases is irrational, it's called hyperbolic discounting.

In both cases, the amounts and the time lapse the same. The difference is whether the amount is received now or in the future. An amount of money received now is much more salient and hard to resist than something happening in the future.

Present-bias has important consequences for long-term decisions. Saving for retirement, for example, involves foregoing consumption now for future

consumption. It's hard to forego consumption now. Everybody would agree that a person needs to save for retirement, but how many people actually do it? About 33% of Americans save through 401(k) plans (equivalent of RRSP), but only 11% say they save enough. A similar argument can be made about having a healthy lifestyle.

Inertia

Inertia is a form of present-bias. Changing something requires an effort now for a benefit later. Here's a personal example. My wife and I moved from Germany in 2008. My wife had a cellphone in Germany. When do you think she cancelled her cellphone contract? I think it was 2014. During 6 years, a monthly amount[2] was taken from her account by the cellphone company. Cancelling the contract meant finding the address of the cellphone provider, writing and sending a letter to cancel the contract. It involved a cost now for a long-term benefit. There was always something that was more pressing[3]. We tend to procrastinate and avoid unpleasant tasks, even though it can be ultimately very costly.

Marketing experts know how to take advantage of inertia. Quite often, memberships are offered at a very low cost or even for free for the first few months. How could one refuse such an offer? It's free! The consumer is always reminded that it's very easy to cancel the membership after the first

[2]It wasn't that much.
[3]Between 2008 and 2014, we did have 3 kids...

few months. Even if it is easy, most people won't do it. It involves finding a phone number and calling. That's too complicated... People end up paying for something that they only wanted, because it was free.

Inertia can have far-reaching implications. Consider organ donations. In Canada, people must inform the government of their intention to donate their organs in case of death. It's complicated; very few people actually do it. In other countries, people are assumed to be willing to donate their organs. If they are unwilling, they can still choose not to donate, but they must inform their local government. Since most people don't really care what happens to their body once they die, most people "choose" not to act and therefore follow the default option.

To understand the magnitude of this difference, let us can compare the donation rate in Belgium (op-out country) of 27.1% with the donation rate in Germany (opt-in country) of 15.3%. The 10 percentage point difference translates into longer wait for organs in Germany. Determining the default option is therefore very important, because most people will choose the default.

Representativeness and Availability

In the two previous sections, we have discussed the importance of time on decision-making, now we'll focus on risk and probabilities. In the section on risk, we assumed that probabilities were known. In reality, nobody knows the true probabilities of events. We go through life assessing probabilities

with more or less success. For example, when we see clouds in the sky, we infer that the probability of rain is higher than when there is no cloud in the sky. Our experience has shown that it rarely rains when there is no cloud in the sky.

How do we understand basic concepts of probabilities? The Linda experiment is probably the most famous demonstration of our inability to deal with probabilities. Consider Linda, she is 31 years old, single, outspoken, and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in anti-nuclear demonstrations.

Rank these statements by likelihood (from most likely to least likely):

1. Linda is a bank teller
2. Linda has a cat
3. Linda is involved in the union
4. Linda teaches at elementary school
5. Linda is a bank teller involved in the union

If you are like most people, your ranking looks like this: 2, 4, 3, 5 and 1. This ranking is logically wrong, because statement 5 is a combination of statements 1 and 3. It is more likely for her to be a bank teller who may or may not be involved in the union (statement 1) than being a bank teller who is involved in the union (statement 5). The more specific is a statement, the

less likely it is. Why does the majority of people make this mistake? Because Linda's description fits the description of somebody involved in a union. Our brain desperately wants Linda to be in the union and is therefore willing to make a logical mistake to satisfy this desire.

Now that we know Linda, let me introduce Steve. He is very shy and withdrawn, invariably helpful but with very little interest in people or in the world of reality. A meek and tidy soul, he has a need for order and structure, and a passion for detail. Is Steve more likely to be a librarian or a farmer?

A librarian, right? The description fits perfectly the one of a librarian. How many male librarians are there in the US? In 2009, there were 200,000 librarians in the US and 17% of those were male[4]. There were therefore 34,000 male librarians in the US. How many farmers were there? There were 2.2 million male farm operators in the US in 2002. There are about 100 times more male farmers than male librarians.

Let's say that 5% of farmers and 80% of librarians correspond to the description. 110,000 farmers and 27,000 librarians would then be introverts. Even though a smaller share of farmers are introverts, the fact that there are so many more farmers than librarians means that there are also more introvert farmers than introvert librarians. Knowing these numbers, is Steve more likely to be librarian than farmer? Farmer.

At this point, one would argue that one could not have answered the question initially without knowing the number of male farmers and librarians.

[4]Here's the source

Since this information was not provided, it was impossible to answer the question. Correct. However, nobody asked for this information. One reason why we are not interested in this piece of information is that our brain prefers to answer the easier question: what is the probability that this statement is true given that the person is a librarian/farmer instead of answering the true but harder question: what is the probability that Steve is librarian/farmer given the information. Our brain is sometimes lazy and fools us by answering easier questions.

Another way through which we can trick our brain is to ask it to do something at which it does not excel. For example, are words that start with "k" more likely than words that contain "k" as third letter? Any normal person would intuitively try to come up with words that start with "k" and words with "k" as third letter to assess the relative frequency. Words that start with "k" are easy to recall: knee, knight, kite, kale, know, knob, kilo, kiss, keep, kill, king etc. What about words that have "k" as third letter? It's much harder to come up with them. Hence, we think there are more words that start with the letter "k". Actually, there are more words that have "k" as third letter[5]. We don't really know what our brain can or cannot do. We assume that it can do everything equally well. We therefore think that if we cannot recall something, it's because there is nothing to recall and it's not because our brain is not good at recalling this type of information.

[5]Here are some examples: take, rake, lake, bake, cake, sake, joke, oak, bike, ask, wake, poke, ink, fake, acknowledge, token etc.

Our memory is biased. Certain events are easier to recall than others. Perhaps they happened to relatives or they were portrayed in the media. It is therefore important to be aware of these biases to avoid certain pitfalls.

Anchoring

Not only are we guided by our memory, some outside factors can also lead us astray. Consider this experiment. Group A will first be presented this question: "Is the distance between London and Karachi (Pakistan) greater or smaller than 9,000 km?" and will then be asked to guess the distance between London and Karachi. Group B will first answer the following question: "Is the distance between London and Karachi (Pakistan) greater or smaller than 4,000 km?" and will be need to guess the actual distance.

Nobody knows the distance between London and Karachi (it's 6,300 km). It's very difficult to guess this distance, because we have no point of reference. If we were to guess the distance between Winnipeg and Toronto, we could guess more or less accurately, because the map of Canada is somewhat wired into our brain. In a situation of total confusion, our brain is desperate for hints and will take any information as a suggestion. On average, group A will therefore guesses a number close to 9,000 and group B will guess in the neighbourhood of 4,000, even though nothing in the question tries to fool the respondent. The first question does not attempt to mislead, but it manages to mislead nonetheless.

Anchoring happens whenever we face difficult situations. What is the

value of a house? It's very difficult to evaluate a house. Luckily, there is a posted price. This price can serve as anchor. Similarly, price of stocks are also anchors. Whenever we evaluate an asset, we must try not to be influenced by the anchor or if we try to sell an asset, we should try to be the first to set an anchor.

Loss aversion

Whenever we take risks, there is an upside and a downside. In other words, we may be lucky or not. Nobody likes to lose, but most humans are very averse to losing. Consider these two experiments. First, I give everybody $1,000, and then you have a choice between two gambles: 1) 50% of losing $750 and 50% chance of losing $250 or 2) 100% chance of losing $500. Second, you have the choice between two gambles 1) 50% chance of gaining $250 and 50% chance of gaining $750 or 2) 100% chance of gaining $500.

Most people would choose 1) in the first case, and 2) in the second case. Notice that both situations are exactly the same in the long-run. Yet, by framing the situation as a loss and the other one as a gain, it is possible to flip preferences. When we are losing, we become risk loving, because we desperately want to reduce losses. When we are gaining, we become risk averse, because we are satisfied with the certain gain. Depending on how the question is asked, our answer is different.

The Monty Hall game is another example of loss aversion. In this game, a participant can choose between 3 doors (A, B and C). Behind one of these

doors, there is a prize. If the participant opens the right door, he/she wins the prize. The participant initially chooses a door (let's say door A). The host then opens one of the two other doors (B or C, whichever one does not hide the prize. Let's assume door B), and asks the participant whether he stays with door A or wants to change to door C. What would you do?

Most people keep their initial choice, even though it's wrong. Initially, each door has a probability of 1/3 of hiding the prize. The initial choice is therefore irrelevant. Once the host has shown that door B does not hide the prize, the probability that the prize is between door B is zero. Where does the 1/3 probability go? It goes to door C. There is a 2/3 probability that the prize is behind door C and 1/3 probability that the prize is behind door A. Yet, people generally keep to their door. Why? Possibly people would feel very disappointed if they had changed door and their initial choice had been the right one. To avoid feeling this anger, people keep to their initial choice.

How could loss aversion affect day-to-day decisions? The stock market is a place where loss aversion can do a lot of damage. When do people sell stocks? When they are above the price at which they purchased them. Selling a stock at a loss is hard. It means realizing a loss. People prefer to gamble hoping that the stock will recover. In most cases, the stock will not recover and selling would have been the best idea.

9.3 Public policy

How does this irrationality affect public policy? Do we expect the government to protect us against ourselves, against our irrationality? The Canadian Pension Plan (CPP) exists to address one of these irrationalities: present-bias. If people are not willing to save, the government forces them through CPP to save for their retirement for their own good.

Governments around the world are starting to realize the power of nudges: how to use inertia to help people. In determining the default option, the government effectively chooses for many people. How should the government use this power without misusing it? It is a difficult moral question.

Representativeness and availability can only be addressed by providing reliable information. The government can, for example, keep track of certain events to provide correct information on which they can base their decisions. The incidence of terrorism for example is generally overestimated, because it is easy to recall terrorist attacks. When voting, people need to have the right probabilities in mind to make sensible decisions.

Loss aversion is an important issue on financial and insurance markets. These markets are heavily regulated, because unsophisticated investors can easily become victims. The role of the government is to protect these people from themselves.

10

What's the return of university education?

So far, everything has been very theoretical. Most researchers involved in microeconomics are actually applied micro-economists. They assess empirically the responsiveness of behaviour to outside changes or the impact of decisions taken by individuals on other outcomes. This type of research involves one important challenge: how to compare similar individuals who have taken different decisions. In this chapter we illustrate this issue by discussing the return to education. It's a relevant topic to students who spend much resource to acquire an education and to the government who subsidizes education heavily. If the return to education were small, the time of students and the money of governments would be wasted. This chapter discusses how one would determine the impact of education by first discussing the cost of

education and then describing how researchers was tried to assess the benefits of education.

10.1 Cost of education

The first and easiest step of determining the return of education is the cost. What is the cost of education? As we did in section 2.1, we will distinguish between two types of costs: explicit and implicit costs. The explicit costs represent a direct payment undertaken to pursue a university degree and the implicit costs is the opportunity cost of not being able to use resources that are used up in the process of being educated.

Explicit costs

The most obvious explicit costs are tuition fees. To study at Saint Mary's, domestic students pay approximately $6 000. This cost is higher for international students and lower for excellent students who benefit from scholarships.

Are there any other explicit costs? In other words, what payments do students make that non-students could avoid? For students whose parents live outside Halifax, attending university also means living in residence and paying those fees. These students could have decided to move to Halifax to get a job even without starting university. In that case, residence cost would not be counted towards the cost of attending university.

Implicit costs

As we have discussed in chapter 2, determining implicit costs is like entering the parallel universe of "what would have happened if you hadn't gone to university". Let's assume you would work 40 hours per week at $12 per hour. Per year, you would therefore earn approximately $25,000 (12*40*52). By going to university, you partially forego this possibility. You could probably work part-time during the term and full-time during the summer and earn $13,000 (12*10*32 +12*40*20). The implicit cost of attending university is therefore approximately $12,000 in foregone income per year.

Overall cost of university is therefore approximately $18,000 per year. Even though, everybody is focused on tuition fees, it only represents one third of total cost of attending university. The foregone income is a much greater share of total cost

10.2 Benefits of education

Education has numerous benefits, because it provides students with skills. Not only are these skills important in themselves, they also enable students to acquire more skills. Consider reading. Learning to read is very useful in its own right, but once a person can read, this person can also learn a foreign language by reading a book about this foreign language. Education is similar to a snowball effect.

To measure the impact of the knowledge acquired through education,

economists consider wages and unemployment rates of individuals who attended or not university. One would expect education to increase wages and decrease the unemployment rate as employers decide to hire productive people or pay them more to keep them from working elsewhere.

10.3 Measuring the impact of education

From the previous section, we developed the hypothesis that more educated people should have a lower probability of being unemployed and higher wages. How can we test this hypothesis?

Naive method

Statistics Canada conducts numerous surveys collecting information on the education, wages and employment status of Canadians. The 2011 National Household Survey[1], for example, contains this type of information for a sample of 4.5 million Canadians.

Using the NHS, one could simply compare the wages and unemployment rates of people with university education with those of people with college education. The table available at this link shows that individuals with a university degree earned on average $44,100, while those with a college diploma earned $40,400. Does this information show that education causes an increase in earnings of approximately $4,000 per year?

[1]This survey was known as the Census before participation was made voluntary.

The problem is that individuals who choose to complete a university degree are different from those who decide to undertake a college degree. Let's assume that individuals who complete a university degree are more intelligent, more motivated, better organized etc. than those who complete a college degree. By comparing the average earnings of people with a university degree to those of people with a college diploma, we are comparing different types of individuals who have a different level of education. What is responsible for the difference in education? The initial differences or the different levels of education?

It is important to distinguish between both explanations for policy-makers. Imagine that university were completely useless[2]. The self-selection into university (more intelligent individuals going to university) could still explain observed differences in wages, but public money devoted to post-secondary education would be a complete waste. We need to find evidence that education has a causal impact on wages.

Randomized controlled trials

One solution to address this issue is to follow the pharmaceutical method and conduct a randomized controlled trial. Whenever new drugs are tested, participants with certain health conditions are asked to take part in studies. Some of these participants are randomly selected to receive the real drug and others receive a placebo. Scientists then compare the health outcomes of both

[2]It's hard but make an effort.

groups to determine whether the drug has a positive impact on patients. The comparison is valid, because participants who received the drug and those who did not are identical, because they were randomly chosen.

Applied microeconomists could follow this method by visiting high schools and randomly choose who attends university and who does not. As much as this may be possible in totalitarian regimes, such a procedure would fail to receive approval for any research ethics board. Science is useful but cannot justify ruining the lives of people.

Sophisticated methods

We need to keep the intuition of the randomly selected individuals, but we cannot randomly select them ourselves. We need to rely on historical events.

One such historical event is the GI Bill. Veterans from World War II and Vietnam were offered free or highly subsidized education to help them reintegrate civilian life. One can therefore expect veterans to have reached higher levels of education than non-veterans. Are veterans different from non-veterans? How did a person become a soldier?

To determine who would serve in the American army in the Vietnam war, the government used a lottery. Young men with last names between certain letters living in certain states were sent to Vietnam. This lottery is very similar to the method used in pharmaceutical trials. Soldiers and therefore veterans are therefore randomly selected. If veterans and non-veterans have different earnings, it is not because they are systematically different but

because they reached different levels of education.

Another historical method is the introduction of compulsory schooling laws. In Nova Scotia, students must attend school until they reach the age of 16. This law can be exploited in two ways by researchers. First, economists can compare the earnings of students born in January with those born in August. Students born in January can legally drop out of school before completing grade 12. Students born in August cannot. The latter group is therefore forced to complete high school. One would therefore expect them to finish high school and accumulate more schooling than those born in January. Are people born in August otherwise significantly different from those born in January? Probably not. We can imagine that babies are randomly born[3]. Some of them are born in January and others in August. Those born in January have a lower probability to complete high schools than those born in August due to compulsory schooling laws. We can therefore compare the income of people born in January and August. If there is a difference, we can probably explain it by arguing that people born in August have on average more education than those born in January.

Compulsory schooling laws can also be useful, because they change. In 1883, a law was introduced in Nova Scotia that forced all children aged 7 to 12 to attend school. Consider someone born in 1877 who was 6 in 1883. This person was forced to attend a minimum of 5 years of schooling. A person

[3]Don't worry, babies are not randomly born. If unsure ask your parents where babies come from.

born in 1871 would have been 12 in 1883 and would never have been forced to attend school. Were people born in 1871 significantly different from those born in 1877? Again, it is as if babies were born randomly. Two similar people born in different years will receive a different amount of schooling. If the wages of these two people are different, we can attribute this difference to differences in schooling.

All these sophisticated methods take advantage of the fact that similar people receive different amounts of schooling for reasons beyond their control. It is then possible for researchers to disentangle personal differences from schooling differences.

10.4 Moral of the story

If you were expecting a number showing the return to education, you'll be disappointed. Applied economics is not about results, it's about methodology[4].

This discussion is obviously important for somebody conducting applied research in social sciences, but it's also important for anybody consuming research. Every day, we hear on the radio that some type of behaviour causes an increase or decrease in the probability of cancer. One should therefore avoid or embrace this type of behaviour. Should we take this research seriously or not? In most cases, researchers simply use differences in a certain

[4]Ok, ok, a ballpark estimate would be around 7%, but don't quote me. It depends on numerous assumptions.

past behaviour to explain present health outcomes. Could people who behave differently be different in other aspects of their lives? Probably.

Unfortunately, health researchers have a difficult time taking advantages of policy changes like compulsory schooling. There was never any great 1976 carrot prohibition that lasted until 1979 or a jogging compulsion from 1920 to 1925. Since these policies were never enacted, health researchers must rely on statistical relationships. Unfortunately, there is rarely any justification to transform these correlations into causal relationships. One should therefore use some salt when listening to the newest health fad, but not too much, because salt causes coronaries diseases, I think.

11

Conclusion

Microeconomics offers a basic framework to understand different players in the economic environment. In chapters 2, 3 and 4, we discussed what is a firm and how it would behave to maximize profit. Chapters 5, 6 and 7 focused on the role of the state as a solution to market failures, a taxation authority, and a catalyst for economic development. In chapters 8 and 9, we studied issues arising when information is imperfect or agents lack rationality. Finally, chapter 10 discussed some empirical challenges that arise when conducting applied microeconomic research.

Even though all these topics are clearly related to microeconomics, they are interconnected with a number of other courses offered in the bachelor of commerce. The first two chapters discuss the pricing procedure. Marketing courses will build on this knowledge and provide more tools to understand the markets facing different products. Taxation, the topic of chapter 6, is very

important in accounting courses. In these courses, you will learn how to apply taxation rules and how to manage a firm to minimize a firm's tax burden. Finance was covered in the section on asset taxation, in the discussion on microfinance, and in the chapters on information asymmetry and behavioural economics. Finally, human resources addresses problems related to principal-agent issues. Microeconomics offers an overview of the whole B.Comm.

Students can also choose to continue their study of economics. Chapter 3 and consumer theory form the basis for intermediate microeconomics. Chapters 5 and 6 are traditional topics in public economics. Chapter 7 offers an overview of development economics. Public and development economics are both offered at the 3000 level courses. Econometrics and statistics would be the logical next step for students interested in applied economics.