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- **Chapter 6 – Applications of Rational Choice and Demand Theories**
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CHAPTER

6

APPLICATIONS OF RATIONAL CHOICE AND DEMAND THEORIES

Suppose that you recently purchased a house for €200,000. And today you woke up to the news that a change in government policy has resulted in the prices of all houses, including the one you just bought, falling by a half. How do you think you would feel?

The overwhelming majority of people would interpret the news as bad news. After all, a house you just purchased for €200,000 is now only worth €100,000. And it is the government's fault.

It turns out, however, that you are actually better off as a result of the fall in house prices. You should, therefore, be thanking the government that your house now costs €100,000 less than you paid for it! A straightforward application of the rational choice model is enough (as we shall see shortly) to make sense of this counter-intuitive finding.

CHAPTER PREVIEW

The most interesting questions in economics are typically about the consequences of a *change* in prices or income. If, for instance, an oil shock affects the price of oil, or a drought affects the price of wheat, or the government reduces the tax on cars, we would hope that the micro-economist can say something useful about the likely consequences. Indeed, the policy maker may have relied on an economist's advice before deciding to reduce the tax on cars.

Fortunately, the rational choice model is often at its most informative when it comes to analysing the effects of a change in prices or income. In this chapter we consider a variety of applications and examples involving the rational choice and demand theories developed in Chapters 4 and 5. We will see that the rational choice model can yield crucial insights not always available to policy analysts armed with only common sense.

We begin with some examples of how price elasticity of demand can inform policy making. Next, we shall look at the effect a tax has on market equilibrium prices and quantity. We shall see that price elasticity, and not whether the tax is imposed on buyers or sellers, is of crucial importance.

When studying any change in price or income we are naturally interested in whether people will be better off or worse off as a result of the change. Will, for instance, a change in the tax system make people better off? Or will it benefit the rich and harm the poor? A theme throughout the applications and examples will, therefore, be that of welfare. In the second half of the chapter we shall introduce specific techniques to measure changes in welfare, including consumer surplus and compensating variation.

USING PRICE ELASTICITY OF DEMAND

In the sphere of applied economic analysis, few tools are more important than the concept of price elasticity of demand. In this section we examine applications of this concept in two very different settings.

EXAMPLE 6.1 Fares on the London transport system increased by around 6 per cent in January 2012. London Mayor, Boris Johnson, said that the fare increase was essential in order to fund upgrades in the existing transport infrastructure. But, how much extra revenue could Transport for London expect from the increase in fares? And what will be the effect on demand for public transport?

In order to answer these questions we need to know the elasticity of demand for public transport in London. Fortunately, we have some reliable estimates.[1] For example, the elasticity of demand for the London Underground is estimated at around −0.3 in the short term (one to two years) and −0.6 in the long term (more than two years). The distinction between short-term and long-term elasticity captures the fact that it may take time for passengers to substitute to an alternative.

Given a fare increase of 6 per cent and an elasticity of demand of −0.3, demand should fall by 1.8 per cent. Note that demand is estimated to be relatively inelastic and so the drop in demand is relatively small. In 2011 there were around 1,171 million passenger journeys on the London Underground.[2] So, we should expect around 1,150 million journeys after the price rise. Note that this is a reduction of 21 million journeys. Revenue from the London Underground in 2011 was £1,981 million, suggesting an average fare per journey of £1.69. If the average fare increases by 6 per cent or, equivalently, 10 pence then extra revenue of $1{,}150 \times 0.1 - 21 \times 1.69 = £80$ million will be raised from the London Underground. ◆

Clearly, the estimate provided in Example 6.1 is a very crude one. A much more thorough analysis is needed to get a more precise estimate of the extra revenue. Knowing the elasticity of demand is, however, crucial to doing that.

EXERCISE 6.1 Suppose that prices on the London Underground were raised by 10 per cent. How much extra revenue would have been raised?

What if we tell you that the number of journeys made on the London Underground increased after the 2012 price rise? Does that mean our calculations were wrong? Not at all. Passenger

[1] R. Balcombe et al., 'The Demand for Public Transport: A Practical Guide', TRL Report 593, 2004.
[2] Transport for London Annual Report and Statement of Accounts for 2012.

numbers increase, year on year, on the London Underground for a variety of reasons. Without the fare increase passenger numbers would almost certainly have increased by more than they did. So, we still need to know how much demand will fall, everything else the same, in order to calculate the effect of the price rise.

Our discussion of price elasticity of demand in the previous chapter and this has focused on market demand. Policy analysis often, however, requires us to look at price elasticity for sub-categories of consumer. For instance, we may well be interested in whether a rise in public transport prices will disproportionally disadvantage the poor. To address this question would require us to know something about price elasticity of demand for the poor.

A particularly telling illustration on the importance of considering sub-categories of consumer is provided by the demand for alcohol.

Price Elasticity of Demand for Alcohol

Many support taxes on alcohol to reduce the social costs associated with alcoholism and alcohol abuse. But, how does the consumption of alcoholic beverages respond to changes in their price? For many decades, the conventional wisdom on this subject responded, 'not much'. Unfortunately, however, estimates of the price elasticity of demand for alcohol tend to be unreliable. The problem is that the prices of alcoholic beverages usually do not vary sufficiently to permit accurate estimates.

In a careful study,[3] Philip Cook made use of some previously unexploited data on significant changes in alcohol prices. He suggested that the price elasticity of demand for alcohol may be much higher than we thought. Cook's method was to examine changes in alcohol consumption that occur in response to changes in liquor taxes. He found that liquor consumption declined relative to the national trend in the year following a tax increase. His estimate of the price elasticity of demand was −1.8, a substantially higher value than had been found in previous studies.

Cook's interpretation of his findings provides an interesting case study on the factors that govern price elasticity. One salient fact about the alcohol market, he noted, is that heavy drinkers, though a small fraction of the total population, account for a large fraction of the total alcohol consumed. This fact had led many people to expect that alcohol consumption would be unresponsive to variations in price. The common view of heavy drinkers, after all, is that they drink primarily out of habit, not because of rational deliberations about price. Stated another way, analysts always expected the substitution effect to be small for these people.

But even if the substitution effect were zero for heavy drinkers, there would remain the income effect. The budget share devoted to alcohol tends to be large among heavy drinkers for two reasons. The obvious one is that heavy drinkers buy a lot of alcohol. Less obvious, perhaps, is that their incomes tend to be significantly smaller than average. Many heavy drinkers have difficulty holding steady jobs and often cannot work productively in the jobs they do hold. The result is that the income effect of a substantial increase in the price of alcohol forces many heavy drinkers to consume less. In support of this interpretation, Cook observed that mortality from cirrhosis of the liver declines sharply in the years following significant tax increases. This is a disease that for the most part afflicts only people with protracted histories of alcohol abuse, and clinical experience reveals that curtailed drinking can delay or prevent its onset in long-term heavy drinkers.

If this interpretation is correct then a tax on alcohol appears worthwhile because it would reduce the consumption of heavy drinkers and, therefore, alleviate the problems associated with alcohol abuse. Subsequent studies, however, have challenged this interpretation somewhat. A study by Willard Manning, Linda Blumberg and Lawrence Moulton, for instance, directly estimated the price elasticity of demand for moderate and heavy drinkers.[4] They found that demand of moderate drinkers was price elastic but that of heavy drinkers was price inelastic. This suggests that a tax on alcohol is not worthwhile because it will primarily impact on moderate drinkers, who impose no social cost.

[3]Philip J. Cook, 'The Effect of Liquor Taxes on Drinking, Cirrhosis, and Auto Accidents', in *Alcohol and Public Policy*, Mark Moore and Dean Gerstein (eds.), Washington, DC: National Academy Press, 1982.
[4]Willard G. Manning, Linda Blumberg and Lawrence H. Moulton, 'The Demand for Alcohol: The Differential Response to Price', *Journal of Health Economics*, 14(2), 1995: 123–148.

Can we reconcile the two, seemingly contradictory, findings? Recall that Cook argued heavy drinkers would reduce consumption because of the income effect. A small increase in price may be relatively easy for the heavy drinker to finance. A small increase in taxes would, therefore, impact on moderate drinkers but do nothing to reduce the consumption of heavy drinkers. If we want to influence heavy drinkers then our focus should be on a substantial increase in the price of alcohol.

Clearly a large tax would have a large impact on moderate drinkers. Is the gain from reducing the harm caused by excessive drinking sufficient to justify imposing a burden on all moderate drinkers? This is the kind of normative question that policy makers must grapple with. Note, however, that an understanding of income and substitution effects has allowed us to say with some confidence that a small tax on alcohol would not be a good policy.

SUMMARY

- In this chapter our primary focus was on applications of the rational choice and demand theories developed in Chapters 4 and 5. We saw how a knowledge of price elasticity of demand is key to answering many policy questions. It may also be important to know the price elasticity of certain sub-categories of consumer, such as poor and rich, or heavy and moderate drinkers.
- We also looked at the important distinction between the legal and economic incidence of a tax. Society often focuses on the legal incidence of a tax—who is responsible for paying the tax. We saw, however, that a tax has the same effect whether it is imposed on buyers or sellers. It is the relative price elasticity of demand and supply that determines who shares most burden from a tax. If demand is price inelastic then buyers will face the biggest burden. If demand is price elastic then sellers will face the biggest burden.
- The rational choice model is also useful for evaluating the welfare effects of price and income changes. It suggests why the consumer price index, the government's measure of changes in the cost of living, may often overstate the true cost of achieving a given level of satisfaction.
- We also considered the concept of consumer surplus, which measures the amount by which a consumer benefits by being able to buy a given product at a given price. We saw that consumer surplus is well approximated by the area bounded above by the individual demand curve and below by the market price. Two-part pricing structures are a device by which a portion of consumer surplus is transferred from the buyer to the seller.
- The change in consumer surplus is theoretically an imperfect measure of the welfare effect from a change in price. We also, therefore, looked at the compensating and equivalent variation of a price increase. The compensating variation is how much income a consumer would need to compensate for a price increase. The equivalent variation is how much the consumer would pay to avoid a price increase. If income effects are small then the compensating and equivalent variation and change in consumer surplus will all be similar.
- An income-compensated demand curve shows that a consumer's demand for a good changes if the consumer is compensated for any increase in price. This demand curve is useful for looking at a change in tax policy where the money raised from a tax will be returned to consumers through extra government spending.

QUESTIONS FOR REVIEW

1. Explain in your own words why a petrol tax whose proceeds are refunded to the consumer in a lump-sum amount will nonetheless reduce the consumption of petrol.
2. Explain in your own words what a two-part pricing scheme is and why sellers might use one.
3. Do you think a university education has a high- or low-price (tuition fees) elasticity of demand?
4. Explain in your own words why even long-term heavy drinkers might be highly responsive to increases in the price of alcohol.
5. Bus services are generally more energy efficient than cars yet the trend over the past 30 years has been a decline in the proportion of commuters taking buses despite an increase in real energy prices. Why?
6. Explain in your own words the difference between the compensating variation and equivalent variation of a price increase.