READING LIST

1. Basic economics texts

The general level of the course is *intermediate* microeconomics. The following two basic economics texts are therefore suitable *only as preliminary reading*, but can be a useful starting point for students without A-level economics. These cover both introductory micro- and macroeconomics.

Begg, David K.H, Fischer, S. & Dornbusch, R. Economics, 8th or 7th ed: ch.1-18 (5th or 6th ed: ch.1-19).

Lipsey, Richard G. & Chrystal, K. A. Economics, 10th ed: ch.1-20 (or Principles of Economics, 9th ed, ch.1-19).

2. Intermediate microeconomics texts

The primary textbooks for this course are:

Katz, Michael L. & Rosen, Harvey S. Microeconomics, 3rd ed.

Varian, Hal R. Intermediate Microeconomics - A Modern Approach, 7th, 6th or 5th ed.

We would suggest buying at least one of these, if at all possible. Have a look at the books first, to see which you prefer in terms of style. Try to look at both of these textbooks every week, as sometimes the coverage is more detailed in one or the other.

3. Mathematics for economics texts

Getting to grips with the mathematical aspects of economics is an important part of the course. There are three main texts which are used in the lectures and are pitched at roughly the correct level:

Anthony, Martin & Biggs, Norman Mathematics for Economics and Finance
Renshaw, Geoff Maths for Economics
Jacques, Ian Mathematics for Economics and Business, 5th ed.

They are listed above in order of decreasing difficulty (i.e. Jacques is the easiest to read, but also the least detailed).

4. Additional texts

There are many other texts available in College and other Oxford libraries, which can be used for additional reading and alternative examples, for instance:

Estrin, Saul & Laidler, David. Introduction to Microeconomics, 4th ed.
Hirshleifer, Jack & Hirshleifer, David. Price Theory and Applications, 6th ed.
Pindyck, Robert S. & Rubinfeld, Daniel L. Microeconomics, 6th ed (or any other recent ed).

Week 1 - Preferences and Individual Demand Curves

Introduction

If you have studied A-level economics you will be used to thinking about demand curves. If you haven't, the idea is very simple: a demand curve relates the price of a good to the quantity demanded. We represent demand curves graphically with quantity demanded X on the x-axis and price p_X on the y-axis. A demand curve is drawn with all other variables, such as consumer income and the prices of other goods, held constant (hence the common Latin phrase "ceteris paribus" - "other things equal"). When these fixed variables are changed, the demand curve *shifts*. On the other hand, changes in the price p_X are movements *along* a particular demand curve.

A demand curve can be represented mathematically by a **demand function**, expressed as quantity demanded as a function of price. When we reverse this and express price as a function of quantity demanded, we have the **inverse demand function**.

At degree-level, we are interested in the underlying causes of the demand curve. A demand curve is generated by the behaviour of many individuals. In economics, we work with simplified mathematical models of the world. Consumers are usually modelled as perfectly rational utility-maximizers. A demand curve can then be derived for certain simple models of preferences, which we can express in mathematical form as a **utility function** and in geometric form as **indifference curves**. The more specific features we want to ensure (for example, that the demand curve be downward sloping) the more specific assumptions we must make. In many cases, geometric reasoning is sufficient to bring across the key points in an analysis. However, it can often also be very helpful to have an algebraic model to underpin this.

We can use the theoretical framework of consumer choice to look at some interesting economic questions and to understand more about demand curves. Demand curves are usually downward sloping. This means that an increase in the price of a good leads to a decrease in the quantity demanded, and vice versa, ceteris paribus. This rule is known as the **Law of Demand**. However, it is theoretically possible for demand curves to be upwards sloping (i.e. for an increase in price to lead to an *increase* in the amount consumed). This possibility of a **Giffen good** can be explained using indifference curve analysis and the decomposition into **income** and **substitution** effects, which you are asked to apply in question 3 below.

Reading

Katz & Rosen: ch. 2-4
Varian: ch. 2-6, 8

Begg, Fischer & Dornbusch: 7th ed: ch.5
(ch.6 in earlier ed)
Lipsey & Chrystal: ch.6-7
Estrin & Laidler: ch.2-4
Hirshleifer & Hirshleifer: ch.3-4
Pindyck & Rubinfeld: ch.3-4

Questions

1) Explain what properties of consumer preference orderings imply that indifference curves never cross and are always downward sloping and convex. What is the significance of the curvature of the indifference curves and how does this relate to the marginal rate of substitution (MRS)? [*Hint: Think about what is going on as we move a consumer along an indifference curve.*]

2) Explain under what conditions a consumer will maximize utility by setting their marginal rate of substitution (MRS) equal to the ratio of the market prices of the two goods. Your answer should refer to: (A) Well-behaved preferences (i.e. the role of the assumptions of *consistency*, *monotonicity* and *convexity*) and (B) Corner solutions, particularly the cases of perfect substitutes and perfect complements. [*Hint: These two cases always involve corner solutions but corner solutions can also occur in other situations.*] You should illustrate all your arguments with indifference curve diagrams (using simple two-good models).

3) Derive the income offer curve and the Engel curve using indifference curve analysis for (1) a normal good and (2) an inferior good. [*Hint: Use two separate diagrams on top of each other for each case.*] What difference does it make if the consumer's preferences are homothetic?

4) Use indifference curve analysis to derive the Marshallian demand curve for (A) a normal good, (B) an inferior good which obeys the Law of Demand and (C) a Giffen good. [*Hint: Use two separate diagrams on top of each other to illustrate each case.*] Distinguish between income and substitution effects. [*Hint: Use the Hicksian decomposition, which holds utility constant, for greater clarity.*] Why must a normal good always obey the Law of Demand? Hence, why must a Giffen good always be inferior?

Week 1 - Additional Maths Class for Group A

Reading

Reading from week 1 class.

plus

Maths Workbook: Chapters 1 and 2

The maths workbook is very good as a summary of what you need to know, but moves very quickly through this material. Therefore concentrate on reading at least one of:

Renshaw: Chapters 1-4 and 11

Jacques: Chapters 1-2 and chapter 3 section 3.1

Renshaw is more difficult but also more detailed and goes at a slower pace.

Questions

Worksheets 1 and 2 from chapters 1 and 2 of the maths workbook. The work should be handed in to **Richard Povey** by **9am**, Wednesday of first week.

Week 2 – Preferences and Market Demand Curves

Introduction

Last week we looked at the way in which the preferences of an individual consumer can be used to derive a demand curve. This week we will look at how the demand from a number of individuals can be added together to give a market demand curve. In order to get a specific mathematical result for this, we must assume preferences of a particular form. One of the most commonly used forms in economics is known as the Cobb-Douglas utility function. This is of the form $U=X^{\alpha}Y^{1-\alpha}$, where α is a coefficient between 0 and 1 and X and Y are the amounts consumed of two consumption goods. A second is quasi-linear utility, one example of which is where $U=Y+X^{\alpha}$. If you have done A-Level maths, you will already be able to understand how we can work with these formulas mathematically. If you have not, you will not be able to understand some of the manipulations used this week, but should be able to do so by the end of term. Questions marked with a (*) require calculus and will be very challenging for those in group A. Try to get a basic understanding of what calculus is about in the reading, and take a quick look at the rules for differentiation. This will enable the class to be more productive.

Question (2) is on the two-good Cobb-Douglas model, where $U=X^{0.5}Y^{0.5}$. This model has the neat property that the amount spent on good X depends only on the price of X, and the amount spent on good Y depends only on the price of Y. (Question (1) asks you to derive these results mathematically.) This means that there are no cross-price effects between the two goods. The question looks at the implications of this property for the substitution and income effects.

Reading

Reading list from Week 1 class

plus

Maths Workbook: Chapters 1, 2, 4-5 **(look at the workbook after the textbooks listed below)**

plus

At least one of (with decreasing levels of difficulty):

Anthony and Biggs: Chapters 1-6, 8

Renshaw: Chapters 1-6 and chapter 7 sections 7.1-7.5

Jacques: Chapters 1,2 and chapter 4 sections 4.1-4.4

Questions

1) Suppose that a consumer has the utility function: $U=X^{\alpha}Y^{1-\alpha}$.

(*)(a) Show that the marginal utility of good X, $MU_X=\alpha\left(\frac{Y}{X}\right)^{1-\alpha}$ and the marginal utility of good Y $MU_Y=(1-\alpha)\left(\frac{X}{Y}\right)^{\alpha}$. Hence show that $MRS_{X,Y}=-\frac{\alpha}{1-\alpha}\left(\frac{Y}{X}\right)$.

[*Note: here we are using Varian's definition of the MRS, which is always negative whereas Katz and Rosen's is always positive.]*

(b) What happens to the marginal utilities of goods X and Y as X and Y increase? What is the economic interpretation of this in terms of consumer preferences over the two goods?

(c) Using the budget constraint $M=Xp_X+Yp_Y$, and the condition for (interior) utility maximization $MRS_{X,Y}=-\frac{p_X}{p_Y}$, show that the Marshallian demand function is:

$$X_D=\alpha\frac{M}{p_X}$$

(*)(d) Show that the inverse Marshallian demand curve is given by $p_X=\alpha\frac{M}{X_D}$.

(*)(e) Show that the MRS along an indifference curve where utility is fixed at $\bar{U}$ is given by:

$$MRS_{X,Y}\,\big|_{U=\bar{U}} = -\frac{\alpha}{1-\alpha}\left(\frac{\bar{U}}{X}\right)^{\frac{1}{1-\alpha}}$$

[Hint: You need to use the utility function to substitute in an expression for Y in terms of X so that the expression for the MRS in part (a) becomes solely a function of X , α *and* $\bar{U}$.]

(*)(f) Find the derivative of the formula for the MRS (from part (e)) with respect to X. What is the significance of its being positive? [*Hint: This means that the MRS is getting less negative, i.e. smaller in absolute value, as X increases.]*

(*)(g) Show that this consumer's preferences are (A) Consistent and (B) Well-behaved.
[*Hint: This can all be seen from formulas we have already derived.*]

(h) Suppose there are N consumers, each with the same preferences, the same income M, and faced by the same prices for the two goods. What will the aggregated Marshallian demand curve be? What about if consumers have different income levels and values for α (use M_i for the income of person i and α_i for person i's value of α)?

(i) What is the total amount by spent on each good by all of the consumers (i.e. the price of the good multiplied by the total number bought)? How does this relate to the price of each good? Interpret and explain this result.

(j) Suppose that the aggregated Marshallian demand curve is $\frac{B}{p_X}$. How would the coefficient B relate to the previous analysis *[Hint:* $B=NM\alpha$ *if all agents are identical - what about the other cases when* α *and* M *vary across individuals?]*

(k) Sketch the market demand curve. You do not need to plot individual points on a graph. Instead, think about what happens as p_X gets very large and as p_X gets close to 0.

(*)(l) Find the first and second derivatives of the demand curve to show whether it is upward or downward sloping, and concave or convex.

2) Assume that a consumer's preferences can be represented by utility function $U=X^{0.5}Y^{0.5}$. This is an example of a Cobb-Douglas utility function, which has the property that there are no cross-price effects (i.e. the cross-price elasticity of demand is zero with respect to both goods: if the price of one good changes this will not have any effect on demand for the other good, as proven in question 1). Given this, draw an accurate indifference curve diagram that illustrates what happens if the price of good *x* falls. [*Hint: You do not need to plot the indifference curves mathematically, simply ensure that your diagram fits the above description.*] Carefully distinguish between substitution and income effects *for changes in demand for both goods caused by the change in price of good x*, and explain these. How do we know that both goods must be normal?

3) Suppose we have N individuals each with the following quasi-linear utility function: $U=X^{\alpha}+Y$ (where $0<\alpha<1$).

(*)(a) Using the budget constraint and MRS condition as in question 1, and setting Y as the numeraire good so that $p_Y=1$, show that the inverse Marshallian demand curve is

$p_X=\alpha\left(X_D\right)^{-(1-\alpha)}=MU_x$ and that the Marshallian demand curve is $X_D=\left(\frac{\alpha}{p_X}\right)^{\frac{1}{1-\alpha}}$.

(b) Why does demand for good X not depend upon income M? Illustrate using an indifference curve diagram.

(c) What will the aggregate Marshallian demand curve for N identical consumers be?

4) Consider four consumers A, B, C and D with the following utility functions (where α and β are both positive coefficients in all four cases):

$$U_A=\alpha X+\beta Y$$

$$U_B=(\alpha X)(\beta Y)$$

$$U_C=\alpha X-\beta Y$$

$$U_D=min\{\alpha X,\beta Y\}$$

(so, the utility of person D is the minimum, i.e. the smallest value, out of αX and βY).

(a) Do the consumers described above have *consistent* preferences (i.e. do their preferences satisfy the basic assumptions of completeness, reflexivity and transitivity)?

(b) Do they have *well-behaved* preferences?

(c) For each consumer in turn draw two indifference curves.

(d) Comment on the MRS for each consumer.

Week 3 – Demand Theory and Welfare Analysis

Introduction

This week we will look at two classic economic models which utilize the two-good consumer choice framework we introduced in weeks 1 and 2. The apparatus of decomposing changes in demand into income and substitution effects is a very useful device. This week we will see how to use it to make both positive and normative analyses of changes in government policy and other economic variables.

The first model we will look at is a model of labour supply. This model is central to the economic analysis of of income taxation, since we need a model of labour supply in order to predict and evaluate the effects of different kinds of taxes and benefits.

The second is a model of inter-temporal choice which can be used to model changes in savings and investment behaviour. This is also very important for understanding consumption in macroeconomics (it will crop up again when you do Introductory Macroeconomics in Trinity Term).

Reading

Katz & Rosen: ch.3-5,11
Varian: ch.6-10, 14-16

Estrin & Laidler: ch.3-6
Hirshleifer & Hirshleifer: ch.2,5,7,12, 14
Pindyck & Rubinfeld: ch.2,4,9,14-15
Begg, Fischer & Dornbusch: 7th ed: ch.3-5 (ch.3-6 in earlier ed)
Lipsey & Chrystal: ch.3-7

Questions

1) Explain the relationship between compensating variation (CV), equivalent variation (EV) and consumers' surplus (CS). Under what circumstances will they be identical? Is consumers' surplus an acceptably accurate measure of consumer welfare changes? Why is it more commonly used than the other two measures?

2) A worker's decision of daily labour supply (measured in hours of work per day) can be analysed using indifference curves between leisure hours and consumption goods.

(a) Why must we have leisure on the x-axis rather than labour supplied?

(b) Consider the budget constraint that the worker faces: (i) What determines its slope? (ii) Why may it be kinked, possibly having many kinks? (iii) Why may it be discontinuous?

(c) What difference does it make to the analysis if we assume that both leisure and consumption are normal goods? Do you think such an assumption is justified?

To simplify, we can imagine a budget set where the worker receives 24 hours of leisure per day and a certain non-earned income M. Leisure can be traded in for additional consumption at a rate w, the real wage. In this simple model, the worker's budget constraint is therefore $C=(24-L)w+M$ where C is consumption and L is leisure.

(d) How must the model be altered if we wish to introduce a value added tax at rate v and a proportional income tax at rate t.

[*Hint: The value-added tax affects unearned income as well as earned income (thus altering the intercept and the slope of the budget constraint), whereas the income tax rate only alters the post-tax wage (which is the slope of the budget constraint).]*

(e) Assuming that leisure and consumption are normal, show the effect on the worker's labour supply decision if:

(i) the proportional income tax, *t*, is raised

(ii) value added tax on consumption goods, *v*, is raised, which is passed on to higher prices

(iii) the worker commutes to work by train each day, and the price of train tickets rises;
In each case, demonstrate carefully the substitution and income effects when relevant.

[*Hint: Use the Hicksian decomposition for each of the above 3 parts, for greater clarity.]*

(iv) overtime premium for hours worked in excess of standard working hours (say, in excess of eight hours per day) is offered? Compare the analysis which results from using both the *Hicksian* and the *Slutsky* decomposition into substitution and income effects.

(f) Show using indifference curve analysis that the compensating variation for the reduction in utility of the worker caused by a rise in the income tax rate is always greater than the revenue raised by the tax. What are the implications for efficient taxation? [*Hint: Suggest a taxation method that would be Pareto-superior to this income tax, and that raises the same amount of revenue*.]

3) Analyse a consumer's choice between consumption in period 1 and in a later period 2 allowing for possibility of saving and borrowing at a given interest rate in period 1.

(a) Why may we expect that consumers want to smooth out consumption over the two periods? Can you think of any practical examples of such behaviour? How does this relate to the convexity of the consumer's inter-temporal preferences.

(b) What shape of indifference curves would be required to result in complete consumption smoothing so that the same amount is consumed in both periods?

(c) What is meant by the present value of an endowment? How does this relate to the horizontal and vertical intercept of the budget constraint?

(d) How would (i) an increase in the interest rate and (ii) an increase in period 2 income affect the optimal choice of the consumer? Distinguish between lenders' and borrowers' responses and clearly show the effect on the amount borrowed/saved as well as the total amount consumed in each period.

(e) Why may consumers face different interest rates for lending and borrowing? [*Hint: how do banks make profits and guard against the risk of default by borrowers?*]. How does this affect the inter-temporal budget constraint?

4) Explain how the Laspyres and Paasche price indices can be used to determine whether a consumer is better or worse off after a simultaneous change in prices or income. When is the overall effect indeterminate?

Week 4 – Linear Demand and Supply Curves

Introduction

Linear demand and supply curves are the easiest types to deal with mathematically. This is because the equation systems are simple to solve and the consumers' and producers' surplus, and deadweight loss, are always triangles, whose areas are straightforward to calculate. Looking in detail at the linear demand and supply model therefore provides the best way to understand the welfare effects of commodity taxation.

Reading

Reading from week 2 class.

plus

Katz & Rosen: Chapters 1, 3-5,11
Varian: Chapters 6,8,14-16

Begg, Fischer & Dornbusch: 7th ed: ch.3-5 (ch.3-6 in earlier ed)
Lipsey & Chrystal: ch.3-7
Estrin & Laidler: ch.3-4
Hirshleifer & Hirshleifer: ch.2, 5, 7
Pindyck & Rubinfeld: ch.2, 4, 9

Questions

1) Suppose that the market for pork meat (where X_S is the quantity of pork meat supplied and X_D the amount consumed) can be described by the linear demand curve $X_D = A - bP_X$ and the linear supply curve $X_S = C + d\,P_X$ where *b* and *d* are coefficients greater than or equal to 0 and *A* and *C* are constants.

(a) What do the coefficients and constants mean in economic terms?

Assume that *b* and *d* are both greater than 0.

(b) Would you expect *A* to be positive or negative? Why?

(c) Would you expect *C* to be positive or negative? Why?

(d) Sketch the demand and supply curves. Show how the coefficients relate to features on the graph such as the intercepts and slopes of the curves. Show the market equilibrium and the consumers' and producers' surplus on your diagram.

(e) Find an expression for the price elasticity of supply and demand. [*Hint: Price elasticity is equal to percentage change in quantity divided by percentage change in price.*] What economic factors are likely to determine the price elasticities of demand and supply for pork meat products?

(f) Show that the equilibrium market price P is equal to $\frac{A-C}{b+d}$ and the equilibrium market output is equal to $\frac{dA+bC}{b+d}$.

(g) Assume that in the short run market supply of pork meat is perfectly inelastic, and represented by the equation $X_S = C_{SR} + d_{SR} P_X$. What does this imply about the value of C_{SR} and d_{SR} ? What is the economic intuition for this? Why is this not likely to be the

case in the long run? Show that in this short-run case the equilibrium market price P is equal to $\frac{A-C_{SR}}{b}$ and equilibrium market output is C_{SR} .

(h) Assume that initially $P_S=\frac{A-C-bT}{b+d}$. How much does the equilibrium market price change when A increases by 1 unit in the short run and the long run? How much does the equilibrium market output change in the two cases? Explain the economic intuition behind these results.

(i) Suppose that scientists publicize research which shows that "mad cow" disease may be transmitted to pigs. [*Hint: This can be modelled as a change in A.]* Analyse algebraically (using your answer to part (h)) and illustrate graphically the short run and long run effects.

Suppose the government introduces a unit tax on pork meat. This means that the government levies a tax of *T* for every unit of pork meat sold.

(j) Why does it make no difference to the economic incidence of the tax whether pork suppliers or pork consumers are forced to pay?

(k) Show that with the introduction of the unit tax, the equilibrium price received by suppliers will be $P_S=\frac{A-C-bT}{b+d}$ and the equilibrium price paid by pork meat consumers will be $P_D=\frac{A-C+dT}{b+d}$. How is the economic incidence of the tax related to the elasticities of demand and supply? What is the economic intuition behind this result?

(l) Show that the introduction of the unit tax reduces long run market output to: $X=\frac{dA+bC-bdT}{b+d}$

Thus the reduction in output caused by the tax is: $\frac{bdT}{b+d}$.

How is the size of the output distortion affected by the tax rate and the elasticities of demand and supply? What is the economic intuition here?

(m) Show that the revenue raised by the government is equal to $\frac{T(dA+bC-bdT)}{b+d}$.

(*)(n) Show that the marginal revenue gained by the government by marginally increasing the tax at rate T is: $\frac{dA+bC-2\mathrm{bdT}}{b+d}$.

(*)(o) Hence show that the government's revenue is maximized when $\frac{dA+bC}{2\mathrm{bd}}$.
How does an increase in the elasticity of demand or supply affect the government's revenue-maximizing tax rate? Explain the economic intuition behind this result.

(p) Illustrate the government's tax revenue, the output distortion and the resulting deadweight loss on an accurate diagram, as in part (d). [*Hint: Use colour to shade areas for clarity*.]

(q) Show that the deadweight loss from the imposition of the tax is equal to: $\frac{1}{2}\frac{bdT^2}{b+d}$

[*Hint: The deadweight loss is a triangle whose "base" is the size of the deadweight loss and whose "height" is equal to the size of the output distortion*.]

How do the size of the unit tax, and the elasticities of demand and supply, affect the size of the deadweight loss.

(*)(r) Show that the marginal increase in the deadweight loss from increasing T is:
$\frac{bdT}{b+d}$

This can be thought of as the marginal social cost of increasing the tax rate on this commodity.

Comment on the fact that an increase in *T* increases the marginal social cost of taxation but reduces the government's marginal revenue. How does this relate to the idea that revenue is best raised by taxes spread over a variety of goods rather than concentrated on a single good?

(s) How would the analysis differ if the demand and supply curves were not straight lines (assume they are still downward sloping).

2) (a) Discuss what factors determine the price and income elasticities of demand for pork meat products. Make reference to income and substitution effects.

(b) Assume that the domestic supply curve for pork meat is upward sloping and that the domestic demand curve is downward sloping. Illustrate the market equilibrium on a diagram. Suppose now that the government decides to allow imports of foreign pork. Assume that the country faces perfectly elastic foreign supply at a lower than current domestic price, and that consumers do not care whether they eat domestic or foreign pork meat (i.e. domestic and foreign supplies are perfect substitutes). Use measures of consumers' and producers' surpluses to evaluate who gains and who loses from this policy. How would you use this framework to make the argument that free trade will be beneficial for society?

plus

Longer Questions from Maths Workbook Chapter 4

Week 5 – Production Theory

Introduction

We have so far looked in detail at the theory of consumer choice behind the demand curve. We have also looked at a simple linear demand and supply model. We now need to look in detail at the theory behind market supply. This week we look at how isoquants and isocost lines can be used to derive cost curves. There are many parallels with the theory of consumer choice, but be clear about the differences, one of the most important being that whereas the utility at a particular indifference curve is only a useful label for ordinal ranking, the quantity at a particular isoquant is vital to being able to derive a cost curve.

Reading:

Katz & Rosen: ch.7-10
Varian: ch.18-22

Begg, Fischer & Dornbusch (7th ed): ch.6-7 (ch.7-8 in earlier ed)
Lipsey & Chrystal (10th ed): ch.8-9 (9th ed: ch.8)
Estrin & Laidler: ch.10-12, 21, 24
Hirshleifer & Hirshleifer: ch.6, 11
Pindyck & Rubinfeld: ch.6-8

Questions:

1. (a) What is the production function of the firm? What are isoquants, and what determines their spacing?
(b) Explain how diminishing returns to a factor can apply to a firm that experiences constant returns to scale.
(c) Why might it be possible to argue that decreasing returns to scale cannot occur in practice? Why do they, however?
(d) Is the concept of increasing returns to scale the same thing as economies of scale?

2. Assume that a firm's production technology exhibits constant returns to scale at all levels of output, and that labour and capital inputs are imperfect substitutes.
Using isoquants and isocost lines for all three parts:
(a) Derive the firm's long run total cost curve, assuming factor prices are held constant. Draw this, as well as long run average and marginal cost curves.
(b) Suppose that in the short run capital stock is fixed, and the firm is committed to producing a certain level of output. What happens to labour demand, and total cost of production if wages rise?
(c) Suppose the firm's profit maximising output level falls as a result of wage rise. What happens in the long run to the demand of labour and other inputs?

3. Consider a firm producing a good with a technology which exhibits increasing returns to scale at low levels of output and decreasing returns to scale at high levels of output.
(a) Draw long-run total, average and marginal cost curves for the firm. Explain the relationship between the three curves, in particular why does the marginal cost curve cut the average cost at its lowest point? Are there any other levels of output, which are particularly significant?
(b) Imagine that the firm's existing capital stock is consistent with achieving the minimum point of the long-run average cost curve, but that it is unable to alter its capital stock in the short run. Draw two diagrams, one with the short-run and long-run total cost curves, and another with the short-run and long-run average and marginal cost curves making sure that these two diagrams correspond to each other, and explain these with care.

Week 6 – Monopoly

Introduction

The model of monopoly is a classic one in economics, and is the essence of the normative argument for competition via free trade. However, although competition is usually the best way to alleviate the problem of market power, it is sometimes not feasible. There is a legitimate debate among economists over where and when monopoly may be socially beneficial, or at least necessary. Mathematics is particularly helpful in understanding this model, but must be combined with diagrams and economic intuition.

Reading:

Katz & Rosen: ch.10-11, 13
Varian: ch.22-26

Begg, Fischer & Dornbusch (7th ed): ch.8-9, 17-18 (ch.7-8, 18-19 in earlier ed)
Lipsey & Chrystal (10th ed): ch.10-11 (9th ed: ch.9-10)
Estrin & Laidler: ch.13-16
Hirshleifer & Hirshleifer: ch.6-8
Pindyck & Rubinfeld: ch.8-11,14

Maths Workbook Chapters 5 and 6

Anthony and Biggs: Chapters 6, 8-10

Renshaw: Chapters 6-9

Jacques: Chapter 4

Questions:

1) Suppose that a monopolist is faced by a linear demand curve $X_D = A - bP_X$ and has constant marginal cost C .

(a) Differentiate the monopolist's profit function with respect to price to show that its profit-maximizing price will be $P_X^* = \frac{A}{2b} + \frac{C}{2}$ and profit-maximizing quantity will be $X_D^* = \frac{A}{2} - \frac{bC}{2}$.

(b) Differentiate the monopolist's revenue function with respect to quantity to show that its marginal revenue curve is given by $MR = \frac{A}{b} - 2\frac{X_D}{b}$. How does this relate geometrically to the inverse demand curve?

(c) Find an expression for the price elasticity of demand ε_D in terms of output X_D . Hence show that when $MR = \frac{A}{b} - 2\frac{X_D}{b} = 0$, $\varepsilon_D = -1$. Explain the economic intuition behind this result.

(d) Why will the monopolist always produce an output lower than $\frac{A}{2}$?

(e) What price would a competitive firm charge (a competitive firm cannot make any super-normal profits, or new firms will enter and undercut it)?

(f) What is the socially optimal price (the one which will ensure a Pareto-efficient allocation of resources)?

(g) Show on a diagram the deadweight loss caused by the monopolist's profit-maximizing behaviour. Find a mathematical expression for the size of the deadweight loss.

2) a) What factors give a firm monopoly power, and what are its welfare consequences?
ii) How would your answer change if a monopolist were able to discriminate perfectly between all the consumers? Is this possible in real world markets? Why / why not?
iii) What other possible sources of welfare losses are there associated with monopolies?
iv) Does all this imply that government policy should always ensure that there is large number of competitors in every industry?

3) Suppose that a monopolist is faced by a constant elasticity demand curve $X_D = AP^{-\gamma}$ where $\gamma > 1$, and has a constant marginal cost of production C .

(a) Show that the elasticity of demand ε_D is equal to $-\gamma$ (using Varian's definition of elasticity, which is always negative) everywhere along the curve. Why must $-\gamma$ be greater than 1 for this model to make economic sense? [*Hint: Would a monopolist ever choose to produce on the inelastic part of a demand curve?*]

(b) By differentiating the monopolist's profit function, show that the ratio of the monopolist's profit-maximizing price to its marginal cost is $\frac{P^*}{C} = 1 - \frac{1}{1+\varepsilon_D}$. This is called the mark-up, and shows that a monopolist always prices above marginal cost, and that the mark-up is smaller the larger in absolute terms is the price elasticity of demand. Explain what happens as ε_D goes to minus infinity and as ε goes to -1 (remembering that it must always be less than -1 because $\gamma > 1$). Explain the economic intuition behind these results.

Longer Questions in Maths Workbook Chapters 5 and 6

Week 7 – Industrial Organisation and Oligopoly

Introduction

Perfect competition and monopoly represent the two extreme possible forms of organisation in a particular industry. Most industries will exhibit a structure and outcome somewhere between them. Game theory provides the mathematical and theoretical tools to analyse the outcome in oligopolistic industries, where there is more than one firm but still a sufficiently small number that the firms interact strategically, meaning that they are not price-takers as in the perfectly competitive model.

Reading:

Katz & Rosen: ch.10-11,13,15
Varian: ch.22-27

Begg, Fischer & Dornbusch (7th ed): ch.8-9,17-18
(ch.7-8,10,18-19 in earlier ed)
Lipsey & Chrystal (10th ed): ch.10-12
(9th ed: ch.9-11)
Estrin & Laidler: ch.13-19
Hirshleifer & Hirshleifer: ch.6-8,10
Pindyck & Rubinfeld: ch.8-14

plus

Maths Workbook Chapters 5-6, Chapter 7 sections 1 and 2, Chapter 8 sections 1, 2 and 3.

plus

At least one of (in descending order of difficulty):

Anthony and Biggs: Chapters 8-13

Renshaw: Chapters 6-9, 14

Jacques: Chapter 4 and chapter 5 sections 5.1-5.2

Questions:

1) Contrast the reactions of a perfectly competitive firm *and* the industry as a whole, to those of a monopoly firm when the following changes occur:
(a) The market demand curve shifts outwards;
(b) The market wage for workers increases (assume that the firm must take this price as fixed);
(c) A proportional tax on profits is introduced.
Consider both short and long run responses in each case, and consequences for consumer welfare, and firms' profits.

2) Compare and contrast Cournot and Bertrand models of oligopoly assuming that the firms have identical costs. Use a simple mathematical model with constant marginal cost C and a linear industry demand curve $P_X = A - bX$. What happens in the duopoly case if one of the two firms moves first, i.e. acts as a leader? [*Hint: In the quantity setting case, this yields the Stackelberg model.*] How could one decide which model (price setting or quantity setting) is most appropriate? What happens if the firms move simultaneously but have different (but still constant) marginal costs.

Week 8 – General Equilibrium and Welfare Economics

Introduction

Welfare economics uses all of the theory we have examined over the term. It allows us to go further beyond our positive models to answering the big normative questions concerning the strengths and weaknesses of the market economy, and the role that the state can play in improving the outcome of the market as a mechanism for resource allocation. Most of the things the state does can be interpreted either as improving the efficiency of the market - such as competition policy to make firms more competitive or taxation of pollutive industries to bring the private costs to economic activity in line with the social costs – or to improve the equity of its outcomes, via wealth redistribution. Sometimes these two functions can work in tandem, but sometimes they conflict. We need welfare economics to understand the relationship between these two aims in more detail.

Reading:

Katz & Rosen: ch.12, 18
Varian (7th ed): ch.31-34; (6th ed): ch.30-33, 35; 5th ed: ch.29-32

Begg, Fischer & Dornbusch (7th ed): ch.15-16 (ch.16-17 in earlier ed)
Lipsey & Chrystal (10th ed): ch.19-20 (9th ed: ch18-19)
Estrin & Laidler: ch.27-32
Hirshleifer & Hirshleifer: ch.13, 15
Pindyck & Rubinfeld: ch.16, 18

Questions:

1. Using an Edgeworth box and production possibilities diagrams, demonstrate and explain how overall Pareto efficiency is achieved in a production economy where all markets are perfectly competitive. What assumptions are you making in order to obtain this result?

2. Critically assess the following opinion: "Market economies are inherently inequitable, and there is little a government can do to change this."
[*Hint: try and explain what role the fundamental theorems of welfare economics play when we shape our views on the merits of a market economy; no need to discuss details of market failure in this question – save this for question 3.*]

3. Why are pollution problems often best understood as externalities? Can we rely on private agents to negotiate these away?

Vacation Work

1. Preparing for the collection

You must return to College in time in Hilary to take a microeconomics collection on *Fri 0th week*, and part of your vacation needs to be devoted to revision for this. This is a mock exam and should be *taken seriously*: there is no other way you can test your knowledge, and find out about your progress as revealed in exam conditions. Questions are set based on microeconomics syllabus as defined by University reading list and lectures given this term. You will need to revise all the material covered during the tutorials and classes this term. Some example questions are attached at the end of this work pack.

2. Additional problems and essays

We have not been able to cover all the topics which have been lectured on during the term. You will therefore also have some vacation work. You should spend about the same amount of time on this as you would spend on a weekly tutorial during term time. You will also need to continue working through the Maths Workbook chapters you were lectured on in eighth week, in preparation for a class at the beginning of Hilary Term. There will also be a test on the mathematical material towards the end of Hilary Term.

Vacation work must be ***handed in to Richard Povey by 6pm Fri 0th week*** in Hilary (i.e. you must write your essays, answer problem sets and do the maths questions over the vacation, *not* during next term when you move on to new work in other subjects).

Reading:

Reading list from week 7 class

plus

Varian: ch.25
Katz & Rosen: ch.14

Begg, Fischer & Dornbusch (7th ed): ch.9
Lipsey & Chrystal (10th ed): ch.12; (9th ed): ch.11
Pindyck & Rubinfeld: ch.12

plus

Maths Workbook - Chapters 3, 7, 8 and 9.

Anthony and Biggs: Chapters 21-22

Renshaw: Chapters 10-17

Jacques: Chapters 3-5

Questions:

1) Why might firms wish to differentiate their products? What difference does it make for market outcomes and efficiency if firms produce differentiated rather than homogenous goods?

2) How does a monopolist selling its product in two different markets maximise their profit? Compare the welfare consequences of this with the case when customers in the two markets can engage in arbitrage. [*Hint – Set up a mathematical model with linear demand curves*.]

3) Suppose that a bank account pays 0.5% interest per *month*.

(a) If £100 is deposited at the beginning of the year, then how much will be in the account at the end of they year (i.e. after 12 monthly interest payments) if there are no further deposits or withdrawals.

(b) What rate of interest paid once at the end of the year would be equivalent to the 0.5% interest every month for 12 months.

(c) What constant rate of interest over the year with continuous compounding would be equivalent to the 0.5% interest per month?

(d) Explain why your answers to (b) and (c) are different and why neither of them is equal to 0.5*12=6%

4) Suppose that a government bond pays a return of £X per year for the next 30 years.

(a) Suppose that the current interest rate is r% per year. What is the present discounted value of the government bond? Justify why this will be the equilibrium market price of the bond.

(b) Suppose now that $r=5$ and $X=100$. Calculate the present discounted value of the bond.

(c) What will be present discounted value of the bond be if the interest rate r increases to 7 with X remaining at 100. Explain the economic intuition behind this.

(d) Answer part (a) again but this time assume instead that the bond is a consol so that it pays £X per year forever. Why isn't the present discounted value infinite?

Maths Workbook – Longer questions from chapters 7 and 8.

SAMPLE PRELIMS PAPERS

FIRST PUBLIC EXAMINATION

Preliminary Examination for

Philosophy, Politics and Economics,
Modern History and Economics,
Economics and Management,
Engineering, Economics and Management,
Materials, Economics and Management.

Time allowed: three hours.

Answer four questions: three from part A and one from part B. All questions attract the same number of marks.

Candidates should show knowledge of both microeconomics and macroeconomics.

PART A

*Answer **THREE** questions from the five in this section*

1. (i) Explain what is meant in consumer theory by goods which are (a) perfect substitutes, (b) perfect complements and (c) independent in demand.

(ii) Suppose that the price of a good increases and the government decides to compensate each consumer for the price increase by giving each individual a lump-sum transfer equal to the increase in price multiplied by the original quantity purchased by that individual. When will this compensation strictly increase the welfare of consumers? When will the compensation keep the consumer's welfare at the original level?

2. (i) How are the price, marginal revenue and the price elasticity of demand of a monopolist related to each other?

(ii) Suppose that a monopolist initially serves only market 1, which has the demand function $Q_1 = 2 - p$ for $0 \leq p \leq 2$ and $Q_1 = 0$ for $p > 2$ where Q_1 is the quantity demanded and p is the price. The monopolist's marginal cost is zero and its fixed cost is 0.5. What is the profit-maximizing price?

(iii) The government imposes a lump-sum tax of 0.25 on the firm. What effect does this have on the monopolist's price and output?

(iv) Suppose now that an additional market becomes available, and in this new market demand is $Q_2 = 1 - p$ when $0 \leq p \leq 1$ and $Q_2 = 0$ for $p > 1$. The monopolist must serve demand in markets 1 and 2 at the same price. There are no additional costs of serving market 2.

(a) Write down the expression for the aggregate demand function.
(b) Draw the inverse demand curve (i.e. price as a function of quantity) for the aggregate demand function, and the marginal revenue function.

(v) What is the profit-maximizing price for the combined market? Are consumers in market 1 better off or worse off than when the firm only served market 1?

3.
(i) Compare the equilibria in the Cournot and Bertrand models of duopoly.
(ii) Suppose that one firm in a duopoly achieves a technological improvement and cuts its marginal cost, while the other retains the higher marginal cost. Compare the effects on the duopolistic equilibria under Cournot and Bertrand assumptions.

4. Using the long-run aggregate demand-aggregate supply model show the effect on output and the price level of:
(i) an improvement in technology;
(ii) an increase in the money supply; and
(iii) the imposition of a minimum wage.

5. In the IS-LM model what is the effect on the equilibrium rate of interest and level of income of:

4) the introduction of Internet stock-broking services that reduce the cost of converting stocks and bonds into money and *vice versa*;

5) a previously-unexpected announcement that the age at which the state pension can be drawn will be higher in the future; and

6) an increase in government spending financed by an equal increase in lump-sum taxation?

PART B

*Answer **ONE** question from the four in this section*

1. What effect would (a) a lump-sum tax per firm and (b) a per-unit output tax have on perfectly competitive firms and on the industry?

2. When is government intervention in the economy to alter the allocation of resources justified?

3. What determines the demand for money? Should central banks control the supply of money?

4. What trade-offs, if any, must the government take into account if it wants to reduce the rate of inflation?

Introductory Microeconomics Collection Paper for

Philosophy, Politics and Economics,
Modern History and Economics,
Economics and Management,
Engineering, Economics and Management,
Materials, Economics and Management.

12th January 2007 9:15 am

Time allowed: three hours.

*Answer four questions: **three from part A** and **one from part B**. All questions attract the same number of marks, so your time should be apportioned equally between them. Economics and Management Candidates should not attempt the questions marked with a (*) as these are on material not yet covered*

PART A

*Answer **THREE** questions from the six in this section*

1. Suppose there are only two goods and one consumer in the economy (whose preferences are well-behaved). For each of the following cases, either derive the income offer curve using an accurate diagram, or explain briefly why they are impossible:

(i) Both goods are normal goods.
(ii) Both goods are luxury goods.
(iii) One good is a necessity (i.e. a normal good but not a luxury good) and one is inferior.
(iv) One good is a luxury good and the other is inferior.
(v) Both goods are inferior.

2. (i) Explain how a U-shaped average cost curve is derived from a production function which exhibits at first increasing but then decreasing returns to scale.
(ii) Derive the short run average, marginal and total cost curves at the point where decreasing returns to scale set in. (Assume that the capital stock is fixed in the short run but that labour input can be freely varied.)

3. Suppose that a monopolist faces a linear market demand curve $X_D=A-bP_X$, where X_D is the amount demanded of good X and P_X is the price of good X, and has zero production costs. (Also assume that the monopolist cannot price discriminate and thus must charge the same price for all units.)

(i) Show that the monopolist will maximize its profit by setting $P_X=\frac{A}{2b}$.
(ii) What will the monopolist's maximized supernormal profit be?
(iii) Suppose that a unit tax of T is imposed by the government, so that the price received by the monopolist per unit sold, P_S, satisfies the following: $P_S=P_X-T$, (where P_X remains the price paid by the consumers). Show that the profit-maximizing consumer price set by the monopolist will be $P_X=\frac{A}{2b}+\frac{T}{2}$.

(iv) Comment on this result for the incidence of the unit tax. Explain briefly how the analysis in parts (i), (ii) and (iii) would differ if this market was supplied by perfectly competitive firm(s)?

4. (i) Explain how the Cournot-Nash equilibrium is derived for a duopoly where both firms have identical and constant marginal costs, C, and compete by simultaneously setting their output quantities.
(ii) What happens when the marginal cost of one of the firms decreases, with that of the other remaining unchanged?

5. Suppose that an individual has utility function $U=\frac{1}{\varepsilon}X^{\varepsilon}+Y$, where $0<\varepsilon<1$. The individual has fixed income M which they can spend on goods X and Y. Assume that the price of good X is P_X and that the price of good Y is 1 (so, good Y is the numeraire good).
(i) Show that (provided we are not at a corner solution) the individual maximizes their utility by buying $\left(\frac{1}{P_X}\right)^{1-\varepsilon}$ units of good X (and spending the rest of their income on good Y).
(ii) Comment on the fact that the amount of good X chosen in the consumer's optimal bundle does not depend upon income M, and illustrate this using income and substitution effects on an indifference curve diagram.

6. (i) Explain, using indifference curve analysis (including substitution and income effects) in a two-good consumption-leisure model, how the labour supply curve could be backwards-bending.

(ii) Could labour supply be backwards-bending if leisure were an inferior good in this model? If not, why not?

PART B

*Answer **ONE** question from the five in this section*

7. (*) "Taxation of any kind wastes resources by distorting the economy and creating a deadweight loss. Therefore, to maximize social welfare, all taxes should be kept as low as possible." Discuss.

8.(i) Explain how a Pareto-efficient outcome is reached in the long run equilibrium of a perfectly competitive market. What assumptions underpin this result?
(ii) Should we conclude from this model that monopoly power is always a bad thing?

10. (*) How should public policy go about correcting for pollution externalities?

11. (i) Under what conditions are demand curves downwards-sloping?
(ii) Under what conditions are supply curves upwards-sloping?

12. When, if ever, should firms be prevented from engaging in price discrimination?