

**EC111 Introduction to Economics**  
**Answers to Class Exercises 10 (week 16)**

1)

a)

Pareto Efficiency is defined as a situation where no-one can be made better off without making someone else worse off. Think in terms of the utility possibility frontier in the lecture notes. A Pareto improvement is a change where at least one person is better off and no-one is made worse off.

b)

1. Exchange or consumption efficiency. There are no further mutually beneficial trades or exchanges that can be made between consumers. The result is that each consumer has the same marginal valuation of one good relative to another so all consumers have the same MRS.
2. Production efficiency. Factors of production are optimally allocated such that no additional output could be gained by one industry without reducing the output of another industry. This requires that the marginal product of any factor is the same across all industries and therefore that the MRTS is the same in each industry. Note that this ensures that the economy is on the PPF.
3. Output choice or allocation efficiency. The marginal valuation that consumers place on goods is equal to the marginal resource costs of the goods. This requires that the MRS of consumers (the slope of consumers' indifference curves) is equal to the marginal rate of transformation, MRT, in the economy (which is slope of the PPF and is the ratio of marginal costs).

c)

1. For exchange efficiency, if consumers all face the same prices and maximise their utility, each consumer's MRS will be equal to the price ratio. If consumers are price takers, then each consumer will have the same MRS.
2. Production efficiency. If factor markets are competitive and each firm minimises the cost of producing its output then it will set the Marginal Rate of Technical Substitution equal to the factor price ratio. If all firms face the same factor price ratio then they will all have the same MRTS.
3. If there is perfect competition in goods markets then for all industries price equals marginal cost. Thus the ratio of the prices of two goods equals the ratio of the marginal costs of the two goods. That means that  $MRS = MRT$ .

2.

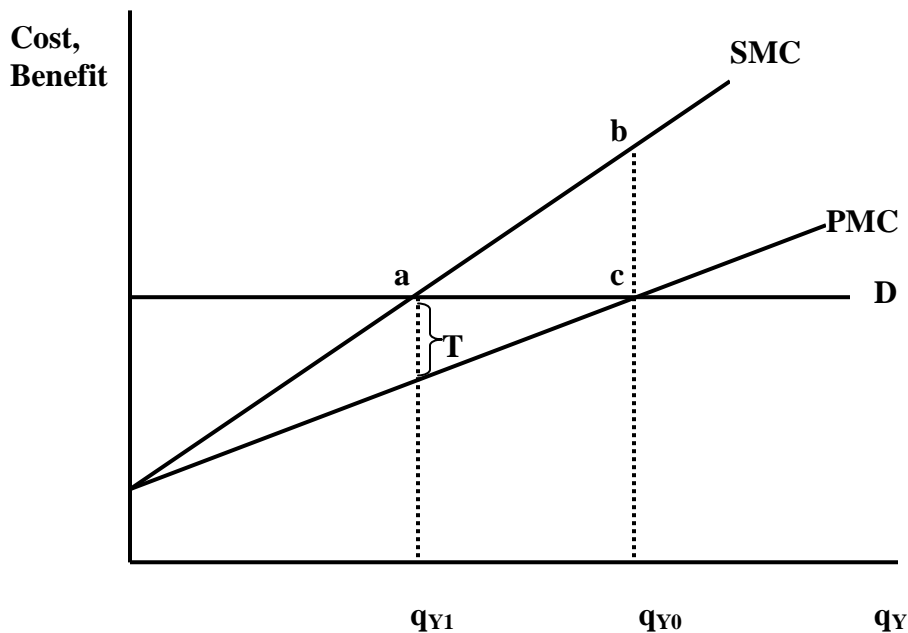
a)

See lecture notes: last lecture p. 2. If there is monopoly in one industry then  $P > MC$  in that industry. As a result less of the good is produced than under perfect competition and one of the conditions for Pareto efficiency is violated. This is the allocation efficiency condition. As a result the MRS of consumers differs from the MRT of the economy. If there is monopoly in the industry producing good X then we have:

$$MRT_{XY} = \frac{MC_X}{MC_Y} < \frac{P_X}{P_Y} = MRS_{XY}$$

b)

A negative production externality means that the production of one good raises marginal costs in another industry directly rather than through affecting the prices of goods or factors. From the lecture notes the social marginal cost of the pollution industry is higher than its private marginal cost.



The difference is the effect of the externality on the marginal costs in the other industry.

Both these situations are related to allocation efficiency. Using the diagram from the lecture notes (below) we can characterise the two situations.

If the industry producing good X is a monopoly then the monopolist restricts output such that  $P_X > MC_X$ . This would be a point like B on the diagram. At this point the MRS of consumers exceeds the MRT of the economy. There is a welfare loss that can be measured by the deadweight loss in the partial equilibrium diagram. Alternatively it can

be seen on the diagram below as a loss of utility for the representative consumer as compared with point A on the diagram.

The policy recommendation would be to regulate the monopolist so that  $P_X = MC_X$ , or alternatively to create the conditions for competition in the industry.

If the industry producing good Y is producing the pollution externality then the 'true' marginal cost for society is SMC, which is higher than the price. This industry is producing too much for Pareto efficiency. So again, the economy is at a point like B in the diagram below. The deadweight loss is the area abc in the partial equilibrium diagram above.

If the externality cannot be resolved by the market, then the policy recommendation would be to introduce a Pigouvian tax of T in industry Y (diagram above), or to regulate output to  $q_{Y1}$ . It might be more efficient for the government to tax or regulate the externality directly rather than directing policy to reducing the industry's output.

