

2014 Prelim H2 Economics Paper 2

Essay Question 1

Growing demand for non-renewable energy such as crude oil and a rise in its extraction cost have led to huge government subsidies on renewable energy such as biofuel.

- (a) Explain how price elasticity concepts determine whether the producers or consumers of renewable energy will be more likely to benefit from a subsidy. [10]
- (b) Discuss how the combination of the above changes might affect consumer expenditure on renewable and non-renewable energy. [15]

Suggested Answer - Part (a)

Development 1 [Impact of an indirect subsidy]

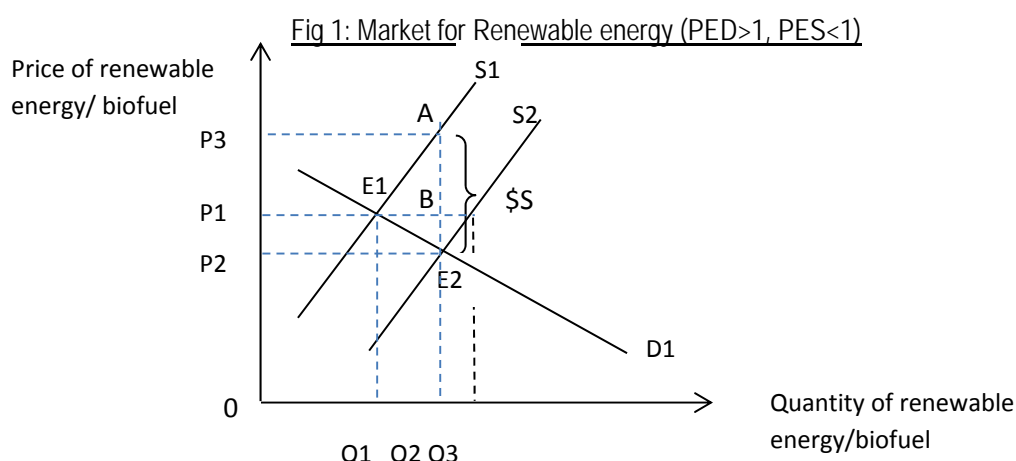
A specific subsidy (i.e. \$s per unit of good) will result in a fall in the unit cost of production (COP) of renewable energy. Hence, at every price, producers are willing able to produce a lower quantity supplied, which results in a rise in the supply of renewable energy from S1 to S2 (Fig 1).

The initial price is at P1 with output Q1. New equilibrium is achieved at a lower price, P2, and higher output, Q2.

Development 2 [Short run analysis : Incidence of subsidy]

The introduction of a subsidy will benefit both consumers and domestic producers of renewable energy. However, the relative share of benefit or incidence of indirect subsidy for the consumers and producers would differ depending on different relative values of Price Elasticity of Demand (PED) and Price Elasticity of Supply (PES). A subsidy favours the side of the market that is less price elastic.

PED measures the degree of responsiveness of quantity demanded of a good to a change in the price of the good itself, ceteris paribus. PES measures the degree of responsiveness of quantity supplied of a good to a change in the price of the good itself, ceteris paribus.



Government subsidy on renewable energy suggests that it may be rather expensive which makes it less affordable to consumers. Hence, the **demand for renewable energy** such as biofuel may be **relatively price elastic** (i.e. $PED > 1$) in the short run as expenditure on this good is likely to constitute a large proportion of consumers' income. Furthermore, non-renewable energy such as crude oil is

available as a close substitute for renewable energy. A fall in the price of renewable energy would therefore result in a more than proportionate rise in quantity demanded of renewable energy.

The **supply of renewable energy such as biofuel** is likely to be **relatively price inelastic** (i.e. $PES < 1$) due to the gestation period that is required to grow crops which are required for the production of biofuel. A rise in the price of renewable energy would therefore result in a less than proportionate rise in quantity supplied of renewable energy.

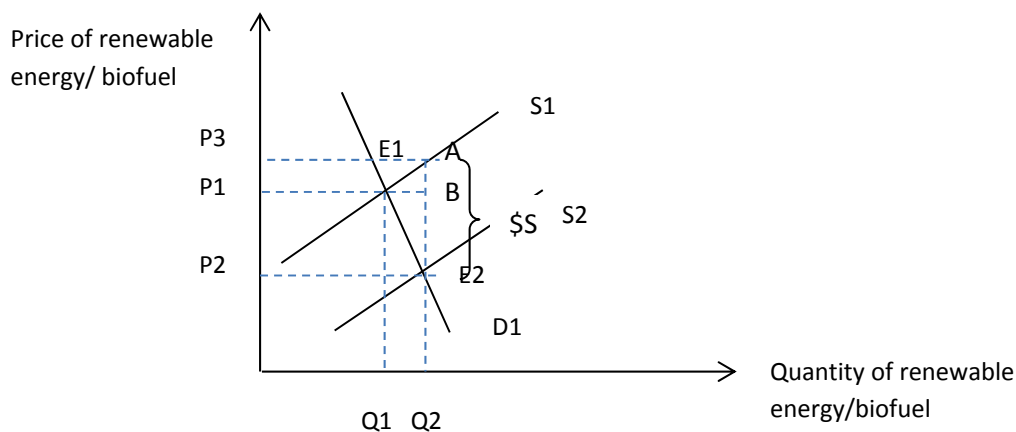
Total subsidy for renewable energy is the product of the unit subsidy ($\$S$) and the new equilibrium quantity of renewable energy (OQ_2), represented by area $P_2E_2AP_3$. Given the renewable energy subsidy, the consumers' share of the benefit from the subsidy is the proportion of the government funding that leads to a reduction in the market price from P_1 to P_2 . The domestic producers' share of the benefit from the subsidy is the proportion of the government funding that allows them to receive a higher price (P_3) which is inclusive of the subsidy

Hence of the total subsidy, area $P_2E_2AP_3$, the consumers' share of the subsidy is given by the area $P_1P_2E_2B$ while the producers' share of the subsidy is area P_1P_3AB . Thus, producers benefit more from the subsidy given to biofuel production.

This is due to the demand for renewable energy being relatively more price elastic than its supply. Producers would absorb more of the subsidy and pass less of the subsidy to consumers who are more responsive to price changes. Thus **a larger share of the subsidy is enjoyed by the producers of renewable energy**.

Development 3 [Long run analysis : Incidence of Subsidy]

Fig 2: Market for Renewable energy ($PED < 1$, $PES > 1$)



The **demand for renewable energy** such as biofuel may be relatively **price inelastic** (i.e. $PED < 1$) in the long run if it becomes a commonly used form of energy such that it is regarded as a necessity. A fall in price of renewable energy would therefore result in a less than proportionate rise in quantity demanded of renewable energy.

The **supply of renewable energy such as biofuel** may be relatively **price elastic** (i.e. $PES > 1$) due to greater spare capacity in growing crops and producing biofuels in the long run. Hence, a rise in price of renewable energy would therefore result in a more than proportionate rise in quantity supplied of renewable energy.

Total subsidy on renewable energy is represented by area $P_2P_3AE_2$. In Fig 2. Of this amount, the consumers' share of the subsidy is given by the area $P_2P_1BE_2$ while the producers' share of the subsidy is area P_1P_3AB . Hence, consumers benefit more from the subsidy given to biofuel production.

This is due to the demand for renewable energy being relatively more price inelastic than its supply. Producers would absorb less of the subsidy and pass more of it to consumers who are less responsive to price changes. Thus **a larger share of the subsidy is enjoyed by the consumers of renewable energy.**

Conclusion

Overall, the incidence of a subsidy depends on the relative price elasticities of demand and supply. In the case of renewable energy, producers are likely to benefit more from the subsidy, while consumers may benefit more in the long run. However, this may not be true if consumers do not regard renewable energy as a necessity in the long run.

Level	Knowledge, Comprehension, Application and Analysis	Marks
L3	For an answer that uses appropriate analysis to explain how relative PED and PES are relevant in determining the incidence of a specific subsidy on producers and consumers. Both cases where $PED > PES$ and $PED < PES$ are considered.	7-10
L2	For an answer that uses appropriate analysis to explain how relative PED and PES are relevant in determining the incidence of a specific subsidy on producers and consumers. Either $PED > PES$ OR $PED < PES$ is considered. OR For an answer that gives a descriptive explanation how relative PED and PES are relevant in determining the incidence of a specific subsidy on producers and consumers. OR For an answer that analyses ONLY how PED OR PES is relevant in determining the incidence of a specific subsidy on producers and consumers.	5-6
L1	For an answer that shows knowledge of the impact of subsidy and relevant elasticity concepts. This could be in the form of a largely unexplained list .	1-4

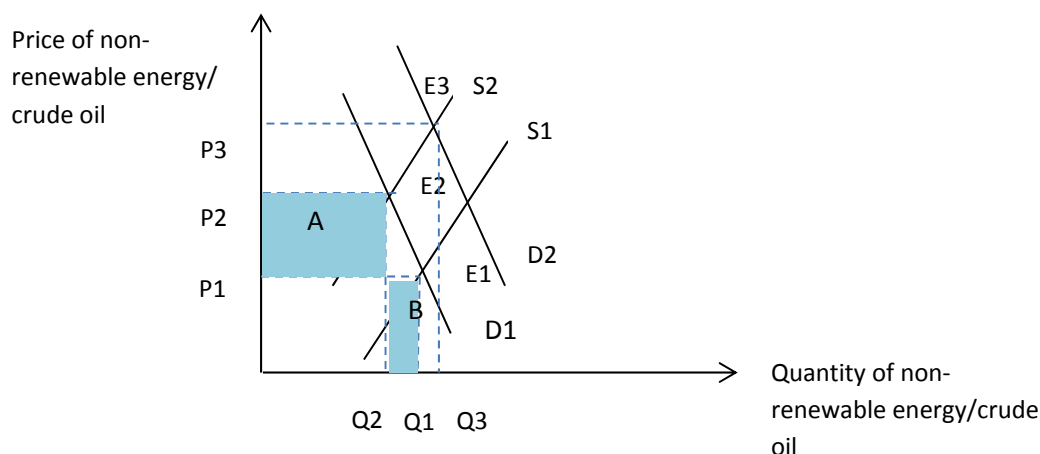
Suggested answer for part (b)

(b) Discuss how the combination of the above changes might affect consumer expenditure on renewable and non-renewable energy. [15]

Development 1: CE on non- renewable energy/crude oil

(i) Short-run: DD for crude oil is relatively price inelastic

Fig 3: Market for Non- Renewable energy (PED<1)



(i) Impact on CE due to a rise in extraction costs of crude oil

A rise in extraction costs for crude oil → lead to a fall in the supply of crude oil → price of crude oil rises from P1 to P2, while quantity demanded of crude oil falls from Q1 to Q2.

The demand for crude oil is likely to be price inelastic ($PED < 1$) since crude oil is a key resource, and hence a necessity. A rise in the price of crude oil → rise consumer spending.

(ii) Impact on CE due to a growing demand for crude oil

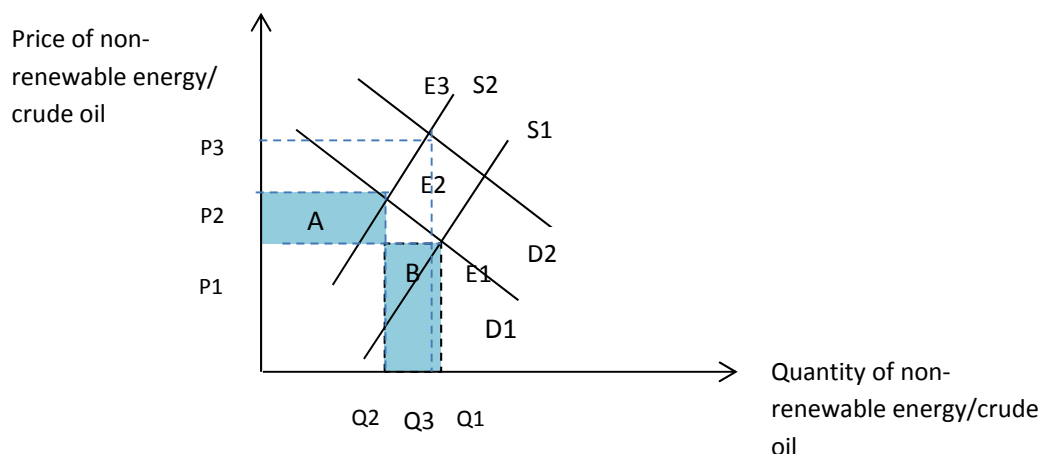
Growing demand for crude oil could be due to several factors such as global economic recovery since the 2008 financial crisis, population growth and low interest rates. Increase in demand brings about an increase in total consumer expenditure.

Combined effect on CE on crude oil: The combined effect on consumer expenditure when $PED < 1$ → total consumer expenditure increases.

Evaluation: The impact on CE on crude oil depends on the extent of shifts of demand and supply of crude oil. For instance, a larger increase in the demand for crude oil due to stronger global economic recovery would lead to a greater rise in CE on crude oil

(ii) Long-run: DD for crude oil is relatively price elastic

Fig 3: Market for Non- Renewable energy (PED>1)



(i) Impact on CE due to a rise in extraction costs of crude oil

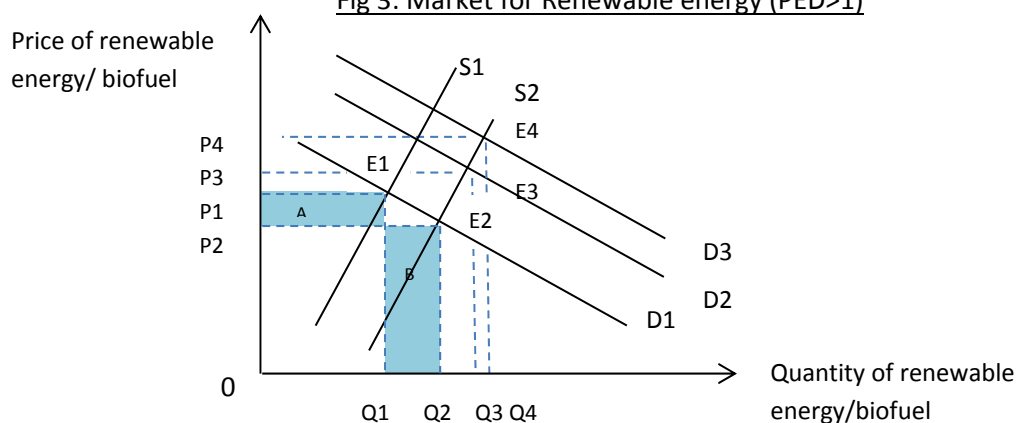
The demand for crude oil is likely to be price elastic ($PED < 1$) in the long run as a greater variety of alternative energy is available due to efforts in research & development. A rise in the price of crude oil would lead to a more than proportionate fall in the quantity demanded of crude oil. Hence, consumer spending on crude oil falls.

(ii) **Impact on CE due to a growing demand for crude oil** -CE rises from $OP_2E_2Q_2$ to $OP_3E_3Q_3$ as previously analysed.

(iii) **Combined effect on CE on crude oil: Evaluation:** The combined effect on consumer expenditure when $PED > 1$ is uncertain.

Development 2: CE on renewable energy/ biofuel

Fig 3: Market for Renewable energy (PED>1)



(i) Impact on CE due to a subsidy on biofuel

As explained in part (a), a subsidy would lead to lower unit COP for renewable energy which would allow firms to produce a larger quantity of renewable energy (Q1) such as biofuel at a lower price (P2).

Consider the case where the demand for biofuel is relatively price elastic. A fall in the price of biofuel would lead to a more than proportionate increase in the quantity demanded for biofuel. CE on biofuel rises.

(ii) Impact on CE due to a rise in the price of crude oil

Renewable energy and non-renewable energy are substitutes ($XED > 0$). Hence, a rise in the price of crude oil would lead to a fall in its quantity demanded, which results in a rise in the demand for biofuel.

(iii) Impact on CE due to global economic recovery

Assuming that biofuel is a normal good, global economic recovery would also lead to a rise in the demand for it which reinforces the rise in CE on biofuel from OP3E3Q3 to OP4E4Q4.

(iv) Combined effect on CE on biofuel: A rise in demand for biofuel due to a rise in the price of crude oil and global economic recovery reinforces the rise in consumer expenditure due to a subsidy.

Evaluation: The demand for biofuel may become more price inelastic as consumers may regard biofuel as a necessity in the long run. In this case, a fall in price of biofuel would lead to a fall in CE on biofuel instead. The overall impact on CE would thus be indeterminant. Assuming that the rise in demand for biofuel is smaller than the rise in its supply, overall CE on biofuel may fall instead.

Conclusion

The impact on CE on each type of energy depends on its price elasticity of demand, extent of shifts in demand and supply. In light of the events highlighted in the signpost, consumer expenditures on both types of energy are likely to increase.

Suggested marking scheme:

L3	For an analytical and balanced discussion on how events impact CE of both crude oil and biofuel. The relevance of PES, XED YED and consideration of extent of shifts in demand and supply are to analyse the impacts on consumer expenditure in both markets.	9-11
L2	For an <u>analysis</u> of the impact on CE on crude oil OR biofuel OR For a <u>description</u> of the impact on CE on crude oil and biofuel which has limited application of PES, XED and YED	6-8
L1	An answer that shows some understanding of the concepts of demand and supply to analyse the impacts. Explanation of the use of PES, XED YED is either absent or poorly	1-5

	done.	
E2	For an evaluative discussion based on economic analysis	3 - 4
E1	For an unexplained judgement, or one that is not supported by economic analysis.	1 - 2