Term 3 Intensive Revision

**Lesson 1 – CSQ – Demand and Supply Q1**

**Bottled Water and Clean Water**

**Figure 1: U.S. per capita beverage consumption**



 Actual: 2000-2014

 Projected: 2015-2017

Source: Wall Street Journal

**Extract 1: Bottled water sales volume to increase in the U.S.**

Building on last year’s growth of 4.7 percent, bottled water that includes sparkling, mineral, distilled and pure water, will again post large increases in both sales and consumption for 2014, according to preliminary data from the Beverage Marketing Corporation. Sales volume of bottled water in 2014 is expected to grow to $13 billion, an increase of 6.1 percent from 2013.

The liquid refreshment beverage market in the U.S. consists of soda, energy drinks, sports drinks, bottled water, and other non-carbonated beverages. The rise in the consumption of bottled water has been driven by the shift in consumer preference for healthier beverages. Soda has often been criticised for its high sugar content and caffeine. The alleged health impacts include high blood pressure, diabetes, and obesity. Many consumers know that convenient and refreshing bottled water has zero calories and is the healthiest option on the shelf, as compared to soda. Nevertheless, the overall rise in obesity rates in the U.S. shows that consumers may be less willing to give up on soda and other sugary beverages. Positive growth rate in the U.S. has also played an imperative role in the growth of the bottled water industry.

The bottled water industry is appealing with an increasing number of players every year, primarily due to positive sales revenue. The main type of plastic used for plastic bottles, polyethylene terephthalate, as well as the main type of mineral used for glass bottles, silica sand have been experiencing fall in prices. These plastic and mineral made up a relatively large proportion of the production of bottled water, and U.S. being the one of leading producers has sufficient stocks available. The other costs of making bottled water such as fuel, electricity and labour are also obtained easily with ease.

 Source: *The Economist*, 15 November 2014

**Extract 2: Competition in the U.S. bottled water industry**

Nestle Waters North America is the market leader of the U.S. bottled water industry. Aside from the other major market players PepsiCo’s Aquafina and Coca-Cola’s Dasani, Nestle also competes with the bottled water brands of private players. The firms in the bottled water industry are interdependent as they consider their rivals’ reactions when setting prices, output, advertising budgets and other business models.

Coca-Cola’s Dasani broadcasted a new ad campaign featuring actress Jennifer Aniston touting its vapor-distilled, electrolyte-enhanced Smartwater and launched an unsweetened, zero-calorie sparkling water beverage in lime, lemon, apple, and berry flavors in early 2014, whereas PepsiCo this summer ran its first ad campaign for Aquafina since 2008. Dozens of smaller, high-end specialty-water brands with names like Real Water, People Water and Happy Water have also came up with new bottle designs and exotic minerals to attract consumers. Firms also continue to invest in the exploration of technologies and recovery systems that enable more energy-efficient and cost-effective production of bottled water.

Source: *Wall Street Journal*, 19 August 2015

**Extract 3: Consumption of clean water**

Water is a basic necessity for life and drinking clean water reduces the number of episodes of diarrhea for an individual, making him healthier and more productive. Apart from the benefits to the individual, consuming clean water also leads to healthier populations as the spread of water-borne diseases is lowered, increased productivity and growing economies. Despite this overwhelmingly clear evidence, millions of people still struggle to access clean drinking water, and more than 840,000 people die each year from consuming unclean water and sanitation.

The most commonly used definition of “access” is defined as having a source of safe water within 1 kilometer of the dwelling. It is estimated that in 2015, 663 million people still lacked access to “improved” drinking water sources. Improved sources are those deemed to be relatively protected from contamination and, therefore likely to provide clean water for human consumption and household use, such as piped water supplies into the house or protected wells or springs. For the high number of poor households living in urban slums and in rural areas, there is insufficient access to clean water or sanitation, highlighting the inequality issue in most developing countries.

Poverty and local power inequalities can exacerbate inequalities of access to water. For example, in areas where informal providers are the only source of water delivery to poor households, without regulation to ensure fair pricing, extortion and bribery can inflate the cost of this essential service, such that the poorest households can in fact be paying the most for their water.

 Source: Global Water Partnership and World Health Organisation

**Extract 4: Towards a way to improve the situation**

Water should be recognised as a great priority. One of the main objectives of the World Water Council is to increase awareness of the water issue, and decision-makers at all levels must be implicated. One of the Millennium Development Goals is to halve, by 2015, the proportion of poor people without sustainable access to clean water and increase its consumption. To achieve that aim, several measures should be taken.

Firstly, the subsidising of production of clean water that requires the use of sophisticated technology. This makes clean water affordable for the poor, yet may be costly for countries with weak fiscal position as spending on welfare programmes has to be cut. Secondly, the deregulation of the control of water supplies to private companies creates a more efficient system and allows more people access to clean water, and hence consume them. Yet, while water companies are able to update water systems, making them more efficient and more accountable to consumers, they can also make water more costly to the poor once market power is consolidated. Thirdly, educating citizens on the responsible use and benefits of consuming clean water, which may be difficult to implement and monitor. Lastly, the signing of water treaties to import clean water supplies provides a structure for nations to address their differences in managing and monitoring shared resources, as well as increases the access to clean water especially for third-world countries. However, these countries may not have sufficient capital and/or resources available for exchange.

Source: World Water Council

**Questions**

1. Using Figure 1, compare the trend between U.S. per capita soda consumption and U.S. per capita bottled water consumption. [2]
2. Discuss the view that supply factors are likely to be more important than demand factors in explaining the extent of the change in sales volume of bottled water in the U.S. [8]
3. **(i)** Explain why governments intervene in the market for clean water. [4]

**(ii)** With reference to the data, assess whether subsidies would be the most appropriate policy option for the government to achieve its microeconomic objectives. [10]

 [Total: 30 marks]

**Suggested Answers**

**(a) Using Figure 1, compare the trend between U.S. per capita soda consumption and U.S. per capita bottled water consumption. [2]**

U.S. per capita soda consumption has a continuously falling trend whereas the general rising trend of U.S. per capita water consumption has a falling trend between 2007 and 2009. The rate of increase in U.S. per capita bottled water consumption is faster than the rate of decrease in U.S. per capita soda consumption.

**(b) Discuss the view that supply factors are likely to be more important than demand factors in explaining the extent of the change in sales volume of bottled water in the U.S. [8]**

According to Extract 1, there is a large increase in the sales volume of bottled water in the U.S. by about 4.7% from 2012 to 2013, and an expected 6.1% from 2013 to 2014.

Explain change in supply of bottled water

The bottled water industry has become increasingly profitable for potential entrants over the years as shown by its positive sales revenue (Extract 1), holding cost constant. This results in an increase in the number of sellers, hence increasing the supply of bottled water.

There is also a fall in prices of factor inputs, such as polyethylene terephthalate used to make plastics bottles as well as silica used to make glass bottles. These lead to a fall in cost of production and rise in profits. Profit-maximising producers then have more incentives to produce, increasing the supply of bottled water.

Explain change in demand for bottled water

The positive growth rate in the U.S. (Extract 1) implies that national income is increasing. Holding price and population constant, real GDP per capita increases and the purchasing power of an average consumer increases. Hence demand for normal goods such as bottled water increases.

Tastes and preferences of health-conscious consumers change in favour of healthier bottled water compared to unhealthy soda that causes high blood pressure, diabetes and obesity (Extract 1). This increases demand for bottled water.

Explain supply factors are more important than demand factors

Supply factors are more important than demand factors in explaining the large increase in sales volume of bottled water in the U.S. The increase in supply is likely to be more significant than the increase in demand. The overall rising obesity rate in the U.S. (Extract 1) implies that it takes time to change the mindsets, hence the taste and preferences of consumers to consume the healthier bottled water as there is still a large group of consumers who are inclined to consume soda and other sugary beverages.

The increase in supply is likely to be more significant because the fall in prices of major factor inputs (plastic and mineral) used in bottled water production contribute to a substantial fall in cost of production. This is coupled with the increasingly profitable sunrise industry that results in the increased number of smaller private players to enter and increase the supply of bottled water (Extract 1).



 Figure 2

As shown in Figure 2, both the less significant increase in demand for bottled water from D0 to D1 and the more significant increase in supply of bottled water from S0 to S1 have a mutually reinforcing effect in the increase in equilibrium quantity from OQ0 to OQ1. This explains the large rise in sales volume of bottled water in the U.S.

Explain extent of change in sales volume using PES and how PES is more important than demand

The supply of bottled water is likely to be price elastic in the U.S. This is because the main factor inputs, of polyethylene terephthalate and silica sand in producing plastic and glass bottles that are largely produced in the U.S., have sufficient stocks available (Extract 1), indicating existence of spare capacity. Also the other factor inputs such as fuel, electricity can also be obtained with ease (Extract 1). Hence quantity supplied of bottled water is likely to be sensitive to price changes.



Figure 3

As shown in Figure 3, the increase in demand for bottled water from D0 to D1 leads to a more significant increase in equilibrium quantity from OQ0 to OQe with supply of bottled water being price elastic (Se), as compared to a less significant increase from OQ0 to OQi if the supply is price inelastic (Si). This explains the large increase in sales volume of bottled water in the U.S.

Given a highly price elastic supply (considered as a supply factor), the relatively small increase in demand is sufficient to result in a large increase in sales volume, hence the elasticity of supply is more important to explain the increase in sales volume.

Explain extent of change in sales volume using PED and how supply is less important than PED

The demand for bottled water is likely to be price elastic in the U.S. due to the availability of substitutes as a liquid refreshment beverage, such as energy drinks, sports drinks and other non-carbonated beverages (Extract 1). As the obesity rate in U.S. has been increasing (Extract 1), it can be implied that bottled water and the other sugary beverages are considered to be close substitutes for the majority of U.S. consumers. Hence quantity demanded for bottled water is likely to be sensitive to price changes.



 Figure 4

As shown in Figure 4, the increase in supply of bottled water from S1 to S2 leads to a more significant increase in equilibrium quantity from OQ0 to OQe with demand for bottled water being price elastic (De), as compared to a less significant increase from OQ0 to OQi if the demand is price inelastic (Di). This explains the large increase in sales volume of bottled water in the U.S. Hence the price elastic demand is relatively more important than the increase in supply to explain the large increase in sales volume.

**Conclusion**

Hence overall, the supply factors are more important than demand factors the U.S. bottled water industry. In addition, the price elastic supply of bottled water is more important than the increase in demand to explain the large increase in sales volume. Comparatively, the price elastic demand for bottled water is more important than the increase in supply to explain the large increase in sales volume.

**(d) (i) Explain why governments intervene in the market for clean water. [4]**

Under-consumption of clean water due to the presence of positive externalities

Governments intervene in the market for clean water as consumption of clean water generates positive externalities.

The private costs of consuming clean water refer to the price paid for the clean water and the time spent to access the sources of clean water by an individual. The private benefits refer to the healthier well-being due to reduced episodes of diarrhea for an individual (Extract 3).

The consumption of clean water generates positive externalities and external benefits are spilled over to the third-parties. For example, its consumption leads to healthier populations as the spread of water-borne diseases is lowered, hence increasing productivity of the workforce and contributing to economic growth positively (Extract 3).

MPC=MSC

0

MSB = MPB + MEB

Qs

Qp

Quantity of clean water

MPB

Costs / Benefits

a

c

b

 Figure 5

As shown in Figure 5, the presence of external benefits leads to the divergence between social benefits and private benefits, so marginal social benefit (MSB) is higher than marginal private benefit (MPB) for each unit of output.

Assume no negative externalities, the marginal private cost (MPC) is equal to marginal social cost (MSC). Utility-maximising consumers only consider their private costs and private benefits, ignoring the external benefits spilled over to the third-parties. Left to the free market, individuals will consume at OQp level where MPB=MPC. However, the socially optimum level of consumption should be at OQs where MSB=MSC.

Since Qp is more than Qs, there is under-consumption of clean water, resulting in welfare loss as shown by the area abc, as the social benefit of an additional unit of clean water consumed is higher than its social cost. Hence, governments intervene in the market for clean water to achieve an efficient allocation of resources.

Under-consumption of clean water due to imperfect information

Clean water is a merit good that generates positive externalities, and whose consumption is deemed intrinsically desirable by the government. Consumers, especially those living in developing countries that lack access to clean water, have imperfect information on the actual private benefit of clean water. They do not have perfect knowledge of the health and non-health benefits from the consumption of clean water (Extract 3). This results in under-consumption and inefficient allocation of resources, thus governments intervene to correct the market failure in the clean water market.

Under-consumption of clean water due to income Inequity

The poor consisting of the high number of poor households living in urban slums and in rural areas do not have the ability to pay for clean water, hence exacerbating inequalities of access and consumption of clean water (Extract 3). Such poverty issues result in the poor to consume at a level that is below the socially optimum level of consumption.

**(d) (ii) With reference to the data, assess whether subsidies would be the most appropriate policy option for the government to achieve its microeconomic objectives. [10]**

The microeconomic objectives of the government are achieving efficient allocation of resources and equity. As mentioned in Extract 4, subsidising production of clean water that requires the use of sophisticated technology is part of World Water Council’s efforts to increase water consumption.

**Thesis: Subsidies is the most appropriate policy to achieve microeconomic objectives**

The production of clean water is not cheap given the use of sophisticated technology (Extract 4). Hence the government can subsidise private firms to lower their cost of production hence pass on the cost-savings to consumers in terms of lower prices.

The government can give subsidies per unit, equivalent to the MEB at Qs. This will lower the cost of consuming clean water, hence shifting MPC to the right to MPC’ as shown in Figure 6 below. Consumption of clean water increases from Qp to Qs, which is the socially optimal level of output, and the deadweight loss is eliminated. Hence efficient allocation of resources is achieved.

In addition, the lowering cost of consuming clean water will make such a basic necessity more affordable for the poor (Extract 4), hence narrowing the income gap and achieving equity.

MPC=MSC

0

MSB = MPB + subsidy per unit

Qs

Qp

Quantity of clean water

MPB

Costs / Benefits

MPC’

 Figure 6

**Anti-thesis: Subsidies is not the most appropriate policy**

Limitation of subsidies

It is difficult to measure the monetary value of external benefits accurately and hence the amount of subsidy given may not be able to attain an efficient allocation of resources. This is because external benefits are difficult to define in monetary terms due to the existence of both tangible and intangible benefits – for example, the benefits of increased in workforce productivity from the consumption of clean water on the economy are difficult to quantify. If MEB is underestimated, the government is only moving the equilibrium nearer to the socially optimum level, but not fully eliminating the market failure. If MEB is overestimated, there would be over-correction in the market and resource allocation would still not be efficient. In reality, it is not easy to measure the value of external benefits that are spilled over to the third parties.

Moreover, subsidies are not appropriate for countries that have weak fiscal positions (Extract 4). For example, such a policy will worsen the budget deficit a country already has, and incur huge opportunity costs in terms of forgone spending on other welfare programmes such as redistribution of income policies, hence unable to narrow the income gap and achieve equity.

**Explain that other policies are more appropriate**

Deregulation of the control of water supplies to private companies

Deregulation of the control of water supplies to private companies (Extract 4) means that the government opens up the market to greater competition that spurs private firms to increase cost efficiency and productivity. This creates a more efficient system and allows more people access to clean water (Extract 4).

Such deregulation aims to increase market supply, hence the access to clean water especially for high number of poor households living in urban slums and in rural areas (Extract 3) and drive down prices of clean water. As the cost of consuming clean water is lowered, MPC shifts to the right to MPC’ as shown in Figure 6. Consumption of clean water increases from Qp to Qs, which is the socially optimal level of output, and the deadweight loss is eliminated. Hence efficient allocation of resources is achieved.

Hence, the increased competition through deregulation also ensures that poverty and local power inequalities will not exacerbate inequalities of access to water (Extract 3), whereby poor households are exploited with high prices of clean water. The lowering cost of consuming clean water through the deregulation will make such a basic necessity more affordable for the poor (Extract 4), hence narrowing the income gap and achieving equity.

Limitation: However, this policy may not be appropriate as such a deregulation consolidates market players once cost-inefficient firms are driven out of the industry (Extract 4). As a result of the reduced number of market players, profit-maximising firms with higher market share will exploit consumers by charging higher prices for clean water, earning supernormal profits that are concentrated in the hands of the few dominant firms and aggravating inequity.

Public education

Public education through campaigns aims to raise awareness on the responsible use and benefits of consuming clean water (Extract 4) such as being a more productive individual. Also, educating the people about the positive spillover effects to third parties will help the individuals internalise the external benefits. This increases the private benefits of consumers, shifting MPB to the right to MSB as shown in Figure 6, and consumers increase the consumption of clean water from Qp to Qs, which is the socially optimal level of output, eliminating the deadweight loss. Hence achieving efficient allocation of resources.

Limitation: However, this policy may not be appropriate as it incurs high cost in implementation. It is also difficult to monitor whether consumers have changed their consumption pattern (Extract 4). Even if the campaign is successful in persuading consumers to consume more, the increase may not be very significant. Also, public education does not have a direct impact on achieving equity.

Signing water treaties

Trade policy such as signing water treaties with neighbouring trading partners to import clean water supplies is another policy option. This allows countries to manage and monitor shared resources effectively, and is especially appropriate for countries that lack access to clean water (Extract 4). The import of clean water supplies into the country drives than price of consuming clean water. MPC shifts to the right to MPC’ and consumption of clean water increases to Qs, the socially optimal level of output, hence achieving a more efficient allocation of resources.

Limitation: However, this policy may not be appropriate as it takes time for treaties to be negotiated. Moreover, third-world developing countries need money to purchase clean water and may not have sufficient capital and/or resources available for exchange (Extract 4). In addition, signing water treaties does not directly achieve equity unless the agreement involves a fall in clean water prices for the importing country.

**Conclusion and Evaluation**

Subsidies is the most appropriate policy option in achieving the microeconomic objectives of the government to a small extent as it allocates resources closer to the socially optimal level of output and make clean water more affordable for the lower-income households, but it has its limitations. The use of subsidies needs to be complemented by other policy options to increase access to clean water at a lower price, and a combination of policies is hence more appropriate to achieve the microeconomic objectives.

In addition, the appropriateness of policy depends on the budget position of the government. For example, subsidies is a less appropriate policy option for countries facing budget deficits as their weak fiscal positions will be aggravated (Extract 4).

The appropriateness of policy also depends on the root cause of the problem. In third-world developing countries in which the root cause of under-consumption of clean water is due to lack of access to it by the high number of people living in urban slums and rural areas (Extract 3), a more appropriate policy option is perhaps deregulation or the signing of water treaties such that there is distribution of clean water to regions that are less accessible to clean water. However, in countries in which the root cause of problem is imperfect information regarding the private and external benefits of consuming clean water, a more appropriate policy option is definitely public education to change the mindset and consumption pattern of the people (Extract 4).