

H1 Economics: A Level Revision

Microeconomics CSQ – Demand & Supply and Market Failures

Extract 1: The known unknowns of plastic pollution

Humans have produced about 8 billion tons of plastic since 1950, and more than half of it went straight to landfills. Of all of the plastic that's no longer in use, only about 9% was actually recycled. Much of the plastic that isn't recycled or sent to landfills is believed to end up in the ocean. Scientists estimate that 4.8 to 12.7 million metric tons enter the ocean in a year.

Often, as with disposable coffee cups, drinks bottles, sweet wrappers and other packets that account for much of the plastic produced in advanced economies where deliveries and take-out meals are common. If the stuff ends up in the sea, it can wash up on a distant beach or choke a seal. Exposed to salt water and ultraviolet light, it can fragment into "microplastics" small enough to find their way into fish digestive systems. From there, it seems only a short journey to dinner plates.

High-income countries tend to generate more plastic waste per person, according to a report on plastic pollution by Our World in Data. While high-income countries usually have well-managed waste streams and therefore lower levels of plastic pollution to external environments, plastic waste still enters rivers and oceans, especially from coastal populations.

Source: Various

Table 1: Selected indicators on GDP and plastic waste in 2010

Countries	Real GDP per capita (US\$)	Plastic waste per capita (per day), kg	% of mismanaged plastic waste
United States (US)	48,466.82	0.34	2
Malaysia	9,040.57	0.20	57
Thailand	5,076.34	0.14	75
China	4,550.45	0.12	76
Philippines	2,217.47	0.08	83
Bangladesh	781.15	0.03	89

Source: earthday.org and worldbank.org

Extract 2: China's ban on plastic waste imports shifts waste crisis to Southeast Asia

For a time, China, was the centre of the global recycling trade. As it became the world's leading manufacturer of cheap clothing and other synthetic goods, its appetite for plastic feed stock grew. It grew a whole waste processing and recycling industry, but improper handling of trash and a lack of effective supervision turned the country into a major polluter. There's also a significant amount of imported plastic waste that couldn't be recycled and thus the world's non-biodegradables kept mounting in Chinese landfills.

With China's door to plastic waste effectively closed due to ban on plastic waste imports, hundreds of small-operation Chinese plastics recyclers relocated to other Southeast Asian countries. China's imports of solid waste, which include plastics, paper and metal, fell by 54 percent in the first quarter of 2018 following the January ban. Several Southeast Asian countries such as Vietnam, Malaysia and Thailand reported spikes in waste imports — an indication that trash was diverted there. Experts, however, said they didn't think these countries can fill all the void left by China.

In the long term, the problem has to be solved at source. Rather than looking for the next place to dump waste, advanced countries should bear the responsibility of cutting on waste generation through sustainable practices.

Source: National Geographic, 16 November 2018 and CNBC.com, 16 April 2018

Extract 3: In Singapore, where trash becomes ash, plastics are still a problem

Singapore's streets are glistening clean, its parks and beaches mostly free from the trash that plagues neighbouring countries like Malaysia and Indonesia. Almost all of Singapore's non-recyclable waste is incinerated, with the ash and some solid waste shipped to a man-made island nearby that doubles as a nature reserve.

The tip on Semakau island was supposed to meet Singapore's dumping needs until as late as 2045, according to environment ministry documents. But with the use of disposable products growing at a rapid rate, the ministry's most recent estimates show that Semakau could be full a decade earlier.

So far, the government has not adopted any bans or charges on plastic bags or single-use plastic items like straws and plates. It has also not disclosed any plans to replace the Semakau dump. "More needs to be done to prolong the life of Semakau landfill beyond 2035," the NEA said in an email when asked about plans for the dump.

The agency said that recycling initiatives had helped stabilize the amount of trash sent for incineration, despite increases in waste generation caused by population and economic growth. Singapore was offering research grants for companies and organizations to develop sustainable waste management technologies, and planned to make it mandatory for large generators of packaging waste to report the types and quantities they use and their reduction plans by 2021. Singapore is small - there are a lot of competing uses of land, especially for productive uses to boost economic growth. Singapore is more suited to be a hub for recycling technology development, not as a hub for recycling material from other countries.

"There is no rubbish piling up in the streets, so Singaporeans don't perceive a waste problem or feel personally responsible to reduce waste," said Sonny Ben Rosenthal, an academic who specializes in environmental issues at Singapore's Nanyang Technological University.

Source: Reuters, 6 June 2018

Extract 4: Ocean plastic is a massive problem. But whose problem is it exactly?

A problem that does more than \$13b of damage to marine ecosystems annually seems more the purview of large-scale government action than of individuals. But should we expect governments to absorb the costs? After all, it's the corporations that create most plastic packaging and they are the ones that "put it out there." Then again, they only use plastic packaging because consumers pay them money for it. If consumers stopped voting with their dollars in favour of plastic packaging or if they demanded that their governments incentivize change, there wouldn't be so much plastic waste.

So the real question isn't who is to blame, but rather how can each of these different actors redirect their resources and actions in ways that complement one another to solve this crisis?

Governments tend to want to tax or ban, rather than invest in crucial infrastructure or improve sanitation that costs much more money. Efforts to ban single use plastics like straws or plastic bags, while hugely effective in raising public awareness of the ocean plastic problem, do little to address it. In fact, unfortunately, these kinds of single use plastics represent less than 1% of ocean plastic. Moreover, banning something leads to using an alternative, which may bring its own negative externalities. And singling out one product or material type to tax or ban doesn't help us better manage our waste.

Consumer brands and plastic companies need to improve how they design packaging and increase the demand for recycled materials, thereby advancing the circular economy. Consumers can change their consumption habits, purchasing products that are more durable, reuse packaging and pressure corporations to develop better plastic practices.

Recyclers blame brands for not paying enough for recycled material or cities for paying them enough. But recyclers can and should do more, as well. In the US, recycling infrastructure was built decades ago and we haven't invested enough to adapt to newer types of plastic like flexible plastics.

There are no silver bullets, and not one of these solutions will suffice. To turn plastic waste into a resource, we need to engage a suite of solutions: from public policy and corporate commitments to financial incentives and changes in human behaviour. Some of these solutions – like developing plastic alternatives – may take considerable time to scale.

Source: Forbes, 16 May 2019

Questions

(a) With reference to Table 1, state the relationship observed between

(i) real GDP per capita and plastic waste per capita [1]

(ii) real GDP per capita and mismanaged plastic waste (%) [1]

(iii) Using relevant economic analysis, account for the two relationships stated above with reference to Extract 1. [4]

(b) Explain the difference between a positive statement and a normative statement and identify an example for each type from Extract 2. [4]

(c) Explain why US could have the highest material standard of living amongst the countries shown in Table 1 and why GDP per capita (adjusted using purchasing power parity) is preferred. [4]

(d) Extract 2 mentioned that China used to import plastic waste for recycling. Such recycled plastic is then used to manufacture cheap clothing and other synthetic goods.

Explain the benefits and costs of importing plastic waste that the China government would have considered in deciding whether to impose a ban on plastic waste import and comment on whether such a ban will lead to a more efficient allocation of resources in the world market of plastic. [10]

(e)

(i) Define the term 'opportunity cost'. [1]

(ii) Explain, using a production possibility curve diagram, why increasing opportunity cost may occur when additional land is used for landfills rather than productive purpose and comment on whether Singapore government should allocate more land for landfills. [8]

(f) Discuss whether it would be more effective for the government to provide subsidies to encourage recycling or ban single-use plastics to address ocean plastic waste pollution. [12]

[Total: 45]

Suggested Answers

(a) With reference to Table 1, state the relationship observed between

(i) real GDP per capita and plastic waste per capita [1]

Positive relationship.

(ii) real GDP per capita and mismanaged plastic waste (%) [1]

Negative relationship.

(iii) Using relevant economic analysis, account for the two relationships stated above with reference to Extract 1. [4]

Countries with higher GDP per capita → Higher income per person → Higher demand for goods and services that involves convenience (taste and preference) e.g. disposable cups and bottles → higher consumption such goods and services → higher level of plastic waste per capita

OR

Countries with higher GDP per capita → Higher income per person → higher purchasing power to buy more goods and services and these involved more goods that has plastic packaging e.g. disposable cups and bottles → higher consumption such goods and services → higher level of plastic waste per capita

and

Countries with higher GDP per capita → higher tax revenue collected enables the government to fund 'well-managed waste streams' through use of technology → reduced level of plastic waste into the environment → lower % of waste mismanagement.

(b) Explain the difference between a positive statement and a normative statement and identify an example for each type from Extract 2. [4]

Explain the difference: Positive statement is a statement of fact, which its accuracy can be tested or verified. On the other hand, normative statement contains value judgement.

Positive statement: The country's imports of solid waste, which include plastics, paper and metal, fell by 54 percent in the first quarter of 2018 following the January ban, according to Chinese customs data.

Normative statement: Rather than looking for the next place to dump waste, advanced countries should bear the responsibility of cutting on waste generation through sustainable practices.

(c) Explain why US could have the highest material standard of living amongst the countries shown in Table 1 and why GDP per capita (adjusted using purchasing power parity) is preferred. [4]

Standard of living comprises of material and non-material aspects

Part 1: Explain why US could have the highest material SOL based on real GDP per capita.

US has the highest real GDP per capita (US\$48,466.82) compared to the other countries in Table 1. This means that they have the highest average income per person, and hence purchasing power to buy goods and services → highest material SOL.

Part 2: Explain GDP per capita (PPP adjusted) is preferred

GDP (PPP adjusted) is a more accurate indicator to compare SOL between countries as it takes into account of difference in cost of living between US and the rest of the countries.

(d) Extract 2 mentioned that China used to import plastic waste for recycling. Such recycled plastic is then used to manufacture cheap clothing and other synthetic goods.

Explain the benefits and costs of importing plastic waste that the China government would have considered in deciding whether to impose a ban on plastic waste import and comment on whether such a ban will lead to a more efficient allocation of resources in the world market of plastic. [10]

China's Government's objective is to maximise social welfare. The ultimate decision of ban implies that that the benefit > cost

Part 1: Explain the benefits and costs the China government would have considered before they decide to impose ban on plastic waste imports

Benefit of importing plastic waste

- Boom in China's recycling trade on plastics and such plastic feed stocks would serve as a cheaper source of inputs for manufacturing cheap clothing and other synthetic goods (Extract 2) → higher revenue for producers in both recycling and its related goods industries
- Positive impact on economic growth

Cost incurred by the recycling firms and its related industries

- Cost of imported plastic waste as raw materials for recycling firms
- Cost of recycled plastic waste as raw materials for manufacturers
- Negative externalities of accumulation of plastic waste and improper handling of trash → pollution in the ocean → damage to marine ecosystems and could also cause harm to human's health when we ingest microplastics (Extract 1 and 4)

Part 2: Comment on whether such a ban will lead to a more efficient allocation of resources in the world market of plastic

Such a ban could lead to more efficient allocation of resources in the world market for plastics

Waste producing countries have to find ways to cut down on plastic waste □ reducing consumption of plastic from market quantity (Q_m) towards socially optimal level (Q_s) in these countries → allocation of resources in world market of plastic becomes more efficient.

Such a ban diverts plastic waste to other countries such as SEA countries, where there are reports of spikes in waste imports

Conclusion

It will eventually result in more efficient allocation as “Other countries cannot fill the void left by China”. As such, other countries may also implement ban as it is not sustainable. In the long term, the problem has to be solved at source. Rather than looking for the next place to dump waste, advanced countries should bear the responsibility of cutting on waste generation through sustainable practices.

(e) (i) Define the term ‘opportunity cost’. [1]

The cost of a decision in terms of the next best alternative forgone.

(ii) Explain, using a production possibility curve diagram, why increasing opportunity cost may occur when additional land is used for landfills rather than productive purpose and comment on whether Singapore government should allocate more land for landfills. [8]

Part 1: Explain why increasing opportunity cost may occur

[Draw diagram]

The resources used to convert land for landfills and productive purpose are labour and capital. If resources are fully utilised, as we increase the land area for landfills, accounting for greater output for landfills, we will have to transfer resources out from the landfills to productive purpose, decreasing output generated from productive purpose.

In this case, the opportunity cost of using land for landfills would be increasing as the resources are not homogenous.

Part 2: Comment on whether Singapore government should allocate more land for landfills

Singapore government could allocate more land for landfills

- There is increase in waste generation caused by population and economic growth → Semakau Island is likely to be filled by year 2045 or earlier.

May not allocate more land (Choose 1 of the points)

- Singapore has limited land space, use of land for landfills will incur high opportunity cost in terms of loss of economic output (if land is used for productive purpose) → adversely affect actual growth and potential growth
- From Extract 1 and Figure 1+ Table 1, it is shown that high income countries tend to have better waste management as they have resources to do so. In Singapore, research grants for companies and organizations are given by government to develop sustainable waste management technologies, and planned to make it mandatory for large generators of packaging waste to report the types and quantities they use and their reduction plans by 2021.

Conclusion

Government should not allocate more land for waste disposal to ensure a sustainable waste management. Singapore government can generate alternative innovative ways to dispose waste + measures to cut waste to overcome the land constraint.

(f) Discuss whether it would be more effective for the government to provide subsidies to encourage recycling or ban single-use plastics to address ocean plastic waste pollution. [12]

Introduction

1. Explain how subsidies work to encourage recycling in order to address plastic waste pollution + Limitations

Price of recycled materials are too low → not profitable and insufficient funds for R&D. Hence, there is a need for government to intervene.

Government subsidies reduces unit cost of production for recycling firms to undertake R&D. For e.g. Singapore government offered research grants for companies to do R&D on sustainable waste management, others could include newer types of plastic that is more easily recycled OR built better recycling infrastructures that could adapt to newer types of plastics.

[Draw Diagram]

This reduces EMC generated in the market for plastic (context of negative externalities from consumption of plastic) → Shifts SMC downwards to SMC' → the gap between market equilibrium quantity and socially optimal level of quantity is reduced from $(Q_m - Q_s)$ to $(Q_m - Q_s')$

Outcome:

- Less inefficient allocation of resources in the market for plastics
- Reduced deadweight loss from Area ABC to AB'C'
- Lesser plastics production and consumption of plastics results in lesser ocean waste pollution

OR

Recycling generates positive externalities in the form of reduced pollution and 3rd parties can benefit from cleaner environment and hence better health. Subsidies (= EMB at Q_s) reduces unit cost of production of recycling i.e. PMC in the market for recycling from PMC to PMC-subsidy. New market equilibrium quantity is now at $PMB = PMC - \text{subsidy}$, which coincides with socially optimal equilibrium level of quantity of recycling.

Outcome:

- Efficient allocation of resources in the market for recycling as Q_m increases to Q_s
- Eliminated deadweight loss of Area ABC
- More recycling means Lesser plastics production and consumption of plastics results in lesser ocean waste pollution

Limitations:

- Extract 1 states that there is huge amount of plastic waste that cannot be recycled (only 9%).
- Costly – strain on government's budget (can see from Table 1 that plastic waste mismanagement is typically higher in less developed countries)
- Imperfect information on the amount of subsidy

2. Explain how ban on single use plastics work to address plastic waste pollution + Limitations

Explain total ban with diagram on the market on single use plastic □ show less DWL with total ban.

Limitations:

Single use plastic like straws and plastic bags only account for less than 1 % of ocean plastic → total ban does little to reduce ocean pollution

Furthermore, it could result in consumers using an alternative that could bring about other forms of negative externalities

Conclusion

- The more effective solution is one that is more sustainable in reducing plastic ocean.
- Banning single use plastic is just a short-term measure and it is largely insufficient to curb ocean pollution.
- Currently only 9% of plastic waste are recycled.
- Provision of subsidies to encourage recycling through improvement in R&D and waste management technologies would be more effective than ban on single use plastics.