

ECN 362 — Homework #4 (Due 8 Apr 2014 on Canvas)

Read this article: <http://tinyurl.com/m4kc4z8><sup>1</sup>

1. Go here (<http://www.eia.gov/cfapps/ipdbproject/iedindex3.cfm?tid=90&pid=44&aid=8>) and look up TOTAL CO<sub>2</sub> emissions (million metric tons, mmt) for Canada and China in 2011 and 2001. (Ignore decimals! Do not round)
  - (a) List mmt emissions for both years for both countries.
  - (b) Has the *total* gone up or down in the past decade for Canada? China?

**Answers (1 point):**

Canada: CO<sub>2</sub> emissions went from 561 mmt in 2001 to 552 mmt in 2011. Down.

China: CO<sub>2</sub> emissions went from 3,353 mmt in 2001 to 8,715 mmt in 2011. Up.

2. From the same place, look up 2011 CO<sub>2</sub> emissions from
  - (a) Coal for Canada and China in mmt AND % of 2011 totals from (1a).
  - (b) Petroleum for Canada and China in mmt AND % of 2011 totals from (1a).

**Answers (1 point):**

Canada: 91 mmt from coal (16%) and 284 mmt from petroleum (51%) in 2011

China: 7,178 mmt from coal (82%) and 1,279 mmt from petroleum (15%) in 2011

3. Scientists recommend zero emissions of GHGs by 2050 to prevent dangerous climate change (<http://tinyurl.com/lekfg24>). Let's target a 40% emissions reduction in both China and Canada in ten years. Let's *assume* that elasticity over a ten-year period is -0.5 for BOTH coal and oil in both countries.<sup>2</sup> Now go to <http://www.eia.gov/countries/index.cfm?view=consumption> for 2012 oil and <http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=5&pid=5&aid=2> for 2011 coal, to look up consumption of
  - (a) 2011 Coal (thousand short tons, tst) in Canada and China.
  - (b) 2012 Oil (millions barrels/day, mbd) in Canada and China.

**Answers (1 point):**

Coal in 2011: Canada and China consumed 47,123 and 3,826,869 tst, respectively

Oil in 2012: Canada and China consumed 2.3 and 10.3 mbd, respectively

4. Using a 2011 price of \$37/short ton for coal and \$87 per barrel for oil, calculate:
  - (a) Using a -0.5 elasticity, how big should an “extra carbon tax” (ECT) be if it is going to reduce quantity demanded by 40 percent over 10 years for coal and oil in each country? Ignore inflation, the fact that this is a point elasticity estimate, and existing taxes.

**Answer (1 point):** -0.5 elasticity means 80 percent price increase for coal or petroleum, i.e., \$37 to \$66.60 and \$87 to \$156.60. The tax is implemented in year 1 and held in place for all 10 years. (Note: The tax percentage will not change from 80%, but the tax price will rise and fall as energy prices rise and fall.)

---

<sup>1</sup>No articles mentioned on this HW will be on the exam, BUT the ideas will!

<sup>2</sup>According to <http://www.inderscience.com/info/inarticle.php?artid=27645>, coal price elasticity in China is -1.1 in the long run and nearly 0 in the short run. NB: I've switched from petroleum for convenience

- (b) (You may want to use a spreadsheet for the following questions...) According to CBC (<http://tinyurl.com/ku67j28>), about 30% of the \$1.30/liter price of gasoline in Canada is from taxes and 50% is from the price of crude oil. What would the price of **gasoline** be if the price of **oil** was *increased* by the ECT you found in 4(a)?

**Answer (1 point):** \$1.30 has \$0.65 from oil. Add 80% of that (\$0.52) as an additional tax, to get a price of \$1.82/liter

- (c) How much revenue will the ECT generate in the first and last year of this program for the Canadian and Chinese governments? Use 2011 consumption levels for first year consumption. Assume that 10th year consumption is 40 percent lower than first year consumption. Calculate ECT-revenues using the SAME pre-tax prices for oil and coal in year 1 and year 10. You will get four values for revenues in Canada and China in year 1 and revenues in year 10.

**Answers (1 point):** Revenue from taxes in year 1 for Canada:  $47,123 \text{ tst} \times \text{tax of } (\$37 \times 0.8) + 2.3 \text{ mbd} \times 365 \times \text{tax of } (\$87 \times 0.8) = \$1.395 + \$58.429 = \$59.824 \text{ billion}$

Revenue from taxes in year 1 for China: \$374,937 billion

Revenue from taxes in year 10 for Canada: \$35,894 billion (60% of 59.824 billion)

Revenue from taxes in year 10 for China:  $(3,826,869 \text{ tst} \times 0.6) \times \text{tax } (\$37 \times 0.8) + (10.3 \text{ mbd} \times 0.6) \times 365 \times \text{tax } (\$87 \times 0.8) = \$67,965 + \$156,997 = \$224,962 \text{ billion}$

- (d) How much will **each** Canadian citizen receive if ALL first year ECT revenues are rebated to citizens (assume 30 million people)?

**Answer (1 point):** \$59.824 billion / 30 million = \$1,994 per Canadian

- (e) How much will **each** Chinese citizen receive if ALL first year ECT revenues are rebated to citizens (assume 1.3 billion people)?

**Answer (1 point):** \$113,294 billion / 1.3 billion = \$288 per Chinese

5. Assume you are a citizen of Canada or China (choose one). Would you (as a person, not a country) support this tax as a consumer (who pays for energy) and citizen (who experiences climate change and local pollution)? Why?

**Answer (2 points):** As a citizen, you should be happy to solve the collective action problem and address climate change. As a consumer, you will be happy if you expect to get a larger rebate than you spend on energy. You may be sad if you are a big consumer. Many answers are possible here.