

## Resource Endowments, Incentives and Footprints

We respond to the incentives we face or perceive when making consumption and production decisions. Preferences, habit, peer pressure, laws and regulations, infrastructure availability and other factors influence us as well, but given a bit of time we drive less, walk and bike more, buy less petrol if price doubles. Prices for goods and services often provide the most obvious incentives we face when making consumption and production decisions. Prices are often but not always determined by markets. Many 'prices' are established administratively – school fees, pharmaceuticals charges, water charges. Government's often have a major role influencing prices we face – taxes on petrol and diesel, subsidies on dental care for minors, subsidies on medical care for people of all ages, free entry to National Parks and to Te Papa Tongarewa.

If we have options over how much of each good or service to use in production or consumption, a low price or zero price will encourage us to use items plentifully. This obvious idea is echoed in an economic theory that attempts to explain what items countries will produce and export to each other. Eli Hecksher and Bertil Ohlin argued that countries differ in the relative availability of resources they have within their borders such as land, labour and capital, and this will influence the types of goods they produce, and their cost of production. Their theory also says that countries will export products that use heavily inputs that are relatively plentiful within their country, and import products that use heavily inputs that are relatively plentiful in the trade partner country.

A country that has low population density has relatively more land than does a densely populated country, and it is likely to have lower land prices and lower cost production of land intensive goods. Australia, Canada, New Zealand, Norway are four such countries. All four are ranked below 200<sup>th</sup> position on the list of human population density per country. All are renowned as producers and exporters of land intensive products. Singapore, Netherlands, South Korea, Bangladesh are all in the top 25 for human population density per country. Their resource endowments per capita lead them toward production of capital and labour intensive goods.

The recent announcement that *New Zealand's ecological footprint is the sixth largest in the world* is inaccurate as the words *per capita* are missing from the headline. Equally inaccurate headlines and sound bites have been used to introduce the news item in Australia which is fifth on the list for Ecological Footprint per capita. The report by WWF, ZSL and GFN (2008) lists Australia, Canada, New Zealand, Norway at 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup>, 8<sup>th</sup> on size of their ecological footprint per capita. Singapore, Netherlands, South Korea, Bangladesh are ranked 31<sup>st</sup>, 32<sup>nd</sup>, 37<sup>th</sup>, 143<sup>rd</sup> on the same list. The ideas in the preceding paragraphs of this article provide some insight when reflecting on why New Zealand and Australia are listed as ecological villains. Both countries have plenty of land, and use it to generate income.

Missing from the headlines and sound bites is corresponding information on the amount of land per person in each country. The WWF *et al.* (2008) report includes data on 'biocapacity per person by country'. Near the head of the biocapacity per person list are: Canada 2<sup>nd</sup>, Australia 4<sup>th</sup>, New Zealand 6<sup>th</sup>, Norway 21<sup>st</sup>. The first three named have greater biocapacity per capita than their ecological footprint per capita. In Norway the two measures are about equal. At the other end of that list are: Netherlands 104<sup>th</sup>, South Korea 127<sup>th</sup>, Bangladesh 150<sup>th</sup>, Singapore 151<sup>st</sup>. All of these four countries have less biocapacity per capita than their ecological footprint per capita.

Ecological Footprints claim to measure the amount of biologically productive land and water required to produce the goods and services we consume and to absorb the wastes it generates given prevailing technology and resource management. Do Ecological Footprints provide information that is useful for environmental professionals? I have puzzled over that question since being a member of the first group of researchers to calculate an Ecological Footprint for New Zealand, Bicknell *et al.*, (1998). In that research we struggled to develop a defensible way to calculate with tolerable accuracy how much land was used to support New Zealand's consumption and waste absorption. Input output analysis was used for the first time in those EF calculations. Our approach differs somewhat from that of WWF *et al.* as we strove to calculate real measure of land required based on New Zealand technology and resource management. The EF hectares quoted in WWF *et al.*, and many other EF calculations are global hectares, based on global average technology and resource management. The WWF *et al.*, EF per capita are hypothetical numbers.

How useful are hypothetical numbers? If we think of the well known Pressure, State Response trio, where do EF fit in? My view is that EF are most like a pressure indicator and EF proponents do talk in terms of 'the pressure on the land.' Do EF and EF per capita provide real insights about the amount of pressure we are applying to the biosphere? EF are estimated per capita, per city, per country, globally. Would we be usefully informed if we are told that Auckland or Christchurch has an EF that is greater than the area within their city boundaries? It's not clear that information is valuable as it's obvious that cities are high population density areas and city dwellers consume many goods that are produced elsewhere. For a city state such as Singapore, or densely populated countries, the same reasoning applies. EF are static (hypothetical) measures. That does not sound a strong basis on which to make claims about how many planets are needed to sustain consumption and waste absorption. A recent article by Nathan Fiala (2008) provides several more reasons to be cautious about the usefulness of EF as measures of sustainability.

Returning to the ideas discussed at the beginning of this article, it may be more useful to focus on the incentives producers and consumers face rather than dwelling on EF or EF per capita. If there are very low, or zero prices for some inputs (use of airways, stratosphere, piped water in Christchurch, water for irrigation) we should not be surprised if they are used until the marginal benefit from the last unit is close to zero. What policy changes are worth arguing for to provide resource users greater incentives to use resources more carefully?

## References

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