

A (short) Primer on Environmental Economics

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Prevalent myths about how economists think about the environment

- 1) Economists believe the market solves all problems.
- 2) Economists always believe creating a market (or restructuring a market) is the solution when markets are missing.
- 3) Economists only focus on market prices – the “market value” of resources/environment.
- 4) Efficiency is all that economists are concerned with.

1) Economists believe the market solves all problems.

- True... sort of.
- Markets can be perfectly efficient in theory.

A definition of efficiency: an efficient outcome is one in which the maximum *net benefits* (= benefits minus costs) are achieved from an allocation of resources. **All** benefits. **All** costs.

- For markets to be efficient there cannot be any “distortions”:
 - » No externalities
 - » No monopolists
 - » No information problems
 - » No transactions costs
 - » No distortionary taxes
- At least one of the above is present when we consider the interaction between humans and the environment.

- When “distortions” are present, market prices will not fully reflect true benefits and costs of consumption and production.
- Markets will also not result in resources being allocated in an efficient manner (in other words, net benefits are not maximized).
- I will refer to this as “market failure” – economics jargon – please do not think: Lehman Brothers collapsing or the stock market crash!

- Environmental economics is fundamentally the study of markets when there are distortions.
- In the human/environment interface, a common distortion that is present is externalities.
 - Externalities: my action affects others' production or consumption or well-being, yet I do not (fully) include these effects in my decision calculus.

Classic externality generating activity: Driving your car

- Raleigh-Cary (2005):
 - 30.7 million vehicle miles traveled (VMT) / day
 - Earth diameter \approx 8,000 miles (3,800 trips/day)
 - Distance to sun \approx 93 million miles (3 day trip)
 - Atlanta: 152 million VMT/day
 - 673 million gallons of fuel per year
 - 1.67 million metric tons of carbon emitted per year

What is the cost of driving?

- Private costs:
 - Gas, maintenance, insurance, etc.

What is the cost of driving?

- Private costs:
 - Gas, maintenance, insurance, etc.
- External costs:
 - Crashes
 - Congestion
 - Air pollution
 - Noise pollution

Quantifying the costs... **all costs.**

- In 2000, 231 million autos/vans/pickups were estimated to have driven 2.5 trillion miles.

- Private Costs?
 - Estimated to be \$0.53 per mile or \$1.3 trillion.

Quantifying the costs, continued.

■ External Costs?

– Congestion:

- » 75 urban areas: 3.6 billion hours of delay,
5.7 billion gallons of wasted fuel.
- » Total cost: \$68 billion
- » Privately borne amount: \$62.5 billion
- » External cost: \$5.5 billion

Quantifying the costs, continued

■ External Costs?

– Crashes:

- » 13.8 million accidents killed 43,000 people
- » Estimated total cost: \$334.7 billion
- » Insurance payout: \$108.4 billion
- » Estimated external cost (cost not borne directly by drivers): **\$226.3 billion**

Quantifying the costs, continued.

- External Costs?
 - Air pollution:
 - » Pure externality
 - » Estimated cost: **\$40.2 billion**
 - Noise pollution:
 - » Pure externality
 - » Estimated cost: **\$4.5 billion**

Full Cost Pricing

- Total costs?
 - Private costs:
 - » \$1.3 trillion or \$0.53 per mile
 - External costs:
 - » \$276.5 billion or about \$0.11 per mile.
- ***Full-cost pricing*** of a mile driven: \$0.64/mile.
- How to get there?
 - Add external cost to the price of a gallon of gas.

Full Cost Pricing Example

- Assume 21 mpg average for fleet => the external cost of a gallon of gas is \$2.30.
- In 2000, price of a gallon of gas was \$1.50 to \$1.75.
- Full cost pricing would imply a gallon of gas would cost \$3.80 to \$4.05.

Full Cost Pricing Example

- Adjusted for inflation, the external cost would be \$2.90/gallon today.
 - (More recent work suggests around \$2/gallon)

- Today's prices around \$2.50/gallon

- Full cost of a gallon today: \$5.40.

What to take away?

- Total costs of production are higher than private costs of production when an externality is present.
- Market prices will reflect only private costs of production
- Prices will be too low (relative to efficient level)
- Quantity produced (and consumed) will be too much (relative to efficient level).

What to take away?

- Do not take the exact numbers!
 - (go to original sources – most available on-line)
- Take away the principles:
 - When externalities are present markets are inefficient (fail to maximize net benefits)
 - Prices will be too low, quantity produced and consumed too high (relative to efficient amount)

What to take away?

- Take the principles, contd.:
 - External costs **can be quantified**
 - » (hire your favorite local environmental economist!)
 - Role for market-based policy.
 - » Pricing (taxes)
 - » Tradeable property rights
 - Get the prices right!

What to take away?

- Take the principles, contd.:
 - Benefit/cost analysis is very useful tool
 - Critical is that it include **all** benefits and **all** costs
 - Observable market prices (costs or revenues) can be a small component of true benefits/costs.

Other Examples

(being green can be tricky!)

■ Recycling

- Benefits: reduce use of virgin material; reduce waste that must be disposed.
- Always best choice?
- Full cost accounting considers entire life-cycle and all benefits/costs.

Recycling contd.

- Paper vs. polystyrene in disposal drink cups?
 - Paper is recyclable; polystyrene is not.
 - Paper cups made from bleached wood pulp – a resource-intensive activity (chemical, water, air, waste, forest system impacts)
 - Polyst. made from petroleum.
 - Life cycle impacts?

Recycling contd.

- Production of a paper cup as compared to polystyrene cup uses:
 - 6 times more raw material
 - 33 times more chemicals
 - 36 times as much electricity
 - 580 times more water (wood pulp production)
 - Produces 2.6 times as much air pollution

Recycling contd.

- Recyclability?
 - Paper cups only recyclable if do not have “hot melt” (stuff that makes them OK to hold hot liquids)
 - If covered in wax, not recyclable.
- Weight in transportation?
 - Paper is heavier, more costly to transport.
- Landfill properties?
 - Polystyrene is inert
 - Paper theoretically biodegradable

Thank you.

Back to Myths...

- 2) Economists always believe creating a market (or restructuring a market) is the solution when markets are missing.
- This refers to the creation of **tradable permits** (cap-and-trade) and environmental **taxes**.
 - Yes... but conditions aren't always present that would allow markets to be successful
 - » Ex: Enforceable property rights and carbon trading across countries.

- 3) Economists only focus on market prices – the “market value” of resources/environment.
- Yes and no.
 - For policy analysis, benefits & costs must be quantified.
 - Market prices represent a **small fraction of the benefits/costs we try to quantify**
 - And **non-use values** (existence values, bequest values, option values) have long been recognized & quantified

- Benefit/cost analysis is a powerful tool – but **all** benefits and **all** costs should be considered (monetized) to the fullest extent possible.
- Even if not possible to monetize, consider the hidden (usually external) costs/benefits.

- 4) Efficiency is all that economists are concerned with.
- No.
 - Start with efficiency, then consider distributional impacts.
 - Distributional impacts are important to consider, but tend to be normative analyses. Efficiency tends to be a positive analysis.
 - » Positive analysis: “what is”. Example of a positive statement: The unemployment rate is 7%.
 - » Normative analysis: “what ought to be”. Example of a normative statement: The unemployment rate is too high.

Thank you again.