Conceptual thoughts on Essential and Non-essential uses

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"A critical review of the [Montreal] Protocol's history, however, suggests that its successes are deeply entrenched in the economic opportunities that were made available to phase out CFCs. The Montreal Protocol, in other words, was a "best-case scenario" for CFC producers. This may be problematic for policymakers, ecological modernization practitioners, and other scholars who look to the Montreal Protocol for guidance in phasing out other global environmentally harmful substances and practices that are not as "economically efficient."

—Gareau (2010)

Setting the scene

- Essential uses first defined in the Montreal Protocol
- At the time the MP was designed:
  - ✓ scientific agreement on harmfulness of ODS was incomplete but parties were aware of the risks (Norman et al. 2008)
  - ✓ even non-ratifiers cut back, suggesting that MP was institutionalisation of a first best (Murdoch & Sandler 1997)
  - ✓ alternatives were available providing an economic rationale for phase out (Gareau 2010)
  - ✓ "critical uses" got exempted (DiCanio & Norman 2005) indicating disagreement about the applicability of EsU criteria
  - ✓ substitution costs were relatively predictable (Hammitt 2005)

Original criteria

- Essential uses defined in Decision IV/25:

  "[A] use of a controlled substance should qualify as "essential" only if:

  - it is necessary for the health, safety or is critical for the functioning of society (encompassing cultural and intellectual aspects); and
  - there are no available technically and economically feasible alternatives or substitutes that are acceptable from the standpoint of environment and health"

- Critical use exemptions defined in Decision VII/29:

  "In recommending suitable modalities and criteria, the Technology and Economic Assessment Panel may take into consideration:

  - Whether alternative practices or substitutes exist that are commercially available and efficacious;
  - The relative costs and benefit of alternative practices and substitutes to allow the Parties to assess their economic viability taking into account the scale of application and the individual circumstances of particular uses;
  - Whether a Party has demonstrated that all economically feasible actions are being taken to minimize use and any associated emissions from the approved exemption, and that continued efforts are being made to evaluate and develop alternatives […];
  - The feasibility of placing a cap on the total percentage of baseline production and consumption permitted under an essential use for any particular country; and
  - A range of alternative decision-making and implementation processes."

Transferring these criteria to chemicals

- Several noteworthy differences b/ ODS and other substances:
  - ✓ Scientific agreement on harmfulness of substances may be larger or smaller than for ODS depending on the substance
  - ✓ Short-term harm likely to be smaller than that of ODS (ozone depletion → strong impact on health)
  - ✓ Long-term harm often uncertain or completely unknown
  - ✓ Risk may be less substance and more use-specific
  - ✓ Alternatives may not be available for some uses
- However, criteria are transferable to a conceptual EsU model

Primitives of the conceptual model

- Consider a market with:
  - ✓ $i = 1, \ldots, n$ sellers: normally firms producing goods
  - ✓ $j = 1, \ldots, m$ buyers: consumers, patients, firms, etc.
  - ✓ $k = 1, \ldots, o$ third parties affected by externalities
  - ✓ There might be overlap (e.g. j can be a buyer and a 3rd party)
  - ✓ There might be unaffected parties for whom nothing changes when moving from the unregulated to the regulated state
  - ✓ Primes (') indicate that regulation has kicked in

Conceptual model: sellers

- Regulatory impact on sellers:
  - ✓ Before regulation, sellers (incl. those not using the substance) are characterized by the set of producer surpluses $\langle s_1, \dots, s_n \rangle$
  - ✓ Regulation changes the surpluses made to $\langle s'_1, \dots, s'_n \rangle$
  - ✓ The regulatory impact on seller i is given by $\Delta s_i = s_i - s'_i$
  - ✓ Total producer surplus change is given as $\Delta S = \sum_i \Delta s_i$
  - ✓ We are agnostic about who earns a surplus, i.e. if only two sellers, *a* and *b*, are affected and $s_a + s_b = s'_a + s'_b \rightarrow \Delta S = 0$

Conceptual model: buyers

- Regulatory impact on buyers:
  - ✓ Before regulation, buyers are characterized by the set of consumer surpluses $\langle b_1, \dots, b_m \rangle$
  - ✓ Importantly, buyers are not necessarily "consuming" trivial goods (could be a cancer drug, or a critical airplane part)
  - ✓ Regulation changes the surpluses made to $\langle b'_1, \dots, b'_m \rangle$
  - ✓ The regulatory impact on buyer j is given by $\Delta b_j = b_j - b'_j$, i.e. there can be spill overs via price changes
  - ✓ Total consumer surplus change is given as $\Delta B = \sum_j \Delta b_j$

Conceptual model: externalities

- Regulatory impact on externalities:
  - ✓ Before regulation, 3rd parties are characterized by the set of externalities $\langle e_1, \ldots, e_o \rangle$ imposed by the use of the substance
  - ✓ Regulation changes these externalities to $\langle e'_1, \ldots, e'_o \rangle$
  - ✓ Regulatory impact on externalities is given by $\Delta E = \sum_k e_k - e'_k$
  - ✓ Importantly, the regulation may not eradicate risk, e.g. when a substance is replaced by a safer but not benign alternative

Conceptual model: aggregate impact

- Total welfare impact of regulation:
  Δ sellers + Δ buyers + Δ externalities
- Hence, any Pareto improving regulation fulfils: $\Delta S + \Delta B + \Delta E \geq 0$
- What do EsU criteria mean in this context:
  - ✓ necessary for health, safety or critical for society
    → buyers stand to lose a lot, meaning ΔB is large
  - ✓ no technically and economically feasible alternatives available
    → sellers stand to lose, meaning ΔS is sizeable
  - ✓ substitutes are not acceptable from the standpoint of environment and health
    → substitution would be ineffective, meaning ΔE is small

Conceptual model: implications

- A natural definition of ***non-essential*** uses is thus:

$$\Delta \text{ externalities} \geq \Delta \text{ sellers} + \Delta \text{ buyers}$$

meaning that regulating is Pareto optimal.

- A natural definition of ***essential*** uses is thus:

$$\Delta \text{ sellers} + \Delta \text{ buyers} \gg \Delta \text{ externalities}$$

meaning that regulating is not Pareto optimal.

- In between, you have situations where:

$$\Delta \text{ sellers} + \Delta \text{ buyers} > \Delta \text{ externalities}$$

meaning that ***critical*** use exemptions might apply, i.e. a phase out should be smoothened to minimize cost of substitution.

Conclusions

- Economics offers a clear logic for defining essential and non-essential uses
- For certain uses, critical use exemptions may be considered (just like in derogations from REACH restrictions or REACH authorisations)
- SEA as currently applied under REACH can already account for essentiality of uses
- Quantitative or qualitative impact assessment may inform policy makers whether a use is essential, non-essential, critical
- …but policy makers need to decide in the end how they value the different elements.

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