FSR Climate Annual Conference 2019
EUI, Badia Fiesolana, 28 November 2019

The More the Merrier? Potential and Pitfalls of Instrument Combinations in Climate Policy

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Introduction

- Most economic analysis of using taxes and regulations to control externalities considers them as alternatives.
- Taxes, emissions trading and other "economic instruments" are preferred to "command-and-control" regulation because they offer cost-reducing flexibility.

- In practice, many countries' environmental policies make use of multiple instruments simultaneously.

- We need to know more about what happens when instruments are used together.
  - When can instrument combinations achieve more than a single, optimally-set instrument?
  - What problems can arise when instruments are combined?

When policy instruments are used together….

…the results can be unexpected

- an instrument which is effective when used alone can become ineffective when used in combination
  - *eg a subsidy to energy efficiency investments, combined with energy emissions trading.*

- an instrument which is *in*effective when used alone can become powerful when used in combination
  - *eg a percentage subsidy to the cost of emissions abatement equipment, combined with an emissions tax.*

There's little theory of multi-instrument regulation

- Price and quantity regulation under uncertainty
  - Roberts and Spence (1976)
  - *One instrument acts as a safety valve for possible ex post inefficiency of the other*
  - *This literature assumes inability to make policy adjustments in the light of experience, but doesn't explain why.*

- Instrument combinations with multiple objectives
  - Tinbergen principle
    - *As many instruments as objectives*
  - Papers by Don Fullerton and Anne Wolverton
    - *Multi-part instruments, in which tax plus subsidy combined to achieve better outcome than either alone.*
    - *Various applications – eg waste management, road transport*
    - *Typically problems with multiple objectives / constraints (eg to encourage reductions in household garbage, without stimulating additional unregulated disposal / dumping)*

Instrument imperfection

- Imperfect externality-correcting taxes
  - Sandmo (EER, 1976),Green and Sheshinski (JPolE, 1976)
    - *Use of excise taxes as a proxy for direct taxation of externality*

- **The static efficiency argument for using taxes rather than regulation is underpinned by implicit assumptions about instrument imperfection.**
  - *Under conditions of full information, costless implementation and certainty, an equivalent first-best outcome can be achieved by either command-and-control regulation or a market mechanism.*
  - *Information costs and asymmetries are central to the instrument choice debate.*
  - *If abatement costs are private information, C&C regulation may be compelled to treat firms the same when in fact they differ, while economic instruments allow for differential responses.*

In one strand of work....

…. jointly with Vidar Christiansen (University of Oslo)….

- we consider the case for combined use of taxes and regulation

  …. in conditions where both instruments are in some way imperfect.

- For example, some European countries levy high taxes on motor fuel to discourage excessive motoring externalities
- ….. and also have various regulations (on vehicle emissions, performance, driving speeds, vehicle access to certain areas, parking restrictions, etc).

- Why are both taxes and regulation needed, and how do they interact?

- eg: When we ban diesel cars from city centres, does this *reduce* the optimal externality tax on diesel fuel?

Basic framework

- We look at combined use of "imperfect" taxes and regulation to address simple externality problems
  - ….in the form of consumption externalities generated by individual consumption behaviour.
  - *Confine attention to conditions of certainty*
  - *Purpose of externality taxation is only to correct the externality*
- Various forms of imperfection in taxes and regulation
- **Imperfect tax differentiation**:
- We can tax a good associated with an externality, but the extent of the externality varies between consumers
- **Imperfect regulation**
- We represent consumption regulation as increasing the real cost of acquisition, or lowering the quality of the commodity consumed.
  - *Limits on permitted sellers or hours of sale (inconvenience costs)*
  - *Restrictions on where and when goods can be consumed (smoking in public places, driving in certain streets, etc)*
  - *Key characteristic is that restrictions inflict real costs*
- We also consider the case where regulation takes the form of an outright ban
  - *Easier to enforce zero activity than any other level.*

Some results

- Where a Pigouvian tax is supplemented by regulation it is the consumption causing the larger marginal external cost that should be regulated.

- How does regulation affect the level at which the tax should be set?
- In many cases, stricter regulation will lower the tax rate that should be set. But not always.
- Where the two activities are substitutes, it is possible that the tax should increase when regulation is tightened…
  - … if aggregate marginal external costs increase because substitution towards the unregulated consumption drives up its marginal external cost substantially, or
  - … if regulation makes the consumption with the larger external cost more price-sensitive.

Economics of a ban

- Banning an externality-generating activity has three effects:
  1. Eliminates the external cost generated by that activity
  2. Allows the tax to be set so that the external cost from the other activity is fully internalised
  3. Loss of consumer surplus (net of external cost) from the banned activity.

- If #3 is large enough it could exceed the gain from the first two effects
- Even if activity A causes a larger externality per unit than activity B, we should ban the activity for which total external cost exceeds total consumer surplus.
- A soft regulation will always target the activity with the larger marginal external cost. This need not be the case with a ban. Sometimes it could be more efficient to ban the less-damaging activity.

Another strand of work…

- Environmental regulation under uncertainty.
- Roberts and Spence (1976): combined use of two instruments can mitigate the potentially-extreme ex post inefficiencies from using a single instrument (price or quantity regulation).

- Clearer characterisation of uncertainties and asymmetries, and the constraints these impose on regulation.
- Uncertainty represented as uncertainty about future prices. This affects future cost of abatement through output reduction (more costly with higher future prices).
- Firms invest in (irreversible) abatement technology, and make subsequent output decision.
  - Both firms and government face uncertainty when long term abatement decisions are made.
  - But firms then make output decision after uncertainty is resolved.

Key result

- In deterministic cases, efficient policy requires an emissions tax set at the level of marginal damage cost
- In our model, an emissions tax set at the level of expected marginal damage will be *ex post* inefficient
- It will provide insufficient incentive for abatement in states of the world where emissions and damage are high.

- Ideally we need an instrument mix which encourages additional abatement in states of the world where damage is high.
  - Tax plus regulation
  - Tax plus abatement –cost subsidy.

Implications for practical policy

- The case for multi-instrument regulation needs to be made, rather than assumed.
- All instruments are costly to operate – for the regulator and for the polluter. So the presumption should be against multi-instrument regulation.
- Multi-instrument regulation can be justified where one instrument can be deployed to offset another's weakness
- But this requires clear identification of a problem, and an appropriate solution.
- Optimal instrument combinations may be counter-intuitive, which makes optimal policy difficult to design and to maintain.