Be Careful What You Wish For – Lessons from U.S. Cap-and-Trade Experience

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The European Union Emissions Trading System (EU ETS) – Taking Stock, Looking Forward: Options for Reform

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U.S. Experience with Cap-and-Trade Policies

- Leaded Gasoline Phasedown (1982-1987)
- SO_2 Allowance Trading, CAAA of 1990 (1995-2010)
- Regional Greenhouse Gas Initiative, RGGI (2009-2019)
- California's AB-32 GHG Cap-and-Trade System (2013-2020)

Leaded Gasoline Phasedown

- Basics
  - Lead content of gasoline reduced to *10%* of previous level
  - *Refinery trading* of lead credits began in 1982; *banking* began in 1985
- Performance
  - Each year more than *60%* of lead added to gasoline associated with traded credits
  - Leaded gasoline *phased out* of market by 1987, *faster* than anticipated
  - Cost savings about *$250 million/year* (about 25%)
  - Measurable *incentives for technology diffusion*

Leaded Gasoline Phasedown – Lessons

- A cap-and-trade system *can be* environmentally effective and economically cost-effective
- Transaction costs trivial with *homogeneous* compliance entities
- Banking *very* important
- Leakage *non-existent* due to national scope & nature of market
- International competitiveness *not an issue* (nature of market)

SO_2 Allowance Trading Program (CAAA of 1990)

- **Basics**
  - Declining cap cut SO_2 emissions by 50% (10 million tons) below 1980 by 2000
  - Free Allowance Allocation
    - *Not auctioned* (no revenue to cut distortionary taxes, reduce cost of program)
    - Freely allocated allowances addressed distributional concerns & *built political support*

- **Performance**
  - Environmentally effective
    - Achieved and exceeded targets more quickly than expected
    - Compliance near 100% ($2000/ton statutory fine & CEM)
  - Costs savings significant
    - Savings between 15% and 90% (depends upon chosen counterfactual)
    - Program brought down abatement costs over time via incentives for innovation & diffusion

SO_2 Allowance Trading Program – Lessons

- Banking was extremely important in terms of cost-effectiveness
- Low transaction costs (*somewhat* homogeneous compliance entities)
- Free allocation fostered political support
  - Free allocation can be used to address issues of "distributional equity"
  - Despite the fact that this forgoes auction revenue that could be used to lower social costs of the policy by cutting distortionary taxes
- Other laws & regulations can (unintentionally) nullify a trading program (Clean Air Interstate Rule & subsequent litigation)

Regional Greenhouse Gas Initiative – Basics

- Downstream CO_2 cap-and-trade system for electricity sector in 9 states
- Limits emissions to average of 2002-04 level during period 2009-2014
- States must auction 25% of allowances, but trending towards 100% auction
- Price ceiling: *Cost Containment Reserve* releases additional allowances for sale if auction price hits specified, escalating prices (expands/loosens cap)
- Price floor: *Auction Reserve Price* creates floor; and unsold allowances at end of 3-year periods may be permanently retired by states, hence a mechanism for automatically tightening cap in face of chronic surplus allowances
- Design – with price collar – is essentially a hybrid of cap-and-trade and tax

Regional Greenhouse Gas Initiative – Performance

- Non-Binding – modest targets, recession, energy conservation, *low gas prices*
- In response, cap lowered by 45% in 2015, then 2.5%/year until 10% cut by 2019 (13% below 1990, 35% below BAU)
- With non-binding cap, no direct emissions impact; allowance price at auction reservation price ($2.00/ton CO_2)
- But auctions (at reserve price) raise considerable revenue for states (> $1 billion)

Regional Greenhouse Gas Initiative – Lessons

- Numerical & geographic offset-use *constraints* rendered offsets *ineffective*
- Changing economy can render a cap *non-binding* or drive prices *too high* → role for price floor & ceiling, i.e., *price collar*
- Downstream system meant *limited economic scope*; also, limited geographic scope and threat of 50% *leakage* (due to interconnected electricity market) →
  - *Modest targets* to keep allowance price down
  - Addressing leakage threat with modest targets *limits leakage*, but *also limits emissions reductions*
  - Free allocation would *not* reduce leakage threat (later)
- *Best* way to address a non-binding cap for the long term is *reducing the cap*

California's Global Warming Solutions Act (2006, AB 32)

- Broad, ambitious policy to cut GHG emissions to 1990 level by 2020
  - Energy efficiency standards for vehicles, buildings, & appliances
  - Renewable portfolio standard (increases from 20% to 33%)
  - Low carbon fuel standard
  - Cap-and-trade system

AB 32 Cap-and-Trade System – Basics

- Cap, covering 85% of economy, declines from 2012 through 2020
- Increasing use of auctions over time
- Price ceiling: *Allowance Price Containment Reserve* releases allowances *from reserve* if auction price hits specified, escalating prices (cap unchanged)
- Price floor: *Auction Reserve Price* creates floor; and unsold allowances held until reserve price exceeded for 6 months to stabilize prices
- Design – with price collar – is essentially a hybrid of cap-and-trade and tax
- Output-based updating allocation used to protect trade-sensitive industries
- Up to 49% of reductions can be from offsets
- Link with Quebec system; others pending

California's AB 32 Cap-and-Trade System – Lessons

- Initial free allocation *fostered political support*
- Economy-wide system *feasible*, and *much more effective* than sectoral
- Price collar *effective* (auction floor price + allowance reserve)
- Free allocation *per se* does *not* affect leakage/competitiveness (inframarginal)
  - But *output-based updating* system makes allocations *marginal*
  - So *reduces competitiveness and leakage risks* for trade-sensitive sectors
  - Profound leakage risks remain for electricity sector due to *contract reshuffling*
  - Ultimately, *only way to eliminate* leakage/competitiveness risk is through broader international coalition of action
- *Linkage* very important, particularly in the *long term*

California's AB 32 Cap-and-Trade System – More Lessons

- Carbon pricing is necessary, but *not* sufficient, due to other market failures
  - Examples include basic R&D and principal-agent problem (buildings)
  - So, specific non-pricing policies *can be* complementary

- But some "complementary policies" *conflict* rather than compliment!
  - *California example* – Low Carbon Fuel Standard, Renewable Electricity Standards
  - *Consequences* of policy for sources *under the cap* of a cap-and-trade system
    - *Achieves no incremental CO_2 emission reductions* –relocates emissions
    - *Drives up abatement costs* (marginal costs not equated)
    - *Suppresses allowance price* (by reducing overall demand for allowances)
  - With carbon taxes, other policies *can achieve* additional reductions (but not c/e)
  - As long as cap-and-trade is employed, many so-called "complementary policies" are *nothing of the kind*!

For More Information

Harvard Project on Climate Agreements
www.belfercenter.org/climate

Harvard Environmental Economics Program
www.hks.harvard.edu/m-rcbg/heep/

Blog – An Economic View of the Environment
www.robertstavinsblog.org/

www.stavins.com