

# Observations on the economics of AB 32

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# Topics

- Background: the limits to price signals in the real world.
- Auctioning allowances
- Offsets

# Preliminary observations

- There should be care in placing too much weight on the conclusions from most existing economic models used to analyze climate change policy – both theoretical and empirical models – because they generally fail to represent the actual behavior of economic agents in some important ways.

# What is missing from the economic theory of the firm?

- Theory treats firms as a single, unified decision maker, with a single objective, profit maximization, typically treated as a static decision.
  - Multiple- decision makers (fuel purchase manager, product design manager, CEO)
  - Different objectives and incentives (principal-agent problem, being green as a marketing tool, etc)

# The limits to price signals

- Economics tends to take preferences and technology as given; focuses on price changes and signals they generate.
- An incentive has to be *visible* to the decision maker (car owner, car manufacturer, etc).
- Not all prices are equally effective. “The carrot has to be in front of the donkey, not behind.”
- Also, in order to prompt a shift in behavior, an incentive has to be *salient* and *meaningful*.

# The importance of salience

- Conventional economic analysis models decision making as a global optimization, with every conceivable option on the table.
- Decision making often has a different structure:
  - Keep doing the same thing, or make a change?
  - If a decision to make a change, there is typically a limited *consideration set*, and a limited attribute set.
  - Salience is a key influence in both regards.
- Hence, behavior changes less continuously and less smoothly than implied by economic models.

- In my experience, non-price attributes can have a larger influence on behavior than prices.
- Direct regulation may dominate price signal in terms of attention and salience.
- Nevertheless, price signals are likely to be an essential *complement* to regulation. But, by themselves, they are likely to be only a weak driver of behavior change.

# Emission trading in theory

- The theory is that emission trading with a cap on aggregate emissions generates price signals which radiate throughout the economy.
- Commodities which are carbon-intensive become more expensive.
- This triggers price-induced demand and supply responses: decrease in demand for carbon-intensive commodities, increase in supply of less intensive substitutes.
- The price signals trigger demand/supply responses upstream and downstream of the capped sector.

# Successful experience with emission trading

- SO<sub>2</sub> and NO<sub>x</sub> under Clean Air Act
- RECLAIM, to a lesser extent
- Phase-out of lead from gasoline
- Initial reliance of trading to phase out ozone-depleting CFCs.

# How emission trading worked

- In all these cases, the producer essentially reformulated the product in a manner that met the emissions cap without requiring the users of the product to (i) switch to a different type of product produced by a different manufacturer, or (ii) reduce their use of the product.
- Almost all of the action was by the party that was capped.
- There was minimal adjustment in other sectors in response to price signals radiating from the capped sector.

- With lead in gasoline, the automobile manufacturers had to produce cars that could run on unleaded gasoline, but this was a relatively minor modification. The consumers did not have to adjust their behavior at all (e.g., buy cars with a higher fuel–efficiency, or drive less).
- With SO<sub>2</sub>, the electricity generator reformulated his production process, leaving the product unchanged, and there no further adjustment downstream.

- In all these cases:
  - Emission trading did not work by generating price signals that radiated throughout the economy motivating behavior changes in other sectors.
  - The entities that responded were primarily the firms that were capped.
  - To the extent that they responded by employing new inputs or new technologies that were not used previously, what occurred was a *shift in the supply curve*, rather than a move up or down a given supply curve.
  - The caps, and how they were set, were key to the outcome of the emission trading.

- Does this mean that emission trading was an unnecessary innovation? NO
- Emission trading was superior to prior emission regulation in two ways:
  - It was a performance standard as opposed to a technology standard.
  - It gave regulated firms flexibility in compliance.
    - A firm could re-allocate abatement among its different plants. Instead of abating at plant A, it could abate more at plant B.
    - Instead of having to install abatement equipment immediately, a firm could buy permits for now and invest in abatement at a more opportune time in the future.

# What *didn't* happen with SO<sub>2</sub> trade

- While operational practices were refined, the strategies relied on known, mature technologies.
- Strategies *not* used:
  - Energy conservation, demand management
  - Switch to renewables
  - New combustion technologies
- Fundamental technological innovation played essentially no role.

# CO<sub>2</sub> is different than SO<sub>2</sub>

- For CO<sub>2</sub> there is no good analog for the strategies used to reduce SO<sub>2</sub>:
- Fuel switching is not such a major option
  - There is no low-CO<sub>2</sub> coal
  - Co-firing with biomass can be done, but on a limited scale and the logistics are complicated.
- There is no post-combustion scrubber
  - Carbon capture and sequestration can't be retrofitted to an existing power plant; it requires a new plant.
  - It is a technology still in its infancy, 10+ years away from commercialization.
- Therefore, there is no reason to believe that an emission market price signal will be anything like as effective in inducing a reduction in CO<sub>2</sub>.

# Climate policy is about capital stocks

- With SO<sub>2</sub>, we could work with existing capital assets and readily modify their operation.
- With CO<sub>2</sub>, we are stuck with the *wrong set of assets* – coal-fired power plants, coal-burning industrial boilers, SUVs, suburbs hostile to public transportation etc.
  - Changing the dispatch order is a short-run fix
- It will take time, resources, and new technologies to change the capital stock.
- We have to balance a short-run goal of emission reduction with a long-run goal of decarbonization

# Implication

- For climate policy, the key questions are how long it takes:
  - For new physical capital to be installed
  - For new human capital to be acquired
  - For old assets to be removed from service
  - For behavior to adapt and change
  - For institutions to adapt and change.
- The trajectories of change and issues of timing are crucial.
- I see many of the ETAAC recommendations, including but not limited to the Carbon Trust, as motivated by this point of view.

# Auctioning allowances

- The economic argument against pure free allocation and in favor of auctioning are overwhelming.
  - Any substantial free allocation would create large and economically unjustified windfall profits.
- There is a case for some free allocation for compensatory purposes, but that proportion is likely to be small: national estimates are ~10-15%.
- If one wants to start off slowly and ramp up, the initial ration fraction should still be well over half.

# Offsets

- Offsets can serve two beneficial purposes:
  - They can provide compliance flexibility
  - They can provide cost containment.
- But there are also other mechanisms that can provide these benefits. It would be a mistake to rely too narrowly on offsets. These include:
  - **Banking and borrowing** at either the firm or system level could help contain costs stemming from temporary divergences of prices from expectations.
  - A **multi-year compliance period** could help reduce price pressures by smoothing out annual energy demand fluctuations (but could also increase end-of-period price volatility and noncompliance events).
  - **Delayed implementation** and a **gradual tightening of caps** could give firms time to make cost-effective adjustments.
  - A "**circuit breaker**" could be triggered if costs rose too high, postponing tightening of the cap.
  - A "**safety-valve**" price could provide a ceiling for the market price of allowances but the cap would be exceeded if it were used. Also, a price floor.
  - A government agency could act as a **market maker**, buying allowances and offsets when prices were low and selling them when prices were high, or it could **adjust auction sizes** as needed to hit a price target.

# Two questions about offsets

- Offsets from where?
- What fraction of emission reduction can be offset.

- The MAC report recommended:
  - “California would only accept offsets from other states or countries if those other jurisdictions have an agreement with California to adequately ensure a similar level of environmental integrity and accountability in their emissions control programs.”
- To me this means offsets from WCI members, and from certain other US states and certain EU countries that have credible commitments to measure and limit their emissions.

- The policy objective is not just to a modest reduction in global emissions in the current and near-term period. There is a long-term goal which calls for a very substantial reduction in emissions – essentially a decarbonization of the California and US economies.
- I am concerned that excessive use of out-of-state (and international) offsets will undercut fulfillment of the longer term goal.
- The allowed fraction of offsets should not be large, and should decline over time.