



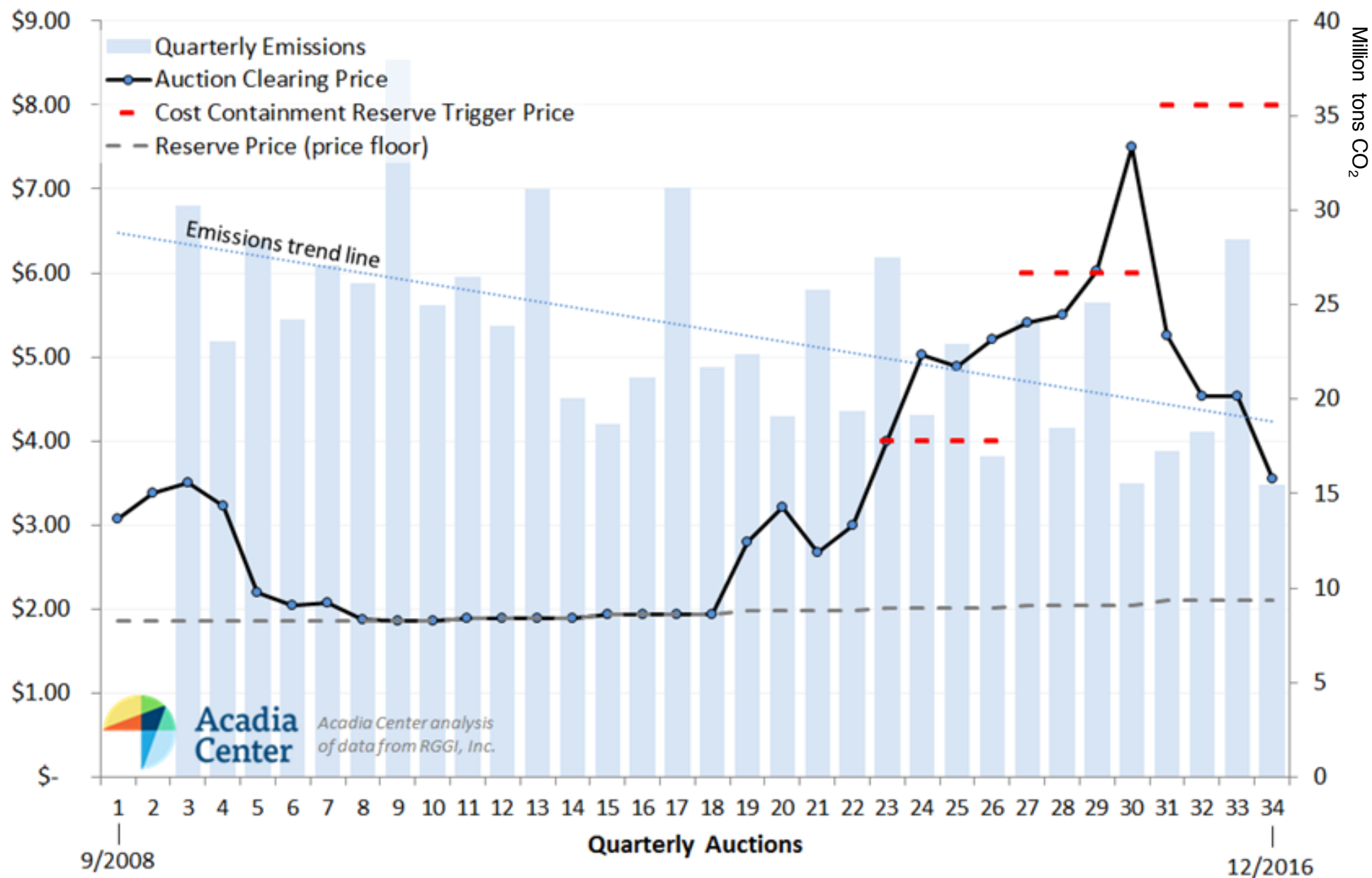
Improving How Emissions Trading Works: An Emissions Containment Reserve

Dallas Burtraw
Resources for the Future

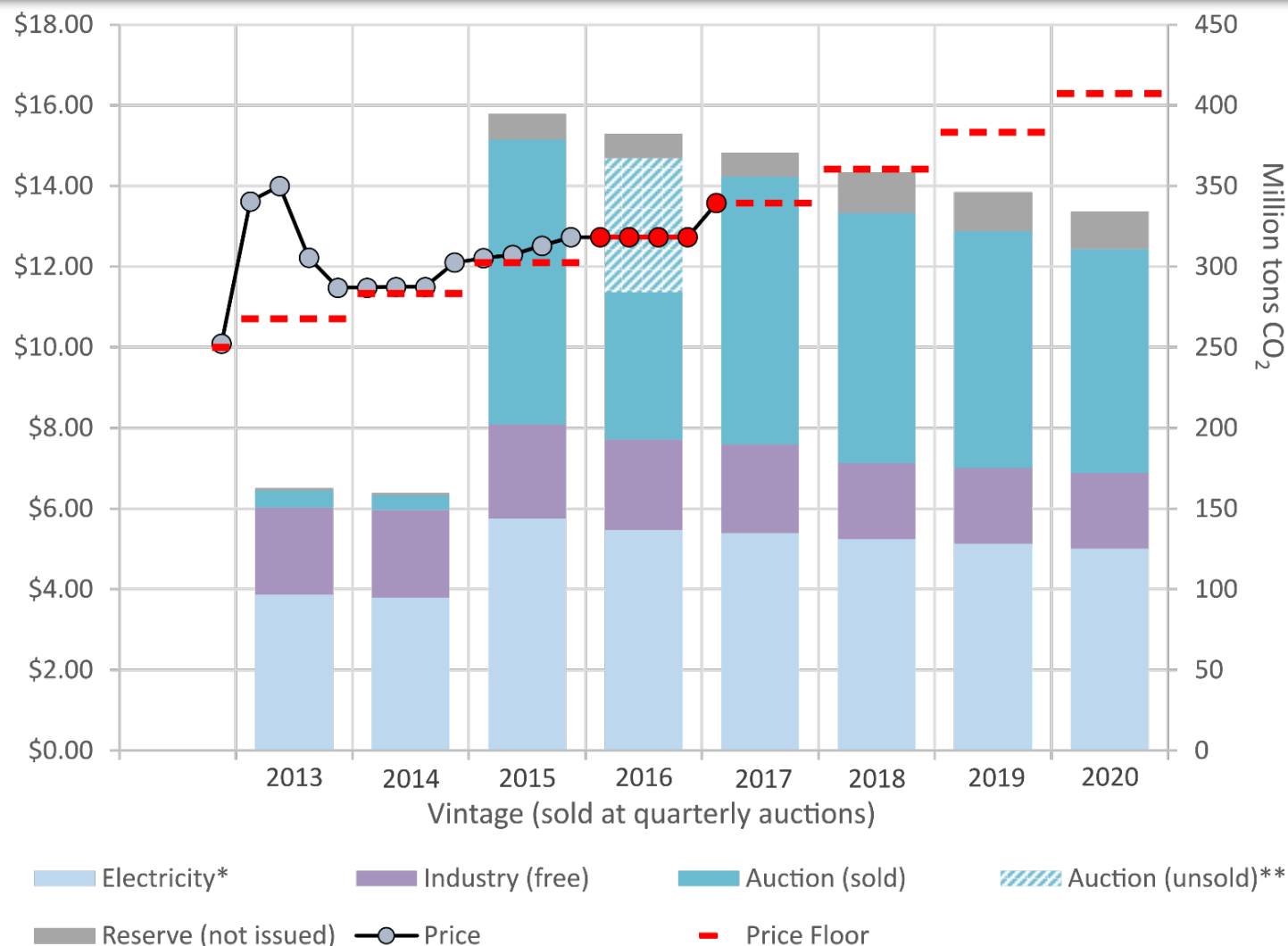
Symposium on Carbon Prices
Ecole Normale Supérieure
Paris, 17 May 2017



RGGI Experience with Allowance Prices



California Experience with Allowance Prices



*Free allocation "for the benefit of retail ratepayers" is made to retail companies. There is no allocation to electricity generators. Based on 2013 data, ~58% of allowances to investor owned utilities and ~2% to publicly owned utilities are distributed as dividends. The use of allowance revenue by natural gas suppliers is currently being discussed.

**The cross-hatch indicates that approximately 83 million state-owned allowances were unsold in 2016 due to a binding reserve price.

EU prices also have shown downward trend

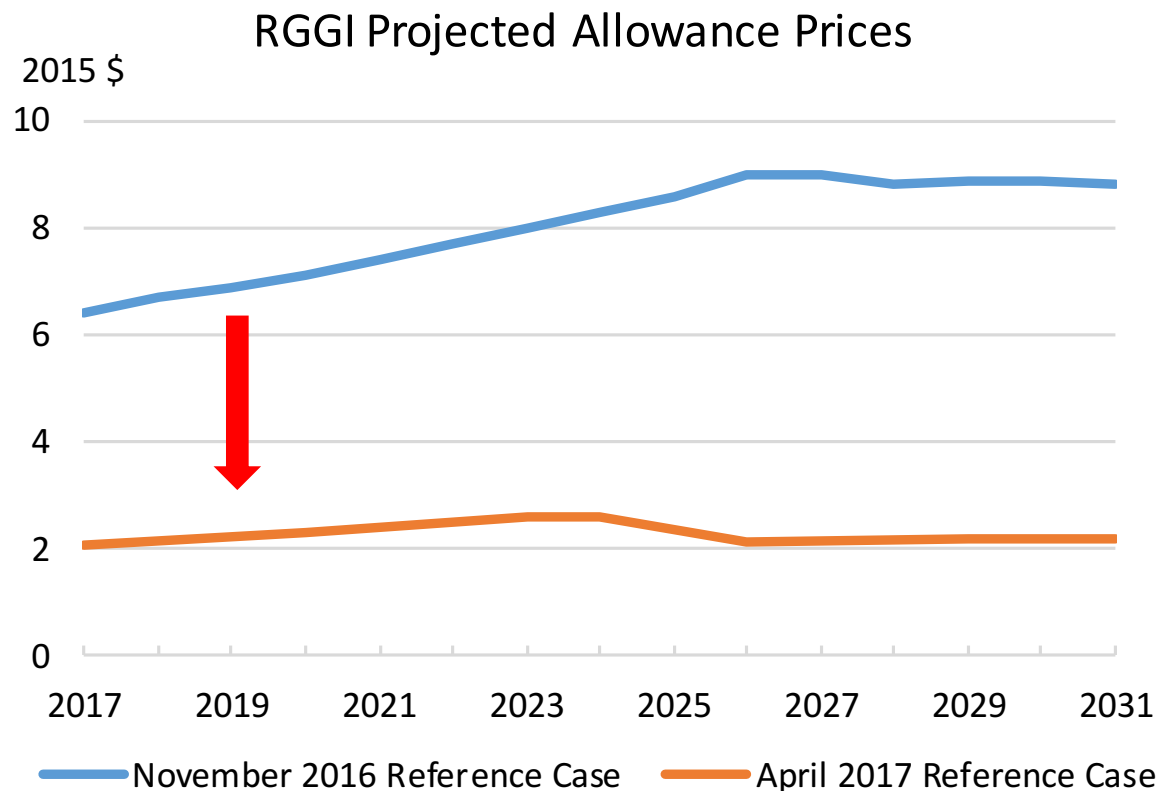


Sightline Institute

Why Cost and Emissions Containment?

- Prices in a market-based program are uncertain.
 - One finds volatility of natural gas prices and electricity demand.
 - Uncertain operation of existing nuclear fleet.
 - Program investments in energy efficiency help reduce emissions.
 - Federal and state programs provide incentives for renewables.
 - There is uncertainty about future regulatory changes.
- The possibility for a slack emissions cap is real.
- Sudden extreme outcomes affect investment.
- If cost or emissions containment measures are triggered, the program continues to function between program reviews.

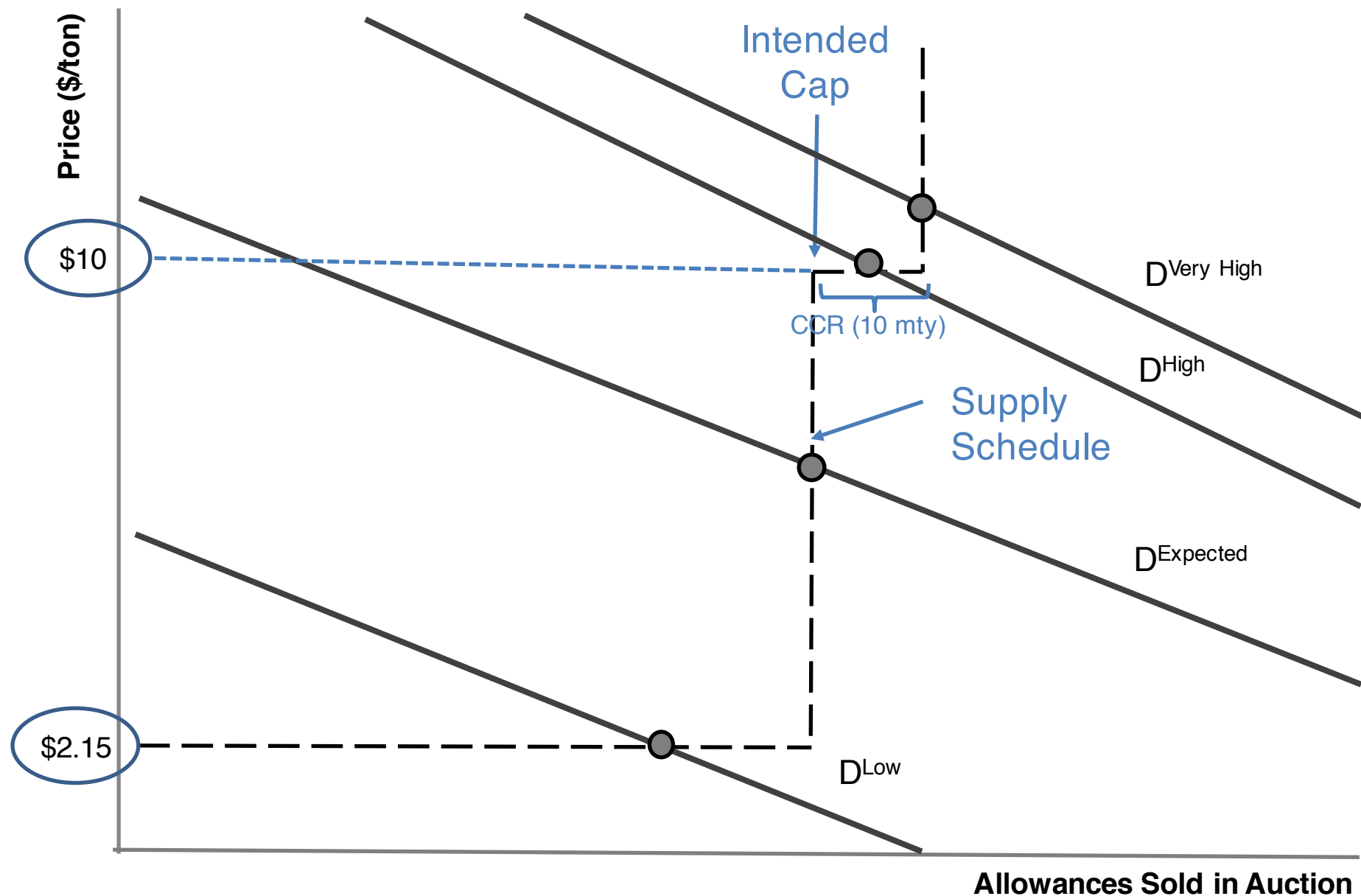
Potentially Unanticipated Outcomes Are Illustrated in Changes in Assumptions *from November 2016 to April 2017!*



Source: RGGI

- Projected emissions allowance prices are on average about \$5.75 lower in the April 2017 reference case than in the November 2016 reference case
- A range of model inputs have been updated:
 - Natural gas price projections (from AEO 2015 to AEO 2017)
 - Regional energy demand projections
 - Projections for cost and performance of renewables and natural gas
- The April 2017 model now incorporates imports of renewables from Quebec and Ontario
- Both reference cases include the adjusted cap and the Clean Power Plan. Removing the Clean Power Plan has virtually no effect on allowance price projections.

Illustrative Supply & Uncertain Demand Currently in RGGI



What is the Emissions Containment Reserve?

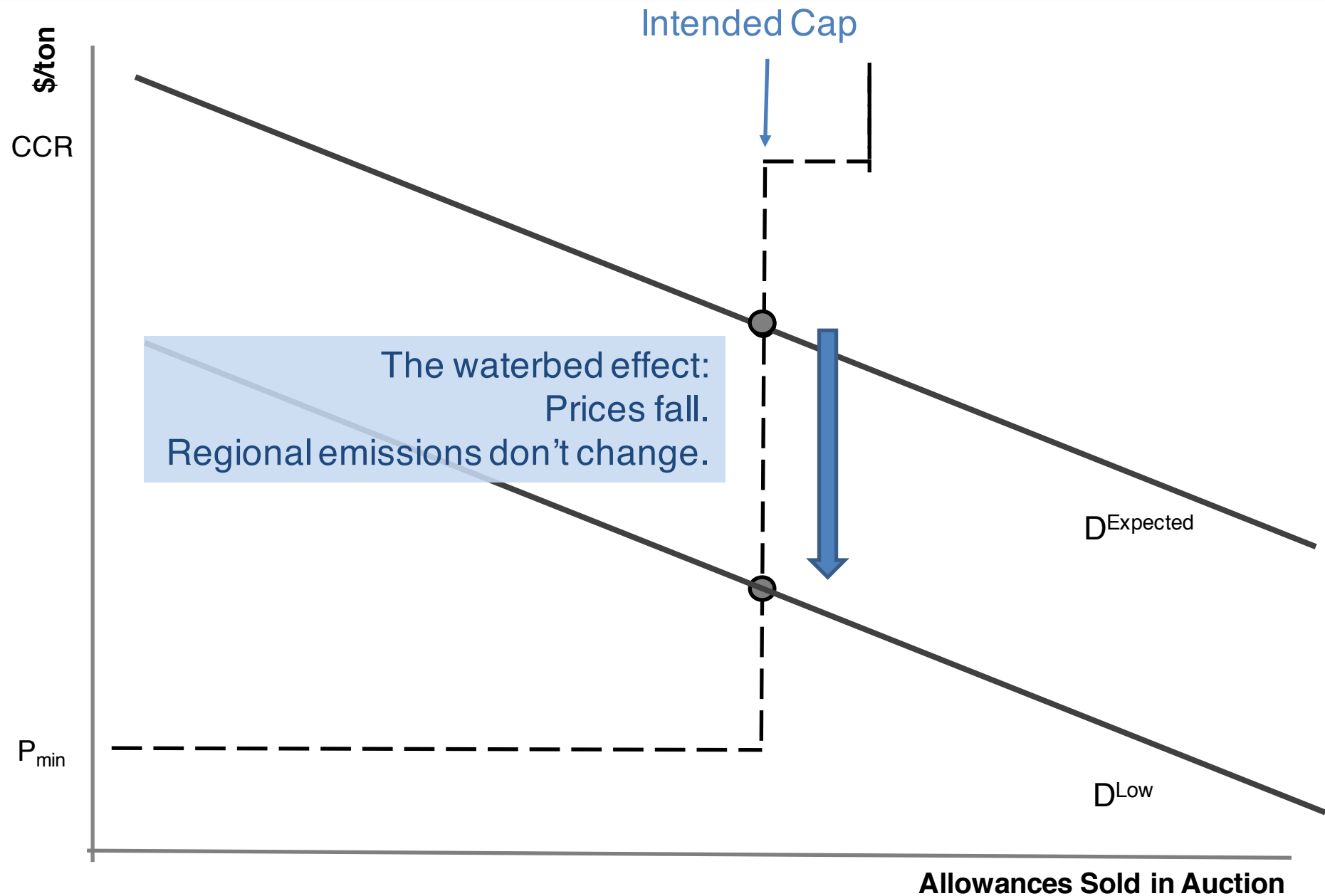
- The ECR would introduce a *soft* price “step” or “steps” above the *hard* price floor.
- It yields a supply schedule analogous to commodity markets.
- If the auction price falls below a given step, a quantity (“lot”) of allowances would not enter the market.
- By supporting the price and potentially reducing allowances in the market, the ECR would potentially reduce the size of the privately held allowance bank. It would not undermine the incentive or logic of banking.

Why would RGGI consider this new feature?

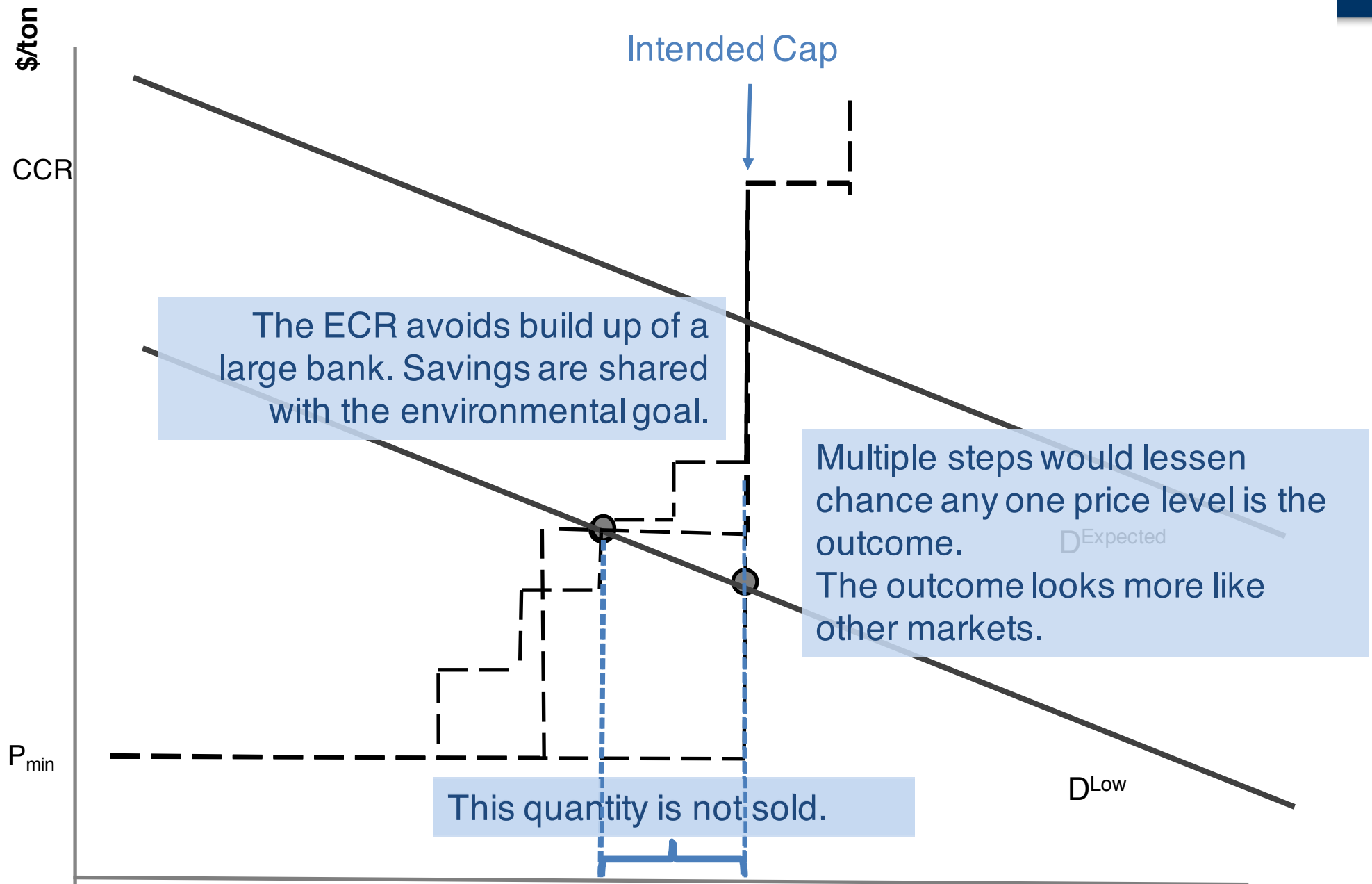
- Some states and constituencies (firms, schools, cities) are taking additional actions.
 - Under a regional cap this leads to *the waterbed effect*.
 - Prices fall, and emissions go up somewhere else.
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- Indeed, price trends are again headed down.



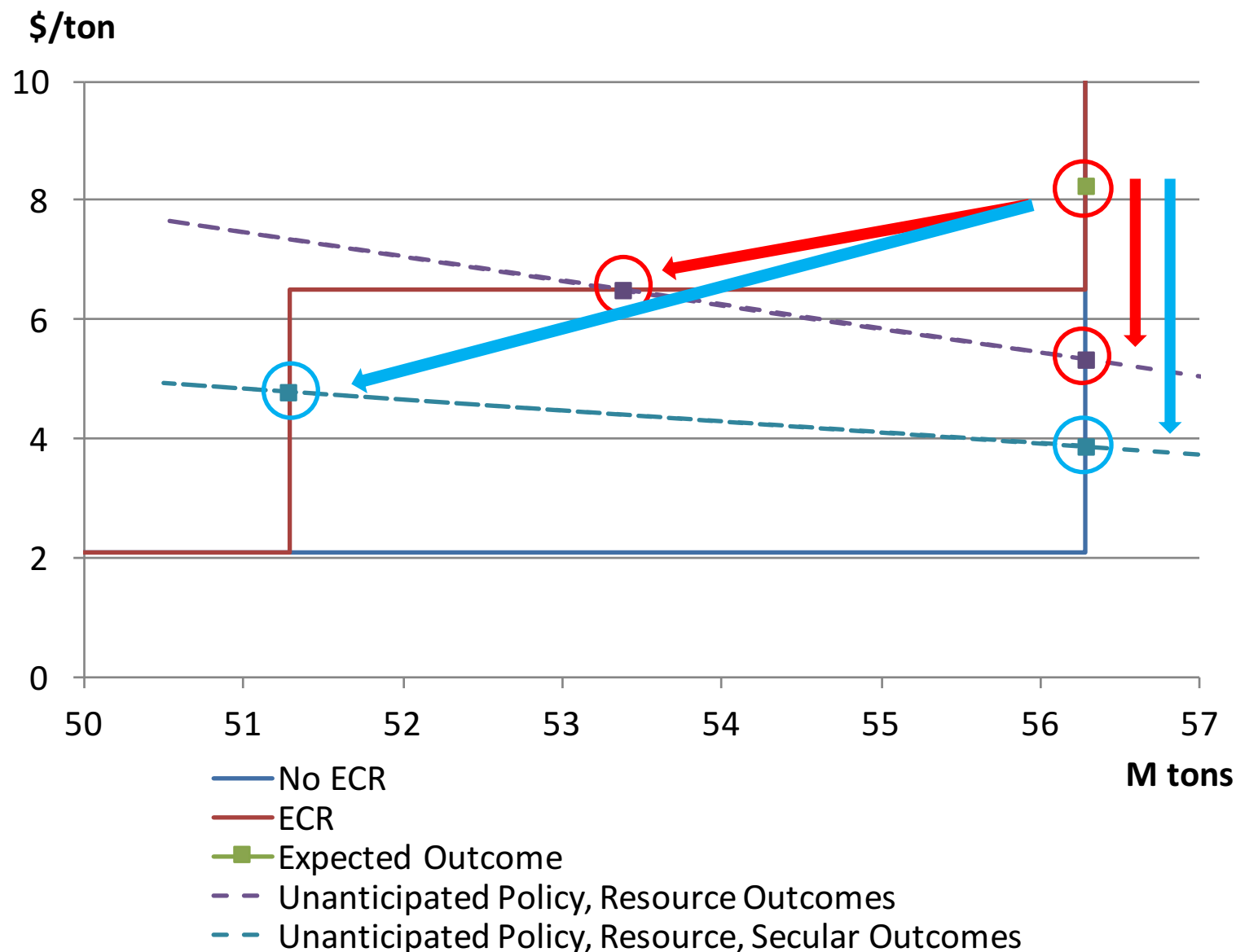
A Supply Schedule **without** the ECR



A Supply Schedule **with** the ECR



Simulation modeling in RGGI demonstrates “sharing” outcomes in 2020



The supply schedule reflects the adjusted cap through 2020 and then returns to reference case (3.5% annual decline).

Laboratory Experiments

Experiments at the University of Virginia Economics Laboratory examine performance of this market design in a behavioral setting. (with Bill Shobe and Charlie Holt)

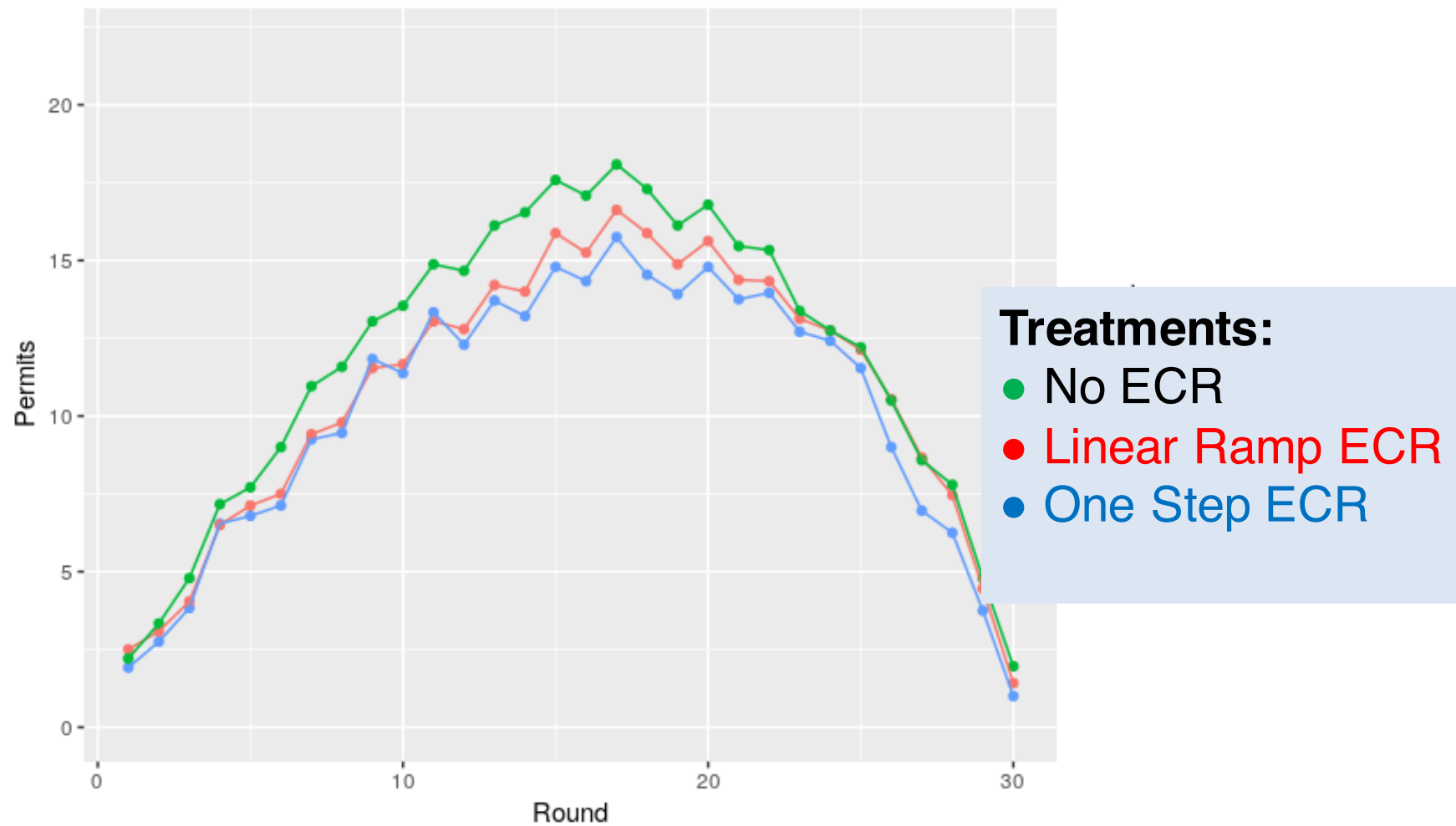
Comparing:

- No ECR
- One step ECR
- Linear ramp ECR

Some (very) early results:

- ☐ Students understand the ECR and make coherent intertemporal decisions.
- ☐ Prices are higher under the ECR. Difference in revenues is relatively small.
- ☐ Deviations from Walrasian equilibrium are less costly with the ramp than with the one step ECR.
- ☐ The size of the bank is reduced under the ECR as anticipated.

Total Banked Permits by Treatment by Round



International Implications

- ❑ A blocking rhetoric is that a minimum price would determine the price and constitute a tax, triggering the unanimity rule.
- ❑ An ECR does not prevent prices from dropping below the ECR's price step(s).
- ❑ Additional efforts by member states and constituencies in the EU would be recognized.
- ❑ To quote RGGI state staff, the “negotiated cap balances costs and benefits of emissions reductions...”
 - “...If reductions cost significantly less than we anticipated, then we got that balance point wrong...”
 - The ECR would yield additional investments, air quality benefits, and GHG reductions at costs that are lower than were expected.

Extra Slide: Laboratory Experiments Setup

- Cap declines from 66 at 1 permit per period, so goes from 66 to 37 over 30 rounds
- There is no spot market trading. The only way to get permits is via auction
- Each bidder can make up to 6 bids. [But for high emitters each bid is for 2 permits]
- 12 subjects, 6 “coal”, 6 “natural gas”
- 30 rounds
- 4 capacity units (plants) for each subject
- Each capacity unit produces one unit of output per round if it is run.
- banking is unlimited
- Output price varies between \$30 and \$40 with probability of 50% each
- Costs of production: uniform on [10,28] for low emitters and [1,28] for high emitters.
- Long-run, Walrasian price over the 30 sessions: \$8
- Reserve price: \$5
- Step function at \$8 for 16 permits (25% of the initial cap).