

# Auctions with Consignment Sales of Free Allocations of Resource Rights and Permits

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April 2016

(based on joint work with Bill Shobe, Jacob Goeree,  
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## History Matters

- Allocations of rights to use natural resources are often “grandfathered,” with allocations based on historical uses.
- Free allocations can soften the impact of regulations, e.g. free allocations of emissions allowances for carbon emissions in the California AB34 (with scheduled declines).
- Grandfathered allocations can also become institutionalized as property rights, which promote appropriate investment.
- But sales of grandfathered allocations are sometimes problematic, either in a technological sense (spectrum conversion must be coordinated), or in a strategic sense (firms resist selling spectrum competitors).

## Problems with Reallocations

- Markets can help, but free allocations can impede the price discovery process if significant proportions of use rights are allocated outside of ongoing markets, and hence, are never traded or are only traded years later.
- Even when markets for allowances and rights exist, recipients of free allocations may resist selling (via endowment effect biases or failure to recognize true opportunity costs of allowances received at no cost).
- Current owners may demand and lobby for unrealistic high compensation in a classic “hold-up problem.”
- **What is needed is a way to break the history-based log jam.**

# Solutions

- **Times change:** earlier spectrum allocations to analog TV broadcasters now has a higher value for wireless communications.
- FCC “Incentive Auction” will buy spectrum from broadcasters in a “reverse” auction, and sell repackaged spectrum in a “forward sale” auction. Coordinating two separate multi-multi-billion dollar auctions, and “revenue neutrality” can be a huge concern.
- The FCC commissioner went back to Congress for more money and flexibility, in case the forward-sale auction scheduled to start in the summer does not cover the buy-back costs of the reverse auction that is just beginning.
- **How do you sleep at night? Why aren't the two parts of this auction combined, with current users being forced to consign their frequency for sale and then bid back if they want to continue operations?**

# Consignment Sales of Free Allocations

- The California AB32 greenhouse gas emission program mandates that regulated utilities consign 100% of their free allocations for sale in the auctions, in exchange for a proportional share of auction revenues, and then buy back their what they need to cover emissions.
- This process is “**revenue neutral**” and it provides a market-based price benchmark, while letting firms use their bids in the auction as individual reserve prices.
- Such consignment is easier to envision for multi-unit auctions of homogeneous commodities, like emissions allowances, but the same principle could be applied in more complex situations, e.g. spectrum, where the competition is between reallocations of entire frequency bands (“band plan competition”).

# Conjectured Benefits of Consignments

- “The merits of consignment sales stem from the fact that market imperfections and institutional complexities present obstacles to achieving an efficient and fair allocation of allowances . **If allowances are used directly for compliance and do not enter the market, low liquidity and slow price discovery may result.**
- “In addition, firms not receiving allowances sufficient to cover their compliance obligation may fear limited access to allowances, and **within firms receiving allowances, the opportunity cost of using allowances for compliance may not be salient**, resulting in inefficient firm behavior. - Dallas Burtraw and Kristin McCormack (February 2016 RFF memo to EPA on proposed model rule for the Clean Power Plan)

# Previous Study Informs Experiment Design

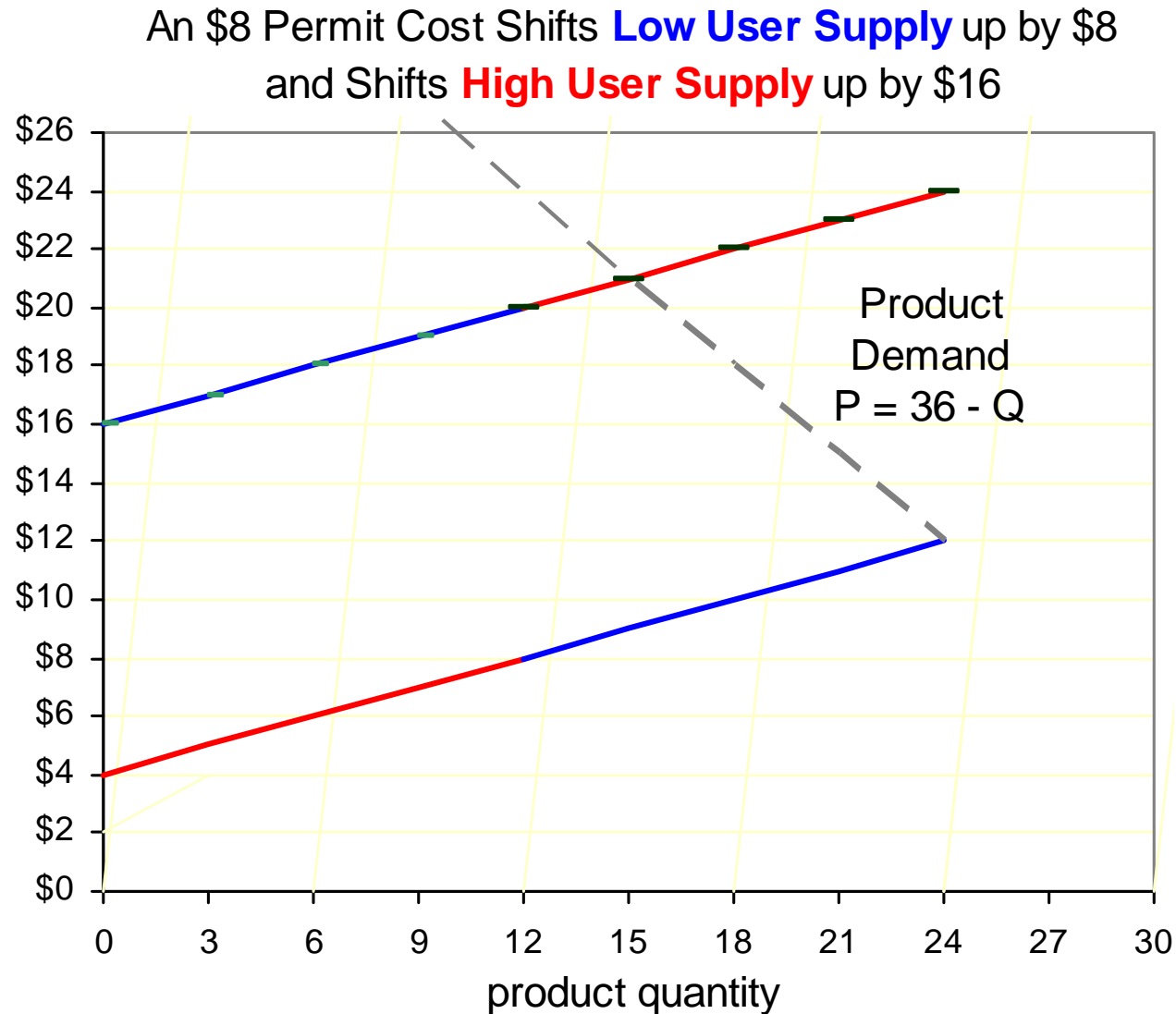
- Issue: auctions versus “grandfathering” of permits
- Debate: at the 2006 Auction Design Meeting in NYC for Regional Greenhouse Gas Initiative (RGGI)
- Industry: If you make us pay for emissions permits in auction, we’ll have to raise the price of electricity.
- Theory: initial allocation shouldn’t matter, permits have an opportunity cost even if they are received for free and can be traded in “spot markets” or used.
- Regulators and state officials seemed to roll their eyes at the opportunity cost argument!
- We ran laboratory experiments with financially motivated human subjects to design the RGGI auction procedures and to evaluate the issue of auctions versus grandfathering (Goeree, Burtraw, Holt, Palmer, Shobe, 2007, 2010 etc.)

# Experiment Setup: Strong Asymmetries

- **High Users:** require 2 permits for each produce unit produced, have low costs on  $[4, 8]$  and high grandfathered allocations.
- **Low Users:** require 1 permit for each product unit, with higher marginal costs  $[8, 12]$  and low grandfathered allocation.
- Original allocations optimal if permits are freely available, but a restriction on emissions will raise the cost of permits and reverse relative efficiencies in favor of low users.
- Costs go up by 2x the permit price for high users, and only by 1x for low users, which “should” shift most production to low users.
- Market (supply/demand) Predictions: cutting the number of permits in half will raise the permit price to \$8 and result in a product price of \$21.



Product Market Design:  $p^* = \$21$ ,  $r^* = \$8$   
*regardless of how permits are allocated*



# Competitive Equilibrium Predictions

- ▶ Output and permit prices:  $p$  and  $r$
- ▶ Supply low emitters

$$S_L(p, r) = \begin{cases} 0 & \text{if } p - r < 8 \\ p - r - 8 & \text{if } 8 \leq p - r < 12 \\ 4 & \text{if } 12 \leq p - r \end{cases}$$

- ▶ Supply high emitters

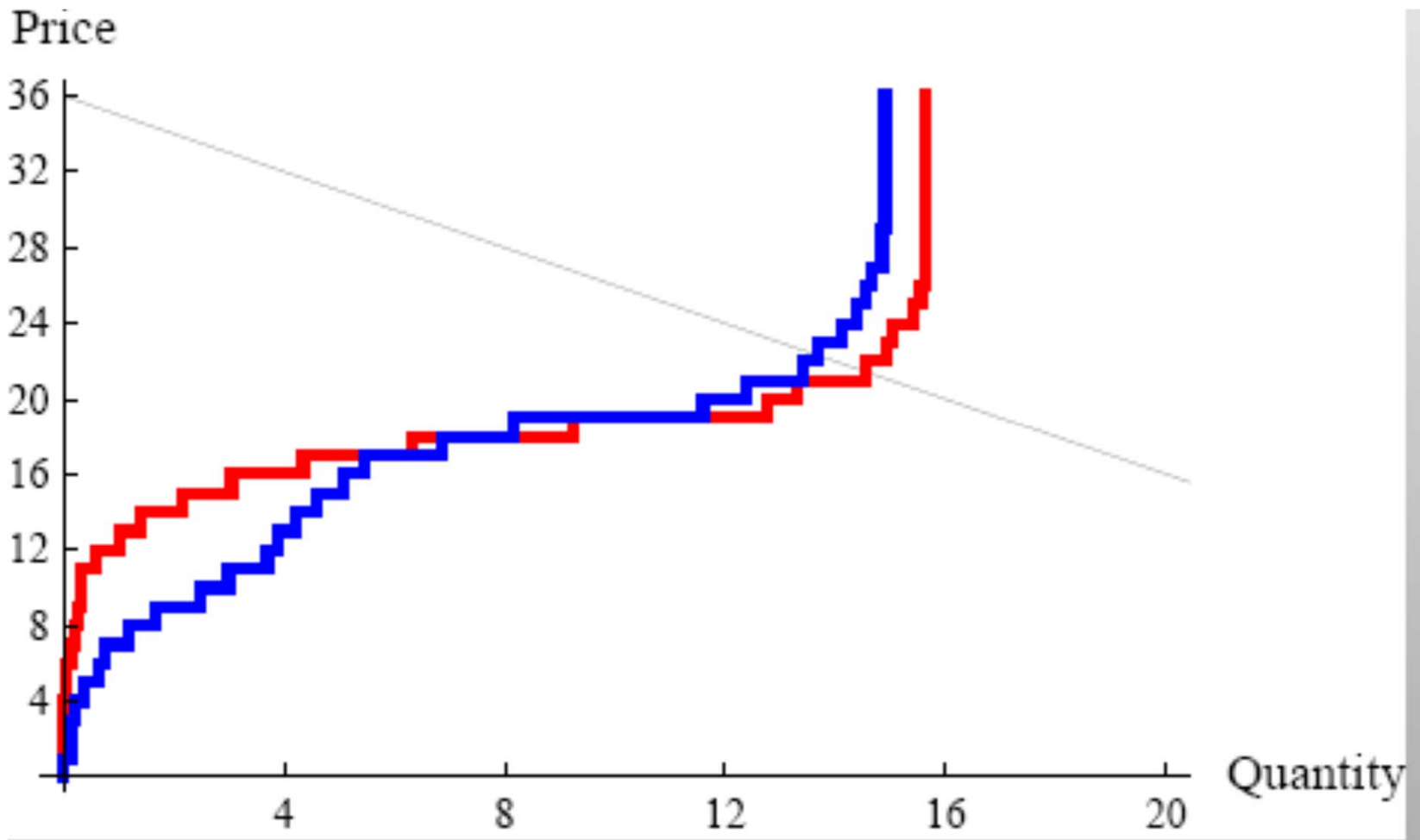
$$S_H(p, r) = \begin{cases} 0 & \text{if } p - 2r < 4 \\ p - 2r - 4 & \text{if } 4 \leq p - 2r < 8 \\ 4 & \text{if } 8 \leq p - 2r \end{cases}$$

- ▶  $D(p) = 3S_L(p, r) + 3S_H(p, r)$  and  $3S_L(p, r) + 6S_H(p, r) = 18$
- ▶ Equilibrium prices:  $p^* = 21$  and  $r^* = 8$

## Experiment Procedures

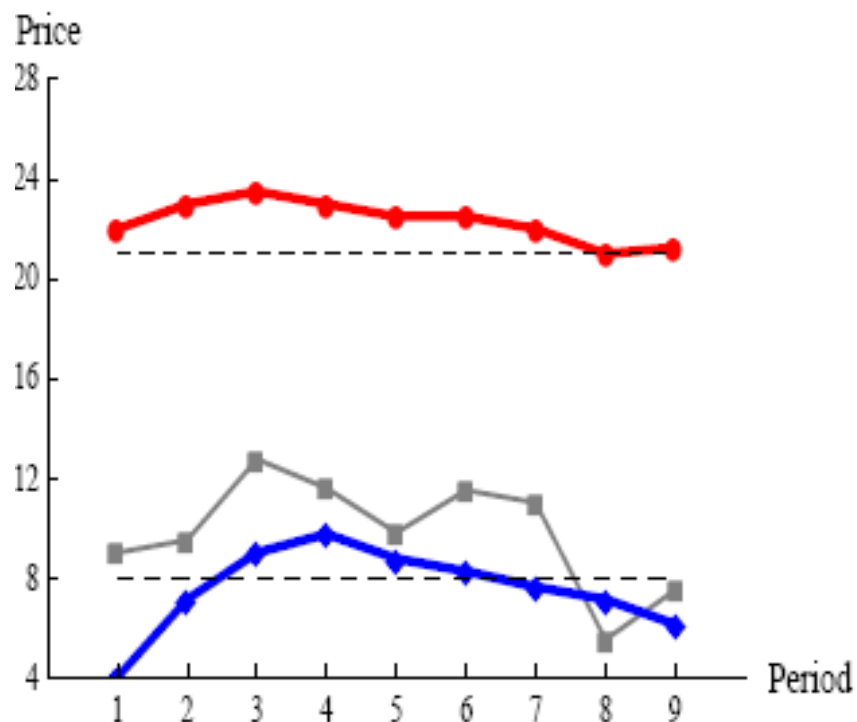
- 12 subjects per market (6 low users, 6 high users)
- Initial Permit Allocation:
  - Grandfathering: 12 for high users, 6 for low users
  - Auctions: sell all 18 to high bidders in a uniform price auction (winners pay highest rejected bid)
- Spot Market: single round limit-order call market used in both treatments.
- Product Market: subjects bid price and quantity to a market maker to sell units, with a known demand  $Q = 36 - p$  that determines a uniform price.
- 9 rounds (allocation, spot, product), banking of unused permits permitted, with penalties for non-compliance

## Product Market Empirical Supply after Auction, after Grandfathering



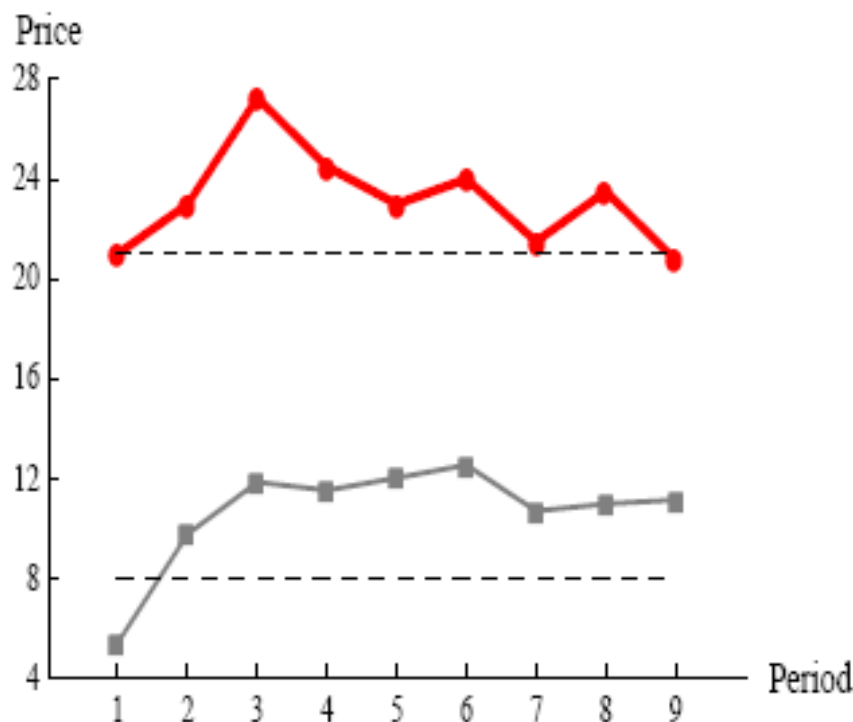
- Note full “pass through” of opportunity costs after grandfathering.

## Product Price after Auctions:



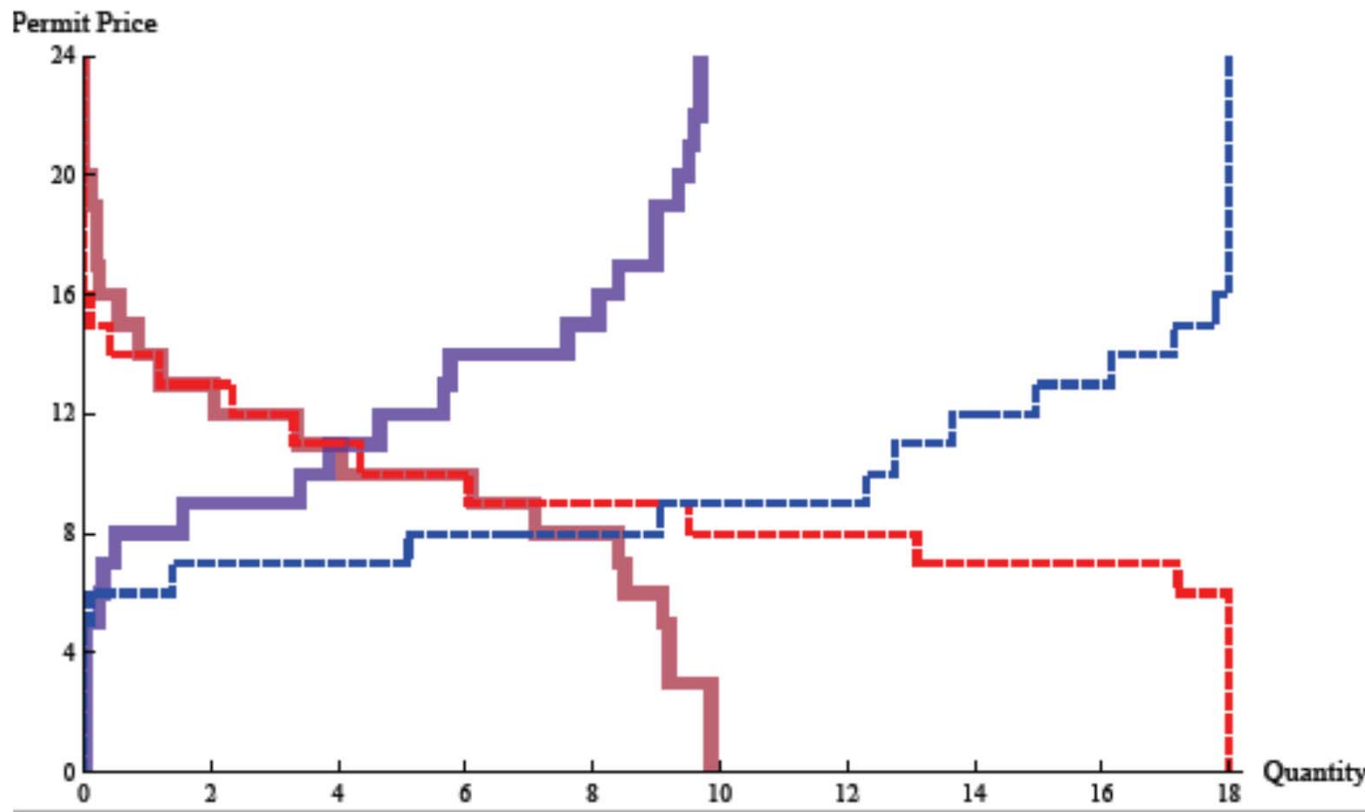
Auction Permit Prices

## Product Prices after Grandfathering:



Spot Prices  
(high after grandfathering)

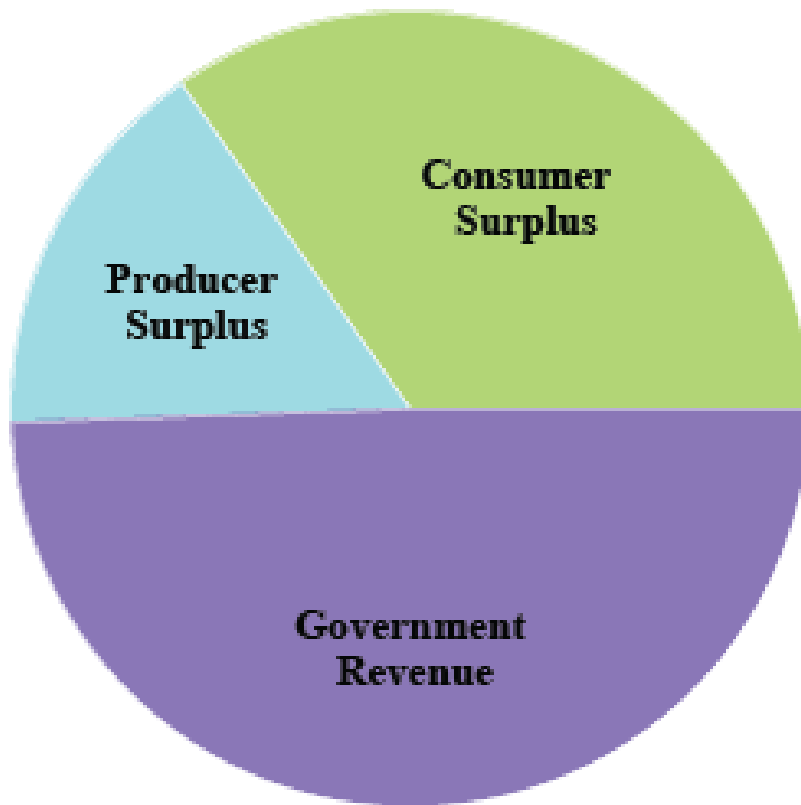
Grandfathering: High Permit Prices  
Observed (thick lines) Predicted (thin lines)  
Low emitters demand, High emitters' supply



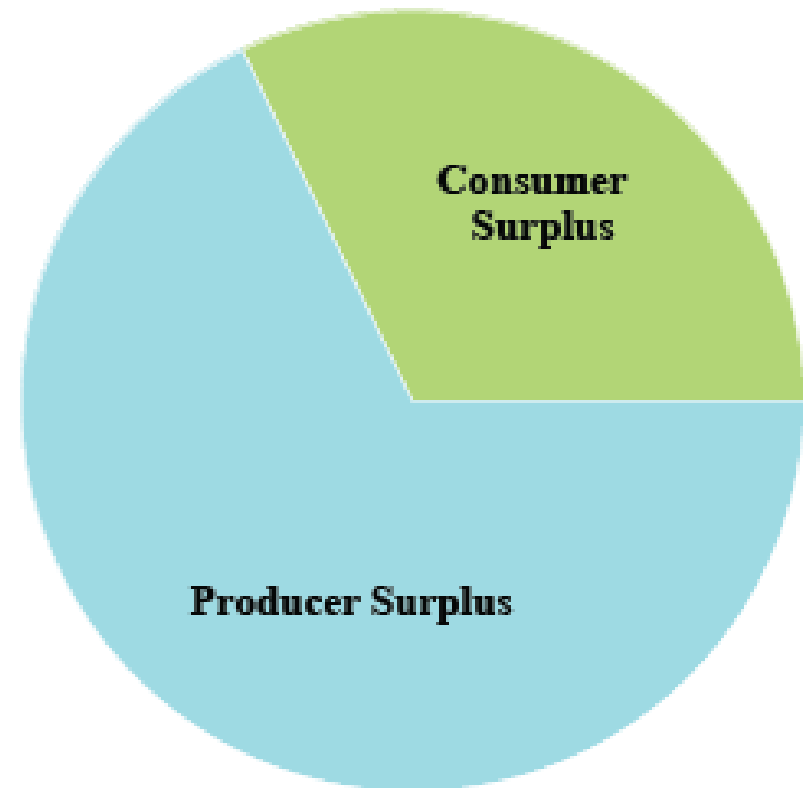
- High emitters withholding supply, market power

# Allocation Results

**Auction**



**Grandfathering**



# Auctions Versus Grandfathering

- Experiment results support the theoretical proposition that the initial allocation (by auction or grandfathering) should not affect the product price. The reason is that sellers with free allocations implicitly recognize the opportunity cost of those free allocations and build this into the price.
- Auctions can generate significant revenues for strategic energy initiatives and subsidies for low-income electricity purchasers.
- Pro-consumer states (NY and Mass.) immediately implemented 100% sales by auction, which became the norm. The EU ETS, which sent representatives to the RGGI meetings, moved from minimal auctions (<5% in phase I) to full use of auctions for the power sector by 2013.



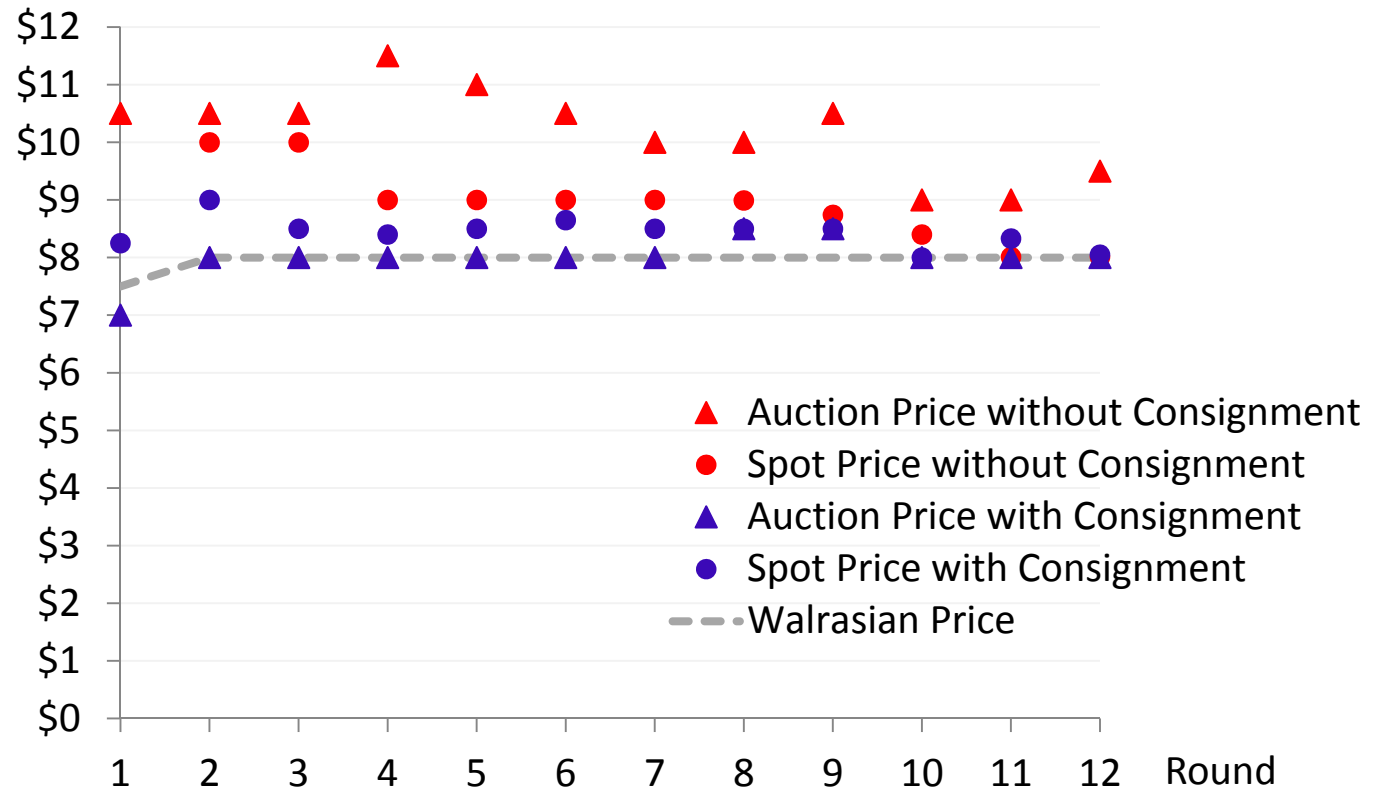
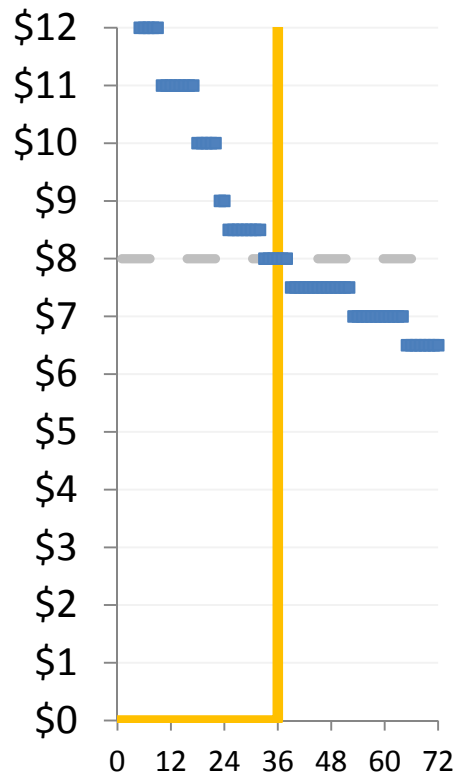
# Consignment Transforms Grandfathering into an Auction, Is that All?

- **Possible Manipulation:** those with high endowments who must consign will be net sellers and may try to manipulate the auction clearing price to achieve higher consignment revenues. A high auction price signal might elevate prices in the relatively thin spot market that would follow.
- **Liquidity Counter-Argument:** consignment enhances auction quantities (higher liquidity) and better price discovery as the buy-back bids of consigners convey value information and as more bidders will participate in the auction, instead of relying on post-auction spot markets.
- **Experiment:** to determine whether forced consignment elevates auction prices or whether it improves convergence to market equilibrium predictions based on total supplies).

## Procedures for the Planned Experiment

- 12 subjects per market (6 low users and 6 high users, with same cost distributions as before )
- Allocation of 36 permits:
  - No Consignment: 24 to high users, 6 to low users, 6 to auction
  - Forced Consignment: 24 to high users are consigned, 6 to low users are consigned, and 6 added to auction, for a total auction quantity of 36
- Spot Market: single round limit-order call market used in both treatments.
- Product Market: all product units sold at an exogenous \$21 price, which produces the same \$8 equilibrium permit price that inverts the positions of high and low users on the supply curve.
- 12 rounds (auction allocation, spot, product).

# Initial Results: a Matched Pair of Sessions

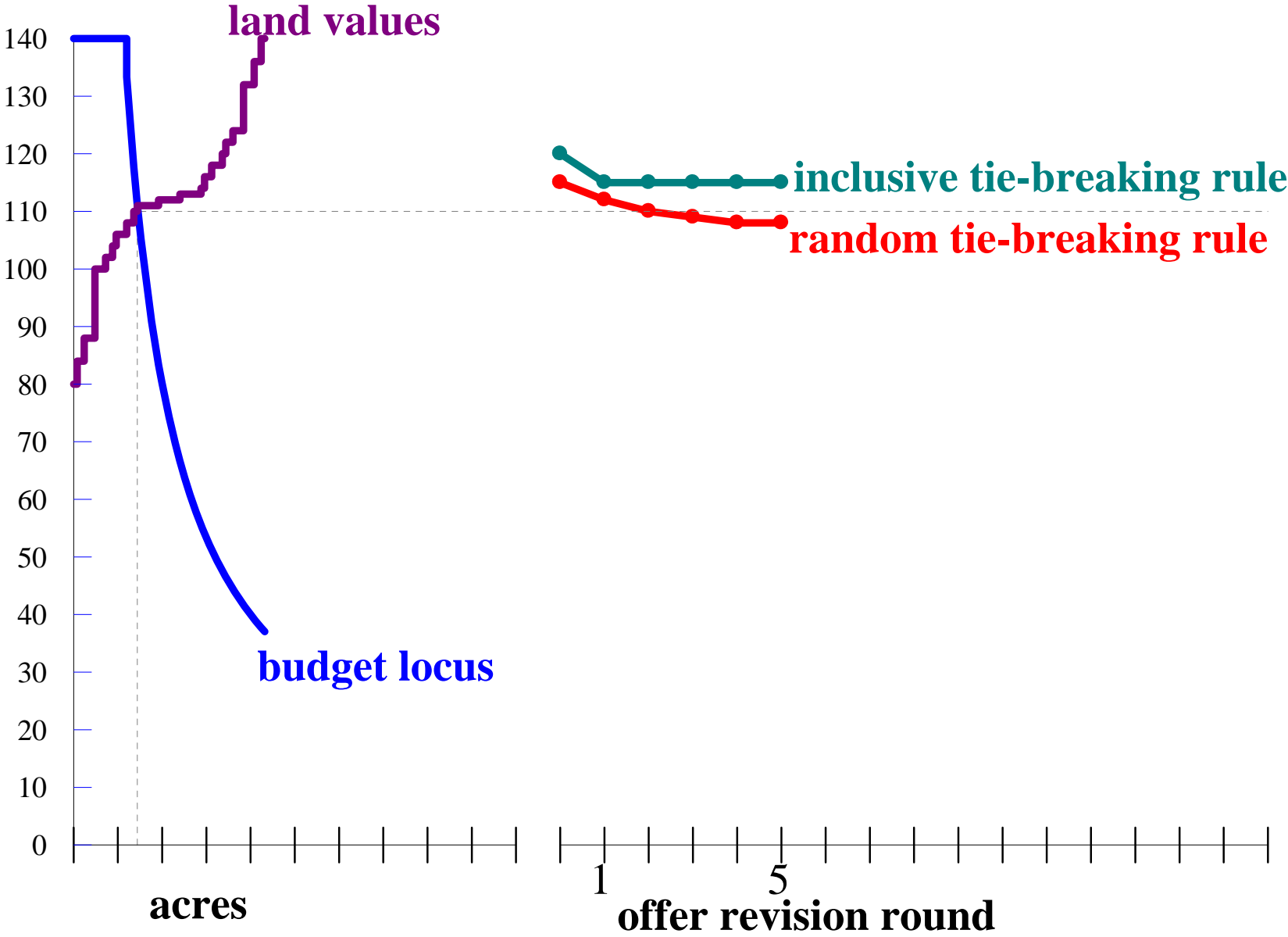


- Forced consignment lowers auction to near-Walrasian levels, with no clear evidence of counter-veiling price manipulation.
- Forced consignment yields higher efficiency, with more reallocation of production from high users to low users.

# 2001 Georgia Water Auction: lab and field simulations used to refine the auction design and instill confidence with state officials



cost per acre



# Questions