

# Tradable Permit Auction (汙染許可執照拍賣)



### Game Rules (遊戲規則)

- There are three rounds (本活動將進行三個回合)
- In each round, each group sends one to draw a card, and keeps the card secret. (在每一回合中，參與遊戲的每組派代表抽一張撲克牌，請確保別人無法看到這張牌。)

**Note that there is LUCK involved here!**  
(請注意，本活動有一定的機運成分存在)

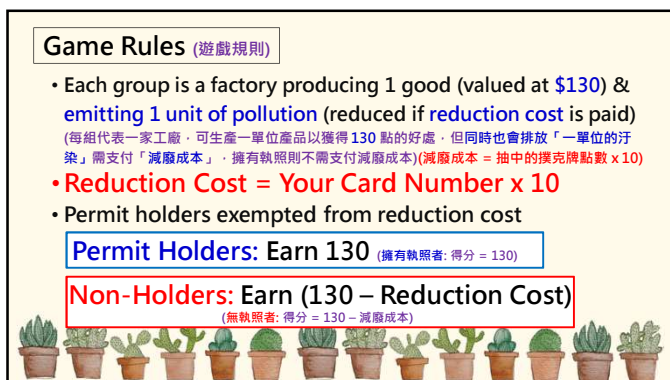


### Game Rules (遊戲規則)

- Each group is a factory producing 1 good (valued at \$130) & emitting 1 unit of pollution (reduced if reduction cost is paid)  
(每組代表一家工廠，可生產一單位產品以獲得130點的好處，但同時也會排放「一單位的汙染」需支付「減廢成本」。擁有執照則不需支付減廢成本)(減廢成本 = 抽中的撲克牌點數 x 10)
- **Reduction Cost = Your Card Number x 10**
- Permit holders exempted from reduction cost

**Permit Holders: Earn 130** (擁有執照者: 得分 = 130)

**Non-Holders: Earn (130 - Reduction Cost)**  
(無執照者: 得分 = 130 - 減廢成本)



## Round 1 (第一回合)

### Randomly Assign 50% Licenses (隨機發放半數執照)



## Round 1

- Gov't Distributes Cards and 50% of the Licenses Randomly  
(由政府隨機發放撲克牌與半數汙染許可執照)
- Licenses are traded publicly (公開市場交易)
- Trading is voluntary, but irreversible  
(自願交易後不得反悔，不得使用暴力威脅等)
- You have 3 minutes to trade under **FREE-FORM BARGAINING**  
(3分鐘內採用自由交易模式)



### What Should Firms Do in Free-Form Bargaining?

(在公開市場交易的情況下理性廠商會進行什麼樣的交易?)

**Permit Holders → Not Sell: Earn 130**  
→ **Sell: Earn (130 - Reduction Cost + Price Sold)**  
擁有執照者 → 不賣: 得分 = 130  
→ 賣: 得分 = 130 - 減廢成本 + 成交價

**Non-Holders → Not Buy: Earn (130 - Reduction Cost)**  
→ **Buy: Earn (130 + Buy Price)**  
無執照者 → 不買: 得分 = 130 - 減廢成本  
→ 買: 得分 = 130 - 成交價

**Where do permits end up after trading?**  
(交易過後，執照會流向哪種廠商呢?)



**Round 1**

**Round 1**

02 :

**Round 1**

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**Round 1**

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**Round 2**  
(第二回合)

**Gov't Buy Back 50% Licenses**  
(政府買回半數執照)

**Round 2**

組別：(Group#)  
**WTA**  
(願售金額)

- Gov't Distributes Cards and Licenses
  - (政府發放撲克牌及小卡)
- **EACH** factory receives one License
  - (各家工廠均可獲得一張汙染許可執照)
- Gov't buys back **HALF** of the Licenses
  - (政府決定買回半數執照)
- Submit **SEALED BIDS** with group # and Willingness-to-Accept
  - (採用密封式投標進行 · 每組寫下組別及願意出售的金額)

### Round 2

- Submit **SEALED BIDS** with group # and Willingness-to-Accept
  - (採用密封式投標進行·每組寫下組別及願意出售的金額)
- Lowest **N/2 bids** win
- Gov't buy price = **(N/2+1)th bid**
  - (統一交出後·政府會以第 N/2 + 1 低的金額 向前 N/2 低的工廠 買入執照)

組別: (Group#)  
**WTA**  
 (願售金額)


**Not Sell: Earn 130** (未被買回執照者: 得分 = 130)

**Sell: Earn (130 – Reduction Cost + Price Sold)**  
 (被買回執照者: 得分 = 130 – 減廢成本 + 收購價)

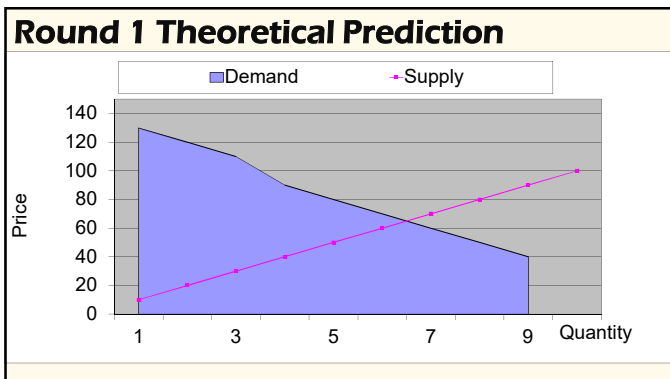
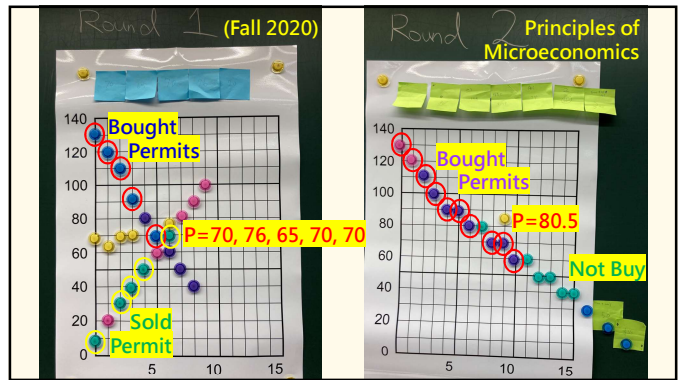


### Round 2

- Lowest **N/2 bids** win; Gov't buy price = **(N/2+1)th bid**
  - (統一交出後·政府會以第 N/2 + 1 低的金額 向前 N/2 低的工廠 買入執照)
- Example: If 10 groups bid 100, 90, 80, 70, 60, 50, 40, 30, 20, 10
  - (舉例來說·如果十組出價為 100, 90, 80, 70, 60, 50, 40, 30, 20, 10)
- Groups who bid **50, 40, 30, 20, 10** win, and get paid **60**.
  - (出價 50, 40, 30, 20, 10 的五組得標·政府用 60 元買下它們的執照)
- They earn **(130 – Reduction Cost + 60)**, and the rest earn **130**
  - (被買回執照者: 得分 = 130 – 減廢成本 + 60 · 未被買回執照者: 得分 = 130)

# Submit Your Bid!




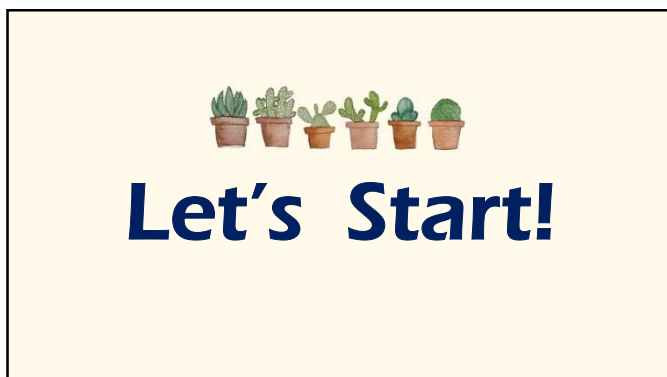
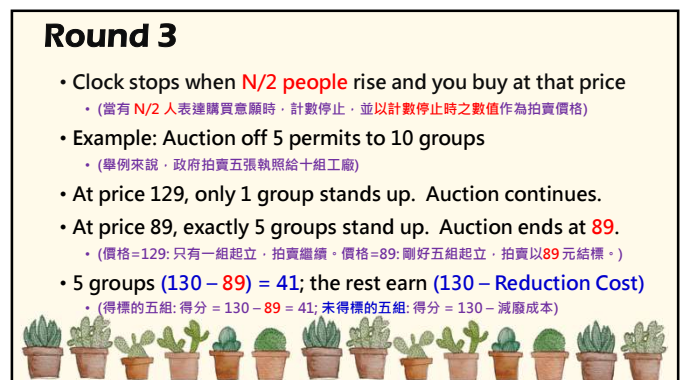
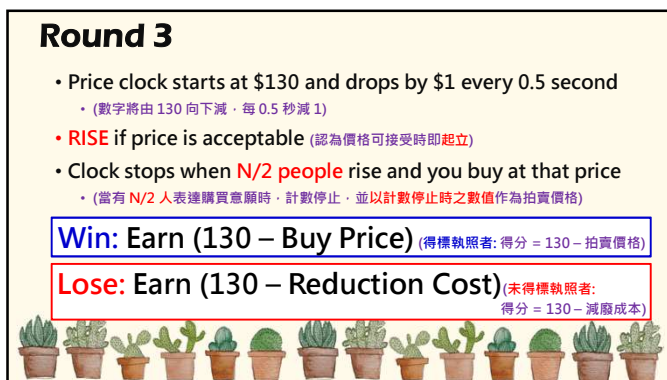
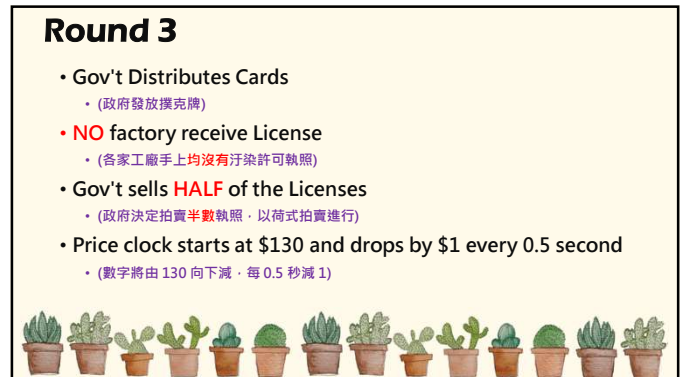
### Round 2

- Gov't Distribute Cards and Licenses (政府發放撲克牌及小卡) (願售金額)
- Every factory **EACH** receive one License (各家工廠均可獲得一張汙染許可執照)
- Gov't buy back **HALF** of the Licenses (政府決定買回半數執照)
- Submit **SEALED BIDS** with group # and Willingness-to-Accept
- Highest **N/2 bids** win; gov't buy price = **(N/2+1)th bid**
  - (採用密封式投標進行·每組寫下組別及願意出售的金額)
  - (統一交出後·政府會以第 N/2 + 1 低的金額 向前 N/2 低的工廠 買入執照)


**Not Sell** (未被買回執照者): **Earnings (得分) = 130**

**Sell: Earn (130 – Reduction Cost + Buy Price)**  
 (被買回執照者: 得分 = 130 – 減廢成本 + 收購價)

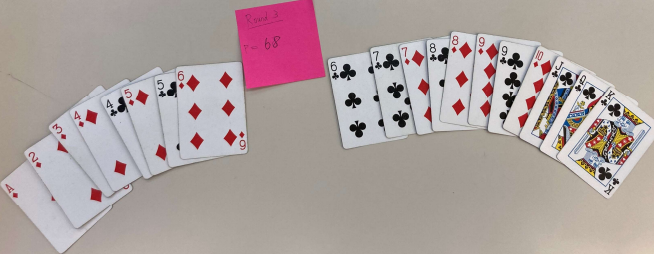




### Round 3




### Round 3 Results



- Is it more efficient (for the society) to have firms with high reduction cost to hold emission permits?
  - (從整個社會的角度來看·由「減廢成本較高」的工廠持有「汙染排放執照」是比較有效率的结果嗎?)

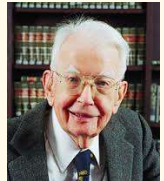
### Discussion (問題與討論)

- Why give out permits? (為什麼要發放執照呢?)
- How is ROUND 2 & 3 related to Vickrey auction?
  - (ROUND 2 & 3 跟維克里拍賣有什麼關係?)




### Coase Theorem (寇斯定理)

- Without transaction cost, the final outcome is always efficient under free trade, regardless of property right allocation. (在無交易成本的前提下·不論原先的產權設定為何·只要允許自由交易·最後的交易結果都會是最有效率的·)




Ronald Harry Coase  
1910-2013



### Coase Theorem Example (寇斯定理範例)

- Alex and Ben are roommates. (假設 A, B 兩人住在一起)
- Alex loves to play loud music, but Ben hates it.
- Guess what will happen between them!
  - (A 喜歡大聲播放音樂·但是 B 很討厭此行為·究竟他們會擦出什麼樣的火花呢?)



Case 1: Alex gains \$200 for playing music, Ben loses \$400 tolerating it. Efficient result: **Stop**

(A 放音樂會有 200 元的滿足程度·B 有 -400 元的滿足程度·有效率的結果是: 不放音樂)

	Room belongs to Alex (房間是 A 的)	Room belongs to Ben (房間是 B 的)
Case 1	(300, -300) <b>Stop</b> (Ben pays Alex 300) (不放音樂)	(0, 0) <b>Stop</b> (No Deal) (不放音樂)



Case 2: Alex gains \$400 for playing music,  
Ben loses \$200 tolerating it. Efficient result: **Play**

(A 放音樂會有 400 元的滿足程度 · B 有 -200 元的滿足程度 · 有效率的結果是: 放音樂)

	Room belongs to Alex (房間是 A 的)	Room belongs to Ben (房間是 B 的)
Case 2	(400, -200)	(100, 100)

(No Deal) **Play** (放音樂) **Play** (放音樂) (Alex pays Ben 300)

