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Allocation or skill?
What's driving corporate trading performance in the EU ETS?

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Background

European Union Emission Trading System

- Large multi-country greenhouse gas emissions trading system
- Launched in 2005
- Regulates direct emissions of electricity generation, energy-intensive industries and aircraft operators
- Divided into trading periods (2005-2007; 2008-2012; 2013-2020; 2021-2030)
- EU ETS has grown over time: more countries and more types of greenhouse gases
- New ETS for transport and heating from 2027 on (ETS II)
- Long period of low prices → reforms (e.g. 2013) and more ambitious reduction targets lead to increasing prices (90 € on 25/7/23)
- Companies develop individual trading (and abatement) strategies based on expectations, abatement options and allowance prices
- Decrease in number and share of free allocation over time

Objective

Empirically investigate factors explaining companies' profits from the trading (= buying and selling) of emission allowances, considering the roles of free allocation and trading strategies

- In theory: emissions trading achieves a given target at minimum cost
- If companies bid for allowances at their marginal abatement costs, allowance price correctly signals scarcity
- Efficiency also requires that companies maximizes their profits from buying and selling allowances
- Companies' profits from emissions trading depend on
  - Allocation: the number of allowances received for free
  - Skills → trading (and abatement) strategies e.g.
    - banking/borrowing
    - timing of transactions
    - use of intermediaries and futures

Previous literature

- Zaklan (2013) factors related with participation in emissions trading in the first trading period
  → **Participation** driven by size, sector, ownership structure, value of free allocation
- Jaraitė-Kažukauskė and Kažukauskas (2015), Naegele (2018), Hintermann and Ludwig (2019), Baudry et al. (2021), analyze **trading behavior** in first and second trading period → **Transaction costs** impede trading especially for small companies
- Zaklan (2022) analyzes trading behavior from 2009-2017
  → Because of transaction costs, Coase's independence property may not hold for small companies
- Abrell et al. (2022) analyze trading behavior from 2005-2014
  → Trading activities related to company size, sector affiliation, productivity, location, and transaction costs, and net position (→ violates Coase)
- Borghesi and Flori (2018) and Karpf et al. (2018)
  → Location of an installation/company affects trading behaviour.
- Cludius (2018) analyze **trading success** in the first trading period
  → Trading success is related to allocation, sector affiliation, and emission levels
- Liu et al. (2017), Guo et al. (2020) analyze corporate trading performance during the first two trading periods
  → Liu et al. (2017): trading success positively correlated with net position, emission levels and belonging to industrial sector
  → Guo et al. (2020): trading success positively correlated with carbon abatements

Contribution

- **Broader set of factors** related to trading skills e.g.
  - banking (notably: do companies bank efficiently?)
  - number of trades /total transactions (learning effects?)
  - timing of trading (for compliance only?)
  - use of intermediaries (information?)
- **Longer temporal scope**: 2005-2017, i.e. include 5 years of the third trading period
- **Panel estimators** accounting for potential selection bias
- **Novel dataset** allows analysis at the company level (instead of installation level, or global or national ultimate owner)

Data

- **EUTL data** can be downloaded free of charge from the European Commission's website and include
  - **Transactions data** contains all transactions completed in the EU ETS (published on a three-year delay)
  - **Account data** contains information to the accounts involved in transactions
  - **Installation data** provide information to free allocations and compliance
- **ORBIS data** contains information on company characteristics
- Matching of EUTL data to the ORBIS data using company registration numbers
  → In cases where a match was not feasible, we used account names and addresses of account holders

Data

Timeframe

- Entire period: 2005-2017
- By trading period, i.e. 2005-2007; 2008-2012; 2013-2017

Sample: Transactions at monthly level January 2005 to April 2018

Aggregation and selection

- Aggregation on an annual per-company basis
- We exclude administrative transactions → they do not reflect trading strategies
- A (trading) year in our dataset is defined as running from May of year t through April of year t+1
  → Companies must surrender allowances by end of April
- We only include regulated stationary installations and respective companies
- We removed all transactions between accounts of the same installation

Variables

Dependent variable		
▪ *Profits*	Difference between the value of all transfers and the value of all acquisitions in a trading year	source: EUTL, EEX, ICE
Covariates		
Allocation		
▪ *Net position*	Allocation of EUA minus verified emissions in year t (absolute value in metric tons of CO_2eq	source: EUTL
Skills – strategic		
▪ *Banking*	Allocation of EUA plus acquisitions minus verified emissions minus transfers in trading year	source: EUTL
▪ *Late buyers/sellers*	Buy/sells in true-up period (February, March, April)	source: EUTL
▪ *Transaction frequency*	Number of transactions in trading year	source: EUTL
▪ *Use of intermediaries*	Number of intermediaries used in trading year	source: EUTL
▪ *Total transactions*	Transaction volume of EUA in trading year t	source: EUTL
Skills – structural		
▪ *Installations*	Number of installations in year t	source: EUTL
▪ *Energy*	Dummy = 1, if company belongs to energy sector	source: ORBIS
▪ *Employees*	Number of employees in year t	source: ORBIS
▪ *Productivity*	Calculated as revenues divided by number of employees in year t	source: ORBIS
Market pressure		
▪ *Carbon leakage*	Dummy =1, if company affiliated with carbon leakage sector	source: EU ETS regulations
Year and regions effects		
▪ *Trading periods*	Dummy for each trading period	source: EUTL
▪ *Regions*	Dummy for regions	source: EUTL

Panel econometric Models

Heckman-type two-step selection estimator

- Participation

$$D_{it} = \begin{cases} 1 \; if \; D_{it}^{*} > 0 \\ 0 \; otherwise \end{cases}$$

$$D_{it}{}^{*} = v_{it}\delta + w_i\theta + \alpha_{1,i} + \varepsilon_{1,it}$$

- Profit equation

$$Y_{it} = x_{it}\beta + z_i\gamma + \alpha_{2,i} + \varepsilon_{2,it}$$

- Identification: participation equation includes shares of companies participating in emissions trading at the country level as an additional covariate
  → Assumption: This share affects participation but not profits

Results I

	Coefficient	SE
Allocation		
Net position	5.986***	(0.238)
Skills - strategic		
Banking	-5.724***	(0.323)
Late buyers	2.262**	(1.104)
Interaction P2 late buyers	-1.838	(1.134)
Interaction P3 late buyers	-2.469**	(1.101)
Late sellers	-2.841***	(1.103)
Interaction P2 late sellers	2.423**	(1.131)
Interaction P3 late sellers	2.972***	(1.098)
Transaction frequency	2.864	(3.891)
Interaction P2 transaction frequency	-3.071	(3.684)
Interaction P3 transaction frequency	-7.410**	(2.905)
Use of intermediaries	2.435	(6.924)
Interaction P2 use of intermediaries	3.260	(7.081)
Interaction P3 use of intermediaries	-2.590	(7.089)
Total transactions	3.347	(11.21)
Skills - structural		
Number of installations	4.751***	(1.542)
Energy	683.9	(987.3)
Employees	13.82	(18.45)
Productivity	3.907	(10.05)
Market pressure		
Carbon leakage	73.68	(79.43)
Year and region effects		
Period 2	0.084***	(0.013)
Period 3	-0.031**	(0.014)
Region effects	yes	
Constant	-0.103***	(0.023)
$\text{corr}(\varepsilon_{1,it}, \varepsilon_{2,it})$	0.274***	

Allocation

- Findings for *net position* suggest that *profits* increase by €5.99 for an increase in the *net position* by one additional EUA (i.e. 1t CO_{2equ})
  →Consistent with literature

Skills - strategic

- Findings for *banking* suggest that each additional EUA lowers *profits* by €5.72 on average

➢ Coefficients associated with *banking* and *net position* are of about the same magnitude (but with opposite signs)

➢ **Suggesting companies choose the number of banked allowances efficiently** and properly take into account the opportunity costs of selling

Results II

	Coefficient	SE
Allocation		
Net position	5.986***	(0.238)
Skills - strategic		
Banking	-5.724***	(0.323)
Late buyers	2.262**	(1.104)
Interaction P2 late buyers	-1.838	(1.134)
Interaction P3 late buyers	-2.469**	(1.101)
Late sellers	-2.841***	(1.103)
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Skills - strategic

- Results for *late buyers* suggest a positive correlation with *profits* but a negative correlation between *profits* and *late sellers*
- Both results appear to be no longer present in second and third trading periods
- We found mixed results for *transaction frequency*, only interaction term with third trading period has statistically significant coefficient
  → Consistent with Cludius (2018) who did not find significant results
- We found no statistically significant correlation between *profits* and the *use of intermediaries*
  → Consistent with Cludius (2018) who did not find significant results
- Coefficient associated with *total transactions* displayed the expected positive sign, but is not statistically significant

Results III

	Coefficient	SE
Allocation		
Net position	5.986***	(0.238)
Skills - strategic		
Banking	-5.724***	(0.323)
Late buyers	2.262**	(1.104)
Interaction P2 late buyers	-1.838	(1.134)
Interaction P3 late buyers	-2.469**	(1.101)
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Market pressure		
Carbon leakage	73.68	(79.43)
Year and region effects		
Period 2	0.084***	(0.013)
Period 3	-0.031**	(0.014)
Region effects	yes	
Constant	-0.103***	(0.023)
$\text{corr}(\varepsilon_{1,it}, \varepsilon_{2,it})$	0.274***	

Skills - structural

- The coefficient for the *number of installations* is positive, and statistically significant
- As expected, we found a positive correlation of *profits* with *energy*, *employees* and *productivity*. But, the associated coefficients were not statistically significant

Results IV

	Coefficient	SE
Allocation		
Net position	5.986***	(0.238)
Skills - strategic		
Banking	-5.724***	(0.323)
Late buyers	2.262**	(1.104)
Interaction P2 late buyers	-1.838	(1.134)
Interaction P3 late buyers	-2.469**	(1.101)
Late sellers	-2.841***	(1.103)
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Constant	-0.103***	(0.023)
$\text{corr}(\varepsilon_{1,it}, \varepsilon_{2,it})$	0.274***	

Market pressure

- Coefficient associated with *carbon leakage* had the expected positive sign but failed to be statistically significant

Findings are robust w.r.t

- Employing Mundlak-approach to explicitly capture time-constant unobserved heterogeneity
- Removing forwards/futures transactions or internal company transactions, or both, from the data set
- Including period interaction terms for net position and banking with periods
- Including emissions intensity (market pressure)
- Including accumulated ‘banking’

Conclusions

- Profits appear to be **mainly driven by allocation**; not much evidence for role of skills
- Findings suggest that **companies bank allowances efficiently**: when they decide on the number of banked allowances to transfer into future periods, companies adequately take into account the opportunity costs of selling these allowances on the market
- We found that late buying (selling) of allowances was correlated positively (negatively) with profits in the first trading period
  In subsequent trading periods, such results can no longer be observed; this may reflect **learning effects achieved by companies**
- We found that **companies with more installations make higher profits** from trading, ceteris paribus, possibly reflecting the conducive role of **complementary assets** in this context
- These findings were obtained for the period **2005-2017**, which was **characterized by relatively low prices** of EUAs
  Future work could investigate the extent to which our **findings also hold for periods with substantially higher prices**, which mean stronger financial incentives to buy and sell allowances efficiently

Literature

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Thank you for your attention

Data issues

- For several accounts we could not match EUTL with ORBIS database
- ORBIS database did not provide company characteristics for many companies
- Analysis of forwards and futures is based on information for typical delivery dates and on yearly average prices
- Data availability limitations does not allow to include information on position of banked allowances (only on banking from previous year)