

Transfers in Phase I of the EU Emissions Trading Scheme: A first reality check of transfer patterns based on cluster analysis

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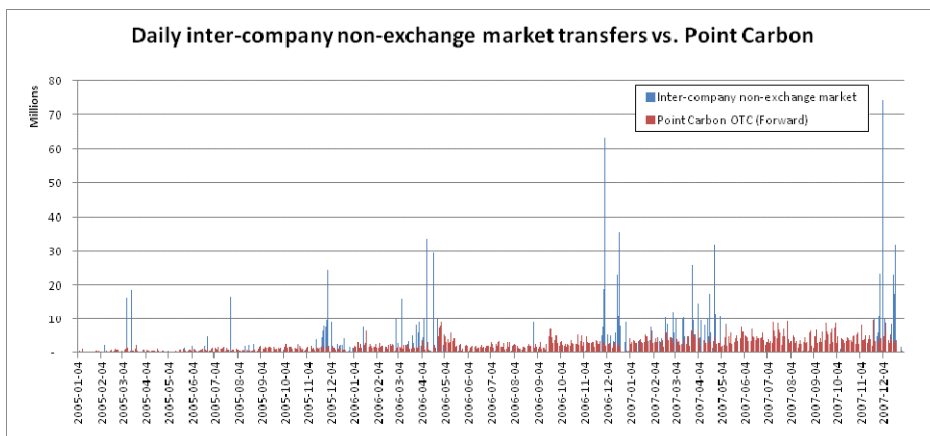
Agenda

1. Introduction
2. The EU ETS – phase I
3. Data
4. Methodology
5. Results (preliminary)
6. Discussion (preliminary)

1. Introduction: Motivation

- EU Emissions Trading Scheme largest environmental market in the world
- Comprehensive information on EU ETS market transfers is scarce and data only available with considerable delay
- Scarce Literature on actual company trading behaviour in environmental markets
- Avenues for future research

1. Introduction: Transfer volumes



Source: Own graph based on CITL data and point carbon volume data

1. Introduction: Literature review

- EU ETS market data analysis
 - World Bank: State of the carbon market
 - Point carbon: Divers publications
 - Banking and Finance literature e.g. Bredin, Hyde and Muckley 2013
- Company trading behaviour
 - ZEW CO₂ Barometer based on surveys of German companies
 - Engels et al. 2008, Pinske 2006, 2007, 2008 based on surveys
- CITL Data
 - Trotignon and Delbosc 2008
 - Jaraité and Kazukauskas 2012
 - Zaklan 2012
 - Weishaar, Couwenberg, Jong 2012

1. Introduction: Research questions & contributions

Research Questions:

- What transaction behaviour in the registry can be observed in the EU ETS Phase 1?
- Can we distinguish between specific transfer patterns?

Contributions:

- First analysis of unrefined data of EU Community Independent Transaction Log (CITL) data including Personal Holding Accounts
- Explorative study to derive further research questions

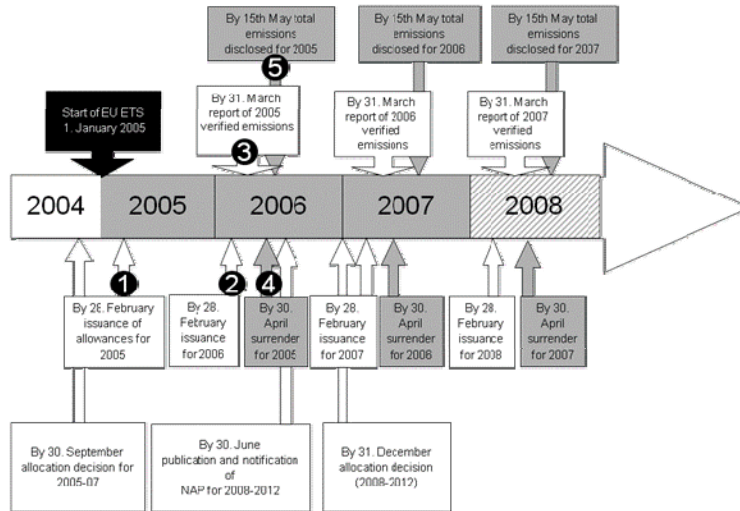
2. EU ETS Phase I: Key Design Features (I)

- **Target**
 - Cap level left to the Member States (National Allocation Plans), approval by the European Commission
 - Phase I cap: 2,082 Mt CO₂ p.a. covered (all GHG in Switzerland 53 Mt CO_{2e})
- **All EU countries participating (Phase 1: 25 EU Member States)**
 - Covers around 50% of Carbon Dioxide emissions (CO₂) of EU
 - Around 40% of total greenhouse gas (GHG) emissions of EU
- **Downstream scheme for CO₂ from stationary sources**
 - Installation-based
 - Power generation & selected industries
- **Flexibility**
 - Full banking within a phase and one year borrowing
 - No banking and borrowing between Phase 1 and Phase 2
- **Units traded**
 - European Union Allowances (EUAs)

2. EU ETS Phase I: Key Design Features (II)

- **Allocation based on National Allocation Plans (NAP)**
 - Allocation left to the Member States, approval by the European Commission
 - Ceilings for auctioning ($\leq 5\%$ phase 1, $\leq 10\%$). Actual auction share Phase 1: 0.13%
 - Total amount of allowances to be allocated and amount per installation
 - Policies & Measures for the non-ETS sectors (informative)
- **Sanctions**
 - Penalty of 40 €/t CO₂ (and make-good provision, no price cap or floor)
- **Offset Mechanisms**
 - Limited use of Kyoto credits (Clean Development Mechanism (CDM) and Joint Implementation (JI), but irrelevant for Phase 1
- **Technical Aspects**
 - Yearly monitoring (mainly calculation based) and reporting of verified emissions
 - Phase 1 2005-2007, Phase 2 2008-2012 (= Kyoto Phase), Phase 3 2013-2020

2. EU ETS Phase I: Timeline

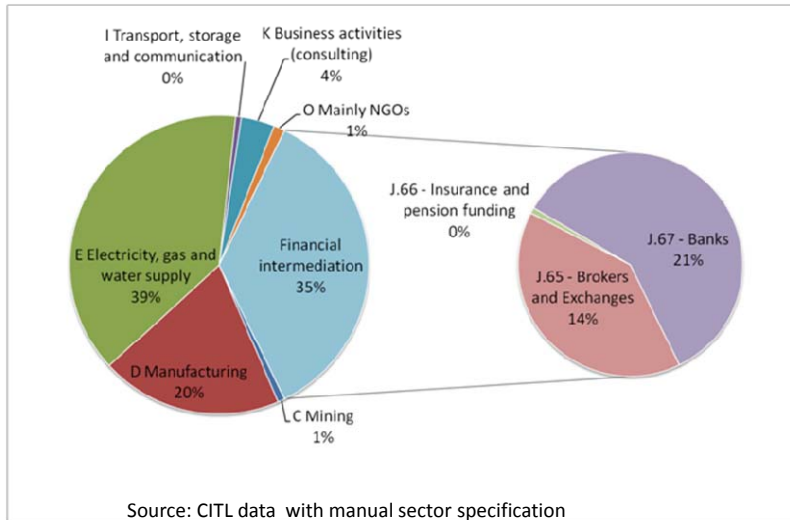


Source: Own graph

3. Data: The CITL Data Base

- EU CITL is an electronic accounting system which provides two data sets:
 - Transaction data: all issuance, allocation, transfer, cancellation, retirement, and surrendering of EUAs (97,000 transactions 2005-2007)
 - Account information (11,273 accounts) including for OHAs allocation, verified emission, surrendering, compliance
- Transaction data: on account level, reported with 5-calender year delay (Period 2.2005 – 12.2007), 4 months true up period in 2008 missing
- Three types of accounts:
 - Operating holding accounts (OHAs): 6,873 active in 2005-2007
 - Personal holding account (PHAs): 729 in 2005-2007
 - Country accounts: 58 active in 2005-2007
- Different information for different countries (e.g. Austrian and Greek report no account identifiers for domestic transactions; Denmark different account identifiers between transaction data and accounts)
- No price data available

3. Data: Personal Holding Accounts

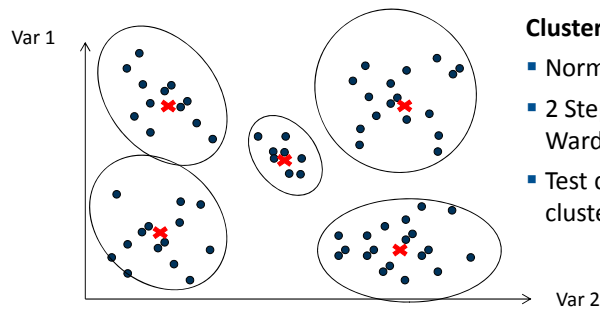


3. Data: Data Processing

- Generate registry-specific identification codes (Unique IDs) to link account information with transaction data
- Includes market transfers: excluding allowance issuance, retirement, cancellation, surrender, allocation, and correction (CITL types 1-51, 3-21, 4-3, 10-0, 10-1, 10-2, 10-53, and 10-55 respectively)
- Market Transfers (2005 – 2007):
 - 2,85 Billion EUAs transaction volume
 - 42,956 market transactions
- Exclusion of 305 accounts e.g. 247 OHAs (comprising 0.75% of total market transfers) since no link possible and 58 country accounts
- Includes only accounts which conducted market transfers: 6,628 OHAs and 727 PHAs (Total 7,355 accounts)
- We detected that a number of transactions are missing from the CITL (few PHA accounts had transfers > acquired EUAs) and have been in discussion with European Commission to solve this problem (not finalised yet, but omitted data will not significantly affect our analysis since very few accounts).

4. Methodology: Cluster Analysis

- Cluster analysis is a multivariate technique for grouping datasets on the basis of distance of each object
- Aim: to split datasets into groups (clusters) which exhibit high internal homogeneity and high external heterogeneity



Cluster method:

- Normalization of all variables
- 2 Steps:
Ward's hierarchical + k-means
- Test differences between clusters for significance

4. Methodology: Variables

Transfer Variables

- Total transaction volume (EUAs acquired + EUAs passed on)
- Net acquisition volume (EUAs acquired - EUAs passed on)
- Transactions relative to allocations (Total transaction volume/sum of allocated EUAs)
- Number of parties acquired from (number of different accounts)
- Number of partners transferred to (number of different accounts)
- Dispersion of transfers (st dev of account's transfer volume/mean of all accounts' transfer volume)

Attributes of Accounts

- For all accounts:
 - Account type (operation or person holding account)
 - Sector affiliation (based on NACE codes)
- For OHAs, only:
 - Size (in terms of average verified emissions p.a.)
 - Allocation position (allocated emissions – surrendered emissions)

5. Results: Cluster Centers

	Passive	Medium Active	Acquiring	Partnering	Transferring	Continuous	LCH
Transaction Volume [1000 tonnes]	290	14,742	18,526	37,776	97,480	78,368	221,464
Net Acquisition [1000 tonnes]	-38	382	7,526	1,016	332	19,147	0.0
Transactions relative to allocation	97	14,384	12,448	37,776	97,480	78,368	221,464
Number of parties acquired from	1.11	34.82	11.78	121.55	50.29	37.20	24.00
Number of parties transferred to	1.25	20.68	6.90	67.00	41.43	30.80	23.00
Dispersion of transfers	2.40	1.36	1.74	1.03	1.36	1.06	1.74
No. of accounts	7,212	78	41	11	7	5	1
% of total accounts	98.06%	1.06%	0.56%	0.15%	0.10%	0.07%	0.01%

- Vast majority in the passive cluster
- 2% of accounts show significantly higher transfer activities

5. Results: Attributes of accounts/account holders

	Passive			Medium Active			Acquiring			Partnering			Transferring			Continuous			LCH	
	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	N
Account type	0.08	-	7212	0.96	-	78	0.49	-	41	1	-	11	1	-	7	1	-	5	1	1
Sector affiliation (NACE)	1.50	0.74	7212	2.13	0.97	78	1.29	0.68	41	1.64	1.12	11	2.43	0.98	7	1.00	0.00	5	3.00	1
Size (in k tonnes)	220	1013	6604	1189	1832	3	5333	5118	21											
Allocation Position (in k tonnes)																				
2005	60	441	6604	266	460	3	-1395	4083	21											
2006	-30	443	6604	-553	991	3	-3774	3515	21											
2007	6	258	6604	-218	483	3	-2558	1923	21											

- Passive cluster: small OHAs, from both Energy and Industry
- Medium active: mainly PHAs across all three sectors (e.g., Total Gas, RWE Vertrieb, Thyssen Krupp, Morgan Stanley)
- Acquiring: 50/50 PHAs/OHAs, mainly Energy, under-allocated (E.on UK, RWE Power, Vattenfall, EnBW, SWM but also UBS...)
- Partnering: all PHAs of large energy and financial industry (BP, Shell, GDF, Fortis Bank, Carbon Capital Markets)
- Transferring: PHAs of large energy and financial industry (RWE, EDF, Barclays, CdD)
- Continuous: PHAs of large power (EDF, Nuon, RWE, SSE)
- LCH: LCH.cleartnet (clearing house)

6. Discussion

Research Questions:

- What transaction behaviour in the registry can be observed in the EU ETS Phase 1?
- Can we distinguish between specific transfer patterns?

Key results:

- Vast majority quite inactive
- More active accounts dissimilar trading patterns
- These are mostly PHAs: partly of regulated firms (energy and industry), partly of financial industry

Future Research Agenda

- Majority of installations passive: What is the role of transaction costs? Can management transactions explain some of the passive accounts (aggregation of accounts on firm/MNC level)?
- Not only financial intermediaries but also big oil and big power companies seem to act as brokers: Did they make use of their market insights?
- Power generators appear in 5 different clusters: Which strategies were more successful (winners/losers)? How do electricity market and emission market strategies interact?
- Banks appear in many clusters: What role did banks play – providing liquidity vs. injecting volatility?
- We find the same firms in different clusters (e.g., RWE): Do (especially large) firms split their emissions trading activities between different business units and use different strategies?
- State owned companies vs. private owned companies: Do we see any differences (firm level aggregation necessary)?
- Country specific patterns: Why are many accounts opened in Denmark?

THANK YOU FOR YOUR ATTENTION!

Open Questions:

- Any important information lacking?
- Anything unclear?
- Better cluster names?
- Journal?