

Financial Intermediation in the European Emissions Market

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Abstract

The European Union Emissions Trading System is the world’s largest carbon emissions market, covering over 8,500 installations with an annual trading value exceeding €800 billion. Whether market-based environmental regulation minimizes abatement cost depends on how efficiently firms can trade the permits it creates. The foundational theory of emissions trading establishes that, under competitive equilibrium, allowances flow to their highest-valued use (Montgomery, 1972) and prices follow the risk-free rate net of the convenience yield (Rubin, 1996). A growing body of work has studied the aggregate effectiveness of cap-and-trade systems (Colmer et al., 2024), the welfare effects of environmental market design (Fowlie et al., 2016), and the microstructure of over-the-counter financial markets where search frictions generate demand for intermediation (Duffie et al., 2005, Hugonnier et al., 2020). Yet competitive equilibrium requires a frictionless price-clearing mechanism that is rarely available in practice. In the EU Emissions Trading System, regulated firms and financial intermediaries trade across multiple platforms—government auctions, a centralized limit-order market (LOM), and over-the-counter (OTC) bilateral trades—that differ in access costs, pricing rules, and the role of search. The system has also undergone substantial regulatory evolution since its inception in 2005, progressively shifting from free allocation to auctioning and tightening the aggregate cap, so that a growing share of regulated entities must acquire allowances through these platforms (Känzig, 2023, Fuchs et al., 2024). For entities whose core competence lies in production rather than financial risk management, the cost of navigating these channels is itself a substantial compliance burden. Financial intermediaries with no compliance obligations have steadily expanded their presence, holding nearly half of all banked allowances and accounting for a large share of trading volume. The European Parliament has repeatedly debated restricting their participation on grounds of excessive speculation, yet whether financial intermediaries reduce trading frictions or extract rents from regulated firms remains an open empirical question.

This paper develops a continuous-time search and matching model that jointly captures all three trading platforms. Heterogeneous emitters choose which platforms to access, how intensely to search for over-the-counter counterparties, and how much to trade. Symmetric financial intermediaries buy from surplus firms and sell to deficit firms, earning an intermediation spread that exists because of frictions. The model nests competitive equilibrium as a benchmark. The gap between the frictional equilibrium and the competitive benchmark decomposes into an inventory misallocation, a friction wedge encoding trading costs and intermediation spreads, and a dynamics gap capturing how distortions compound over time. This decomposition provides a metric for each source of inefficiency and enables counterfactual analysis of market design changes, including the welfare consequences of financial participation.

We construct a novel transaction-level dataset from the European Union Transaction Log (EUTL) that traces each firm’s trading activity across all three platforms. We complement these records with auction-level clearing prices and bidder statistics, daily settlement prices and volumes from the European Energy Exchange (EEX) and the Intercontinental Exchange (ICE), a daily over-the-counter price index from the London Energy Brokers’ Association (LEBA), and high-frequency order book data from late 2018 onward. A distinctive feature of these combined data is that they cover every channel through which market participants acquire and trade allowances, enabling us to compare compliance costs across platforms and trace how allowances flow from issuance to surrender.

Compliance behavior diverges sharply with firm size. Variance decomposition of installation-level emissions shows that firm fixed effects explain 88.9% of total variation, indicating that firms have considerable foresight about their own emissions. Despite this predictability, firms with smaller net allowance needs concentrate a disproportionate share of their purchases near the compliance deadline, whereas large firms spread acquisitions more evenly and participate directly in auctions and exchange trading. Small emitters rely almost exclusively on OTC transactions intermediated by financial firms. Financial intermediaries accumulate allowances during periods of low compliance demand and distribute them during the pre-surrender season, earning an intermediation spread. Order book liquidity follows a pronounced seasonal cycle aligned with the surrender deadline: ask-side depth falls in the pre-surrender months and bid-ask spreads widen, so that firms concentrating purchases near the deadline face thinner liquidity and wider spreads.

We develop a parametric version of the model and establish identification of the structural parameters from observed transactions, prices, and the cross-sectional distribution of firm inventories. The key identifying equation links each firm’s marginal valuation to observable trading behavior; the estimating equations exploit variation across platforms, firm types, and calendar time to pin down search costs, trading costs, matching efficiency, and the convenience yield of holding allowances. Estimation is in progress.

We establish how trading frictions shape compliance costs in environmental markets, contributing to the literatures on limit-order markets (Hollifield et al., 2004), over-the-counter intermediation (Duffie et al., 2005, Hugonnier et al., 2020), and environmental resource markets (Rafey, 2023, Kong, 2023, Toyama, 2024). Colmer et al. (2024) show that the EU ETS reduces emissions without detectable economic harm, establishing that the system works at the aggregate level. Yet the cost of acquiring allowances varies not with emissions but with how firms access the market. Small emitters rely on OTC intermediation and concentrate purchases near the compliance deadline, paying an implicit premium for timing flexibility. Financial firms provide immediacy to participants who cannot maintain continuous market presence, and strategic order placement shapes execution costs on the exchange. Disentangling whether intermediaries reduce these costs or merely price them cannot be resolved in a reduced-form setting, since financial participation and regulatory reform have evolved jointly. We provide the empirical regularities and structural framework needed to answer that question.