



# Capital market response to emission rights returns: Evidence from the European power sector<sup>☆</sup>

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## ABSTRACT

Prior studies on the distributional effects of the European Union's Emission Trading Scheme (EU ETS) have so far only relied on supply and demand data. Empirical evidence from capital markets has been missing. We address this gap and measure the ETS's economic consequences, using the expectations of investors towards the regulatory impact on firm value. Employing a multifactor model, we show that returns on common stock of the largest affected industry, power generation, are positively correlated with rising prices for emission rights. This implies that the market predicts that firms are not only able to pass on their share of the regulatory burden to customers but even achieve windfall profits by overcompensating for the costs.

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## 1. Introduction

Even though the EU Emission Trading Scheme (ETS) is the world's largest market-based environmental regulation, only a few studies have so far tried to quantify its economic effects (e. g. [Sijm et al., 2006](#); [Smale et al., 2006](#); [Demailly and Quirion, 2008](#)). These papers have examined how the ETS possibly affects a firm's earnings by analyzing demand and supply functions. There is an additional way of assessing the ETS's likely impact on earnings: evaluating investor expectations. Using capital market data, we test whether investors believe that the regulation has an impact on the profitability of the firm. Our study thus complements the existing literature by adding a capital market perspective to the existing approach of procurement and sales markets.

Economic theory suggests that a voiding of pollution certificates affects a firm's cost structure – as the usage for production of any other asset does: a rising price for carbon alters the outlay for additional certificates, the preferred input mix or the optimal output, and hence decreases the firm's income. Inherent to an emission trade is that the absolute effect on earnings is determined by the actual pollution caused by the production facilities and by the price quoted for emission allowances ([Zimmermann and Veith, 2007](#)). Firms may also be able to simultaneously adjust selling prices of goods and thus

pass on a share or all the cost of certificates. Capital markets provide insight into how investors consider this possibility. If this regulatory burden is expected to be borne exclusively by the emitting firms, the relationship between share prices and the prices for emission rights should be negative: following capital market theory, a rising price for the input factor emission rights revises investors' expectations of future profits and in the end leads to lower share price quotations.

Using a multifactor market model for the European power sector, we find that stock prices are positively correlated with prices of emission rights. This result indicates that the introduction of the ETS did not only alter the cost structure of firms, but also gave rise to an opportunity for price increases which even overcompensated for the imposed costs. Our results are robust towards a control group and to the inclusion of the firm-specific fuel mix and power market regulation.

## 2. Hypotheses development

### 2.1. Distributional effects for firms subject to emissions trade

To achieve the CO<sub>2</sub> pollution targets of the Kyoto protocol, the EU established an emission trading scheme, which started in 2005. The scheme allocates to every regulated production facility a number of certificates (emission rights, allowances) which carry a pollution right of 1 tonne of carbon. The allotted amount is determined by a facility's historical emissions during a reference period minus a defined reduction. Allocation modes can be changed by the regulator after each five year period: rights can, for instance, be allocated for free or

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auctioned off. During the first, shorter, phase from 2005 to 2007 all rights were granted for free.

Allowances are traded as a commodity on various exchanges. If projected emissions exceed the certificates initially obtained, the missing number can be bought on the market; supernumerary certificates can be sold. Speculation, for instance in the form of a sale and a subsequent buy-back, is also possible. Used certificates have to be surrendered to a national authority within one year, according to the pollution verified for the facility.

The core question arising from the creation of the EU ETS is whether it has distributional effects for the regulated firms or for other market participants, such as the firms' customers. At first glance, effects on the firm level are likely, since the trading scheme puts compliance costs on the firms subject to it (Stigler and Friedland, 1962). However, upon further inspection, it is questionable whether the regulatory burden is to be paid completely by the dischargers, since they may be able to share the additional costs with other market participants, particularly with the customers. If a firm can completely pass on the cost of the regulation, no effects on the entity level occur. Three hypotheses can be formulated:

- (1) the EU ETS has no distributional effects on the firm level (null hypothesis);
- (2) the EU ETS does have distributional effects on the firm level (alternative hypothesis), which can either be
  - (2a) negative or
  - (2b) positive.

Finding capital-market based evidence for one of the competing hypotheses sheds light on the question whether emission trading leads to beneficial or detrimental effects for shareholders. Which one of these hypotheses actually materialised during the first phase of the EU ETS is estimated by considering the capital market effect of the regulation. If investors expect emission rights to either increase costs or give rise to undisclosed rents there will be a correlation between the price for carbon and expected future profits.

#### 2.2. Hypothesis (1): No economic consequences for business

The first hypothesis posits that emission trading has no economic consequences at the firm level. One rationale behind this hypothesis is that these entities may be able to pass on any additional burden arising from the scheme to their customers. In this case, firms can choose a strategy that allows attaining the regulatory emission target at no additional cost. Another reason for insignificance might be due to carbon market effects: the spot price for CO<sub>2</sub> allowances plummeted from almost 30.00 EUR in April 2006 to around 0.03 EUR at the end of the first trading period in early 2008, due to the publication of a first phase oversupply. Hence a business-as-usual strategy is not going to cause a significantly higher outlay. Neither attributes to economic insignificance will cause a negative effect on corporate net income nor will they affect economic decision making.

If hypothesis (1) holds, then shareholders do not account for the price of pollution allowances in their valuation. Future corporate profits are not expected to be influenced by the emission market, regardless of its developments. Hence, a change in market value of regulated firms cannot be attributed to respective carbon price movements.

#### 2.3. Hypothesis (2a): Negative economic consequences for business

Hypothesising that the trade in emission rights has a negative impact on the capital market value of listed firms is consistent with the public-interest hypothesis that a regulation distributes wealth from firms to their consumers (Schwert, 1981). The reason is that curbing pollution by rights emission affects the production of regulated firms and is likely to lead to additional costs which cannot

be completely passed on to customers. An ETS sets out to reduce the polluting production, to purchase additional certificates covering excessive emissions or to invest in abatement measures (Montgomery, 1972). This effect is said to hold even in case of grandfathering, since the usage of free certificates causes opportunity costs (Bode, 2006). Accordingly, it was found that the emission trading schemes in the USA<sup>1</sup> led to an adverse capital market effect for coal mines and power producers (Hughes, 2000; Kahn and Knittel, 2003; Linn, 2006).

If hypothesis (2a) holds, capital market participants expect decreasing profits of regulated firms due to a rising price for emission rights. In this case certificates and shares behave in an inversely proportional manner.

#### 2.4. Hypothesis (2b): Positive economic consequences for business

The hypothesis of positive economic consequences suggests that regulated firms are not only able to pass on the additional costs arising from the EU ETS to their customers; instead, imposed regulatory costs will even be over-compensated by the buyers. In this setting, regulated firms generate additional income from their customers, which can be raised with reference to the cost of abatements. Following industrial economics, a high bargaining power and a high concentration (Porter, 1991; Makhija, 2003) can result in benefits from rising factor costs. Increments to earnings may also be expected when allowances are grandfathered. Only substantial emission targets which necessitate technical and economic abatement measures are likely to lower these effects (Goulder and Parry, 2008). Abadie and Chamorro (2008) show that investing in a carbon capture and storage facility maximizes future cash flows only if allowance prices exceed 55.00 EUR. The current legal framework with a generous cap and low carbon prices thus favours a business as usual emission strategy and potentially gives rise to regulatory rents.

In all industries that are investment-intensive, barriers to entry account for a significant stake in income generated at the expense of the customers, as capital intensity and economies of scale restrict the access of new competitors (Bain, 1954). It could be shown that regulatory efforts did not significantly lower the monopoly rents of US American power producers (Stigler and Friedland, 1962) but that they even lowered the systematic risk of this industry (Clarke, 1980; Norton, 1985). Hence, both industry structure and barriers to entry probably cause rents arising from emissions trade.<sup>2</sup> It is likely that firms affected by the EU ETS are able to pass on a material share of carbon costs to their customers. Due to the entirely free allocation of certificates, the risk of a windfall profit looms large. The regulator chose to implement weak measures for the first phase: the rights are not only fully grandfathered, but carbon abatement lies at around 5%; both factors additionally indicate a possible over-compensation of all firms (Bovenberg et al., 2005).

If this hypothesis holds, investors consider the expected positive correlation between rising quotations of pollution rights and undisclosed rents. A higher price for carbon will then contribute to profits and will lead to a more favourable evaluation of the affected firm's common stock.

### 3. Model specification

In this paper, the three competing hypotheses are empirically assessed using a simple market model. The applied intuition is that

<sup>1</sup> The Clean Air Act Amendments of 1990 (CAAA), enacted on 15 November 1990, Public Law PL 101-549, codified at 42 USC 7401 et seq., are the legal basis to the so called Acid Rain Program, the national trading scheme in allowances for sulphur dioxide. The U.S. Environmental Protection Agency (EPA) is responsible for surveillance and enforcement of the emission reduction aims, see for further details Juskow and Schmalensee, 1998. Some US states additionally operate other schemes like the Nitrogen Oxides Budget Trading Program.

<sup>2</sup> These arguments can also be found in recent papers employing either a Cournot or an equilibrium model calibrated with empirical data. There, it is simulated that firms are likely to benefit from the trading scheme by cutting production and simultaneously increasing earnings (Sijm et al., 2006, 62; Smale et al., 2006; Demailly and Quirion, 2008).

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