CARBON PRICE SIGNAL
IN THE ITALIAN ELECTRIC POWER SECTOR

ASSESSING THE STOCK MARKET VALUE OF ITALIAN POWER PRODUCERS
IN THE THIRD PHASE OF THE EU ETS

CARLOTTA PIENTIERI
carlotta.pientieri@gmail.com
TABLE OF CONTENTS

I. Emissions Trading and Carbon Pricing in the Power Sector
II. EU ETS – The numbers
III. EU ETS Carbon Pricing in Financial Markets

IV. Research Question
V. Analysis of the Italian Power Market
VI. Regression Analysis
VII. Results
VIII. Conclusions
Why - Emissions Trading

Article 1 of the EU ETS Directive outlines its broad objectives:

“This Directive establishes a scheme for greenhouse gas emission allowance trading within the Community in order to promote reductions of greenhouse gas emissions in a cost-effective and economically efficient manner. This Directive also provides for the reductions of greenhouse gas emissions to be increased so as to contribute to the levels of reductions that are considered scientifically necessary to avoid dangerous climate change.”

THROUGH CARBON PRICES THAT EMERGE FROM THE TRADING OF EMISSIONS ALLOWANCES
How - Carbon Pricing in the Power Sector

Channels for the promotion of GHG emissions reduction

1. POWER PRODUCTION
   ◦ Production cost of carbon-intensive power plants
   ◦ Merit order of power production
   ✓ Operations
   ✓ Investments decisions

2. POWER CONSUMPTION (industry and end-users)
   ◦ Price of electricity (cost pass-through)
   ✓ Demand of energy
   ✓ Investments

3. INNOVATION
   ◦ Demand of new carbon-free and/or energy-efficient technologies

4. FINANCIAL MARKETS
   ◦ Expectations of financial investors
The numbers – EU ETS (I)

16 €/tCO2 avg coal to natural gas switching cost

EU ETS carbon price is not able to drive innovation on its own

The numbers – EU ETS (II)

Net monetary position of EU ETS market participants

Source: Elaboration on EEA and ICE data; ICTSD, 2017.
Litterature on Carbon Pricing in Financial Markets

Net monetary position of EU ETS market participants

Positive carbon price effect on stock prices of the majority of ETS-regulated firms

Source: Elaboration on EEA and ICE data; ICTSD, 2017.
Phase 3 Carbon Pricing in Financial Markets

Net monetary position of EU ETS market participants

Years characterized by large climate policy discourses on carbon pricing

Source: Elaboration on EEA and ICE data; ICTSD, 2017.

Negative effect of carbon price signal on stock values of carbon-intensive power production companies?
RESEARCH QUESTION:

Does the carbon price signal of Phase III of the EU ETS generate a loss of market value of Italian electricity production companies according to their carbon intensity?

RESEARCH METHODOLOGY:

STEP 1: Analysis of the Italian Power Market

STEP 2: Multivariate time-series regression model to test the effect of EUAs’ returns on the returns of three different portfolios of stocks of Italian power production companies
Analysis of the Italian Power Market (I)

1999

Liberalization
- Breakup of the state-controlled monopolist Enel
- Zonal market
- Merit-order criterion for the determination of the PUN (national single price)
- Frequent congestions to the power transmission system → Zonal sub-markets

2008

Imperfect competition (Chernyavska and Gullì, 2008)
Analysis of the Italian Power Market (II)

1999 Liberalization

2008

Imperfect competition (Chernyavska and Gulli, 2008)
- Entrance of new power producers
- Redefinition of the Zones in order to limit transmission system congestions
- Rare congestions to the power transmission system

2015

Perfectly competitive power market
- National Hirschmann-Herfindahl Index: 832
- Appropriate regulatory setting for the reception of EU ETS pricing signals
- 100% Carbon cost pass-through
Analysis of the Italian Power Market (III)

GROSS ENERGY PRODUCTION MIX

- COAL
  - After a vast investment plan in 2000
  - Rely on gas imports
  - Security of supply issues
  - Cost issues
  - Energy efficiency concerns

- GAS
  - 43%

- OIL
  - 4%

- RENEWABLE
  - 36%

Green Certificate Policy
Feed-in-tariff Policy since 2013

(Elaboration on Terna (2016) data)
Regression Analysis (I)

Multivariate time-series regression model:

\[ r_{\text{Port},it} = \beta_1 + \beta_2 r_{\text{Oil},t} + \beta_3 r_{\text{Gas},t} + \beta_4 r_{\text{Coal},t} + \beta_5 r_{\text{Elec},t} + \beta_6 r_{\text{Fin Market},t} + \beta_{\text{Carbon},i} r_{\text{Carbon},t} + \epsilon_i, \]

- \( r \) = returns (log first differences)
- \( t \) = weeks (Jan 2013 – March 2017)
- \( i \) = Portfolio
  1. Carbon-intensive portfolio
     Portfolio composed by the biggest carbon-intensive power production companies
  2. Clean portfolio
     Portfolio of renewable energy companies
  3. Clean – Carbon-intensive portfolio
Regression Analysis (II)

Multivariate time-series regression model:

\[ r_{Portf, it} = \beta_1 + \beta_2 r_{Oil t} + \beta_3 r_{Gas t} + \beta_4 r_{Coal t} + \beta_5 r_{Elec t} + \beta_6 r_{Fin Market t} + \beta_{carbon, i} r_{carbon t} + \varepsilon_i, \]

\( r = \) returns (log first differences) \qquad \( t = \) weeks (Jan 2013 – March 2017) \qquad \( i = \) Portfolio (1,2,3)

Independent Variable:
- carbon = EUAllowances Future contract (Dec 2017) continuous price

Control variables:
- Oil commodity;
- Gas commodity;
- Coal commodity;
- Electricity Prices - Italian Energy Agency;
- Financial Market (FTSE MIB index).
Results (I)

1. Carbon-intensive Portfolio
   -5.30%**

2. Clean Portfolio
   + 1.98%

3. Clean – Carbon-intensive Portfolio
   + 29.5%***

Robustness check of the assumptions
Electricity price determinants (Multivariate time-series regression) – ✓ 100% Carbon cost pass-through
Results (II)

In the context of the study, financial investors perceive carbon emissions as:

- a pervasive risk factor,

- which translates into an even higher opportunity cost when renewable energy subsidies are in place.

Despite EU ETS carbon price is not able to drive innovation on its own, EU ETS carbon price signal is able to drive the expectations of financial investors.
Conclusions

The climate discussions of the last years (EU ETS Phase III) have given political impetus to accelerate climate action. The sense of urgency has increased.

- Financial investors respond to climate policy signals by reducing their investments in carbon-intensive companies.
- EU ETS policy has been delivering effective carbon signals despite its carbon price levels.

National incentives for renewable energy sources of power can be a powerful complement to the carbon price signal.
THANK YOU