



The best (and worst) of Air Emission Trading Schemes: comparing the EU ETS with its followers

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Existing ETS



- **AIR (GHG emissions)**

- EU ETS
- California
- RGGI (Regional Greenhouse Gas Initiative)
- Australia
- China
- Others (New Zealand, Japan, Taiwan, South Korea, India, Switzerland....)

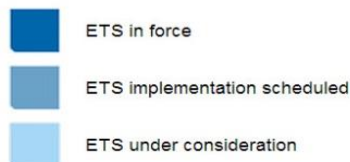
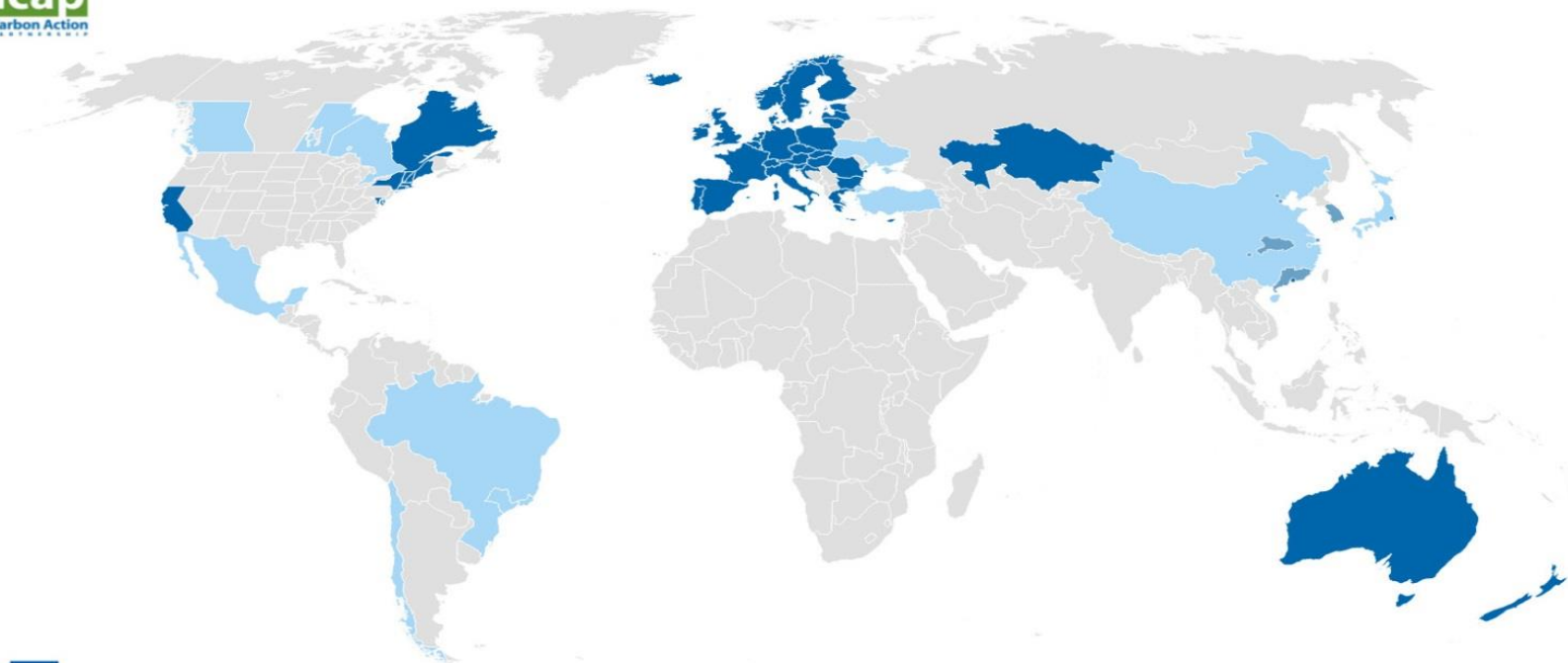
- **WATER**

- TWPR: Tradable Water **Pollution** Rights (US, Australia)
- TWAR: Tradable Water **Abstraction** Rights (US, Australia, Chile, Mexico...)
- (Borghesi, 2014, Journal of Env. Planning & Management, *forthcoming*)

Air Emissions Trading Schemes around the world



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Developed in cooperation with **ECOFYS**

The EU Emission Trading Scheme (EU ETS)



- 3 phases: 1) 2005-07, 2) 2008-12, 3) 2013-2020
- Goal: -20% GHG emissions (by 2020 compared to 1990)
- GHG Scope: CO₂ and beyond (N₂O and PFCs)
- Geographical scope: 31 countries = the EU 28 Member States + Iceland, Norway and Liechtenstein
- Coverage: 11.000 installations EU wide cap
- Allocation: auctioning (with carbon leakage exemptions)
- Sanctions (100 € for each tonne/CO₂eq in excess + obligation to surrender allowances in the following year)

The EU-ETS: from follower to forerunner



The EU ETS set several new records:

- world's largest carbon market
- first transboundary cap-and-trade system
- involves the highest number of countries

Prototype system for other countries (Ellerman, 2010)

From follower to forerunner

- The introduction of the ETS dates back to the 1970s, (USA to implement the Clean Air Act).
- EU originally more focused on “command and control” and on a EU-wide carbon tax (1991)
- The EU and the US inverted their trends: While the EU implemented and further upgraded the EU ETS, the US did not manage to establish an overall federal ETS

The EU-ETS: a leader with some leadership problems...



However, several problems emerged in its functioning:

1. Overallocation
2. Allocation criteria: grandfathering vs auctioning
3. Monitoring problems: fraudes
4. Price volatility on the EU-ETS market

EU-ETS: market price volatility



- Price of carbon permits tripled in the period January-July 2005, then more than halved in April 2006 (cf. The Economist, 2006)
- Causes:
 - Late data release and unexpected results
 - Price discovery on a new market (“learning phase”)

but market instability in ETS not limited to initial phases:

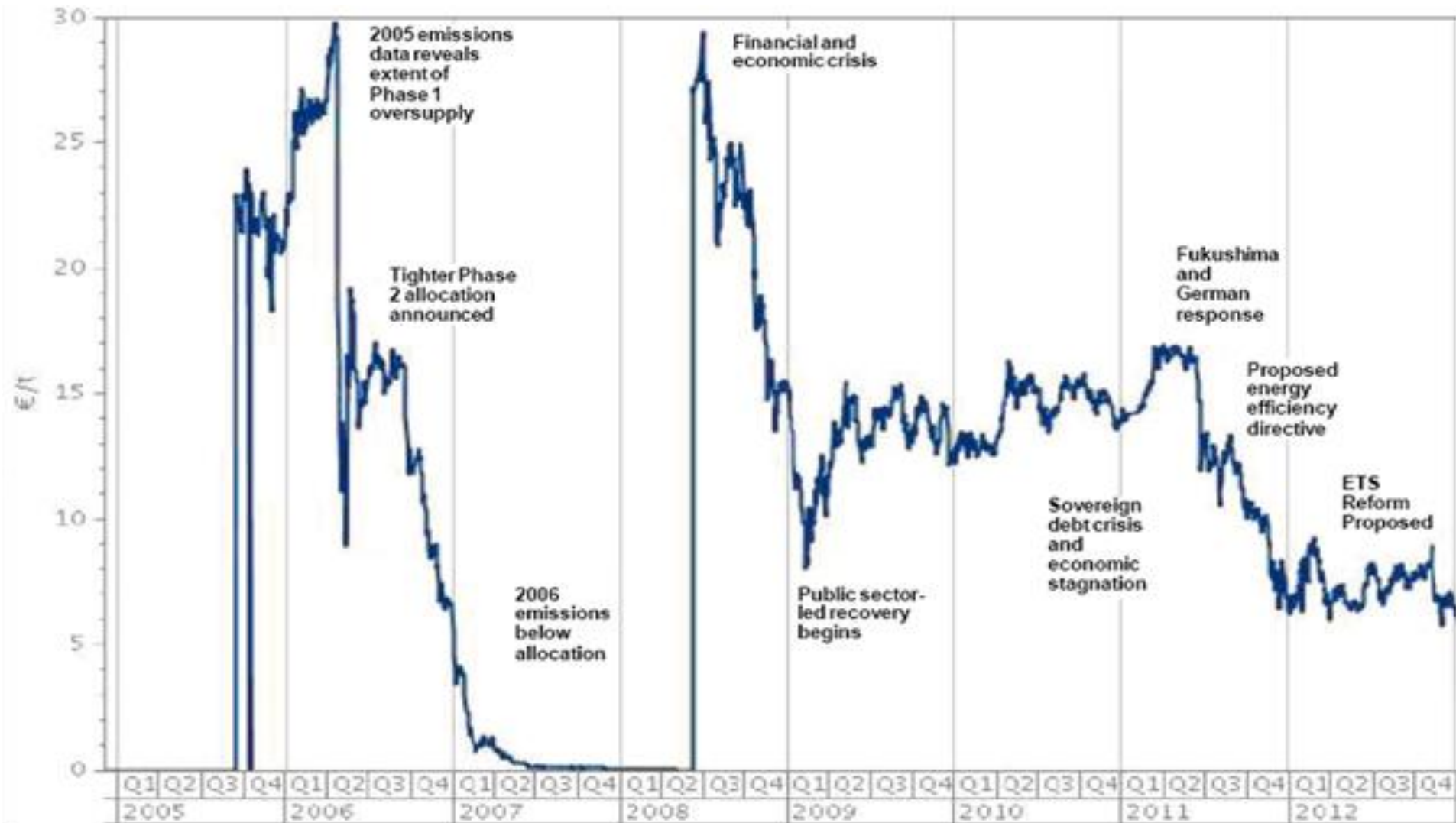
EU ETS: carbon price more than halved in a few months (from above 27 €/tonne in June 2008 to 13.25 €/tonne as of 15 January 2009);

extreme volatility in December 2009 (+3% ahead of COP-15, then -8.7% immediately after Copenhagen)

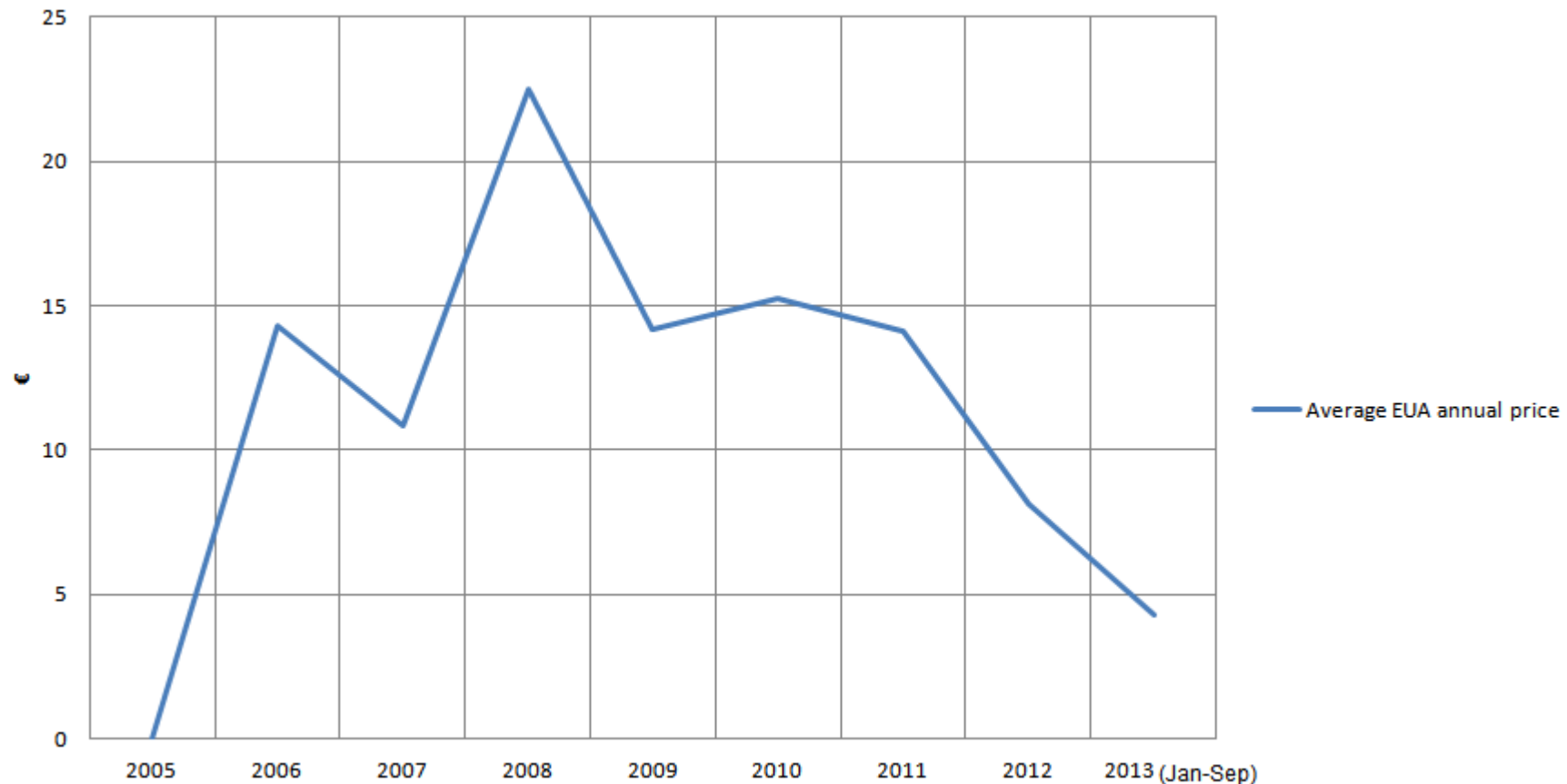
→ crucial role of expectations and credibility

- Effects: uncertainty discourage investments in environmental friendly technologies

Price volatility in the EU ETS



EU ETS allowance (EUA) price trend during the 2005-2013 period: roller coaster or collapse?



Author's elaboration on European Energy Exchanges reports.

The carbon price decline: causes



- Economic crisis: drastic emissions decline → overshooting (-7.7% in 2006 to -19.09% in 2012 wrt 1990)
- EU enlargement: new EU-12 emissions -32.74% in 2012 wrt 1990, EU-15 -14.9% (only -6.5% in 2008)
- Conflicting environmental policies: RES and EE reduce emissions → allowance prices↓

Price volatility and ecoinnovation



- Price volatility affects the technological effectiveness of the ETS, i.e. the ecoinnovation (EI) needed to reduce polluting emissions
- Market price signals scarcity of the resource and creates the incentive to eco-innovation (in order to avoid the cost of purchasing the permits)
- The lower the carbon price, the lower the incentive to ecoinnovation

The EU ETS as a driver of EI



- Large and increasing debate on the impact of the EU ETS on ecoinnovation
- Surveys of managerial interviews (Aghion, 2009; Rogge et al., 2010; Martin et al., 2011; Hervé-Mignucci, 2011...)
- Econometric modelling (Ellerman and Buchner, 2008; Anderson and Di Maria, 2011; Abrell et al., 2011; Egenhofer et al., 2011....)
- Mixed evidence and no unanimous consensus: little/no impact of EU ETS on ecoinnovation
- The Italian case: in the first phase, ETS limited impact on EI in energy efficiency and CO2 abatement (Borghesi, Cainelli, Mazzanti, 2012, 2014)
- Results possibly driven by uncertainty on ETS functioning (phase 1) and price volatility → “wait and see” strategy (buy quotas and keep them), particularly in some sectors (ceramics and cement)

The followers:

1) the California Cap & Trade Programme

- Goal: Reducing GHG emissions by 2020 to 1990 levels
- GHG Scope: CO₂ and beyond (CO₂, CH₄, N₂O, SF₆, HFCs, PFCs, NF₃)
- Three compliance periods (3 years each)
- Coverage: 600 facilities (85% of emissions)
- Allocation: auctioning (exemption for 'emissions-intensive and trade-exposed activities')
- Sanctions: pecuniary sanction (*excess emission*) applies, equal to four times the liable entity's excess emissions

2) The Regional Greenhouse Gas Initiative (RGGI)

- Goal: stabilise (by 2014 compared to 2009) and reduce - 10% GHG emissions (by 2018 compared to 2009)
- GHG Scope: CO₂ only
- Geographical scope: applies to 9 US East Coast States
- Three compliance periods (3 years each)
- Coverage: 168 facilities (located in all 9 States)
- Allocation: auctioning (no carbon leakage exemption)
- Sanctions: pecuniary sanction (*excess emission*) applies, equal to three times the source's excess emissions

3) The Australian Carbon Pricing Mechanism (CPM)



- Goal: -5% GHG emissions (by 2020 compared to 2000)
- GHG Scope: CO₂ and beyond (N₂O, CH₄ and PFCs)
- Three compliance periods (3 years each): 1) fixed price (carbon tax); 2) and 3) flexible price
- Coverage: 500 installations (60% of emissions)
- Allocation: from 2nd period = auctioning (exemption for 'emissions-intensive trade-exposed activities')
- Sanctions: pecuniary sanction (*unit shortfall charge*) which is equal to 130% - 200% of the allowance price

Next please!

The Chinese ETS pilot experience



- Goal: ‘endeavor to lower its carbon dioxide emissions per unit of GDP by 40-45% by 2020 compared to the 2005’ (source: Letter of NDRC to UNFCCC Secretariat)
- NDRC chose Beijing, Tianjin, Shanghai, Chongqing, Guangdong, Hubei, Shenzhen as the pilot cities and provinces for developing pilot ETSs (accounting for 18% of Chinese population and 28% of GDP)
- The first Chinese pilot ETS (Shenzhen) started in June 2013
- Towards a nationwide ETS?



Outcome of comparative analysis



Similarities wrt EU ETS

- Compliance periods
- Scope of application (beyond CO₂);
- Exemptions (thresholds and carbon leakage);
- Banking but not borrowing.

Differences wrt EU ETS

- Targets;
- Sanctions/penalties;
- Allocation methods (auctioning);
- Carbon pricing: price floors and price ceilings;

Implications of different sanction systems

Hp: firm A emits 50 tons in excess of permits at disposal

$$\text{EU: } 100 * 50 + P_{\text{EU}} * 50 = \mathbf{5314 \text{ €}}$$

(hp: $P_{\text{EU}} = 6.28\text{€}$ as of Sept 5, 2014)

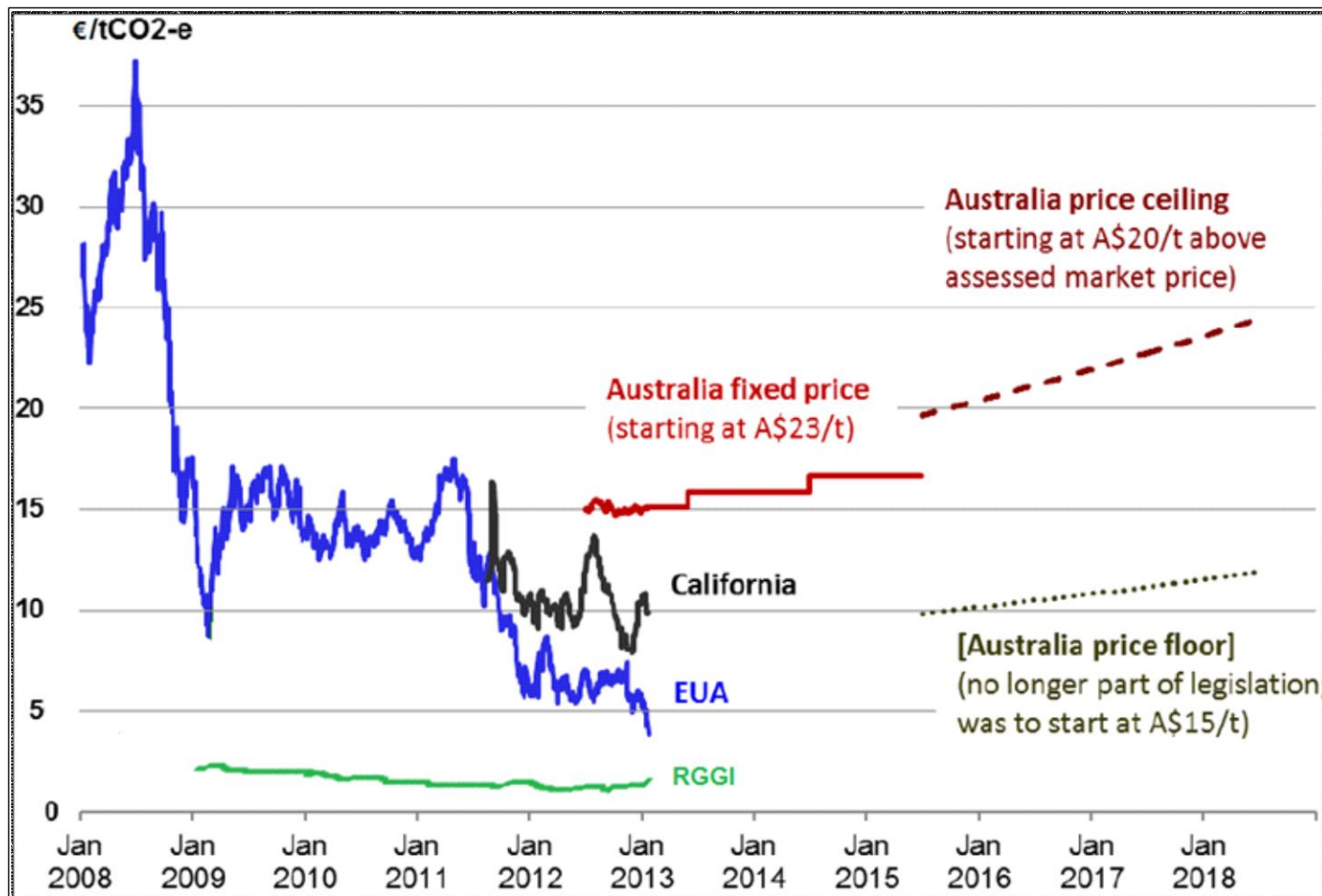
$$\text{CF: } (4 * 50) * P_{\text{CF}} = 2398\$ (\mathbf{1851.32 \text{ €}})$$

(hp: $P_{\text{CF}} = 11.99\$$ as of August 29, 2014)

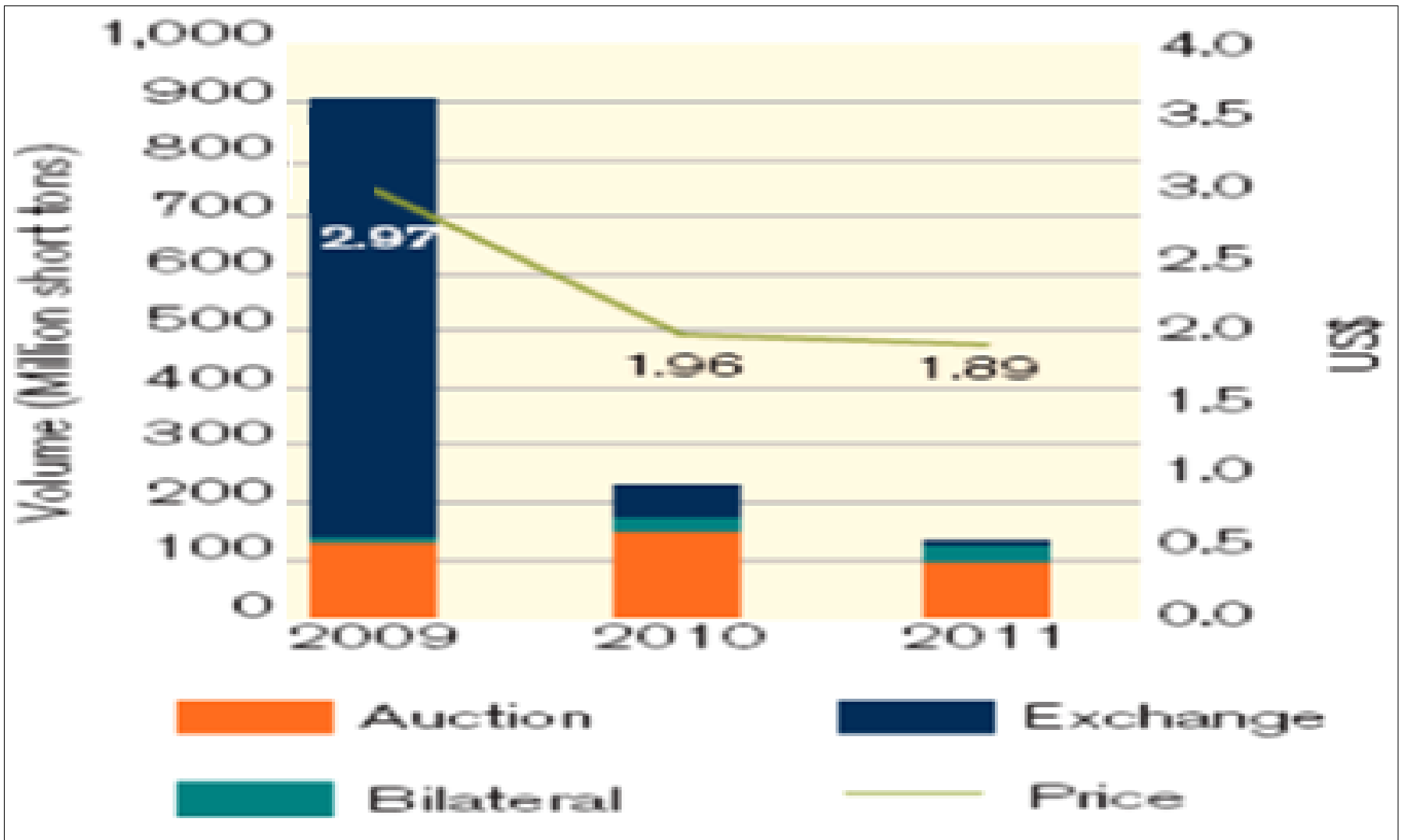
$$\text{RGGI: } (3 * 50) * P_{\text{RGGI}} = 732\$ (\mathbf{565.12 \text{ €}})$$

(hp: $P_{\text{RGGI}} = 4.88\$$ as of Sept 5, 2014)

EU vs Rest of the World: price volatility at a glimpse



RGGI: market volumes and prices during the period 2009-2011



«Hitting the floor»



- Widespread tendency to price decline and to hit the floor
- California: P floor = 10.71\$ (Auction Aug 2013: P = 12.22)
- RGGI: P floor = 2\$
- Guangdong: P floor = 60Yn (about €7/t CO₂)
- EU: learning from the followers → price floor??

→ both a price ceiling (safety net) and price floor (otherwise “polluter *does not* pay principle”)

Conclusions



- ETS has become a milestone instrument in the fight against climate change and is living a crucial moment of his evolution: between extension (towards a supra-national perspective) and extinction (due to credibility problems)
- EU ETS leader role but followers rapidly growing
- Followers share with the EU ETS some common flaws, especially in terms of price volatility, but they have also shown the capacity to innovate and possibly devise alternative ways to manage their own ETS regimes, which may in the long term jeopardise the EU leadership in the ETS context
- EU from follower to forerunner and backwards?



Thank you for your attention
Comments welcome!!