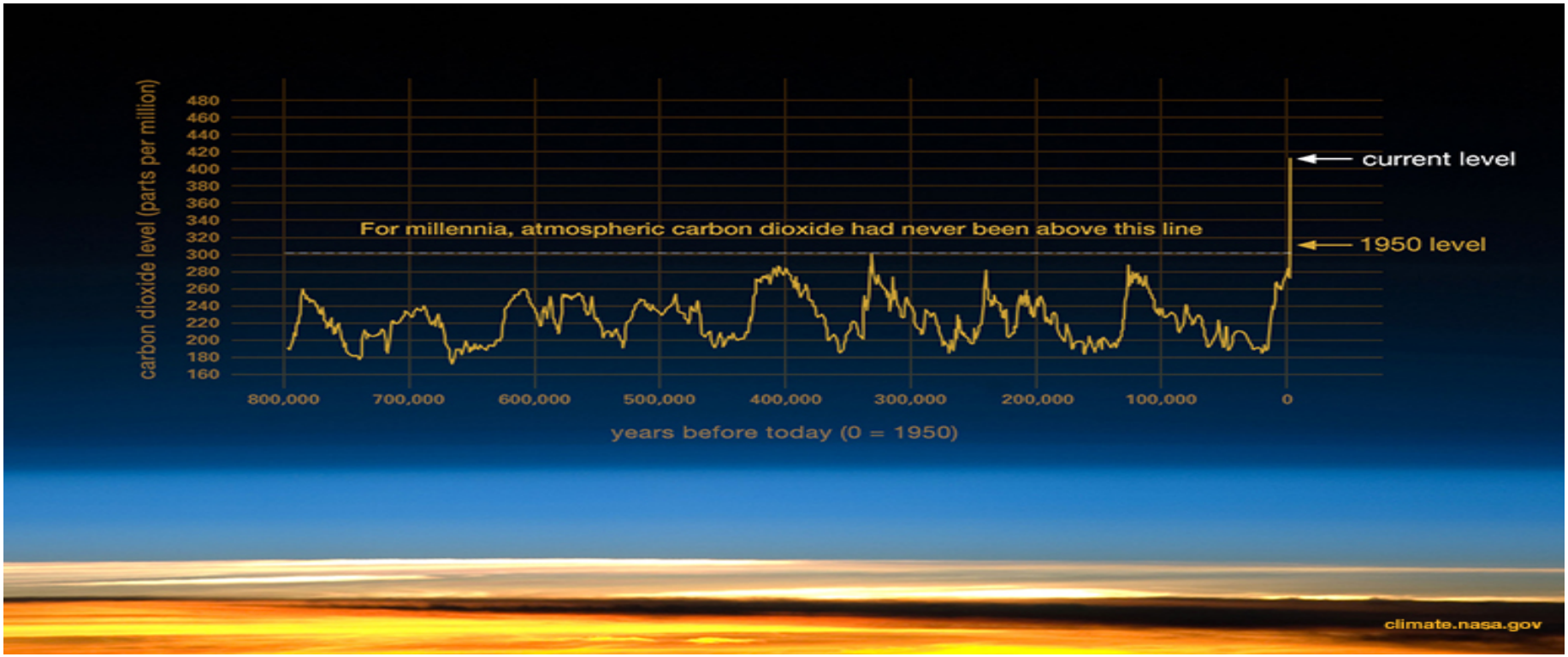
Società Italiana degli Economisti
60esima Riunione Scientifica Annuale, Palermo, 24-26/10/2019
Plenary session: LA SFIDA DELLA SOSTENIBILITA' PER LO SVILUPPO, LE POLITICHE, E LA RICERCA ECONOMICA

Economics and climate change: A "hot" topic

Simone Borghesi
(European University Institute and University of Siena)

CO_2 concentration in the atmosphere

source: Global Climate Change (NASA, 2019)



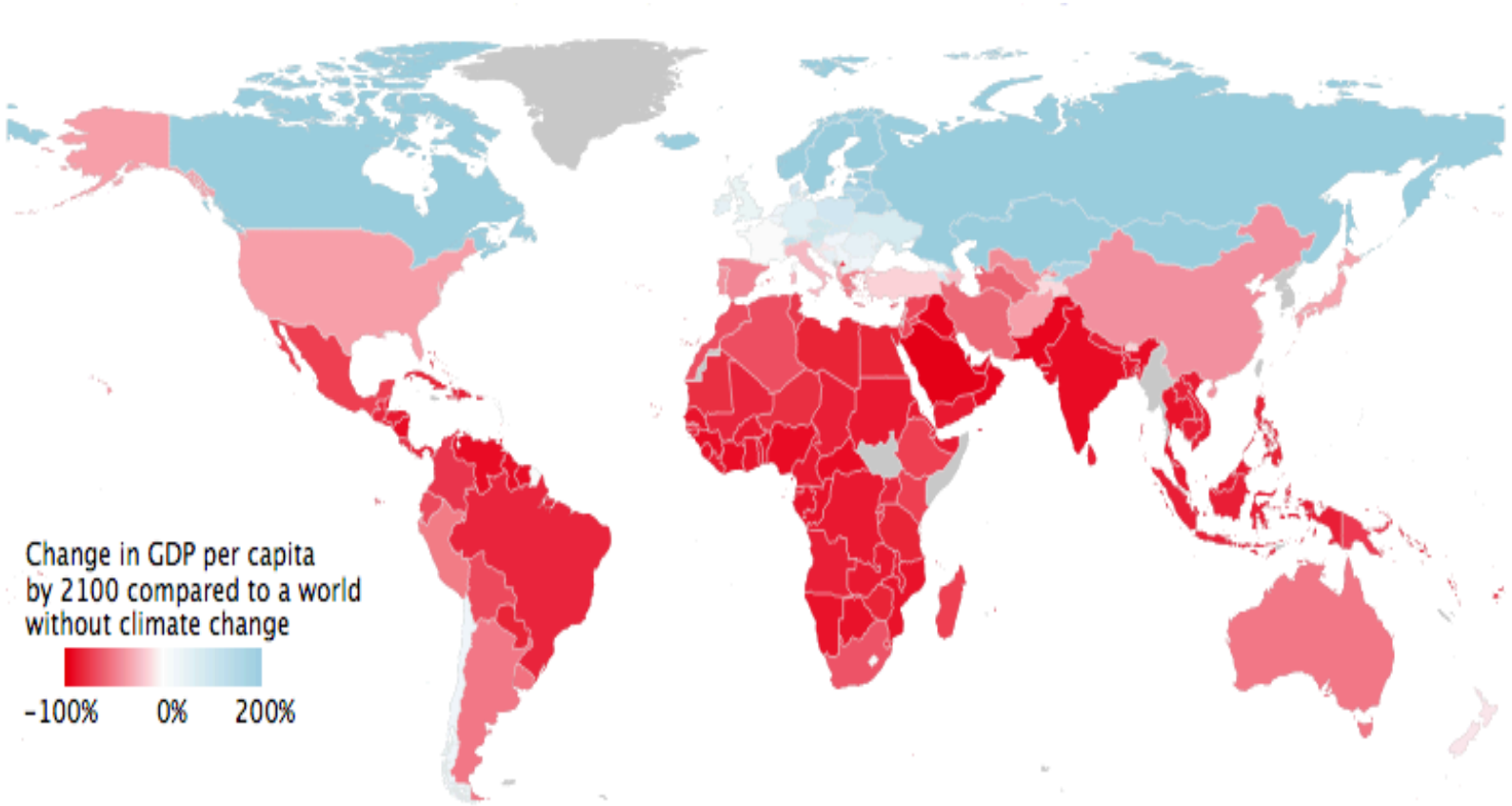
CO2 concentration: 410ppm in 2018; +44% wrt pre-industrial levels; emissions record in 2018 37GtCO2eq (Le Quére et al., 2018)

+0.9°C since beginning 19° century; 5 warmest years all after 2010

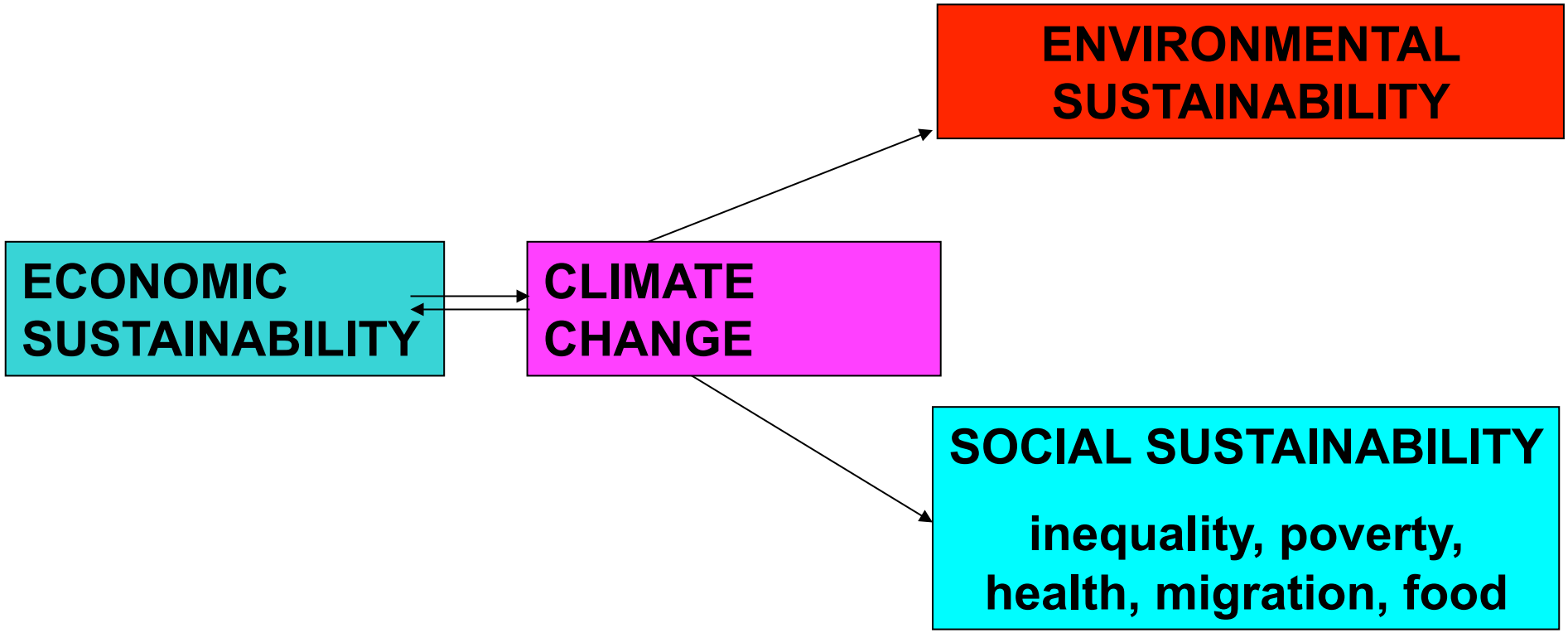
Economic costs of climate change (CC)

- Mitigation and adaptation costs
- Stern Review (2006): without action, the overall costs of climate change ≥ 5% of global GDP each year; if we take action now, annual costs = 1% global GDP to stabilise CO2e around 550ppm (+6°C)
- Heated debate in favour (Sterner and Persson, 2008) or against (Tol and Yohe 2006, Nordhaus 2007: critiques to the discount rate used by Stern)
- Stern was right for the wrong reason (Weitzman, JEL 2007 "A Review of the Stern Review")

Economic effects of climate change
(Burke et al., Nature 2015)



Sustainability and climate change: the general framework



Società Italiana degli Economisti
60esima Riunione Scientifica Annuale, Palermo, 24-26/10/2019
Plenary session: LA SFIDA DELLA SOSTENIBILITA' PER LO SVILUPPO, LE POLITICHE, E LA RICERCA ECONOMICA

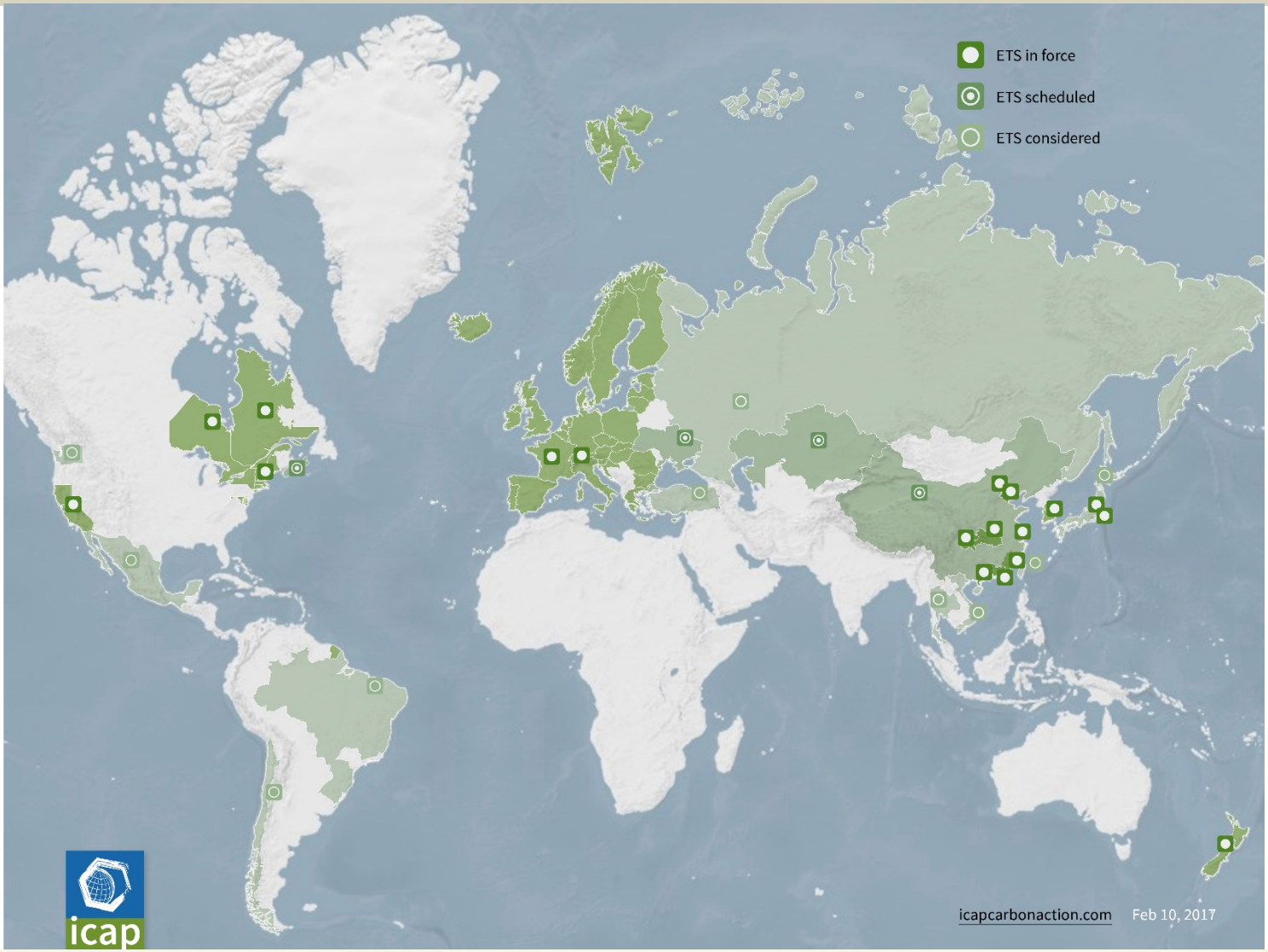
Economics and climate change: Policy and research

Simone Borghesi
(European University Institute and University of Siena)

Existing Emission Trading Systems

- **WATER**
  - TWPR: Tradable Water **Pollution** Rights (US, Australia)
  - TWAR: Tradable Water **Abstraction** Rights (US, Australia, Chile, Mexico)
- **AIR**
  - 1995: US Acid Rain Program (NO_x, SO_2)
  - 2005: EU ETS (CO_2, GHG)
  - California+Quebec
  - RGGI (Regional Greenhouse Gas Initiative)
  - China
  - Others (New Zealand, Japan, Taiwan, South Korea, India, Switzerland….)

ETS for GHG around the world



The EU ETS: a brief overview

The EU ETS (2003/87) set several new records:

-first transboundary cap-and-trade system

-world's largest carbon market

- >11,000 installations, 31 countries, 45% EU GHG emissions

-additional sectors and gases and longer compliance periods (2005-07; 2008-12; 2013-20)

-Phase IV: 2021-'30

Prototype system for other countries (Ellerman, 2010)

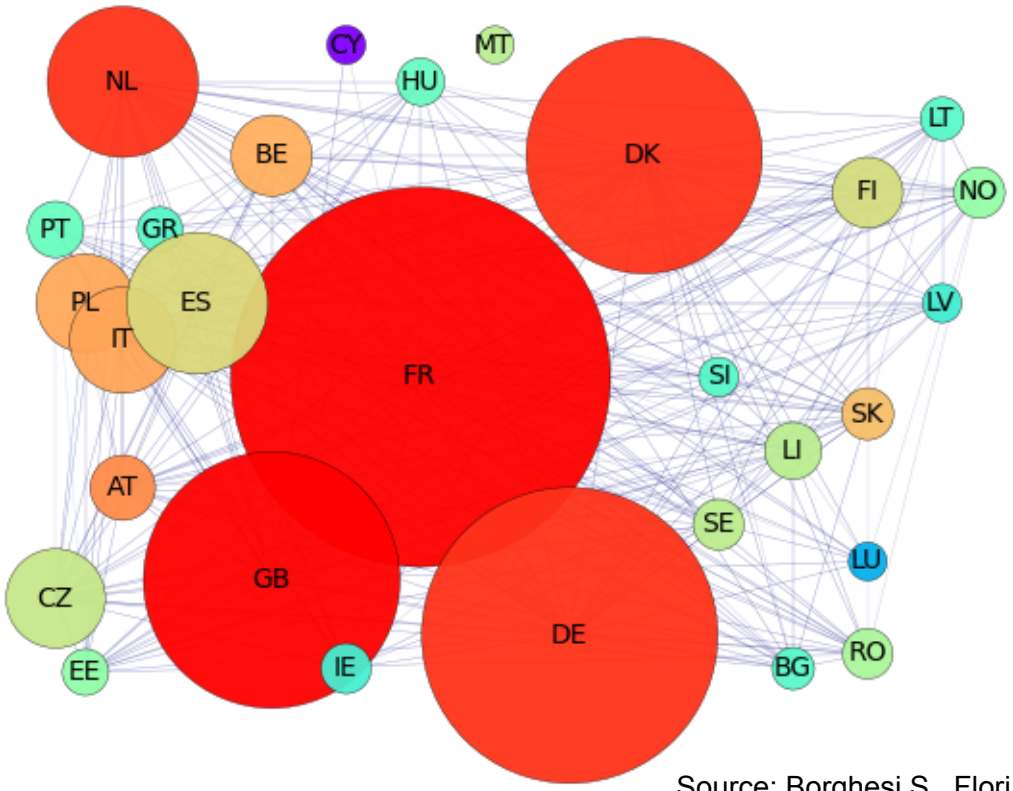
However, a few problems emerged in its functioning --> several reforms (Directive 2009/29, backloading 2014, MSR 2019, revision for Phase IV: increasing the pace of emissions cuts, increasing share of auctioning, use entries to finance low-carbon innovation…)

Carbon price trend in the EU ETS

Price CO2 European Union Allowances 2017-2019

The EU ETS as a Network

- **Size** of the nodes is proportional to the **In-Strength**
- **Color** is related to the **PageRank** (from blu/low to red/high values)



Source: Borghesi S., Flori A. (2018) "EU ETS Facets in the Net: Structure and Evolution of the EU ETS Network", *Energy Economics*, 75, 602-635.

Centrality vs. emissions

Moving accounts within the EU-ETS

- Big nodes attracted operators from abroad: >1.5k (out of 15k) accounts opened from firms located abroad
- Moving accounts migrated to:
- DNK (32%)
- UK (18%)
- FRA (14% but 41% in Phase 1)
- NDL (10%)
- DE (7%)

The UK role in the EU ETS

- UK pivotal role:
  - >17% of the traded units as either transferring or acquiring registry
  - 18% of moving accounts
- UK idiosyncratic features:
  - first broad application of GHG trading in 2002
  - UK price floor: in August 2013 UK unilaterally introduced a price floor equal to £16 per tonne of CO2 planned to rise over time

What if the UK says good-bye?

With or without U(K)

What could be the impact of Brexit on the EU ETS? What could be its impact on the direction and flows of transactions?

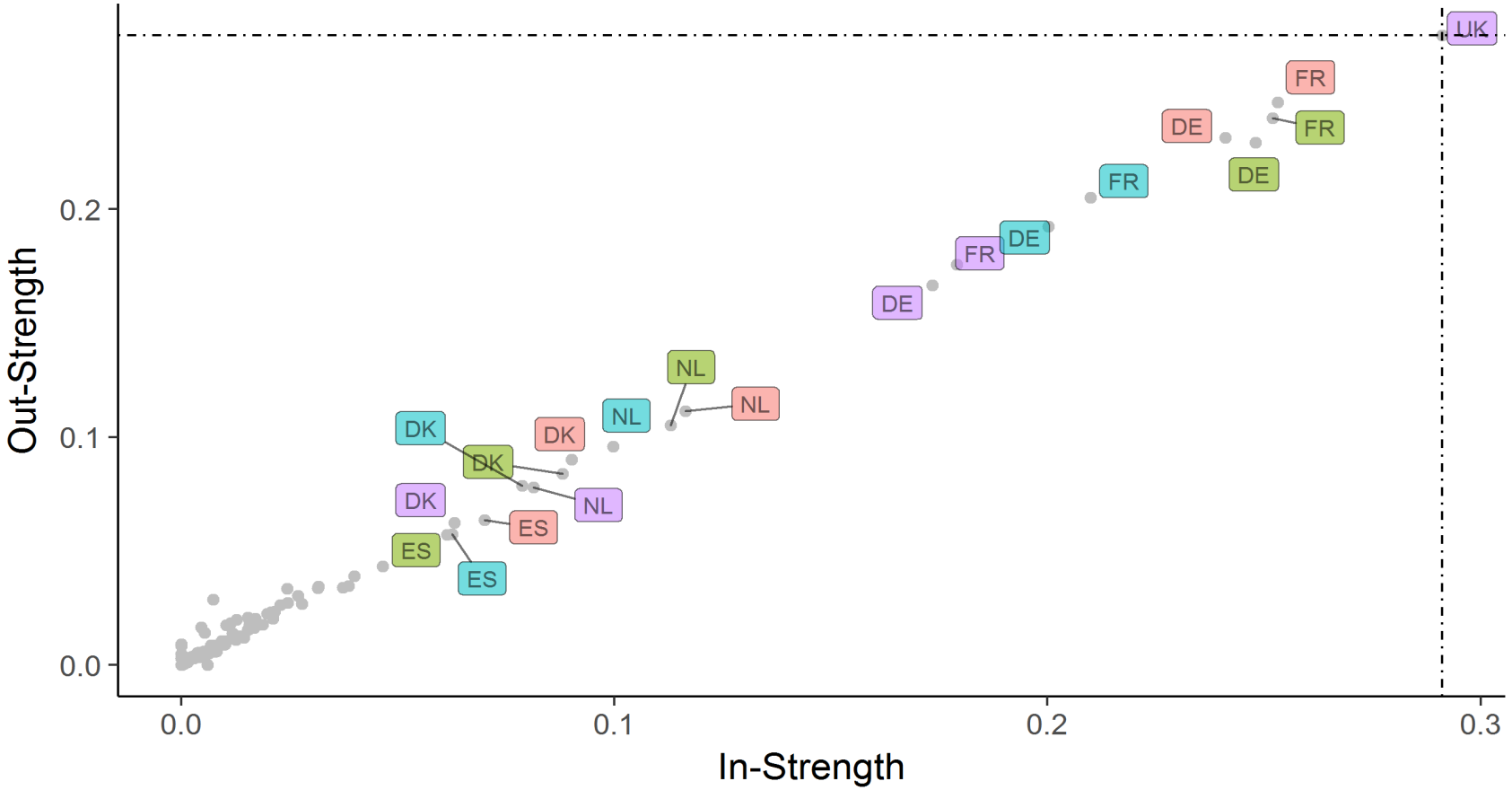
Different scenarios depending on possible reallocation of the transactions that are currently involving UK partners

Borghesi S., Flori A. (2019) "With or without U(K): a pre-Brexit network analysis of the EU ETS", *PLOS ONE*

https://doi.org/10.1371/journal.pone.0221587

Trade cases, Phase II

Legend: purple=actual, red= no reassignment, green=proportional, blu=random



But I still haven't found what I'm looking for… Policy and research: future challenges-1

- Caveats: many….
  - Problem irrelevant? No Brexit from the EU ETS…for the moment
  - Backward looking (on Phases I and II) rather than forward looking (on Phase IV)…however one could perform network analysis in real time to identify anomalies in market behaviour
- Further extensions: many….
  - community detection
  - sector analysis
  - effects network structure on price
  - linking different ETS...

Policy and research: future challenges-2

- Households: diffusion of pro-environment behaviours and theory of endogenous preferences
- Firms: impact of carbon pricing on competitiveness and carbon leakage
- Governments: green new deal and public deficit; redistribution policies vs. regressive effects
- Supra-national level: climate clubs and coalition theory
- Beyond economics: need for interdisciplinary approach

Thank you for your attention!

simone.borghesi@unisi.it