BANCA D'ITALIA

EUROSISTEMA

Climate-related risk in the Italian financial system

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Workshop FEBAF

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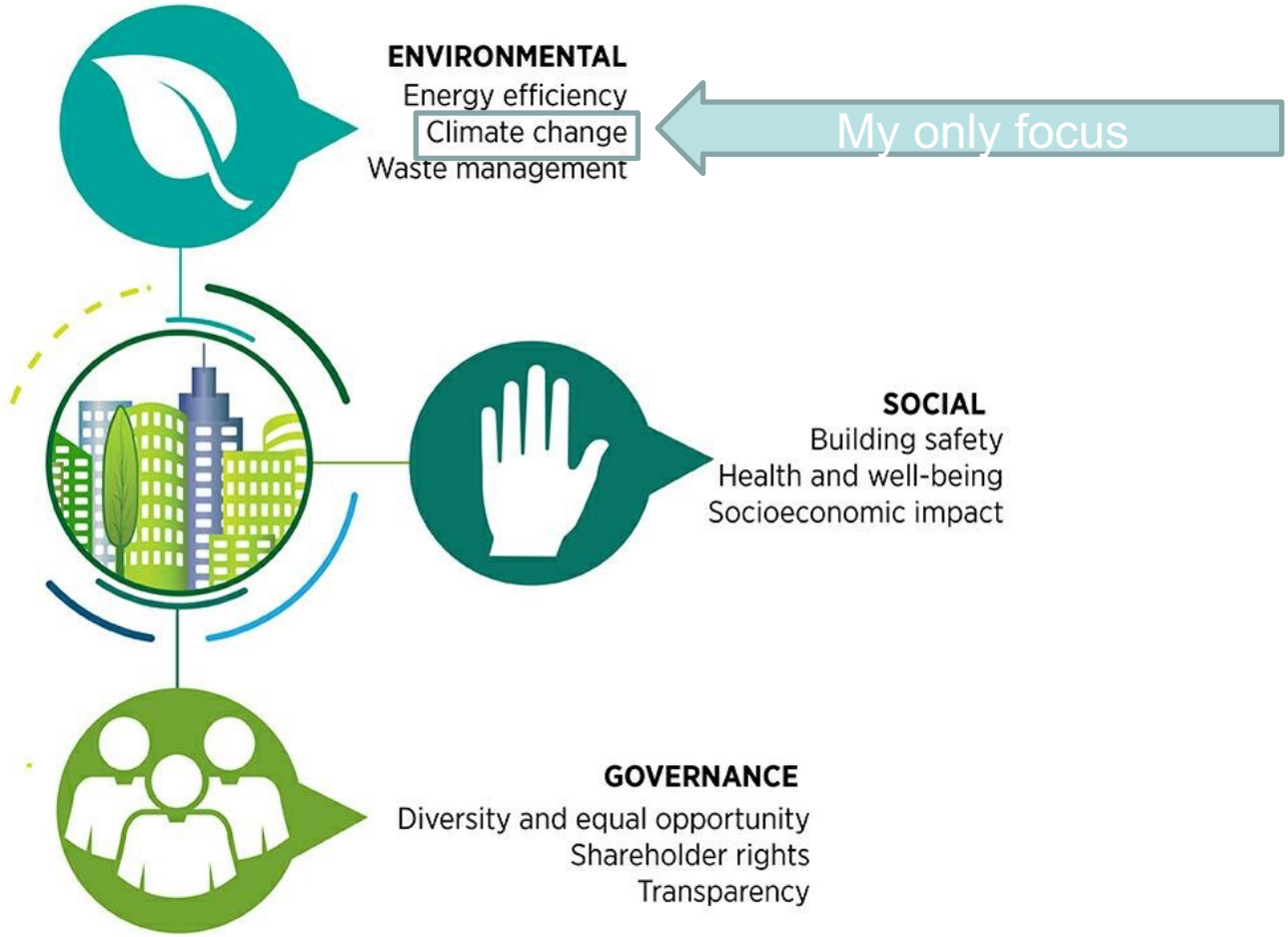
* *Banca d'Italia, Dipartimento economia e statistica*. *Le opinioni espresse sono personali e non implicano in alcun modo quelle della Banca d'Italia*

Sustainability is a very complex concept



I will talk of …

1. … what are **climate change effects** on the economy
2. … how these changes can impact the financial **(classification of climate-related financial risk - CRFR)**
3. … what this in practice mean for **risk managers** (information, information,…)
4. …what are the **international initiatives** on CRFR and sustainable finance
5. … some **empirical research** done at the Bank of Italy

Climate change in ITALY

More heat …

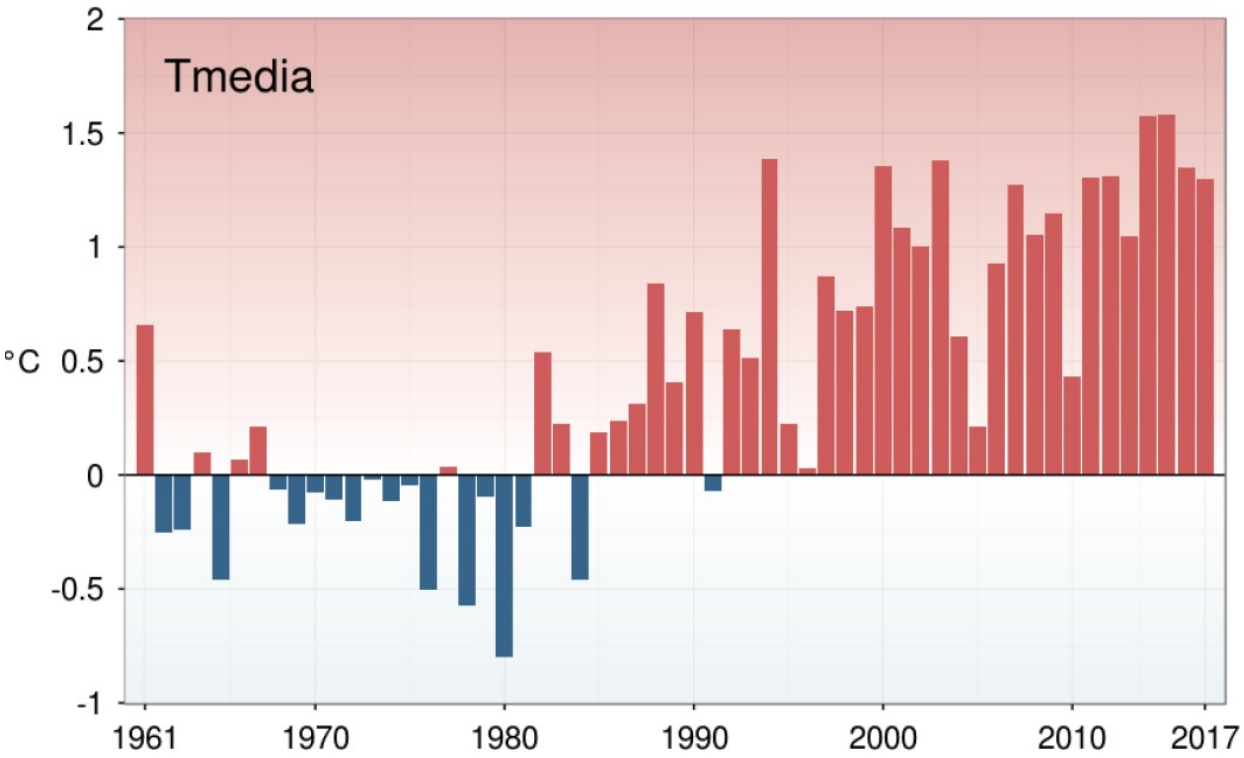


Figura 3.8: *Serie delle anomalie medie in Italia della temperatura media rispetto al valore normale 1961-1990.*

Source: ISPRA (2018).

Climate change in ITALY

…less rain

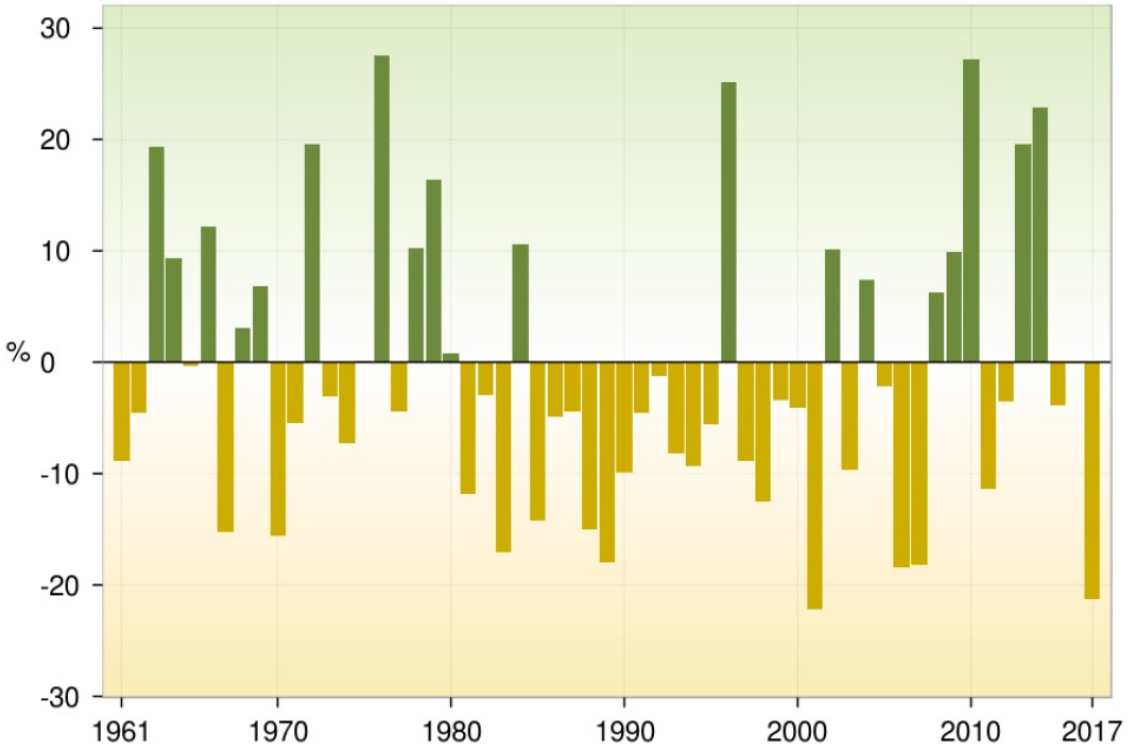


Figura 5.7: *Serie delle anomalie medie in Italia, espresse in valori percentuali, della precipitazione cumulata annuale rispetto al valore normale 1961-1990.*

Source: ISPRA (2018).

How does climate change affect the economy

Climate change impacts

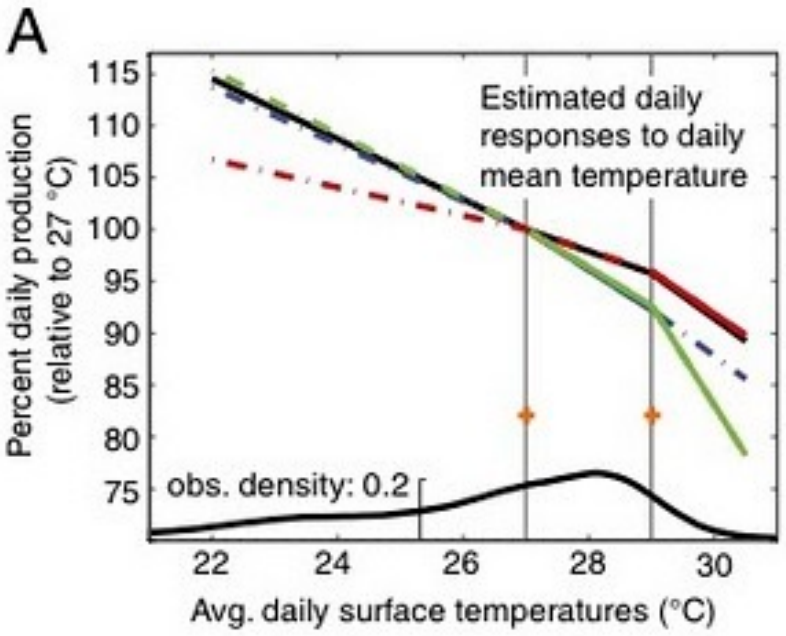
Source: American Climate Prospectus (2014)

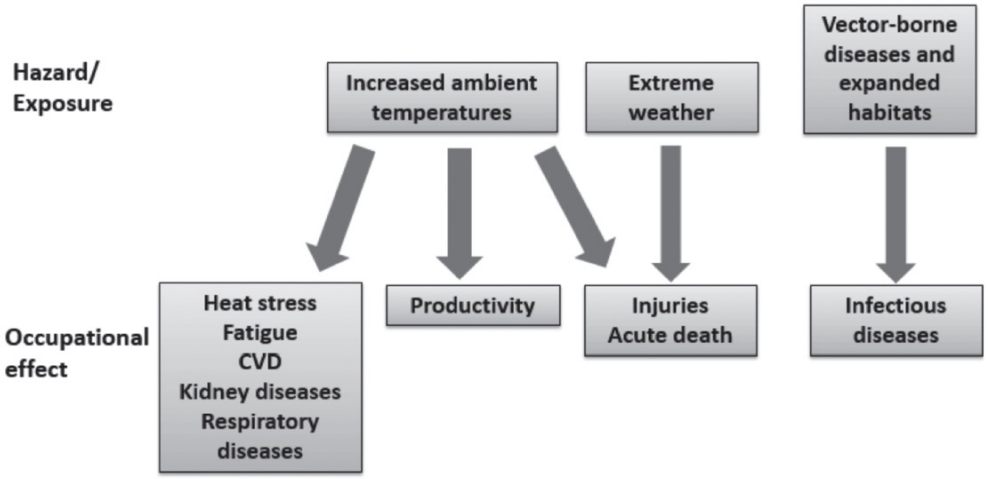
What does mean in practice: permanent vs temporary effects

1. A first effect of the temperature change is to **affect productivity.** Lower productivity may be a **direct consequence** of climate change on agricultural or energy production (eg due to poor water caption or extreme events) or a consequence of **poor health** due to an increase in morbidity.
2. Secondly climate-related disasters directly impact the economy by destroying physical capital and by forcing households, businesses and local and central governments to use financial resources to rebuild.

What does mean in practice: lower productivity

- Persistently **reduced labor productivity** may be one of the largest economic impacts of anthropogenic climate change. . . .
- Hsiang (2010) found **that labor-intensive sectors of national economies decreased output by roughly 2.4% per degree C (above 27 C)** …





Source: Hsiang (2010)

Source: Levi, Kjellstrom and Baldasseroni (2018)

Climate change effects on the Italian economy

1. For Italy, Galeotti and Roson (2012) find that the effects of climate change would lead to a loss of GDP of 0.3 per cent by 2050, with **tourism as a factor explaining much of this reduction**.
2. With its unique geological and geomorphological characteristics, **Italy is particularly susceptible to hydrogeological instability** and the impact of weather and climate factors are often amplified by human activities. This impacts will increase in frequency and intensity in the future (L. Alfieri et al., 2015)

Carbon risk or *carbon uncertainty?*

1. How climate change is going to affect our economy is still unclear (Through productivity in a persistent way? With consecutive shocks because of extreme-weather event?)
2. This uncertainty on the effects is amplified by the uncertainty in the climate policies (see how Germany is now prudent on tightening EU carbon targets or the unpredictability of the EU ETS).

But…

… and we need more climate intelligence

…in the dark all the Swans are black

How does climate change affect the financial system

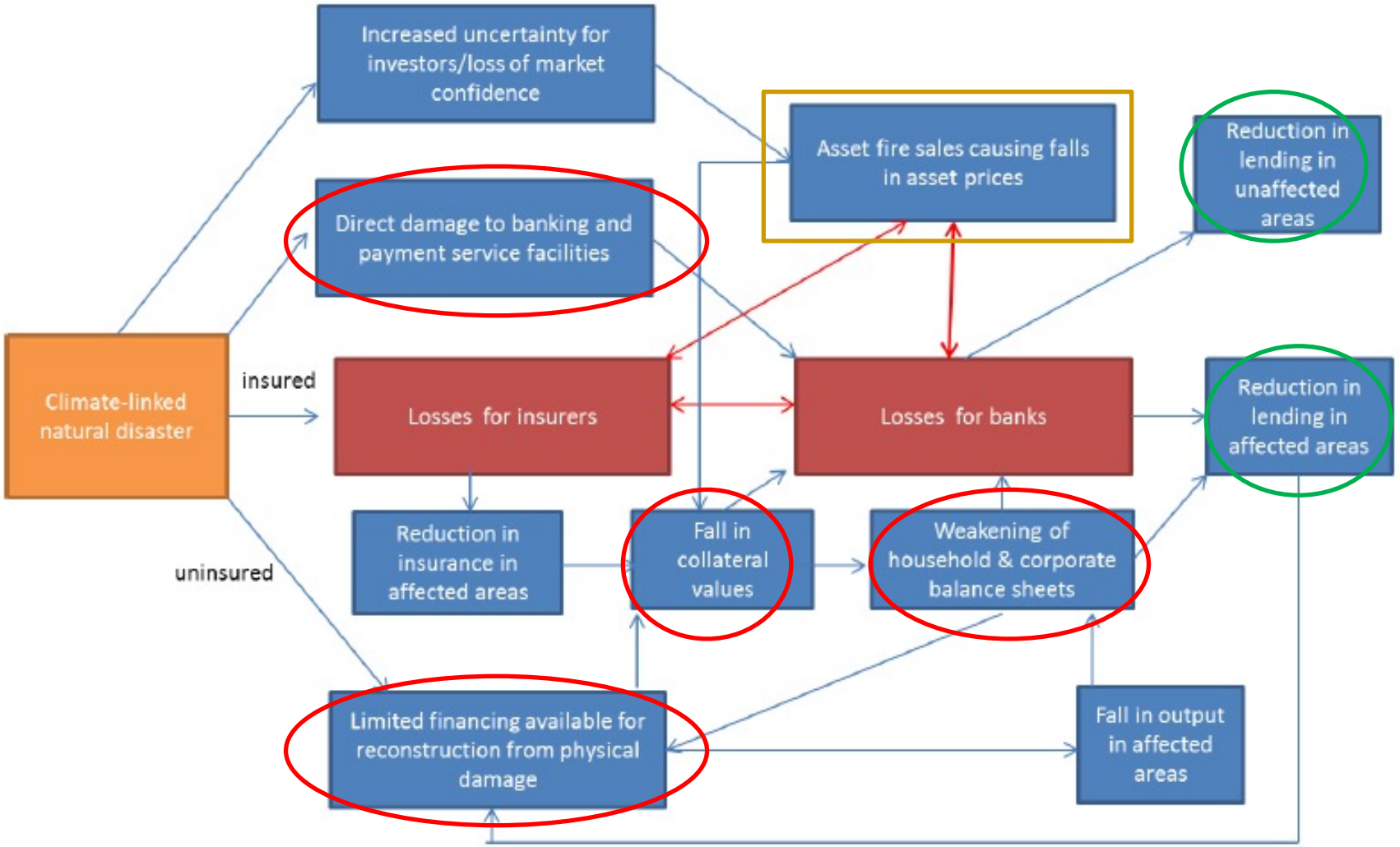
Carbon emissions generate climate risk …

- The atmosphere's capacity to safely absorb emissions is limited
- From an economic perspective that capacity is a scarce resource that is being wasted (**sink**)

… in turn climate risk can increase financial risk generating climate-related financial risk - CRFR

1. **Physical risks**, direct (e.g. on property and casualties) and indirect (e.g. on economic activity) effects of climate-related events, such as floods and storms;
2. **Transition risks**, sudden (unexpected) devaluation of carbon-intensive financial assets and infrastructure as a consequence of climate policies that aim at the decarbonization of the energy sector (the so-called Carbon Bubble/Stranded Assets issue);
3. **Liability risks**, insured parties having suffered loss from climate-related events seek to recover losses from insurance firms under third-party liability contracts (e.g. Tobacco, Asbestos, Deepwater horizon accident).

How does climate change (interpreted as more frequent and more intense natural disasters) become a financial risk?



Examples of CRFR* for Italian banks

	Market risk	Credit risk
Physical risk	• Losses from a reduction in the value of assets owned by the bank (dwellings, land, etc) and damaged by climate-induced extreme weather events • Losses from a reduction in the value of shares/bonds in the bank portfolio issued by firms whose performance is affected by climate change material effects (eg. because less productive, energy-water dependent, etc…)	• Extreme weather events affect the output of firms/households and make them more financial vulnerable therefore reducing their ability to repay their debts • Extreme weather events affect the value of the collateral of indebted firms/households. If losses are uninsured possible systemic effects in the affected areas with spillover on the local banking system
Transition risk	• Losses/Profits from a reduction/increase in the value of shares/bonds/assets in the bank portfolio issued by firms whose future performance is affected by climate change policies (eg. Coal generating utilities, energy intensive companies, companies operating in the oil and gas sector, Recent policies to limit land use)	• Losses from due to the non-performing loans from firms whose future performance is affected by climate change policies (eg. Coal generating utilities, energy intensive companies, companies operating in the oil and gas sector).
Systemic risk	• If the effects (in particular of transition risk) are affecting a whole sector (constructions, energy production and distribution, agriculture, etc) there is a risk of spillover effect across all the financial system	

* I skipped **liability risk**

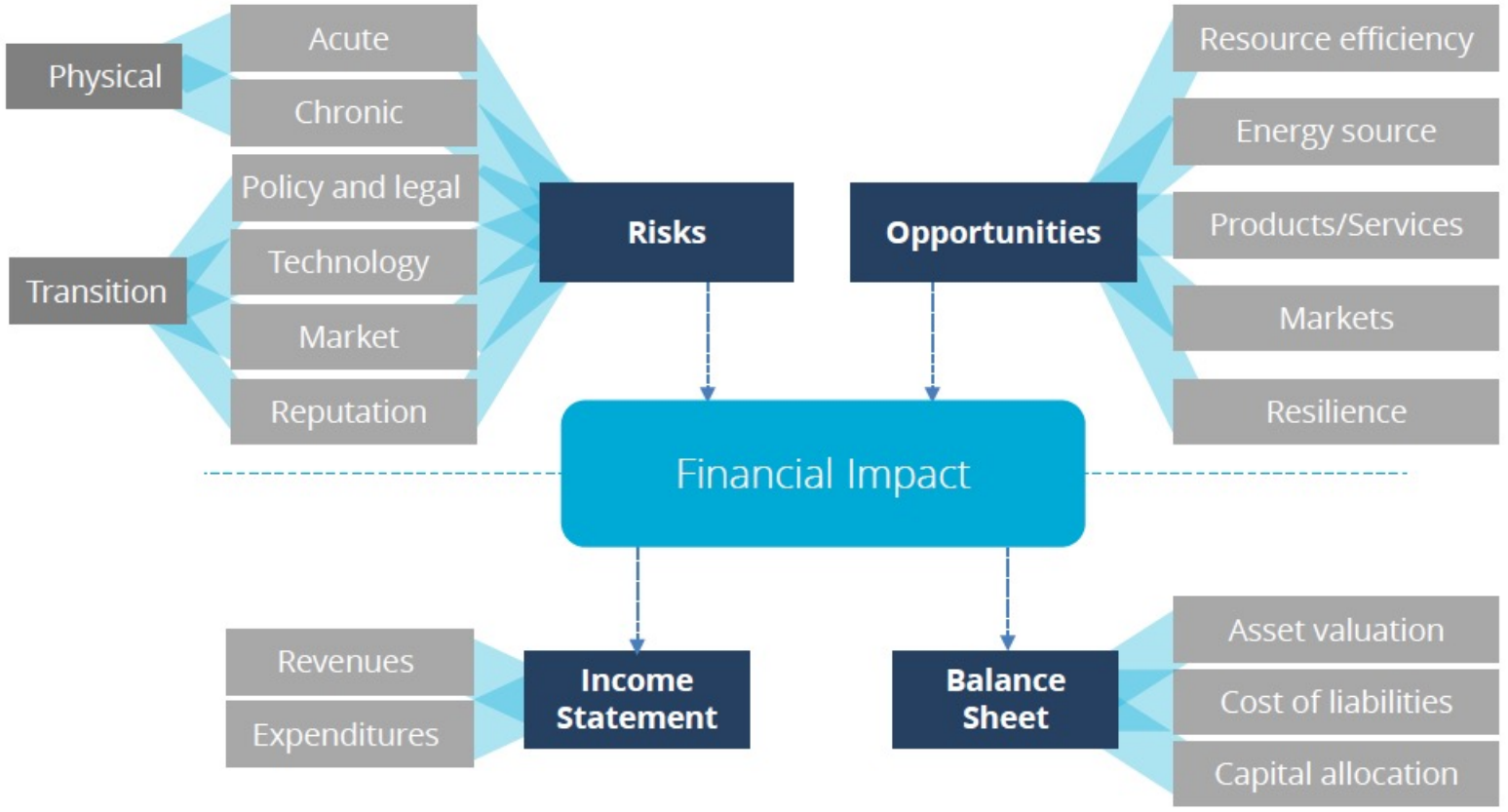
International and National intiatives

Climate-risk disclosure

TCFD TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURES

EVALUATING FINANCIAL IMPACT

Climate-related risks and opportunities can impact organizations' financial performance.



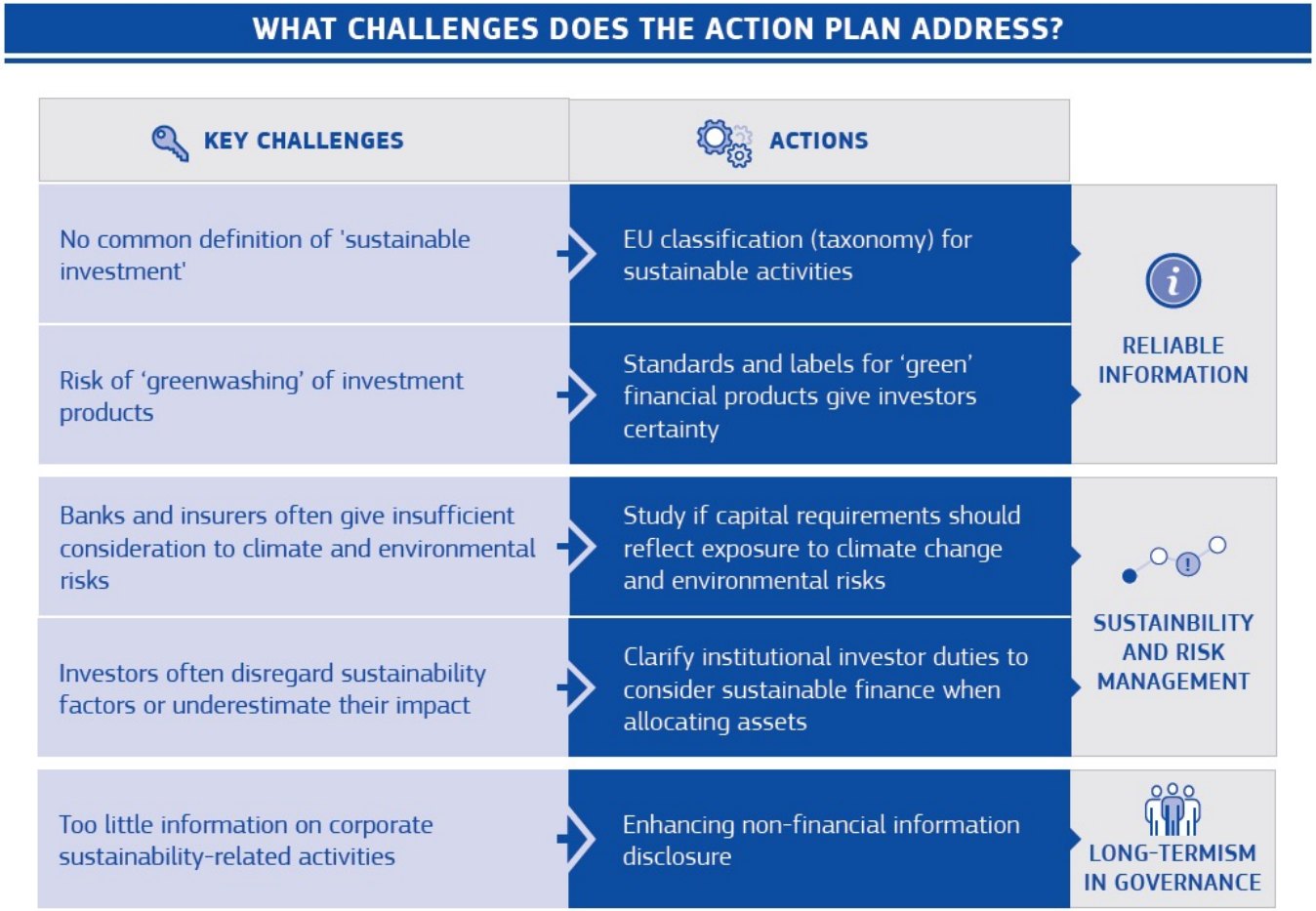
The EC sponsored HLEG on Sustainable Finance

8 early recommendations

1. Develop a classification system for sustainable assets
2. Establish a European standard and label for green bonds and other sustainable assets
3. Clarify that fiduciary duty encompasses sustainability
4. Strengthen the analysis of Environmental, Social and Governance (ESG) factors in reporting requirements
5. Introduce a sustainability test for EU financial legislation
6. Create 'Sustainable Infrastructure Europe' a new entity with the aim of channelling finance into sustainable projects
7. Enhance the role of the European Supervisory Agencies in assessing ESG-related risks
8. Unlock investments in energy efficiency through relevant accounting rules

Among the issues to be further discussed three are particular important for financial regulators: the inclusion of sustainability considerations by credit ratings agencies, banks' (including the possibility to modify Basel 2nd and 3rd pillar) and insurance companies (easing the investments constraints under Solvency II).

Commission action plan on financing sustainable growth



Osservatorio italiano sulla Finanza Sostenibile (OIFS)

Inquiry: Design of a Sustainable Financial System

UN environment

FINANCING THE FUTURE
Report of the Italian National Dialogue on Sustainable Finance

LOOKING AHEAD

The National Dialogue on Sustainable Finance has generated a broad-based agenda for market innovation and policy reform.

At the domestic level, it is important to maintain and deepen the momentum. This can be done by establishing a National Observatory on Sustainable Finance, which could assure the continuation of the work started by the Dialogue, particularly through the promotion, coordination and monitoring of suggested options. It would also encourage all actors in the financial community to make the Italian

The OIFS established 4 workstreams

1 - Financial Centres for Sustainability

2 - Green Finance for Reindustrialization

3 - International Dimension

4 - Monitoring progress

Some empirical research at the Bank of Italy

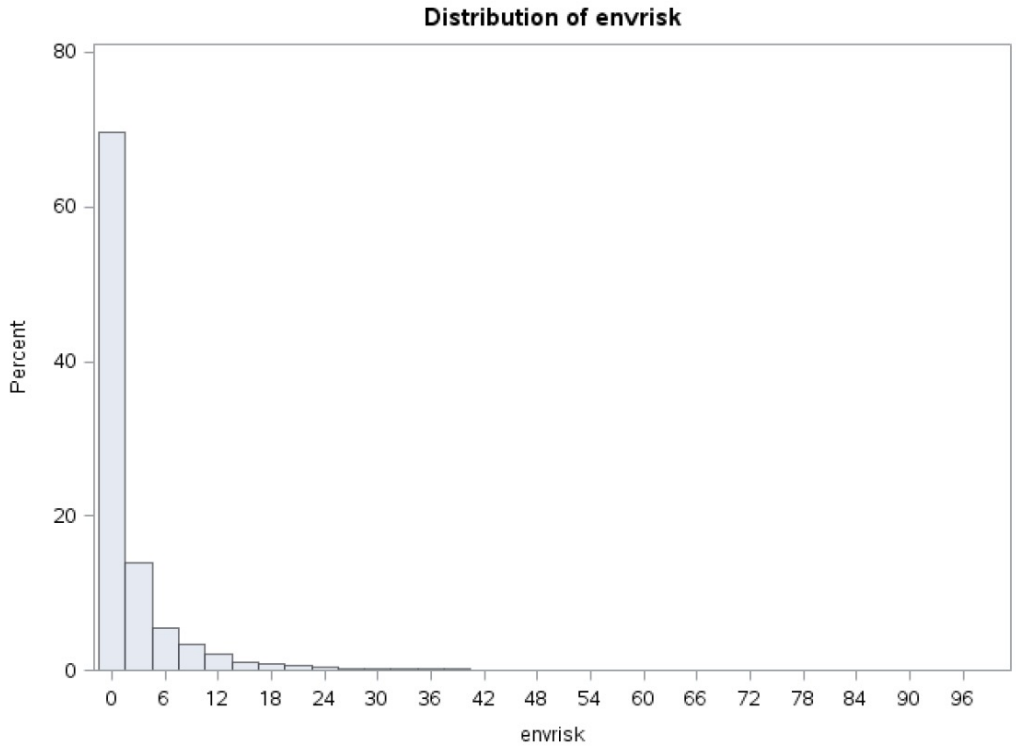
Carbon risk intelligence: two empirical studies at the Bank of Italy

1. How **does hydrogeological risk affect credit supply to firms** (Faiella and Natoli, *Natural catastrophes and bank lending: the case of flood risk in Italy*, forthcoming) → Physical risk
2. How **carbon risk is affecting the value of European utilities generating electricity** (Bernardini, Di Giampaolo, Faiella and Poli, *Gli investimenti nelle utilities del settore elettrico: implicazioni del carbon risk*, Occasional paper n. 410, Nov. 2017) → Transition risk

Does natural catastrophe risk affect Banks' lending propensity?

Catastrophe risk and bank lending

- Investigation of the disaster risk borne by the banking sector, studying the case of Italian banks dealing with flood risk.
- Measure of disaster risk is the share of firms at risk of floods per municipality.
- We define **High-Impact Flooding (HIF) municipalities** those with a percentage of exposed firms higher than the 75th percentile exposure rate.



Catastrophe risk and bank lending

- Stock of loans in 2014: 776 bln euros, of which 23% in HIF municipalities
- The bulk of business loans at risk located in Lombardia, Veneto, Emilia Romagna and Tuscany, high-value-added regions

Region	LIF	HIF	Total
Abruzzo	9.763	1.037	10.801
Basilicata	2.040	18	2.059
Calabria	2.531	1.785	4.316
Campania	25.030	1.733	26.763
Emilia-Romagna	52.734	26.091	78.825
Friuli-Venezia Giulia	11.057	2.649	13.706
Lazio	64.498	2.006	66.504
Liguria	223	15.611	15.834
Lombardia	227.927	39.873	267.800
Marche	1.997	1.533	3.529
Molise	1.191	1	1.193
Piemonte	48.561	6.481	55.042
Puglia	15.261	2.950	18.211
Sardegna	4.927	2.814	7.740
Sicilia	18.366	37	18.404
Toscana	49.059	22.860	71.919
Trentino	20.161	1.847	22.008
Umbria	6.105	2.933	9.038
Valle d'Aosta	580	262	842
Veneto	51.587	29.435	81.023
All	613.601	161.956	775.557

Catastrophe risk and bank lending

- About 60 percent of the loan amount in HIF municipalities is concentrated in four industries: Construction, Wholesale and Retail Trade, Real Estate activities and Basic Metals and Plastic Products.

#	Industry sector	LIF	HIF	Total
1	Mining	1.294	454	1.748
2	Food Products	22.462	6.105	28.567
3	Textiles	14.471	5.787	20.258
4	Wood and Products of Wood	9.229	2.694	11.923
5	Paper and Paper Products	6.874	2.134	9.009
6	Chemicals and Pharmaceuticals	12.173	2.592	14.764
7	Rubber and Plastic Products	7.932	2.025	9.956
8	Basic Metals and Metal Products	38.001	13.272	51.273
9	Electrical Equipment	8.751	2.174	10.924
10	Machinery and Equipment	16.490	4.787	21.276
11	Transport Equipment	7.795	1.718	9.512
12	Other Manufacturing	6.612	1.830	8.442
13	Electricity and Gas	33.882	5.608	39.490
14	Construction	106.765	30.639	137.404
15	Wholesale and Retail Trade	101.226	27.430	128.656
16	Transportation and Storage	34.246	5.903	40.149
17	Accommodation and Food Service	22.113	8.149	30.262
18	Information and Communication	13.031	1.556	14.587
19	Real Estate Activities	91.854	24.646	116.499
20	Professional Activities	25.929	5.596	31.525
21	Rental and Leasing Activities, Travel Etc	16.697	3.063	19.760
22	Other Service Activities	15.776	3.795	19.571
	All	613.601	161.956	775.557

Catastrophe risk and bank lending

$$\mathrm{PL}_{j,h,k} = \beta_0 + \beta_1 \mathrm{CatRisk}_{j,h} + \delta\ \mathbf{controls}_{j,h,k} + \epsilon_{j,h,k} \tag{4.3}$$

where $\{j = 1, \ldots 7885\}$ indicates the municipality, $\{h = 1, \ldots, 108\}$ the province and $\{k = 1, \ldots, 23\}$ the borrower's industry sector; **controls** stands for control variables, which include 107 province dummies and 22 sectoral dummies.

Dependent variable: PL						
Parameter	Estimate	Std Err	t Value	p-value	95% Conf Int	
Intercept	- 0,135	0,043	- 3,120	0,002	- 0,221	- 0,049
CatRisk	- 0,176	0,031	- 5,640	<.0001	- 0,238	- 0,114
controls:						
Industry sector fixed effects	Yes					
Province fixed effects	Yes					
R-square	0.162					

Table 7: Regression of PL on CatRisk and controls. PL and CatRisk are in natural logarithm. Standard errors are clustered at province level (108 clusters). Observations are 69,232.

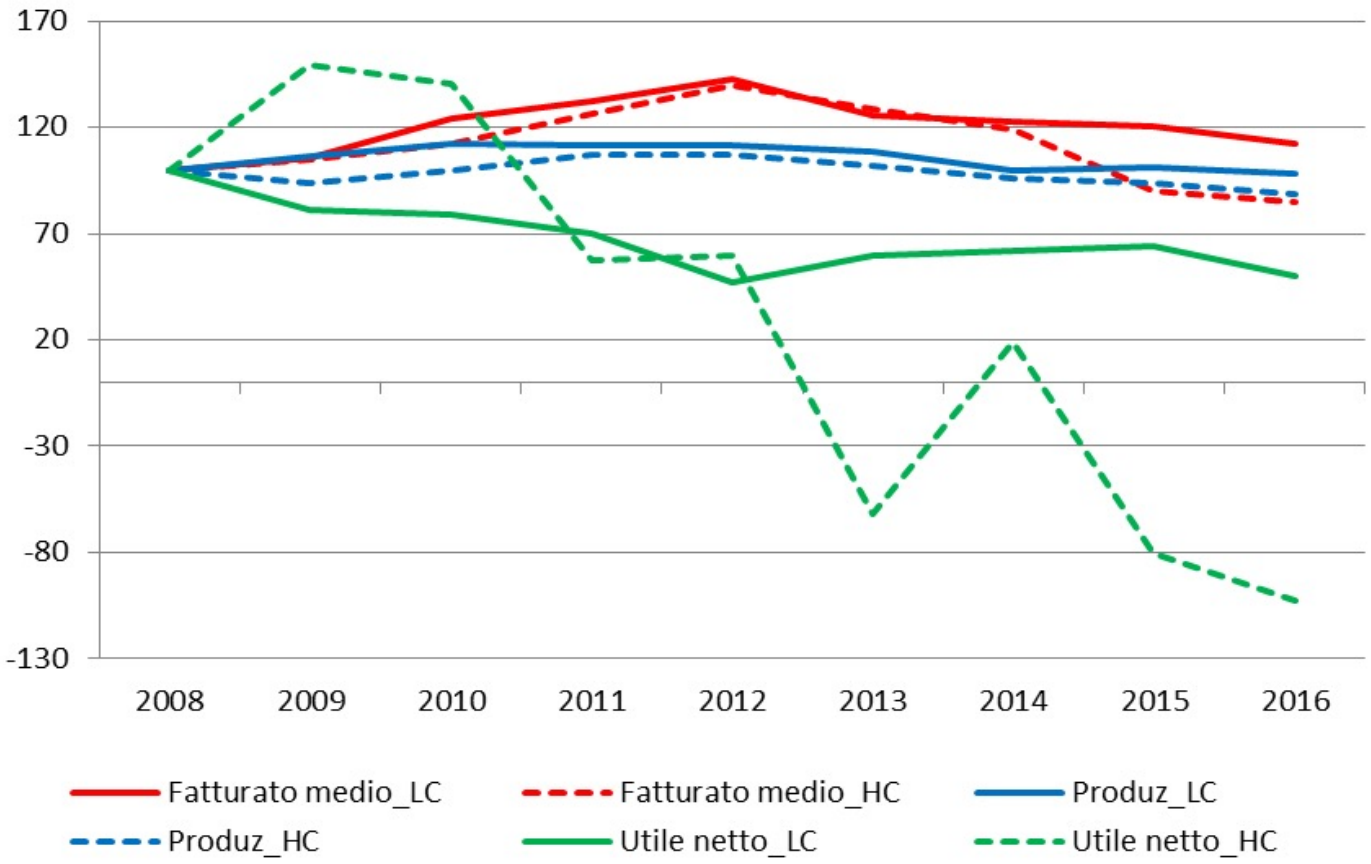
How does carbon risk affect the value of European Energy Utilities?

Gli investimenti nelle utilities del settore elettrico: implicazioni del *carbon risk*

1. Analysis of 13 electricity-generating utilities (UEN) listed in the Stoxx 600 Europe index. 55% of utilities sector capitalization, 48% of the EU's 2016 production and 15.4% of greenhouse gas emissions in the EU in 2015.
2. The analysis was conducted on the basis of production, emission, economic and financial data and market performance data **for the period 2008-2016**, for which homogenous data were reconstructed.
3. UENs have been divided into **two groups according to a carbon intensity index** (based on the carbon intensity of energy production) that is influenced not only by the quantities produced but also by the energy mix adopted.

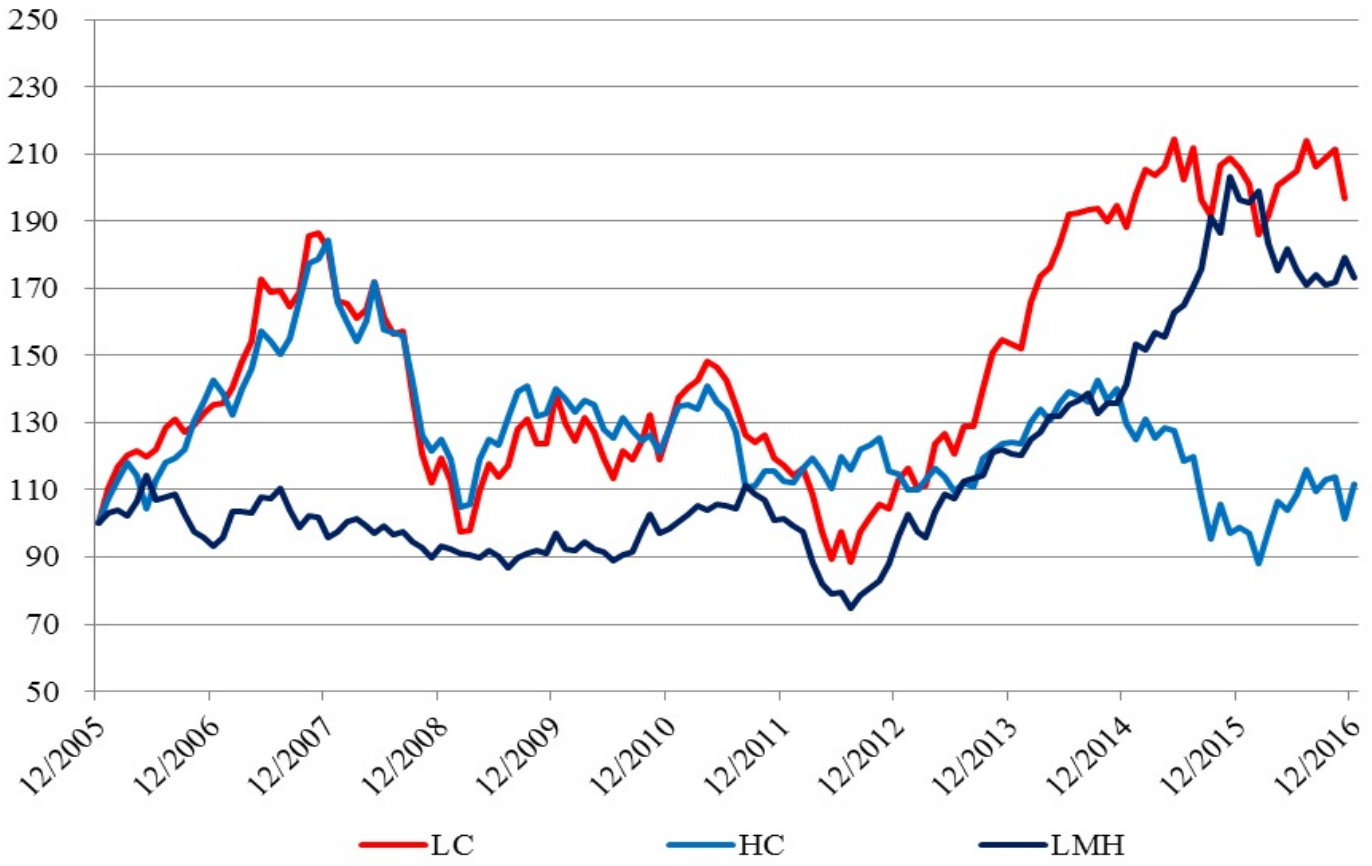
Gli investimenti nelle utilities del settore elettrico: implicazioni del *carbon risk*

Turnover, production and net profit (Index 2008 = 100)



Gli investimenti nelle utilities del settore elettrico: implicazioni del *carbon risk*

Two competing portfolios (HC and LC) and their difference (LMH)
(Index 31 dec 2005= 100)



Gli investimenti nelle utilities del settore elettrico: implicazioni del *carbon risk*