

ANNUAL REPORT 2021

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Banco de España
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Chapter 1

An incomplete and uncertain recovery: from the pandemic to the spike in inflation and the outbreak of war

Chapter 2

Challenges and policies for a sustainable and balanced growth of the Spanish economy

Chapter 3

Rising global inflation

Chapter 4

The Spanish economy and the climate challenge

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1. Introduction
2. Global warming and initiatives to limit it
3. The asymmetric impact of climate change in Spain
4. The role of public policy in Spain
5. The role of the financial system
6. The role of central banks
7. Conclusions

OVERVIEW

- A global challenge with an extraordinarily uncertain economic impact
- A process that will have a markedly asymmetric impact in Spain
- Governments must lead the green transition
- The financial system also has a key role to play in the face of the climate challenge
- Central banks, within their mandates, must also contribute to the green transition

One of the biggest challenges facing our society

Considerable uncertainty in the assessment of the economic impact of the different physical and transition risks associated with climate change

Consensus as to the high costs of not adjusting the current path of GHG emissions and the advantages of an orderly adjustment

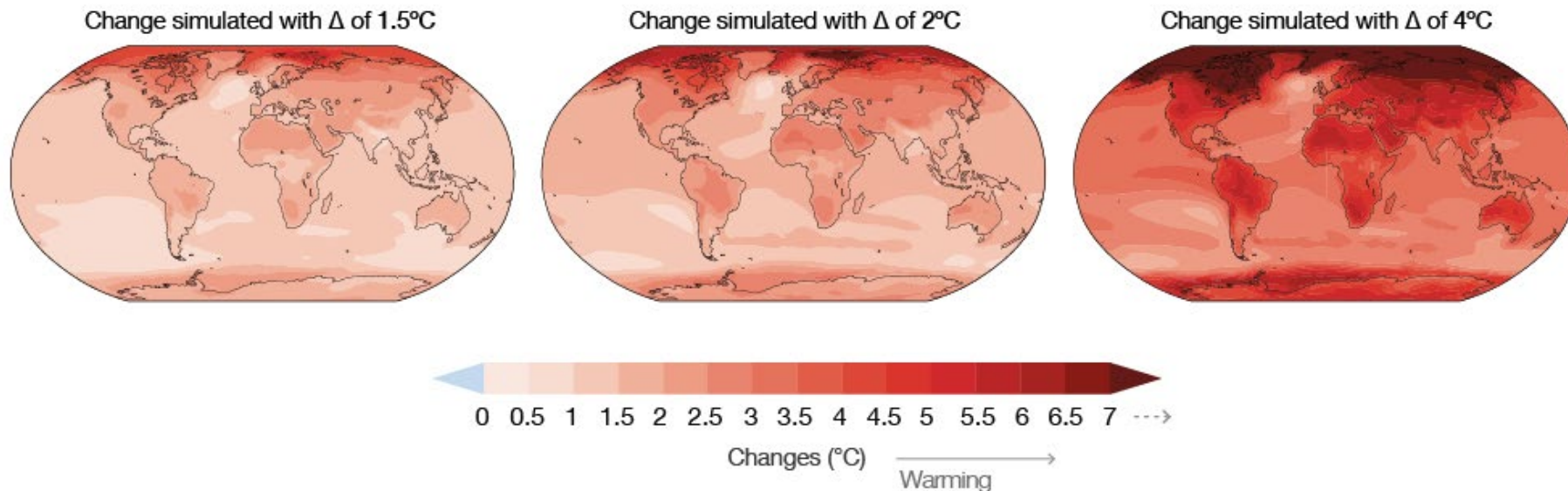
All economic policies and agents need to contribute very actively to the green transition

Further progress in the fight against global warming will require greater international coordination, while taking into account the specific development conditions of each country

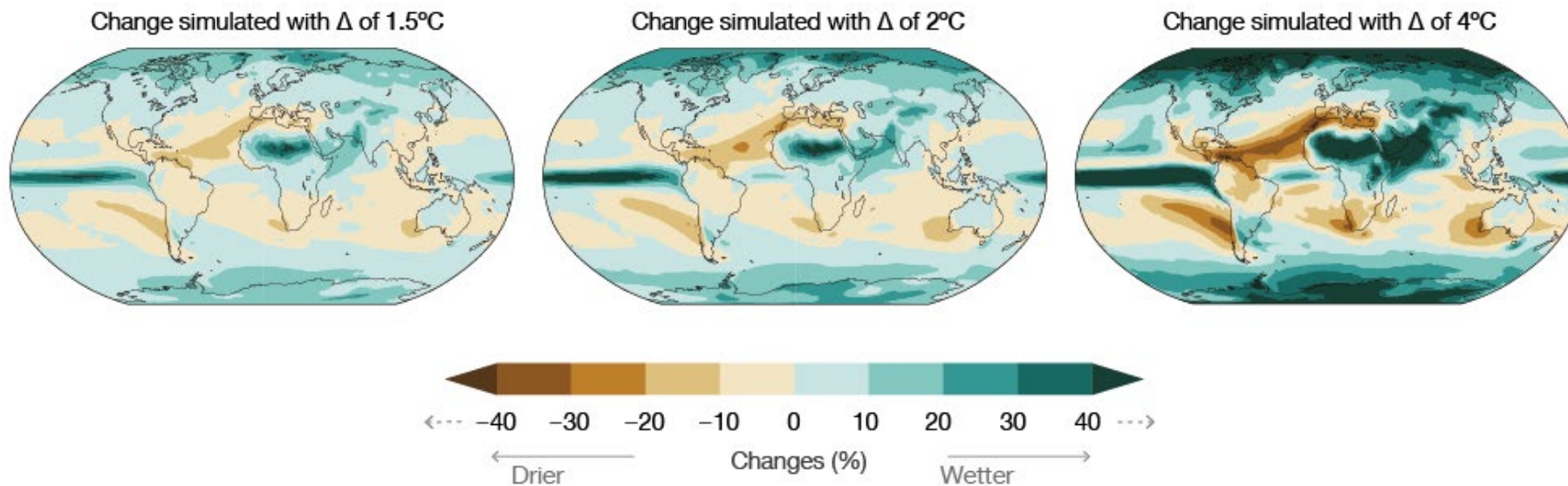
More high-quality and harmonised environmental data is essential

IPCC: WITHOUT A SHARP REDUCTION IN GHG EMISSIONS, GLOBAL WARMING WILL CONTINUE, WITH VERY SERIOUS CONSEQUENCES FOR THE PLANET

Annual temperature changes (°C) relative to 1850-1900



Annual rainfall changes (%) relative to 1850-1900

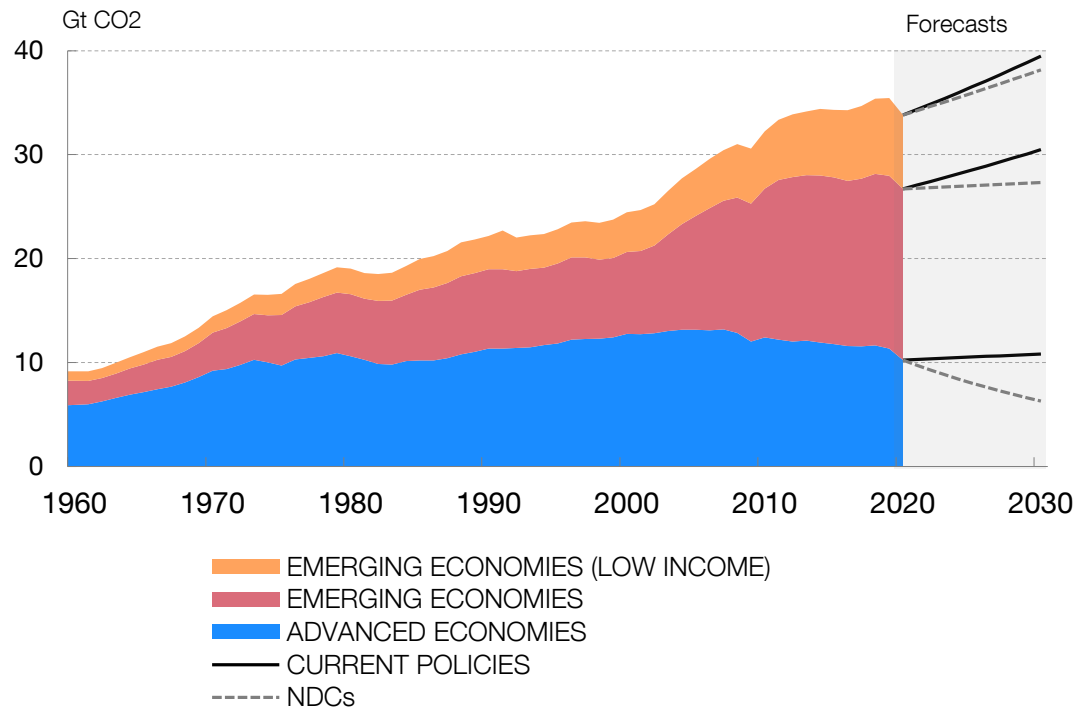


Source: IPCC (2021)

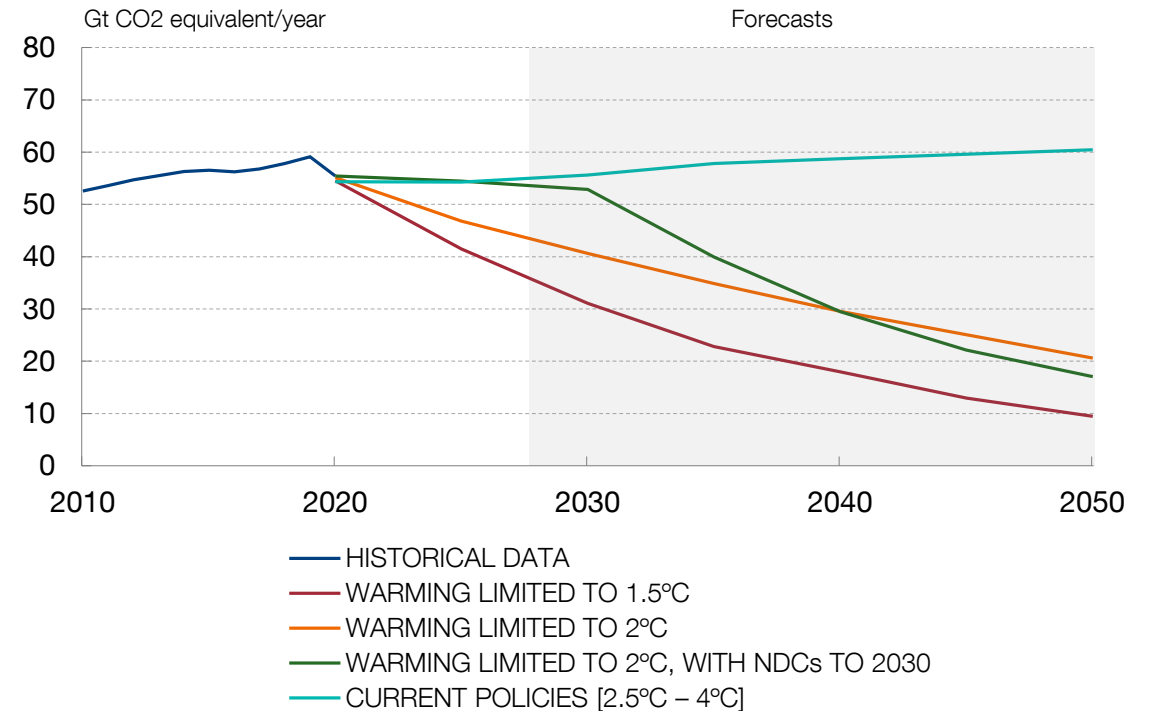
THE TREND REDUCTION IN GHG EMISSIONS COMMITTED TO IN THE CURRENT NDCs IS STILL NOT APPARENT

- Under the current NDCs, the global temperature at the end of the century would still be more than 2°C above pre-industrial levels (some 2.4°C higher)

CO₂ EMISSIONS BY REGION (a)



ANNUAL GHG EMISSIONS AND GLOBAL WARMING SCENARIOS IN 2100 WITH RESPECT TO PRE-INDUSTRIAL LEVELS (b)

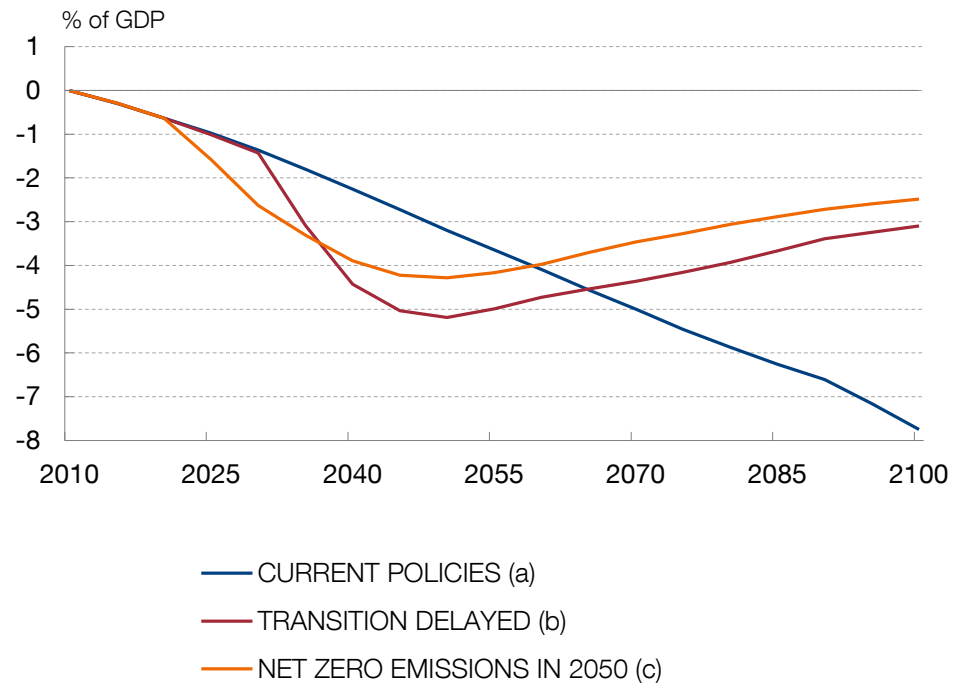


Sources: IMF, Global Carbon Project and IPCC.

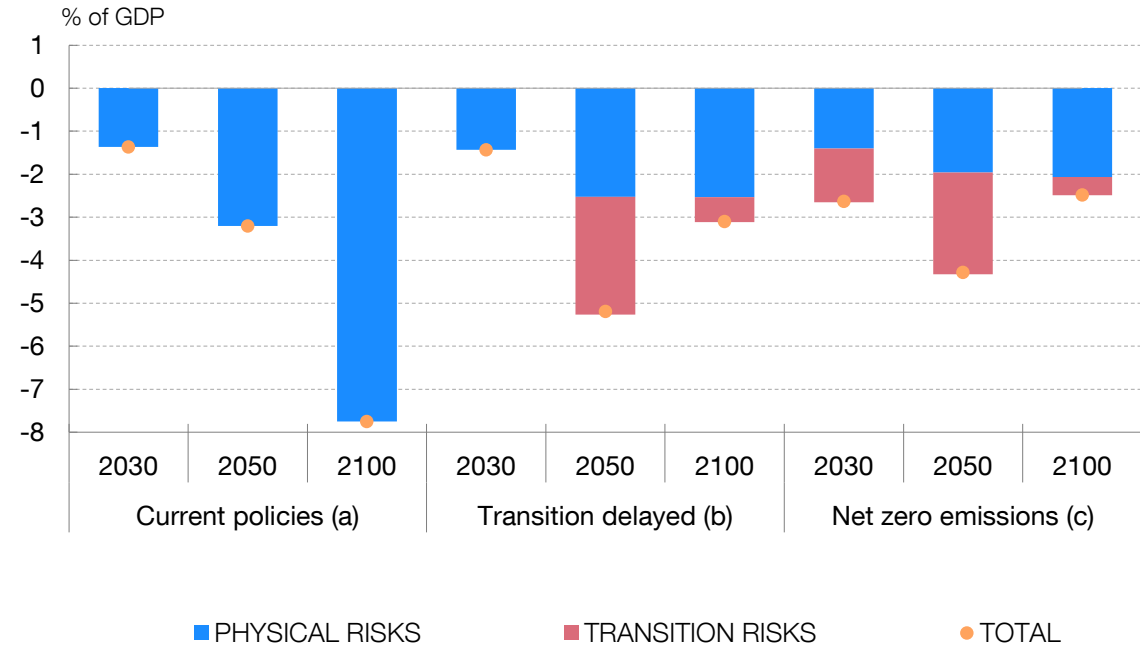
a. Shows the CO₂ emissions arising from fossil fuels. From 2020, the forecasts correspond to a scenario with current policies. "NDCs" includes, in addition, the national mitigation initiatives up to 2030.
 b. The scenarios correspond to the trajectories presented in the contribution of Working Group III of the IPCC (2022) and are expressed in terms of planet temperature increases in 2100 with respect to pre-industrial levels.

THE ECONOMIC IMPACT OF THE PHYSICAL AND TRANSITION RISKS IS HIGHLY UNCERTAIN. THE NGFS HAS MADE SOME ESTIMATES, WHICH SHOULD BE INTERPRETED WITH GREAT CAUTION

ESTIMATED GLOBAL ECONOMIC LOSSES



BREAKDOWN OF EXPECTED CHANGE IN GLOBAL GDP



Source: NGFS.

- a. In this scenario no further measures are taken in addition to those already in force, leading to an increase in global temperatures of between 2.5°C and 4°C in 2100, with respect to pre-industrial levels.
- b. This scenario assumes that annual emissions do not decrease until 2030 and that, as a result, harsh policies have to be implemented to keep global warming below 2°C.
- c. This last scenario envisages measures to reduce net emissions to zero in 2050, while the increase in global temperature is kept below 1.5°C.

A PROCESS THAT WILL HAVE A MARKEDLY ASYMMETRIC IMPACT IN SPAIN

The Iberian Peninsula may be severely affected by the physical risks associated with climate change, an impact that would be highly uneven across regions

In recent years, in line with other European countries, Spain has made very significant environmental commitments

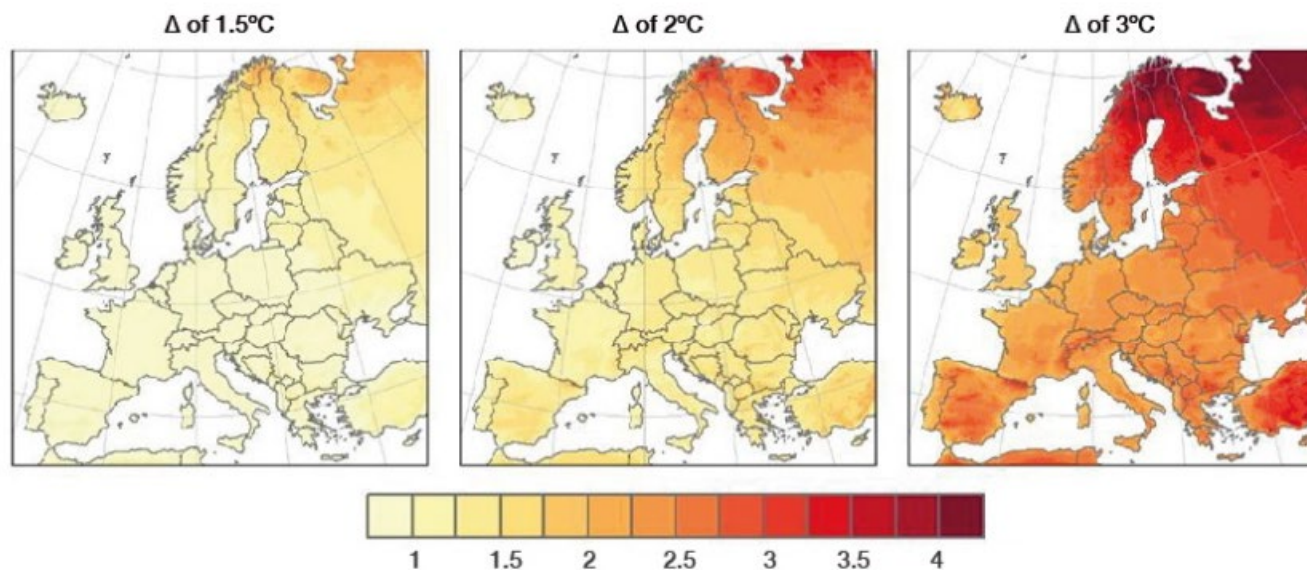
Achieving these objectives will involve an enormous transformational challenge for the Spanish economy as a whole in the years ahead

The impact of this process is likely to be very uneven across regions, sectors, firms and households

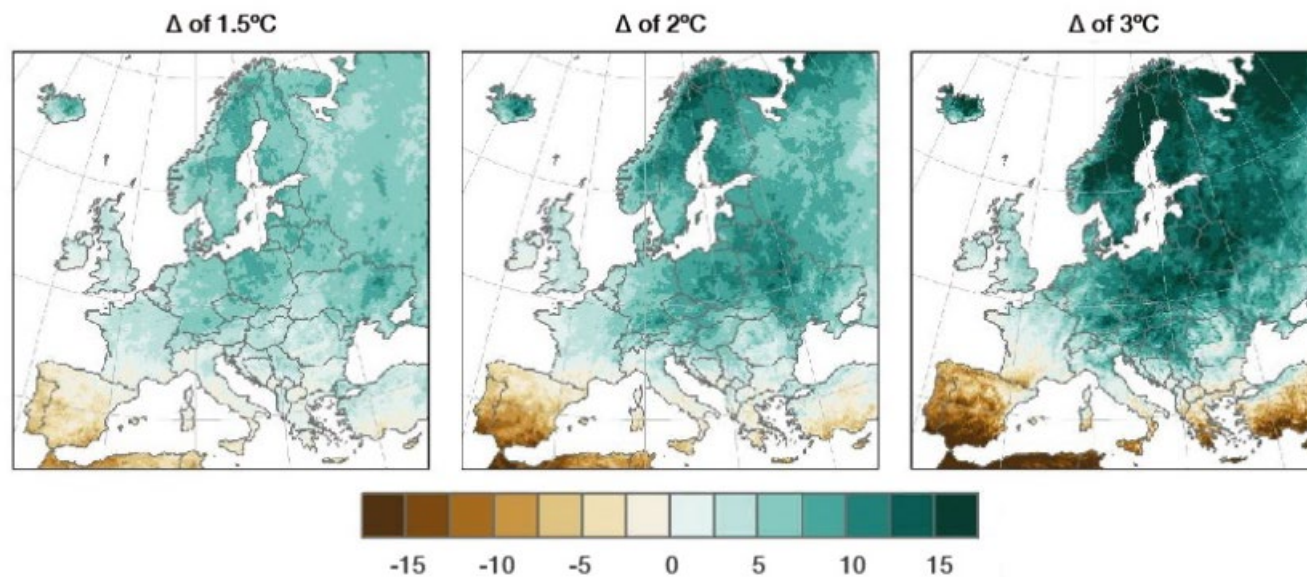
Climate change risks may affect certain more vulnerable households and firms more acutely

THERE IS CONSENSUS AMONG THE SCIENTIFIC COMMUNITY THAT THE IBERIAN PENINSULA COULD BE SIGNIFICANTLY AFFECTED BY THE PHYSICAL RISKS ASSOCIATED WITH CLIMATE CHANGE

Changes in average annual temperature (°C) relative to 1981-2010



Changes in average annual rainfall (%) relative to 1981-2010

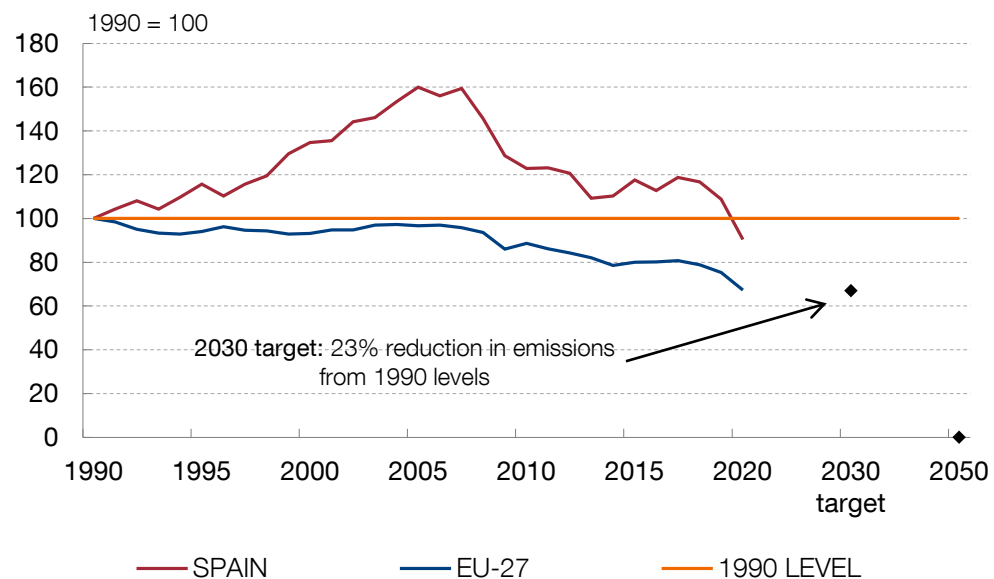


Source: JRC PESETA IV report, European Commission, 2020.

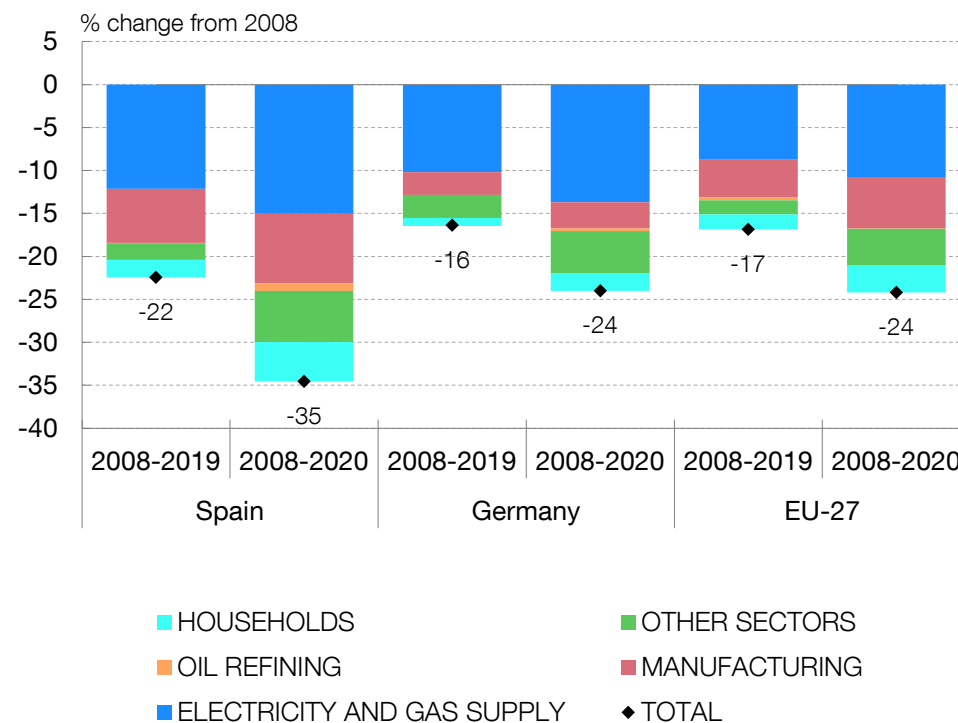
THE TRANSFORMATIONAL CHALLENGE FACING THE SPANISH ECONOMY IS ENORMOUS

- For example, the proportion of electricity generated using renewables should increase from 43% in 2020 to 74% in 2030

CO2 EMISSIONS



SECTOR CONTRIBUTIONS TO THE REDUCTION IN EMISSIONS SINCE 2008

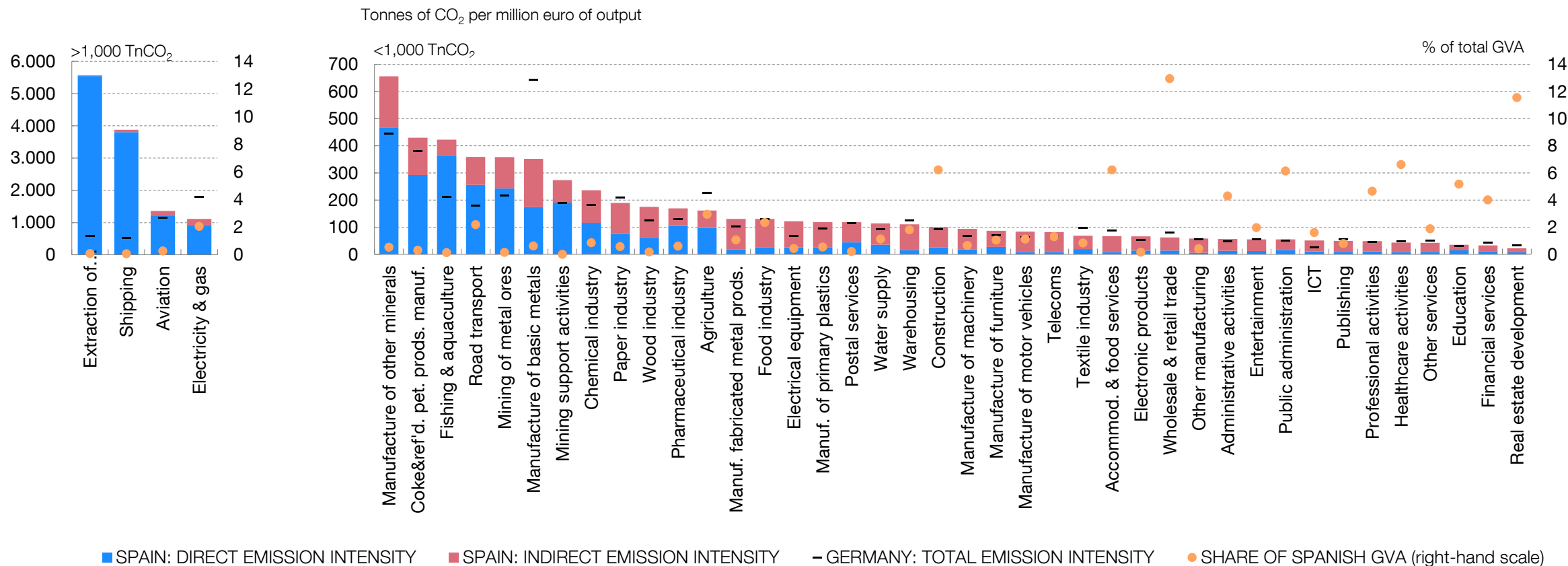


Sources: Our World in Data and Eurostat.

MANUFACTURING, AGRICULTURE, TRANSPORT, AND ELECTRICITY AND GAS SUPPLY ARE THE MOST GHG EMITTING PRODUCTIVE ACTIVITIES IN SPAIN ...

- ... but an individual sector's exposure to climate change depends not only on its direct GHG emissions but also on its energy intensity and its links with other sectors

EMISSION INTENSITY OF OUTPUT (a)



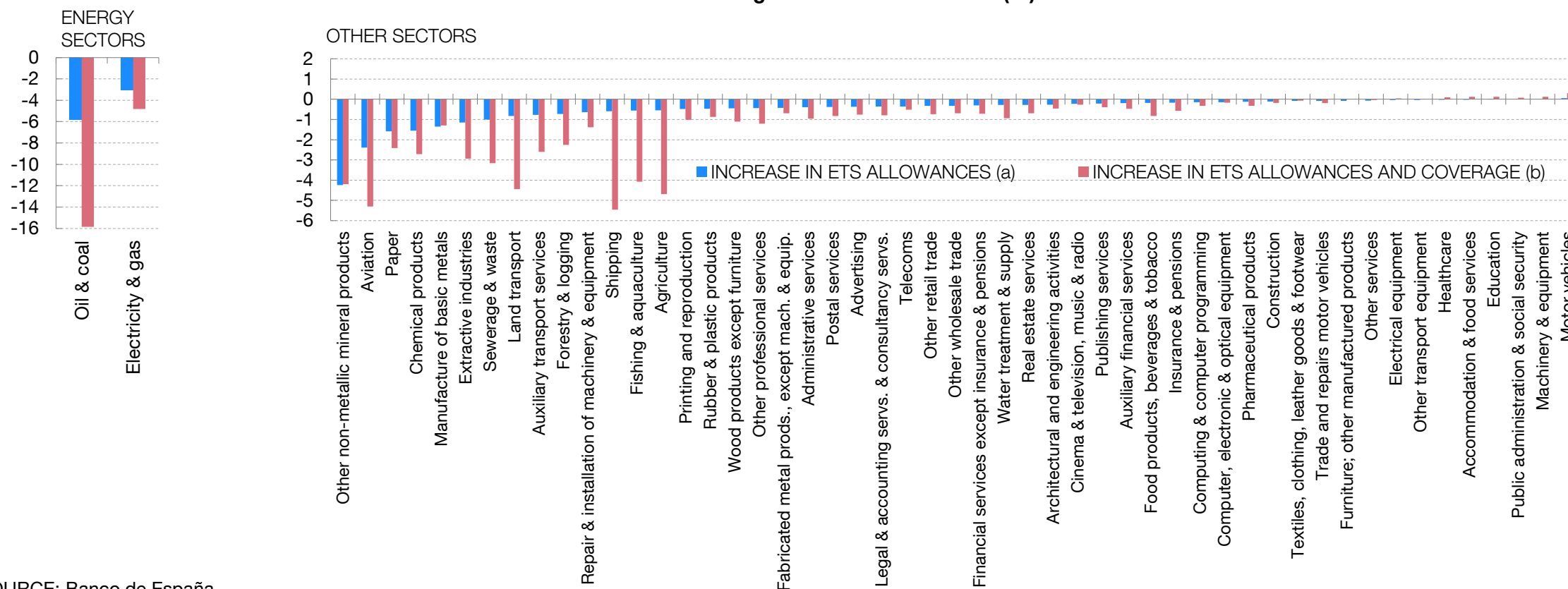
SOURCE: IMF Climate Dashboard.

a. Direct and indirect emission intensity is calculated with data as at 2018 drawing on International Energy Agency (IEA) data on energy-related CO₂ emissions and the 2021 OECD Inter-Country Input-Output (ICIO) Tables.

THE BANCO DE ESPAÑA'S CATS MODEL ENABLES THE – HIGHLY UNEVEN – IMPACT OF THE GREEN TRANSITION ON SPAIN'S ECONOMIC SECTORS TO BE ASSESSED

- According to the CATS model, if Spain's sectoral structure and Spanish industries' emission intensity were the same as those of Germany or the EU-27 average, the aggregate economic impact of the simulated transition risks would be virtually unchanged

INCREASE IN PRICE OF CO₂ EMISSIONS FROM €25 TO €100 PER TONNE, AND INCREASE IN PRICE AND COVERAGE
Rate of change of sector value added (%)



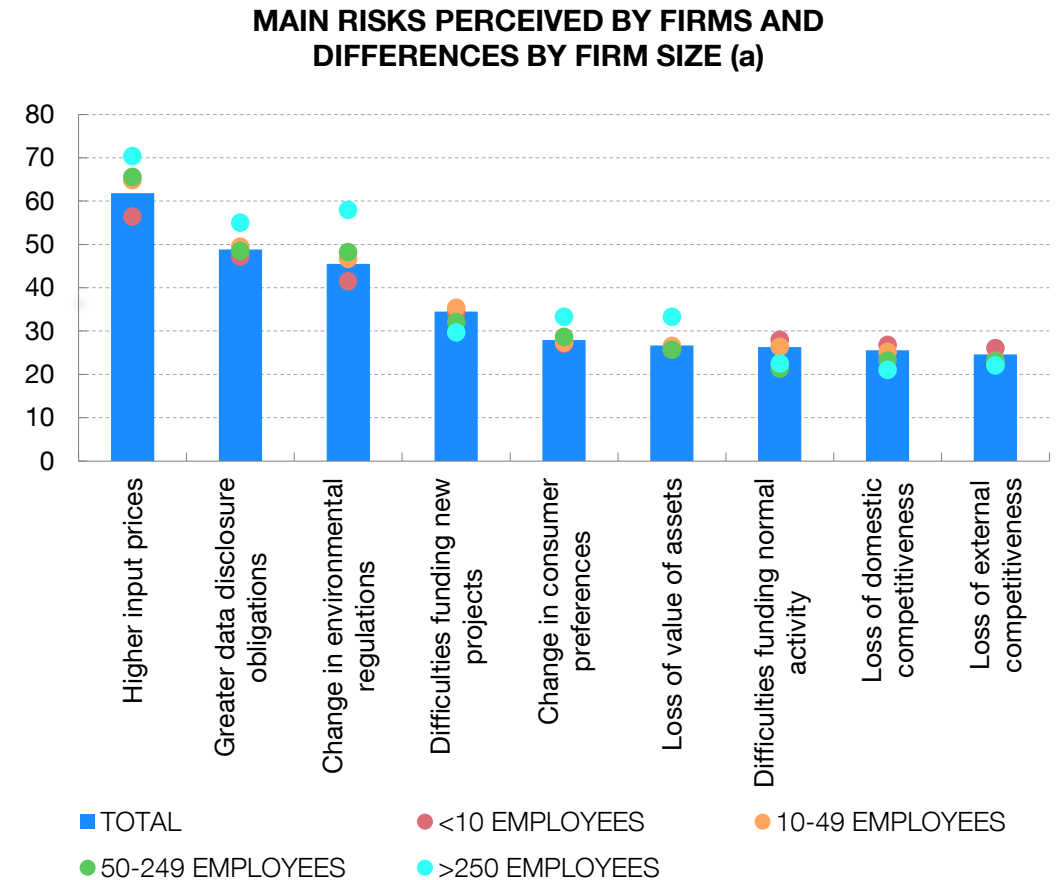
SOURCE: Banco de España.

a. Increase in price of CO₂ emissions, from €25 to €100 per tonne.

b. Increase in price of CO₂ emissions, from €25 to €100 per tonne, and extension of coverage of EU-ETS to include all the emissions of all the productive sectors.

WITHIN EACH SECTOR, THE SMALLER FIRMS APPEAR TO BE LESS WELL PREPARED FOR CLIMATE CHALLENGES

- In late 2021 the Banco de España surveyed Spanish firms on their view of how climate change and the transition towards a more sustainable economy might affect them
- A large majority of smaller firms have still not assessed the impact that climate change and the green transition may have on their activity
- In addition, of those that had carried out this assessment, the percentage of small firms that expected a negative impact was almost 8 pp higher than among the larger firms
- The main risks associated with the green transition detected by the firms included greater inflationary pressures and a heavier administrative burden linked to data disclosure obligations



SOURCE: Banco de España (Climate module of 2021 Q4 EBAE).

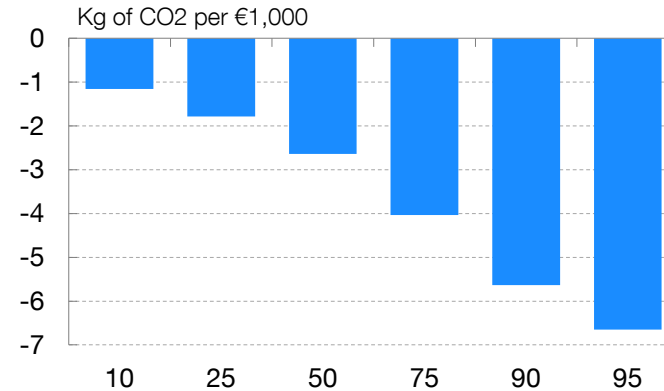
a. Size differences estimated after taking into account the impact of the industry in which the firms operate.

THE FORESEEABLE FUTURE INCREASE IN THE PRICE OF THE MOST POLLUTING GOODS AND SERVICES WILL HAVE MOST IMPACT ON CERTAIN POPULATION GROUPS ...

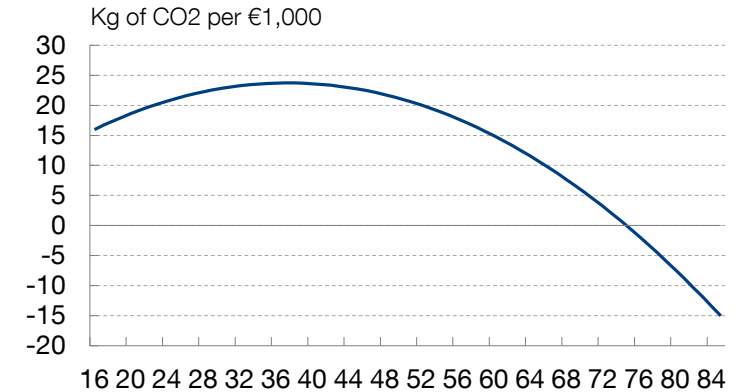
- ... especially, in view of their consumption patterns, on

- lower income households,
- households whose reference person is in the 35 to 45 age group,
- households in rural areas,
- households with a lower educational level,
- and larger households

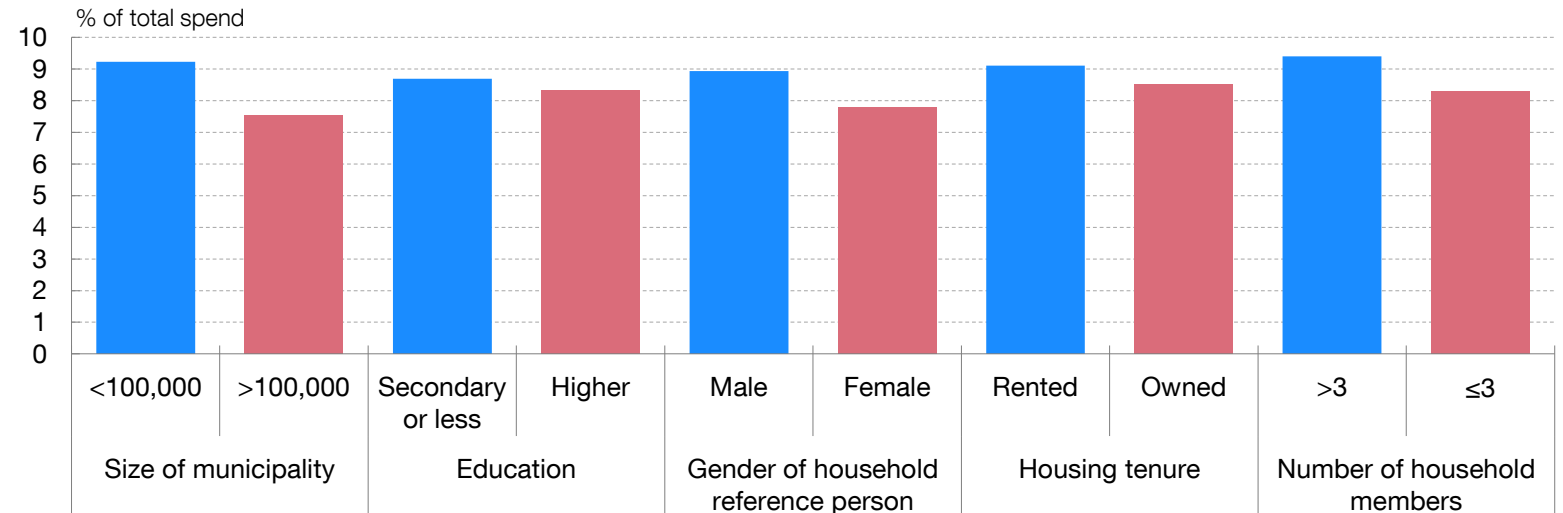
CHANGE IN EMISSION INTENSITY BY INCOME DECILE (a) (b)



CHANGE IN EMISSION INTENSITY BY AGE GROUP (c) (d)



PROPORTION OF EXPENDITURE ON HIGH EMISSION INDUSTRIES BY OTHER SOCIOECONOMIC FACTORS



SOURCES: INE and Banco de España.

a. Household income.

b. Difference in emission intensity compared with non-income households.

c. Age of household reference person.

d. Difference in emission intensity compared with households whose reference person was around 75 years old.

GOVERNMENTS MUST LEAD THE GREEN TRANSITION PROCESS

Governments have the necessary democratic legitimacy to establish the roadmap and the broadest and most suitable set of instruments to achieve the proposed targets

Green taxation is the most efficient instrument. It is essential to strengthen and improve the design of environmental taxes in Spain

Offsetting measures must be rolled out for the hardest hit sectors, firms and households. These must be temporary, highly targeted and carefully designed

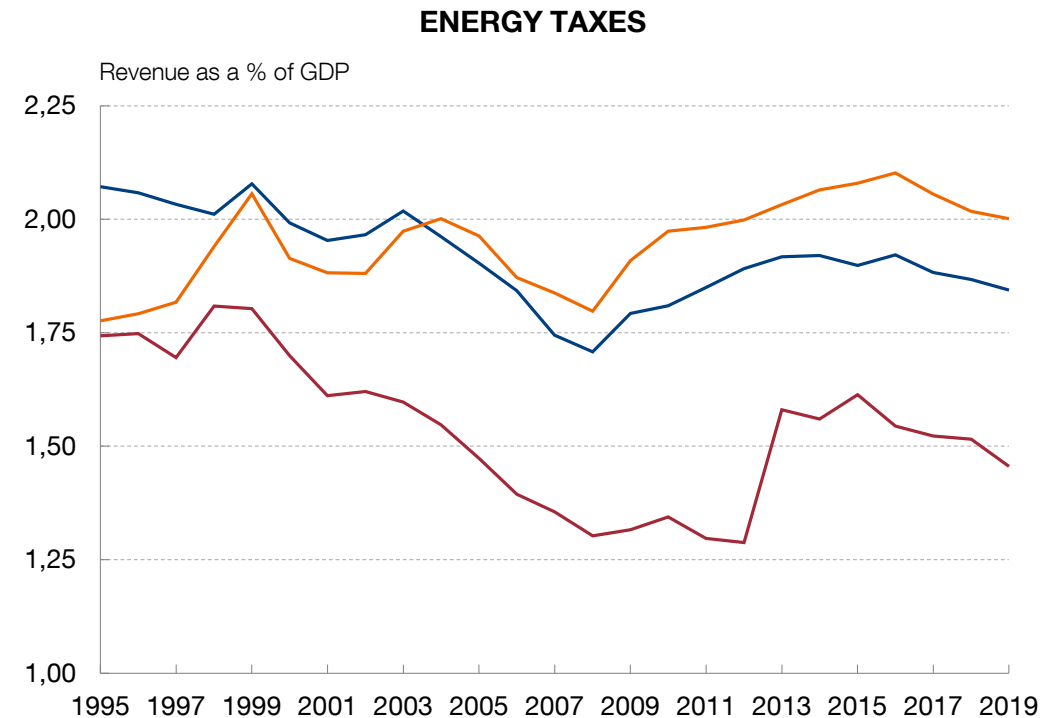
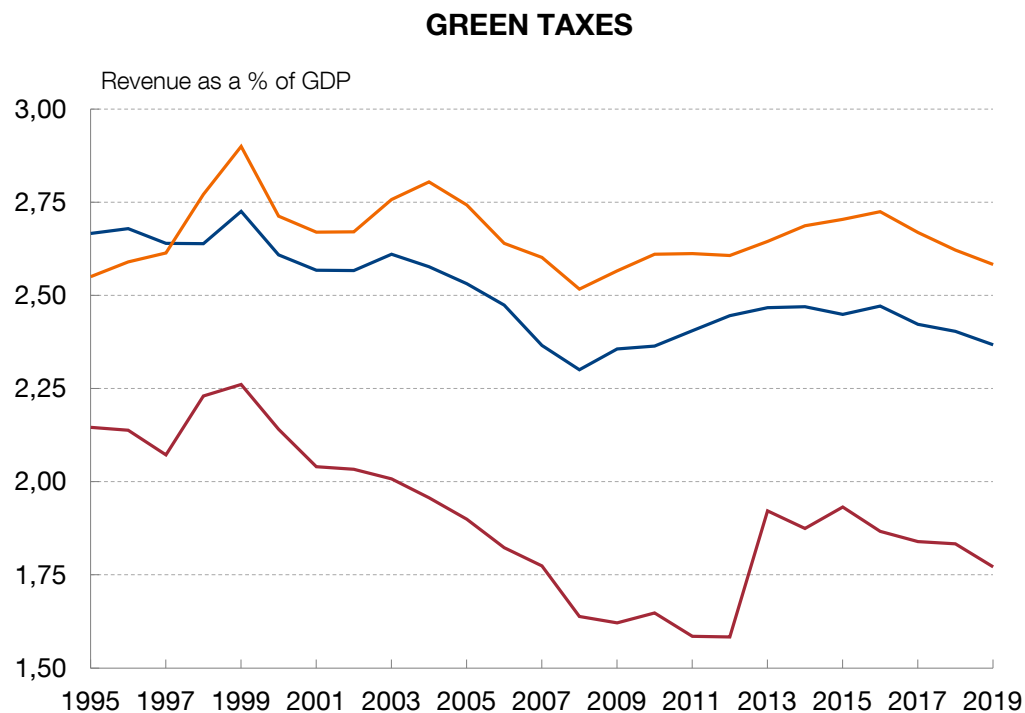
Public and private investment also play a decisive role. The potential of the NGEU programme must be fully harnessed

Public policies must undergo ongoing assessment so as not to waste resources and avoid unwanted effects on activity

In such an uncertain process, public policies must provide certainty and a stable operational framework for economic agents

SPAIN CONSISTENTLY FEATURES AMONG THE EU-27 ECONOMIES IN WHICH GREEN TAXATION RAISES THE LEAST REVENUE IN RELATIVE TERMS

- Although hydrocarbon taxes in Spain are lower than elsewhere, the tax rates have not risen in real terms in recent years.



— SPAIN — EU-27 (WEIGHTED) — EU-27 (ARITHMETIC)

SOURCE: Eurostat.

EVALUATING CLIMATE-RELATED PUBLIC POLICY IS CRUCIAL, GIVEN THE EXISTING UNCERTAINTY SURROUNDING THE ECOLOGICAL TRANSITION AND THE INSTRUMENTS USED

- The ongoing, proper evaluation of public policies requires an increase in the amount of granular information available on environmental matters and access to that information for researchers
- Some recent studies by Banco de España researchers:

Holub et al. (2020)

As part of the fight against climate change, the fight against air pollution could have a very significant impact on the health and labour market participation of the Spanish population

Anghel and Muñoz (2022)

In Spain, the impact of subsidies to purchase electric vehicles has been highly uneven across municipalities

Fabra et al. (2022)

While investment in renewable energy sources could have a positive impact on overall employment, this need not necessarily be apparent at local level

The huge amount of funds required for the green transition cannot be efficiently channelled without the active participation of the financial system

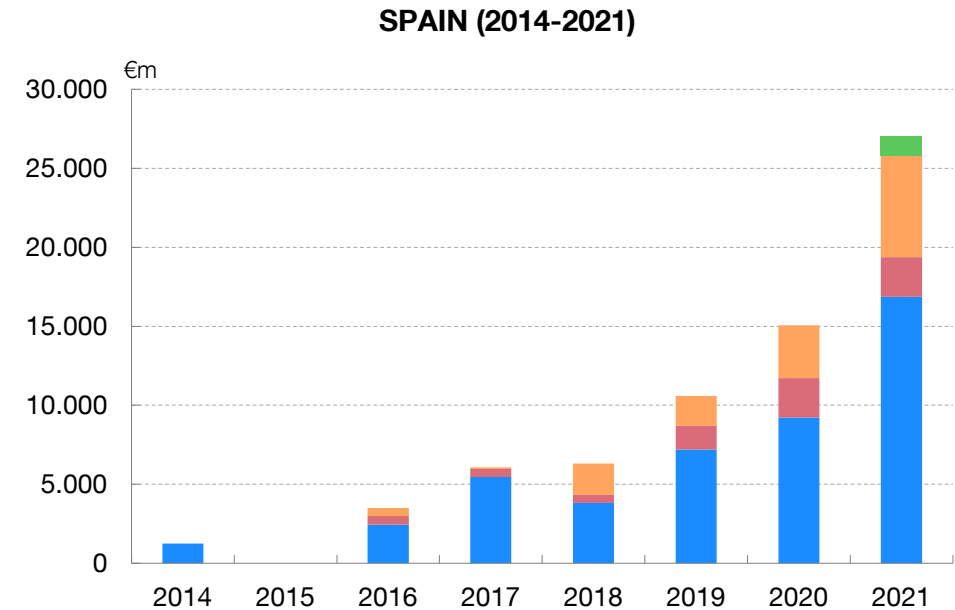
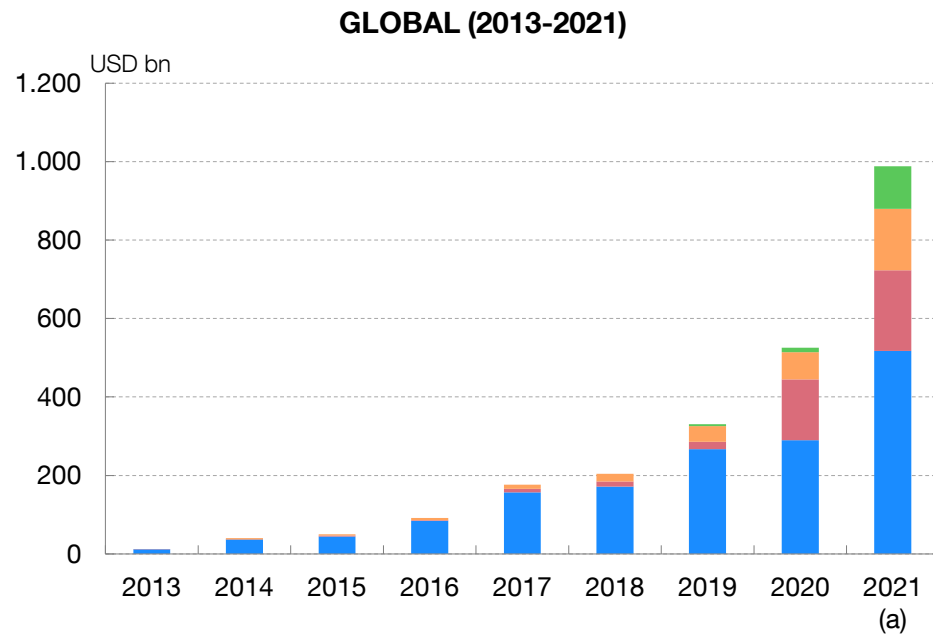
All participants in the financial system must accurately identify the extent to which they and other agents are exposed to climate risks and factor such information into their risk management

Looking ahead, the progress of sustainable finance will depend on improvements to the information available, on the headway made in defining international standards and on the ex post verification of the commitments undertaken by the issuers of sustainable instruments

RECENT YEARS HAVE SEEN AN EXTRAORDINARY BOOM IN SUSTAINABLE FINANCE

- On the capital markets, a key current question is whether the various financial assets fully price in all of the climate risks to which they are exposed

GREEN AND SUSTAINABLE BONDS



■ SUSTAINABILITY-LINKED BONDS ■ SUSTAINABILITY BONDS ■ SOCIAL BONDS ■ GREEN BONDS

SOURCE: González and Núñez (2021) with figures from IFF, Sustainable Debt Monitor & CBI and Dealogic.
a. Provisional figures.

CENTRAL BANKS, WITHIN THEIR MANDATES, ALSO HAVE TO CONTRIBUTE TO THE GREEN TRANSITION

The world's main central banks have begun to factor in climate change and green transition-related considerations when determining and implementing their monetary policy

Stress tests for adverse weather events have begun to be conducted. The Banco de España's top-down analysis shows that climate risks will have a moderate impact on the Spanish banking sector in the short term

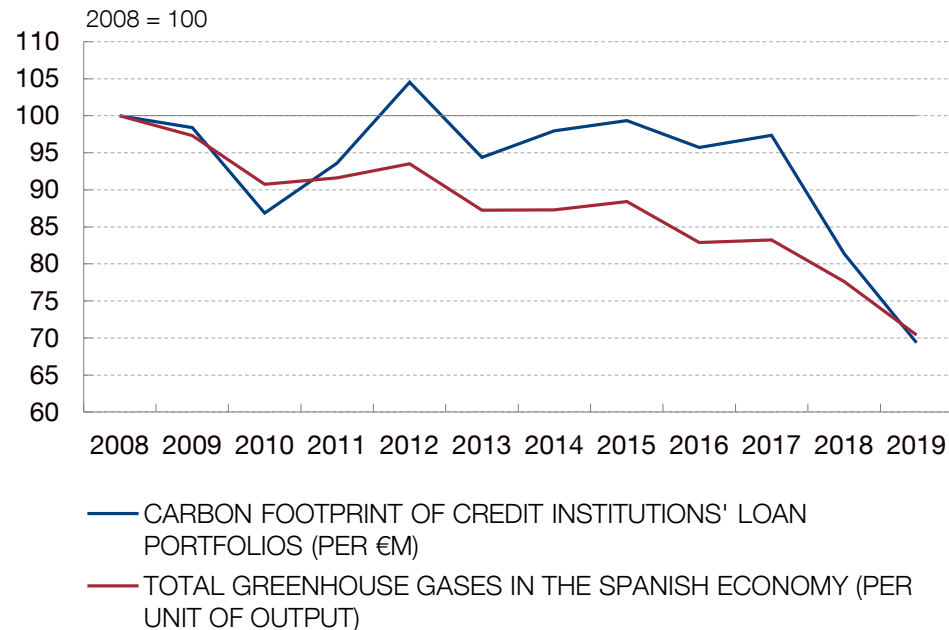
Regulation and prudential supervision: work is under way so that credit institutions are ready to identify, measure, manage and report on the financial risks posed by climate change

Central banks can also contribute to the green transition by incorporating sustainability criteria in their own investment portfolios. Active role played by the Banco de España

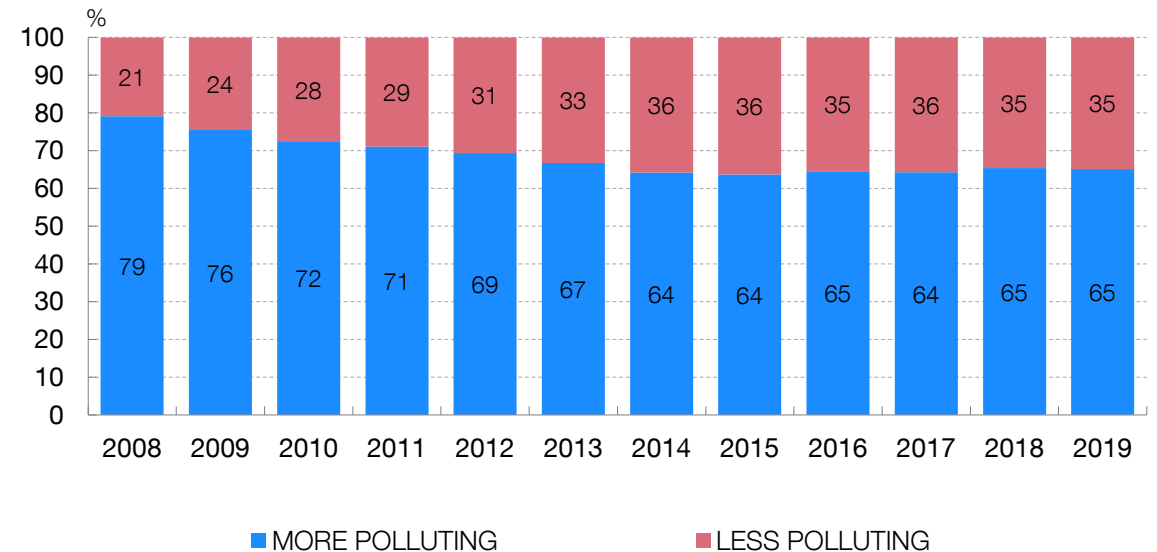
ONE WAY TO ESTIMATE BANKS' EXPOSURE TO TRANSITION RISKS IS BY DRAWING ON THE DISTRIBUTION OF LENDING TO FIRMS ACCORDING TO THEIR EMISSIONS

- The carbon footprint of Spanish banks' loan portfolios has shrunk in recent years, in line with the decline in emissions in the total Spanish economy, but also with a slight restructuring of the loan portfolio towards less polluting industries

CARBON FOOTPRINT OF SPANISH CREDIT INSTITUTIONS' LOAN PORTFOLIO (a)



STRUCTURE OF SPANISH CREDIT INSTITUTIONS' PORTFOLIO OF LOANS TO PRODUCTIVE ACTIVITIES ACCORDING TO EMISSION INTENSITY (b)



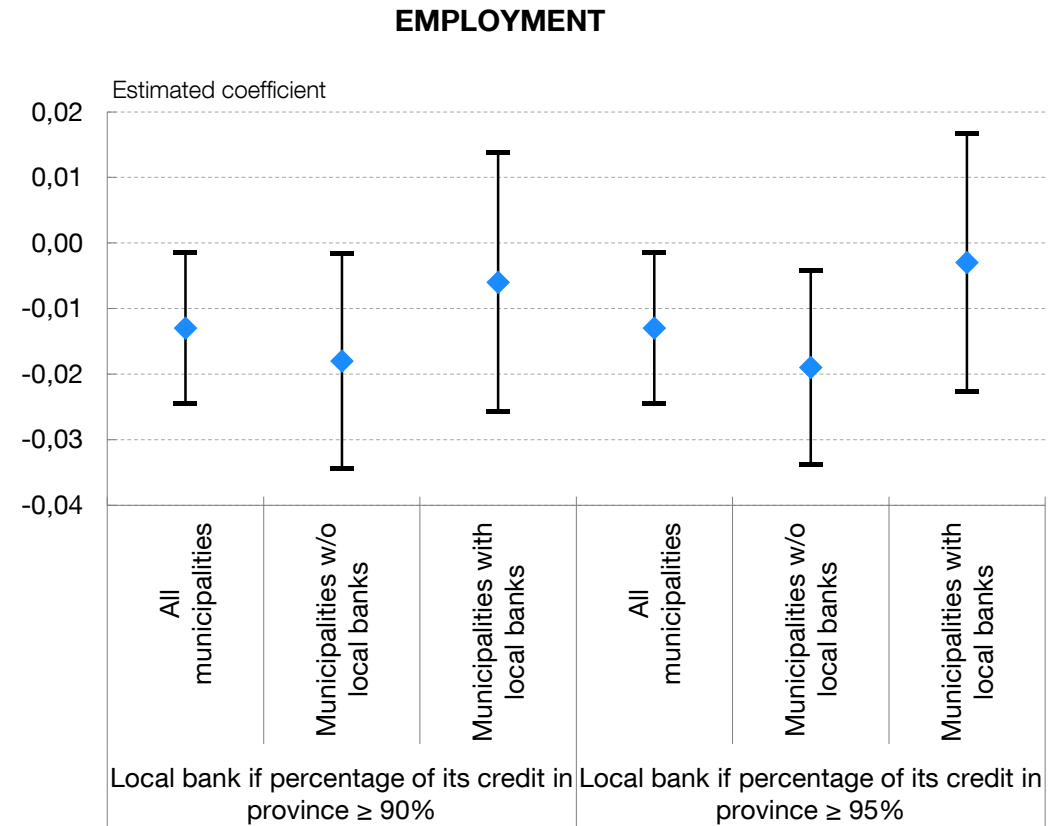
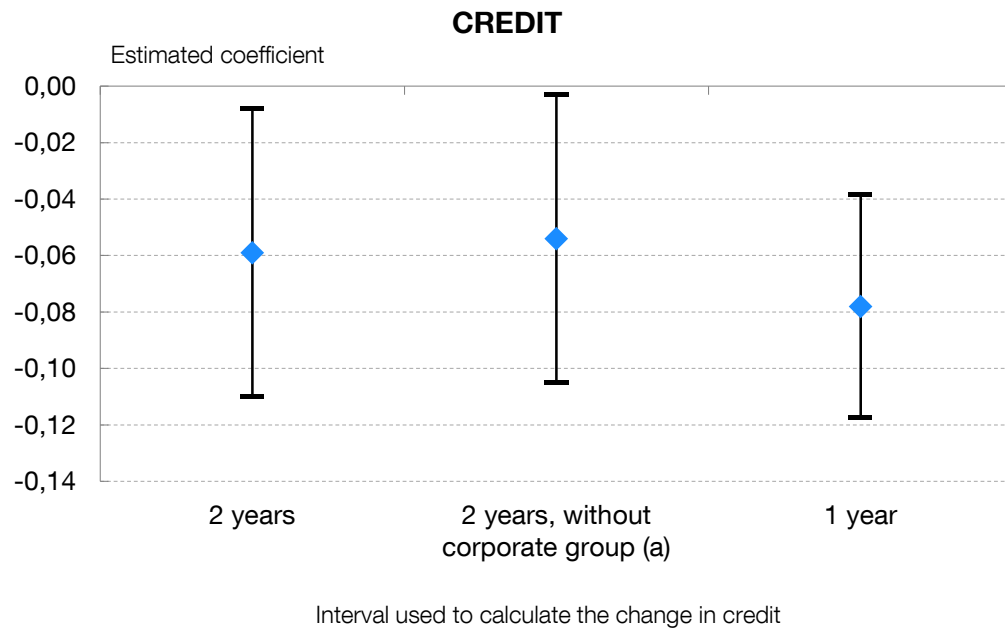
SOURCES: ECB, INE and Banco de España.

a. This indicator represents the weighted average of (direct and indirect) emission ratios per unit of output of the productive activities according to the relative weight of each industry in the stock of loans extended by Spanish credit institutions.

b. Industries are classified as more or less polluting on the basis of their emission intensity (2008-2019 average), such that those whose emission ratios exceed the median of the 64 industries analysed are classified as more polluting.

THERE ARE DIFFERENT APPROACHES FOR ASSESSING THE BANKING SECTOR'S EXPOSURE TO THE PHYSICAL RISKS POSED BY CLIMATE CHANGE, BUT SUCH EVALUATIONS ARE VERY PRELIMINARY

- A recent Banco de España study confirms the adverse impact of physical risks on business activities and suggests that firms affected by a wildfire in Spain suffer reductions in their credit balance and employment

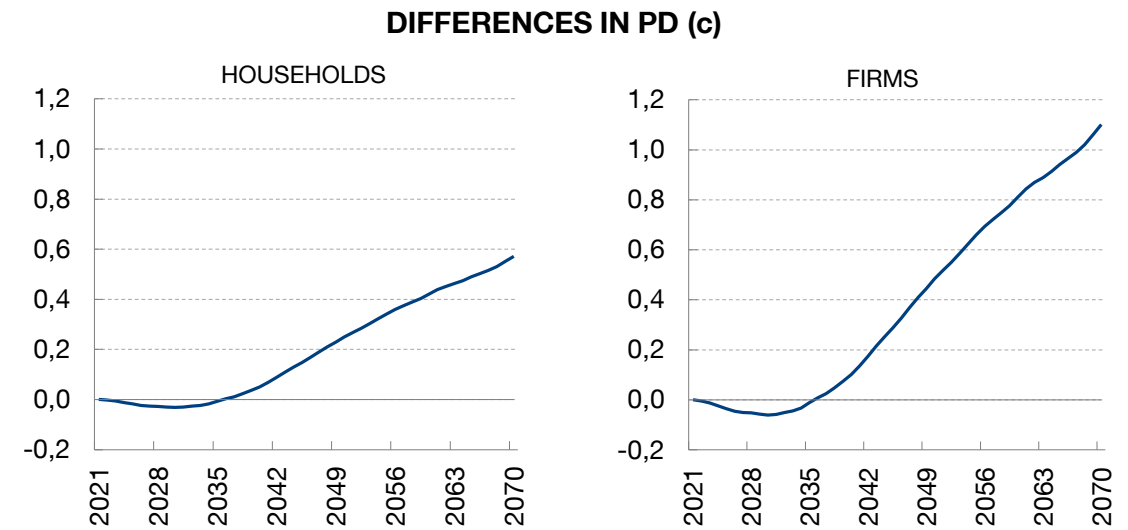
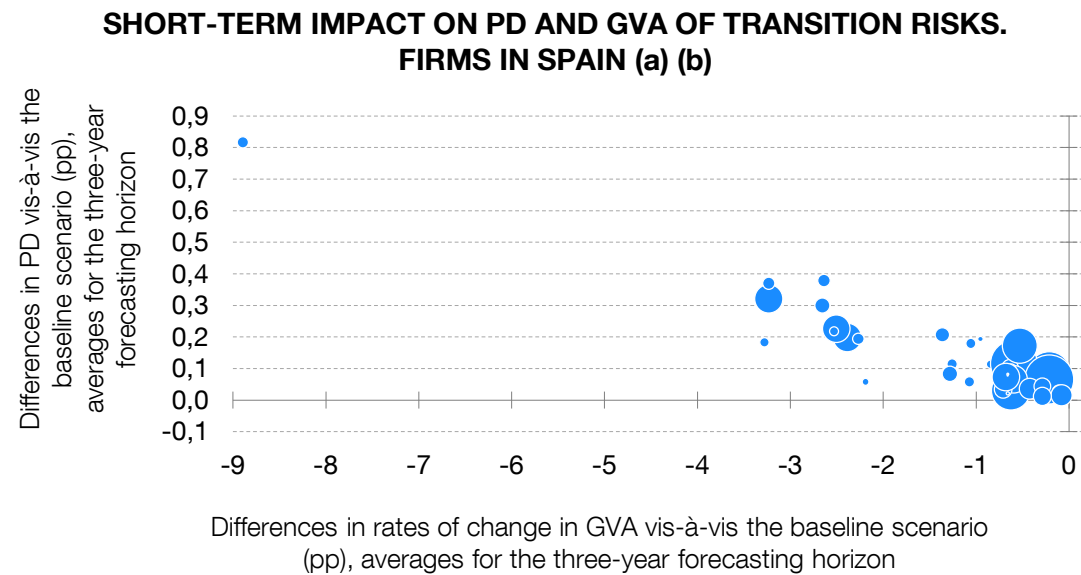


SOURCE: Álvarez et al. (2022).

a. The sample excludes firms belonging to a corporate group.

THE LONG-TERM DETERIORATION IN THE QUALITY OF LOANS OWING TO THE MATERIALISATION OF PHYSICAL RISKS IS EXPECTED TO BE GREATER THAN THAT DUE TO TRANSITION RISKS

- A preliminary analysis indicates that, if the physical risks associated with climate change were to materialise forcefully, there would be substantial long-term increases in households' and firms' probabilities of default. In the case of firms, the increases would be much sharper than those estimated at the outset of an orderly transition towards a more sustainable production model

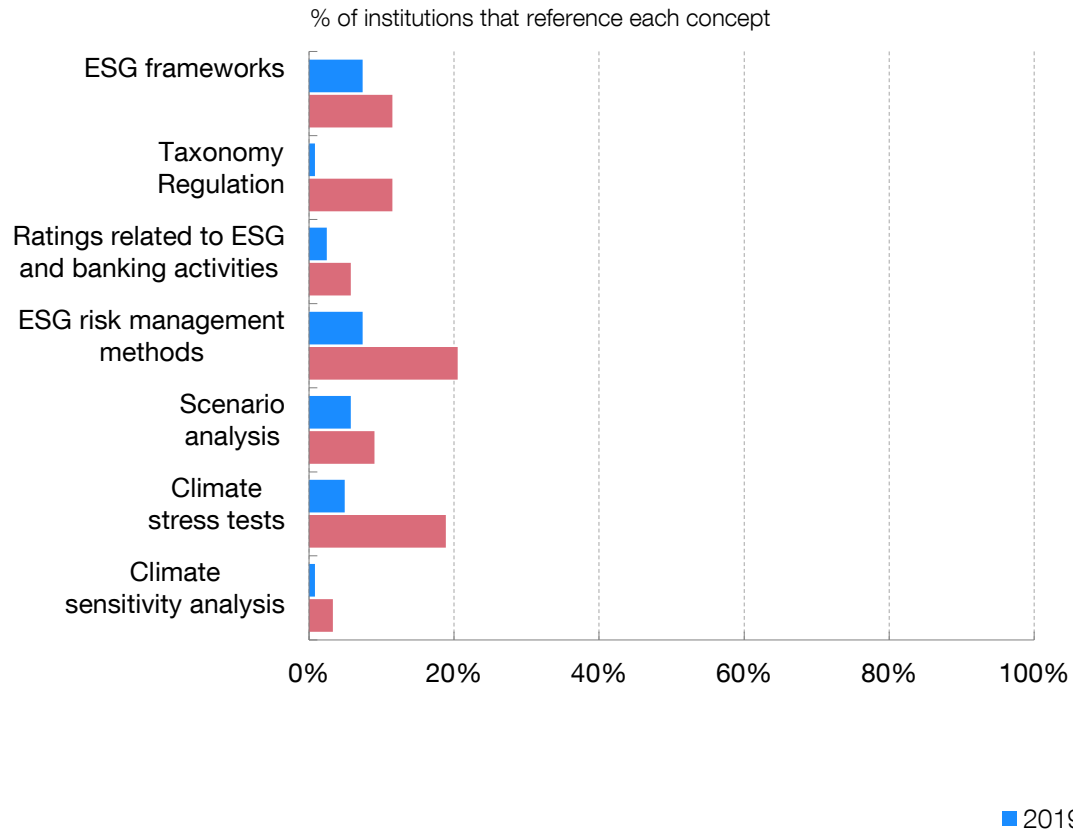


SOURCE: Banco de España.

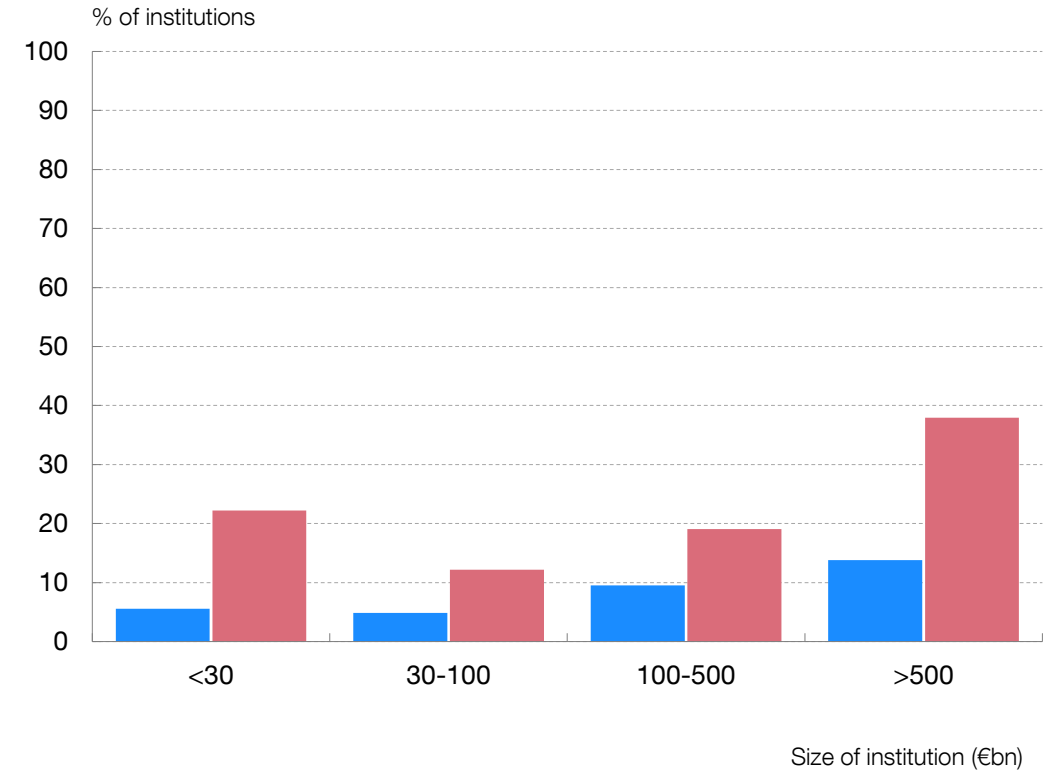
- The severest scenario considers the combined effect of an increase in emission prices and the extension of ETS coverage to all business sectors and also to households.
- Each dot on the chart represents a sector. PD represents the probability that firms do not meet their financial commitments with banks. PDs are estimated over the projection horizon for each bank, but the difference in each sector's weighted average is depicted. Weighting is by number of borrowers. The size of the bubbles indicates the share of the sector's exposure in total credit exposures in Spain.
- The chart depicts, for each portfolio (households and firms) and each year, the difference in expected PD under two different scenarios: one in which physical risks materialise forcefully (hot house scenario) and another which envisages an orderly transition towards a sustainable energy model. The projections to 2070 are obtained by sequentially applying an autoregressive model that relates PDs and GDP growth. The GDP growth trajectories derive from scenarios drawn up by the NGFS.

THE LEVEL OF DETAIL ON ESG RISKS IN EUROPEAN BANKS' PILLAR 3 REPORTS HAS INCREASED, BUT REMAINS LOW

INSTITUTIONS REFERENCING CONCEPTS RELATED TO ESG FRAMEWORKS AND ESG RISK MANAGEMENT METHODS



INSTITUTIONS REFERENCING CONCEPTS RELATED TO ESG FRAMEWORKS AND ESG RISK MANAGEMENT METHODS BY SIZE



SOURCE: Moreno and Caminero (2022).