FINPRO 4 - 25-26 September 2024 - Barcelona (ESADE)

Day 1

Official Welcome by Filippo di Mauro (CompNet)

Filippo di Mauro, Chairman of CompNet, commenced the conference by outlining CompNet's core activities, which include dataset production, research publications, and event organization. He highlighted the significant milestones achieved with the CompNet and MDI datasets, emphasizing the valuable research opportunities these data sets provide.

Keynote by Professor Patrick Bolton (Columbia Business School, Imperial College London)

Patrick Bolton emphasized the crucial role of finance in combating climate change. He traced the rise of climate finance, noting its early momentum but also the significant hurdles it faces, including greenwashing and a growing backlash against Environmental, Social, and Governance (ESG) initiatives. These challenges, he argued, have slowed the pace of meaningful progress. Prof. Bolton stressed that the process of scaling up climate finance is complicated by fragmented efforts and a lack of cohesive strategy across sectors.

He pointed out that while the private sector is essential in driving the transition to a low-carbon economy, it cannot lead the charge alone. Governments must take a more active role in creating regulatory frameworks and implementing policies that ensure financial markets reflect the true costs of climate risks. Carbon pricing mechanisms, he suggested, are one key instrument, but they require stronger political will and alignment across countries to be effective.

Prof. Bolton also called for more long-term planning and transparency in corporate climate strategies, emphasizing the need for greater accountability from businesses and financial institutions in meeting their net-zero commitments. The keynote concluded with a clear message: only through coordinated government interventions and international cooperation can climate finance be scaled effectively to meet the challenges posed by climate change.

Session 1 – Innovation, Market Power, and Carbon Management

Paper 1 – The Role of Firms in Green Transition by Gülserim Özcan (OECD)

Presentation:

This paper investigates the determinants of green investments by firms and their impact on productivity and performance. It also explores the macroeconomic implications of policies like carbon taxes and how firm heterogeneity influences decisions around green investments, output, pricing, and market dynamics. Using a dynamic General Equilibrium (GE) model, the authors simulate energy price shocks and analyze their impact on firm behavior, including decisions about technology adoption and market competition. Firms make decisions based on forward-looking net present value (NPV) calculations, taking into account productivity signals, future costs, and potential energy price shocks. The model incorporates three productivity channels: energy price shocks affecting input allocation, entry/exit decisions of firms, and overall welfare. The study uses Portuguese firm-level data, which predicts that larger firms invest more in green capital. The findings show that carbon pricing leads to productivity gains and increased market concentration, benefiting larger firms at the expense of smaller ones. Higher energy prices reduce energy consumption but increase average markups due to resource reallocation between firms. Policymakers are advised to monitor market concentration and the disproportionate impact on smaller firms, with a broader focus on financial and managerial constraints that inhibit green investments, beyond just carbon pricing.

Discussion:

Helena Schweiger (EBRD) highlighted the paper's contribution to understanding the role of green capital in firm dynamics, contrasting with prior literature focused on green patents. She pointed out the trade-off between market concentration and green transitions, emphasizing the complexity of validating green investment measures, as firms interpret them in various ways (e.g., energy efficiency vs. broader sustainability). Additionally, she stressed the importance of organizational constraints, financial barriers, and carbon pricing, which are only partially captured by the model.

Q&A:

Key questions raised included how the model addresses investments that transform the production process. The authors responded that this is not explicitly modeled, and exit decisions are currently exogenous. Another question focused on the persistence of technical change, with the authors clarifying that while not path-dependent, the model

allows firms to make investment decisions over multiple periods. Future versions of the model plan to incorporate a more comprehensive approach.

Paper 2 – Market Power, Innovation, and the Green Transition by Rik Rozendaal (Leiden University)

Presentation:

This paper explores how market power influences the transition to green production, with evidence showing that market leaders are often "dirtier" than their competitors. Using ORBIS data, the author demonstrates that innovation within industries is path-dependent and correlated with market power. The model incorporates climate change and firm heterogeneity, distinguishing between clean and dirty technologies. The findings suggest that the introduction of a carbon tax would drastically reduce emissions and slow temperature increases. Additionally, the carbon tax would foster increased innovation and competition throughout the transition, although some firms may still pursue dirty innovation. The study highlights the importance of considering the strategic incentives of large incumbents to ensure a successful green transition.

Discussion:

Yusuf Soner Baskaya (Glasgow University, Adam Smith Business School) commended the paper for its novel extension of the Akcigit and Ates (2021) model and its challenge to conventional climate change policy frameworks. He emphasized the interesting results presented and the important role of policy in guiding the green transition.

Q&A:

Questions addressed included the definition of clean and dirty technology within the data, the specific carbon tax level needed to achieve significant temperature reductions, and the interaction between the financial sector and the model. The author acknowledged that these areas, particularly the role of the financial sector, will be further explored in future research.

Session 2 – Production and Supply Chain Responses to Environmental Regulation

Paper 3 – Climate Supervisory Shocks and Bank Lending by Maria Alessia Aiello (Banca d'Italia)

Presentation:

This paper analyzes the short-term impact of climate supervisory shocks on credit supply in Italy, following the European Central Bank's (ECB) climate risk initiatives, including the ECB's supervisory expectations on climate risk (November 2020) and the Climate Stress Test (November 2021). The study uses data from AnaCredit, FINREP/COREP, Cerved, and environmental targets from Refinitiv and SBTi, and controls for the financial effects of COVID-19. A difference-in-differences (DiD) approach is employed to estimate firm "brownness" based on CO2 emissions. The findings reveal that Significant Institutions (SIs) with climate commitments reallocated credit away from more polluting firms, whereas Less Significant Institutions (LSIs) showed a weaker response. There was no significant change in the cost of lending, with credit reallocation being the primary effect. The study also notes that firm commitments to emission reductions had limited impact on credit decisions, largely due to data gaps. Banks struggled to fully incorporate forward-looking climate data, especially for small and medium-sized enterprises (SMEs). The paper concludes by cautioning against reducing credit too aggressively to brown firms with transition plans, which could hinder their ability to become more sustainable.

Discussion:

Diana Bonfim (Banco de Portugal, ECB, Católica Lisbon and CEPR) emphasized that while supervisors cannot directly halt climate change, they can influence lending behavior. She pointed out that banks in Italy reduced credit to polluting firms following the ECB's SSM Guide in 2020, but there was no significant impact following the Climate Stress Test announcement in 2021. The discussant suggested that the 2020 expectations may explain the lack of later results and recommended adjusting the treatment period. Concerns were raised regarding the representativeness of the data and whether smaller banks might assume greater climate risk. Additional suggestions included exploring alternative borrowing sources for polluting firms and refining firm-level emissions estimates.

Q&A:

Key questions addressed whether smaller banks could take on more climate risks and how alternative borrowing sources for polluting firms could be explored. There was also discussion on how firm-level emission targets could be better integrated into credit decisions, given the data limitations.

Paper 4 – Picking Up the PACE: Loans for Residential Climate-Proofing by Francesco Mazzola (ESCP Europe)

Presentation:

This paper examines the role of Property Assessed Clean Energy (PACE) loans in financing energy-efficient home improvements, with a particular focus on addressing the energy efficiency (EE) gap for low-income households. The study highlights the financial challenges these households face, including liquidity constraints and uncertainty around savings, and presents PACE loans as a potential solution. PACE loans, offered by specialized lenders and repaid through property taxes, increase households' debt capacity but also raise concerns about default risks and the potential crowding out of traditional mortgages. Using a staggered difference-in-differences (DiD) approach, particularly the Callaway and Sant'Anna (2021) estimator, the paper compares early and late adopters of PACE loans, drawing on data from PACE loan datasets and CoreLogic Data, especially from Florida following Hurricane Irma in 2017. The research found that PACE loans increased house prices by about 30%, offering particular benefits to financially constrained households, especially those with older, lower-value homes. However, this comes at the cost of increased delinquency rates, especially within the first year of loan adoption. Despite initial concerns, the study finds that PACE loans do not crowd out traditional mortgage lending but instead expand mortgage supply for high-risk borrowers by improving collateral values. Nevertheless, the program raises concerns about long-term sustainability, particularly regarding households' ability to manage the increased debt burden tied to rising property taxes, which may outpace income growth.

Discussion:

Pedro Gete (IE University) raised several concerns about the PACE program, focusing on the role of predatory contractors, particularly in states like Florida, where lawsuits and inflated insurance claims have been linked to PACE projects. He questioned the long-term sustainability of PACE loans, pointing out that the increase in property values and taxes might place a financial strain on households, especially retirees or those with fixed incomes. The discussant highlighted the potential negative impact on housing affordability, as increased debt tied to property taxes could make it harder for households to manage their finances. Additionally, he emphasized the need to

differentiate between the effects of COVID-19, which spurred many home improvement projects, and the specific impacts of the PACE program.

Q&A:

Key questions focused on the risks posed by predatory contractors, the program's long-term sustainability, and whether the increased delinquency rates and potential financial strain on households outweighed the benefits of the PACE loans.

Policy Panel

The policy panel featured a discussion among experts Beatrice Weder di Mauro (CEPR, IHEID), Lucrezia Reichlin (London Business School), Galina Hale (UC Santa Cruz), and Mirabelle Muûls (Imperial College London). The panelists agreed on the increasing frequency and severity of climate-related disruptions, emphasizing the need for innovative financial tools to help firms sustain growth in the face of climate shocks.

The panelists highlighted the importance of collaborative global efforts, particularly in facilitating the transition to greener economies. Beatrice Weder di Mauro underscored the irreversible nature of the climate crisis, cautioning that policies aimed at limiting warming to 3°C, instead of the more ambitious 1.5°C target, carry existential risks for vulnerable regions. She also critiqued the structural flaws of the Paris Agreement, arguing that the unequal distribution of emissions allowances disproportionately favours large emitters like the U.S. and China, to the detriment of lower-emission countries in Africa and India.

Galina Hale underscored the need for central banks to incorporate climate risks into their monetary policies, arguing that the financial sector can play a crucial role in promoting sustainable growth. She advocated for the development of new financial tools and frameworks to assess the long-term impacts of climate shocks on global markets.

Mirabelle Muûls stressed the need for USD 6 trillion in climate adaptation funding, stating that governments alone cannot meet this financial requirement. She called for increased involvement from private financial markets but noted that profitability challenges hinder investment in natural projects like reforestation. She also highlighted the misallocation of resources in current mitigation efforts.

Lucrezia Reichlin emphasized the necessity of global cooperation, particularly in emerging markets, and advocated for public-private partnerships to support investments in sustainable agriculture and the transition away from coal. She concluded

that the private sector alone cannot resolve these issues, highlighting the importance of coordinated efforts between governments and businesses.

The audience actively participated in the discussion, with questions being raised about the feasibility of large-scale climate adaptation funding and how climate risks can be better integrated into policies. Other questions focused on the role of the private sector in driving sustainability initiatives and how governments can create frameworks that encourage long-term investment in green technologies.

Session 3 – Financial Markets and Insurance with Climate Risk

Paper 5 – How Climate-Awake Are Financial Markets? by Galina Hale (UCSC, NBER, CEPR)

Presentation:

This paper investigates how financial markets price climate risks, specifically focusing on two main types: physical risks, such as natural disasters, and transition risks, including policy changes like carbon pricing. Unlike traditional risks, climate risks evolve over time with high uncertainty, which makes conventional asset pricing models inadequate. The study introduces belief formation into an asset pricing model, particularly focusing on the trending of climate parameters and the uncertainty surrounding their path, both fundamental and policy-related. Bayesian updating is used to account for changes in climate risk beliefs, incorporating scenarios of both climate optimism and climate denial. Using a Poisson distribution, the model quantifies subjective beliefs about disaster frequency and severity, revealing that low climate optimism and low belief rigidity align with realistic expectations of future risks. Higher perceived disaster risks result in a lower risk-free rate and a higher equity risk premium, reflecting the increased compensation demanded by investors. This model is calibrated using historical data on disaster probabilities and asset returns, providing a structured framework for analyzing climate risks and their impact on asset pricing.

Discussion:

Gülserim Özcan (OECD) praised the innovative integration of belief formation into asset pricing models but raised concerns about how belief rigidity was framed. While rigid beliefs may suggest friction in financial markets, the discussion questioned whether belief rigidity could instead serve as a stabilizing force that prevents extreme market fluctuations. The discussant also explored whether real frictions could be measured or

influenced by government policies, particularly their effects on macroeconomic and prudential policies, sovereign yields, and fiscal policy sustainability.

Q&A:

The questions focused on differentiating between green and brown assets in the model and whether belief rigidity differs between these asset types due to varying exposures to climate risks. There was also discussion on the model's out-of-sample fit, suggesting it be tested against empirical data on disasters to strengthen its robustness. Further exploration was encouraged on capital loss and productivity shocks caused by climate disasters, particularly regarding how disaster arrival rates could enhance the model's accuracy in capturing broader economic impacts.

Paper 6 – Climate Change, Catastrophes, Uninsurability, and the Macroeconomy by Miles Parker (ECB)

Presentation:

This paper presents a comprehensive analysis of the climate insurance protection gap and its macroeconomic effects, particularly in the context of climate-related disasters. The protection gap refers to the inadequacy of insurance coverage for climate risks, and the paper quantifies how uninsured losses amplify the negative impacts of disasters on GDP. The theoretical model, combined with empirical evidence, demonstrates that the protection gap significantly reduces capital stock and output as the frequency and intensity of climate events increase under global warming scenarios. The empirical results reveal that while insured losses help mitigate GDP contractions after disasters, the widening protection gap poses significant risks to long-term economic stability. Parker advocates for policy interventions, such as enhanced private insurance solutions, risk prevention measures, and public-private partnerships, to stabilize insurance markets and strengthen economic resilience under increasing climate risks.

Discussion:

Francesco Mazzola (ESCP Business School) highlighted the paper's significant contribution in showing how insurance mitigates both the macroeconomic and welfare impacts of climate-related disasters. He noted that insurance shortens recovery periods and reduces the GDP loss following disasters. The discussant also raised concerns about potential omitted variable bias and suggested further exploration of the interaction between insurance markets and natural disasters. He recommended a more detailed breakdown of disaster impacts on GDP and emphasized the need to examine insurance's role in post-disaster reconstruction versus relocation efforts.

Q&A:

Key audience questions centered on the importance of considering sectoral heterogeneity in the value added by insurance when mitigating climate risks.

Session 4 – Economic Effects of Climate Shocks and Adaptation

Paper 7 – Heterogeneous Effects of Weather Shocks on Firm Economic Performance by Romano Tarsia (London School of Economics)

Presentation:

This paper investigates the within-country heterogeneity of climate damage by analyzing firm-level data across Europe. Current studies often rely on average marginal effects, which may not fully capture the varied impacts of climate change. Using data from Orbis, the study reveals significant firm-level heterogeneity in climate damage, showing that the impacts of climate change differ substantially among firms. The findings indicate an inverted-U relationship, where the most productive firms ("winners") tend to benefit from weather shocks, while the least productive firms ("losers") suffer disproportionately. The paper goes beyond country- and regional-level impacts by focusing on labor productivity, capital productivity and stock, energy costs, and supply chains at the firm level. The study employs balance sheet data from 1995-2020, merged with temperature data from Copernicus ERA5-Land, and uses a quadratic temperature model with L lags to address concerns about non-stationarity and endogeneity, particularly in hotter regions like southern Italy, Greece, and Spain.

Discussion:

Andrea Chiavari (Oxford University) highlighted the paper's importance for macroeconomic climate policy, noting its attempt to quantify firm-level damages and provide a micro-level perspective that can inform broader macro-level estimates. He suggested that the empirical strategy resembles country-level estimates, advising the author to include both levels and lags of variables to improve the analysis. The discussant also recommended clarifying the benefits of the quadratic model and considering the inclusion of lagged shocks for further refinement.

Q&A:

Key questions raised included whether seasonal effects had been accounted for, and whether GDP was included in the regressions to enhance policy relevance. Other questions explored the distinction between temperature trends and actual shocks, and whether cold countries are gaining while hot countries are losing due to climate change,

potentially leading to inequality analysis. Finally, there was a question about the role of industrial composition differences across countries, though the study found these differences to be less informative.

Paper 8 – Weathering the Storm: Sectoral Economic and Inflationary Effects of Floods and the Role of Adaptation by Matteo Ficarra (Geneva Graduate Institute)

Presentation:

This paper examines the economic impact of floods on local authorities in England, focusing on sectoral GDP and inflation responses. Floods have intensified significantly in the UK over the past 50 years, putting millions of properties at risk. Using granular ITL3-level data (from 309 local authorities between 1998 and 2021), the study adopts a local projection method with an instrumental variable approach to address endogeneity concerns related to adaptation capital. The findings reveal that floods lead to a delayed but persistent decline in GDP, with aggregate output dropping by up to 3% over three years. The impact varies across sectors, with civil engineering benefiting in the short term due to increased demand for infrastructure repair, while other sectors, such as agriculture, exhibit mixed or negligible effects. Inflationary trends were found to be less consistent, with a zigzag pattern complicating the interpretation of price dynamics. The paper emphasizes the importance of long-term investments in adaptation strategies, such as flood defences, which prove more effective when spread over time rather than through one-off investments.

Discussion:

Bhavyaa Sharma (University of California, Santa Cruz) praised the paper's contributions in estimating the macroeconomic effects of floods across various sectors and agents, beyond just households. She commended the use of precipitation z-scores as an instrument for floods but recommended exploring alternative instruments, such as soil moisture and groundwater saturation, to enhance the robustness of the estimates. The discussant also suggested testing for nonlinear dynamics in precipitation by incorporating quadratic transformations, accounting for spatial clustering of standard errors, and examining sector-specific resilience and time-varying adaptation effects.

Q&A:

Key questions focused on the timing of adaptation investments and how spatial clustering of standard errors could be accounted for in the analysis. There was also interest in exploring the differential resilience of sectors and the time-varying effects of adaptation strategies.

Keynote by Dr. Mirabelle Muûls (CEPR, Imperial College London)

Dr. Mirabelle Muûls addressed the critical role of climate policy in 2024, particularly given the significance of upcoming elections in the EU, UK, and US. These political events, she explained, are likely to shape global climate policies, influencing the progress of climate change mitigation. She highlighted the importance of economic analysis in assessing the effectiveness of these policies, with the US Inflation Reduction Act standing as a prominent example of recent climate legislation.

One of the key themes Dr. Muûls explored was market failure, using greenhouse gas (GHG) accumulation as an example. She argued that the social costs of climate change must be internalized through pricing mechanisms like Emissions Trading Systems (ETS). While the ideal scenario would involve a global carbon price, the reality is that carbon pricing differs vastly across countries, complicating efforts to achieve uniform emission reductions. She pointed out that the EU ETS, with rising carbon prices, has been one of the most successful examples of a cap-and-trade system, significantly reducing emissions in Europe since its introduction.

Dr. Muûls discussed her study on the EU ETS's impact between 2012 and 2018, revealing a 15% decrease in emissions during Phase II of the system, with no negative effects on value-added or employment. She noted that firms became more emission-efficient, largely driven by investments in pollution control technologies. However, these reductions weren't solely attributed to ETS, as firms were already moving toward greater energy efficiency.

The keynote also delved into the issue of carbon leakage, where firms might shift production to regions with less stringent regulations, undermining the effectiveness of carbon pricing. While her research found little evidence of carbon leakage among multinational enterprises (MNEs) operating under the EU ETS, the potential for leakage remains a concern in other sectors and regions. Furthermore, the allocation of free permits to firms, particularly in trade-exposed sectors, was highlighted as a factor that reduced the incentive for emissions cuts.

Dr. Muûls emphasized the role of green management practices in helping firms adapt to climate policies, noting that firms with knowledgeable management were more likely to invest in emissions reduction strategies. She concluded by stressing the need for coordinated climate policies across jurisdictions and further research into voluntary carbon markets, innovation incentives, and supply chain dynamics to better address global climate challenges.

Session 5 – Policy and Financial Tools for Climate Adaptation

Paper 9 – Opening the Brown Box: Production Responses to Environmental Regulation by Lakshmi Naaraayanan (London Business School)

Presentation:

This paper investigates the impact of India's 2009 Comprehensive Environmental Pollution Index (CEPI) on within-firm production responses in industrial clusters with high pollution levels. The CEPI targets clusters exceeding pollution thresholds, with those scoring over 60 subjected to central monitoring and those above 70 required to submit action plans for pollution reduction. Using a difference-in-discontinuity approach, the study compares clusters just below and above these thresholds, analyzing firm-level data on inputs, outputs, energy usage, and abatement investments. The findings show that firms in regulated clusters significantly reduced emissions by shifting from coal to electricity, reducing energy intensity, and reallocating production towards less polluting products. Abatement expenditures also increased, particularly in clusters with stronger regulatory enforcement and cost-sharing schemes. However, these environmental improvements came at the cost of reduced local economic dynamism, with evidence of lower firm entry and diminished product variety in the regulated clusters.

Discussion:

Ralph de Haas (EBRD) raised several suggestions for refining the analysis. He pointed out the need for clarification regarding the difference-in-discontinuity (DiRD) estimator, cautioning that the lack of bandwidth around the threshold may reduce the local nature of the estimation, making it closer to a traditional difference-in-differences (DiD) approach. Points were also raised about the small control group size (13 clusters), recommending robustness checks using wild cluster bootstrapping or randomization inference to address sensitivity concerns. The discussant further questioned the reported reductions in energy inputs and CO2 emissions at the product level, which appeared unusually high (63% and 66%, respectively). Investigating potential emission shifting was suggested, particularly at the intensive margin, where firms may purchase emission-intensive inputs from outside the treated clusters.

Q&A:

Key discussion points included the realism of the reported emission reductions and the potential for firms to shift polluting activities outside the regulated clusters.

Paper 10 – Rewiring Supply Chains Through Climate Policy by Olimpia Carradori (University of Zurich)

Presentation:

This paper examines the impact of California's cap-and-trade system on supplier-customer relationships within the U.S., focusing on suppliers subject to the policy compared to competitors outside California. The cap-and-trade policy, introduced in 2013 and expanded in 2015 to include petroleum and natural gas distributors, requires firms to buy permits to emit more. Using a difference-in-differences approach, the study finds that treated suppliers were significantly more likely to lose customers and less likely to establish new relationships than similar suppliers outside California. The results showed a 29% reduction in the likelihood of forming new customer relationships and a 20% reduction in overall supplier-customer relationships for treated suppliers. These effects were particularly pronounced in competitive sectors and among suppliers with standardized inputs or lower R&D investment. Two main channels explain these results: a financial channel, where switching costs led customers to seek alternative suppliers, and a climate awareness channel, where less environmentally conscious customers were more likely to end relationships. Interestingly, customers with strong environmental interests did not necessarily move away, suggesting political or environmental motivations influenced supply chain decisions. The paper also highlights the risk of carbon leakage, where emissions may increase outside of California due to the uncoordinated nature of climate policies, potentially leading to unintended environmental consequences.

Discussion:

Lakshmi Naaraayanan (London Business School) underscored the unintended consequences of government decarbonization policies, particularly the disruptions in supply chains and increased financial risks. The discussant suggested using a Cobb-Douglas function to better understand how cost increases impact profitability and differentiating between the first moment (cost increases) and the second moment (regulatory uncertainty). He also questioned whether the observed effects were a result of natural buying patterns or other factors related to regulatory interventions.

Q&A:

Key issues discussed included the implications of carbon leakage and whether uncoordinated climate policies could lead to increased financial risks and further disruptions in supply chains.

Final Remarks by Filippo di Mauro (CompNet)

Filippo di Mauro delivered the final address, thanking all participants for their valuable contributions and insightful discussions. He expressed his appreciation to the speakers and attendees for their engagement throughout the event. He also noted the potential for a future gathering at the European Investment Bank (EIB) in June 2025 for FINPRO5, encouraging continued collaboration and progress on the key themes addressed during the conference.