

# **Climate change and the macroeconomy - Implications for the conduct of monetary policy and the coordination of monetary, prudential and fiscal policy**

---

Overview of the projects funded under the fourth open  
call for research proposals

January 2021



**INSPIRE**

## PROJECT

### **The impact of climate change and policies on the balance of payments and central banking in commodity-exporting emerging economies**

Pablo Gabriel Bortz<sup>ab</sup>, Annina Kaltenbrunner<sup>c</sup>, Nicole Toftum<sup>a</sup> and Anne Löscher<sup>d</sup>

<sup>a</sup> National University of San Martín (UNSAM), Argentina; <sup>b</sup> National University of the West, Argentina; <sup>c</sup> Applied Institute for Research in Economics, Leeds University Business School, UK; <sup>d</sup> University of Siegen, Germany

The research proposes to assess the implications of climate change and policies for monetary policy mediated through their impact on the balance of payments. It focuses on developing countries where pressures from the balance of payments and subsequent implications for exchange rates are a key determinant of monetary policy making. It conducts a case study of transitional and physical risks with regard to countries where the influence of balance of payments on monetary policy is shaped by their strong dependence on primary commodities, on top of their larger vulnerability to external financial shocks in comparison with developed economies. We here address both transitional risks, i.e. the indirect effects coming with climate change and climate policies, such as sudden divestment strategies, changes in demand patterns, recessionary pressure and the risk of economic and financial crises; as well as physical risks of climate change that encompass the direct physical destructions due to natural disasters such as droughts and floods. These events have a significant detrimental impact on export performance, exchange rates volatility and financial stability in developing countries with shallow financial systems.

We use two case studies of middle-income countries to conduct this research. We analyse the experience of Nigeria, an oil-dependent commodity exporter, during three sharp declines of international oil prices (the global financial crisis of 2008, the fall in oil prices in 2014 and the fall in 2020 due to the COVID-19 pandemic). This will serve as an example of the potential impact of transitional risks such as decarbonisation policies and divestment strategies. Regarding physical risks, we take the case of Argentina, a country with a significant share of agricultural products in its export basket. The country is experiencing more frequent and prolonged droughts and floods in its main agricultural regions.

The study conducts a mixed methodology approach. The focus will be on export performance, exchange rate volatility and the implications for monetary policy design and implementation, capturing direct (trade balance) and indirect effects (exchange rate and financial stability) of developments in commodity exports and prices. Immediate effects are assessed with the help of event studies and time series econometric analyses. These quantitative results are triangulated with qualitative data derived from semi-structured expert interviews with central bankers.

## PROJECT

### From Covid-19 to climate change and nature loss: how can a precautionary financial policy framework coordinate monetary, prudential and fiscal policies to address long term challenges?

Hugues Chenet<sup>ab</sup>, Katie Kedward<sup>c</sup>, Josh Ryan-Collins<sup>c</sup>, Romain Svartzman<sup>d\*</sup>

<sup>a</sup> Chair Energy and Prosperity, Paris, France; <sup>b</sup> Institute for Sustainable Resources, University College London (UCL), UK; <sup>c</sup> Institution for Innovation and Public Purpose (IIPP), UCL, UK;

<sup>d</sup> Banque de France, Paris, France. \* [R.Svartzman is not funded by the project]

In the face of climate-related financial risks (CRFR), Bolton et al. (2020) in their 'Green Swan' book demonstrated the importance of coordination between green fiscal policy, prudential regulation and monetary policy. Such coordination must be underpinned by a shift in intellectual framework to facilitate financial policymaking under unprecedented global-threat situations.

Aligned with this assessment, we propose to develop the Precautionary Financial Policy (PFP) framework introduced by Chenet et al. (2019) to address the dual issues of **policy coordination and the need for an underlying paradigm shift**. The PFP framework provides the theoretical justification for more ambitious financial policy interventions, in the face of the radical uncertainty characterizing long-term and potentially irreversible risks such as those posed by climate change and massive biodiversity loss.

The project will develop the PFP framework as a new paradigm that could support greater coordination between monetary, prudential, industrial and fiscal policies (henceforth financial-fiscal) in the face of emerging climate- and nature-related financial risks. In particular, we will examine: 1) how this approach may provide a more coherent alternative than the 'market neutrality' principle (or how the latter can be reframed to account for CRFR) in facilitating such coordination (van 't Klooster & Fontan 2020), in the light of the recent ECB declarations questioning this principle (Schnabel, 2020; Arnold 2020); and 2) how the PFP could help to deal with the problem of differing time horizons across policy spheres, institutions and mandates that also mitigates against policy coordination.

The research will involve analysis of historical examples since the 1930s up to and including the most recent Covid-19 policy responses of financial-fiscal policy coordination and expanded institutional purpose. We will develop a typology of financial-fiscal policy coordination and use this to formulate concrete policy recommendations in terms of institutional set up and governance.

Arnold, M. (2020). ECB to consider using climate risk to steer bond purchases, says Lagarde. *Financial Times*, 14 October. Available at: <https://www.ft.com/content/f5f34021-795f-47a2-aade-72eb5f455e09>.

Bolton, P., M. Després, L. Pereira da Silva, F. Samama, R. Svartzman (2020). The green swan: Central banking and financial stability in the age of climate change. *Bank for International Settlements*. Available at: <https://www.bis.org/publ/othp31.pdf>.

Chenet, H., J. Ryan-Collins, F. van Lerven (2019). Climate-related financial policy in a world of radical uncertainty: Towards a precautionary approach. *UCL Institute for Innovation and Public Purpose, Working Paper Series (IIPP WP 2019-13)*. Available at: <https://www.ucl.ac.uk/bartlett/public-purpose/wp2019-13>.

Schnabel, I. (2020). When markets fail – the need for collective action in tackling climate change, *Speech by Isabel Schnabel, Member of the Executive Board of the ECB, at the European Sustainable Finance Summit, Frankfurt am Main, 28 September 2020*. Available at: [https://www.ecb.europa.eu/press/key/date/2020/html/ecb.sp200928\\_1~268b0b672f.en.html](https://www.ecb.europa.eu/press/key/date/2020/html/ecb.sp200928_1~268b0b672f.en.html)

van 't Klooster, J. & C. Fontan (2020). The Myth of Market Neutrality: A Comparative Study of the European Central Bank's and the Swiss National Bank's Corporate Security Purchases. *New Political Economy*, 25:6, 865- 879, DOI: 10.1080/13563467.2019.1657077

## PROJECT

### **Building a macro-financial integrated-assessment model for ordered transitions and fiscal-monetary policy interactions**

Francesco Lamperti<sup>a,c</sup>, Valentina Bossetti<sup>b,c</sup>, Andrea Roventini<sup>a</sup> and Massimo Tavoni<sup>c,d</sup>

<sup>a</sup> Institute of Economics and EMbeDS, Sant'Anna School of Advanced Studies, Italy; <sup>b</sup> Department of Economics, Bocconi University, Italy; <sup>c</sup> Resources for the Future (RFF) Euro-Mediterranean Center on Climate Change (CMCC) European Institute on Economics and the Environment, Italy; <sup>d</sup> Polytechnic University of Milan, Italy.

Assessing the impacts of climate physical and transition risks on the financial system and the macroeconomy is one of the most urgent and prominent needs to support climate policy design. However, the modelling toolbox for the assessment of these risks is - to date - rather scant. This project will contribute filling this gap by developing a macro-financial model that brings a detailed energy sector into a macroeconomic agent-based model with heterogeneous banks and cross-sectoral exposures.

The advantage of the proposed framework is twofold: it builds on two consolidated models in their respective domains (macro-financial and integrated assessment modelling) and includes a representation of both micro- (e.g. insolvency rates, mark-ups, productivity dispersion, non-performing loans) and macro-level indicators of economic activity (e.g. output growth, volatility, unemployment, public debt). Crucially, the macroeconomic properties will emerge indirectly from the decentralized interactions of individual agents and will possibly show non-linear and threshold effects (e.g. due to contagion).

After calibrating the model, we structure the project around two main applications. First, the model will be used to assess how the transition pathways of major emission/socio-economic scenarios (SSPs) and the associated changes in the climate would affect macroeconomic fundamentals and financial stability. Our results will add a macro-financial perspective to the scenario narratives. Second, building on previous work of the project team, we propose testing a variety of climate-related fiscal, monetary and macroprudential policies, with the aim of uncovering trade-offs and/or double-dividends. We believe the results of the project could complement the NGFS's scenario-analysis of physical and transition risks (NGFS, 2019).

## PROJECT

### Optimal Climate Change Mitigation through Green Quantitative Easing and Fiscal Policy

Alexander Ludwig<sup>a</sup>, Raphael Abiry<sup>a</sup>, Marien Ferdinandusse<sup>b</sup> and Carolin Nerlich<sup>b</sup>

<sup>a</sup> Goethe University Frankfurt, Germany; <sup>b</sup> Fiscal Policies Division, European Central Bank

We address the question how green quantitative easing could complement governments' toolkit for climate change mitigation. In our setup, green quantitative easing refers to a given outstanding stock of bonds held by the European Central Bank and its portfolio allocation between a clean (green) and a dirty (brown) sector of production. Our key research question is how the central bank can contribute to an optimal inter-generational sharing of the burden of climate change policies in comparison to, or in combination with, fiscal mitigation policies.

To address this question we develop a quantitative overlapping generations model in which households consume and allocate their savings and their work efforts between a clean and a dirty production sector. A reallocation of the central bank portfolio towards the clean sector increases the capital stock employed for production in that sector relative to the capital stock in the dirty sector. This triggers a relative increase of labour demand in the clean sector and a relative expansion of output. Through this mechanism the central bank can thus influence relative production across the two sectors in the economy.

We will contrast this policy with fiscal policy measures to mitigate climate change. The government may affect the relative allocation of economic resources by taxing the dirty sector (e.g., through carbon taxes) and by subsidizing the clean sector. While in the long-run these fiscal instruments will improve economic efficiency – because they reduce a negative pollution externality from the dirty sector – they may be distortive in the short-run. To mitigate the ensuing economic loss for currently living generations, the government may finance transfer payments to these generations by issuing government debt. In the long-run taxes have to be levied to finance this increase of government debt on future generations who themselves benefit the most from the climate change policy. The key question is whether the central bank can improve the economic allocation beyond what is thus achieved through fiscal policy.

Holding constant the balance sheet of the central bank enables us to focus on the portfolio reallocation mechanism. However, it limits the interaction between fiscal and monetary policy in the model. As a next step, we plan to extend the model by an explicit notion of money and the introduction of a distortion that requires bond purchases by the central, which will enable us to study the effects of an expansion of central bank bond holdings and of climate policy interactions.