Research Statement

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My research assesses how climate change damages and climate change policies impact macroeconomic and financial aggregates, in both the short/medium run and long run. I focus on how climate change dynamics and policies impact households and firms alike. My research contributes to two main literatures: i) macro-finance and ii) environmental and climate economics. My research makes use of theoretical and numerical modeling as well as empirical approaches.

In particular, **my work seeks to advance two core research agendas**. The first addresses one of the most pressing questions in economics and finance: "What are the impacts of uncertainty over climate change dynamics and policy on the macro economy, in both the short/medium run and the long run?" The second aim is to understand how: i) the interaction between climate dynamics and policy, on one hand, and ii) the large disparities in income and wealth observed in the micro data, on the other hand, could impact the green transition, financial stability, the macro economy.

The First Research Agenda: Climate Change Uncertainty and Macro-Finance

One of the main points of disagreement in climate economics is the level of the so-called social cost of carbon (i.e. the optimal carbon price) and the short/medium-run climate policy costs. While most of the early literature on climate macro-finance ignored the role of uncertainty (relying on deterministic models to compute the social cost of carbon), recent findings show that uncertainty over climate dynamics plays a major role in shaping the social cost of carbon and induces important business cycle welfare costs. There is a need to better understand the implications of uncertainty within climate change (e.g. temperature dynamics, climate damages, and climate policy) on the social cost of carbon, as well as to better appreciate the impacts of carbon pricing on the macro economy. My work outlines three strategies to understand the implications of climate change on the macro economy.

First, I examine how uncertainty over climate dynamics and policy impacts the macro economy and financial stability. In "Policy Interaction and the Transition to Clean Technology" ([1]), we examine the aggregate impact of a market for carbon permits designed to meet climate goals (i.e. the Paris Agreement or the net-zero target) in the European Union and the role of uncertainty within climate dynamics and policy. To this end, we develop a highly tractable stochastic general equilibrium model with financial frictions, where households and producers face climate damages and policy uncertainty. We show that the feasibility of net-zero heavily depends on the level of uncertainty. We also show that financial policy is key in smoothing the impacts on financial stability as well as in smoothing the welfare aggregate costs. I further develop this line of research in [2].

Second, although most research has focused on long-run transition impacts, a recent strand of literature seeks to highlight the implications of climate policy on the business cycle. In "Green Asset Pricing" ([3]), we focus on the implications of climate policies on the business cycle and aggregate welfare. We show how climate mitigation policies have important cyclical implications, especially in terms of pre-cautionary savings, premium levels, and business cycle welfare costs, further reinforcing the importance of non-linearities and uncertainty. We also rely on non-linear estimation techniques (usually missing in the climate macro-finance literature), which allow us to run different policy counter-factual exercises using the estimated series of stochastic shocks. In "Macro-Finance, Uncertainty, and Climate Change" ([4]), I document an analogous finding demonstrating the importance of modeling choices (e.g. non-separable dis-utility of climate damages versus production climate damages) and their implications on the macro-financial aggregates.

Third, carbon prices are likely shaped by the diffusion and adoption of green innovation. "Endogenous Abatement Technology" ([5]) provides a framework, in which green innovators are financed by banks, and where loans to green innovators allow for carbon prices to decrease over time, thereby capturing the intuition that green innovation adoption is key in facilitating the transition to net-zero emissions.

The Second Research Agenda: Climate Change and Distributional Macro-Finance

In the past two decades, one of the most remarkable macroeconomic developments was the incorporation of explicit heterogeneity (e.g. in households, producers, and banks) into tractable macroeconomic frameworks. My current research (job market paper) and future work seek to contribute to this fast-growing literature, by focusing in particular on the linkages and implications of climate dynamics and policy uncertainty within distributional macro-finance.

One of the most important policy questions arising from the ambitious net-zero 2050 target is: What are the distributional costs? My job market paper—"The Distributional Costs of Net-Zero: A HANK Perspective" (jointly with J. Roman, a Ph.D. candidate at PSL Research)—focuses on the household distributional impacts of the 2050 net-zero emissions target policy in the United States, which is designed to meet climate goals (*i.e.* the pledged net-zero 2050 target). Using a Heterogeneous Agent model with full climate dynamics and household heterogeneity embedded in a two-sector production economy (energy and non-energy sectors), we show that net-zero policy increases consumption and wealth in the long run but induces distributional macroeconomic disparities in the short/medium run (e.g. by 2035, a 6-10% increase in households facing the borrowing constraint). We then show how distributing revenue from the carbon policy could partially offset consumption losses and smooth the net-zero transition. We also extend our analysis to the case of sticky prices and show how net-zero emissions induces inflationary pressure over the long run, which could represent a challenge for monetary policy conduction in a world with high inflation. Overall, the paper shows that, while climate net-zero policy is welfare enhancing, it is costly over the transition.

My next goal is to understand the implications of uncertainty on these distributional costs. A natural approach would be to extend the analysis by incorporating aggregate uncertainty, inline with the recent advances made in solving heterogeneous models with aggregate uncertainty in continuous time, relying on the master equation. I intend to work on exploring the implications of aggregate uncertainty in both climate dynamics and policy within the heterogeneous agents framework and seek to understand the implications of the green transition on households, firms, and banks.

The common denominator of my research is to develop tractable models and methods for thinking about the

implications of the major challenges policy makers are facing today when designing policy. In my dissertation, I focus on climate change policy and the net-zero transition, with a specific focus on uncertainty, financial stability, and macroeconomic heterogeneity. The constant innovation in the macro-finance literature provides frameworks to address these issues, and, with my research agenda, I hope to contribute to it.

References

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3. Green Asset Pricing, ECB Working Paper Series, 2020, with Ivan Jaccard, and Gauthier Vermandel
4. Macro-Finance, Uncertainty, and Climate Change, 2021
5. Endogenous Abatement Technology, 2022, with Josselin Roman
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