Romain Fillon

Université Paris-Saclay, France
PhD candidate in Economics

French citizen (EU), born 12/96
rfillon@protonmail.com
Personal website

ECONOMICS JOB MARKET CANDIDATE (2024-2025)

Field: environmental economics
Themes: economic dynamics, risk and uncertainty, spatial approaches, social choice
Methods: dynamic stochastic optimization, dynamic quantitative spatial models

References
Johannes Emmerling [mail]: European Institute on Economics and the Environment
Gernot Wagner [mail]: Columbia University, Graduate School of Business
Stéphane Zuber [mail]: CNRS, Université Paris 1 & Paris School of Economics
Céline Guivarch, *advisor* [mail]: CIRED, Ecole des Ponts, Institut Polytechnique de Paris
Vincent Martinet, *advisor* [mail]: PSAE, INRAE, Université Paris-Saclay

EDUCATION

Université Paris-Saclay, PhD in Economics — Expected Dec. 2024
Affiliated to CIRED & Paris-Saclay Applied Economics (INRAE)
Fulbright visit at Columbia University, USA, sept. 23 - jan. 24
Advisors: Céline Guivarch & Vincent Martinet
Committee: M. Fleurbaey, F. Henriet, F. Moore, F. Venmans

Université Paris-Saclay, MA in Environmental Economics — 2021
ESSEC Business School, MSc in Management — 2020
Université Paris 1, BSc in Economics — 2016
ENS Paris-Saclay, Social Sciences, Major in Economics — 2015-2021

RESEARCH WORK (* first author)

Working papers

Fillon*, 'The biophysical channels of climate impacts' (**JMP 1 - spatial**) [pdf]

Fillon*, Guivarch, 'The need for regulation of climate subsystems' (**JMP 2 - risk**) [pdf]

Fillon*, Linsenmeier, Wagner, 'Climate shift uncertainty and economic damages' [pdf]

Publication

Fillon*, Guivarch, Taconet, 2023. 'Optimal climate policy under tipping risk and temporal risk aversion', *Journal of Environmental Economics and Management* [code, coverage, pdf]

Work in progress

Fillon*, 'Place-based environmental policy. An application to the EU'

CONFERENCE & TALKS

[**2024**] FAERE 2024 (BETA, Strasbourg), Doctoriales from CIRED, Economics PhD Meeting (Université Paris-Saclay), EAERE 2024 (KU Leuven), LAGV 2024 (AMSE, Marseille), iRisk invited seminar (IESEG & LEM, Lille)

[**2023**] MIT (CEEPR, weekly lunch talk), Columbia University (SIPA, Sustainable Development Colloquium), Duke University (Nicholas & Sanford Schools, UPEP PhD seminar), Yale University (Environment, PhD seminar), Université Paris-Saclay (Economics & Management, PhD seminar)

[**2022**] CIRED (internal), Université Paris-Saclay (CEPS, PhD seminar), MUSEES (EM Lyon), 12th FAERE Workshop, Public Economic Theory (AMSE), EAERE 2022 (Universita di Bologna, Rimini), annual FAERE (Rouen)

[**2020**] Oxford University (Centre for Business Taxation)

PROFESSIONAL EXPERIENCES

Grants Fulbright Grant (september 23 to january 24), mobility grant from Paris Greater Area (Fall 2023), 3-years PhD grant from Université Paris-Saclay (2021-2024), 3 months extension from Ecole des Ponts (2024), 4-years fully-funded studies at ENS Paris-Saclay (2015-2021)

Service to the profession Co-organizer of the Parisian PhD seminar on economics and environment (First edition held at CIRED, April 2024, 10 centers from Paris greater area represented), reviewer for *Resource and Energy Economics*

Teaching Assistant Econometrics (Fall 2022 Graduate, Sciences Po Paris, SIPA, Pr. Junnan He), Climate-economy models (Fall 2022 Graduate, Université Paris-Saclay, Pr. Céline Guivarch)

Research assistant Oxford University, Centre for Business Taxation (9 months, 2019-2020, public economics & econometrics, mostly with Pr. Eddy H.F. Tam)

Internships CIRED (6 months, 2021, France, research in environmental economics), Cour des Comptes (4 months, 2017, France, audit of public institutions), French Consulate in Shanghai (3 months, 2016, China, diplomacy)

Volunteerings UN World Food Programme (2 months, 2020, Italy, supply chain), ESAT Persan (1 month, 2016, France)

SKILLS

- **Programming & softwares:** GitHub, LaTeX, Microsoft Office, Python, R, Stata.
- **Languages:** French (native), English (fluent), German (once fair, now declining)
- **Miscellaneous:** graduated in piano and music theory (Poissy) and trombone (Cergy-Pontoise), play basketball

DETAILED RESEARCH PROJECTS

I work on climate uncertainties and their implications for economic policy across four dimensions: time, space, stochastic risk within models, scientific uncertainty between models. For readers seeking key insights, I recommend focusing on Papers 3 and 4, which, in my view, make the most significant contributions. These two papers are my 2024-2025 job market papers. They are related as they focus on climate uncertainties, but one uses spatial approaches (Paper 4) while the other one uses dynamic stochastic approaches, focusing on risk (Paper 3).

4 - Fillon, 2024 - 'The biophysical channels of climate impacts'. To what extent does regional economic activity shape regional climate impacts? Land use land cover (LULC) changes with regional economic activity through agricultural and urban land demands. At the regional scale, LULC changes affect climate impacts through changes in albedo, evapotranspiration and roughness length, i.e. biophysical channels. These spatially heterogeneous regional feedbacks have so far been neglected in the quantitative spatial literature assessing the economic consequences of climate change. Indeed, the literature focuses on the biogeochemical channel from global carbon concentration. Accounting for this additional biophysical feedback between regional economic activities and regional climate change yields important welfare implications for both adaptation and mitigation, as the biophysical feedbacks change temperature impacts and interact with regional adaptation decisions. I build a dynamic-spatial sectoral equilibrium model to understand the impact of this omitted nonlinear physical mechanism and take the model to the data at the global gridded 1° resolution to quantify its magnitude along 'middle-of-the-road' SSP2-4.5 with agents that adapt to climate impacts through migration and trade. I leverage recent advances in the climate adaptive response literature to estimate model-consistent dose-response functions of regional amenities and sectoral productivities to regional annual distributions of daily mean surface temperatures from the equilibrium conditions of the model. Im my baseline SSP2-4.5 simulation, without biophysical impacts, almost all locations experience negative welfare changes from non-linear regional intra-annual warming patterns interacted with nonlinear binned damage patterns: there are no benefits to be expected from climate change in the Northern Hemisphere. Adding biophysical channels, i.e. a non-linear and time-varying downscaling from global to regional temperature distributions, accounts for 2.4% of the aggregate biogeochemical welfare impacts of climate change. Both biogeochemical and biophysical climate impacts are regressive, decreasing with 2015 income per capita levels.

3 - Fillon, Guivarch, 2024 - "The need for regulation of climate subsystems'. Understanding stochastic interactions between climate change, the macroeconomy and Earth subsystems with non-linear, self-sustaining and debated dynamics is a major challenge with implications both for global climate policy and regional subsystem's management. We study Earth subsystems with three properties: their dynamics have an impact on climate change, climate change has an impact on their dynamics and their dynamics are not entirely determined by climate change. We analytically derive the three channels through which interactions between subsystem's idiosyncratic risk and aggregate climate risk over intertemporal welfare affect optimal climate policy. First, subsystems have direct scaling effect through their expected feedback on global climate. Second, perturbations in the subsystem caused by carbon emissions reduce its long-term survival and therefore affect intertemporal welfare because of future feedbacks on global climate. Third, subsystems have various insurance values. We also highlight how an explicit reduced-form sub-

systems's geophysical dynamics improves their management, taking into account the changing ability of the subsystems to self-perpetuate over time: we introduce the social cost of the dynamic subsystem (SCDS). We apply our framework in a calibrated stochastic quantitative model of the Amazon rainforest whose fate is fiercely debated. In our benchmark quantitative specification, an endogenous and explicit modeling of the Amazon rainforest implies a 15% risk premium on the social cost of carbon (SCC) at the global scale and a SCDS that is worth 16% of the standard stochastic SCC. These results imply that a 24% increase in the marginal value of a tCO_2 stored in the rainforest should be applied in local cost-benefit analysis.

2 - Fillon, Linsenmeier, Wagner, 2024 - 'Climate shift uncertainty and economic damage'. Focusing on global annual averages of climatic variables, as in the standard damage function approach, can bias aggregate and distributional estimates of the economic impacts of climate change. Here we empirically estimate global and regional dose-response functions of GDP growth rates to daily mean temperature levels and combine them with regional climate projections of daily mean temperatures. We disentangle for various shared socio-economic pathways (SSPs) how much of the missing impacts are due to heterogeneous warming versus heterogeneous damage patterns over space and time. Global damages in 2050 are around 25% higher when accounting for the shift in the shape of the entire intra-annual distribution of daily mean temperatures at the regional scale.

1 - Fillon, Guivarch, Taconet, 2023 - 'Optimal climate policy under tipping risk and temporal risk aversion', ***Journal of Environmental Economics and Management***. We investigate the implications of absolute risk aversion with respect to intertemporal utility, i.e. *temporal* risk aversion, in the presence of a stylized climate tipping risk affecting productivity irreversibly. Optimal climate policy is more stringent under temporal risk aversion, in order to reduce all present and future probabilities of crossing the tipping point and avoid a situation where all generations are badly off. Temporal risk aversion implies a 30% increase in the social cost of carbon (SCC) under our benchmark calibration and for a 10% irreversible increase in the level of economic damage from climate change. The optimal SCC under temporal risk aversion increases sharply with the level of damage brought by a potential tipping point.