MIT Economics

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DOCTORAL STUDIES

Massachusetts Institute of Technology (MIT)
PhD, Economics, Expected completion June 2022
DISSERTATION: "Essays in Macroeconomics"

DISSERTATION COMMITTEE AND REFERENCES

Professor George-Marios Angeletos
MIT Department of Economics
77 Massachusetts Avenue, E52-530
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Professor Christopher Sims
Princeton Department of Economics
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PRIOR EDUCATION

Princeton University 2016
A.B., Economics, with certificate in Applied and Computational Mathematics, *Summa Cum Laude*

CITIZENSHIP USA **GENDER:** Male

FIELDS

Primary Fields: Macroeconomics
Secondary Fields: Economic Growth, Innovation, Theory, Finance

TEACHING EXPERIENCE

14.06 Advanced Macroeconomics (Undergraduate) Spring 2020
Teaching Assistant to Professor George-Marios Angeletos

14.452 Economic Growth (Graduate) Fall 2019
Teaching Assistant to Professor Daron Acemoglu

14.06 Advanced Macroeconomics (Undergraduate) Spring 2019
Teaching Assistant to Professor George-Marios Angeletos

	14.452 Economic Growth (Graduate) Teaching Assistant to Professor Daron Acemoglu	Fall 2018
RELEVANT POSITIONS	Research Assistant to Professor George-Marios Angeletos	2017-2021
FELLOWSHIPS, HONORS, AND AWARDS	Gordon B. Pye Dissertation Fellowship, MIT	2020
	Robert M. Solow Fellowship, MIT	2017
	James A. Lash (1966) Presidential Fellowship, MIT	2016
	Halbert White '72 Prize in Economics, Princeton University	2016

PROFESSIONAL ACTIVITIES

Presentations

2021: European Central Bank (Invited); Minneapolis Fed Junior Scholar Conference (Invited); Chicago Fed Rookie Conference (Invited); ECB-FRBNY Conference on Expectations Surveys (Invited); Northwestern University; Econometric Society European Meeting; NBER Summer Institute, Economic Growth; NBER Summer Institute, Impulse and Propagation Mechanisms; Society for Economic Dynamics Annual Meeting (2020, rescheduled to 2021); American Economic Association Annual Meeting
2020: CESifo Conference on Macro, Money, and International Finance (Discussant); Econometric Society North America Winter Meeting
2019: Society for Economic Dynamics Annual Meeting, Econometric Society North America Winter Meeting

Refereeing

American Economic Review, *American Economic Review: Insights*, *Econometrica*, *Quarterly Journal of Economics*, *Review of Economics and Statistics*

PUBLICATIONS

"Feedbacks: Financial Markets and Economic Activity" (with Markus Brunnermeier**,** Darius Palia, and Christopher A. Sims) *American Economic Review*, 2021, 111(6): 1845-1879.

"Imperfect Macroeconomic Expectations: Evidence and Theory" (with George-Marios Angeletos and Zhen Huo) *NBER Macroeconomics Annual 2020*, 35: 1-86.

"Managing Expectations: Instruments vs. Targets," (with George-Marios Angeletos) *Quarterly Journal of Economics*, 2021, 136(4): 2467–2532.

RESEARCH PAPERS

"Attention Cycles" (with Joel P. Flynn)
Job Market Paper

Using data from US public firms' regulatory filings and financial statements, we document that firms' attention to macroeconomic conditions rises in downturns and that their propensity to make input-choice mistakes rises in booms. We explain these phenomena with a business-cycle model in which firms face a cognitive cost of making precise decisions. Because firms are owned by risk-averse households, there are greater incentives to deliver profits when aggregate consumption is low. Thus, firms exert more cognitive effort and make smaller input-choice mistakes in aggregate downturns. In the data, consistent with our model, financial markets punish mistakes

more in downturns and macroeconomically attentive firms make smaller mistakes. When calibrated to match our firm-level evidence, *attention cycles* generate quantitatively significant asymmetric, state-dependent shock propagation and stochastic volatility of output growth.

"Does Directed Innovation Mitigate Climate Damage? Evidence from US Agriculture" (with Jacob Moscona)
Revise and resubmit, *Quarterly Journal of Economics*

This paper studies how innovation reacts to climate change and shapes its economic impacts, focusing on US agriculture. We show in a model that directed innovation can either mitigate or exacerbate climate change's economic damage depending on whether new technology is on average a substitute for or complement to favorable climatic conditions. To empirically investigate the technological response to climate change, we combine data on the geography of agricultural production, shifting temperature distributions, and crop-specific temperature tolerance to estimate crop-specific exposure to damaging extreme temperatures; we then use a database of crop-specific biotechnology releases and patent grants to measure technology development. We first find that innovation has re-directed toward crops with increasing extreme-temperature exposure and show that this effect is driven by types of agricultural technology most related to environmental adaptation. We next find that US counties' exposure to climate-induced innovation significantly dampens the local economic damage from extreme temperatures, and estimate that directed innovation has offset 20% of the agricultural sector's climate damage since 1960 and could offset 15% of projected damage in 2100. These findings highlight the vital importance, but incomplete effectiveness, of endogenous technological change as a systemic adaptive response to climate change.

"Inattentive Economies" (with George-Marios Angeletos)
Revise and resubmit, *Journal of Political Economy*

We study the efficiency of competitive markets when people are rationally inattentive. Appropriate amendments of the Welfare Theorems hold if attention costs satisfy an invariance condition, which amounts to free disposal of decision-irrelevant aspects of the state of nature. This condition is satisfied by the Shannon mutual information formulation of attention costs. More generally, inefficiency emerges and Hayek's (1945) argument about the informational optimality of prices fails. Markets are the best means of allocating scarce attention when agents gain nothing from directly contemplating prices rather than the entire state of nature.

"Strategic Mistakes" (with Joel P. Flynn)
Revise and resubmit, *Journal of Economic Theory*

To study the equilibrium implications of imperfect optimization, we introduce a model of costly control in continuum-player games in which agents interact via an aggregate of the actions of others. We find primitive conditions such that equilibria exist, are unique, are efficient, and feature monotone comparative statics for action distributions, aggregates, and the size of agents' mistakes. We use our results to provide robust equilibrium predictions in a class of generalized beauty contests, which we apply to study the implications of imperfect optimization for financial speculation, price-setting, and the business cycle. We contrast our model with the mutual information model (Sims, 2003), which in the same games can produce non-unique predictions and non-monotone comparative statics.

"Disagreement About Monetary Policy"

This paper studies the causes and consequences of belief differences between markets and central banks about monetary policy over the business cycle. Using US data since 1995, I document that "bad macroeconomic news" in public signals systematically predicts market over-estimation of interest rates, excessive market optimism about employment, and delayed correction of these forecasts. In a stylized model that can accommodate belief disagreements via three leading mechanisms—asymmetries between the market and central bank in their signals about fundamentals, beliefs about the monetary rule, and confidence in public signals—I show that significantly different confidence in public signals is necessary to explain the facts. The market's relative under-reaction to public signals substantially dampens the response of market beliefs to fundamentals, while the central bank's signaling through policy or the "information effect" has almost no role.

"Inappropriate Technology: Evidence from Global Agriculture" (with Jacob Moscona)

An influential hypothesis explaining the persistence of global productivity differences is that frontier technologies are finely tuned to the local conditions of the high-income countries that develop them and inappropriate for application elsewhere. This paper studies how environmental differences between frontier innovators and the rest of the world shape the global diffusion, adoption, and productivity consequences of agricultural technology. Our empirical design uses differences in the presence of unique crop pests and pathogens (CPPs) as a instrument for the appropriateness of crop-specific biotechnology developed in one country and applied in another. We first find that inappropriateness predicted by CPP differences reduces cross-country transfer of novel biotechnology. We next find that inappropriateness relative to frontier innovators reduces adoption of improved seeds and crop-level output. Our estimates suggest that the inappropriateness of the contemporary frontier reduces global productivity by 50% and increases cross-country dispersion in log productivity by 15% relative to a world in which technology were equally productive in all contexts. We use our framework to study how historical and predicted changes in the geography of innovation affect the global distribution of agricultural productivity.

"Screening with Under-Utilization: Tiers, Multi-Part Tariffs, and Welfare Implications" (with Roberto Corrao and Joel P. Flynn)

We study a screening model in which agents can under-utilize goods. We characterize implementable and optimal contracts and show that, whenever the principal values usage instrumentally, the optimal menu involves multi-part tariffs with tiers of zero marginal prices. We apply our results to study the pricing of digital goods which naturally feature usage-based revenue and unpunishable under-utilization, such as social media, news, and content streaming. We derive comparative statics that map the structure of usage-based revenues to familiar multi-part pricing schemes (premium plans, free trials, and free products) and study the welfare implications of technological progress in targeted advertising. We show how partial contractibility of usage generates an endogenous separation between "users" and "employees" of digital platforms.

RESEARCH IN PROGRESS

"Attentional Hold-up" (with Roberto Corrao and Joel P. Flynn)

"How Much Can We Learn from Regional Data? The Factors That Complicate Inference" (with Jeremy Majerovitz)