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**Personal Information:**

Date of Birth: February 2<sup>nd</sup>, 1994  
Pronouns: he/him  
Citizenship: Dutch, US permanent resident

**Undergraduate Studies:**

B.A., Economics & Business Economics, The Vrije Universiteit Amsterdam, 2015

**Masters Level Work:**

M.S., Econometrics and Operations Research, Tinbergen Institute Amsterdam, 2017

**Graduate Studies:**

University of Pennsylvania, 2017 - present

Thesis Title: "Essays on Macroeconomics"

Expected Completion Date: May 2023

**Thesis Committee and References:**

Professor José Víctor Ríos-Rull (Co-advisor)  
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**Research Fields:**

Primary fields: Macroeconomics, Computational Economics

Secondary fields: Housing Economics, Banking

**Teaching Experience:****University of Pennsylvania:**

Summer 2021 Penn Summer Prep (PSPR: 010, 043) Intro to Economics, Instructor

Summer 2020 Penn Summer Prep (PSPR: 006, 021, 057) Intro to Economics, Instructor

Summer 2019 Economics 2: Intro to Macroeconomics, Instructor

Penn Summer Prep (PSPR: 029, 054) Intro to Economics, Instructor

Spring 2019 Economics 102: Macroeconomic Theory, TA for Professor Dirk Krueger

Fall 2018 Economics 10: Intro to Economics for Business, TA for Professor Gizem Saka

**Tinbergen Institute Amsterdam:**

Spring 2017 Macroeconomics III (Frictions and Resource Allocation), TA for Professor Pieter Gautier and Professor Eric Bartelsman

**The Vrije Universiteit Amsterdam:**

Fall 2015 Finance Banking and Insurance 3.2, TA for Professor Gunseli Tumer-Alkan

Spring 2015 Macroeconomics 2.4: Economic Fluctuations and Growth, TA for Professor Pieter Gautier

Finance 2.5: Options and International Financial Management, TA for Professor Arjen Siegmans

Fall 2014 Finance 2.1: Risk and Portfolio Selection, TA for Professor Arjen Siegmans

**Research Experience and Other Employment:**

2020-2022 Research Intern at the Federal Reserve Bank of Philadelphia for Thorsten Drautzburg and James Vickery.

2019-2020 Research Assistant for Professor Enrique Mendoza, University of Pennsylvania

2017 Research Assistant for Professor Jules van Binsbergen, The Wharton School, University of Pennsylvania.

2016 Summer Intern at Bureau for Economic Policy Analysis for Yvonne Adema in the Netherlands

**Professional Activities:**

Referee Young Economist Symposium

Presentations UPenn Macro Lunch (2022, 2021, 2020), Federal Reserve Bank of Philadelphia (2022), Young Economist Symposium (2022)

**Honors, Scholarships, and Fellowships:**

2017 – 2022 University of Pennsylvania Fellowship

2021 Robert Summers Dissertation Fellowship in Economics for most deserving student working on a dissertation in the fields of empirical macroeconomics or international economics

2020 Lamfalussy Fellowship, European Central Bank

**Computational Skills:** Matlab, Stata, Python, R, Latex.

**Languages:** English (fluent), Dutch (native)

## **Research Papers:**

### *“Institutional Housing Investors and the Great Recession”* (Job Market Paper)

Before the Great Recession, residential institutional investors predominantly bought and rented out condos, but then increased their market share of rental houses from 17 percent in 2001 to 28 percent in 2018. Along with this change, rental survey data show that the annual house operating-cost premium of institutional investors relative to homeowners fell from 44 percent in 2001 to 28 percent in 2015, and the Zillow Transaction and Assessment Dataset (ZTRAX) shows that institutional investors have grown larger in 2015 relative to 2007. This paper argues that institutional investors need to have a minimum scale to achieve lower operating costs, drawing the analogy with their high market share in apartment buildings. Operating costs are the annual maintenance costs and management costs, plus the average annual improvement costs of owner-occupiers. To measure how the reduced operating costs for houses affected the housing bust in 2007-2011, this paper proposes a heterogeneous agent model of the housing market featuring corporate investors and two types of dwellings: condos and houses. The corporate sector exhibits constant returns to scale and free entry. The corporate cost distribution for houses is calibrated to the cost distribution observed in the Residential Finance Survey of 2001. A transition experiment intended to replicate the Great Recession housing bust yields three main results. First, house prices would have fallen by 1.6 percentage points more without the corporate cost reduction. Second, the corporate cost reduction explains the fall in the homeownership rate and the rise in corporate ownership of houses during the Great Recession. Third, the cost reduction produced a welfare gain of 0.4 percent for homeowners and 0.6 percent for individual (mom and pop) investors in the housing market.

### *“Filtering with limited information”* (with Thorsten Drautzburg, Jesús Fernández-Villaverde, Pablo Guerrón-Quintana)

We propose a new tool to filter non-linear dynamic models that does not require us to fully specify the model and can be implemented without solving the model. Specifically, our approach is to approximate the state dynamics with a flexible statistical model, such as a Vector-Autoregression (VAR). This VAR may include non-linear terms and the VAR serves as a plug-in estimate of the model expectations. Given the statistical model, we can filter out an estimate of the hidden state from the measurement equation. While the VAR is a purely auxiliary model, we obtain the full estimates as a fixed point of the VAR estimation and the filtering stage. The partial filtering approach requires two main conditions to be satisfied. The first condition is that the state is sufficiently volatile or persistent to be recoverable. The second condition requires the possibly non-linear measurement to be sufficiently smooth and to map uniquely to the state absent measurement error. We first illustrate the method through a simple univariate example that features different non-linearities in the state or measurement equations. Then, we use a simulation study of a small-open economy real business cycle model with capital adjustment costs and an occasionally binding borrowing constraint to filter Tobin's Q and the multiplier on the borrowing constraint. At last, we apply the partial filter to the same model for Mexican data from 1980 to 2019. We externally validate our results with the Penn World Tables.

### *“Funding Deposit Insurance”* (with Ryan Zalla)

We develop a quantitative model of deposit insurance to characterize the optimal funding scheme for deposit insurance systems. We can extend the model of Dávila and Goldstein (2021) along two key dimensions. First, we incorporate their static game into an infinite horizon framework, which allows us to model a dynamic deposit insurance fund with premium collection. Second, we introduce ex-post bank heterogeneity to allow for a variable crisis size, matching the empirical observation that a small amount of deposit insurance funds is regularly dispatched to failing banks (IADI, 2009). The key model tension is the policymaker's dynamic tradeoff between building a fund with risk-adjusted

premiums to discourage moral hazard and protect taxpayers, and allowing banks to productively invest their deposits. The policymaker optimally chooses the level of coverage for depositors and premiums raised from banks. Premiums are dependent on the subsequent choice of riskiness by banks, and contribute to a deposit insurance fund that lowers taxpayers' resolution cost of bank failures. Our analysis shows that risk-adjusted premiums increase optimal coverage by 3 percentage points and discourages moral hazard by banks, decreasing the annual share of banks expected to fail from 0.66 percent to 0.16 percent. We find that as taxpayers' income increases, the optimal fund-to-covered-deposits ratio decreases. As income increases, agents exhibit decreasing absolute risk aversion. Hence, the model matches the observed decline of the fund-to-covered-deposits ratio in income.

*“Restricted mortgage offering in the Great Recession”* (with German Sanchez Sanchez)

We study how the restricted access to teaser-rate mortgages during the Great Recession amplified the housing bust. Teaser-rate mortgages start with a low initial rate, with the expectation of a rate hike in the future. The government-sponsored enterprises tightened restrictions on their purchases of teaser-rate mortgages at the onset of the crisis, which induced lenders to increase their lending standards. We show that lower-income and (especially) younger households chose teaser-rate mortgages during the housing boom. To evaluate the impact of eliminating teaser-rate mortgages during the crisis, we use a dynamic general equilibrium housing model with long-term mortgages and a contract choice. Financial intermediaries set the interest rates for fixed-rate and teaser-rate mortgages in the aggregate, and we calibrate the introductory rate of the latter contract to the discount of teaser-mortgages during the housing boom. The restricted contract choice amplifies the house price drop by more than half a percentage point. Without the availability of teaser-mortgages housing demand falls, directly lowering the house price. Moreover, as the house price falls, mortgage default rises, which lowers the house price even further. Without the restricted supply, the share of teaser-rate mortgages would nearly have doubled during the crisis episode.