Research Statement

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July 2023

My research interests are in time series econometrics and empirical macroeconomics. In particular, I am interested in the relation between economic dynamics and networks. Networks summarize bilateral connections among cross-sectional units and embody some notion of distance between them. They are omnipresent in (macro)economics. Think of

- countries linked by trade and capital flows, geopolitical and cultural ties;
- cities and regions tied together by infrastructure and migration;
- industries connected via input-output relationships; or
- individuals interacting in a social network.

In **"Cross-Sectional Dynamics Under Network Structure: Theory and Macroeconomic Applications"**, I develop an econometric framework for studying dynamics of cross-sectional variables exploiting this network structure. The Network-VAR (NVAR) is a vector autoregression in which innovations transmit cross-sectionally only via bilateral links and which can accommodate rich patterns of how network effects of higher order accumulate as time progresses. It can be used to estimate dynamic network effects, whereby the network can be taken as given or inferred from dynamic cross-correlations in the data, possibly aided by shrinking towards some observed network. It also offers a dimensionality-reduction technique for modeling (cross-sectional) processes, owing to networks' ability to summarize complex relations among units by relatively few non-zero bilateral links. In a first application, I show that a Real Business Cycle (RBC) input-output economy with time lags between the production of goods and their subsequent use as intermediaries in producing other goods leads to sectoral prices and output evolving as an NVAR. In turn, I estimate how sectoral productivity shocks transmit along supply chain linkages and affect dynamics of sectoral prices in the US economy. The analysis suggests that network positions can rationalize not only the strength of a sector's impact on aggregates, but also its timing. In a second application, I discuss the merits of the NVAR for parsimoniously approximating time series dynamics. The theoretical comparison to factor models suggests that the NVAR is preferred whenever dynamics are driven by many micro links rather than a few dominant units. Consistent with that, in my application to monthly industrial production growth across 44 countries, I obtain reductions in out-of-sample mean squared errors of up to 23% relative to a principal components factor model.

In **"Why Does a Dominant Currency Replace Another?"**, joint with A. Mehl and I. Van Robays, we assess why a dominant currency in international trade invoicing can be replaced with another by contrasting two hypotheses stressed in recent theory: increased trade and reduced exchange rate volatility vis-à-vis the emergent dominant currency area. We show how theory maps itself into a network which links together invoicing currency decisions across countries, and we use a generalized version of the NVAR to jointly model invoicing, trade and exchange rate volatility

dynamics across 13 European countries that saw marked increases in the euro at the expense of the US dollar in trade invoicing. For each country, we identify a "trade shock" and an "exchange rate volatility shock", finding significant evidence in support of the increased trade hypothesis.

In further projects, I worked on extending econometric methods to enable the analysis of pertinent questions in macroeconomics. In **"SVARs with Occasionally-Binding Constraints"** (*Journal of Econometrics*, 2022), joint with S.B. Aruoba, F. Schorfheide and S. Villalvazo, we build a VAR which can accommodate the effective lower bound (ELB) on interest rates and use it to document that inflation responds stronger to monetary stimulus (a decrease in the shadow rate) at the ELB. In **"Sequential Monte Carlo with Model Tempering"** (*Studies in Nonlinear Dynamics & Econometrics*, 2023), joint with F. Schorfheide, we propose a method to substantially speed up Bayesian estimation of models with slow likelihood evaluations. This notably includes nonlinear Dynamic Stochastic General Equilibrium (DSGE) models, which are indispensable for many pressing questions in empirical macroeconomics and whose estimation is often considered practically infeasible.