Essays on Aggregate Fluctuations, Network Dynamics and Statistical Regularities in Economics

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"Learning is like rowing against the current. As soon as you stop, you drift back again."
Xúnzǐ

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Preface

The individual behavior of economic entities, such as agents, firms or industries, and their interaction in markets may create complex economic dynamics and regularities in the aggregate. This doctoral thesis seeks to demonstrate how, and under which conditions, such dynamics may arise, leading to and explaining certain cyclicities in macroeconomic fluctuations, tie formation processes in economic networks and persistent distributional properties in foreign exchange and virtual currency markets. With this aim, this dissertation is divided into three parts.

Part I of this thesis consists of two papers in which we analyze how aggregate fluctuations arise, and the role that can be attributed to idiosyncratic shocks at the microeconomic and mesoeconomic level as well as higher-order linkages in the supply and demand interdependencies driving macroeconomic outcomes. As such, the first paper in *Chapter 1* considers recent advances in the modeling of aggregate fluctuations, which have emphasized the importance of heavily skewed and fat-tailed distributions in firm size (Gabaix, 2011) or connections in production networks (Acemoğlu et al., 2012), arguing that idiosyncratic shocks on the microeconomic level can have considerable macroeconomic effects. We illustrate that both the size of economic entities, measured as the granularity of sales shares, and the heavily skewed distribution of connections in production networks play a significant role in the description of aggregate fluctuations, and that stable results can only be achieved if both concepts are taken into account. In particular, fluctuations at the aggregate level can best be described when explicitly accounting for the size of an entity and its position within the production network when facing idiosyncratic shocks. *Chapter 2*, containing the second paper, aims to shed light on the remarkable degree of synchronicity displayed by business cycles. Here it is shown that the large degree of comovement of GDP time series can mainly be attributed to aggregate regularities in the final goods markets, and that shocks faced by these markets seem to propagate through higher-order connections rather than direct pairwise linkages. Both papers in this part were co-written with Jan Schulz and Mishael Milaković.

In spite of the importance of interacting heterogeneous firms and industries in the

research of international trade and production networks, leading to aggregate fluctuations, there has been a surprising lack of attention to the fact that trading partners are embedded in an evolutionary process of production and exchange across borders globally, which develops over time. This is because trade relationships provide feedback on the underlying network structure, and the structure itself influences trade link formation processes. This makes it difficult to distinguish endogenous network processes from exogenous events, and to attribute them to theoretical or empirical considerations. Part II contains one paper, represented by *Chapter 3*, which attempts to tackle this issue. The contribution seeks to improve our understanding of network dynamics and tie formation processes within and between economies over time. The goal of this paper is therefore to develop a stochastic actor-oriented model that is able to capture established stylized facts in the literature and examine reasons for the evolution of production as well as import and export trade preference networks. The empirical value of the model is demonstrated by combining industry-level OECD data with several covariates such as total factor productivity, labor cost intensity, economic complexity, geographic distance or regional proximity. This allows us to evaluate the influence of these variables on the process of network link formation over time. We identify various important features for production networks in international trade, such as network proximity, geographical distance or technological complements, being crucial drivers for decision processes in trade link formation. Moreover, we find that OECD industries have a tendency to share trade activities, following their peers, a feature that points to herding behavior in the selection of partners outside the OECD or the adaptation of particularly profitable import and export portfolios. Furthermore, we provide initial insights into the dynamics of tie formation processes, where inter-industry OECD trade affects decisions made towards import and export preferences, and vice versa. We find that triadic dependencies exists, allowing certain industries to exploit sourcing differentials of different suppliers, e.g. by cooperation or through competition between two suppliers with partially overlapping capabilities. The content of this part was co-written with Philipp Mundt.

Part III contains *Chapter 4*, which provides a statistical evaluation of the distributional properties and statistical regularities of virtual, intra-virtual and traditional currency exchange rates. The last part of this thesis arose from my own research interest in modern means of payment, following the debate as well as the rise and fall of Bitcoins and similar virtual currencies in recent years. This aspect intersected with the research interests of my first supervisor on statistical equilibrium economic modeling, where interactions in markets, regardless of their mode of operation, give rise to aggregate regularities in the form of statistical distributions, which are neither anticipated nor intended by individual market participants. The analysis at hand shows that, in spite

of their differing mode of formation, daily log-returns of all currency types share peculiar properties that have also been examined thoroughly in other fields of economic literature. Unlike the previously mentioned papers, this chapter was written alone and has already been published in an international double-blinded peer-reviewed journal*.

Each of the four papers are independent from each other, and can be read without any prior knowledge of each other, as they are written in a format suitable for publication in professional journals. Despite the papers mentioned in this preface sharing different specifics, what they have in common is that they seek a better understanding of economic processes within a complex and dynamic world.

*Hempfing A (2019) What's left after the hype? An empirical approach comparing the distributional properties of traditional and virtual currency exchange rates. PLoS ONE 14(7):e0220070. https://doi.org/10.1371/journal.pone.0220070.

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