The premise of the dynamic factor model (DFM) is that there are a small number of common dynamic factors that explain the observed co-movements of economic time series. These common dynamic factors are driven by the shocks. If we manage to give an economic interpretation to these shocks, we call them structural shocks. In turn such a DFM with economically interpreted shocks becomes the structural dynamic factor model.

The aim of the project is to fully develop a methodology for non-Gaussian structural dynamic factor models. Traditional, i.e. Gaussian, structural dynamic factor models (i.e. those imposing normality for structural shocks) are a popular tool used in literature on empirical macroeconomics and finance. They allow for analyzing the impact of economic policies (e.g. monetary policy) or unexpected economic phenomena (e.g. oil supply shocks) on a potentially large set of economic and financial data.

The Gaussian assumption does not always reflect the empirical characteristics of many economic variables. For many of them, the Gaussian assumption seems inadequate, but traditional structural dynamic factor models are inextricably bound by this assumption. In analogy to the rapidly growing literature on non-Gaussian structural vector autoregressive models, the aim of the project will be to develop theoretical foundations for non-Gaussian structural dynamic factor models (N-GSDFMs henceforth).

In particular, the project will lay the foundations for N-GSDFMs, i.e. the theory of global identification, that does not yet exist. We will prove the theorem on observational equivalence in these models under a set of minimal assumptions. We will introduce the useful reduced (canonical) form for this class of models. In the course of analytical work, we will pay attention to the differences and similarities between the (fully developed) identification theory for non-Gaussian structural vector autoregressive models and our results obtained for N-GSDFMs.

An important component of the project will also be the design of an effective estimation method for N-GSDFMs within the Bayesian approach. Since N-GSDFM can contain hundreds of variables, the problem of big data can naturally affect us. In this case, the efficiency of algorithms to sample from posterior distributions is extremely important. The project is also pathbreaking in this area. We intend to provide potential users of our methodology with a fully automated (i.e. not requiring "training" or "tuning") Bayesian inference algorithm that can be used in large models (containing hundreds of economic variables).

From an economic point of view, the most important result by applying N-GSDFMs will be the presentation of their dynamic properties in the form of so-called impulse response functions. For this purpose, showing only the mean path of these functions is insufficient. We also need to obtain small-sample uncertainty presented as an error bands around the mean path of the impulse response functions. It turns out that this is a non-trivial problem. In particular, it is treated as “open” in the general literature on non-Gaussian dynamic models. One of the project's goals is to develop a formal solution to this problem.

In a recently published, widely read article by Angeletos et al. (2020), “Business-cycle anatomy”, American Economic Review, the authors put forward a rather controversial thesis that, in principle, only one dominant “business cycle” shock can be identified. It has the features of a slightly inflationary demand shock, which is not related to the total factor productivity dynamics. Moreover, it explains as much as 70% of the volatility of gross domestic product. Using the fully developed methodology within this project, our goal will be to verify these conclusions.