

1. Empirical testing and further development of sociological middle-range theories

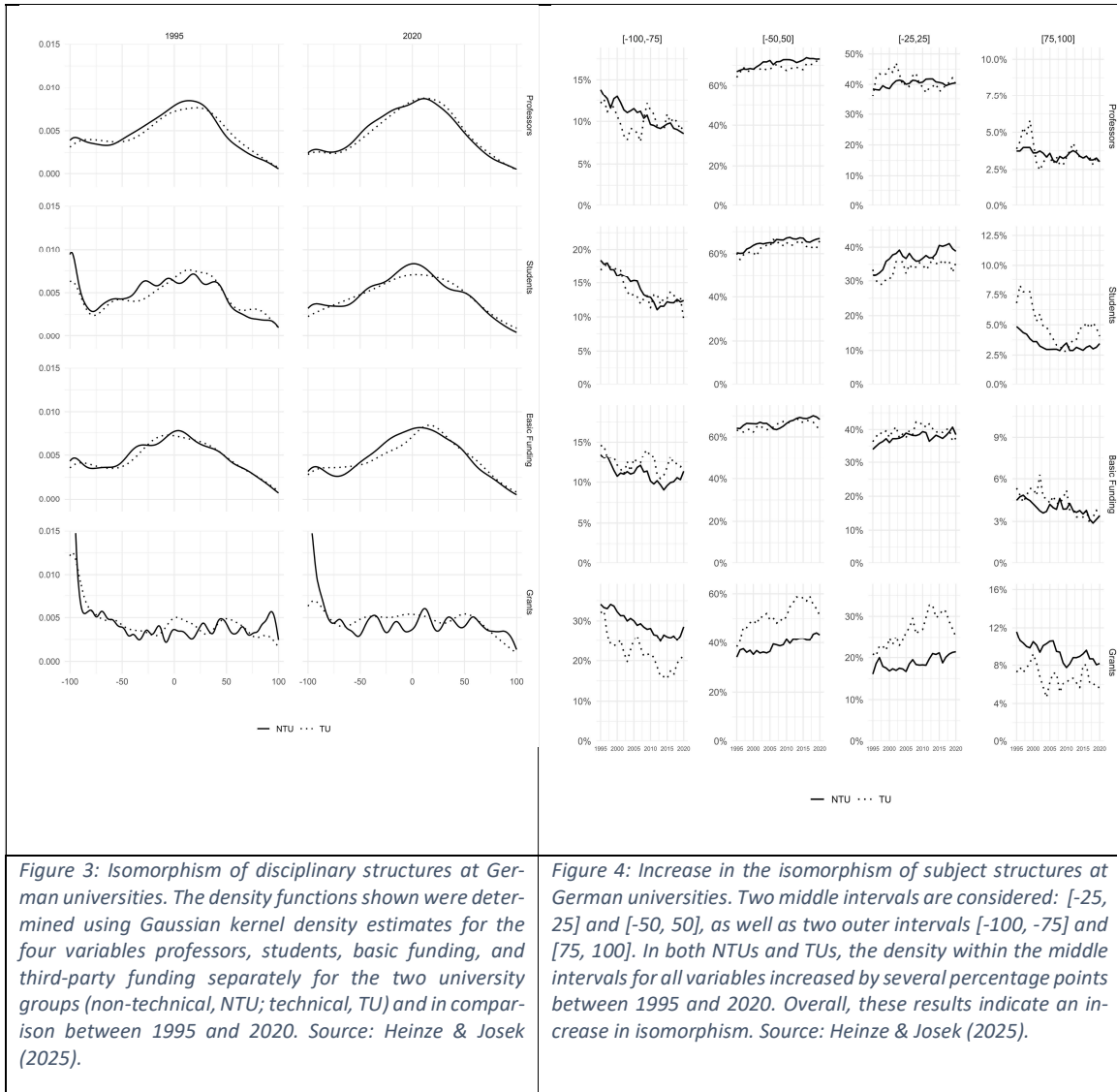
There has been a debate in sociological research about the relationship between theory and empirical research. On the one hand, this debate concerns the question of what is meant by "theory" or "good theory" (Abend 2008) and what significance empirical studies should have in the further development and testing of theories (Besbris & Khan 2017). On the other hand, it is about quality assurance in sociological research (Otte et al. 2023). This debate is also being conducted in the field of quantitative empirical science research with a focus on "middle-range theories." Such middle-range theories, as defined by sociologist Robert K. Merton, are a prerequisite for gradual, cumulative advancement of knowledge in empirical-analytical sociological research. In this regard, Heinze & Jappe (2020) argue that there are middle-range theories that have not yet been subjected to empirical testing. Instead of formulating new theories, the authors recommend examining existing theories more closely empirically using concrete examples, thereby consolidating and further developing them. The following section explains which medium-range sociological theories are being empirically tested in Prof. Heinze's research group or used for the analytical structuring of empirical questions. This includes PhD dissertation projects from the DFG-funded Research Training Group "Transformations of Science and Technology since 1800: Topics, Processes, Institutions" (RTG 2696).

1.2 Organizational theory and organizational sociology

Another prominent sociological middle-range theory is neo-institutional organizational theory (Meyer & Rowan 1977; DiMaggio & Powell 1983), which, in contrast to Abbott's theory, has already been tested in numerous empirical contexts (DiMaggio 1991; Edelman et al. 1999; Greenwood & Meyer 2008). However, there are some theoretical concepts, such as *organizational field* or *isomorphism*, that have not been precisely defined empirically for research systems. Prof. Heinze's research group has made contributions in this regard, thereby closing research gaps. This includes the analysis of the global organizational field of multidisciplinary photon science (Hallonsten & Heinze 2015), which has emerged in a transformation process lasting several decades, as well as the investigation of the alignment of disciplinary structures at German universities (Heinze & Josek 2025). The latter study shows that, with the exception of grant funding, subject structures follow an isomorphic distribution (Fig. 3) and that universities have also become more structurally similar over time (Fig. 4). Contrary to the frequently claimed development of distinct organizational profiles in higher education organizations, an alignment of subject structures can thus be observed.

An important topic in neo-institutional organizational theory is the dissemination of technical and organizational innovations. In a dissertation project completed in 2019 in Prof. Heinze's research group, this topic was examined using the example of the emergence and spread of industrial laboratories in the chemical industry in the United States (Pithan 2021). While previous literature explains the emergence and spread of the industrial laboratory as part of an economic rationalization process, Pithan (2021) highlights the cultural-discursive side of the legitimization of this new form of organization. He shows that in the 1890s, the laboratory emerged in discourse as the place where chemical research was conducted and where chemists trained at universities produced knowledge using scientific methods. It

is of little significance whether basic or applied research is carried out in these laboratories. Rather, the legitimation refers to the laboratory as a new form of organization. Pithan (2021) also shows that in the 1910s, the industrial laboratory became established as a key element of the organizational structure for companies in the chemical industry. With his analysis, Pithan (2021) reconstructs the development of the entire organizational field of the chemical industry in the United States and expands on the existing historical literature, which has largely focused on individual pioneering companies.



Another application of neo-institutional organizational theory is addressed in the DFG-funded Research Training Group 2696 "Transformations in Science and Technology since 1800: Topics, Processes, Institutions" by Artem Antonyuk (3rd cohort). His project examines which institutional factors influence the introduction of new application-oriented disciplines in the curricula of universities in North Rhine-Westphalia and eastern Germany. To this end, the project draws on findings from the US higher education system, according to which low-status universities tend to include application-oriented subjects in their curricula, while high-status universities tend to prefer theoretical and non-application-oriented subjects

(Brint et al. 2011; Brint et al. 2012). The project also takes a closer look at processes of mutual organizational imitation and the aforementioned isomorphism.

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