RESEARCH STATEMENT

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My current research agenda is focused on examining how exogenous variation in the efficiency of exchanging knowledge affects follow-on innovation. Establishing a causal link between the accessibility of existing knowledge and the production of new knowledge has proven challenging in modern environments due to the ubiquity, complexity, and endogeneity of today's communication and transport technologies. Setting the focus on historical environments with fewer communication channels and integrating the econometric approach with the data collection from the very beginning allows me to overcome these challenges and successfully isolate the innovation-spawning effects of changes in a single access technology.

Two of my research projects exploit that postal services had been the only remote access technology until the mid-19th century by leveraging disruptions in the provision of these services. In a third project I develop a new method for conducting policy evaluation in a network formation model. This method exploits network-induced variation to account for unobservable information flows from directly treated to initially untreated pairs of individuals and helps me to measure the impact of unobserved knowledge spillovers in my solo-authored applied project.

In *"A Penny for your Thoughts"* which is coauthored with Walker Hanlon, Stephan Heblich, and Ferdinando Monte we investigate how communication costs affect the production of new ideas and inventions. To answer this question, we study the introduction of the Uniform Penny Post in Great Britain in 1840. This reform replaced the previous system of expensive distance-based postage fees with a uniform low rate of one penny for sending letters anywhere in the country. The result was a large spatially-varied reduction in the cost of communicating across locations. We study the impact of this reform on the production of scientific knowledge using citation links constructed from a leading academic journal, the *Philosophical Transactions* and the impact on the development of new technology using patent data. Our results provide quantitative causal estimates showing how a fall in communication costs can increase the rate at which new ideas and technologies are developed.

In *"Knowledge Access and Cumulative Innovation: Network-Econometric Evidence from the Republic of Letters"* I examine how knowledge production responds to changes in knowledge accessibility. To answer this question, I study the re-establishment of the packet boat service between Dover and Calais in the period between the Nine Years' War (1688-1697) and the War of the Spanish Succession (1701-1714). The packet boat service across the English Channel connected the British and the French postal system and facilitated the bilateral exchange of ideas within a correspondence-based network of scholars called *Republic of Letters*. Citation data from the earliest two academic journals determines the link structure of this network and renders the links indicative of cumulative innovation: If A cited B, then A used the existing knowledge of B to create something new. War-related turmoils in the Channel did not obstruct the bilateral exchange between all scholars. How the individual members of the *Republic of Letters* were affected by the reduction of communication restrictions varied with their geographic location and network of correspondents. Considering each possible pair of scholars as a separate cross-sectional unit gives rise to a

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quasi-experimental setting. The control group consists of initially unaffected pairs and the treatment group of pairs of scholars who benefited directly from the re-establishment of the cross-channel postal service. After accounting for spillovers, comparing the two groups' pre- to post-period changes in the linking probability identifies the average treatment effect on the treated pairs.

To account for knowledge spillovers in the above described analysis, I developed an econometric approach that exploits network-induced variation to estimate the effect of unobservable information flows from directly treated to initially untreated pairs of scholars. This approach is introduced in **"GMM Estimation of Network Formation with Degree Heterogeneity"**. The paper generalizes a Generalized Method of Moments (GMM) approach for dynamic panel logit models with fixed effects to logit network formation models with degree heterogeneity. The proposed moment conditions do not depend on the degree heterogeneity parameters, making it possible to leave the distribution of these parameters unspecified. The approach is applicable to panel and cross-sectional network data, sparse or dense, directed or undirected networks and applies to a range of network formation models for which consistent and computationally feasible estimators were previously unavailable. The wide applicability comes at the price of a common distributional assumption in network formation models with degree heterogeneity. Conditional on the previous link structure, the exogenous regressors, and the degree heterogeneity parameters, the distribution of the error term is assumed to be i.i.d. standard logistic across dyads and over time. Consistency and asymptotic normality follow from standard GMM theory. Computationally inexpensive estimation is achieved by employing analytical derivates of the proposed moment conditions.

The work on the joint paper has inspired new ideas that we wish to explore in **future research**. We are particularly interested in studying how the introduction of the Uniform Penny Post affected migration patterns and literacy rates. Walker Hanlon and I consider using citation data to revive and hopefully inspire the old debate whether the Industrial Revolution was mainly driven by crafty tinkerers or more deeply rooted in the basic research of the scientific community at the time. I would like to pick up the work on a resting project that examines the effect of open access publishing on innovation and am planning to extend the above described GMM approach to a dynamic zero-inflated Poisson model. If funding can be secured, I eventually would like to pursue a larger project that would allow me to apply network-econometric tools to study the drivers of democracy in a more recent historical setting.