Social Spillovers and the Diffusion of Artificial Intelligence: Evidence from Denmark

Application for the EPRN, May 2026

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Motivation and policy relevance

A large body of research has established that the invention of new technologies generates substantial positive spillovers across firms and industries. Theoretically, Romer (1990) and Aghion and Howitt (1992) show that innovation creates knowledge externalities, as advances made by one firm can benefit others at little or no additional cost. Empirically, Bloom et al. (2013) document that these positive spillovers are sizable and on average outweigh negative business-stealing effects. This evidence provides the foundation for policies that support innovation, such as R&D tax credits and DARPA-style direct public investment. In contrast, much less is known about spillovers in the diffusion of technologies, such as whether the adoption of existing technologies by one firm generates external benefits for others. This asymmetry in knowledge is mirrored in policy: most countries actively subsidize innovation, but rarely support the adoption and diffusion of existing technologies.

This project studies one of the most important ongoing transformations of modern economies: the diffusion of artificial intelligence (AI). We examine both the direct effects of AI adoption on firm and worker outcomes and whether adoption spreads across firms through social networks. Estimating the direct effects is important for understanding the economic consequences of AI, while identifying diffusion spillovers is crucial for assessing whether the pace of adoption is socially efficient.

A growing theoretical literature highlights how interpersonal interactions can shape the speed and pattern of technology diffusion (Bikhchandani et al., 1992; Banerjee, 1992; Golub and Sadler, 2016). Empirical evidence, however, is limited. While studies have documented social spillovers for the adoption of agricultural technologies in developing countries (Foster and Rosenzweig, 1995; Bandiera and Rasul, 2006; Conley and Udry, 2010), there is little causal evidence on diffusion spillovers for modern technologies in advanced economies.

We address this gap using detailed Danish administrative data that link firms through their employees' interpersonal networks, including spousal, sibling, and educational ties. These data allow us to construct exogenous variation in exposure to early AI adopters and provide a credible basis for identifying causal diffusion effects.

Project Description

This project studies how artificial intelligence (AI) technologies diffuse across firms and the consequences of this diffusion for firm performance and labor demand.

The empirical analysis exploits a shift-share research design (Borusyak et al., 2024) based on firms' exposure to early AI adopters through their employees' personal networks. Firms are connected to other firms via spousal, sibling, and educational ties of their employees. Some of these connected firms adopt AI early, while others do not. Firms therefore differ in their exposure to early adopters depending on the structure of their workforce's social networks.

This variation provides a source of quasi-experimental identification. If social spillovers in technology adoption are important, firms with greater exposure to early adopters should be more likely to adopt AI themselves. We use this relationship to estimate the causal effect of social networks on technology diffusion.

A key challenge is to distinguish social spillovers from correlated shocks or shared characteristics across connected firms. We address this in several ways. First, we control for detailed firm characteristics, industry and local labor market conditions. Second, we construct a measure of predicted network exposure based on rich observable characteristics of the connected firms, allowing us to isolate the unexpected component of exposure. Third, we exploit the panel nature of the data to validate the parallel trend assumption and implement placebo tests based on alternative network shocks. Finally, we compare our results to estimates from a simpler event-study approach around firms' adoption of AI. The research team has already implemented such an approach for France (Aghion et al., 2025), providing a useful benchmark.

The analysis relies on a unique combination of Danish administrative data. Matched employer–employee records cover the universe of firms and workers, while population registers provide detailed information on family and educational ties, allowing us to link firms through the social network of their employees. These data are merged with firm-level balance sheet information and survey data on AI adoption from the ICT Enterprise Survey (Virksomheders IT-anvendelse, VITA). The survey is conducted annually by Statistics Denmark and covers the full population of large firms and a representative sample of smaller firms.

In addition to the empirical analysis, the project develops a simple theoretical framework linking diffusion externalities to the optimal design of policy interventions, allowing us to translate the empirical estimates into quantitative policy implications.

Research Team

The project brings together a highly complementary research team. Jakob Søgaard contributes extensive experience working with large-scale Danish administrative data and policy-relevant empirical research in labor and public economics. The remaining team members are leading researchers with expertise in both empirical microeconomics and the economics of innovation. Philippe Aghion, Xavier Jaravel, and Alexandra Roulet are internationally recognized scholars, spanning senior to junior career stages, with expertise in both theoretical and empirical work on technology diffusion and public policy, as well as important contributions to the development of advanced empirical methods used in this project. Simon Bunel and Thomas Mikaelsen are junior researchers who already have substantial experience working on closely related projects on AI adoption and labor demand in other settings. Together, the team combines cutting-edge theory, state-of-the-art empirical methods, and extensive experience with large administrative datasets.

Expected Output

The main output of the project will be at least one academic paper aimed at a top international journal. Given the global relevance of artificial intelligence and technology diffusion, the results are expected to be of broad interest.

In addition to academic publication, the project will generate policy-relevant insights that can inform discussions in Denmark and internationally. Results will be presented at academic conferences and seminars, including the EPRN conference. The project also has the potential to generate follow-up papers exploring related questions, such as firm behavior and general equilibrium effects.

Time Plan

Preliminary work on the project has already begun, including the construction of the main variables and an initial empirical analysis of AI adoption and network exposure.

Following funding, the first phase of the project will focus on finalizing the data construction and implementing the full empirical analysis. In particular, this involves integrating the most recent waves of the ICT Enterprise Survey. The variables capturing AI adoption are not included in the standard datasets provided by Statistics Denmark and must therefore be acquired separately on a year-by-year basis.

First results are expected by the end of 2026. These results will be presented at conferences and workshops during late 2026 and early 2027. Based on feedback from these presentations, the analysis will be refined and extended.

A complete research paper is expected to be ready for submission to an academic journal by the end of 2027. The project may subsequently be extended with additional analyses and follow-up papers building on the main findings.

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Brief resumé of research team

Philippe Aghion (Collège de France & INSEAD).
Philippe Aghion is a full professor and one of the world's leading scholars in the economics of innovation and growth, best known for pioneering the Schumpeterian framework of endogenous growth. His work has fundamentally shaped modern thinking on technology, firm dynamics, and public policy, and has been published in top economics journals. For this work, he was awarded the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel in 2025 (jointly with Peter Howitt for their work on creative destruction, and with Joel Mokyr).

Xavier Jaravel (London School of Economics).
Xavier Jaravel is a full professor and a leading applied microeconomist working on innovation, technology diffusion, and inequality. His research has been published in top journals and has made influential contributions to understanding how technological change affects firms and consumers. He is Chairman of the French Council of Economic Analysis and a co-editor of the American Economic Journal: Applied Economics. In 2021, he was awarded the Best Young French Economist prize.

Alexandra Roulet (INSEAD).
Alexandra Roulet is an associate professor and a prominent labor and public economist whose work combines theory, empirics, and policy engagement. Her research has been published in leading journals and addresses topics such as productivity, labor supply, and regulation. She has received major recognition for her work, including the Best Young French Economist award in 2024.

Simon Bunel (INSEAD).
Simon Bunel is a postdoctoral researcher specializing in the economics of artificial intelligence, growth, and labor markets. His research includes both academic publications and policy-oriented work, and he brings substantial experience from institutions such as the Banque de France, as well as ongoing work on AI and employment.

Thomas Mikaelsen (Stockholm University).
Thomas Mikaelsen is a PhD student in economics with a strong background in econometrics and applied microeconomics. He has experience working with administrative data and has contributed to research on technology adoption and labor demand, including ongoing collaborative work within this project. He has also worked as a student assistant in the Danish MAKRO Model Group.