SUERF Policy Brief
No 1327, December 2025

AI News Shocks, Patents and the Macroeconomy


Anastasios Evgenidis | Royal Holloway University of London
Apostolos Fasianos | University of Macedonia and Brunel University of London

Keywords: Artificial intelligence, technological shocks, patents, VARs

JEL codes: O33, E32, C32

Abstract

We examine the macroeconomic effects of artificial intelligence (AI) innovations in the United Kingdom over the period 1982–2022. Using supervised machine learning to classify around 550,000 patent documents, we construct a novel quarterly measure of AI innovation and employ an instrumental-variable approach to identify exogenous AI news shocks. Embedding this measure in a Bayesian VAR, we show that positive AI news shocks generate persistent increases in output, investment, wages, and hours worked, along with a fall in the unemployment rate. Unlike the S-shaped responses of TFP typically associated with the gradual diffusion of traditional technologies, we find that TFP rises on impact, reflecting the rapid spread of software- and data-driven AI technologies, and remains elevated. The accompanying rise in wages and fall in unemployment suggests that the productivity-enhancing effects of AI outweigh its potential displacement effects.

Disclaimer: This policy brief is based on the IFS, Working Paper 25/48. The views expressed are those of the authors and not necessarily those of the institutions the authors are affiliated with.

Introduction

AI is advancing at a remarkable pace, with breakthroughs in machine learning (ML) and large language models (LLMs) fueling expectations of a new era of economic progress. These developments have sparked debate among economists and policymakers: will AI serve as the steam engine of our time, driving growth and productivity, or will it instead reinforce the longstanding Solow paradox, that new technologies are visible everywhere but in the productivity statistics (Brynjolfsson et al., 2017; Syverson, 2017)? At the same time, concerns persist that AI could put large segments of the workforce at risk of displacement. Theoretical work highlights three forces through which AI adoption shapes productivity and employment (Acemoglu and Restrepo, 2018; Acemoglu, 2025). The displacement effect captures automation of existing tasks and jobs. The productivity effect increases labour demand in both AI and non-AI sectors while raising capital productivity. Finally, the reinstatement effect reflects the emergence of new tasks and activities. The productivity and reinstatement effects that generate employment, acts as a countervailing force against the displacement effect, which leads to job losses, and which of these forces ultimately prevails remains an empirical question.

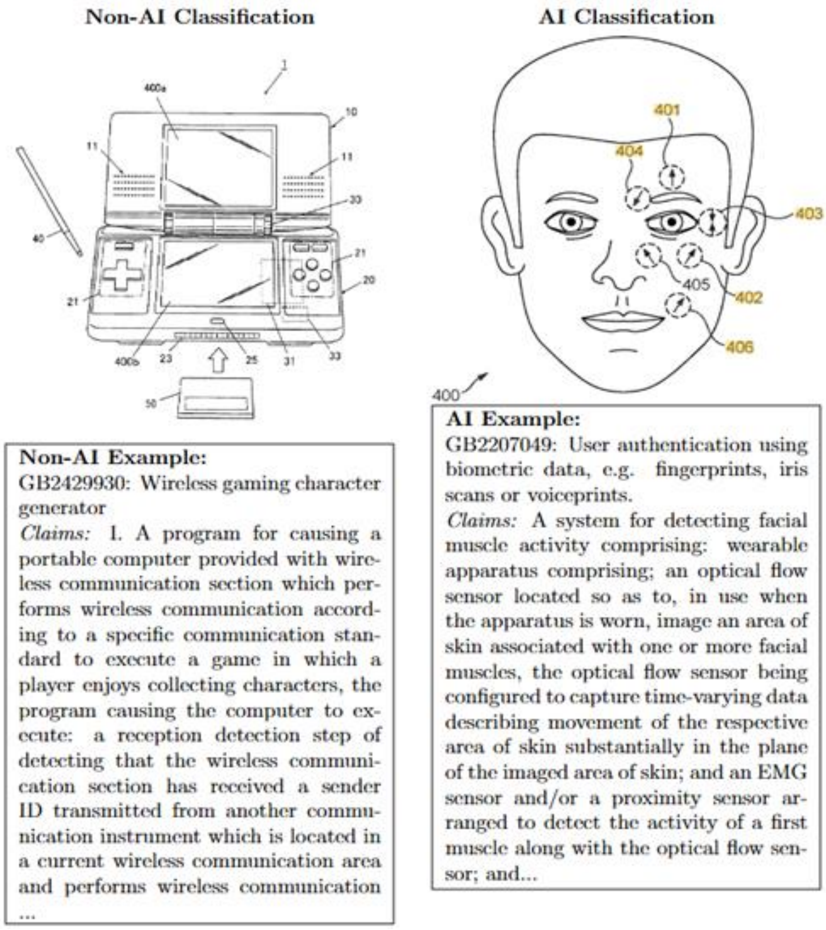
This work provides a first attempt to assess AI's impact at the macroeconomic level by integrating a novel measure of AI innovations into the framework of technology news shocks and expectation-driven business cycles. We aim to empirically answer the following question: how does the UK economy respond to AI news shocks? The UK provides a compelling test case, given its prolonged productivity slowdown alongside major efforts to position itself as an AI forerunner. To this aim, we construct a novel measure of AI innovations, based on patent text data for the UK, over the past four decades. The intuition is that AI-related patent applications inherently convey information about potential future technological developments in the field.

Novel AI Innovation measure

We detect AI innovations via patent texts, which combine detailed technical descriptions, legal claims, and structured metadata, enabling consistent tracking of technological developments across sectors, jurisdictions, and over time.
We merge two datasets containing all patent filings registered in the UK since 1982. The first is the PATSTAT database maintained by the EPO, which includes over 100 million patents registered in about 100 patent offices worldwide, going back to the nineteenth century. PATSTAT provides granular information on each patent, including bibliographic details such as the title, abstracts, inventor addresses, dates, citations, and International Patent Classification (IPC) codes. Despite its widespread use, PATSTAT lacks several key components essential for tracking technological developments, most notably, the full-text descriptions and claims. To address these limitations, we complement PATSTAT with the EPO Full Text Database for the UK, which provides rich textual information, including both the description and claims sections.

To classify UK patents between AI and non-AI related, we apply the Naive Bayes classifier trained on a manually classified sample of patent texts. Since the meaning and scope of AI have shifted over time, a narrow definition would be too restrictive. We therefore employ a broad, component-based framework for our manual classification, drawing on the approach of Giczy et al. (2022). Figure 1 presents two representative examples of both AI and non-AI related patents, illustrating our manual classification process.

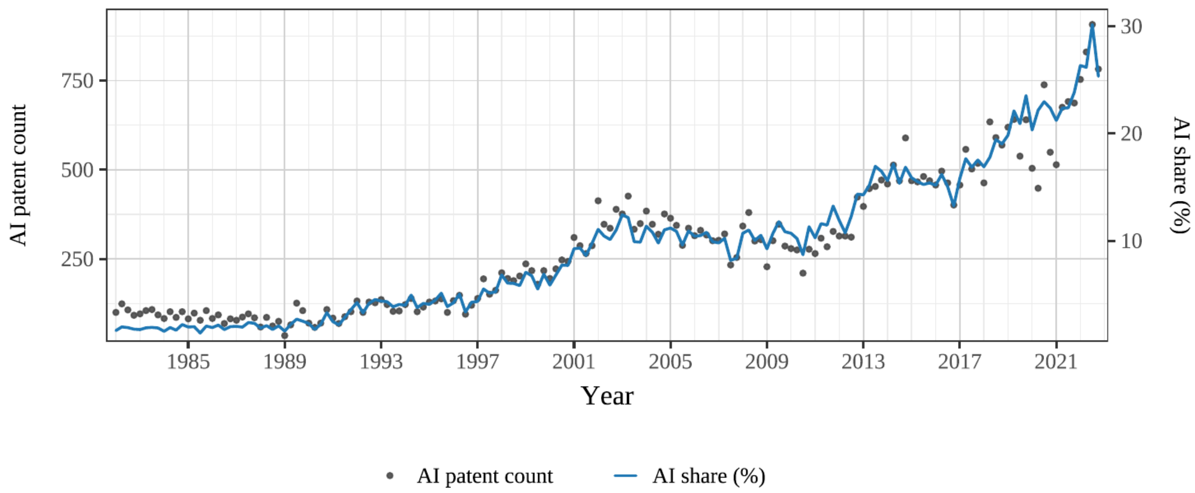
Figure 1. Examples of AI and Non-AI Patent Classification



Note: Patent examples and their images were retrieved from EPO's Espacenet online query database and correspond to observations in our classification sample.

Figure 2 presents our quarterly series of AI-related patents filed in UK between 1982 and 2022, shown both as a share of total patents (right axis) and in absolute counts (left axis). The share of AI patents remains relatively low and stable throughout the 1980s and 1990s. A gradual increase becomes evident in the early 2000s, with AI patents accounting for just over 10% of all filings by 2003. This rise coincides with advances in statistical learning, supported by greater computational power, expanding data availability, and more sophisticated algorithms. From 2010 onwards, the upward trajectory accelerates sharply, with the share of AI patents reaching nearly 30% by 2022. The post-2010 surge reflects rapid progress in deep learning and, more recently, transformer-based architectures and LLMs. In absolute terms, the number of AI-related patents follows a similar pattern, with pronounced growth after 2017.

Figure 2. AI-related patents in the UK (1982-2022)



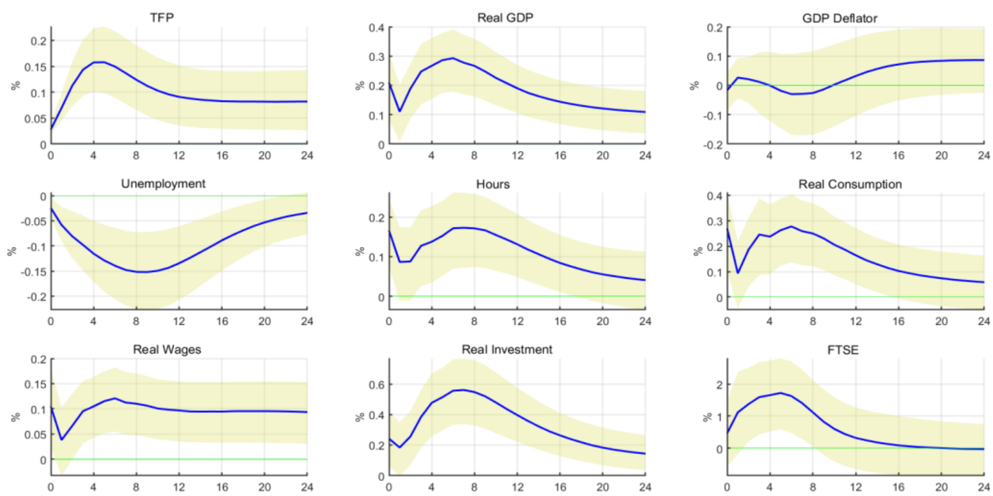
Note: Authors' own estimations. The dotted series indicate the predicted number of AI-related patents (levels), while the line shows their share of all patents registered in the UK patent office.

Macroeconomic and labour market effects of AI News Shocks

Armed with our AI patent-based innovation measure, we construct an instrument for AI news shocks that isolates the component of AI patent applications orthogonal to expectations about the UK macroeconomic outlook. We next employ our AI patent-based instrument to infer the dynamic effects of news about future technological progress in AI on several macroeconomic and labour market variables. To achieve this, we use a proxy Structural VAR (proxy-SVAR) estimated by Bayesian techniques.

The impulse responses functions (IRFs) to a one standard deviation AI patent-based news shock, are depicted in Figure 3. We consider a horizon of 24 quarters (6 years).

Figure 3. Responses to an AI patent-based news shock



Note: The figure shows the impulse response functions (IRFs) to a one standard deviation AI patent-based news shock. Median responses are depicted as solid blue lines, with shaded areas representing 68% posterior bands. The horizon is 24 quarters (6 years).

The first result is that TFP responds upon impact, reaching up to a 0.15% increase, followed by a gradual decline towards its new long-term equilibrium level, which remains significant throughout the forecast horizon. This suggests that news derived from AI patent activity convey essential information about aggregate productivity levels both in the present and over an extended period into the future.

Importantly, we find that TFP responds contemporaneously to AI-news shocks, that is, within three months after the shock. This contrasts with the findings of previous studies in the broader technology news literature that typically find a delayed effect on TFP, often characterized by an S-shaped trajectory. The different timing of the TFP response between AI and general technology news shocks should not be surprising, given the distinctive nature of the former technologies, which can be viewed as a form of intangible capital. AI-related patents, such as ML algorithm or LLMs, can be integrated into production processes much more rapidly than broader tangible technologies such as semiconductors or pharmaceuticals, which face higher adoption frictions and fixed costs.

Turning to the broader economic effects of the shock, the macroeconomic responses depicted in Figure 3 are consistent with a ‘news-driven’ business perspective, where the anticipation of forthcoming technological advancements in AI stimulates a business cycle expansion. An AI news shock triggers a noticeable co-movement among real output, real consumption, and real investment. All responses exhibit a persistent positive hump-shaped reaction, reaching their peak after approximately six quarters. Unsurprisingly, the stock market promptly incorporates positive news regarding future AI developments, exhibiting an immediate upward response upon impact, consistent with the news-driven literature.

Moving to the labour markets, the response of hours worked is positive on impact and rises significantly at the two-year horizon (i.e., 8 quarters), then gradually declines over time. For longer horizons, the effect is not statistically different from zero. Unemployment declines, reaching its lowest point around eight quarters following the shock, and then gradually reverts to its initial impact level after the shock. Real wages also rise on impact and then remain robustly elevated over time. Combined with the subdued initial response of inflation, this indicates that news about future improvements in AI lead to a short-term increase in aggregate nominal wages. Taken together, we view our findings as early evidence that productivity- enhancing mechanisms dominate displacement effects, as reflected in higher hours worked, lower unemployment, and rising real wages.

Conclusion

Our results suggest that AI innovations act as a productivity-enhancing force, stimulating GDP, investment, employment, and wage growth while reducing unemployment. These findings indicate that, in the short and medium term, the benefits of AI adoption outweigh its displacement effects. The results have clear policy implications, suggesting that policymakers should prioritise complementary investments in data infrastructure and workforce skills to accelerate diffusion and ensure that the productivity gains from AI translate into broad-based and sustainable economic growth.

References

Acemoglu, D. and Restrepo, P. (2018), Artificial intelligence, automation and work, NBER Working Paper 24196, National Bureau of Economic Research.

Acemoglu, D. (2025), ‘The simple macroeconomics of AI’, Economic Policy 40(121), 13–58.

Brynjolfsson, E., Rock, D. and Syverson, C. (2017), Artificial intelligence and the modern productivity paradox: A clash of expectations and statistics, Technical report, National Bureau of Economic Research.

Syverson, C. (2017), ‘Challenges to mismeasurement explanations for the us productivity slowdown’, Journal of Economic Perspectives 31(2), 165–186.

About the author(s)

Anastasios Evgenidis is a Senior Lecturer (Associate Professor) in Economics at Royal Holloway, University of London. He previously held academic positions at Newcastle University and has policy and research experience at the Central Bank of Ireland and the Bank of Greece. His research focuses on applied macroeconomics, the economics of artificial intelligence, monetary policy, and macro-finance linkages.

Apostolos Fasianos is an Assistant Professor at the University of Macedonia. He also teaches at Brunel University London and is a Research Fellow at ELIAMEP. His research focuses on applied macroeconomics, the economics of artificial intelligence, and household finance.

SUERF Policy Notes and Briefs disseminate SUERF Members' economic research, policy-oriented analyses, and views. They analyze relevant developments, address challenges and propose solutions to current monetary, financial and macroeconomic themes. The style is analytical yet non-technical, facilitating interaction and the exchange of ideas between researchers, policy makers and financial practitioners.

SUERF Policy Notes and Briefs are accessible to the public free of charge at https://www.suerf.org/publications/suerf-policy-notes-and-briefs/.

Designed by the Information Management and Services Division of the Oesterreichische Nationalbank (OeNB)

SUERF Secretariat
c/o OeNB, Otto-Wagner-Platz 3A-1090 Vienna, Austria
Phone: +43 1 40 420 7206
E-Mail: suerf@oenb.at.suerf
Website: https://www.suerf.org/