



Generative AI and the UK labour market

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Executive summary

Generative AI represents a new type of breakthrough which has the potential to accelerate automation in the labour market. Fears of an impending AI apocalypse might be premature and overblown, as humans will likely continue to be an essential part of the workforce. But, as this technology encroaches on creative and non-routine tasks, it does represent a radical shift from past trends in automation.

Our overall estimates suggest a relatively modest impact on employment and productivity, which could stand at odds with high expectations around this technology. To reach a quantitative estimate, we have considered the broad range of tasks that make up the UK labour market. We've found 10% of jobs facing some impact on over 5% of tasks, but also a 60% of jobs facing little to no effect from Generative AI. To reach these figures, we worked with experts both within KPMG and from our academic partners at the University of Cambridge.

The wider implications that Generative AI may have on the economy and society are highly uncertain. Set against the underlying impacts on employment and productivity, the wider social impacts may warrant a high degree of caution in how regulators and policymakers approach these technologies.

Our key findings



We find a modest but significant impact from Generative AI, identifying 2.5% of overall tasks that could be performed by AI, with 40% of UK jobs seeing some impact¹ from the technology.



We expect around half of the displacement impact of Generative AI to be offset by the creation of new tasks within the affected jobs. This would lead to an overall productivity boost from the technology of 1.2% and add a potential £31bn of GDP to the UK economy within the next decade.



We identify three main applications of Generative AI in the workforce: classification and summary tasks, technical content creation and subjective works, which may increase the risk of future automation for non-routine occupations.



¹ Identified as those with over 1% of tasks affected by Generative AI

What is Generative AI?

Generative AI technologies represent a wide array of statistical techniques which can be employed to produce or 'generate' new pieces of content based on patterns detected in a vast store of data.

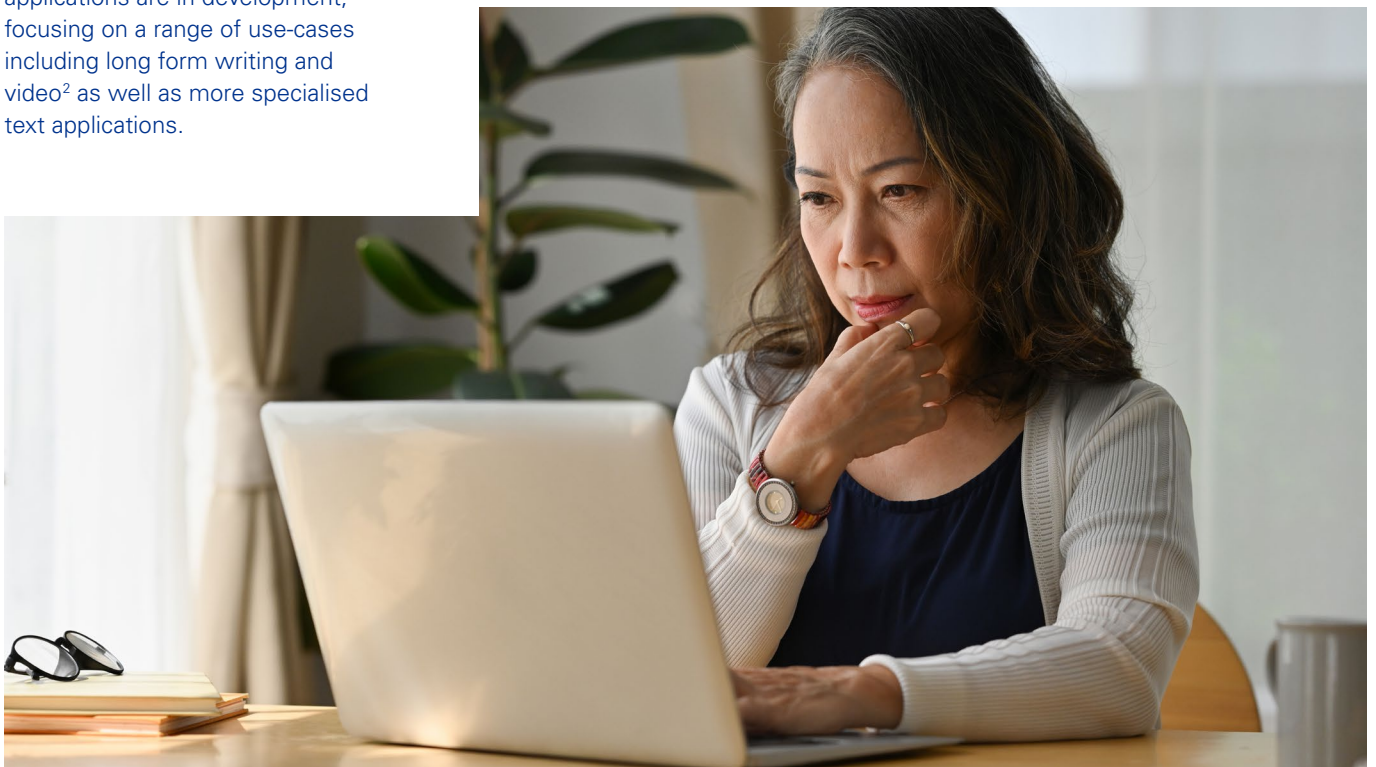
At its core each generated piece of content is essentially random, driven by a set of regularities gleaned from the data. This can lead to the content appearing plausible, convincing, and even novel. But, it also opens the possibility of perpetuating biases and making mistakes.

Recent developments in this field have culminated through a series of publicly available demos and public products, able to create convincing new pieces of text, images and music and other forms of media based on short prompts from the user. Other applications are in development, focusing on a range of use-cases including long form writing and video² as well as more specialised text applications.

The relatively wide applicability of this technology means that the effect on economic output could be substantial. Already, the freely available versions of these tools can be used to help in the authoring of scientific papers³, drafting essays, etc.

What's more, the technology can be considered emergent, in the sense that once an algorithm has been trained, its full capabilities may not be immediately apparent and tend to appear once the training dataset reaches a certain minimum scale. This means that the range of applications for Generative AI can be very broad – and that these tools could have a significant economic impact not just on productivity, but also the way many people work.

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² Harvard business review, 2022, <https://hbr.org/2022/11/how-generative-ai-is-changing-creative-work>

³ A. Orlando, *ChatGPT; Generative AI and the Rise of the Machines: Implications for the US Economy*, 2022

The impact on the labour force

On a basic level, each job can be seen as a bundle of tasks, with each task considered separately. If some tasks become automated, this potentially leaves workers to devote more time towards remaining tasks. For example, if AI tools can make the content for an advertising campaign, this leaves more time for following up on potential leads and identifying potential clients.

On top of this, using AI may lead to new tasks being created that did not exist before⁴. The current limitations of AI could mean that humans are still needed to verify and fact-check any AI-created outputs. For some jobs, as the task of content creation becomes automated, workers may therefore spend a greater share of their time editing and verifying the final product. As with past waves of technology, this too could give rise to a whole range of new jobs that did not exist previously.

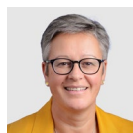
So as some tasks become automated, the definition of what makes up a job can drastically change. In the rare cases where automation can completely overtake the tasks making up some jobs, whole occupations could vanish as a consequence.

Applying this logic to the impact of Generative AI on creative jobs for example, as the act of content generation is partially taken over by AI, they may pivot to other activities. These new tasks could focus on designing and guiding content creation, or refining queries for the algorithm to work with. They could also include editorial tasks of verifying and refining the raw algorithmic output into the finished product. It is clear that how some jobs are performed will increasingly involve collaboration of human workers with (AI) automated tasks.



Talk of AI is suddenly everywhere. From a deep ‘techy’ subject that only we computer scientists knew anything about, mainstream press, politicians and grey-haired business leaders are suddenly focused on both the good and ‘evil’ it seems capable of reaping on the world.

It is important, before we become too worried about its impact on the economy and the future of work, to note that new technologies have been shown over time to generate new work and demands on human expertise. Think industrial revolution and how some of the new machinery was vilified. AI is something we can afford to be cautiously optimistic about, as well as focusing on building appropriate controls.



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⁴ Acemoglu, Daron Restrepo, Pascual; *The Race between Man and Machine: Implications of Technology for Growth, Factor Shares, and Employment*, American Economic Review, 108 6, 2018

Which tasks are impacted by Generative AI?

To identify which tasks Generative AI may be applied to, we have made a distinction across three types of work activities commonly found across different occupations. We broadly anticipate three types of tasks susceptible to applications for Generative AI covering:

- Classification and summary tasks, including searching through documents, summaries and archive maintenance.
- Technical works covering specialised works such as code, and technical drawing.
- Subjective works such as drawing, presentation and marketing content.

For more detail on our classification of tasks susceptible to automation by Generative AI, see Table 1 below:

For each of these groups of tasks, we make a further distinction on the applicability and productivity impact of Generative AI. At one extreme, classification tasks could see the highest levels of AI applicability and impact, which could see almost all activities subject to automation.

For technical works, while the structured nature of outputs could make AI tools highly applicable, we do anticipate human oversight would be required for fact-checking and verifying the automatically generated content. This would dilute some of the time-saving benefits of using AI, reducing the scope for productivity improvements. While some applications are being developed with the concept of ‘ground truth’ in mind, the randomised nature of AI outputs may necessitate some degree of human verification.

Lastly, we consider more subjective works, covering tasks where quality judgements may differ across individuals. This covers non-technical drawing, creation of presentations, and marketing materials among others. While Generative AI may have a wide applicability to these types of tasks and may become widely embedded in workflows, the need to fine-tune and iterate over multiple rounds of AI output may limit the potential for time saving. Therefore, while the activity may become partially or fully automated, there is still a significant role for the human input in finalising and iterating on the output.

Table 1: Classification of tasks amenable to Generative AI

Task category	Task summary	Examples	Potential impact on employment and productivity
Classification and summary	Trawling through large sets of documents, text or data to identify, classify, and create summaries of relevant pieces of information.	Patent searches, legal document searches, archive maintenance.	Wide application, high potential for task automation and high productivity impact with up to 95% of tasks automated.
Technical works	Drafting and maintenance of technical documents and drawings, created either fully automated or guided by a human user. Potential for a set of specialised AI applications for specific uses.	Technical drawings, academic drafts, note summaries from experimental work.	High potential for automation with around 80% tasks automated. Medium impact on productivity as automated tasks requires human editorial and fact-checking.
Subjective content	Creative tasks where work has a more subjective quality, which covers a broad range of image creation, long form text and others.	Essay writing, creation of marketing materials, image generation, presentations and other forms of media.	A relatively low level of AI impact on tasks as the need to fine-tune and edit the results of automatically generated output would require a significant share of human input and involvement.

Source: KPMG analysis

Occupational impact of Generative AI

Our results show a relatively modest level of impact from Generative AI on the UK workforce. Looking across occupations, the most affected jobs relate to the creative and professional service sectors, with occupations where writing or design form a significant part of the job tasks. In total, Generative AI affects 2.5% of tasks within the UK economy, with around 10% of occupations facing an impact on more than 5% of tasks, Table 2 highlights some of the main occupations within this wider group.

Creative occupations see some of the biggest shares of tasks susceptible to automation. As Table 2 shows, 43% of the tasks associated with authors, writers, and translators where text-based algorithms could be applicable to accelerating drafting, summary, and text creation tasks. In a similar vein, the works of graphic and other designers could be heavily impacted by Generative AI technologies, with 15% of tasks susceptible automation with wider applications for marketing professionals who could see 7% of their tasks impacted by Generative AI technologies.



Computer programmers and software development professionals are likely to be affected by code-writing applications and are an example of occupations where technical writing forms an important part of the job's tasks. While this may not directly replace human input, AI tools could greatly boost productivity of these types of tasks. Our estimate for around 26% of task content replaced by automated technologies for programmers makes this one of the most affected occupations as shown in Table 2.

In total, Generative AI affects 2.5% of tasks within the UK economy, with around 10% of occupations facing an impact on more than 5% of tasks

Table 2: Example of some of the more affected occupations due to introduction of Generative AI

Description	Share of tasks automated
Authors, writers and translators	43%
Programmers and software development professionals	26%
Public relations professionals and communications directors	25%
IT user support technicians	23%
Graphic designers	15%
Personal assistants and other secretaries	11%
Legal professionals	11%
Business and related research professionals	10%
Marketing professionals	7%
Auditors	7%
Biological and biomedical scientists	6%
Higher education teaching professionals	6%

Source: ASHE 2022, O*NET database, KPMG analysis

Taking the example of computer programmers, Chart 1 shows the specific tasks that may be performed with AI assistance. Apart from applications that aid with the writing of code directly, collaboration with colleagues could be made easier with text applications, which could also help in producing documentation and instruction manuals. The tasks less likely to be automated cover a range of diagnostics and troubleshooting, as well as training both users and co-workers. Other tasks that are unlikely to face changes from Generative AI include managerial as well as scoping and design tasks that point to an increasing emphasis on product design activities.

The roles of personal assistants and secretaries could potentially see 11% of tasks susceptible to automation by Generative AI. Before the more recent advances in Generative AI technology, these roles were already considered at high risk of automation, with as many as 58%⁵ of jobs at risk through automation of routine and repetitive tasks. To the extent that Generative AI may offer a way to automating non-routine tasks and activities, this increases the overall risk of automation for this occupation.

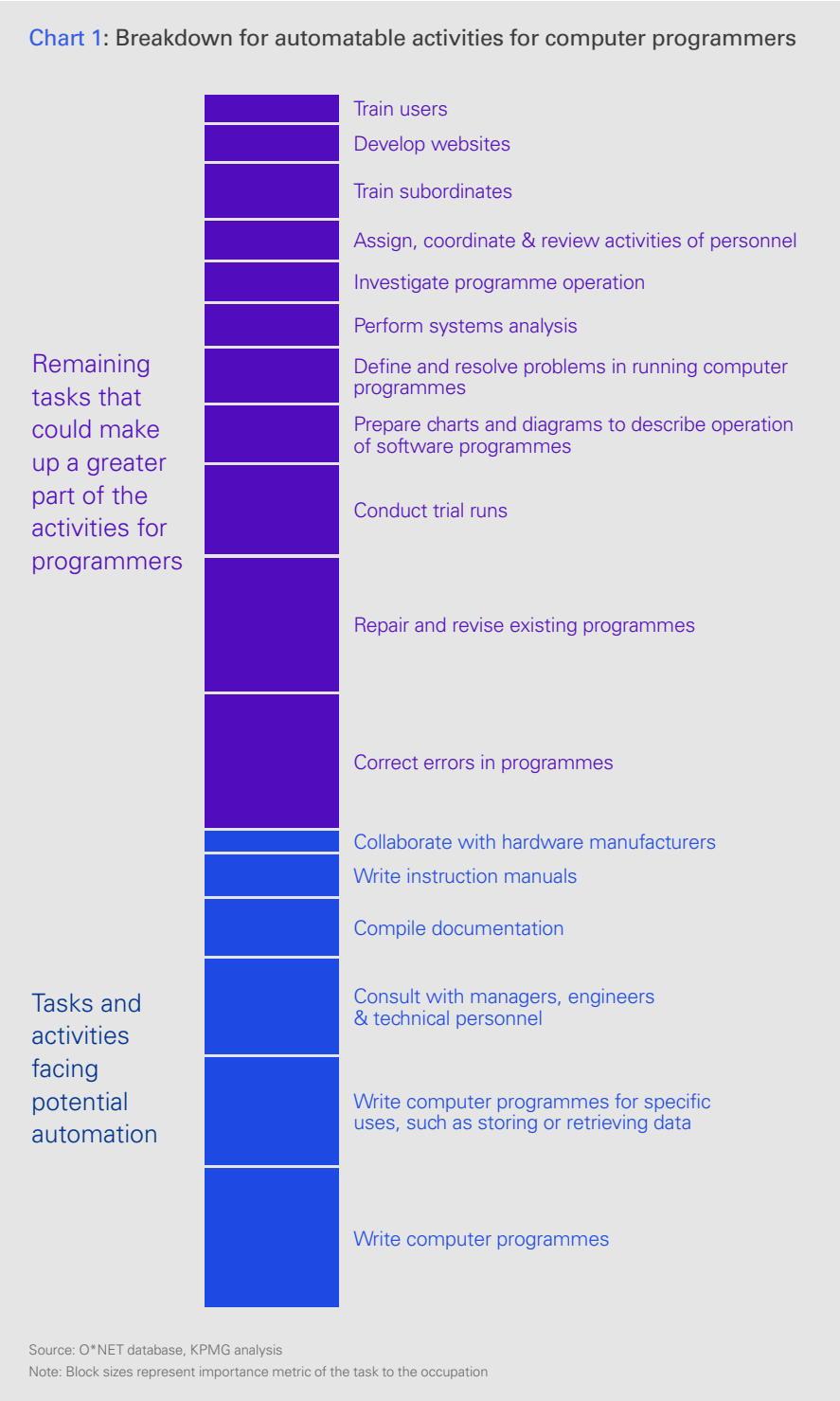
The ability of Generative AI tools to rapidly ingest and summarise large volumes of documents may have a profound impact on legal professionals where the tasks of research and case preparation could become partially automated. Overall, this set of occupations could see 10.8% of tasks affected by Generative AI technologies, particularly the roles of paralegal assistants.

Within research occupations, Generative AI may offer a potential increase in productivity by automating the tasks around gathering research material as well as contributing to drafting, covering note-writing, proposals and more technical papers. Table 2 shows 10% of tasks of business and related research professionals prone to automation by Generative AI, and 6% for biological and medical scientists; and the technology may be relevant to researchers across a range of disciplines from natural to

social sciences. The drafting of technical reports also plays a significant role in the 7% of tasks that face automation among auditors.

Lastly, there is a wide swathe of occupations that see little to no-impact from AI technologies. Of the 412 occupational categories we considered, around 60% see almost no impact

from Generative AI, covering many of the occupations in retail, hospitality, construction and manufacturing. This is an important caveat for any expected impact on productivity of Generative AI. While significant for some specific tasks, it does not appear yet to have the potential to encompass the whole economy, which limits the overall impact.



⁵ ONS, *Which occupations are at highest risk of being automated?*; March 2019

Impact of Generative AI on productivity and economic output

An important benefit that the adoption of Generative AI technology may bring is the potential improvement in productivity. The occupations corresponding to the approximately 2.5% of tasks that could be affected are equivalent to the working time of 670,000 employees. This figure represents the working time that could be saved by using AI, which could allow for redeployment of workers to other tasks and activities, including towards new tasks necessitated by the deployment of Generative AI.

Adoption of Generative AI may lead to an increase in demand for editorial and digital skills. Incorporating Generative AI in the workflow may lend itself towards greater iteration using AI inputs, with the user gradually refining the query, and generating several samples of output before moving on to edit the final piece of output. This means that while the technology does accelerate the completion of some tasks, it creates new activities that reduce the overall impact on productivity.

We anticipate that around half of the initial savings in labour input will be offset by the creation of new tasks, such as the need to adjust AI prompts and iterate on AI outputs, as well as the additional time to verify and edit the completed piece. Our current estimate is therefore for a 1.2% increase in the level of UK productivity thanks to Generative AI techniques being embedded in people's work, or in terms of 2022 level of GDP, £31bn additional output in the UK per year.

This estimate should be seen as a conservative one, particularly compared to some other analysis in this area. Other researchers have found productivity estimates ranging from 7%⁶ for the productivity of the whole economy, although these figures reflect a wider application of the technology than possible with current technology applications. Experimental studies^{7,8}, have found larger impacts for specific tasks, with time taken reduced by 14-38%, however it is unclear whether these estimates can be generalised to a wider range of economic activities.

Even once new applications are developed, it will take time for the new technology to be adopted across the economy, which we expect could take up to a decade. Changes to working practices, skills, and significant levels of digital investments are required to unlock productivity benefits. Organisations may also need to adjust to fully capture the benefits of the new technology – a process that may take time.

AI has the potential to automate many tedious tasks, improving the quality of both the work itself and people's working conditions, thereby potentially allowing workers to be more productive, creative and expressive by allowing them to focus on core tasks. A key challenge to unlock this potential lies in understanding how to design AI-bestowed systems that allow workers and AI functions to work in tandem in productive teams to achieve shared goals. We have seen in prior attempts to introduce automation to workplaces, such as in manufacturing and air-traffic control, that successful automation relies on careful system design that understands the capabilities and limitations of humans, AI, and the integrated resulting system as a whole. This requires a systems approach to design, which is poorly understood at the moment.



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6 Goldman Sachs, *The potentially large effects of Artificial Intelligence on economic growth*, 2023.

7 Noy, Shakked, and Whitney Zhang. *Experimental evidence on the productivity effects of generative artificial intelligence*, 2023.

8 Brynjolfsson, Erik, Danielle Li, and Lindsey R. Raymond. *Generative AI at work*. No. w31161. National Bureau of Economic Research, 2023.

Wider social and economic implications of Generative AI

The full implications of Generative AI for the UK economy and society are inherently unpredictable, and any economic benefits should be weighed against the risks that this technology could pose to society.

We believe that Generative AI in its current form is unlikely to lead to substantial increases in unemployment. Given the example of past episodes of rapid technological change, we would expect as many jobs and tasks to be created as would be destroyed by the adoption of Generative AI. In terms of task

content of jobs, we have already alluded to a greater share of worker time devoted to appraisal and editing tasks, especially on AI-made content. In addition, design and prototype tasks may become less costly and therefore more intensive.

The impact of Generative AI on inequality is also uncertain. Previous waves of automation and offshoring have led to increases in wage inequality, as both the US and UK economies have seen a gradual erosion of wages in routine jobs affected by automation^{9,10}.

However, unlike past waves of automation, Generative AI has the potential to stray into the non-routine domain of creativity, which until now had seen relatively low automation risks associated with it. In addition, experimental evidence to date points to a stronger impact on productivity among lower skill and less experienced workers. In this sense, AI tools are able to embody the implicit skills of more experienced workers, which may instead reduce wage inequality as it may also raise the productivity of low skill workers.



□□ Data privacy concerns also seem to be very prevalent amongst consumers. Tech companies and regulators need to look at what can be done to protect data and ease concerns if these technologies are to become widely adopted. This is becoming increasingly important as AI integrates more and more into our everyday lives...as is often the case, regulation has fallen behind the development of the technology and it is important that this catches up if AI is to become mainstream.

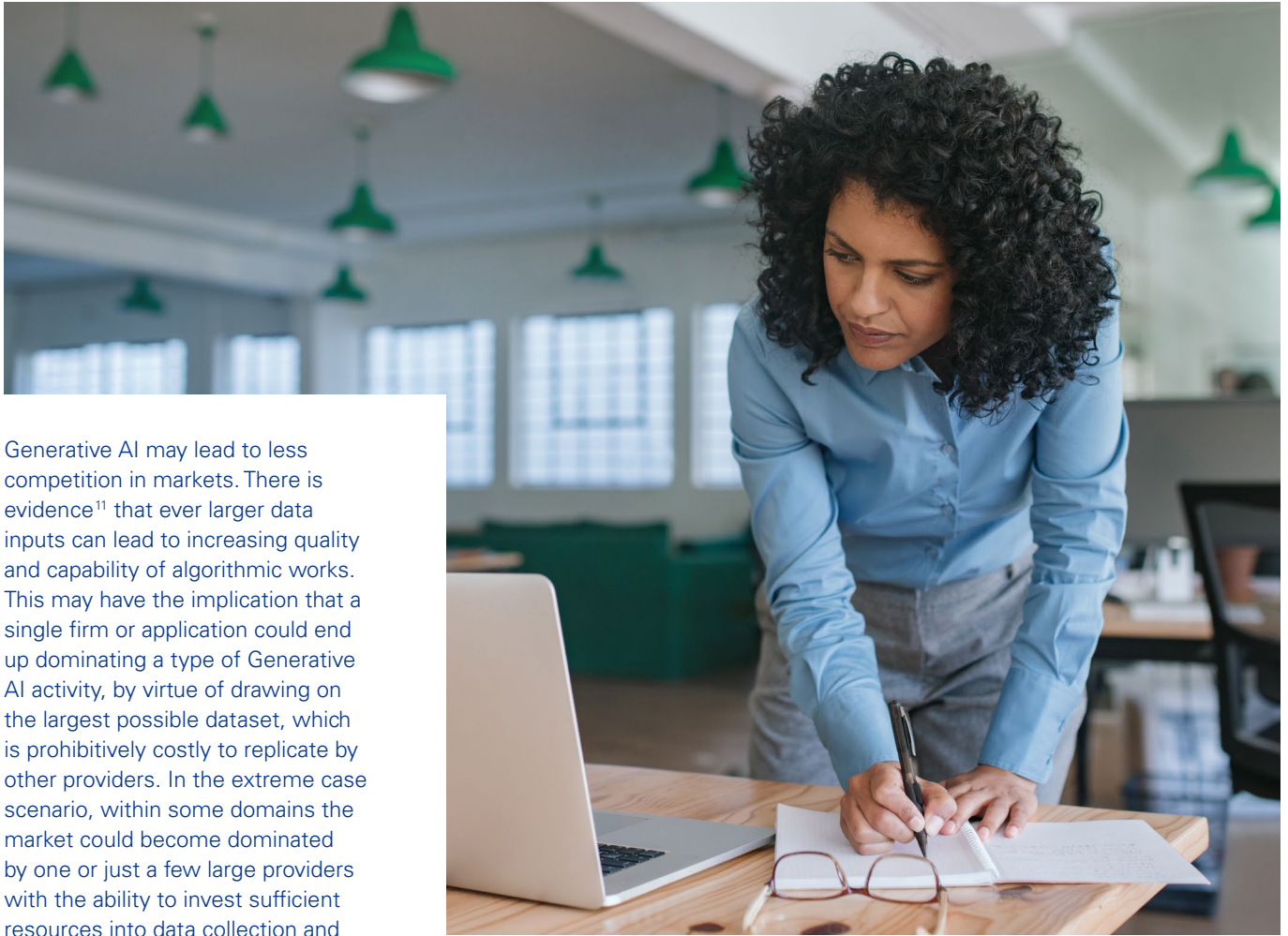


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⁹ Goos, Maarten, and Alan Manning. *Lousy and lovely jobs: The rising polarization of work in Britain*. The review of economics and statistics; 89.1, 2007

¹⁰ Acemoglu, Daron, and Pascual Restrepo. *Tasks, automation, and the rise in US wage inequality*. Econometrica 90.5, 2022.



Generative AI may lead to less competition in markets. There is evidence¹¹ that ever larger data inputs can lead to increasing quality and capability of algorithmic works. This may have the implication that a single firm or application could end up dominating a type of Generative AI activity, by virtue of drawing on the largest possible dataset, which is prohibitively costly to replicate by other providers. In the extreme case scenario, within some domains the market could become dominated by one or just a few large providers with the ability to invest sufficient resources into data collection and accumulation. In this case, regulatory oversight may be necessary to ensure the most appropriate level of access to the technology.

Generative AI poses a serious challenge for regulators. The impact on ownership is a key consideration as the current regulatory environment remains unclear. Key issues pertain to whether copyright protections extend to works used to train the algorithm and whether this extends to the works created by the algorithm. Greater clarity on protection for living artists are a key area where progress needs to be made, balancing the need to protect intellectual property rights from the threat of lower cost AI-works, but also to enable access for AI technologies to a wide breadth of input data on which to base their outputs.

The social consequences of widespread use of Generative AI tools are inherently unpredictable and have the potential to create real harm. Initial applications of the technology have impressed in their capacity to create believable but inaccurate or misleading pieces of content. This has fuelled fears that a low-cost application of Generative AI may lead to an increase in misinformation and a proliferation of low-quality online content. There is a potential for parts of the online sphere to be dominated by bots powered by Generative AI technologies. There is a risk that this technology becomes an effective tool in fraud and cybercrime, especially as the lower cost of content creation could magnify the reach of cybercriminals powered by digital technology.

On a more positive note, Generative AI has potential to impact the pace of technological progress itself and therefore become a driver of sustained productivity improvements, such as materials research¹² and drug discovery¹³. In this sense, the use of AI tools has the potential to increase the rate of productivity growth and enable continuous and sustained increases in economic wellbeing beyond the scope of the technology's direct impact on how jobs are carried out. Our estimates here do not explicitly cover this possibility, so should be seen as a conservative lower bound estimate for the potential impact on productivity and on overall economic growth.

11 Ganguli, Deep, et al. *Predictability and surprise in large generative models*. 2022 ACM Conference on Fairness, Accountability, and Transparency, 2022.

12 Pyzer-Knapp, E.O., Pitera, J.W., Staar, P.W.J. et al. *Accelerating materials discovery using artificial intelligence, high performance computing and robotics*. npj Comput Mater 8, 84; 2022.

13 Dominic D. Martinelli, *Generative machine learning for de novo drug discovery: A systematic review*, Computers in Biology and Medicine, Volume 145; 2022.

Conclusions

In estimating the impact of automation on employment, we have focused on areas where automated tools can replace human inputs and the impact this can have on overall productivity. Our analysis shows a relatively small, but significant aggregate effect of around 3% of the overall tasks performed across the set of jobs comprising the UK economy.

We do not anticipate the introduction of AI to lead to falls in overall employment in the long term. The overall displacement effect is likely to be around half of our estimated number as the incorporation of AI into workflows necessitates the creation of new tasks around creating AI queries as well as editing the output from these tools. This still leaves a significant net loss of 1.5% of tasks from the domain of human activity towards technology. Nevertheless, we do not expect this to lead to increases in the overall rate of unemployment, or to increase the level of redundancy across the workforce as the increased level of automation improves productivity and increases the overall demand for labour.

Despite the modest overall impact, large changes to specific occupations could still lead to short-term skill mismatches as the labour market adjusts to a new technology. This means that societies must face up to the potential harmful impacts of disruptive technology changes on the labour market and offer support to transition affected workers towards new careers. The economic benefits should also be carefully weighed against the wider implications that AI may have on society. Recent warnings^{14,15} against the rapid pace of progress on AI highlight the potential risks ahead. Given the relatively modest impact on productivity estimated here and the wide range of risks to society, a more measured approach may be needed that takes all stakeholders into account.

Despite the modest overall impact, large changes to specific occupations could still lead to short-term skill mismatches as the labour market adjusts to a new technology.



¹⁴ <https://futureoflife.org/open-letter/pause-giant-ai-experiments/>

¹⁵ <https://www.safe.ai/statement-on-ai-risk>

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