

# The Macroeconomic Impacts Of AI

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*The impact of AI on productivity,  $r^*$ , trend growth and inflation*

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*September 2026*

## Executive summary

This note provides an overview of the literature on the potential macroeconomic impacts of artificial intelligence.

The note is in two parts, focusing on:

- The impact of AI on productivity over an extended time horizon. It then uses these conclusions to draw out implications for the trend growth rate and the natural rate of interest ( $r^*$ ).
- The impact of AI on inflation over the course of AI buildout and supply-side expansion.

The key conclusions are as follows:

- Central estimates expect AI to deliver peak increases of productivity growth of 0.3%-0.9% for the US. In the UK, the increase is expected to be slightly smaller but still meaningful: 0.2%-0.6%. Historical precedent analysis suggests that there is upside to these estimates.
- This increase in productivity should flow through to the trend growth rate. However, trend growth will also be affected changes to the labour market. Historical precedent for the impact of technological innovation is not consistent: while the industrial revolution was job destructive; the ICT revolution was not. Initial evidence suggests that AI is beginning to impact early career recruitment negatively but this is difficult to quantify.
- Central bankers agree that the capital cycle and resultant AI productivity growth should raise  $r^*$ . Even with these increases to productivity growth fully 'priced in', long-term real yields in the US and UK appear unsustainable.
- There is a debate around the extent to which AI is inflationary or disinflationary over time. Initial evidence from US consumption and investment cycles suggest that the AI boom has increased inflation; that this is set to persist over the coming years; but that pressures will ease over time as supply-side expansion becomes more apparent.

## The Impact Of AI On Productivity Growth

### Literature Review

There is a very wide range of estimates of the impact of AI on productivity growth. Studies generally apply one of two approaches: (i) historical precedent from prior technological revolutions; and (ii) task-based modelling, which is then used as an input into a general equilibrium macroeconomic model.

Historical precedent analysis tends to give materially higher estimates of productivity growth – however, it is difficult then to pinpoint ex post how much of the realised productivity growth was driven by the technological change versus other developments at the time. By contrast, task-based modelling gives lower estimates of productivity growth, and a narrower band, but cannot fully account for knock-on innovations or changes to the structure of the economy over time.

### Historical Precedents

The Federal Reserve examines three stylised precedents: the lightbulb, the dynamo and the microscope.<sup>1</sup>

- “Lightbulbs” temporarily raise productivity growth as adoption spreads. The effect fades with adoption, such that the output level is permanently higher but the growth rate is not.
- “Dynos” are General Purpose Technology (GPT) innovations which spur knock-on innovations and show continual improvement.
- “Microscopes” are Inventions of Methods of Invention (IMI) which increase efficiency of the R&D process by improving observation, analysis and communication.

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*Generative AI... is likely to raise the rate of productivity growth quickly, and for an extended period of time.*

Both dynamos (GPTs) and microscopes (IMIs) promote productivity growth for extended periods of time. GPTs do so because they promote knock-on inventions – and so raise productivity slowly (although the extent depends on the extent of diffusion). IMIs do so because they lower the cost of ongoing R&D – and so raise productivity quickly. The Federal Reserve’s study concludes that generative AI has the characteristics of both a GPT and an IMI, and so is likely to raise the rate of productivity growth quickly, and for an extended period of time.<sup>2</sup>

The next step is to quantify the productivity impact. Aghion and Brunel (2024) use historical parallels to begin to put bounds on possible productivity impacts by looking at two precedents.<sup>3</sup> The first is the electricity wave of the 1920s in Europe, and the second was the digital technology wave in the US in the late 1990s and early 2000s. There are two general conclusions:

- **Technological revolutions have decades-long impacts on productivity.** The electricity wave had measurable impacts on European productivity for almost 40 years. The digital technology wave impacted US productivity for around 30 years.

<sup>1</sup> Generative AI at the Crossroads: Light Bulb, Dynamo, or Microscope? (Federal Reserve Board, 2025).

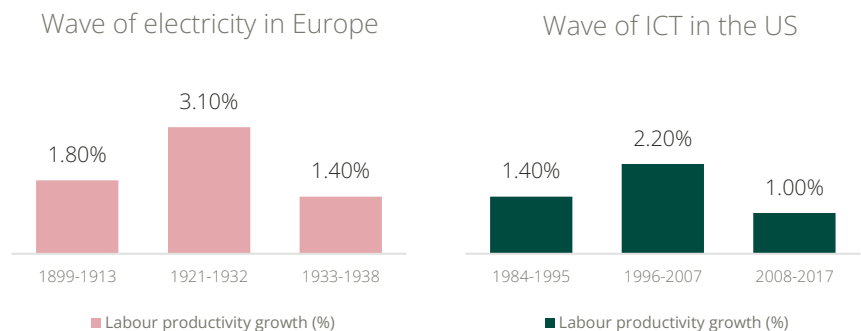
<sup>2</sup> Applications cited as evidence of GPT include in the healthcare industry, in software programming, and in the energy sector (helping to balance supply and demand on electrical grids). Evidence of IMI include AI-related patents and GenAI prompts.

<sup>3</sup> AI and Growth: Where Do We Stand? (Aghion and Brunel, 2024).

## The Impact Of AI On Productivity Growth

- **Impacts on productivity are not uniform over the entire period of study.** Aghion and Brunel divide each revolution into three parts. The highest productivity gains occur in the middle 'block', after an initial period of investment and reorganisation of work, and then finally the gains start to dissipate.

**Chart 1 – Observed productivity growth rates during earlier technological revolutions (%)**



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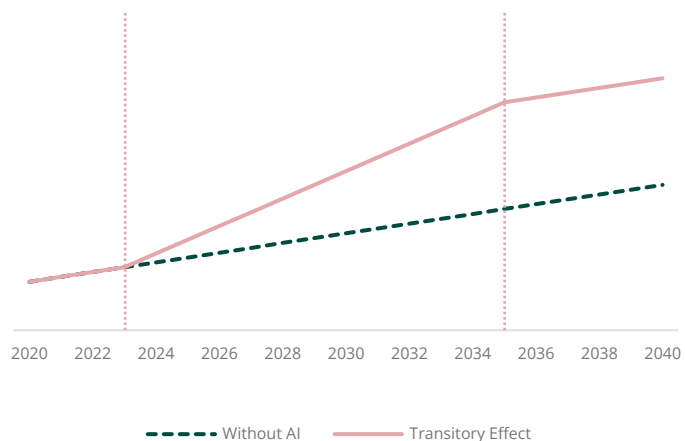
*...very high productivity may begin in the next few years.*

*The authors estimate that the AI revolution should increase aggregate productivity growth by around 0.8%-1.3% per annum over the next decade.*

Applying these findings to the current AI wave, the authors suggest that the analogy of electrification is informative. Like electrification, which required additional investment and changes to the internal organisation of factories, AI will also require a reorganisation of work and additional investment. As we are currently seeing the beginning of both of these trends, particularly in the US, the authors suggest that the years of very high productivity (the middle block) may begin in the next few years. **Using historical precedent, the authors estimate that the AI revolution should increase aggregate productivity growth by around 0.8%-1.3% per annum over the next decade.<sup>4</sup>**

The chart below, from the French AI Commission, depicts the anticipated pattern:<sup>5</sup>

**Chart 2 – Effect of AI adoption on potential production of goods and services**



<sup>4</sup> 0.8% per annum is based on the ICT revolution as a precedent; 1.3% per annum is based on the electricity wave. These estimates attempt to strip out the effect of the technological revolution (i.e. the structural break) from existing trend productivity.

<sup>5</sup> IA: Notre ambition pour la France (Commission de l'Intelligence Artificielle, 2024).

## The Impact Of AI On Productivity Growth

### Tasked-Based Framework

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*One sector's productivity gains can help to expand the productive capacity of other sectors by lowering the costs that they face.*

The alternative approach to estimating productivity impacts from AI is task-based. The intuition behind this is that at a microeconomic level, the effects of AI are driven by cost savings available on individual tasks. These are then aggregated at a macroeconomic level to derive the gains in Total Factor Productivity (TFP) across the economy. Estimates then typically add overlays for 'whole-economy' features such as the input-output multiplier and Baumol effect.<sup>6</sup>

The OECD conducted a comprehensive literature review of existing productivity growth estimates using the task-based TFP framework.<sup>7</sup> I have summarised the key assumptions and results in the table below. **These estimates give a range for expected increases to labour productivity growth of 0.36% - 0.93% per annum.**

The input-output multiplier captures the idea that one sector's productivity gains can help to expand the productive capacity of other sectors by lowering the costs that they face. The Baumol effect, by contrast, is a deduction from TFP to account for the fact that wages in sectors with little productivity growth tend to rise in line with wages in sectors that have experienced high productivity growth.

**Table 1 – Productivity modelling scenarios and underlying assumptions**

| Scenario                            | Low adoption            | High adoption           | High adoption but uneven gains across sectors |
|-------------------------------------|-------------------------|-------------------------|-----------------------------------------------|
| Task-based gains                    | 30%                     | 30%                     | 30%                                           |
| Exposure to AI                      | 17%                     | 47%                     | 47%                                           |
| AI Adoption                         | 23%                     | 40%                     | 40%                                           |
| Factor allocation across sectors    | Mobile / fully flexible | Mobile / fully flexible | Restricted                                    |
| Input-output multiplier             | 0.24                    | 0.62                    | 0.53                                          |
| Baumol effect                       | 0                       | 0                       | -0.08                                         |
| Labour productivity growth (% p.a.) | 0.36%                   | 0.93%                   | 0.80%                                         |

Source: OECD (2024).

At the time that the OECD paper was published (November 2024), AI adoption rates in the US ranged by sector, from <1% (utilities) to 18% (publishing/AV). In the UK, the latest government research suggests that the UK AI adoption rate is 16% and rising.

<sup>6</sup> The input-output multiplier captures the idea that one sector's productivity gains can help to expand the productive capacity of other sectors by lowering the costs that they face. The Baumol effect, by contrast, is a deduction from TFP to account for the fact that wages in sectors with little productivity growth tend to rise in line with wages in sectors that have experienced high productivity growth.

<sup>7</sup> *Miracle or Myth? Assessing the macroeconomic productivity gains from Artificial Intelligence* (OECD, 2024).

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This would suggest that there is still some lead time to the higher productivity growth rates estimated, but that a 23% adoption rate is likely too low. Assuming some degree of inflexibility to reallocate resources adds a degree of realism, particularly in economies such as the UK where labour markets are more tightly regulated and trade unions play a more central role.

It is also important to note that these estimates fail to account for two features of AI, which point in different directions:

- First, **not all productivity impacts from AI will be positive**. Daron Acemoglu (2025) makes the first – partial – attempt to quantify what he calls “new bad tasks” that are introduced by AI.<sup>8</sup> He takes evidence from (i) negative welfare effects of social media; and (ii) spending on malicious IT attacks and associated IT security. He estimates that these two areas contribute 2% to GDP, and that the negative impact of these is 0.36,<sup>9</sup> meaning a negative impact on GDP of 0.072% per annum. This is a low and only partial estimate, but makes the point that some aspects of AI will be negative for productivity.<sup>10</sup>
- Secondly, the modelling is static in the sense that **it fails to account for some of the ‘dynamos and microscopes’ aspects of AI: knock on discoveries, and improved efficiency in research and discovery of new ideas and products**. These features are more fully captured by analysis of historical precedents, noting that historical precedent analysis will invariably capture the impact of other concurrent factors contributing to enhanced productivity at the time.

The final point to make is that **the extent of the productivity gain will vary widely by country**, even across the major advanced economies. The two largest drivers are differences in adoption rate (which may be a function of variable labour market flexibility across countries), and differences in economic structures (in particular, the share of knowledge-intensive sectors in each economy). Of the major developed economies, the US has the highest estimated TFP gains from AI. The UK and Germany are not far behind (range: 0.2%-0.6%). France and Italy have significantly lower potential gains, ranging 0.1%-0.3% per annum.

Most supply-side approaches approximate the **trend growth rate as productivity growth + labour market growth** (often approximated by the population growth rate). So, the impact of productivity growth should flow through to the trend growth rate. Separately to this, the impact of AI on the labour market will also have an effect. Intuitively, a rising unemployment rate or shrinking labour force will weigh against higher productivity growth.

The impact of AI on the labour market is one of the most discussed policy questions with wide-ranging societal implications.<sup>11</sup> Historical precedent is

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*Of the major developed economies, the US has the highest estimated total factor productivity gains from AI.*

### Implications For Trend Economic Growth Rate

<sup>8</sup>The simple macroeconomics of AI (Acemoglu, 2025).

<sup>9</sup> This is based on survey data. For example, users of TikTok and Instagram were asked how much they would be willing to pay \$53 per month to continue using these platforms, but separately, would pay \$19 per month to get everyone from their social network off TikTok and Instagram.

<sup>10</sup> Arguably all the spend on IT security (approximately 1.6% of GDP) could be considered spending which only exists to avoid a negative welfare impact.

<sup>11</sup> See the scenario painted by Citrini Research in February 2026, in which unemployment reached 10.2% by early 2028. Link: The 2028 Global Intelligence Crisis.

## The Impact Of AI On Productivity Growth

inconclusive. There is initial evidence to suggest reduced hiring in AI-exposed area, particularly in early career roles. But these studies fall short of establishing causation. There is also evidence to suggest that most of the impact of AI is through task restructuring, rather than earnings or hours worked. So it is difficult to extrapolate meaningfully into a quantified impact on labour market growth.

**Box 1** below discusses the early evidence in more detail.

### Box 1 - The impact of AI on the labour market

Academic literature suggests that technological advance can impact employment through four main channels:<sup>12</sup>

- Displacement effects: AI replaces humans in tasks that it can do more cheaply or efficiently (e.g. customer service chatbots).
- Reinstatement effects: AI creates new tasks which require human labour (e.g. data scientists).
- Productivity effects: AI makes firms more productive through partial automation, which lowers cost, increases output, and increases demand for labour (e.g. AI allows doctors to complete more scans, so more patients are treated and more doctors are needed).
- Replacement effects: AI mostly replaces labour, and the share of corporate profits rises relative to wages. In this scenario, overall employment falls, but wages for certain skills rise. This may increase demand for skilled workers e.g. who manage AI systems.

These channels all have different impacts on the labour market. The ultimate impact depends on which channels dominate. There is no clear historical precedent:

- In the first Industrial Revolution (1780s-1840s, Engels' pause), productivity growth increased. Traditionally skilled workers saw their wages stagnate, but there was increased demand for unskilled workers.
- Following electrification (1870s onwards), mass factory production led to a more rapid increase in the demand for skilled labour. Real wages also increased.
- In the ICT revolution, unemployment was very low – although the skills mix in demand changed – and there was very strong productivity growth in most parts of the world.

Early evidence suggests some evidence of impact from AI on labour demand:<sup>13</sup>

- AI impact is expected to be greatest on the workforces with highest concentration in services sector. The UK workforce faces high AI exposure, relative to other advanced economies including the US due to its large professional services sector.

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*AI impact is expected to be greatest on the workforces with the highest concentration in the services sector.*

*The UK workforce faces high AI exposure.*

<sup>12</sup> [Can AI make cutlery?](#) Speech by Andrew Bailey (Bank of England, 2026).

<sup>13</sup> [Assessment of AI capabilities and the impact on the UK labour market](#) (UK Government, 2026).

## *The Impact Of AI On Productivity Growth*

Data of job postings suggest that hiring is falling faster in occupations that are more exposed to AI, but it is not clear that AI is causing this. Analysis found that a one standard deviation increase in AI exposure was associated with a 3.9% reduction in posting volume. This was concentrated in high salary occupations, with no significant change observed in low salary roles.

This pattern has been particularly pronounced in early career roles. For example, a study using US payroll data showed that employment in early-career workers in highly AI-exposed roles had fallen by 13% - while it remained stable or grew in other roles. In the UK in 2024, the number of 16-24 year olds employed in computer programming fell by 44% in a year.

Studies are yet to establish causation. There are two issues: AI exposure is different to adoption, which remains low; and AI exposure is correlated with other pertinent factors – sensitivity to interest rates, business cycles, or sector-specific shocks. Danish labour market studies have found that these factors have had better explanatory power for changes in labour demand than AI and that so far most of the effect has been through occupational switching and task restructuring rather than through hours or earnings. For example, employees now have to spend time reviewing outputs from AI prompts.<sup>14</sup>

The Yale Budget Lab suggests that the share of workers in AI-exposed occupations has remained stable, and that so far the occupational mix has not changed markedly faster than during e.g. the introduction of computers or the internet.<sup>15</sup>

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*The neutral interest rate should rise by the additional per annum productivity growth driven by AI.*

*The impact of this will differ by country: the US will arguably see the largest increase to  $r^*$ , followed by the UK.*

A change in trend productivity also has implications for the neutral interest rate. You will recall that the neutral interest rate is the interest rate at which the economy is at full employment and with stable inflation. The economy is neither constrained nor stimulated by monetary policy.

An alternative way of thinking of the neutral interest rate – which may be more intuitive – is to consider the neutral interest rate as the equilibrium rate which balances the supply (savings) and demand (investment) for loanable funds in the economy. Higher productivity can increase the demand for loanable funds – as we are currently seeing – which in turn drives up the equilibrium interest rate.

As a consequence, **the neutral interest rate for an economy should tend towards its trend growth rate.** In the absence of a well-quantified assumption on any change to the size of the labour market, ceteris paribus, **the neutral interest rate should rise by the additional per annum productivity growth driven by AI.** The impact of this will differ by country: the US will arguably see the largest increase to  $r^*$  (+0.4%-0.9%), followed by the UK (+0.2%-0.6%).

<sup>14</sup> Large Language Models, Small Labor Market Effects (Humlum & Vestergaard, 2025).

<sup>15</sup> Evaluating the Impact of AI on the Labor Market: Current State of Affairs (Yale Budget Lab, 2026).

## *The Impact Of AI On Productivity Growth*

Recent central banking publications and speeches support this view. As FOMC chair, Jerome Powell commented that to the extent that US productivity gains are AI driven, they would imply a higher neutral rate.<sup>16</sup> More recently, Governor Barr of the Federal Reserve Board has also explicitly linked higher productivity (he estimates +0.3-0.9%) and the demand for capital as reasons to support a higher neutral rate.<sup>17</sup> The Bank of England and European Central Bank have made similar comments. The Bank of England's Monetary Policy Report has flagged AI-driven productivity growth as a structural driver pushing up on  $r^*$ ,<sup>18</sup> and so too has Isabel Schnabel of the European Central Bank – although she does caveat this by saying that the European Union is yet to see improved productivity growth.<sup>19</sup>

## *The Impact Of AI On Inflation*

### Literature Review

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*There is a live debate on whether AI will be more inflationary or disinflationary over time.*

In comparison to productivity growth – where literature is in broad agreement as to direction, but differs on quantum – there is a live debate on whether AI will be more inflationary or disinflationary over time. This is understandable. AI has the potential to boost both the demand side and the supply side of the economy, and so this is ultimately a judgment on which of these effects will be larger. Adjacent to this debate, there is also increasing US-based evidence of the AI buildout's impact on price levels. This section of the note will explore both the theory and the evidence.

The Bank for International Settlements (BIS) has covered the debate in the most detail. The authors examine two scenarios and consider their impact on output and inflation over a 15-year horizon. They do this using a multi-sector macroeconomic model, in which AI is a positive productivity shock. Both scenarios' results saw rising output, consumption and investment in the short and long run – but showed different paths for inflation.

The distinction made between the scenarios was whether the positive productivity shock was unanticipated or anticipated by economic agents. In the **unanticipated** scenario, productivity improvements from AI increase GDP. Consumption and investment rise largely in line with GDP. Initially, **AI adoption initially lowers inflation** by expanding productive capacity, lowering costs and relaxing supply constraints. This is essentially the 'goldilocks' inflation scenario that Kevin Warsh describes. The demand side response takes some time to materialise (in part due to consumption habits and adjustment costs) but **the path of inflation eventually moves higher as the demand side begins to dominate**, peaking at 75bp higher than it would have been in the absence of the shock.

<sup>16</sup> Transcript of Chair Powell's Press Conference -- December 10, 2025.

<sup>17</sup> Speech by Governor Barr on artificial intelligence and the labor market - Federal Reserve Board (2026).

<sup>18</sup> Bank of England Monetary Policy Report - February 2025.

Navigating inflation and employment in an era of supply shocks and AI - SUERF (Schnabel, 2026)

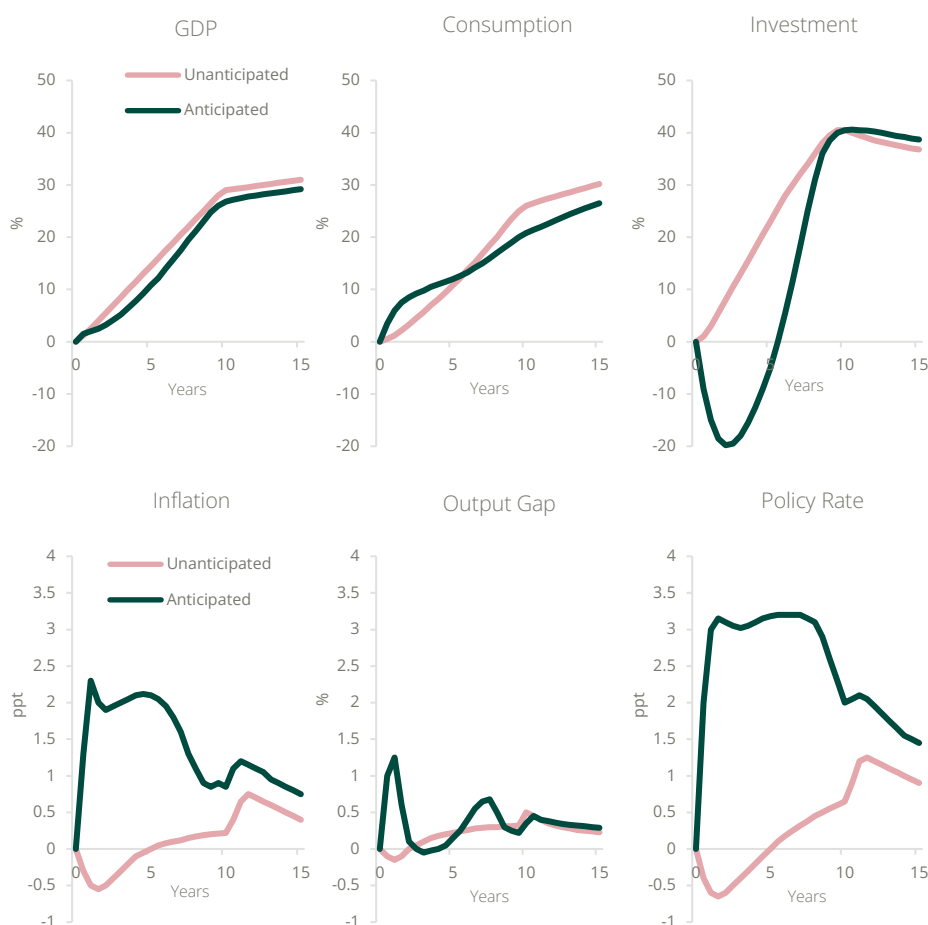
<sup>20</sup> Perhaps the most high profile example of this is the Federal Reserve Chair Kevin Warsh, who has centred his monetary policy strategy ("rates down") on a belief that AI will be disinflationary.

<sup>21</sup> The impact of artificial intelligence on output and inflation (BIS, 2024).

## The Impact Of AI On Inflation

By contrast, in the **anticipated** scenario, **GDP rises more slowly** than in the unanticipated case. This is because households bring forward consumption, which means that the required investment happens more slowly. This also means that capital stock accumulates more slowly, which also slows the expansion of supply capacity.<sup>22</sup> In this case, while output rises, **the final output level is lower than under the anticipated scenario and the resulting inflation is much higher**, peaking at 200bp higher than it would have been in the absence of the shock.

**Chart 3 – Summary of results from BIS anticipated and unanticipated scenarios**



### Initial Evidence

Initial evidence appears more consistent with the anticipated scenario, where elevated inflation appears ahead of supply-side expansion. AI-driven productivity increases are widely expected by corporates and financial markets. This is now spurring elevated levels of capital expenditure. In equity markets, expectations priced into AI hyperscalers' valuations have created a wider wealth effect on consumption. The US household savings ratio is now very low.

## The Impact Of AI On Inflation

Consumer price-led measures of inflation (e.g. PCE) suggest that wealth effects from elevated AI equity valuations are creating price pressures. Separately to this, price pressures on producers from AI capex buildout – some of which are yet to be passed on to consumers – suggest that AI capex is creating inflationary pressures before having supply side impact.

**Box 2 below** explores the evidence of AI-driven inflation in the US in more detail, concluding that we expect these price pressures to persist at least throughout 2027-2028.

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*There are continued upside pressures to consumer prices from AI capex-driven input price inflation.*

### Box 2 - The current impact of AI on US inflation

The US economy is at the epicentre of the AI capex boom. This is likely to continue to be the case. The inflationary impact of AI is becoming increasingly evident in the US data, and is visible across multiple channels:

- **Import prices:** US import prices have risen at the fastest pace since the re-opening after the Covid pandemic driven in part by rising costs of computer equipment linked to the data centre buildout.
- **Hardware costs:** Memory chips and AI-related components are at historically elevated price levels. Small businesses report that the costs of RAM mean that upgrades are barely economical.
- **Energy demand:** Utilities are projected to spend nearly \$230bn – up 56% since 2022 – to meet AI-driven power demand.
- **Broad input prices (second round effect):** The combination of strong demand for AI-related inputs, which is pushing up the prices for technology-linked goods, and the energy demand for the data buildout, which has pushed up retail energy prices, is having a wider impact on broad input prices.

These channels are now creating a visible differential between producer and consumer price indices (the PPI-CPI spread). Currently the spread is at -1.3% (CPI: 3.4%; PPI: 4.7%), having run positive after the reopening from the Covid pandemic and throughout 2023. The negative spread suggests that firms are absorbing cost pressures – compressing their own margins – rather than passing them on fully to consumers. Cost pressures are occurring both upstream (chips, memory, energy) and midstream (data centres, software). **This is unlikely to be sustainable, hence the economic interpretation that there are continued upside pressures to consumer prices from AI capex-driven input price inflation.**

## The Impact Of AI On Inflation

It is also possible to quantify the current impact that AI (broadly construed) is having on US consumer prices.

**Table 2 – Breakdown of current AI contribution to core PCE (bps)**

| Channel            | Sub-component                                   | Contribution (bps) | Notes                                                                                                       |
|--------------------|-------------------------------------------------|--------------------|-------------------------------------------------------------------------------------------------------------|
| IT goods prices    | Memory chips, computer peripherals, electronics | ~18bps             | AI demand driving DRAM shortages which as passed through to computer hardware prices                        |
| Financial services | Financial services and insurance fees           | ~20bps             | AI-driven equity returns have boosted financial services prices                                             |
| Wealth effect      | Broader consumption basket                      | ~6bps              | AI equity valuations have increased household wealth, which has led to higher consumption and higher prices |
| Total              |                                                 | ~44bps             |                                                                                                             |

Source: Bloomberg and UBS Research

While data centres use up considerable amounts of electricity, and this additional demand is causing regional price increases, there is not yet a material impact across broader price levels.

This is expected to change but analysis is clouded by the energy price shock from the war in the Middle East. Looking at the wider price index, price pressures are expected to continue in the near future. While software price pressures are expected to peak in early 2027, price pressures in memory chips and hardware, and associated pressures in e.g. new vehicles, are expected to persist at least into 2028. **Accordingly, we expect AI-driven price pressures to persist over the coming years.**

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**We expect AI-driven price pressures to persist over the coming years.**

### Emma Moriarty



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risks in financial markets. She began her career in the capital markets practice at Bell Gully, a New Zealand-based corporate law firm. Emma holds an MSc in Economic History from the London School of Economics, and studied Economics, Finance and Law at the University of Auckland.