

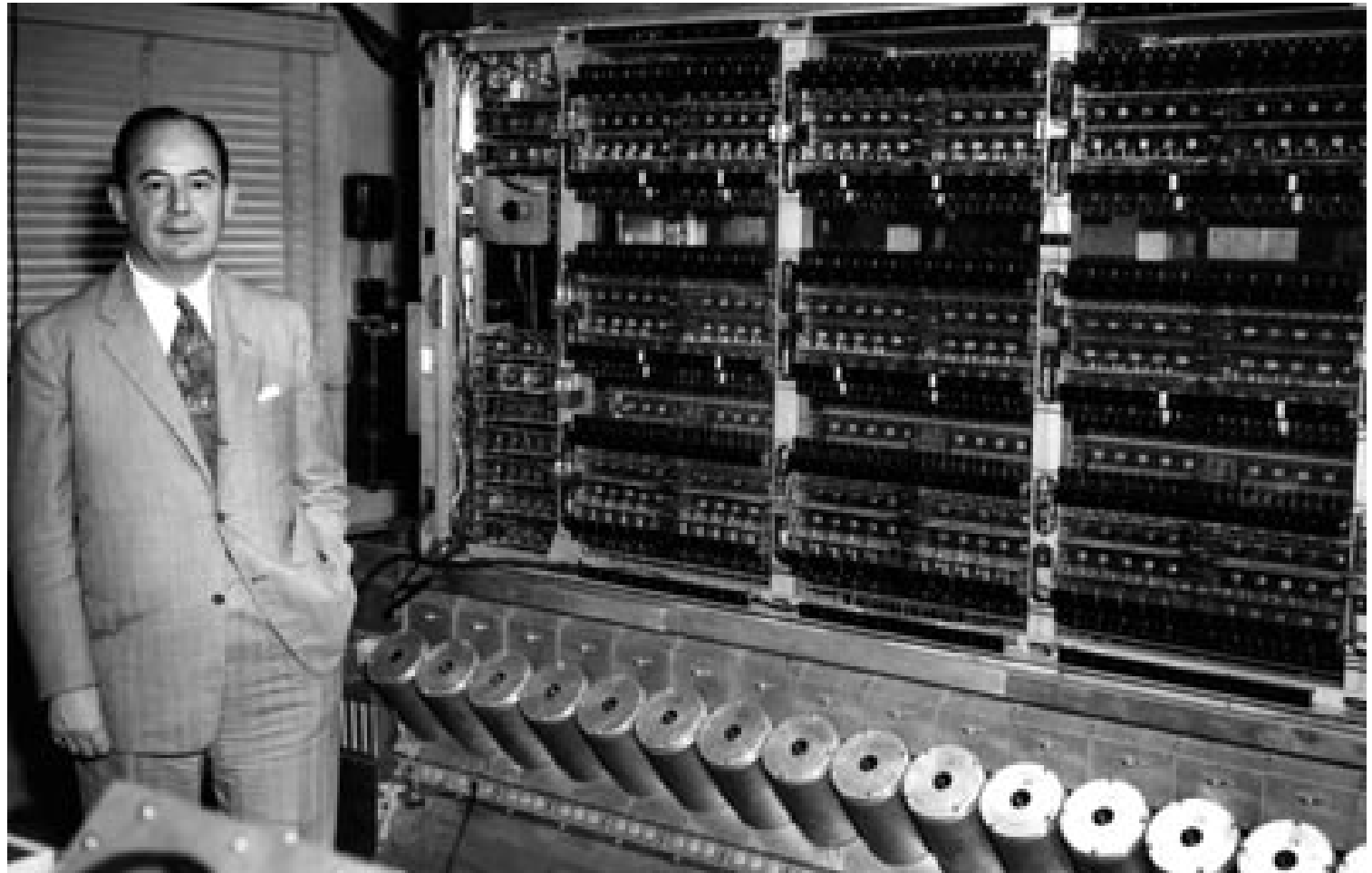


# Artificial Intelligence and the economy: implications for central banks

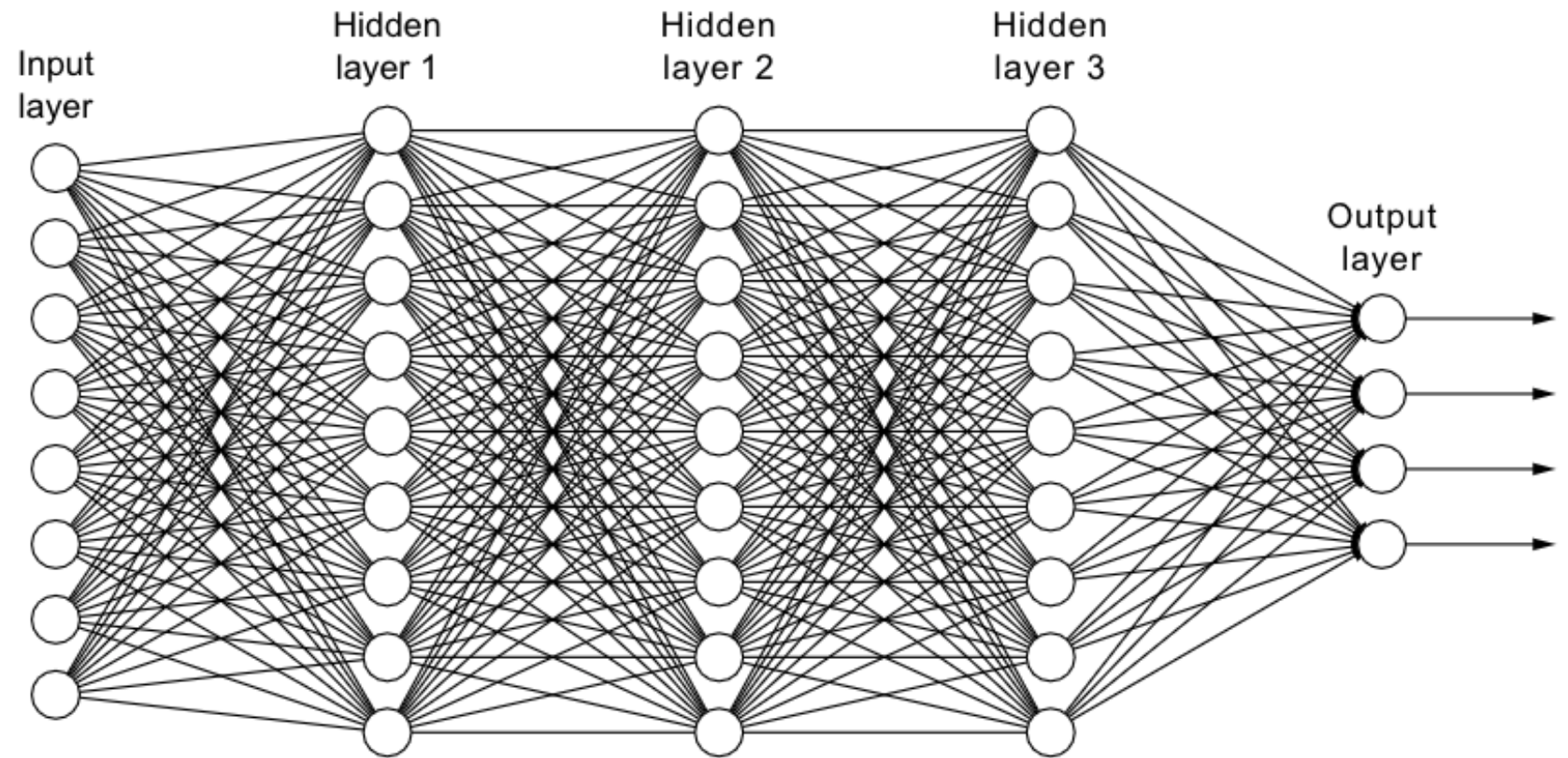
Hyun Song Shin  
Economic Adviser and Head of Research

Basel, Switzerland, 30 June 2024

The technology behind AI can be traced back to the early days of computing itself



The advent of deep learning set the stage for today's AI applications



1950s  
Early AI

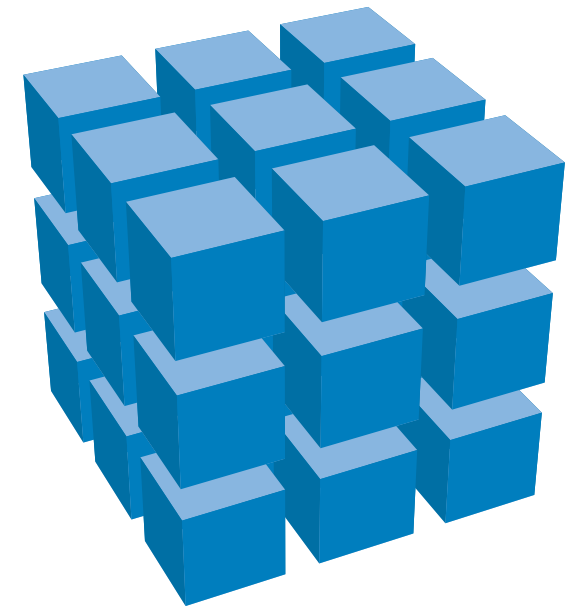
1990s  
Machine learning

2010s  
Deep learning

Today's machine learning models excel at imposing mathematical structure on unstructured data, to identify patterns of interest



**Unstructured data**



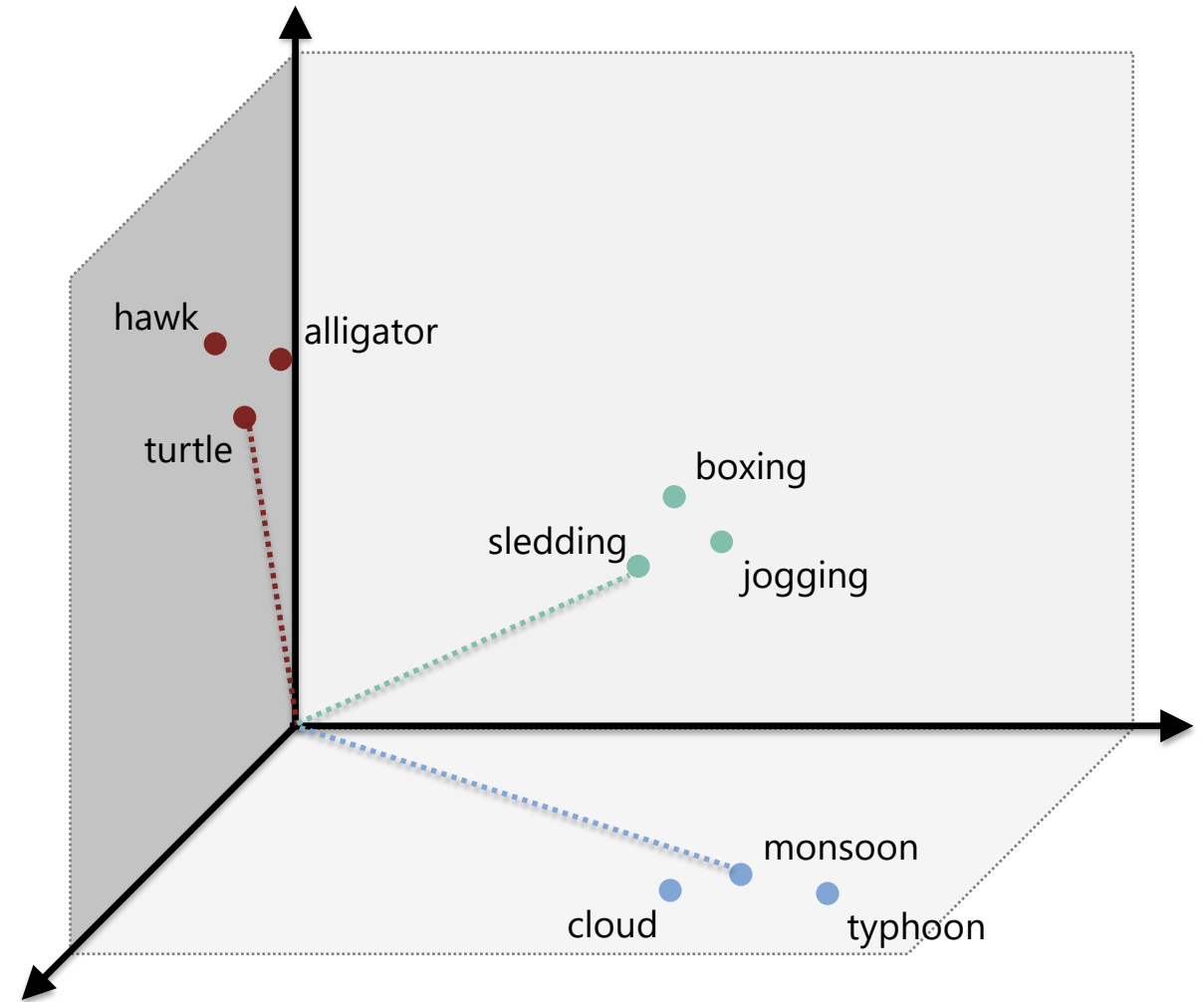
**Structured data**

1950s  
Early AI

1990s  
Machine learning

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Deep learning

“Embedding” turns words into arrays of numbers; similar words are closer together in the vector space



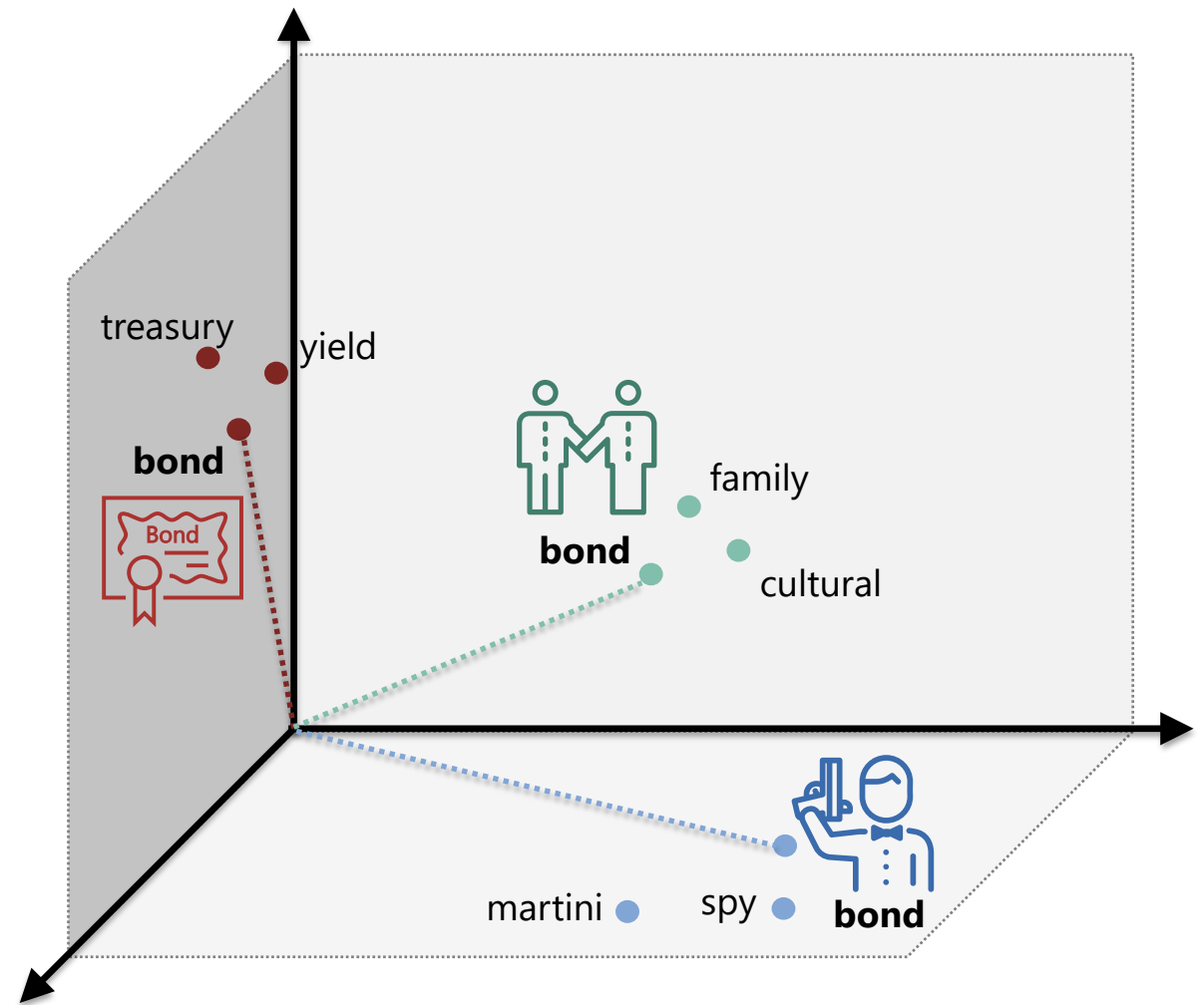
1950s  
Early AI

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Deep learning

The latest models draw on the surrounding **context**

They are particularly suitable for **nowcasting** and **financial monitoring**



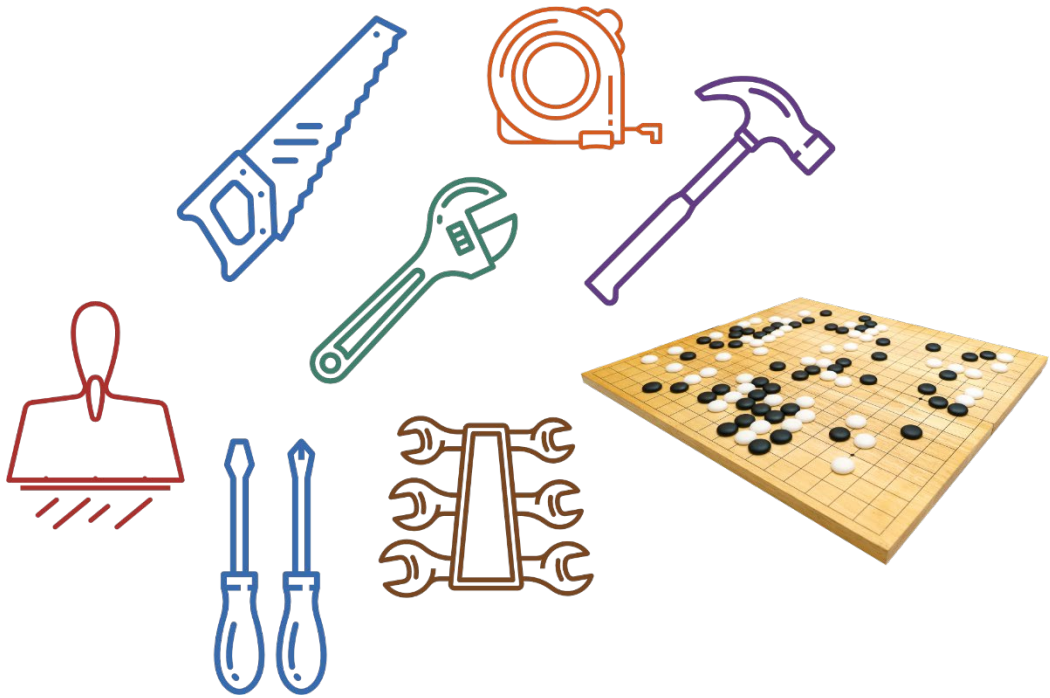
1950s  
Early AI

1990s  
Machine learning

2010s  
Deep learning

2017  
Transformers

Previous expert systems were tailor-made for specific applications. They needed skilled operators to develop and refine them



1950s  
Early AI

1990s  
Machine learning

2010s  
Deep learning

2017  
Transformers

In contrast, the latest AI applications are versatile “zero-shot learners” that can tackle previously unseen tasks



1950s  
Early AI

1990s  
Machine learning

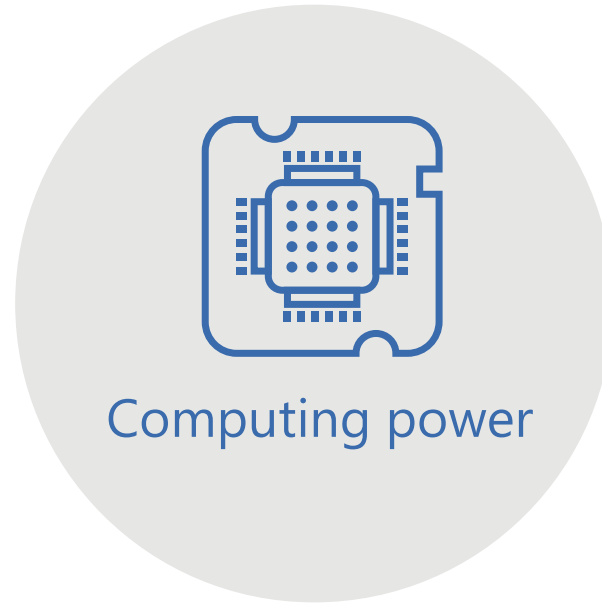
2010s  
Deep learning

2017  
Transformers

Today  
Zero-shot learners



The source of this versatility lies in the combination of vast reservoirs of data and massive computing power



New insights

# Financial sector applications

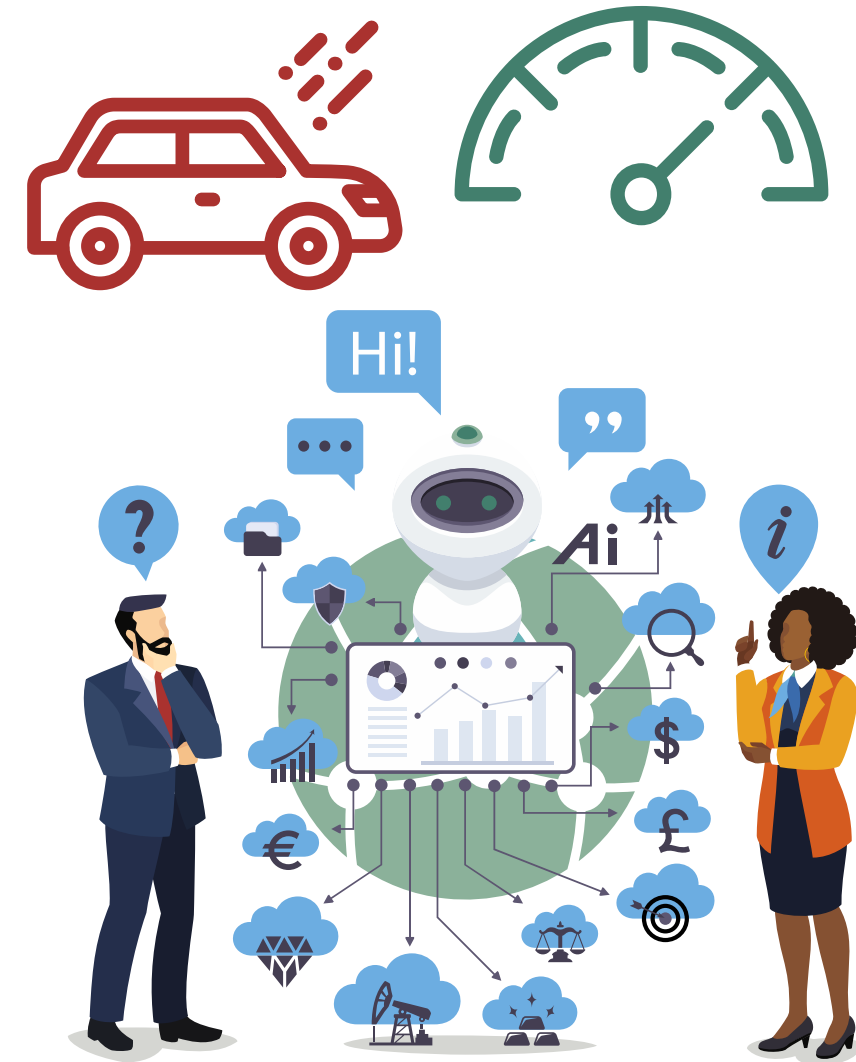
Examples include credit assessment and lending...



Examples include credit assessment and lending, assessing damages in insurance...



Examples include credit assessment and lending, assessing damages in insurance and various applications in asset management



Is this because AI has a magic ability to see things?



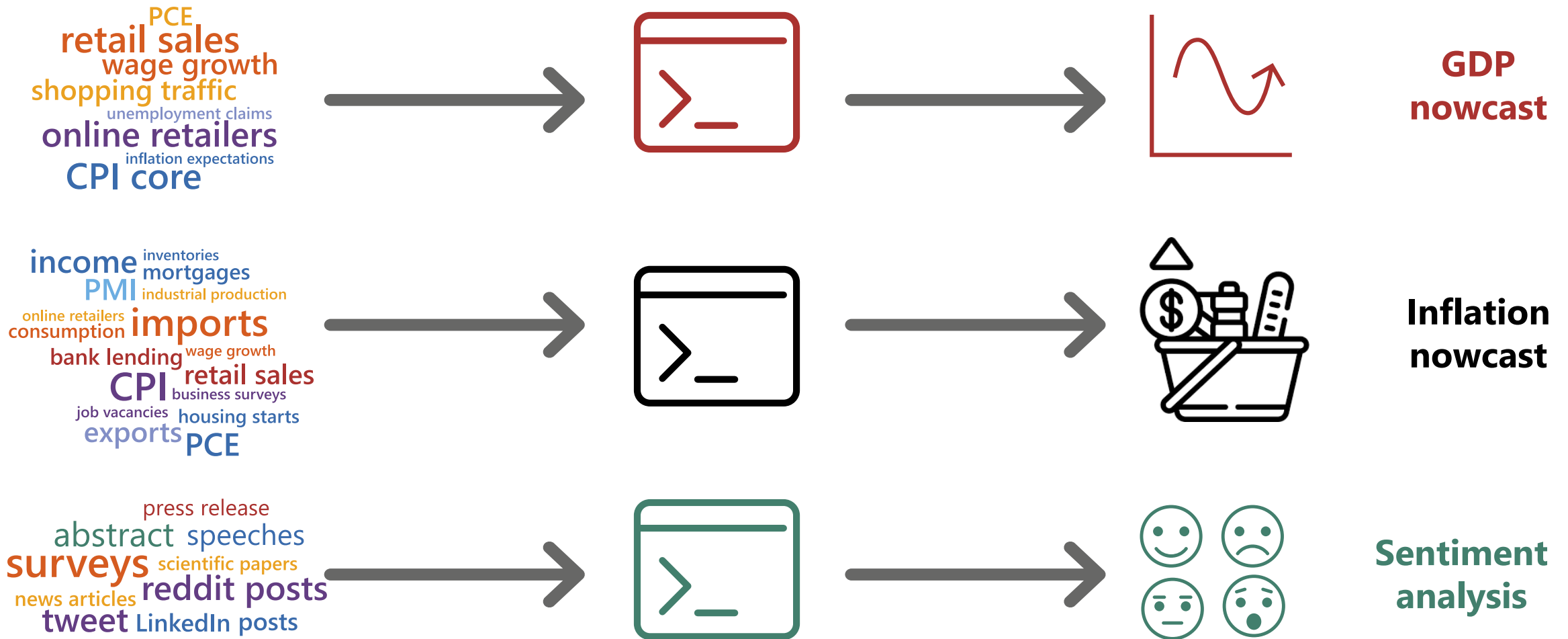
The answer is no. The secret ingredient is data, and lots of it! AI is ideally suited to identify patterns that are otherwise obscured



# Central bank use cases

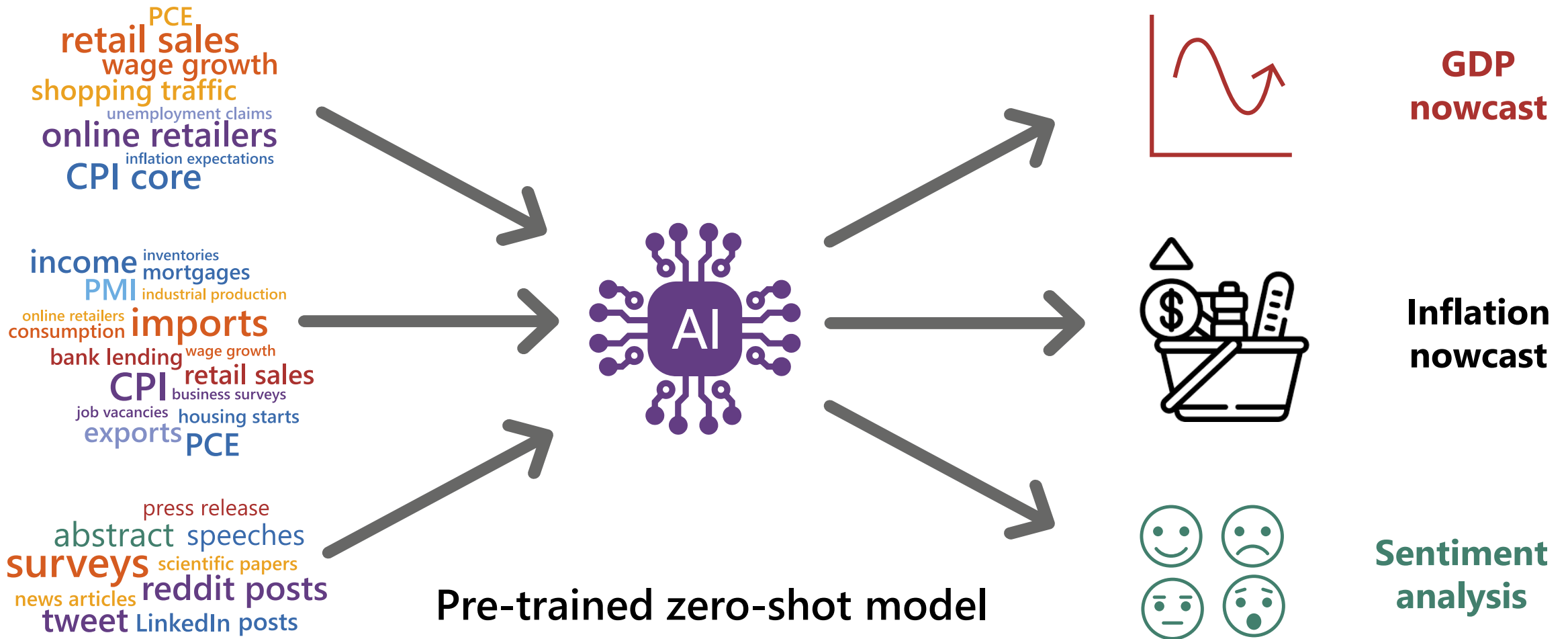


# A key application of large language models is nowcasting real activity or inflation

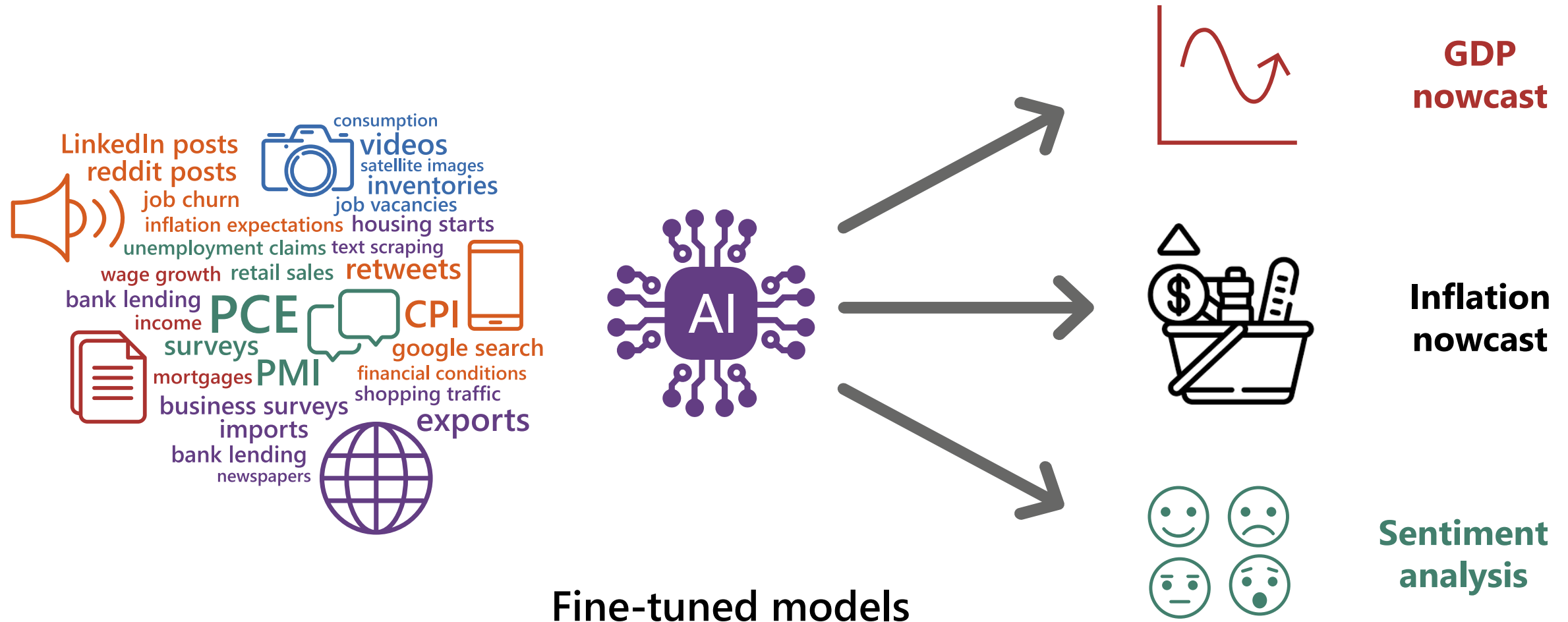


Pre-specified models

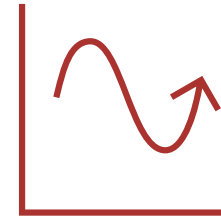
LLMs could help overcome the narrow scope of previous nowcasting models. As zero-shot learners, they can provide forecasts or nowcasts without fine-tuning



# Combining time series data with other forms of unstructured data could further enhance the capabilities of nowcasting models



Central banks should not succumb to “magical thinking” – that somehow the tools alone will bring miraculous outcomes



**GDP  
nowcast**

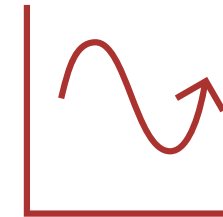


**Inflation  
nowcast**



**Sentiment  
analysis**

# Timely and plentiful data are key to the success of nowcasting applications



**GDP  
nowcast**



**Inflation  
nowcast**

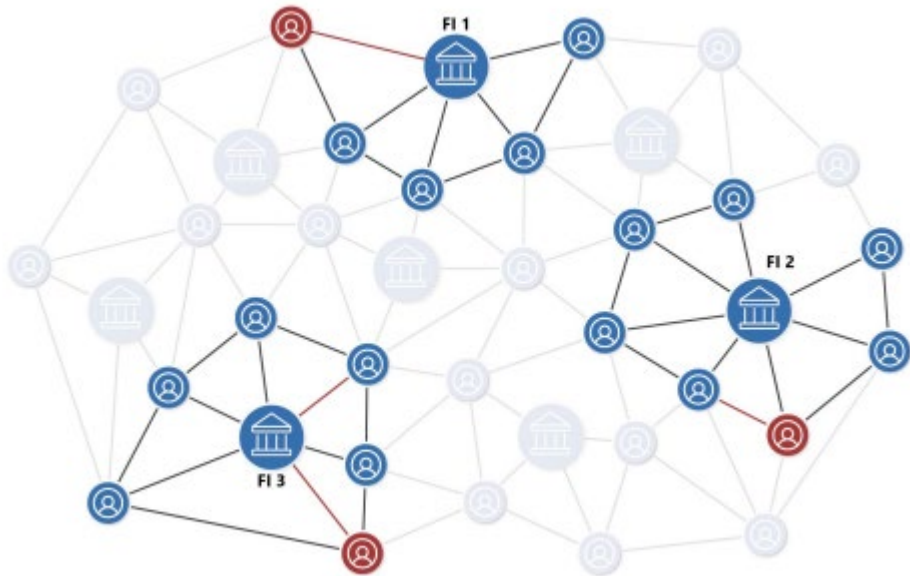


**Sentiment  
analysis**

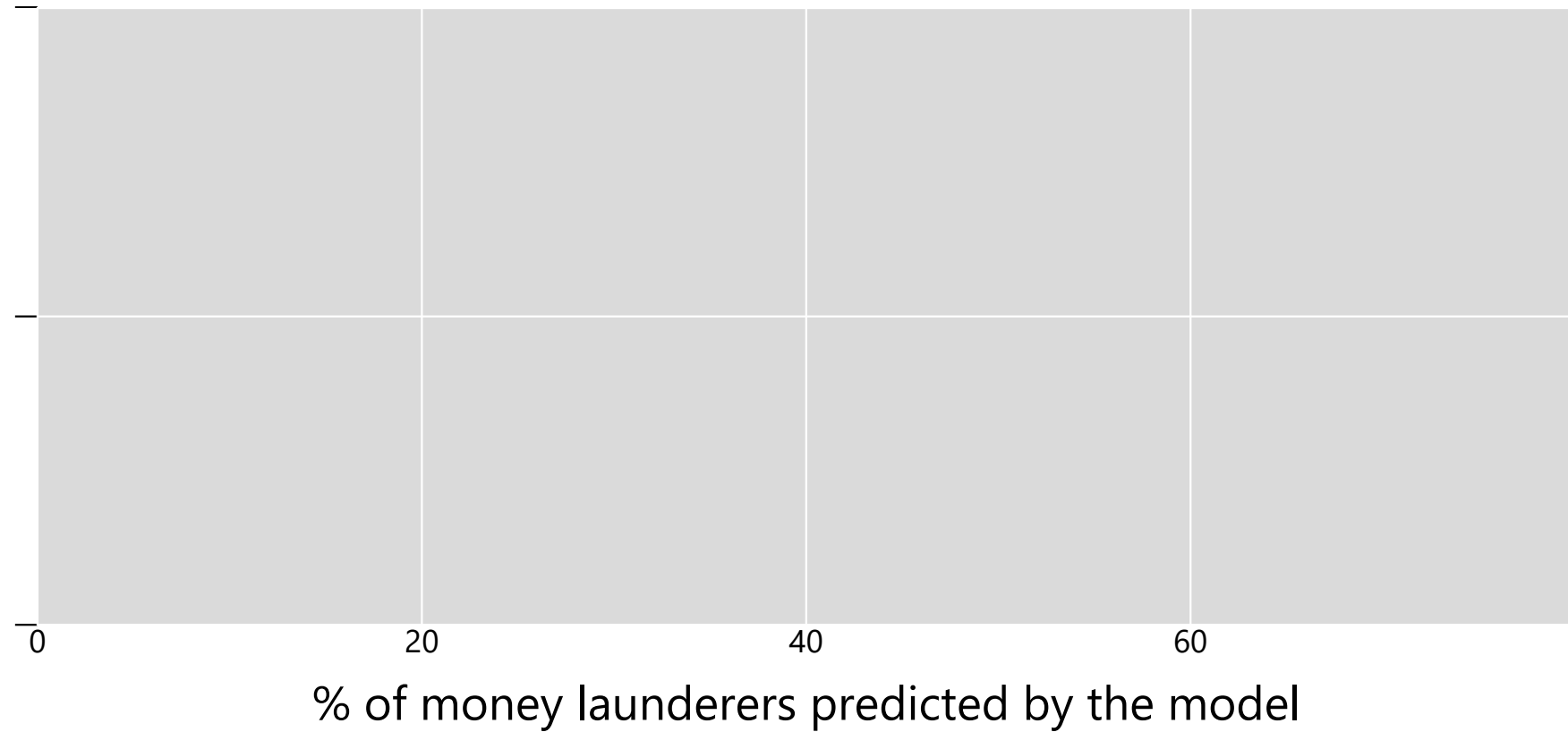
It is in the payment system where AI holds the greatest potential



Money laundering networks exploit the complexity of interconnections across firms both within and across borders

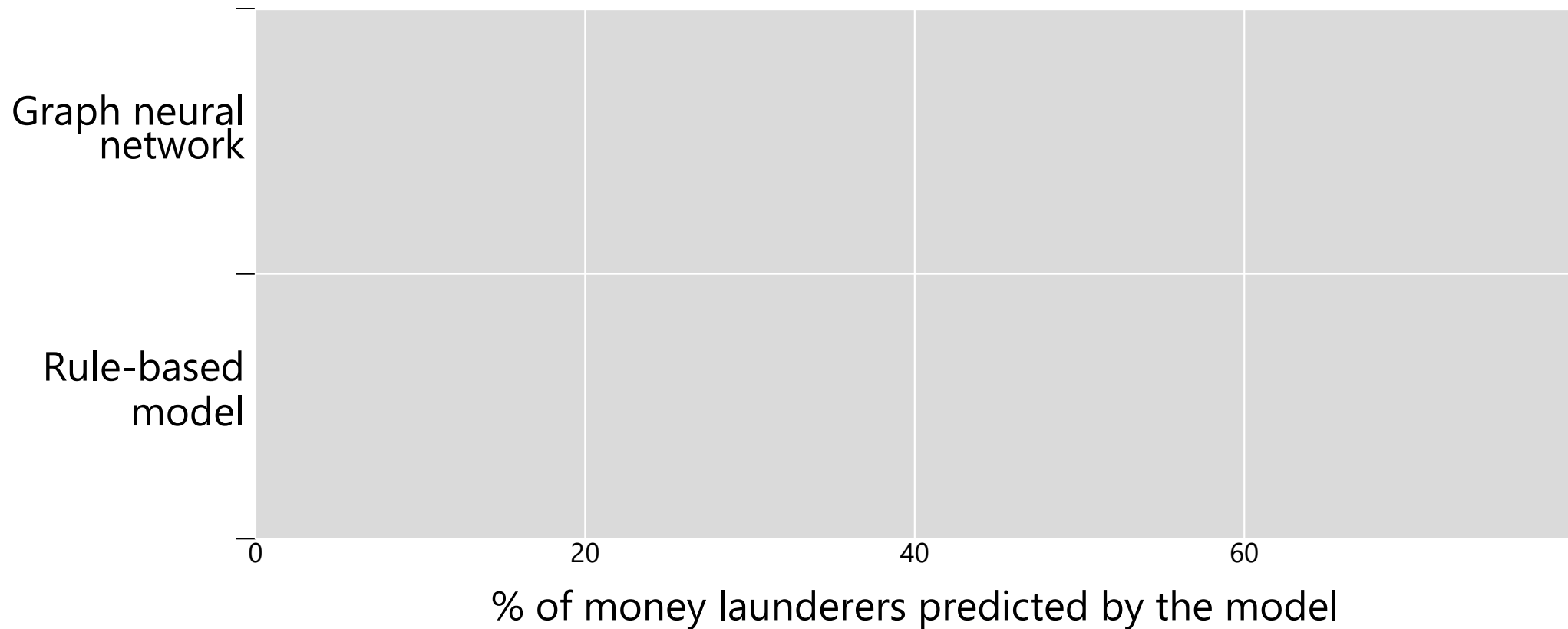


# AI tools can improve the detection of money laundering networks, as illustrated by Project Aurora from the BIS Innovation Hub

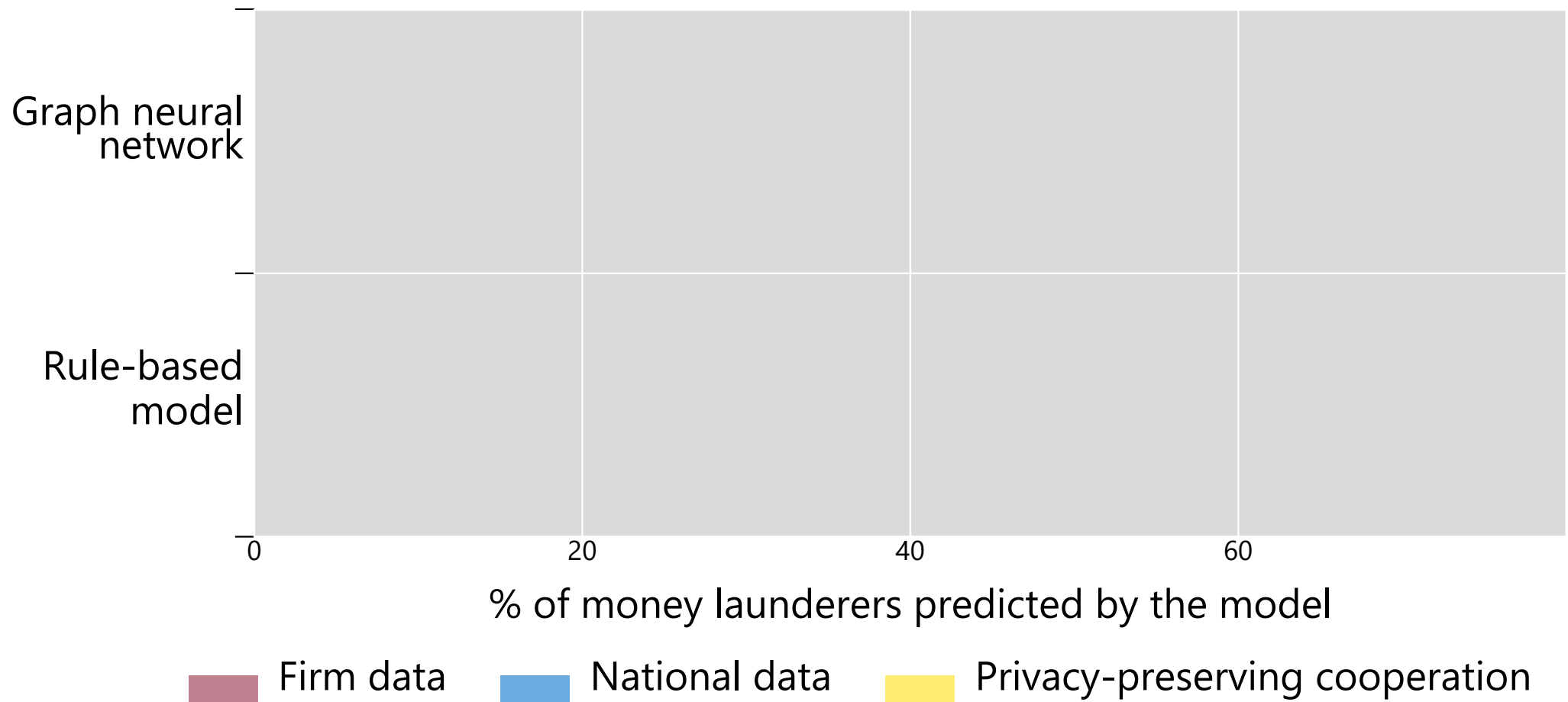




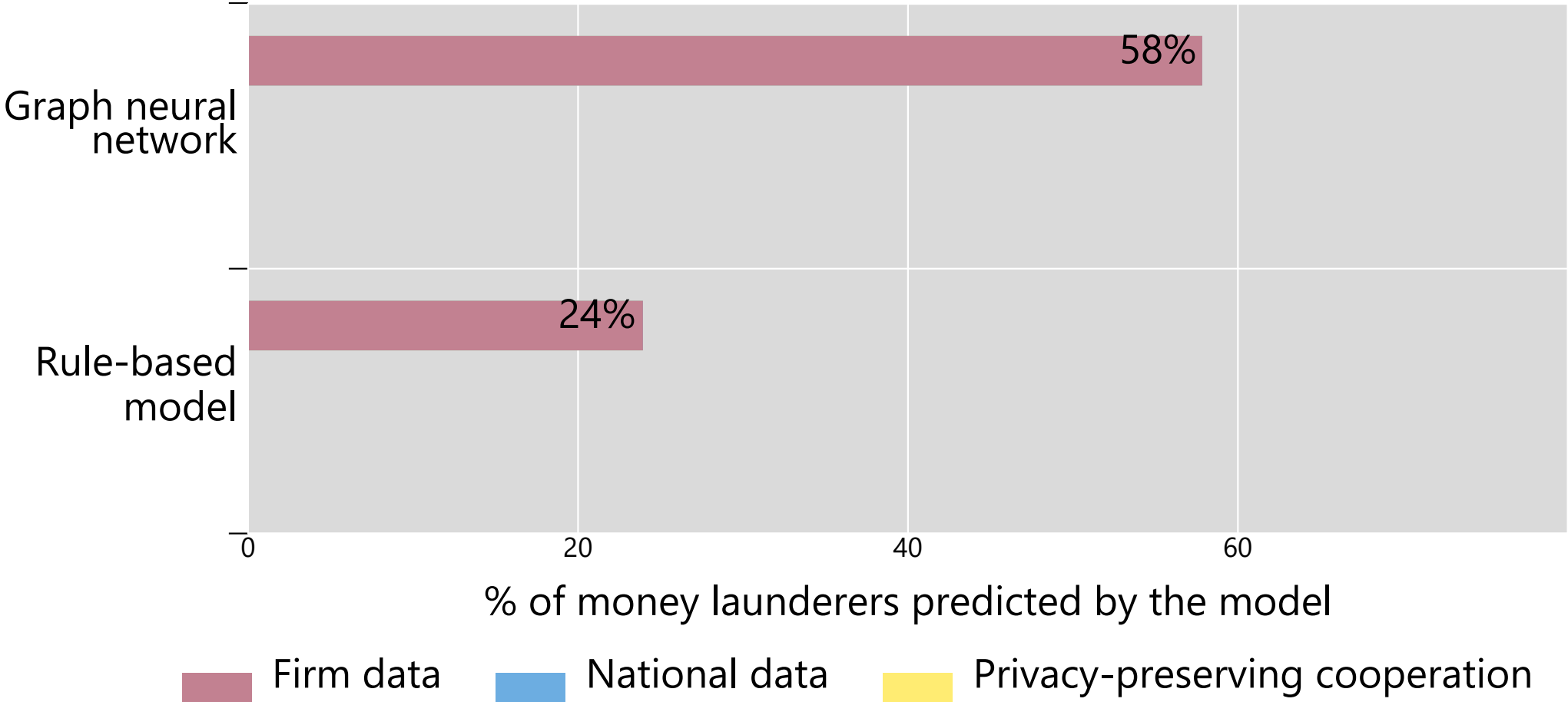
Aurora uses simulated data on money laundering activities to compare the performance of machine learning tools with the prevailing rule-based approach



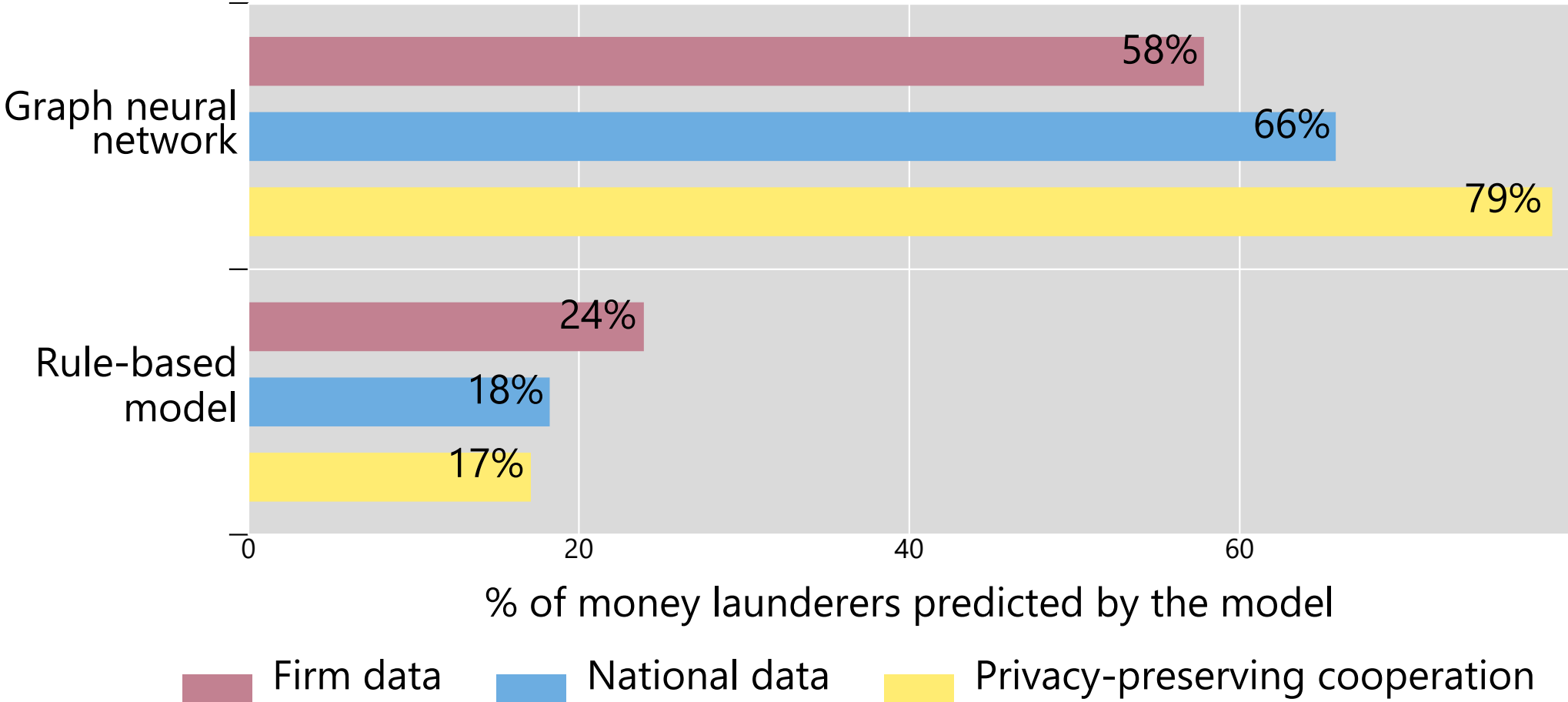
Comparison occurs under three scenarios: transaction data that are siloed at the bank level, national-level pooling of data and cross-border data cooperation



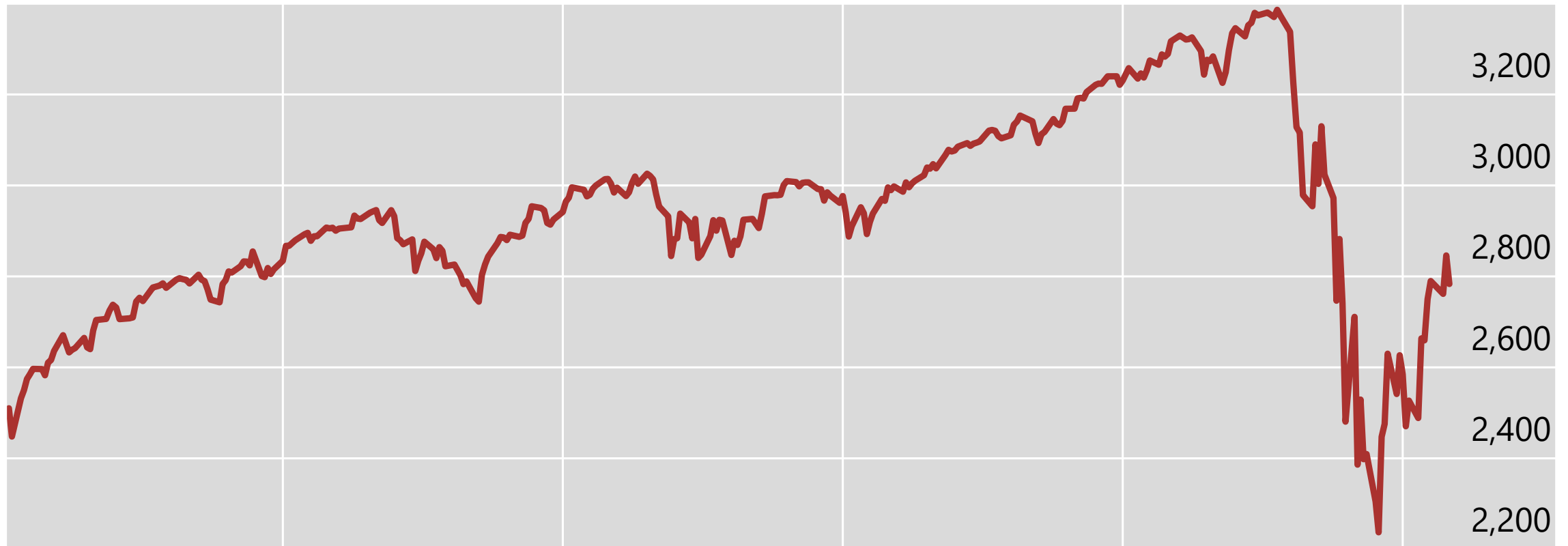
# Machine learning models outperform the traditional rule-based methods



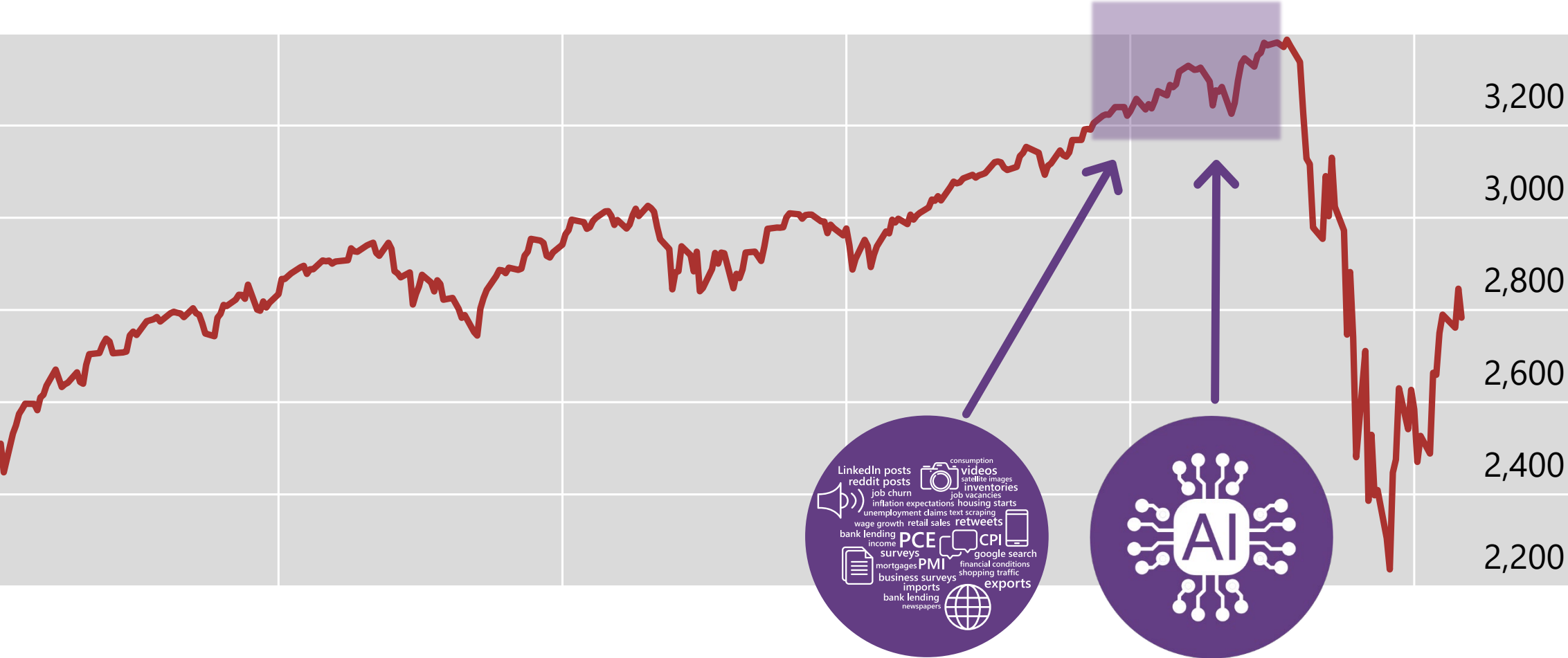
# Gains are largest with privacy-preserving data cooperation across jurisdictions



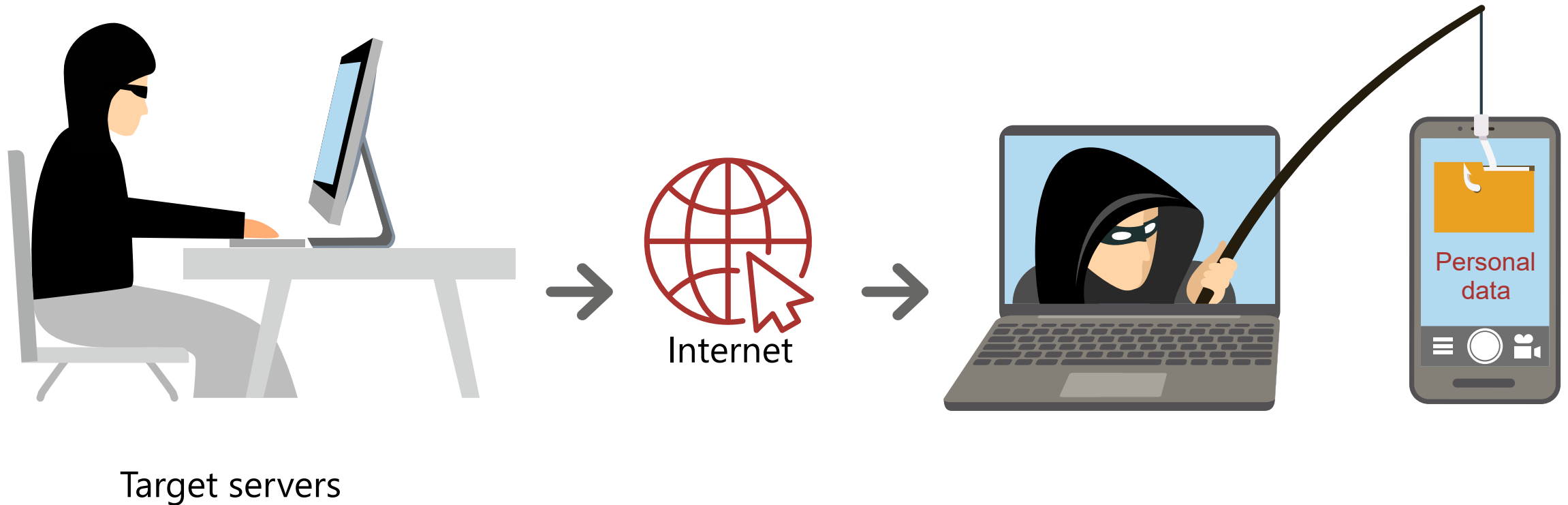
The reliance on the same handful of algorithms could amplify procyclicality and market volatility



# But AI could also be harnessed for more effective financial stability monitoring

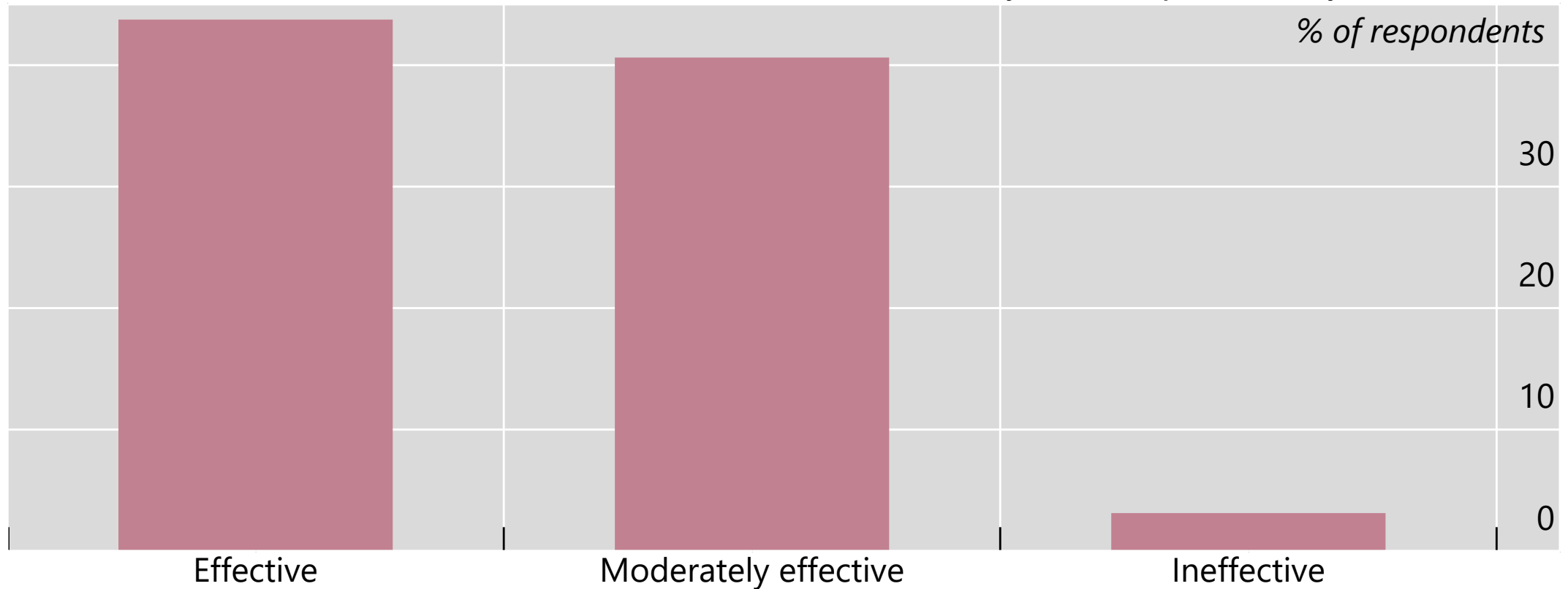


The adoption of AI could increase the risk of cyber attacks and introduce altogether new sources of cyber risk



But here again, just as AI increases cyber risks, it can also be harnessed by cyber defenders

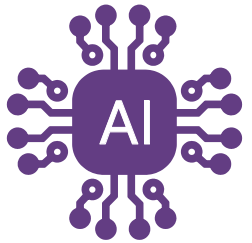
Central banks see more benefits than risks in AI to identify and respond to cyber threats



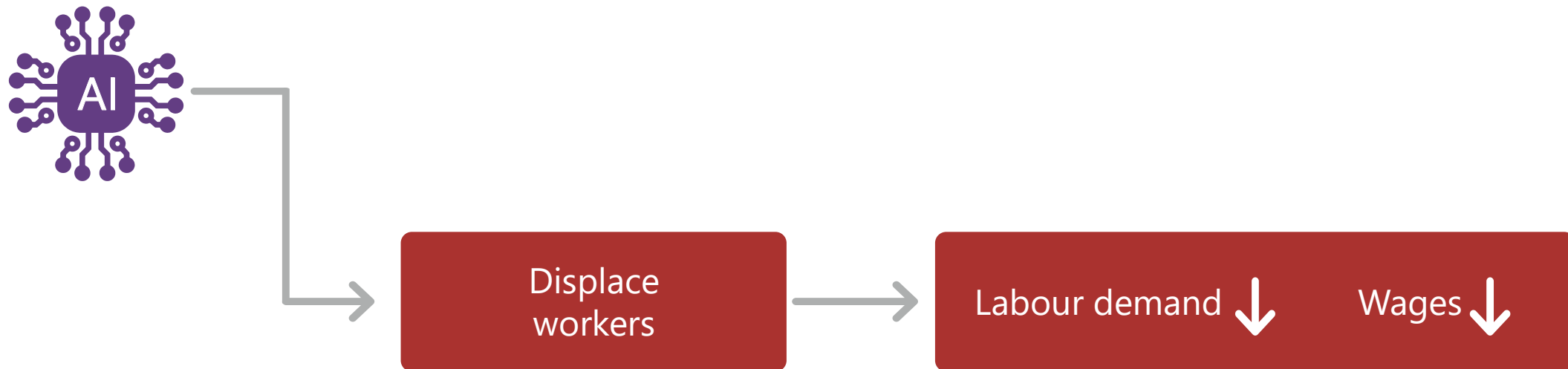


# Macroeconomic impact of AI

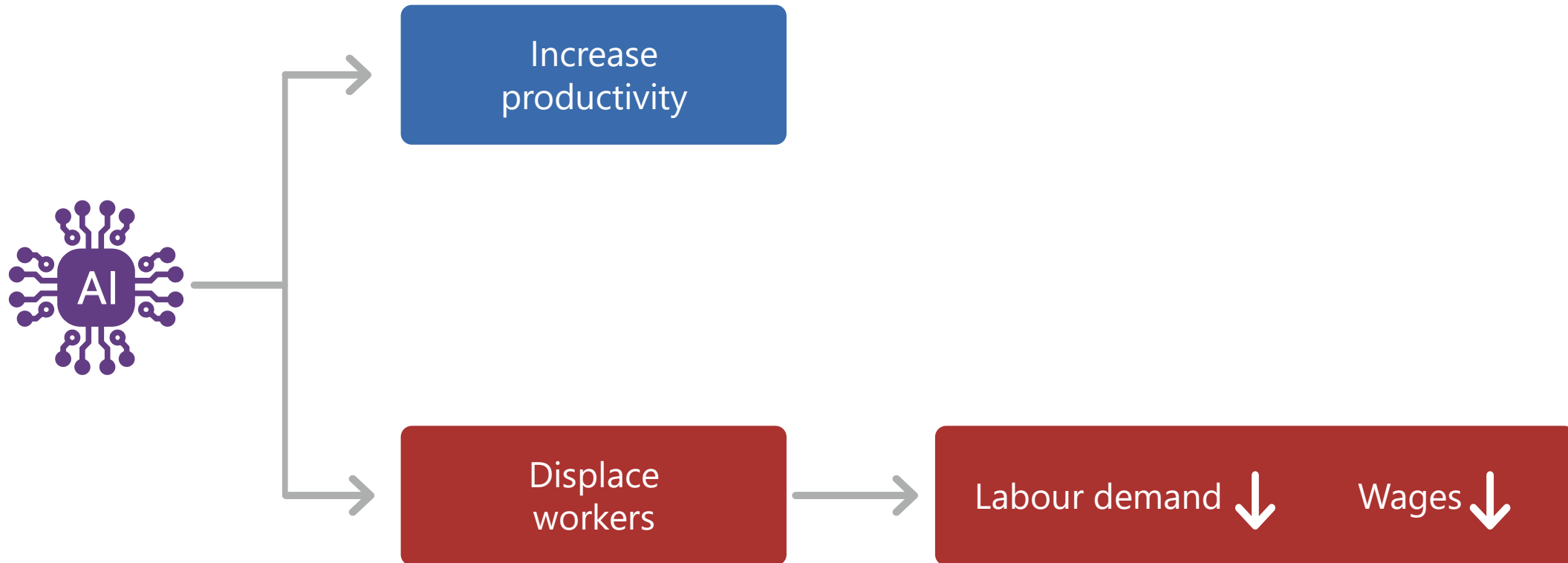
When it comes to the labour market and the macroeconomy, the overall impact of AI will depend on the relative importance of several channels



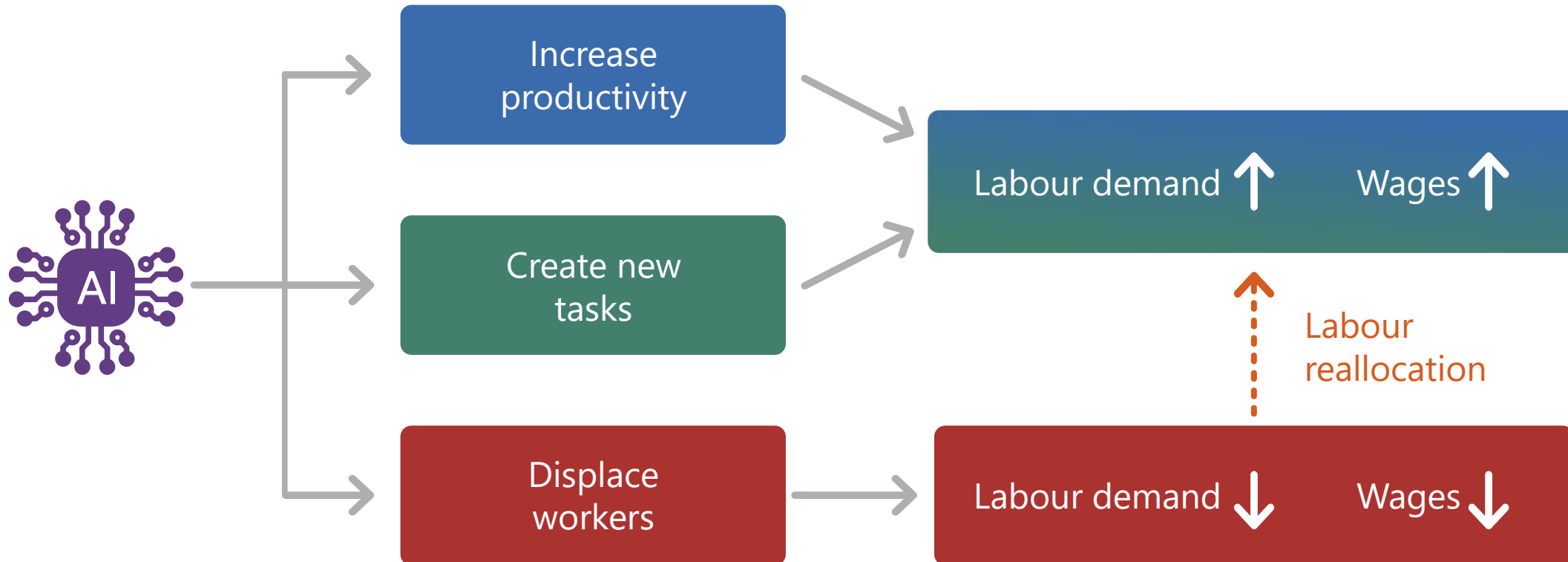
# How many workers AI displaces...



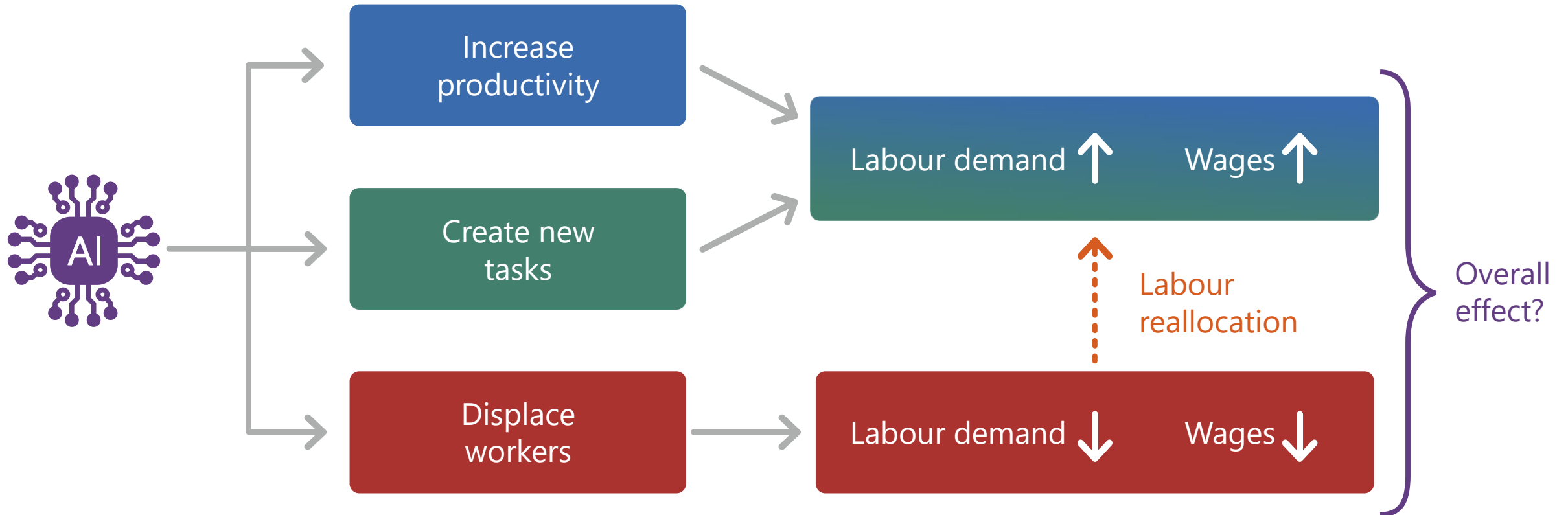
# How many workers AI displaces, by how much it raises productivity...



How many workers AI displaces, by how much it raises productivity and how many new tasks it creates

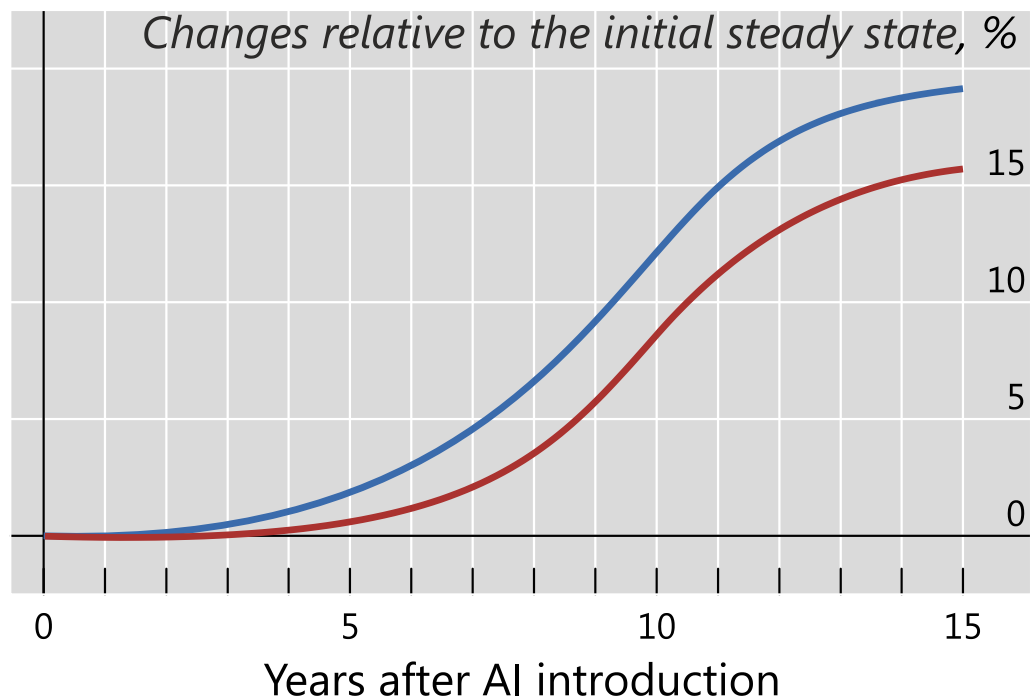


How many workers AI displaces, by how much it raises productivity and how many new tasks it creates

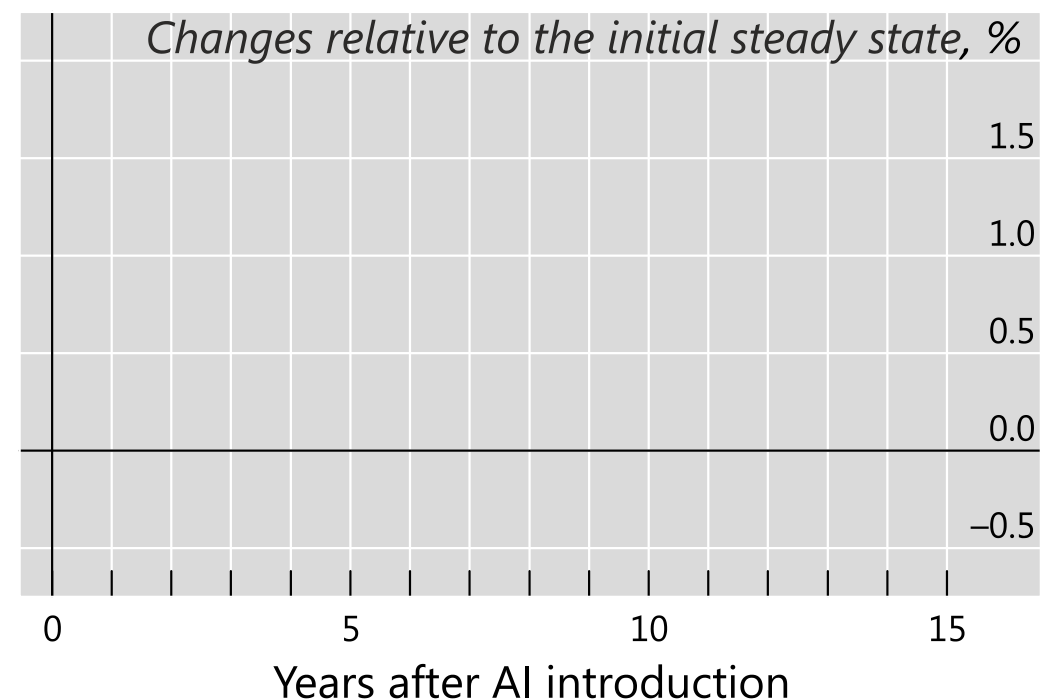


# AI will expand both aggregate demand and supply – and thereby lead to an increase in output

AI will raise output in the short and long run...



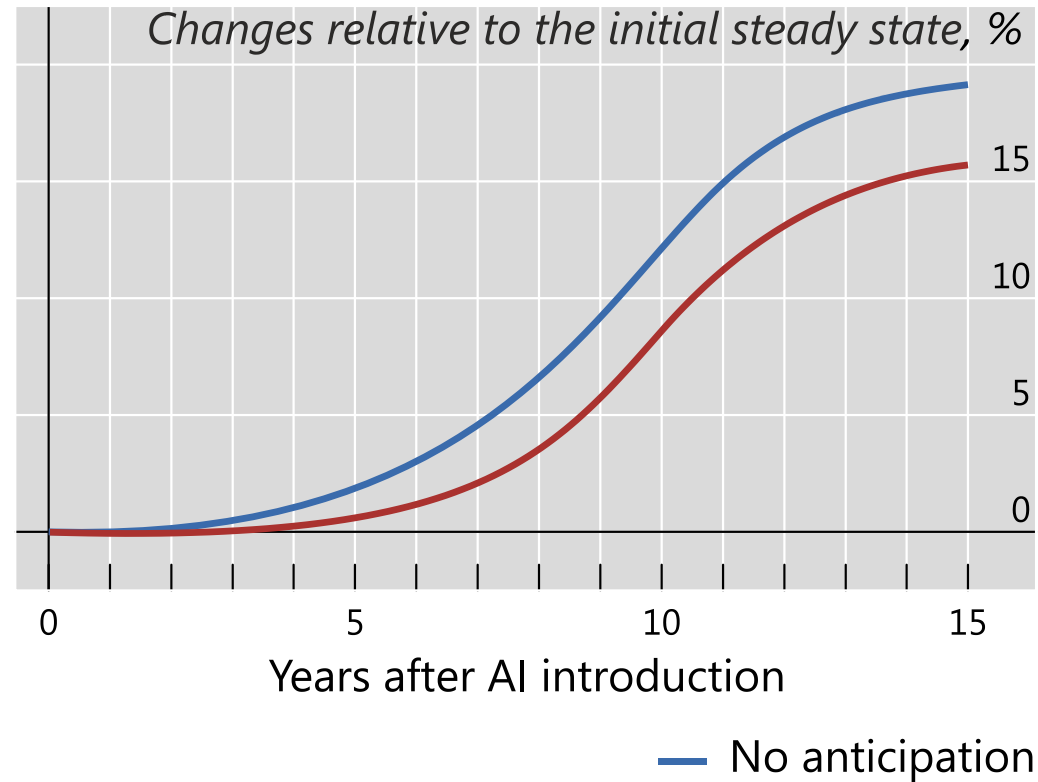
— No anticipation



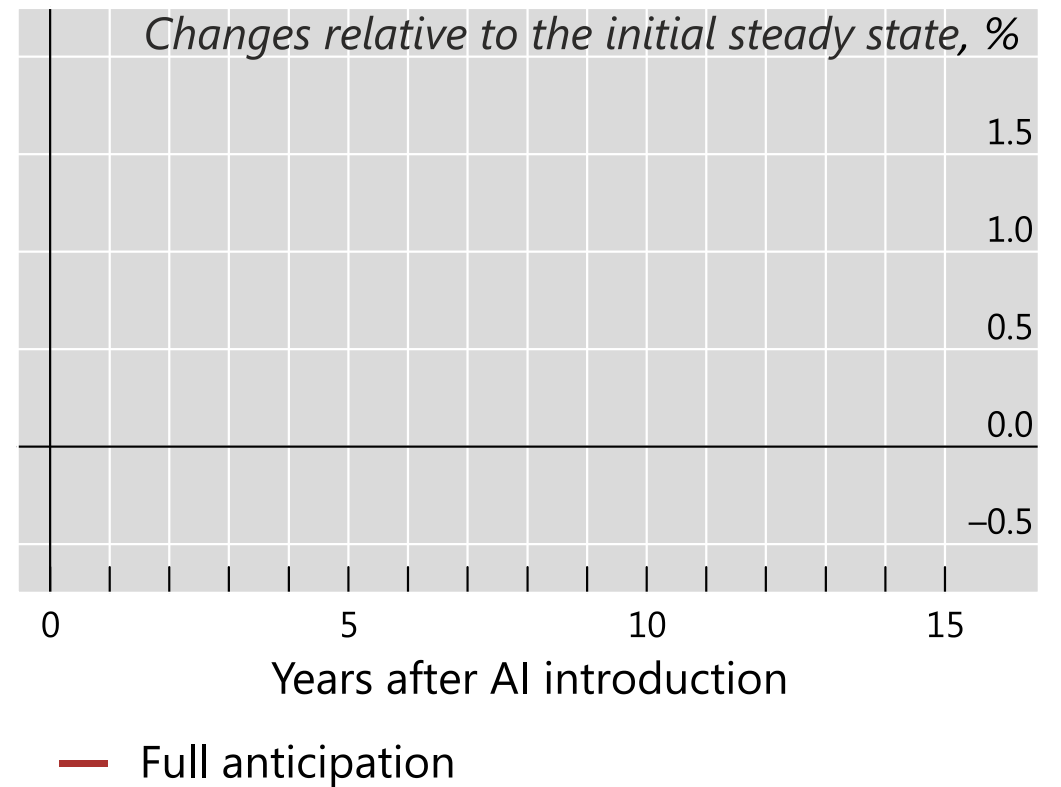
— Full anticipation

# The effects on inflationary pressures in the near term depend on the relative impact on aggregate demand vs supply

AI will raise output in the short and long run...



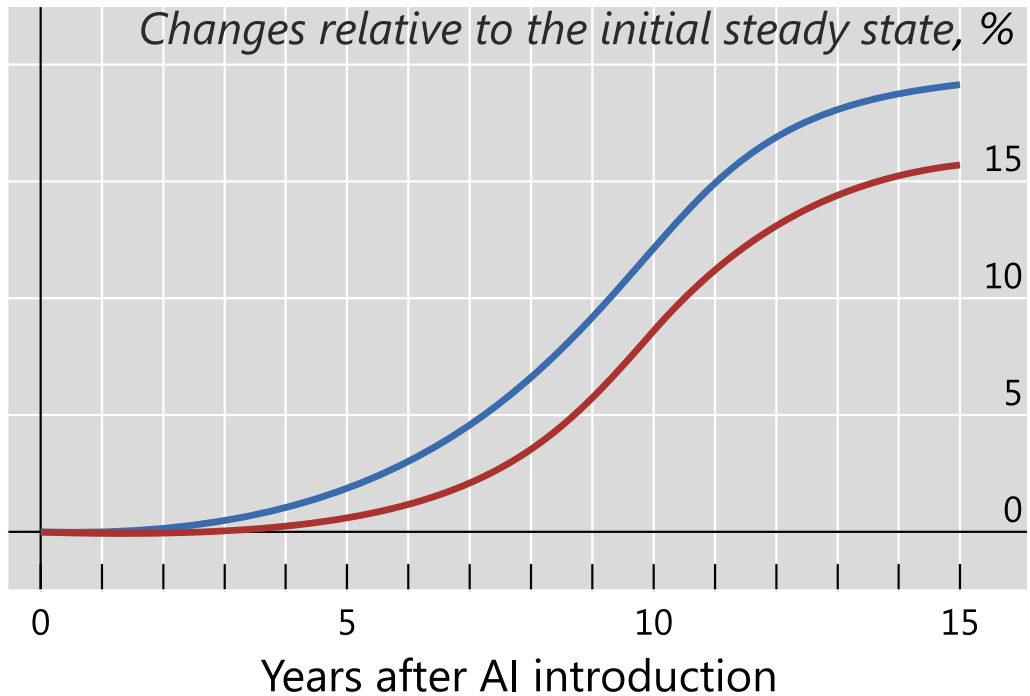
...but could lead to inflationary or disinflationary pressures in the short run





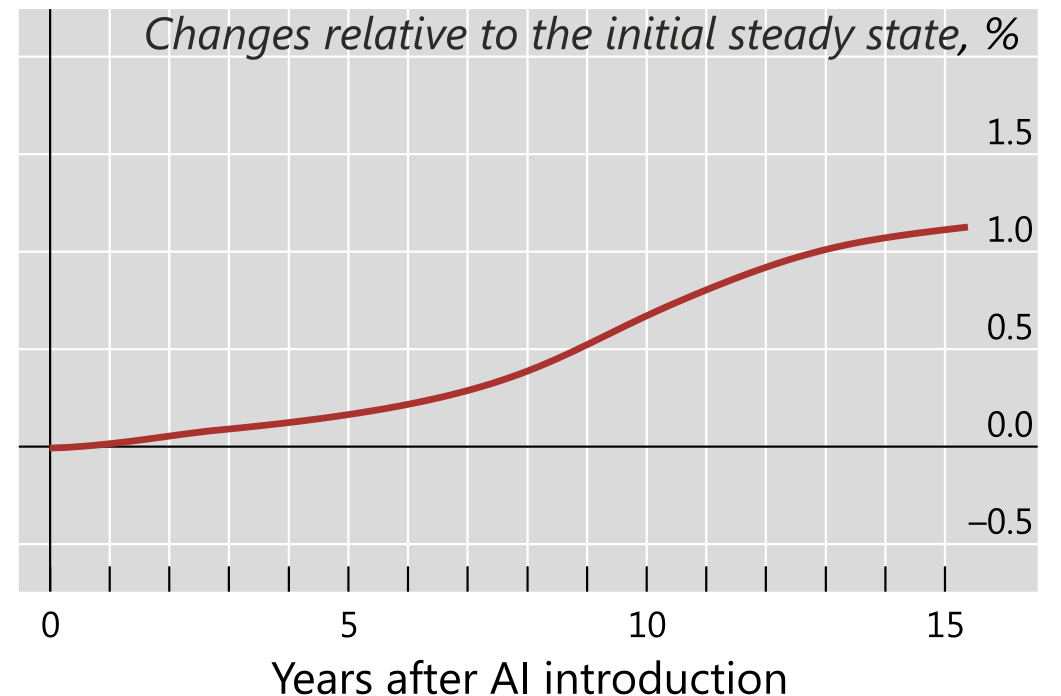
If households anticipate the higher income tomorrow, they will spend more today. Inflationary pressures depend on whether spending outstrips supply

AI will raise output in the short and long run...



— No anticipation

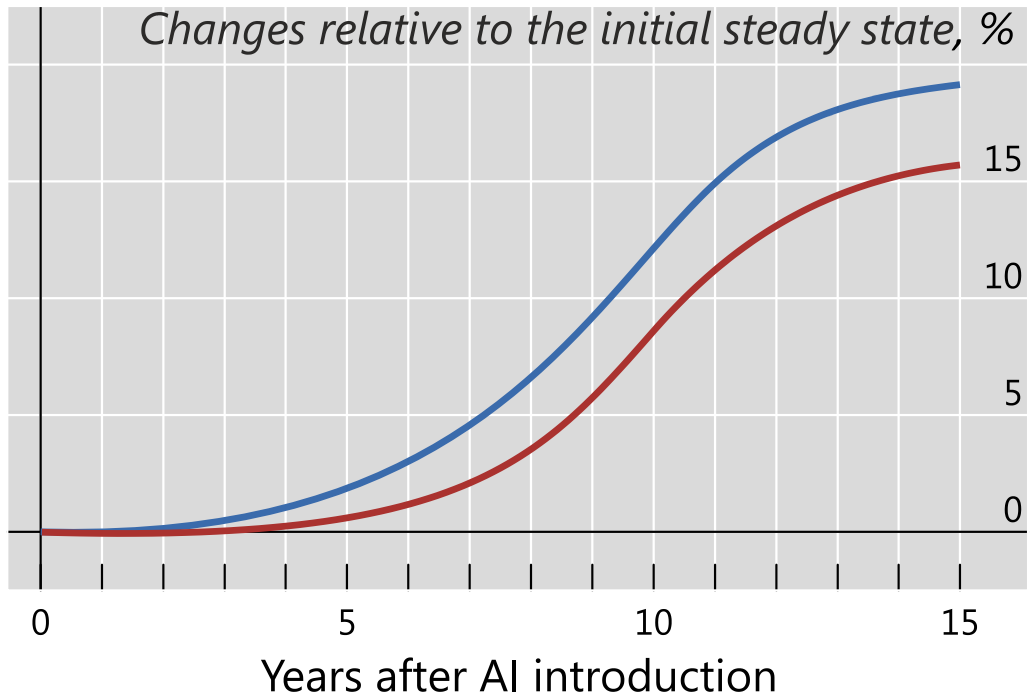
...but could lead to inflationary or disinflationary pressures in the short run



— Full anticipation

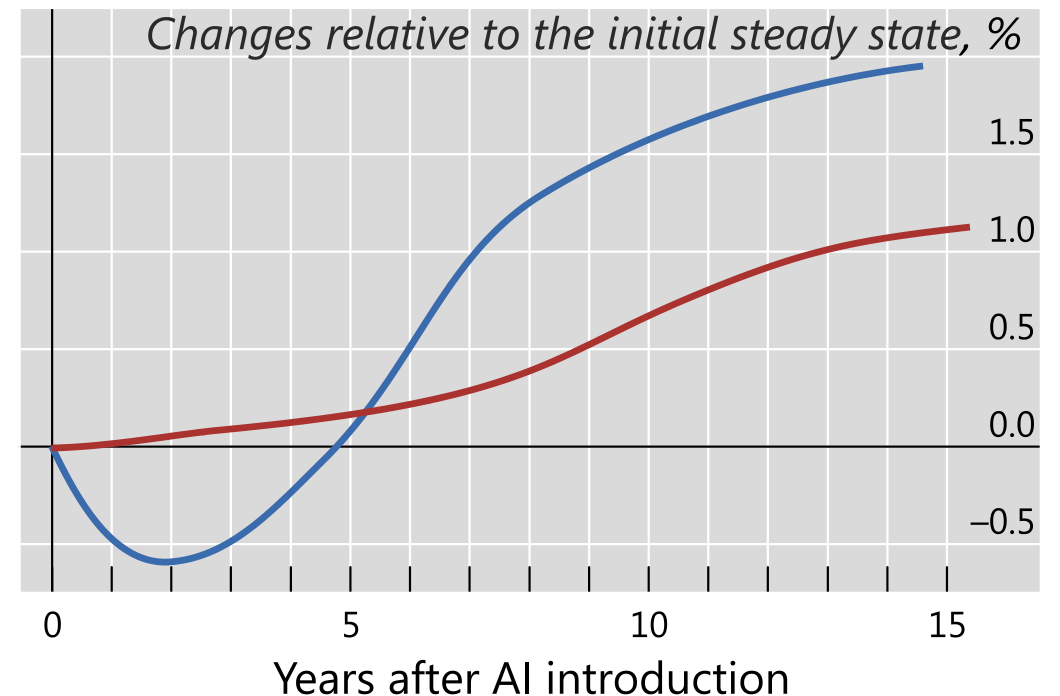
# When there is less anticipation, AI will be less inflationary in the short run

AI will raise output in the short and long run...



— No anticipation

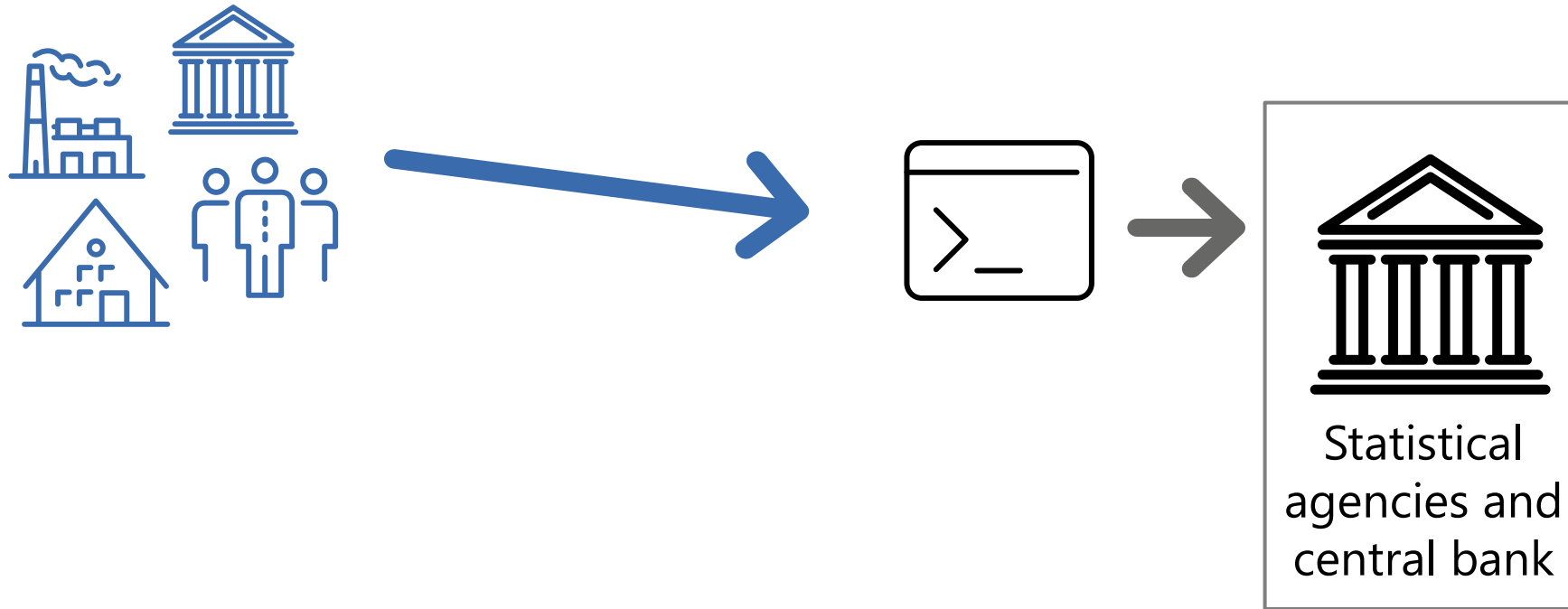
...but could lead to inflationary or disinflationary pressures in the short run



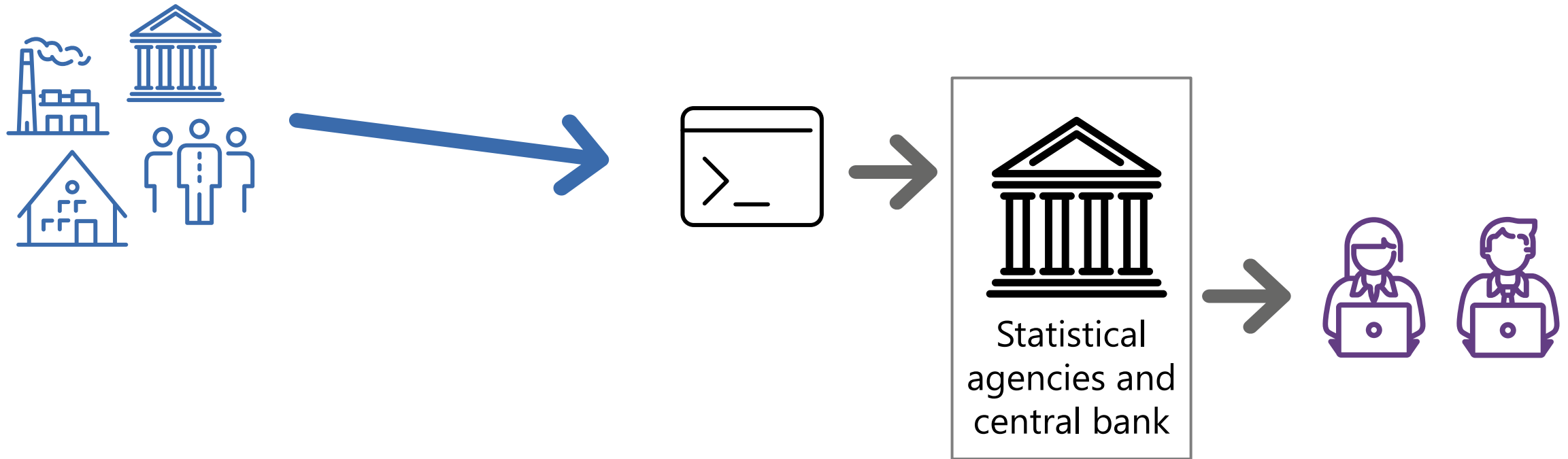
— Full anticipation

# Toward an action plan for central banks

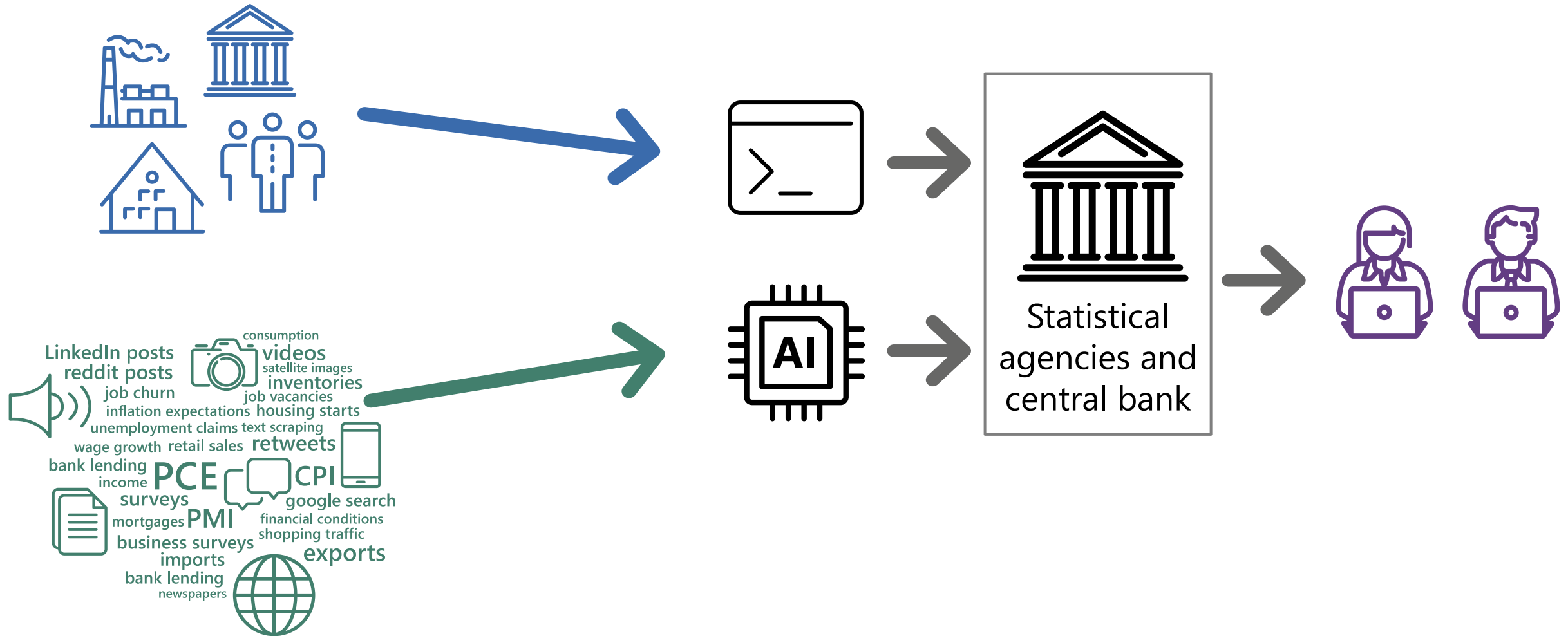
Traditionally, most data were collected and hosted within statistical agencies, including the central bank, with clearly defined access rights



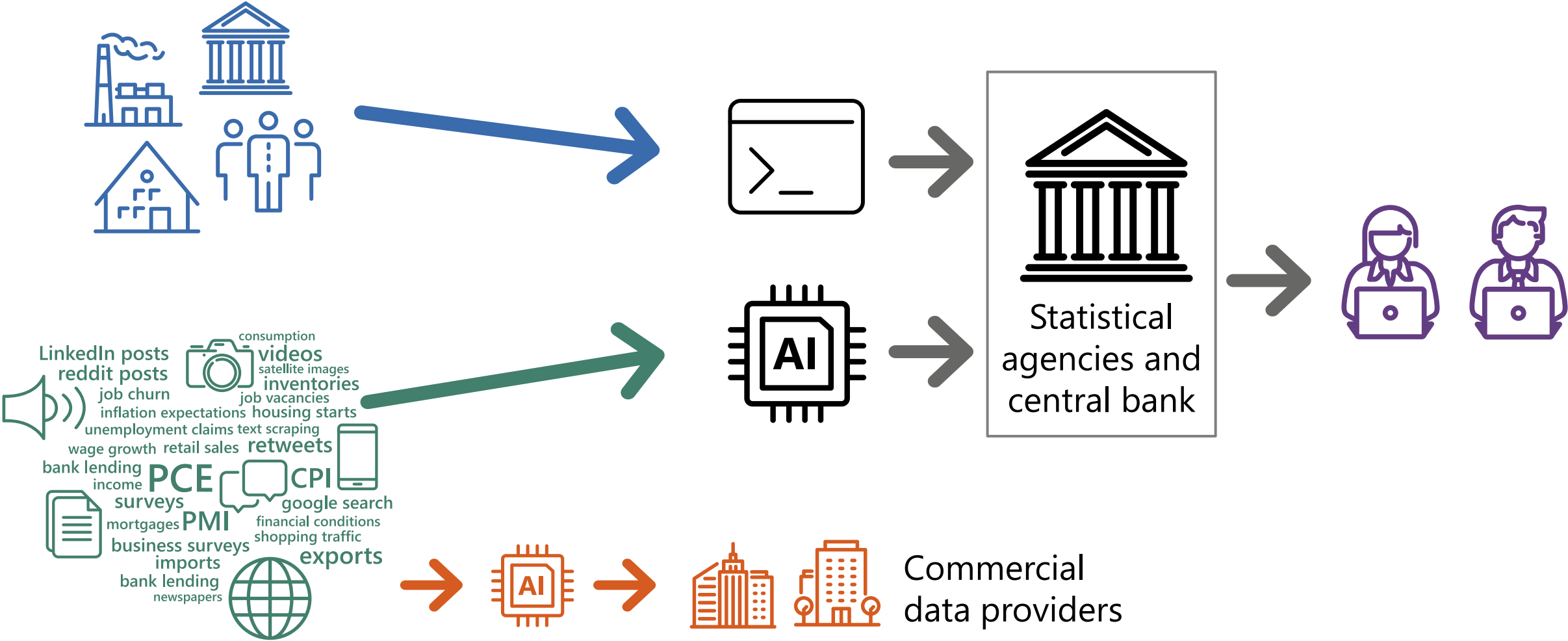
Public institutions have traditionally acted as data provider to private sector firms and the general public



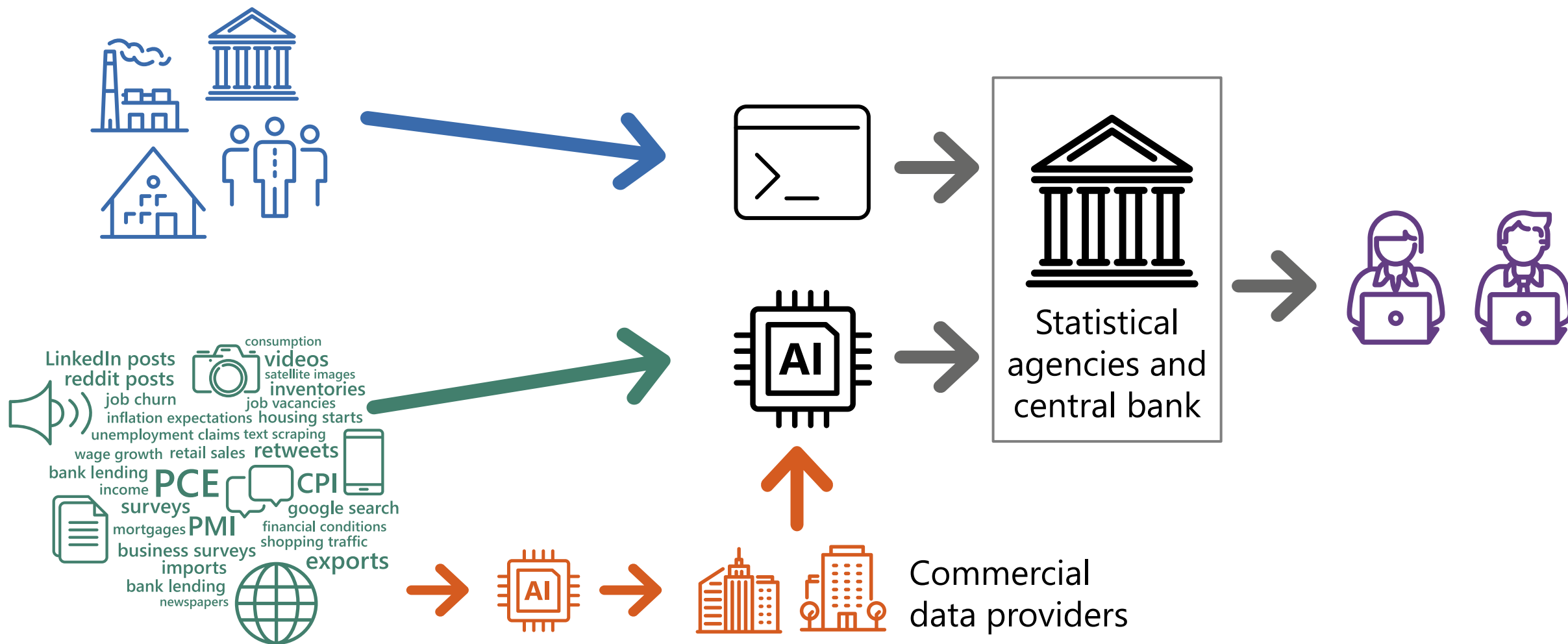
The age of AI will rely increasingly on unstructured data drawn from all walks of life. Central banks already use AI and unstructured data to fulfil their mandates



# But much of the unstructured data reside in the hands of the private sector...

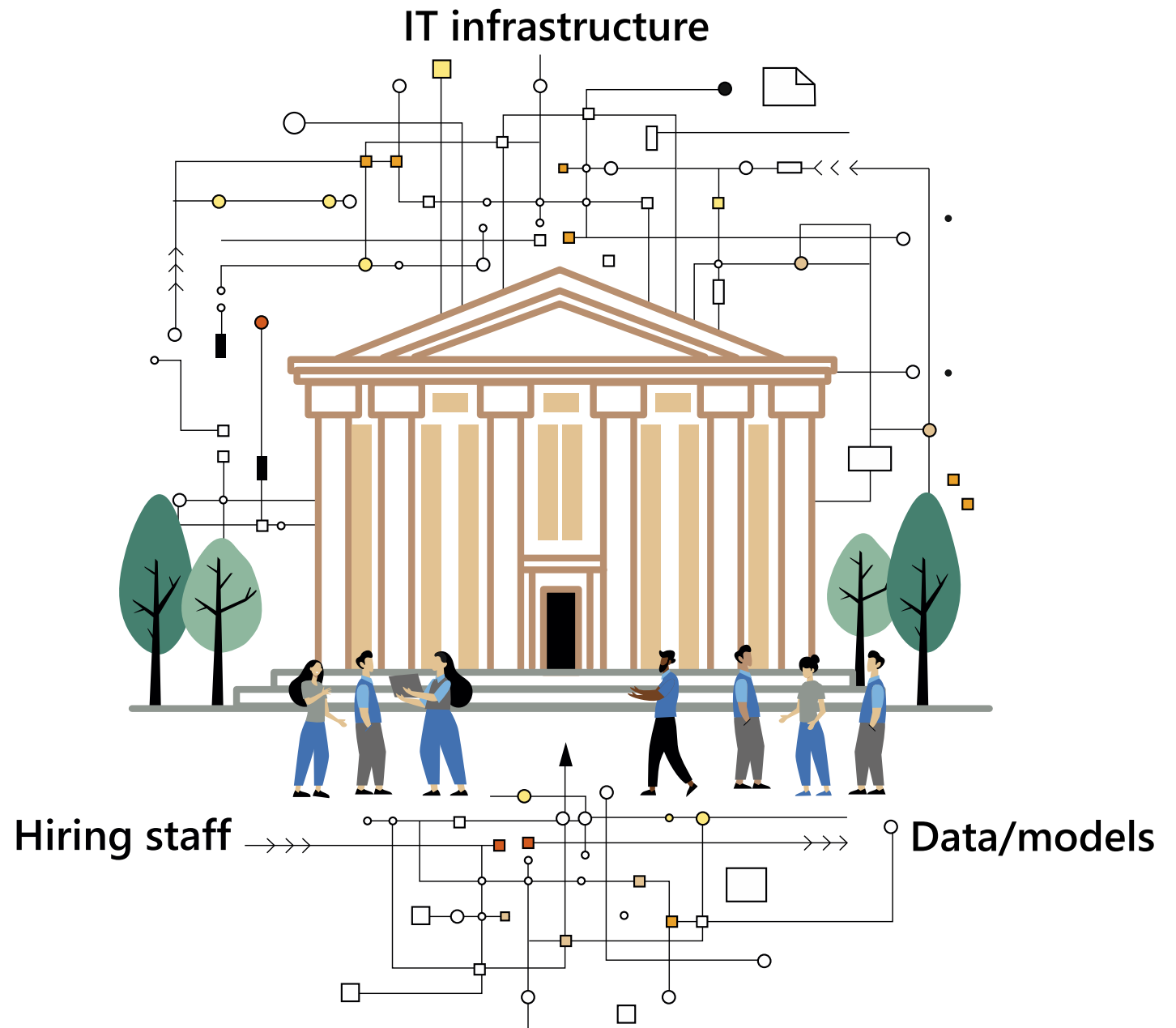


But much of the unstructured data reside in the hands of the private sector, which increasingly acts as data provider

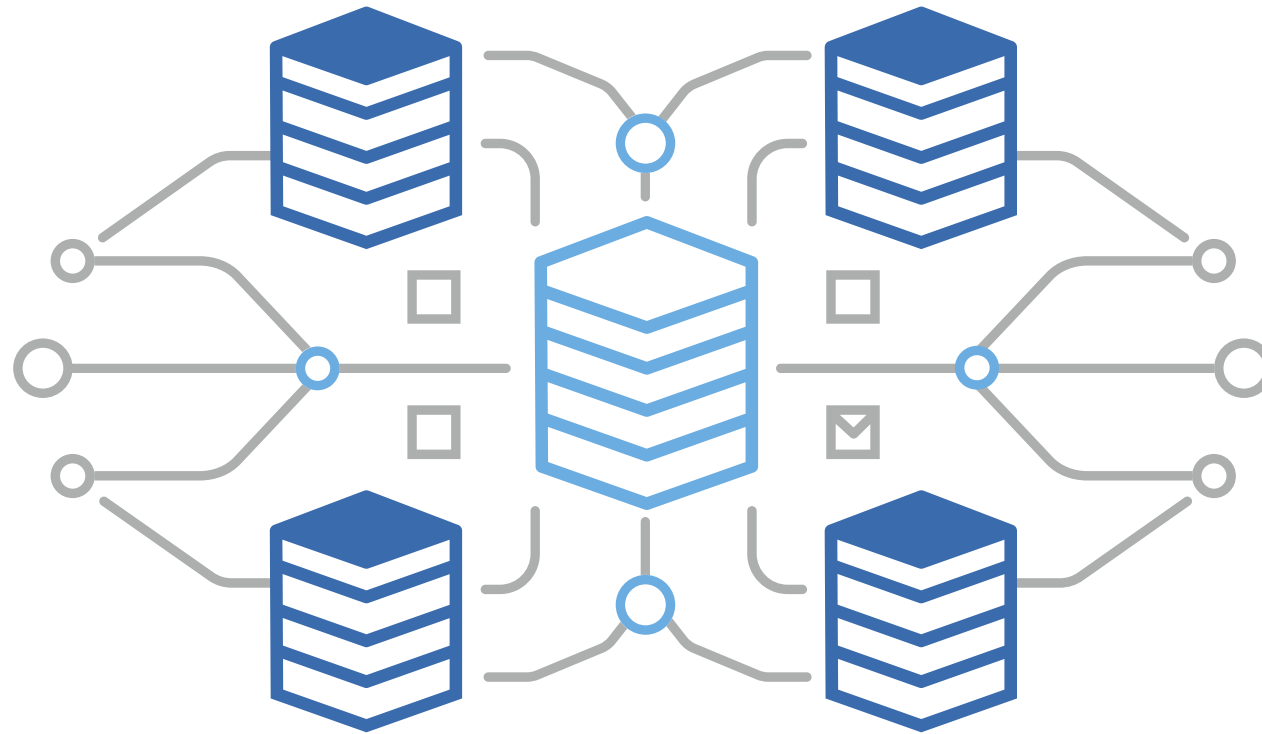




The importance of data is a key factor in central banks' investments in information technology and human capital

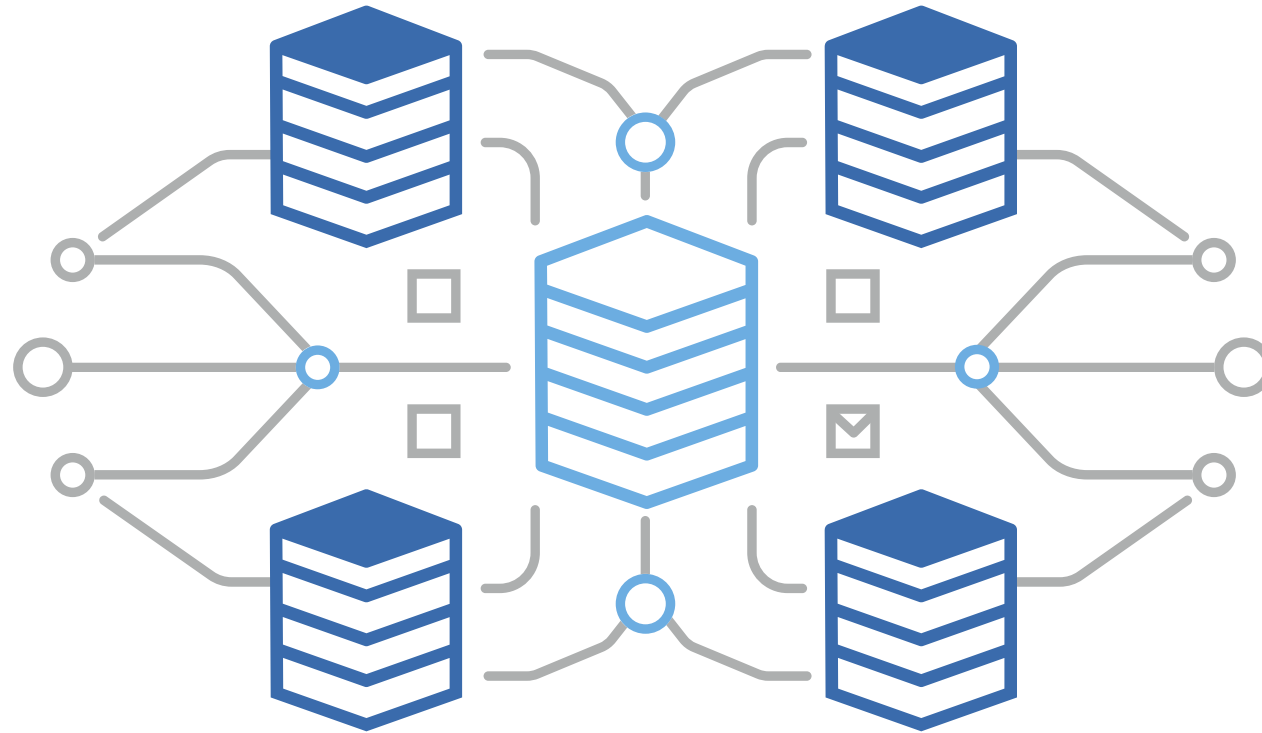


## How can central banks address these challenges?

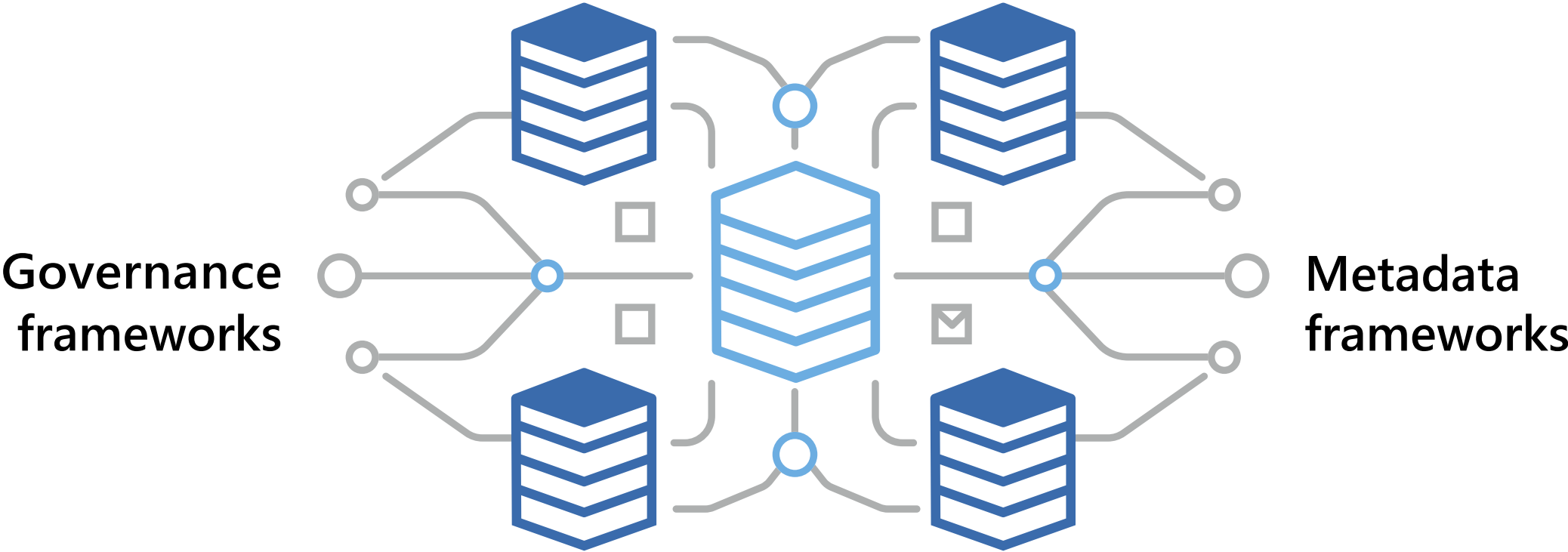


The rising importance of data and emergence of new data sources call for even greater attention to sound data governance practices

**Governance frameworks**



# Metadata frameworks are crucial for data comparability and easier retrieval



Cooperation  
is key



Pooling resources  
and knowledge can  
mitigate resource  
constraints



Sharing models  
lowers the hurdles  
for adoption



Central banks need to update their thinking on their roles as data producers, users and disseminators





Central banks  
should come  
together to foster a  
**community of  
practice**

