



# AI and the economy of tomorrow

October 2024

*Lars Christensen*

# This is what we are talking about



# ...and the markets

## NVIDIA Corp

NVDA:NASDAQ

EXPORT ↕

WATCHLIST +

LIVESTREAM

Squawk on the Street

RT Quote | Last NASDAQ LS, VOL From CTA | USD

Last | 9:33 AM EDT

**139.14** ▼ **-1.38 (-0.98%)**

Volume

5,767,971

52 week range

39.23 - 144.42

1D 5D 1M 3M 6M YTD 1Y 5Y ALL



+ Comparison

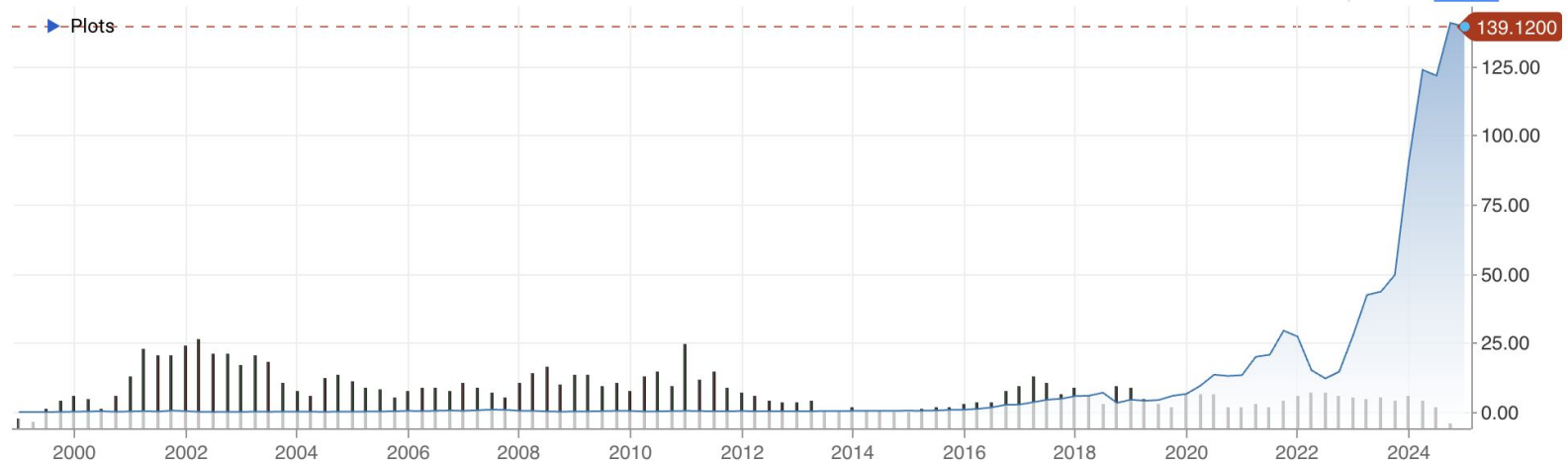
1M

Display

Studies

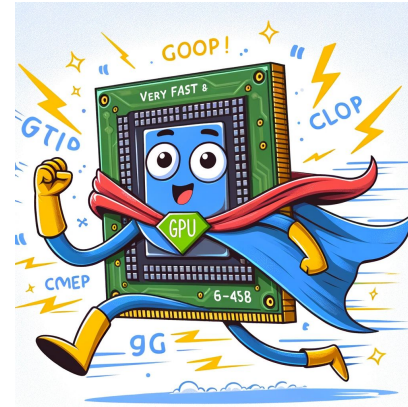


Plots



# The AI revolution – why?

35 years of data



Fast and cheap computing power

---

## Attention Is All You Need

---

Ashish Vaswani\*  
Google Brain  
avaswani@google.com

Noam Shazeer\*  
Google Brain  
noam@google.com

Niki Parmar\*  
Google Research  
nikip@google.com

Jakob Uszkoreit\*  
Google Research  
usz@google.com

Llion Jones\*  
Google Research  
llion@google.com

Aidan N. Gomez†  
University of Toronto  
aidan@cs.toronto.edu

Lukasz Kaiser\*  
Google Brain  
lukasz@kaiser@google.com

Illia Polosukhin\* †  
illia.polosukhin@gmail.com

### Abstract

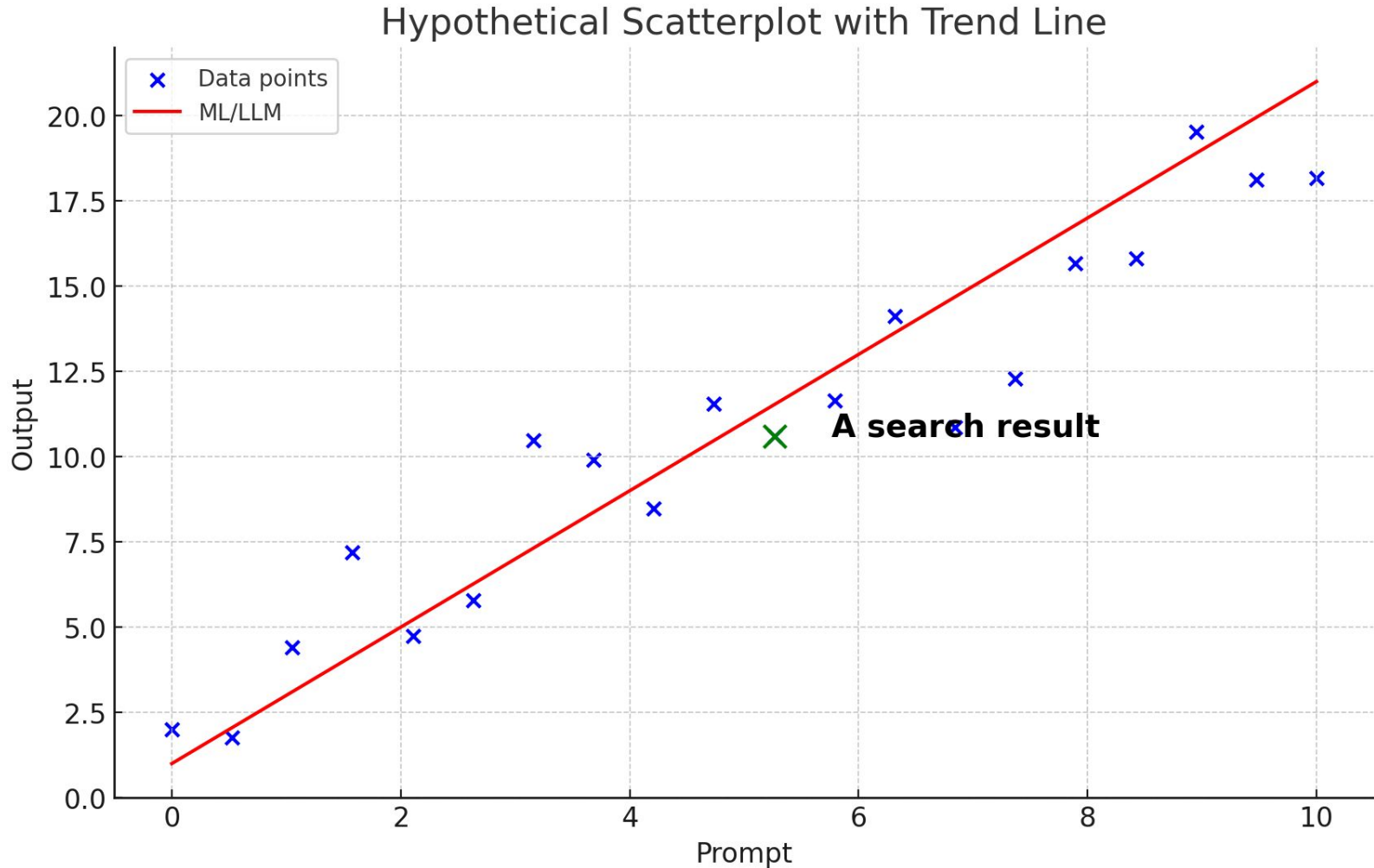
The dominant sequence transduction models are based on complex recurrent or convolutional neural networks that include an encoder and a decoder. The best performing models also connect the encoder and decoder through an attention mechanism. We propose a new simple network architecture, the Transformer, based solely on attention mechanisms, dispensing with recurrence and convolutions entirely. Experiments on two machine translation tasks show these models to be superior in quality while being more parallelizable and requiring significantly less time to train. Our model achieves 28.4 BLEU on the WMT 2014 English-to-German translation task, improving over the existing best results, including ensembles, by over 2 BLEU. On the WMT 2014 English-to-French translation task, our model establishes a new single-model state-of-the-art BLEU score of 41.8 after training for 3.5 days on eight GPUs, a small fraction of the training costs of the best models from the literature. We show that the Transformer generalizes well to other tasks by applying it successfully to English constituency parsing both with large and limited training data.

## An idea



2017

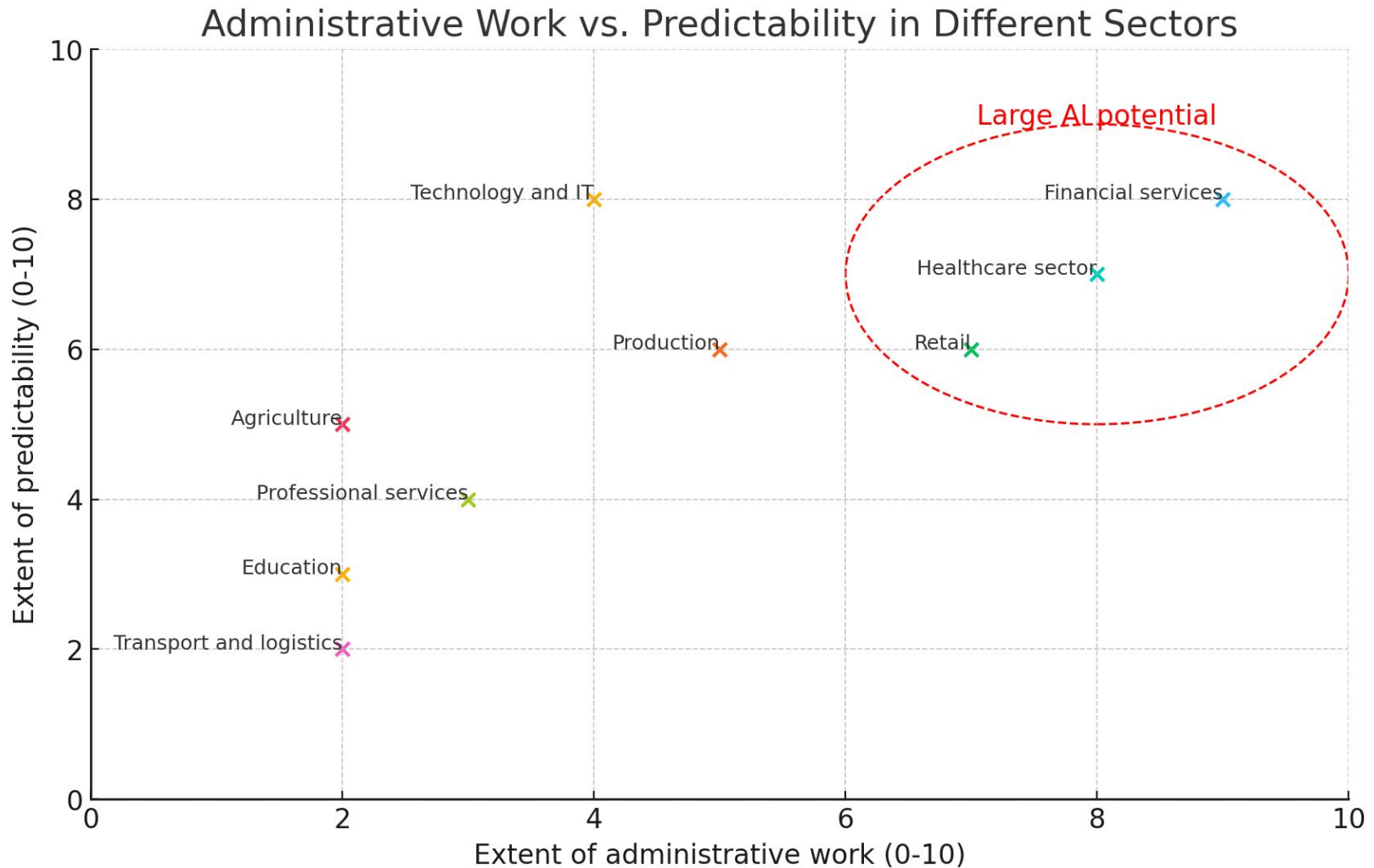
# From search engine to 'prediction machine'



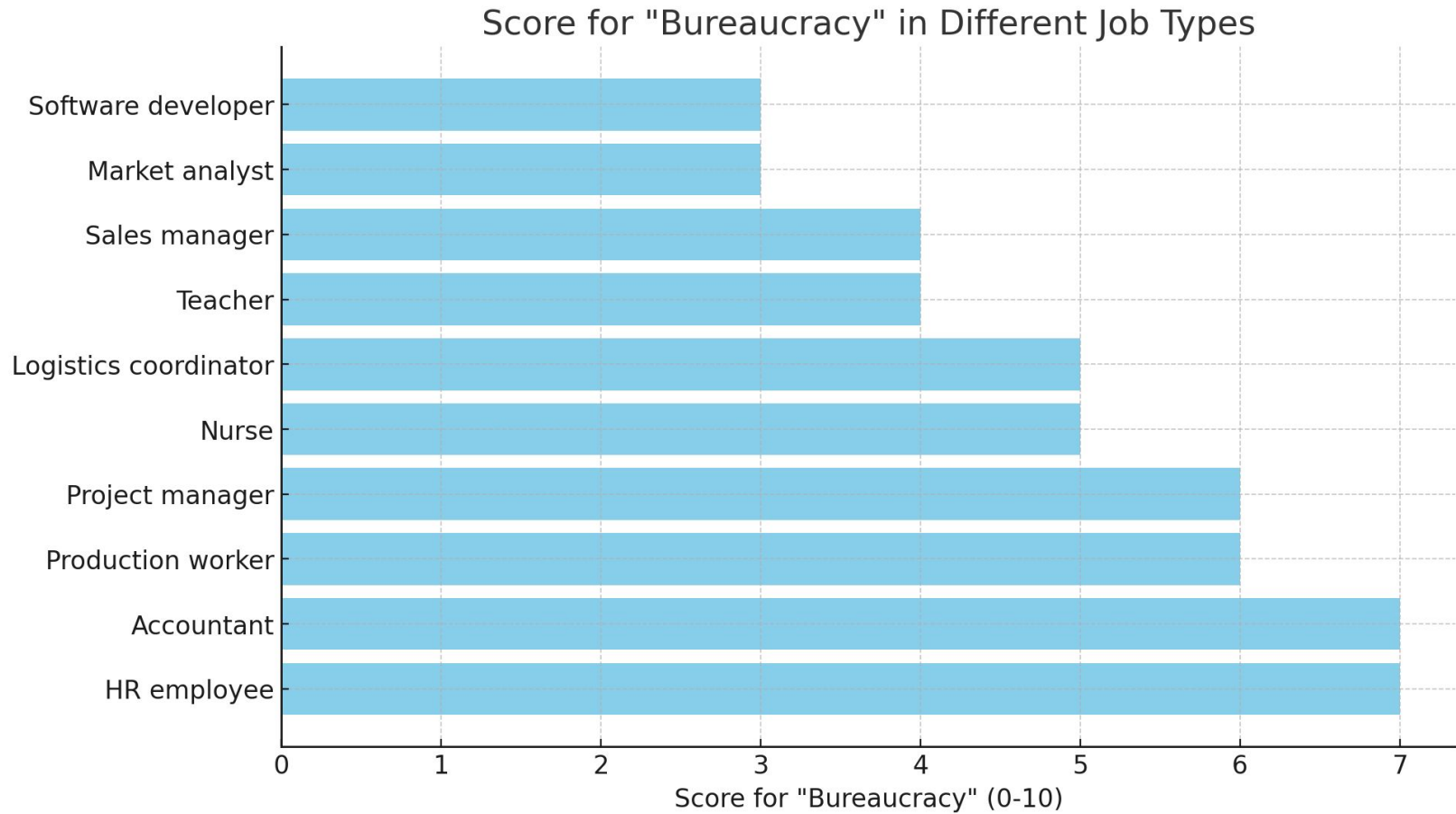
# From the automation of agriculture and industry to the automation of white collar jobs



# Predictions vs Bureaucracy

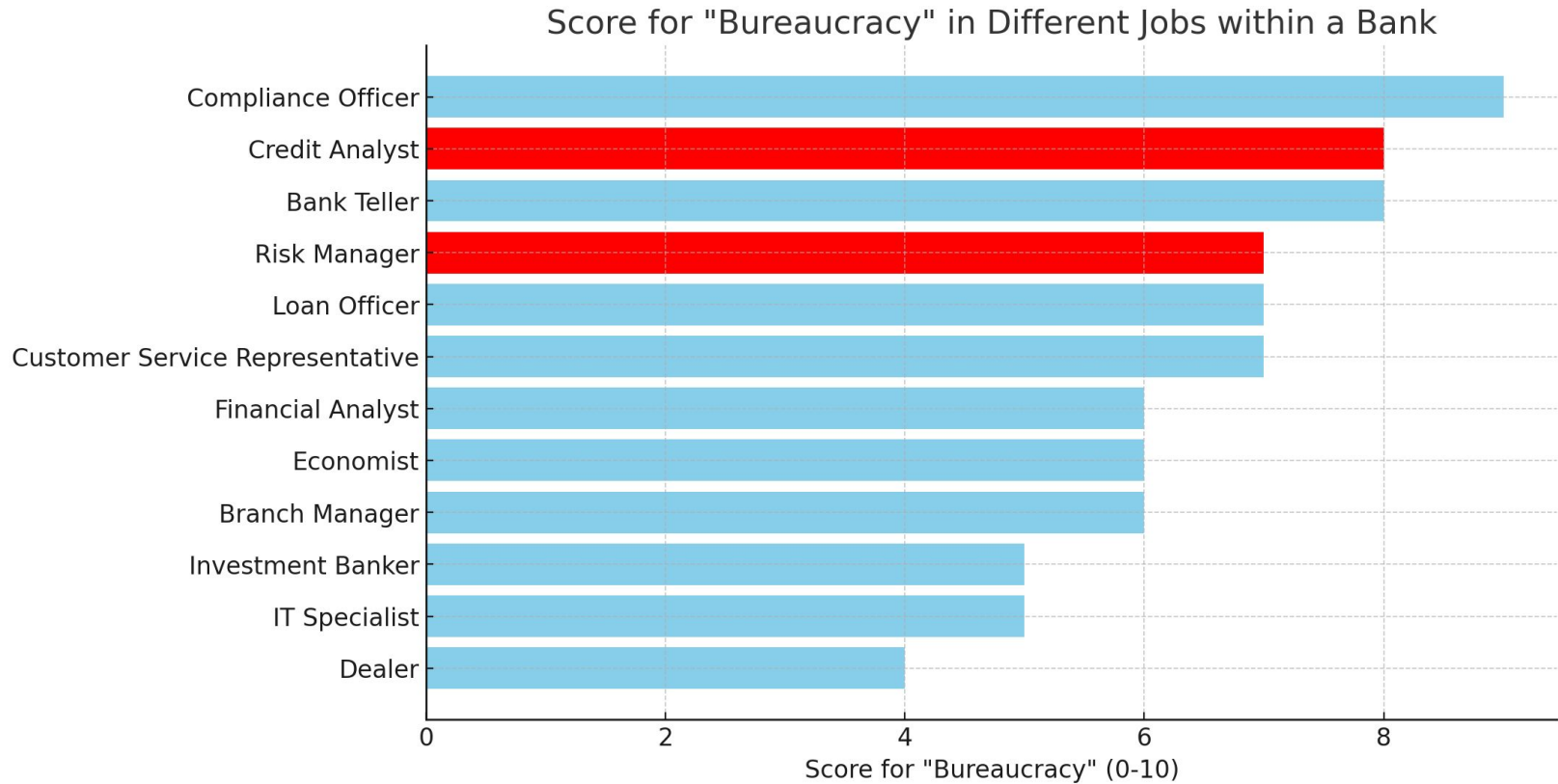


# How much paperwork?

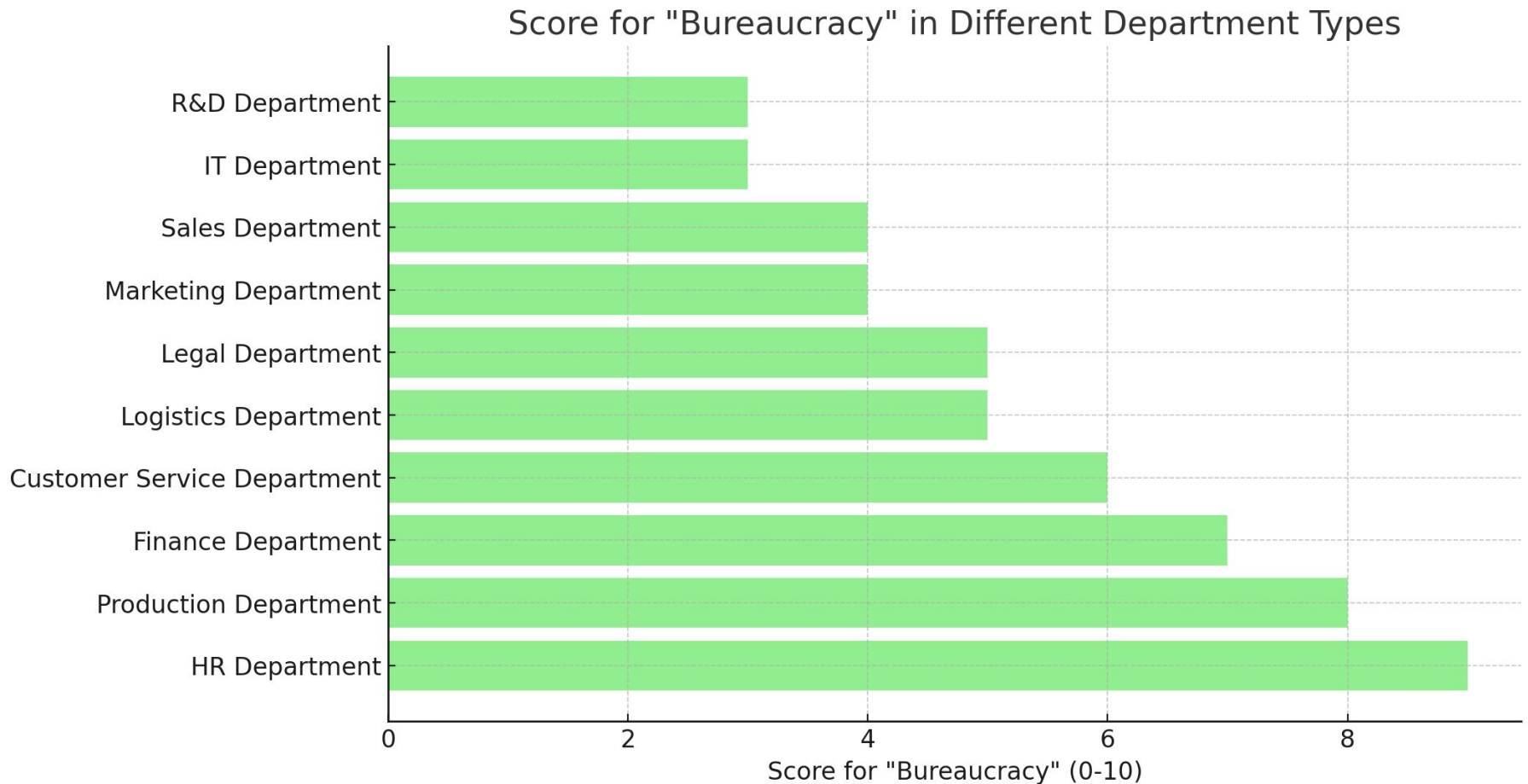




# How much paperwork in banking?

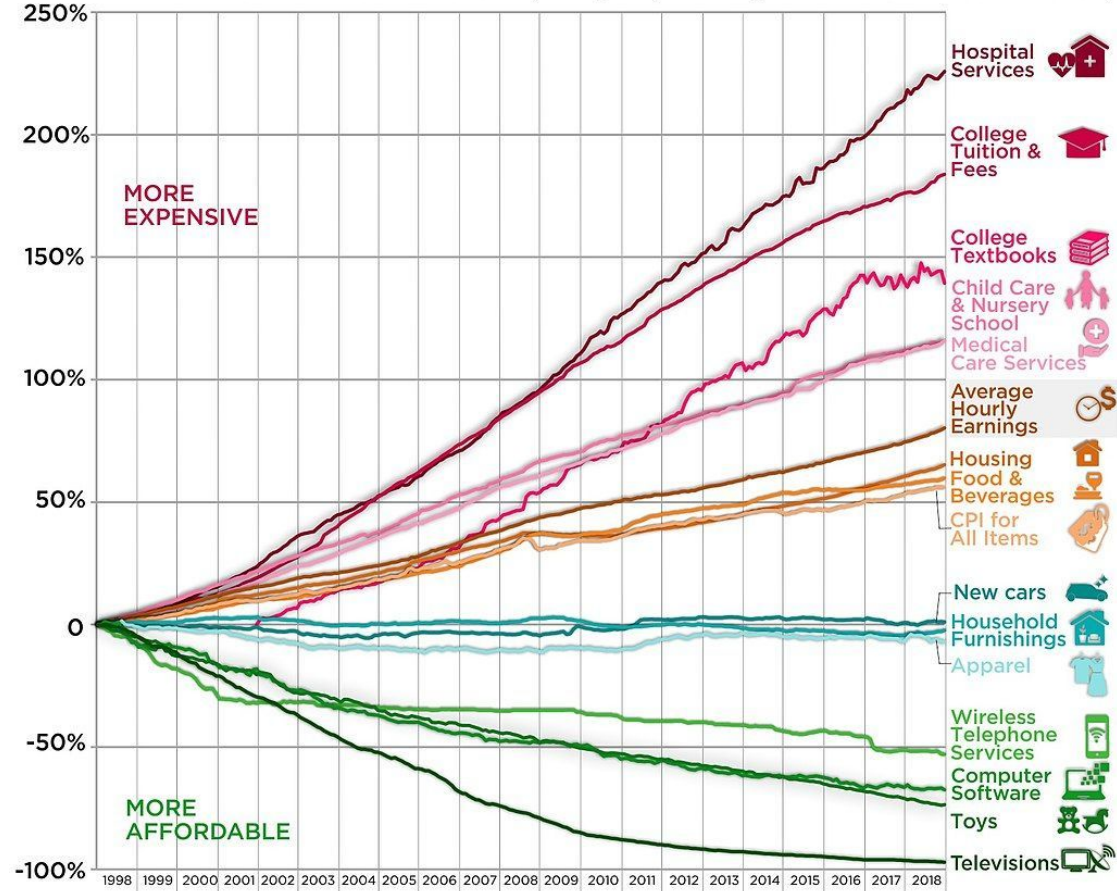


# How much paperwork (II)

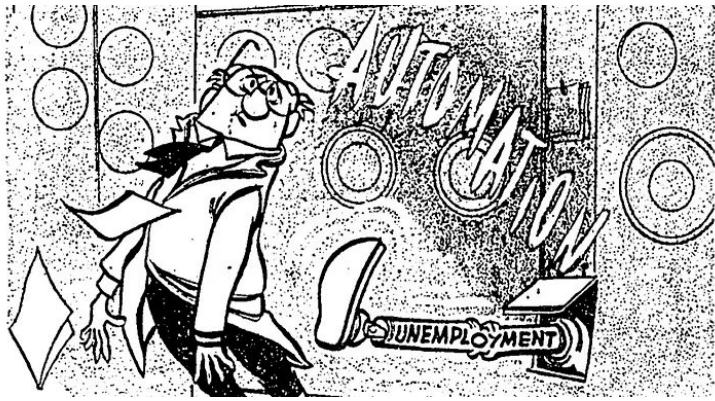


# “Bullshit jobs” and Baumol effect

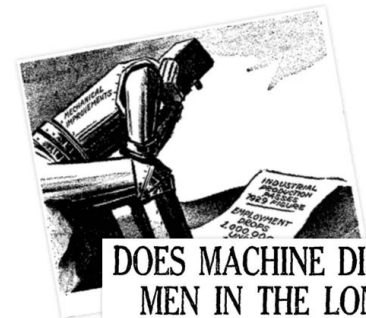
**20 Years of Price Changes in The United States**  
 Selected Consumer Goods & Services, Wages (January 1998 to December 2018)



Article & Sources:  
<https://howmuch.net/articles/price-changes-in-usa-in-past-20-years>  
 CPI and other price indices - Bureau of Labor Statistics - <https://data.bls.gov/PDQWeb/cu>  
 Average hourly earnings - Bureau of Labor Statistics - <https://data.bls.gov/timeseries/CE505000000008>



# World Ills Laid to Machine By Einstein in Berlin Speech



DOES MACHINE DISPLACE MEN IN THE LONG RUN?

## AUTOMATION IN BRITAIN STIRS UNREST IN LABOR

Workers See 'Robot Revolution' Depriving Them of Jobs



AUTOMATION LOOMING LARGE IN LABOR PICTURE

Automation Might End Most Unskilled Jobs In 10 Years

Automation Linked To Jobless Count

THE NEW YORK TIMES, SUNDAY, FEBRUARY 26, 1928.

XX 3

# MARCH OF THE MACHINE MAKES IDLE HANDS

By EVANS CLARK.  
A FEW days ago the General Motors Corporation reported the largest peace-time earnings ever made by a single concern in the history of America. Three days later Governor Smith made public a report from the New York Industrial Commissioner which called public attention to serious unemployment throughout the State: not since the depression of 1921, it was disclosed, have conditions been as bad.  
The people of the United States—in the shadow of a Presidential election—are presented with a social

Prevalence of Unemployment With Greatly Increased Industrial Output Points to the Influence of Labor-Saving Devices as an Underlying Cause

have gone far to make construction a machine industry instead of a collection of hand trades. One gasoline crane takes the place of ten or twelve laborers. The hod-carrier has disappeared before the invasion of the material hoist. In concrete construction building materials are mixed, like dough, in a machine and literally poured into place without the touch of a human hand. The Ohio figures record these results: with 15 per cent. fewer men employed, contractors put up 11 per cent. more square feet of finished buildings last year than in 1927.  
Coal Mined by Machines.



# We will not all be out of a job ...unfortunately



# How do economists think about growth? ...the long run view

$$Y = \lambda \cdot F(K, L)$$

# It didn't start yesterday (I)

- 1840s: Telegraph, Washing machine
- 1850s: Steam locomotives, Photography
- 1860s: Freezing, Periodic table 1870s: Telephone, Incandescent lamp
- 1880s: Electricity, Automobile
- 1890s: Camera, Radio
- 1900s: Airplane,
- Film 1910s: Electron tube, Motorized vehicles
- 1920s: Radio transmission, Refrigerator
- 1930s: Television, Jet engine

# It didn't start yesterday (II)

- 1940s: Atomic bomb, Transistor
- 1950s: Birth control pill, Computer programming
- 1960s: Space exploration, Microchips
- 1970s: Internet, Personal computer
- 1980s: Mobile phones, CDs and digital audio formats
- 1990s: World Wide Web, Mobile phone revolution
- 2000s: E-commerce, Social media
- 2010s: Cloud computing, Artificial intelligence
- 2020s: Artificial intelligence in healthcare, 3D printing



# Leaders of innovation - countries

- 1840s: USA, UK
- 1850s: UK, France
- 1860s: France, Russia
- 1870s: USA, USA
- 1880s: Serbia/USA, Germany
- 1890s: USA, Italy
- 1900s: USA, France
- 1910s: USA, USA
- 1920s: USA, USA
- 1930s: USA, UK
- 1940s: USA, USA
- 1950s: USA, USA
- 1960s: USA, USA
- 1970s: USA, USA
- 1980s: USA, Netherlands, Japan
- 1990s: UK, Finland, USA
- 2000s: USA, USA
- 2010s: USA, USA

# Back to the 1990s

