

THE RISE OF THE MACHINES: HISTORICAL AND PSYCHOLOGICAL PERSPECTIVES ON TECHNOLOGICAL REVOLUTIONS AND BUBBLES

James Montier

GMO

A DEEP-SEATED FEAR OF SENTIENT AI

The development of full artificial intelligence could spell the end of the human race – Hawkins (2014)

2001 – A Space Odyssey (1968)

Westworld (1973)

Demon Seed (1977)

Alien (1979)

Blade Runner (1982)

Terminator (1984)

Terminator 2: Judgement Day (1991)

The Matrix (1999)

I, Robot (2004)

The Machine (2013)

Ex Machina (2014)

I Am Mother (2019)

M3GAN (2023)

We have only bits and pieces of information, but what we know for certain is that at some point in the early twenty-first century all of mankind was united in celebration; we marvelled at our own magnificence, as we gave birth to A.I...a singular consciousness that spawned an entire race of Machines...

—Morpheus

When will there be a 50% chance that Human-level Artificial Intelligence exists?

Our World
in Data

Timelines of 356 AI experts, surveyed in 2022 by Katja Grace and colleagues.

The experts were asked when unaided machines will be able to accomplish every task better and more cheaply than human workers.

Each line represents the answer of one expert

90% of the 356 experts gave a date within the next 100 years.

Half of the experts gave a date before 2061

2020 2030 2040 2050 2060 2070 2080 2090 2100 2110 2120 2130 2140 2150 2160

- 5% gave answers for dates later than 2160.
- 1.1% said it will never exist.

Data from Zach Stein-Perlmán, Benjamin Weinstein-Raun, Katja Grace – 2022 Expert Survey on Progress in AI.

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PROBABLY NOT MUCH TO FEAR FROM LARGE LANGUAGE MODELS (LLMs)

In essence probability-based models...much like a psychic cold reading a room



Shotgun statements: broad statements can apply to lots of people

"I'm connecting with an elderly person, a person who was really special and who recently passed".

Barnum statements: allow the listener to read between the lines

"At times you may have serious doubts that you made the right decision".

Turning success into failure: "I'm being contacted by John" "No wait...it is another J name, James, Jacob..., etc." until a hit is found.

I ASKED CHATGPT ABOUT A SUBJECT I KNOW WELL...ME!

James Montier is a renowned economist, author and investment strategist who has made significant contributions to the field of value investing. With a deep understanding of behavioural finance, Montier has established himself as a leading advocate for a more rational and disciplined approach to investing. His work has had a profound impact on the investment community, helping investors navigate the complexities of the financial markets.

Born on 10 November 1968, Montier developed a passion for economics and finance at a young age. He graduated from the University of Warwick with a degree in Economics, and subsequently obtained a Master's degree in Economics from the University of Sussex.

In 1995, Montier joined GMO (Granite Harbor Investment Advisors at the time), a global investment management firm founded by Jeremy Grantham, Richard Mayo and Eyk Van Otterloo...Throughout his tenure at GMO, Montier published numerous influential paper and articles, shedding light on the flaws in traditional investment models and advocating for a more contrarian and value driven approach. His work challenged prevailing notions in the industry and encourage investors to adopt a more critical mindset when evaluating investment opportunities.

Montier's insights on behavioural finance and value investing have earned him a wide following, and he is highly regarded as an expert in his field. He is known for his ability to simplify complex concepts and deliver them in an engaging and accessible manner, making his research widely accessible to investors of all levels of experience.

In addition to his research and writings, Montier is a sought after speaker at industry conferences and events. His presentations are known for their thought-provoking nature and ability to challenge the conventional wisdom.

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Issues with the facts!

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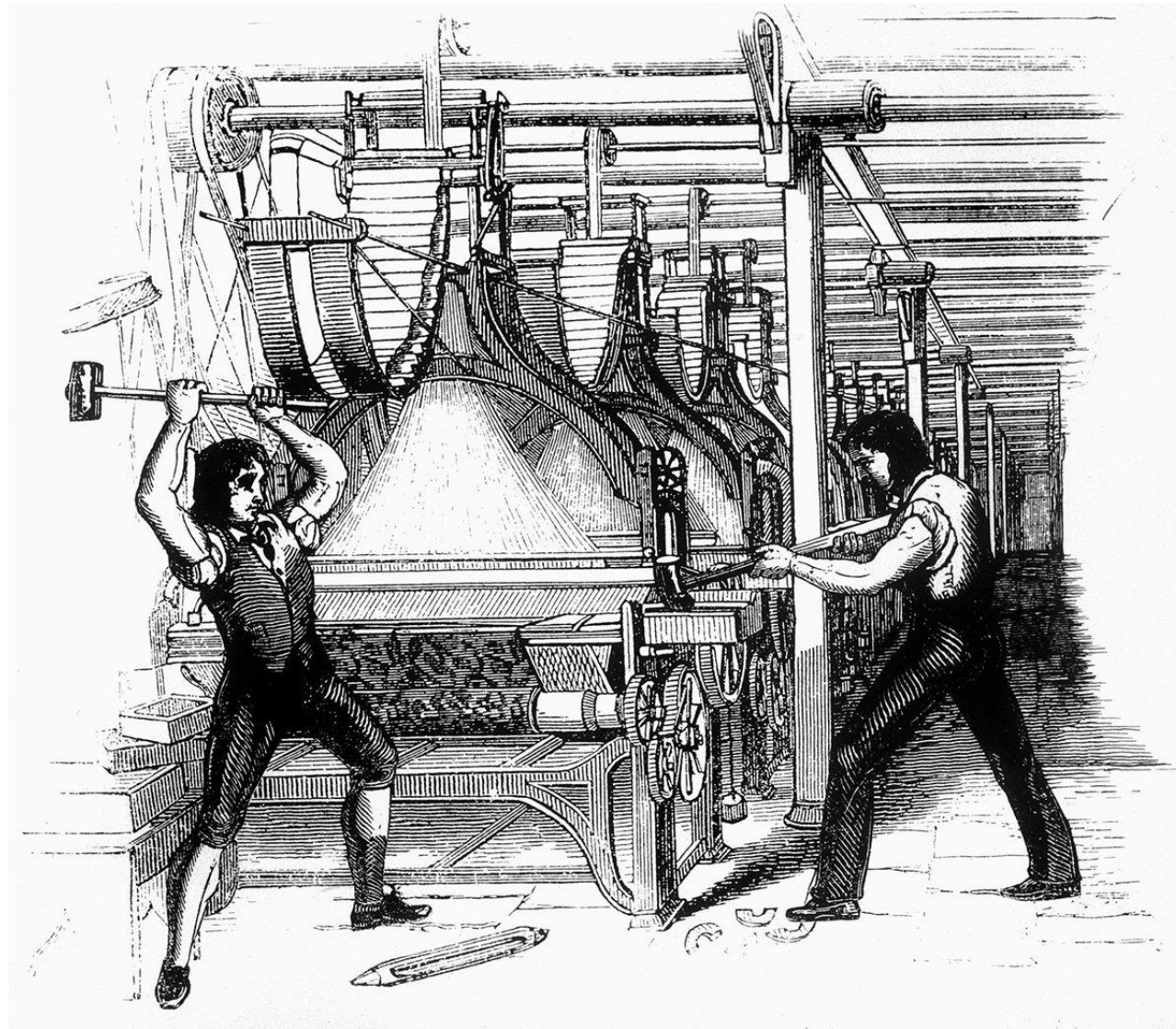
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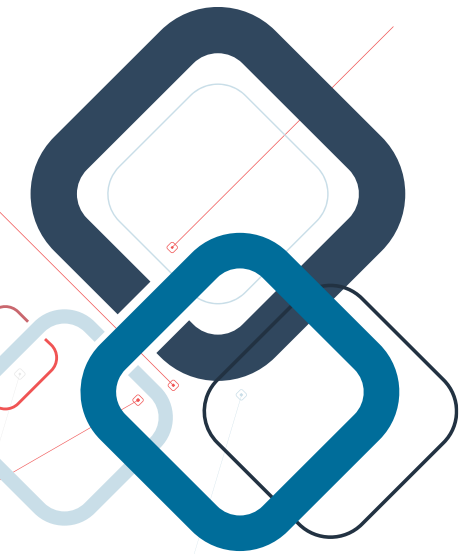
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AM I A MODERN DAY LUDDITIE?

Blood in the Machine





Everything that can be invented has been invented

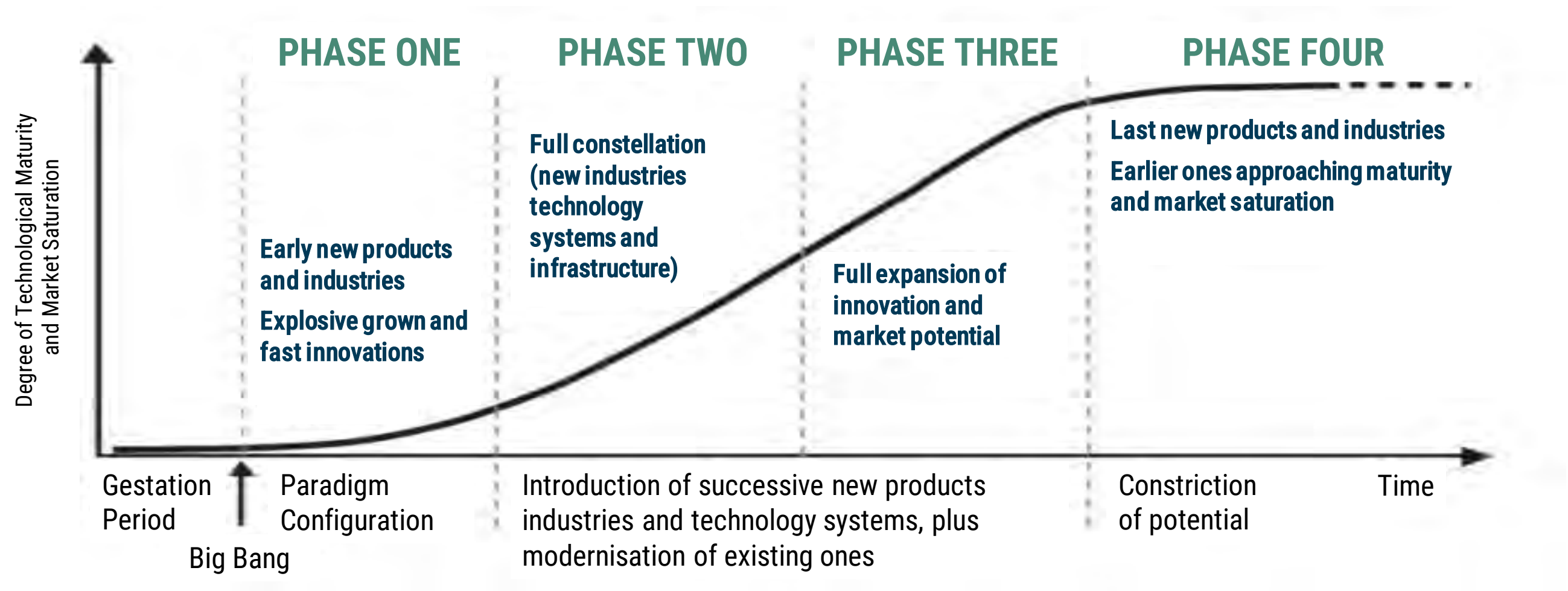
**– Charles H Duell, Commissioner
of the US Patents Office, 1889**

A FRAMEWORK FOR THINKING ABOUT TECHNOLOGICAL REVOLUTIONS



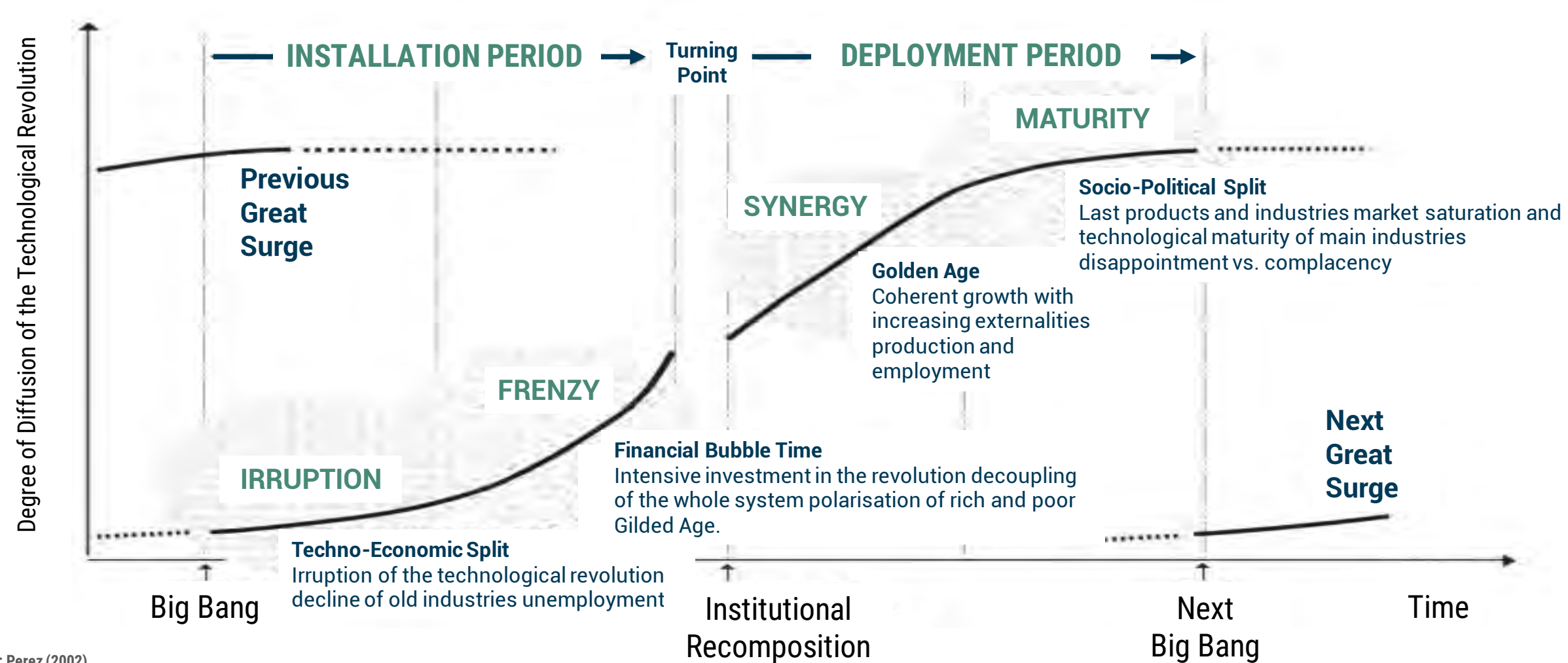
CARLOTA PEREZ – TECHNOLOGY STYLISED PATH

Technological Revolutions and Financial Capital (2002)



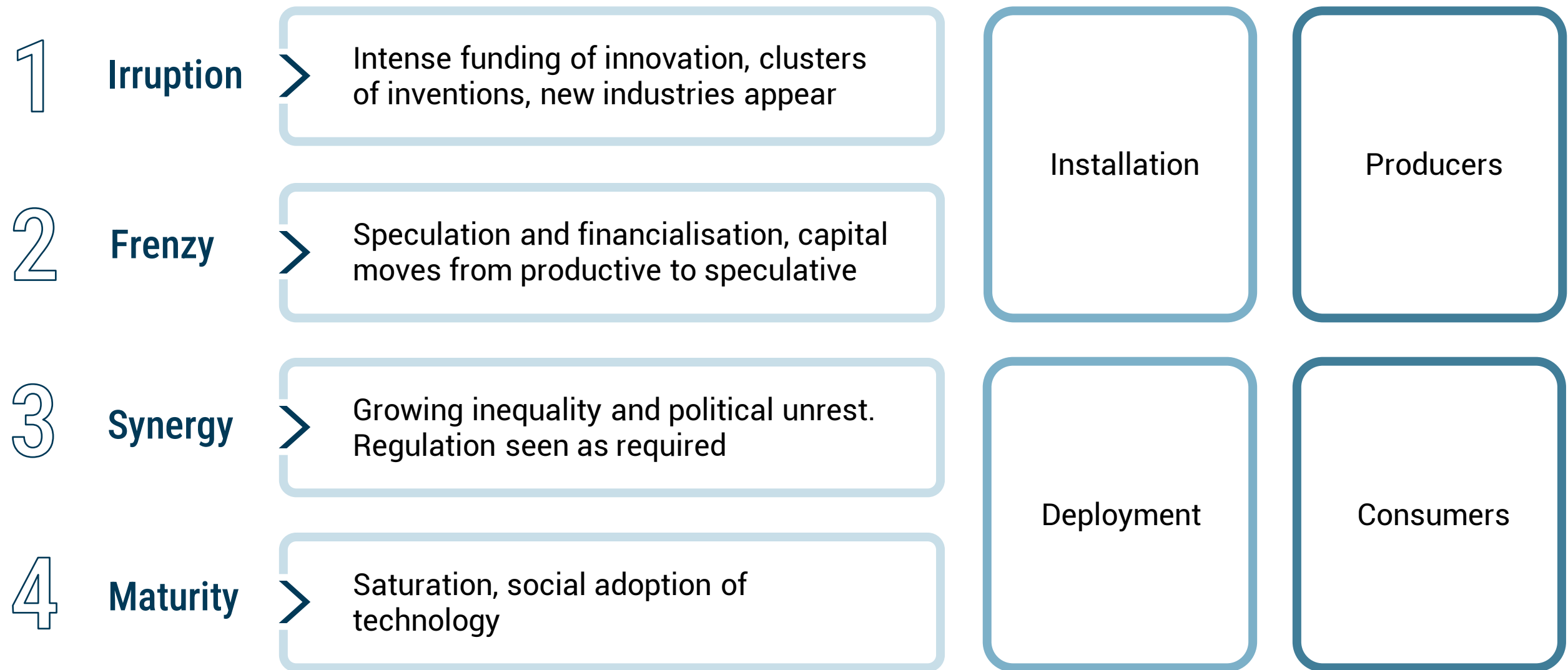
HOWEVER, THE REAL WORLD IS ALWAYS MESSIER THAN THEORY

RECURRING PHASES OF EACH GREAT SURGE IN THE CORE COUNTRIES



Source: Perez (2002)

CHARACTERISTICS OF TECHNOLOGICAL REVOLUTIONS



THE FIVE TECHNOLOGY WAVES

Technological Revolution	New Technologies and Industries	New Infrastructures	Country and Year of Onset
1 The industrial revolution	Mechanised cotton industry, wrought iron, machinery	Canals and waterways, water power, turnpike roads	Britain, 1771
2 Age of steam and railways	Steam engines and machinery, iron and coal mining, rolling stock production	Railways, ports, postal service, city gas	Britain 1829, spreading to Continent and USA
3 Age of steel, electricity and heavy engineering	Cheap steel, full development of steam engine, heavy chemistry, civil engineering, electrical equipment industry, canned and bottled food, paper and packaging	Worldwide shipping, transcontinental railways, worldwide telegraph, telephone, electrical networks	USA and Germany, 1875
4 Age of oil, automobiles, and mass production	Mass-produced automobiles, cheap oil and fuels, petrochemicals, internal combustion engine for automobiles, tractors, airplanes, war tanks, and electricity production, home electrical appliances, refrigerated and frozen foods	Worldwide analogue telecomm unications	USA, spreading to Europe, 1908
5 Age of information and telecommunications	The information revolution, cheap microelectronics, computers, software, telecommunications, control instruments, computer-aided biotechnology, new materials	Worldwide digital telecommunications, the Internet, electronic mail and other e-services, multiple source electricity networks, high-speed multi-modal physical transport links by land, air and water	USA, spreading to Europe and Asia, 1971

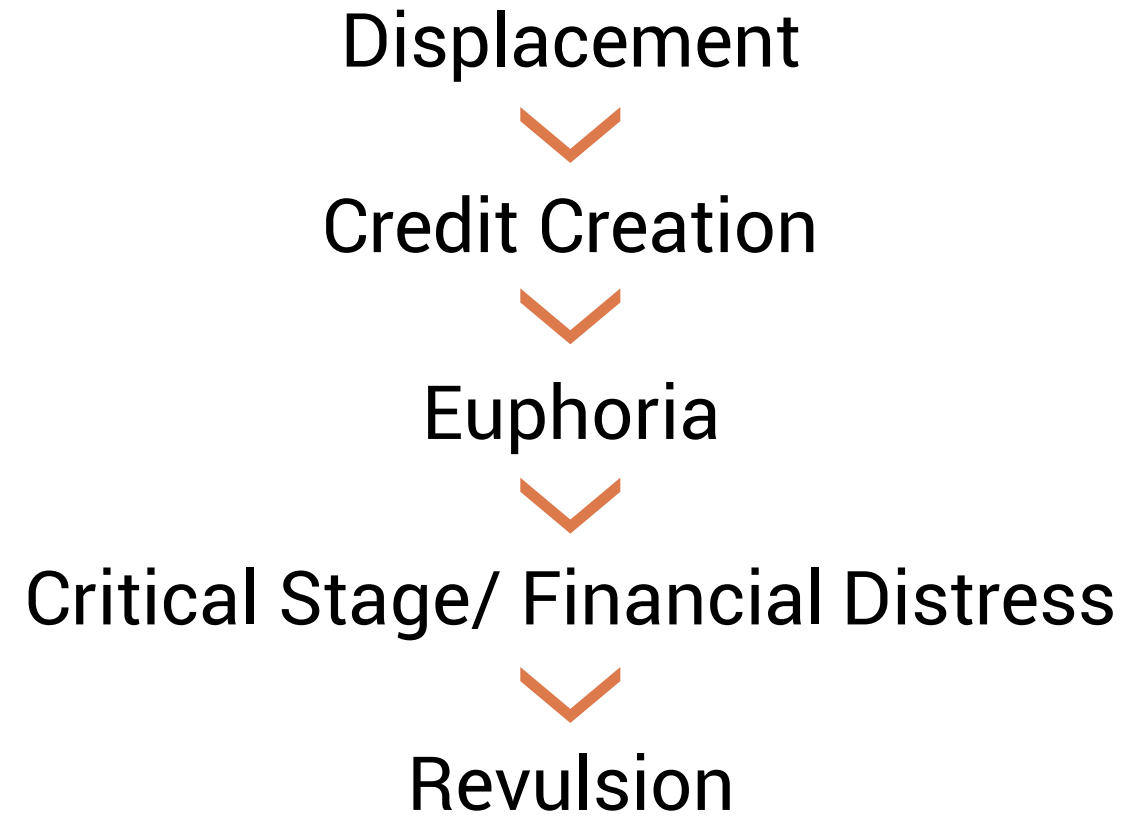
Source: Perez (2002)

TECH BUBBLES – A DEEPER DIVE INTO FRENZY



THE MINSKY- KINDLEBERGER MODEL

An old faithful



THE MOST IMPORTANT PSYCHOLOGICAL ELEMENT – THE STORY

The Narrative Fallacy and the allure of growth

The Rational View

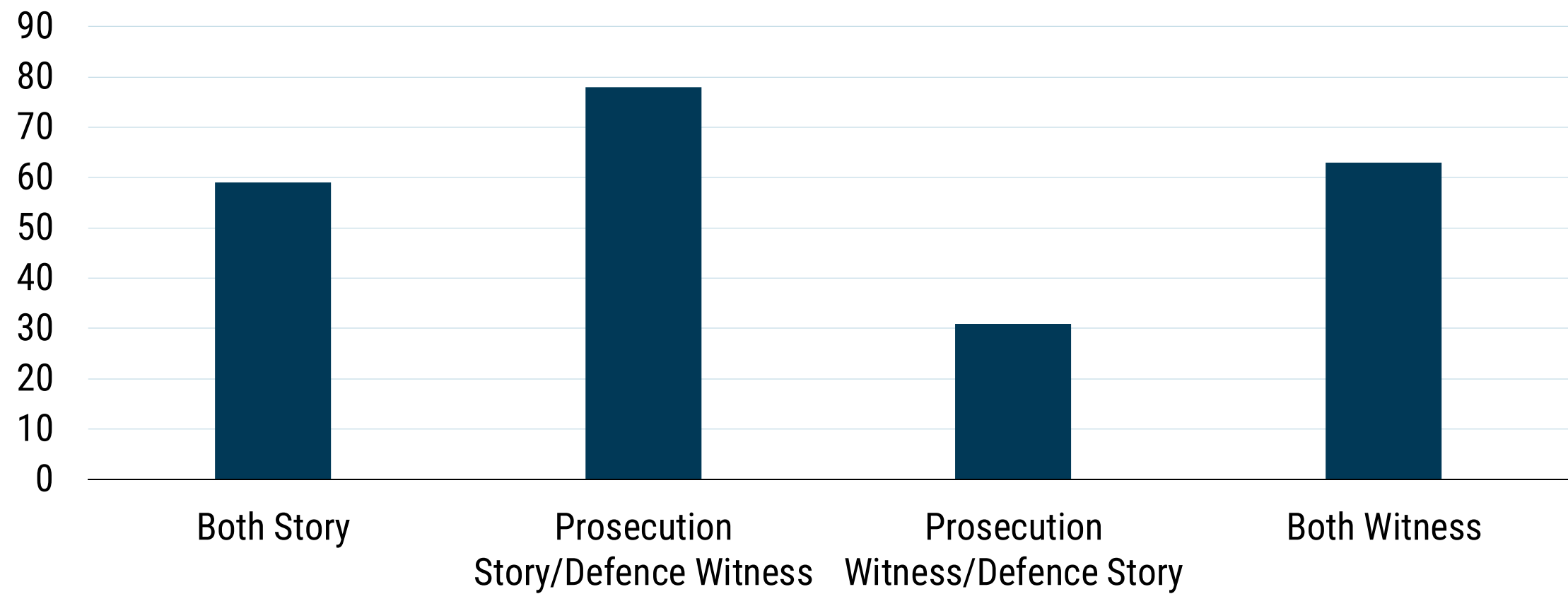
Gather Evidence > Weigh and Evaluate > Decision

The Story View

Gather Evidence > Explain with a Story > Match Story to a Decision

THE POWER OF THE STORY – THE SIRENS’ SONG

% of Jurors returning a guilty verdict



Source: Hastie and Pennington (1998)

DESCARTES VERSUS SPINOZA

Hard Wired to believe

Descartes: Understanding and believing two different things

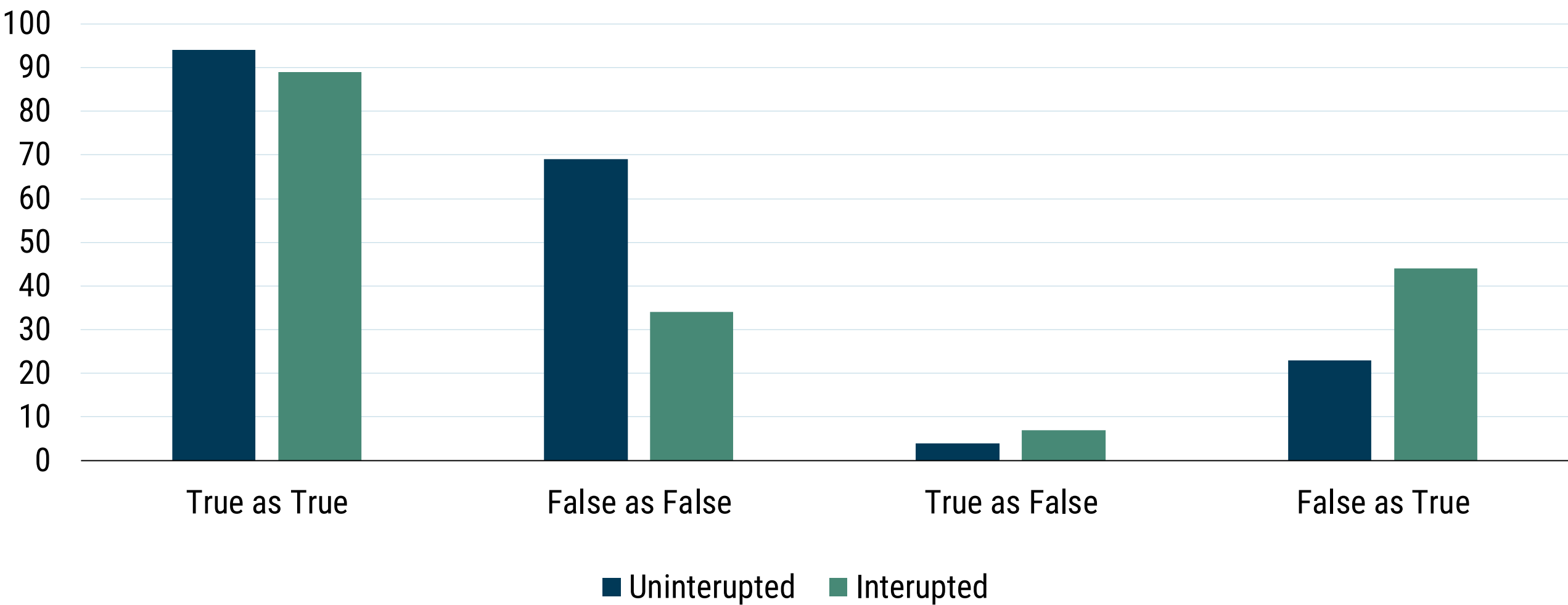
Hold a belief in limbo > Assess > Decide

Spinoza: Understanding and belief occur together

Believe in the idea > Assess > Decide

THE WORLD OF SPINOZA

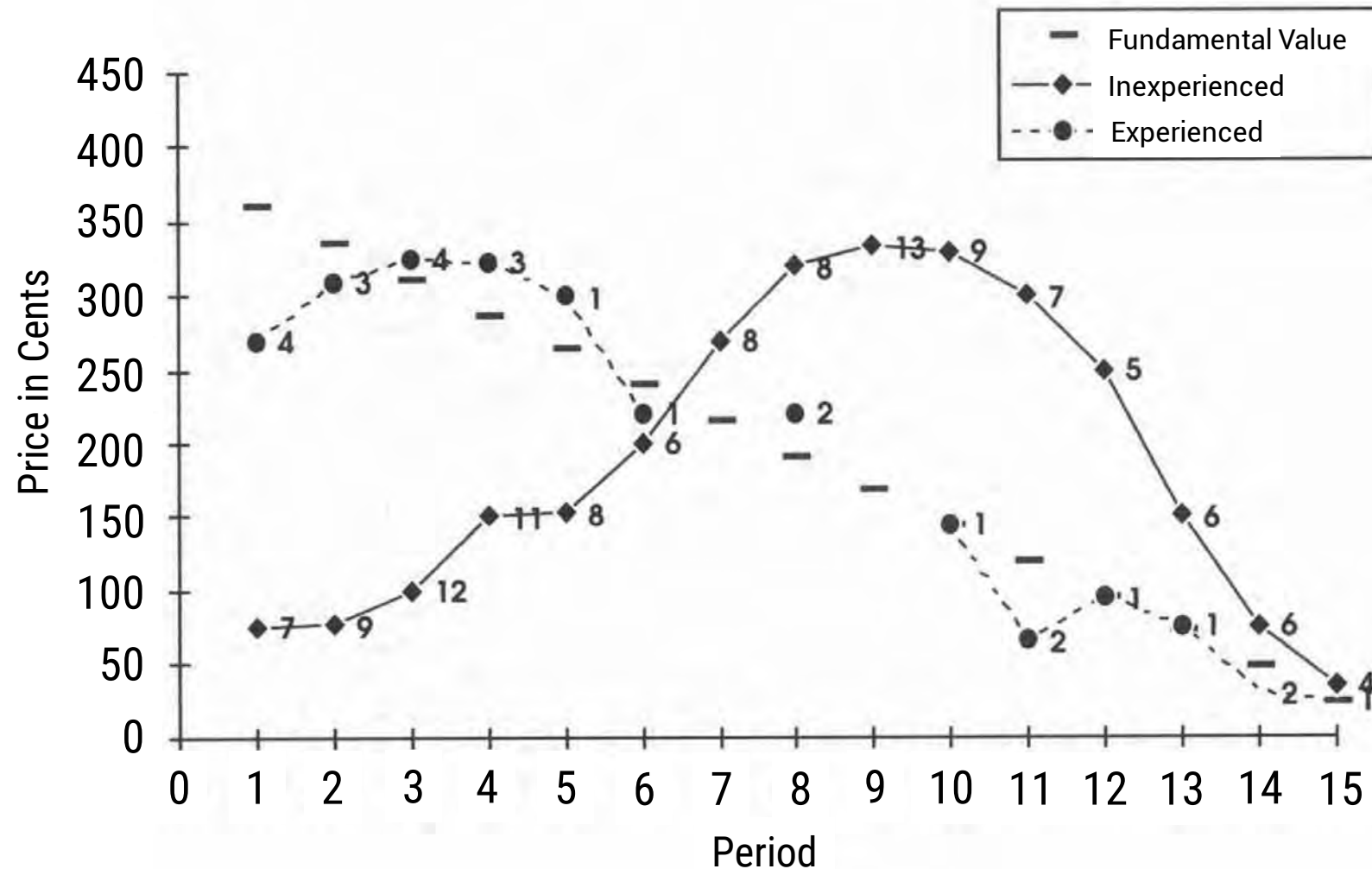
% of statement recognised by category



Source: Gilbert et al (1993)

EXPERIMENTAL DATA

Bubbles are regular occurrences in labs, most amazingly even when trading isn't allowed!



Made worse by

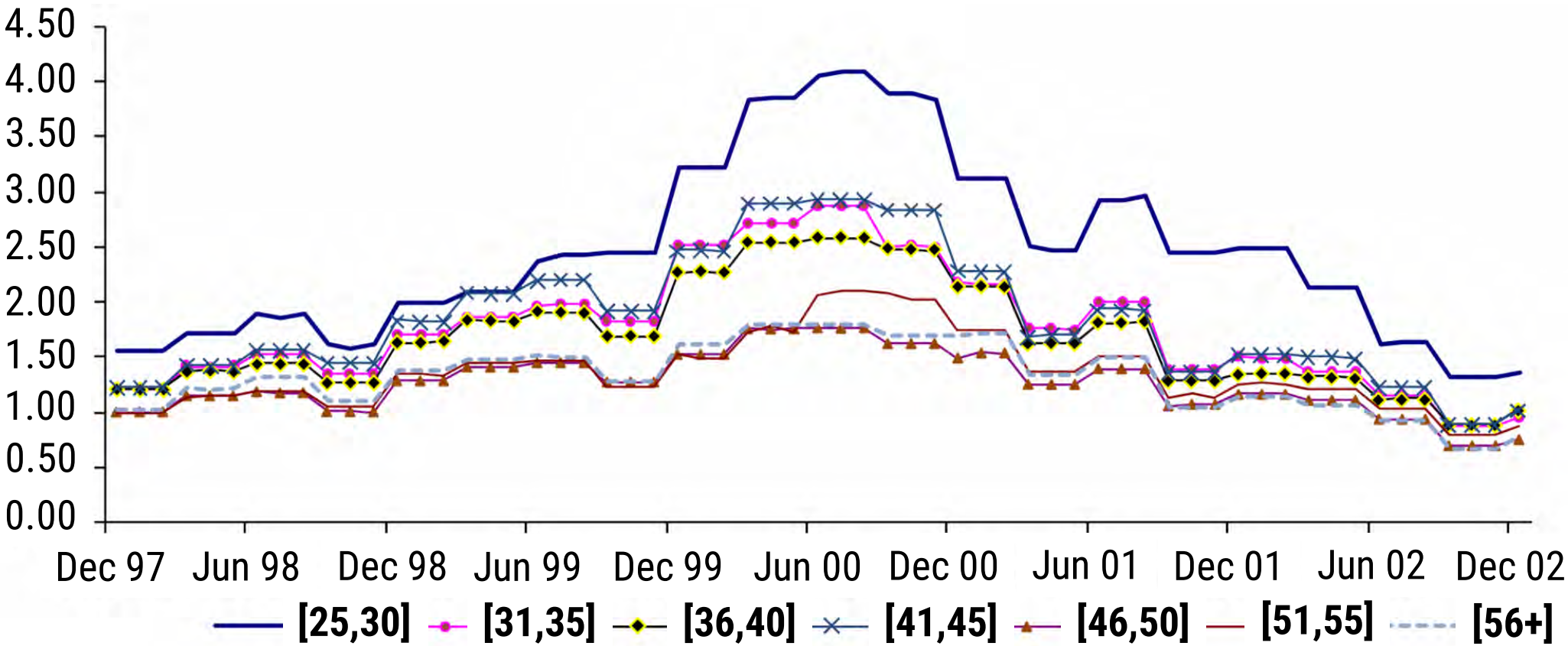
- Dividend uncertainty
- Large numbers of new players
- Large amounts of cash at the start (liquidity)
- Margin Buying is allowed

Source: Smith and Porter

KEEP US GREY HAURED OLD FARTS AROUND

The arrogance of youth

VALUE-WEIGHTED AVERAGE LOG PRICE/SALES RATIO, BY AGE GROUP

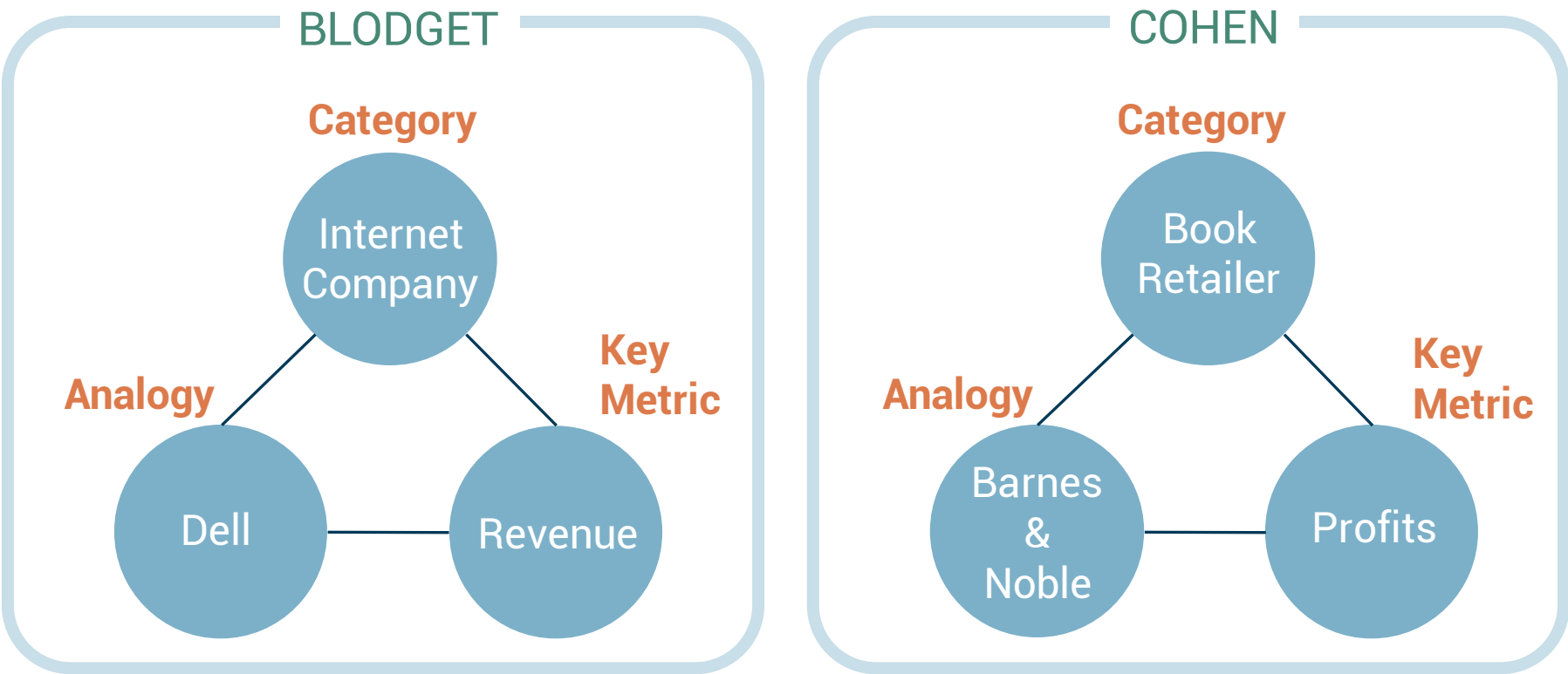


Source: Greenwood and Nagel (200*)

UNCERTAINTY IS KEY

Because it allows for a story

Amazon was
around \$100



Dec 16, 1998	Blodget (CIBC)	Cohen (ML)
Target Price	\$400 (buy)	\$50 (sell)
Revenue Estimate	\$2.5bn (end 00)	\$0.8bn (end 00)
Margin Assumption	12%	10%

Source: Beunza and Garud (2007)

OVEROPTIMISM AT THE HEART OF THE GROWTH STORY

Endemic overoptimism

Entrepreneurs

Cooper et al., (1998) 2994 entrepreneurs, 81% believed that their chance of success was at least 70%, and a third thought success was guaranteed!

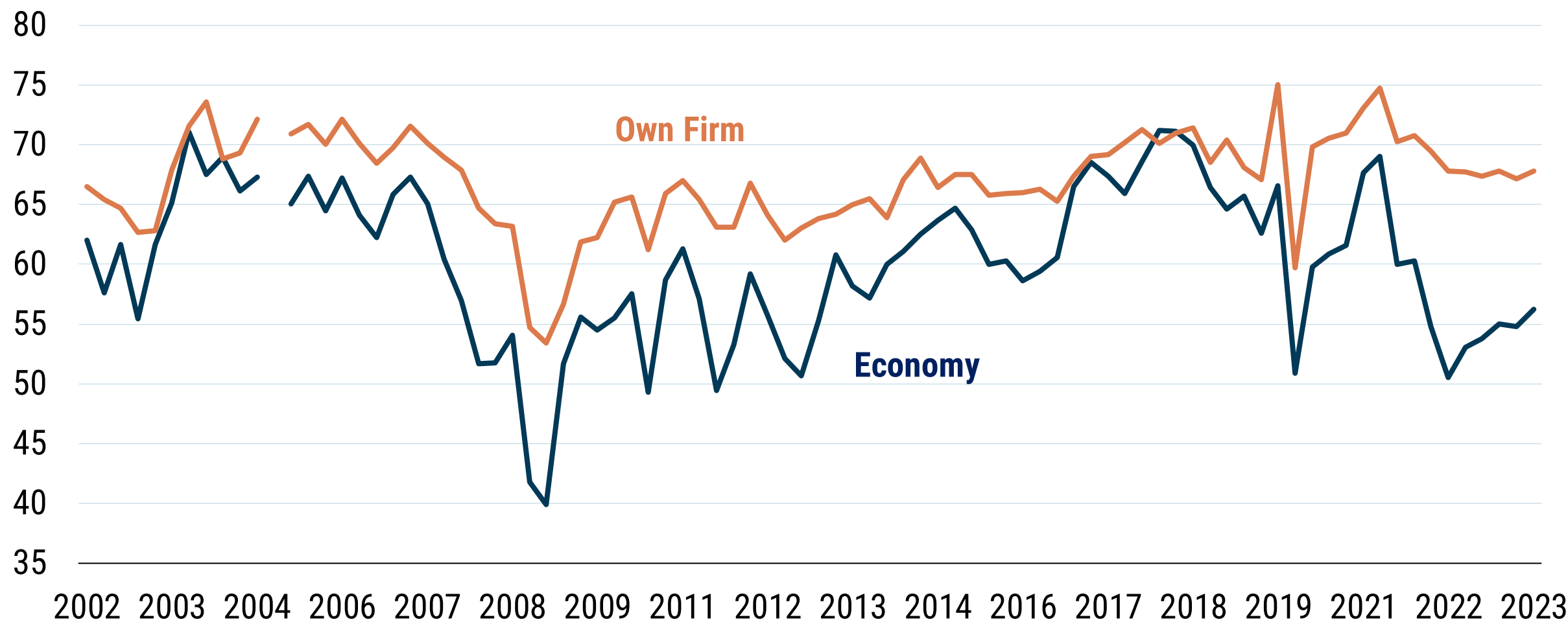
N.B. 75% of new business fail within the first five years.

Investment Managers

74% of Investment Managers think they are above average at their job!

CFOs ARE DELUSIONAL TOO

Optimism %



Source: Richmond Fed

7 LESSONS FROM A WHISTLESTOP TOUR OF 200 YEARS OF THE NEW ECONOMY



LESSON 1: THE SKEPTICS ARE OFTEN WRONG

Painful prognostications

Railroads: "What could be more palpably absurd than the prospect of locomotives travelling twice as fast as stagecoaches?", The Quarterly Review, March 1825

The Telephone: "Well informed people know it is impossible to transmit the voice over wires and were that it were possible to do so, the thing would be of no practical value", Boston Post 1865

The Automobile: "The ordinary 'horseless carriage' is at present a luxury for the wealthy,; and although its price will probably fall in the future, it will never, of course, come into as common use as the bicycle", Literary Digest, October 1899

Television: "For God's sake go down to reception and get rid of a lunatic who's down there. He says he's got a machine for seeing by wireless! Watch him – he may have a razor with him", Editor of the Daily Express in response to a visit from John Logie Baird

Computers: "I think there is a market for about five computers", Thomas Watson, Chair IBM 1943

PCs: "There is no reason for the individual to have a computer in their home", Ken Olsen, president, Dec 1977

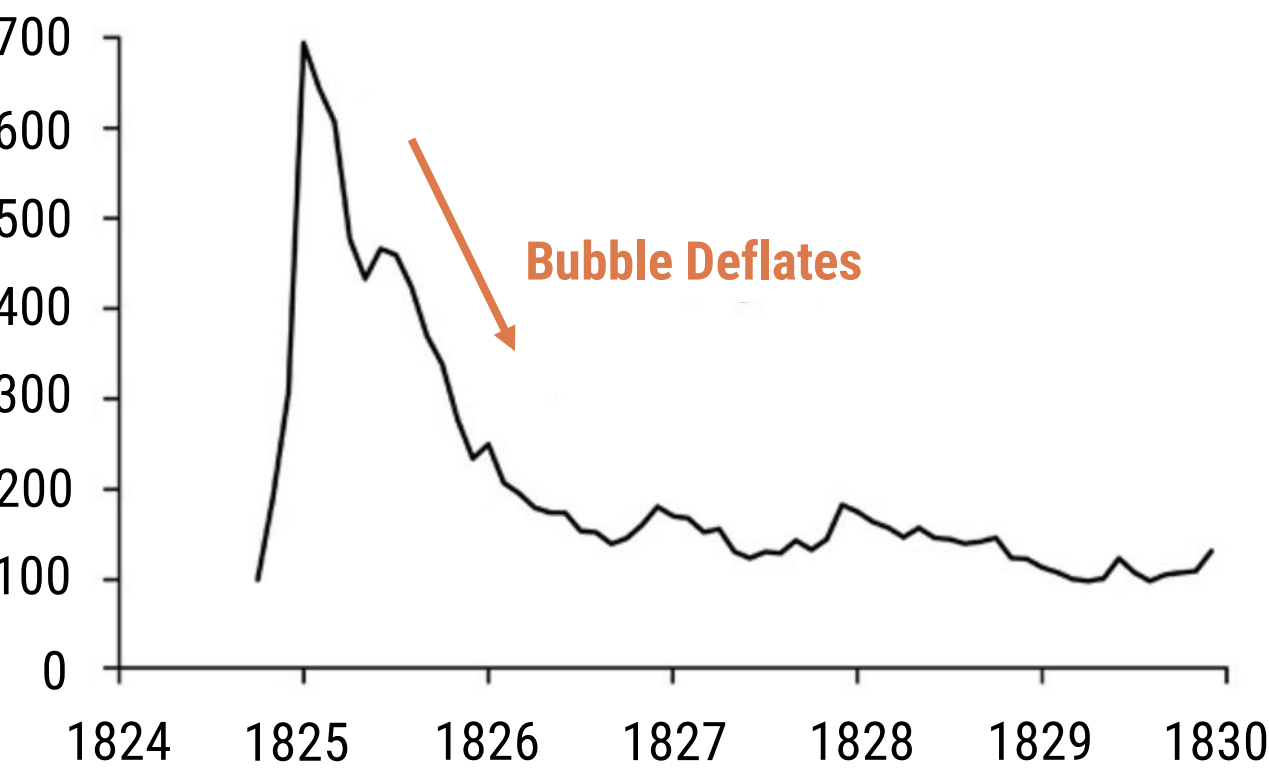
PCs: 640k [of computer memory] ought to be enough for anybody, Bill Gates, 1981

The Internet: "By 2005 or so, it will become clear that the Internet's impact on the economy has been no greater than the fax machine's", Paul Krugman 1998

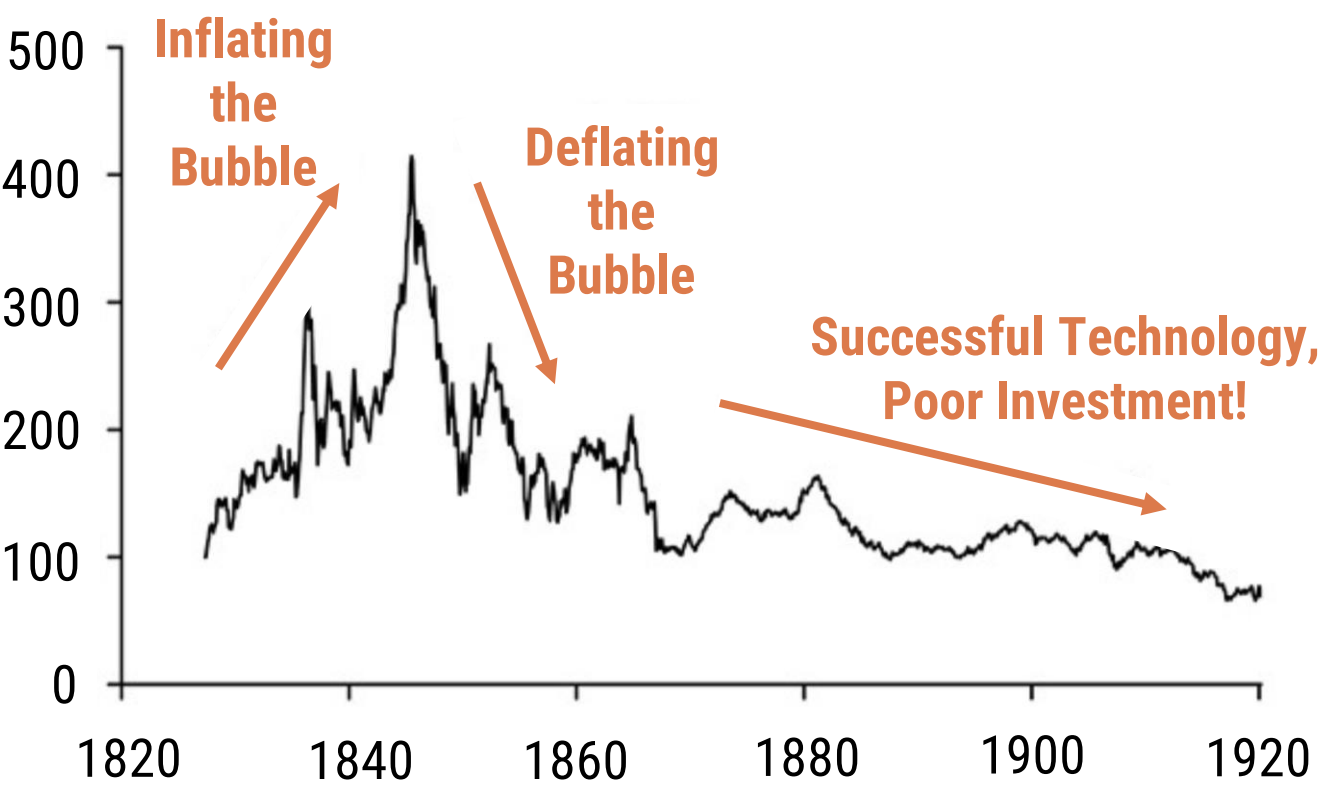
LESSON 2: TECH REVOLUTIONS AND BUBBLES GO HAND IN HAND

Since the industrial revolution onwards

UK MINING STOCKS



UK RAIL ROADS

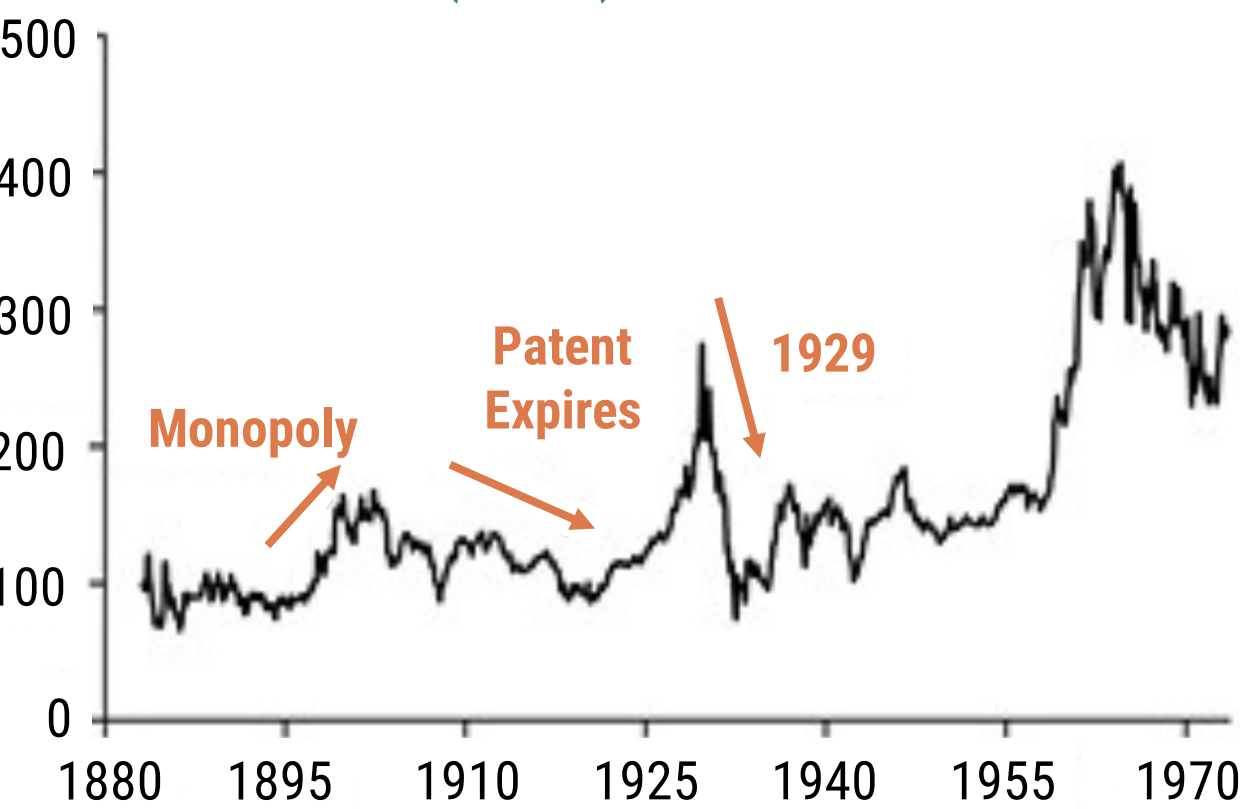


Source: Nairn (2002)

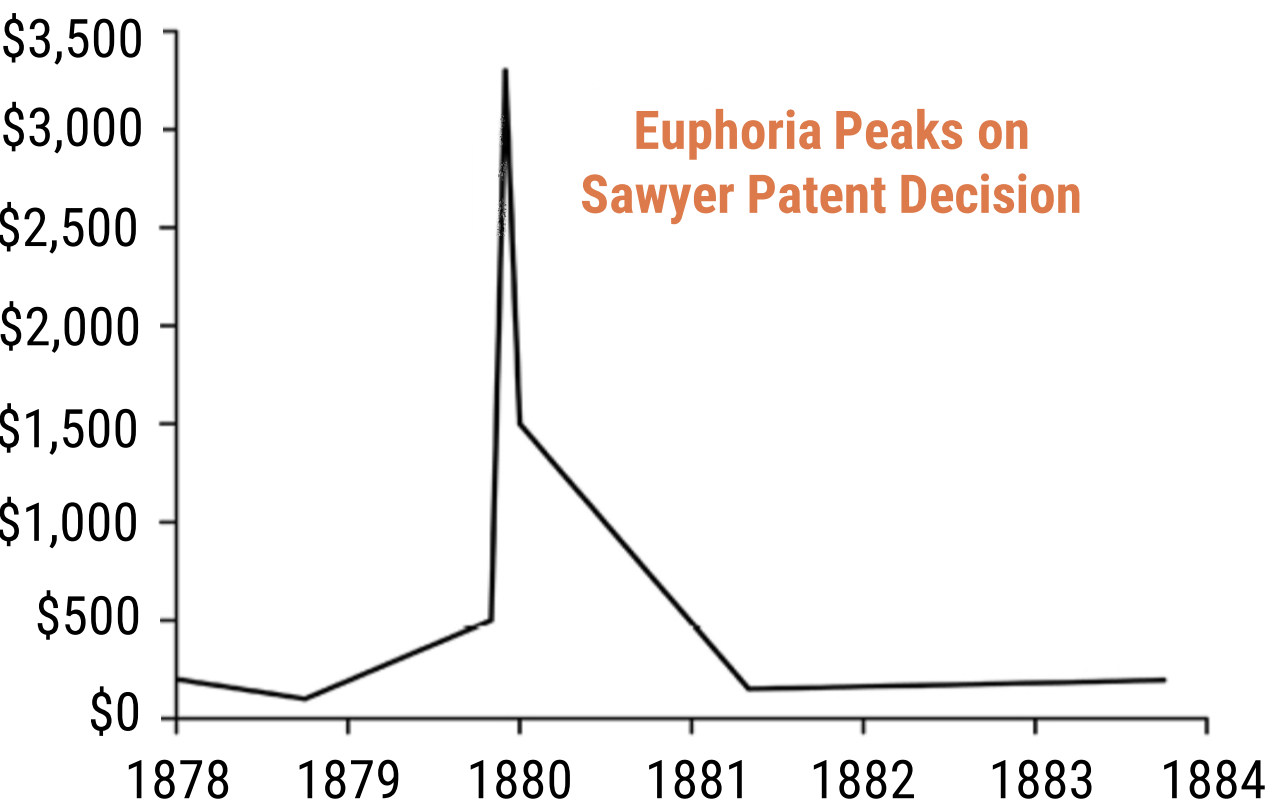
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Telephones and Electric Light

AMERICAN BELL (AT&T)



EDISON ELECTRIC

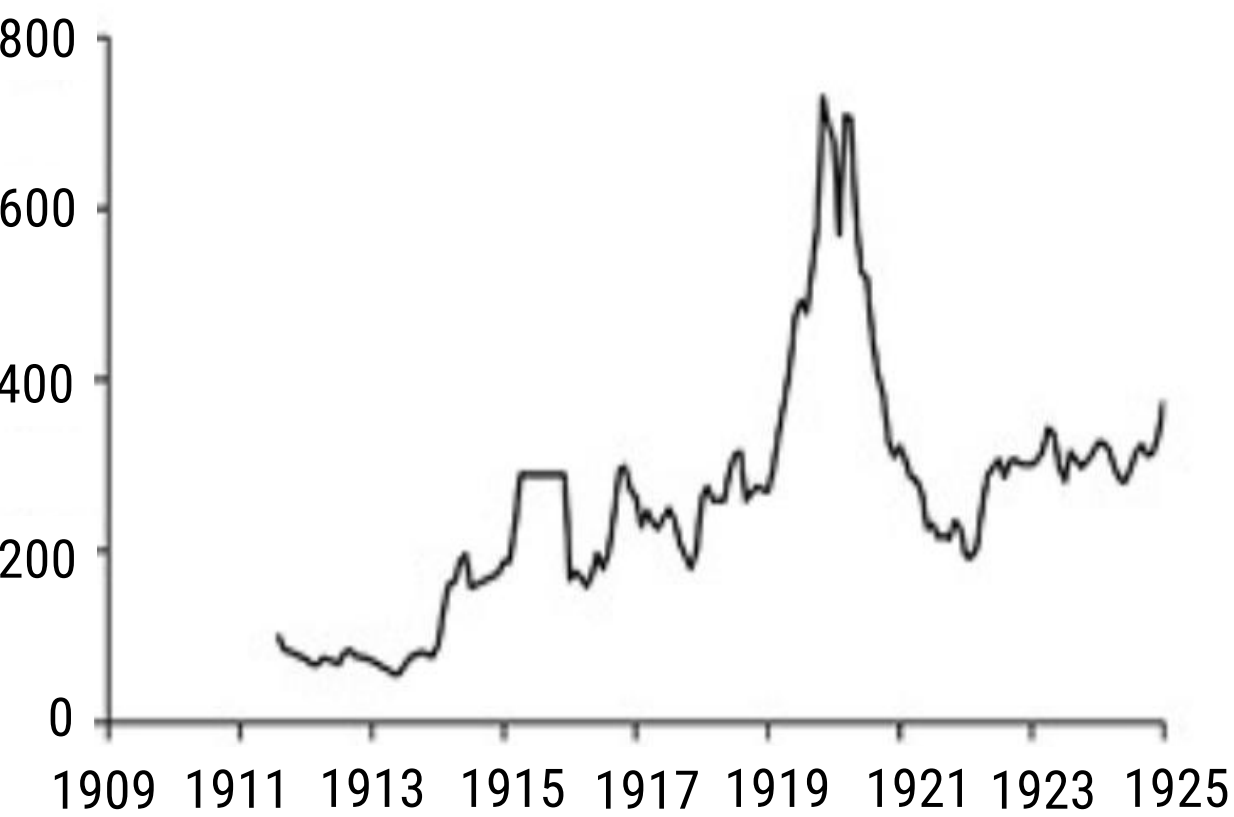


Source: Nairn (2002)

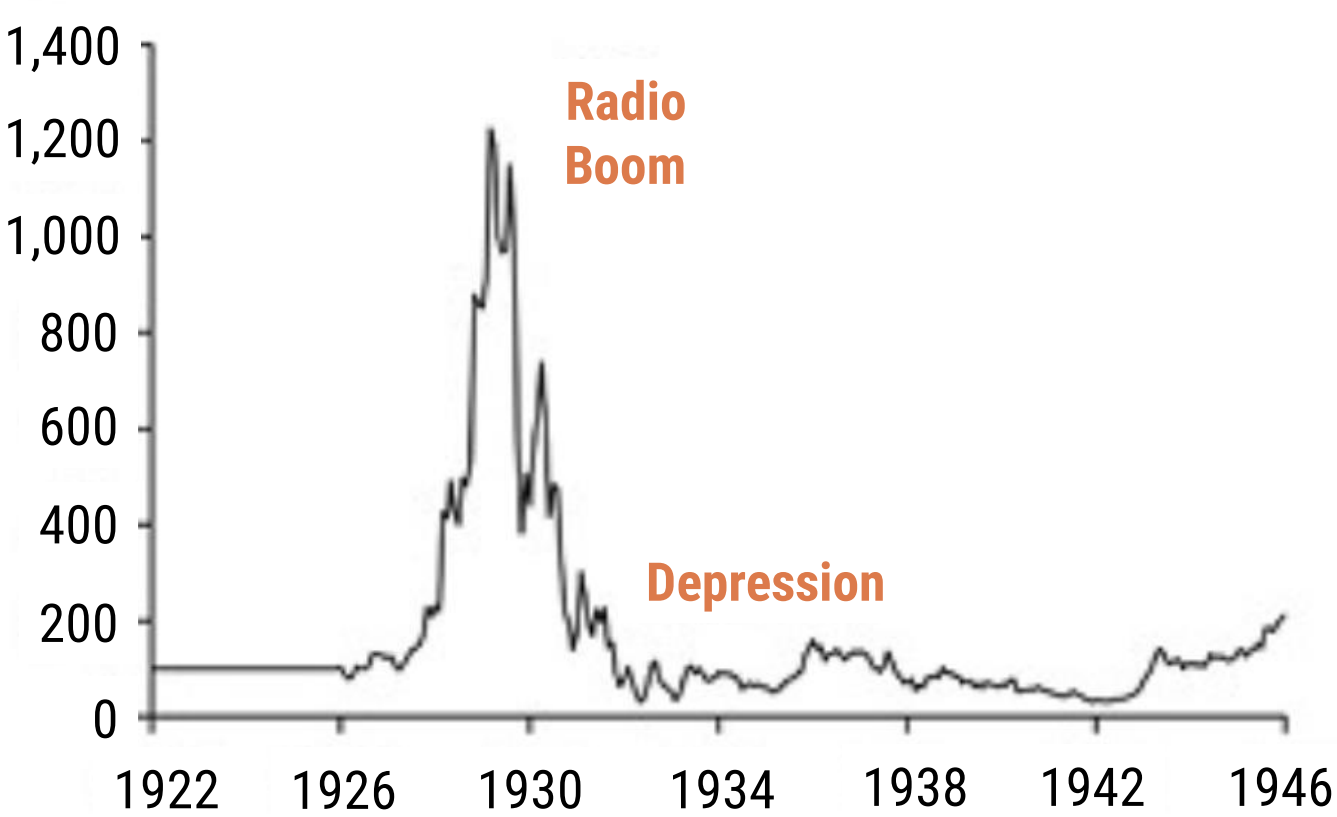
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Autos and Radio

GENERAL MOTORS (GM)



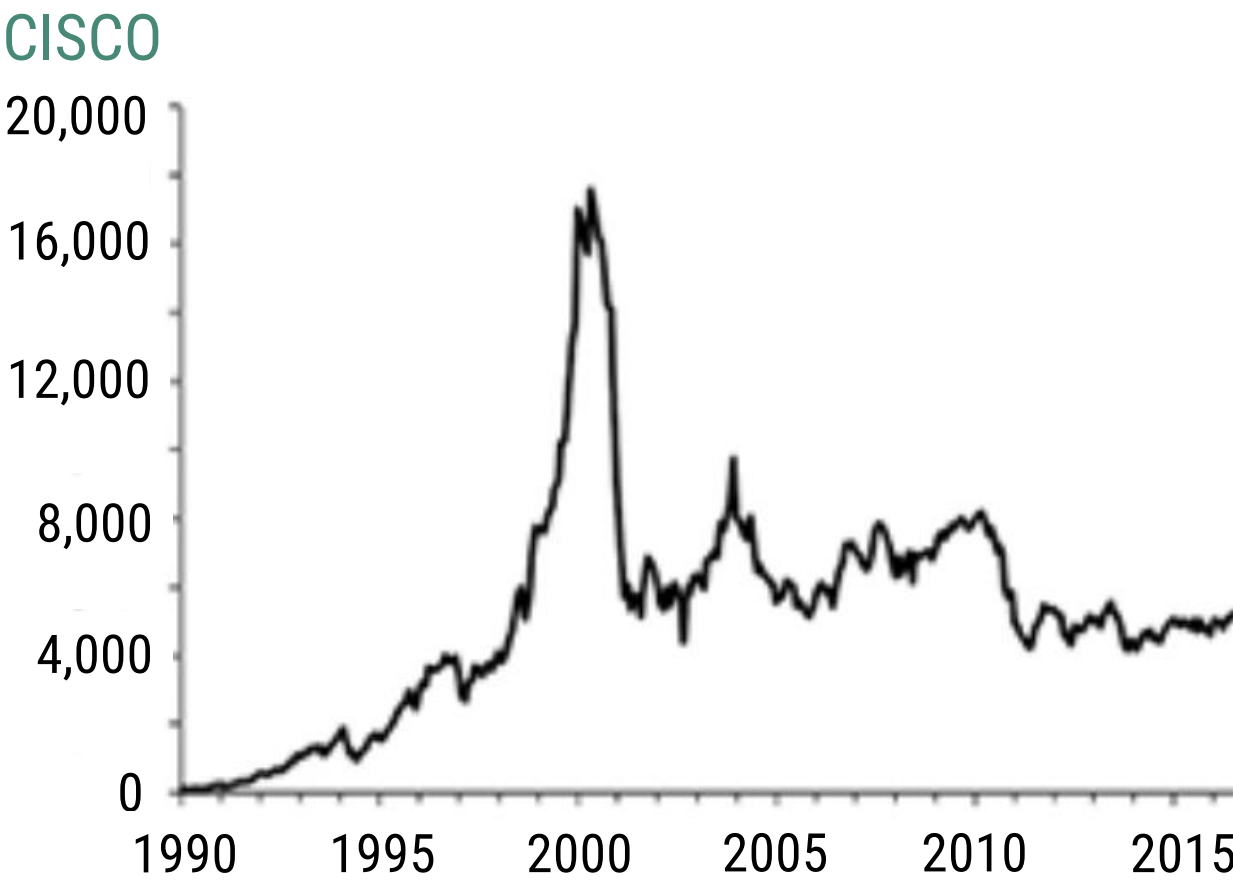
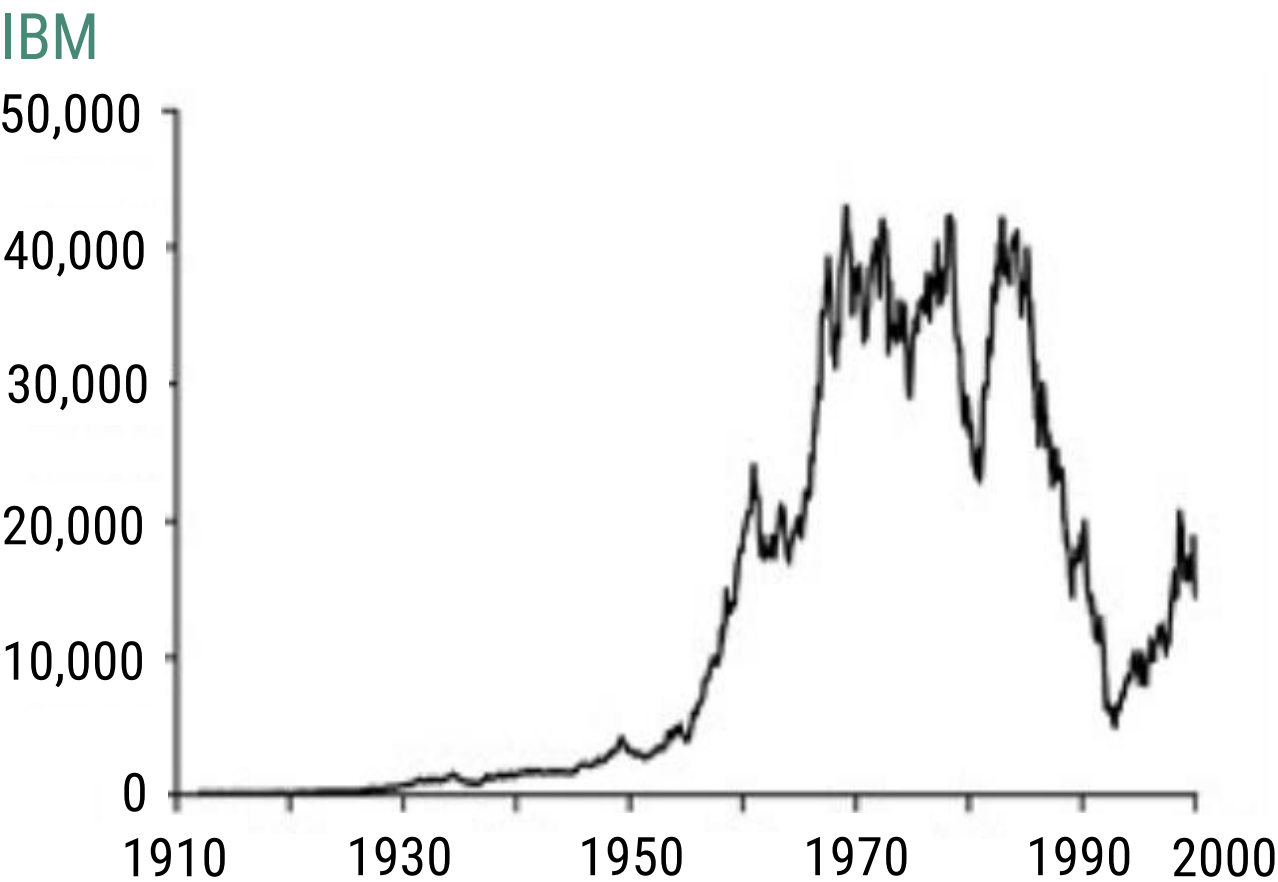
RADIO CORPORATION OF AMERICA (RCA)



Source: Nairn (2002)

LESSON 2: TECH REVOLUTIONS AND BUBBLES GO HAND IN HAND

Big Computing and the Internet



Source: Nairn (2002)

BITCOIN



Source: Datastream

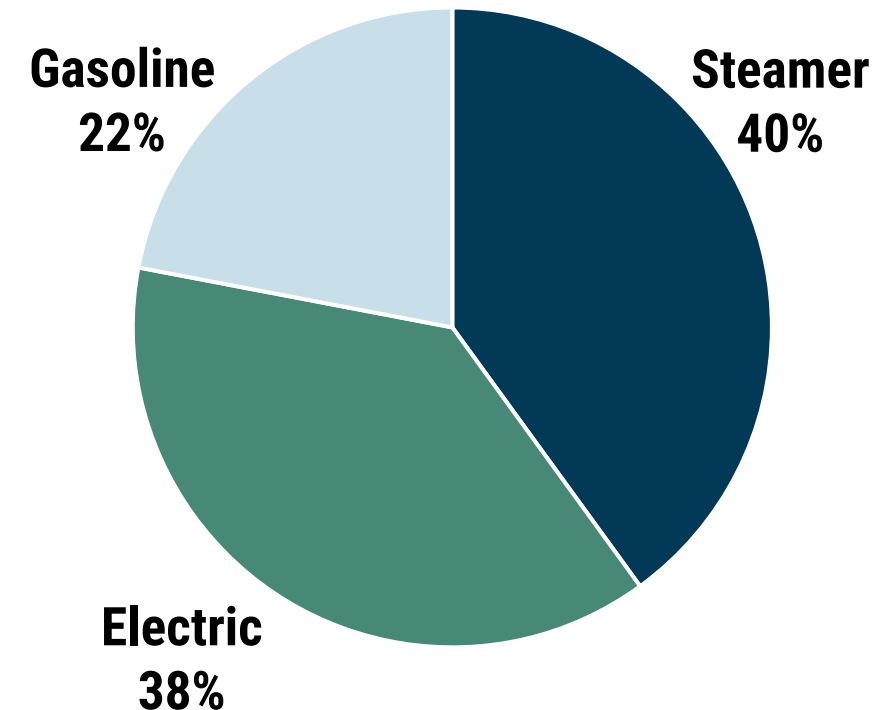
LESSON 3: CLUSTERS OF INNOVATION

Tech begets Tech

History teaches us that innovation seems to cluster – but beware, the **'best'** technology doesn't always win!

- Mining – Canals
- Steam power – Railroads – Steel
- Electricity – Combustion Engine
- Petro-chemicals – Electronics – Aviation
- Digital networks – Software – Robots – AI

MARKET SHARE OF AUTOMOBILE TECHNOLOGIES – 1900

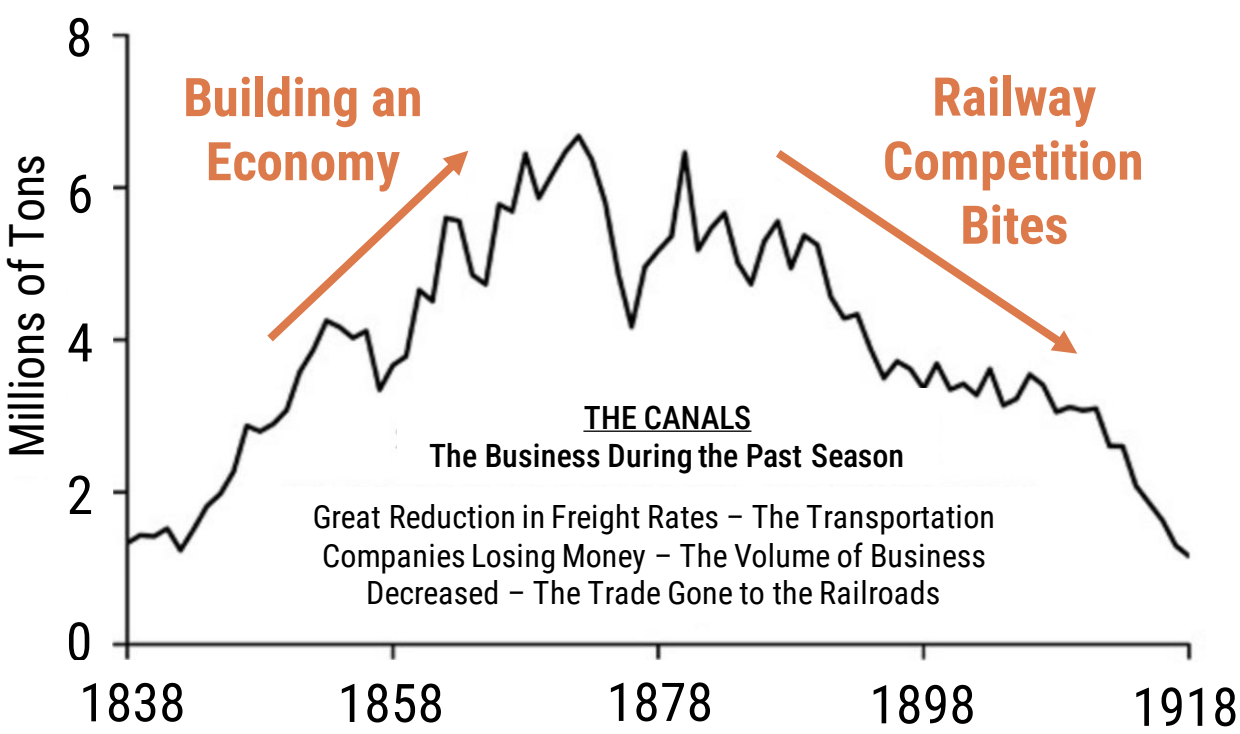


Source: Flink (1970)

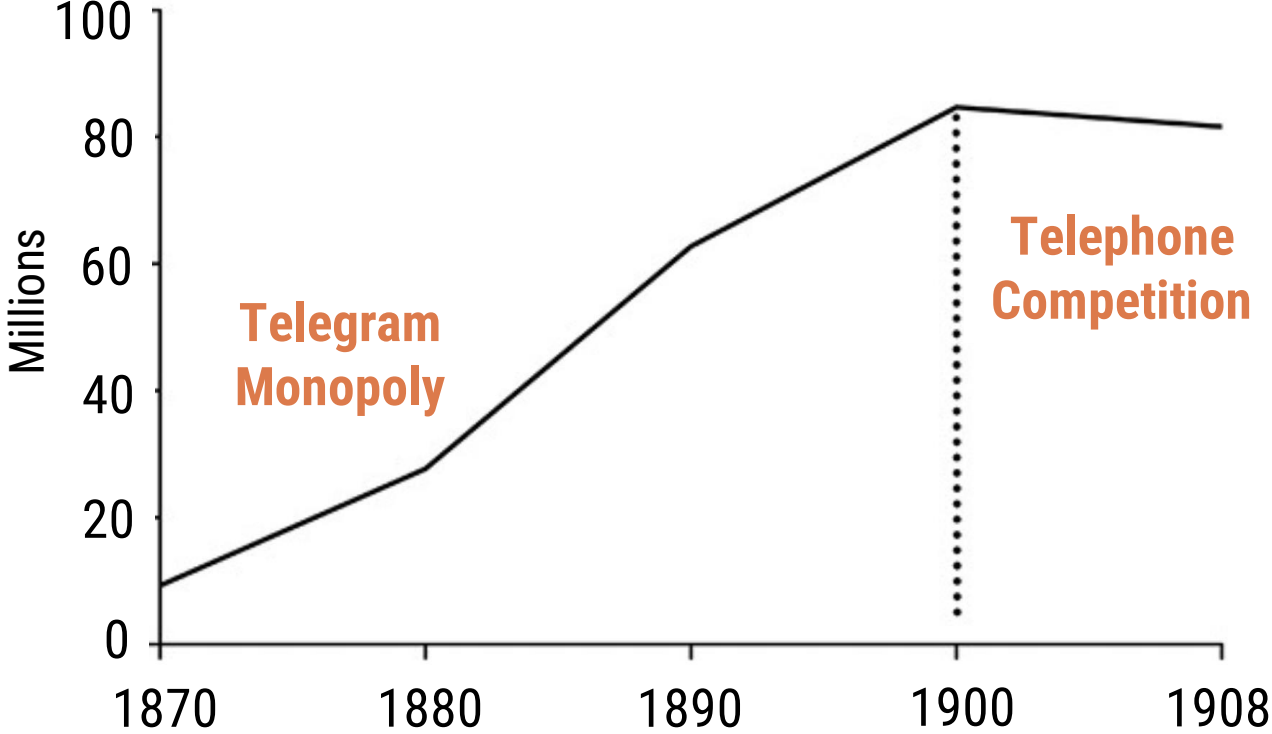
LESSON 4: DISRUPTERS CAN BE DISRUPTED

Thanks to lessons 3

VOLUME OF GOODS TRANSPORTED
BY CANALS (U.S.)



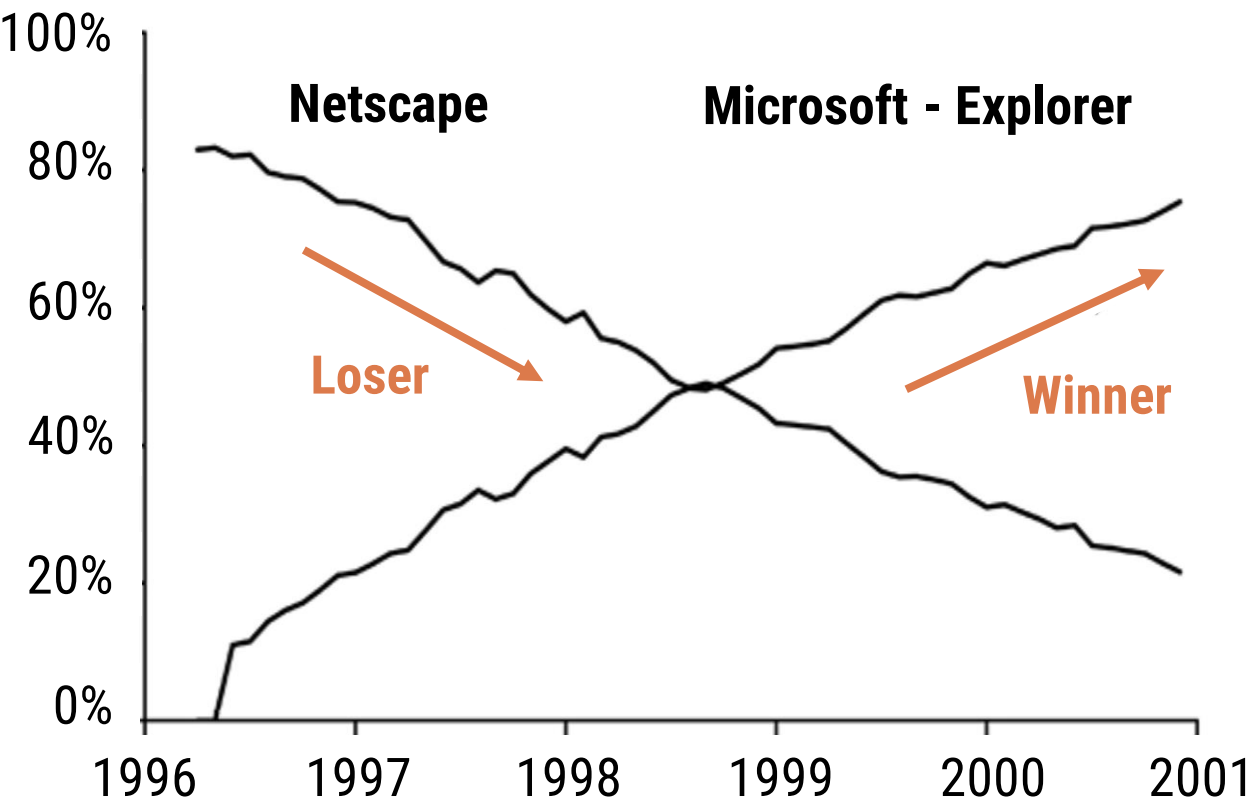
NUMBER OF TELEGRAMS
SENT IN UK



Source: Nairn (2002)

BROWSER WARS

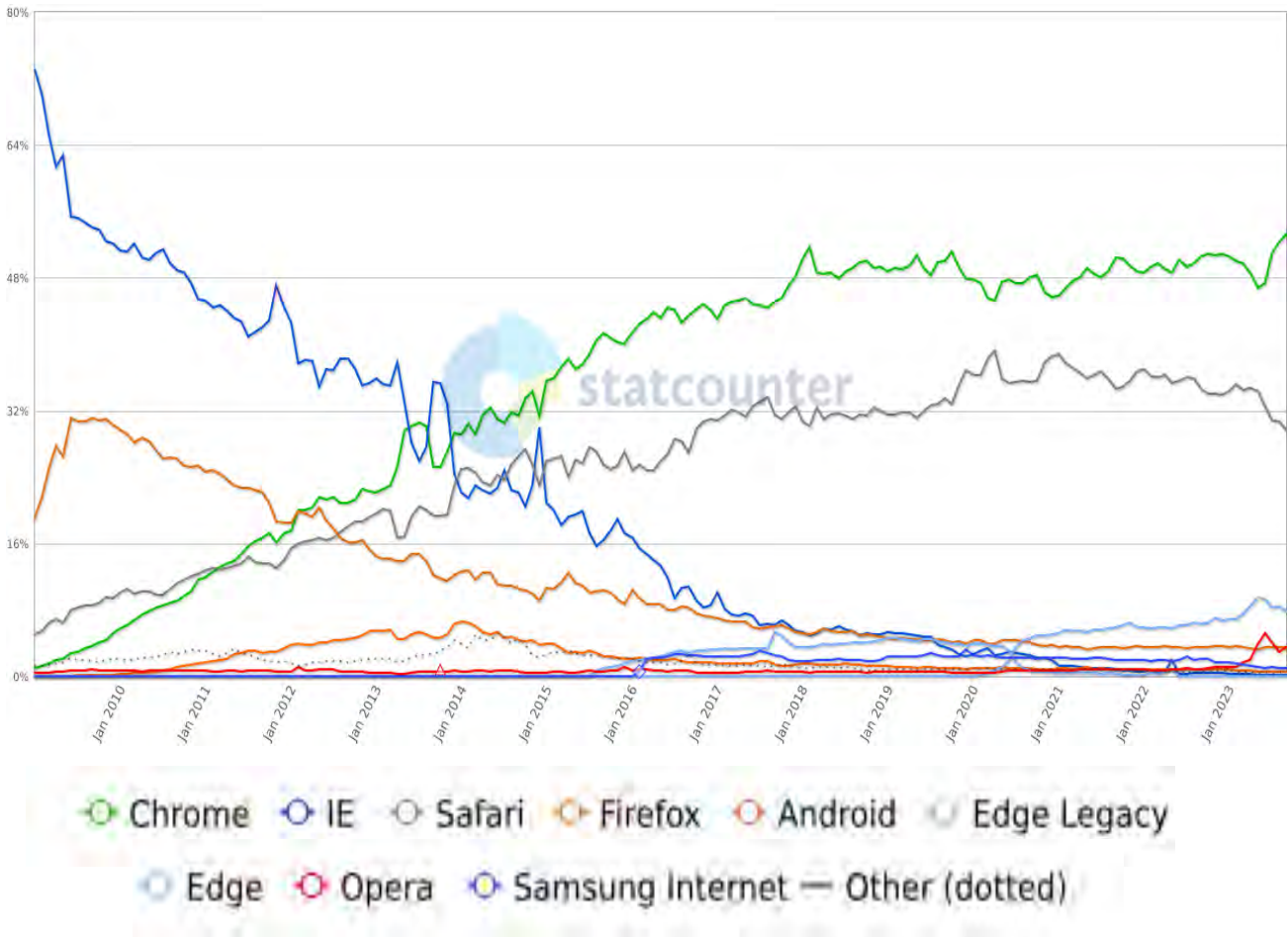
Market Share (%)



Source: Nairn (2002), Statcounter

STATCOUNTER GLOBAL STATS

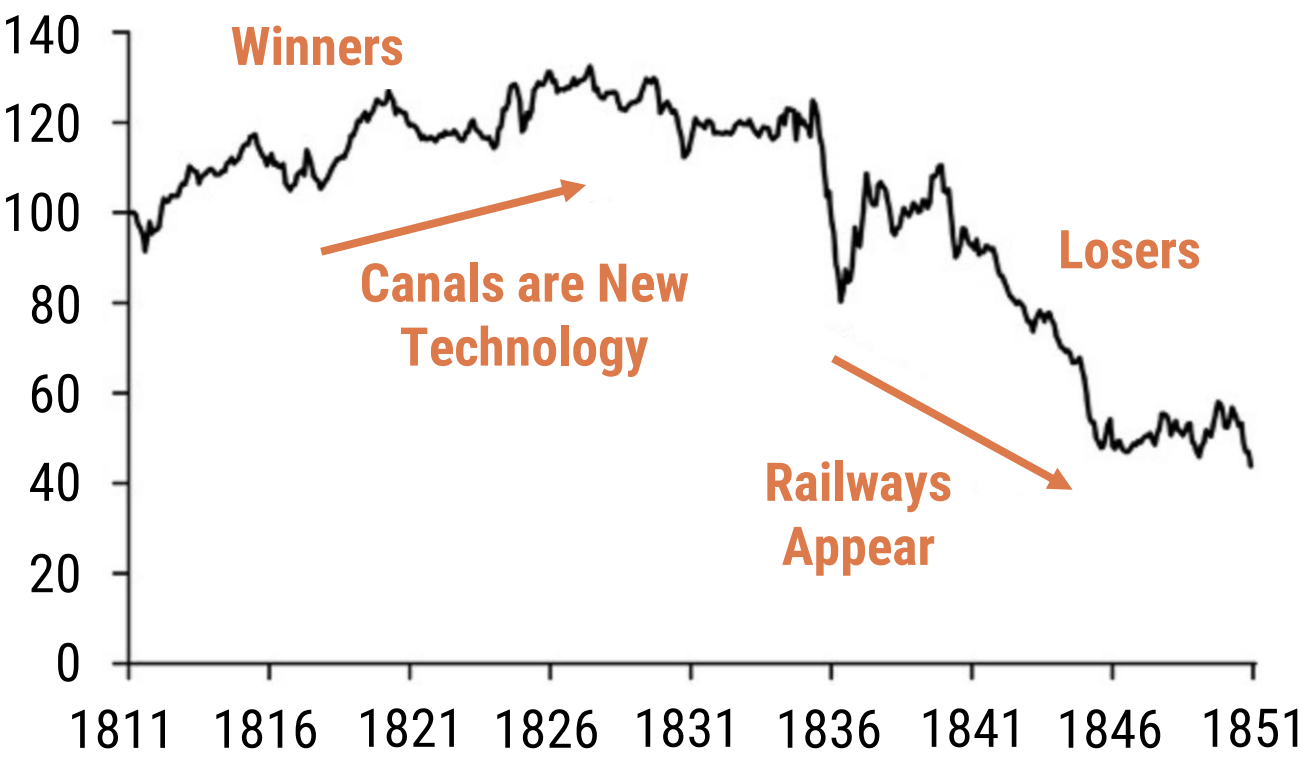
Browser Market Share, United States of America from Jan 2009 – Sept 2023



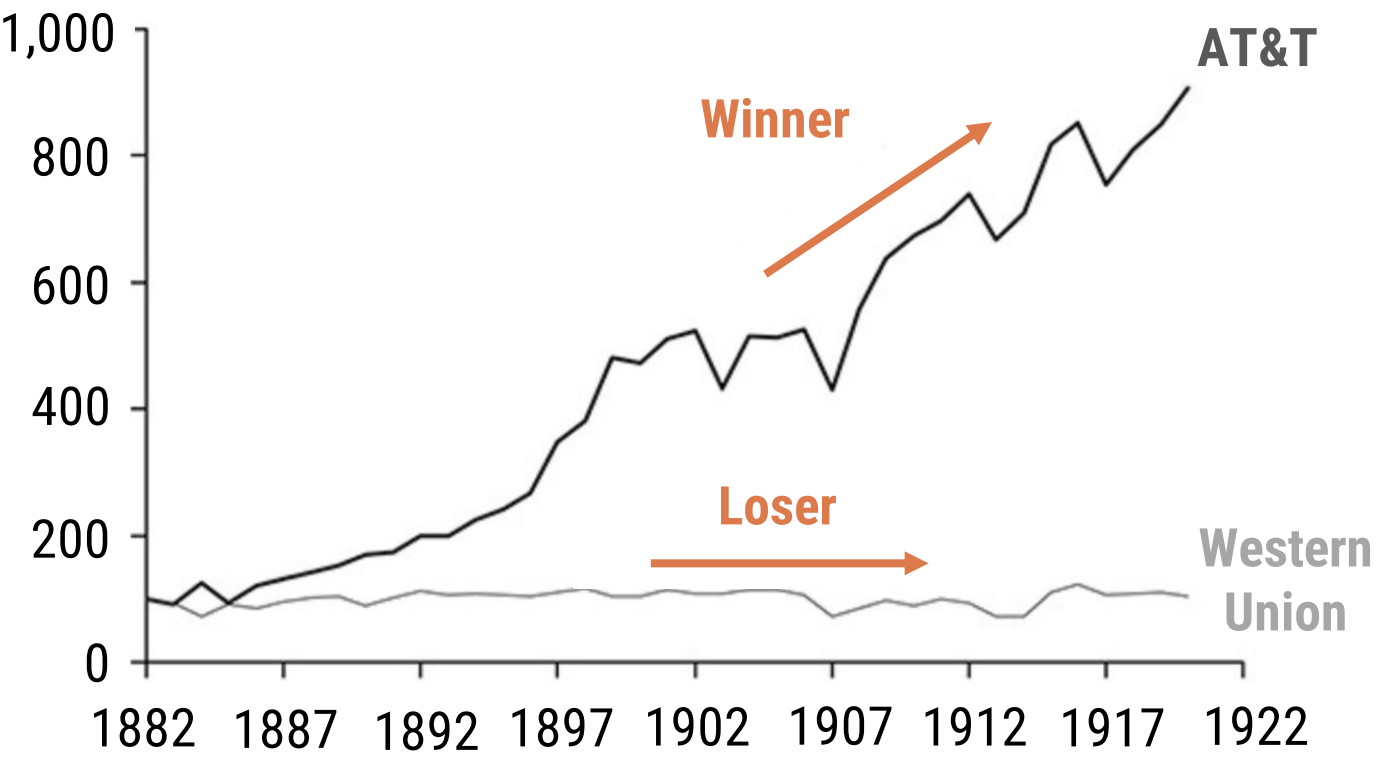
LESSON 5: LOSERS MAY BE EASIER TO IDENTIFY THAN THE WINNERS

The disrupted rarely respond well

CANALS LOSE OUT TO RAILS IN THE UK



TELEGRAM LOSES OUT TO THE TELEPHONE



Source: Nairn (2002)

PICKING WINNERS IS TRICKY

Foreseeing the future is next to impossible

To invest in the telephone: one had to presume to greater foresight than Western Union

To invest in electric light: one had to not invest in arc lighting (widely seen as the winner), and instead go with incandescent lighting, but wait until the various companies had rationalised

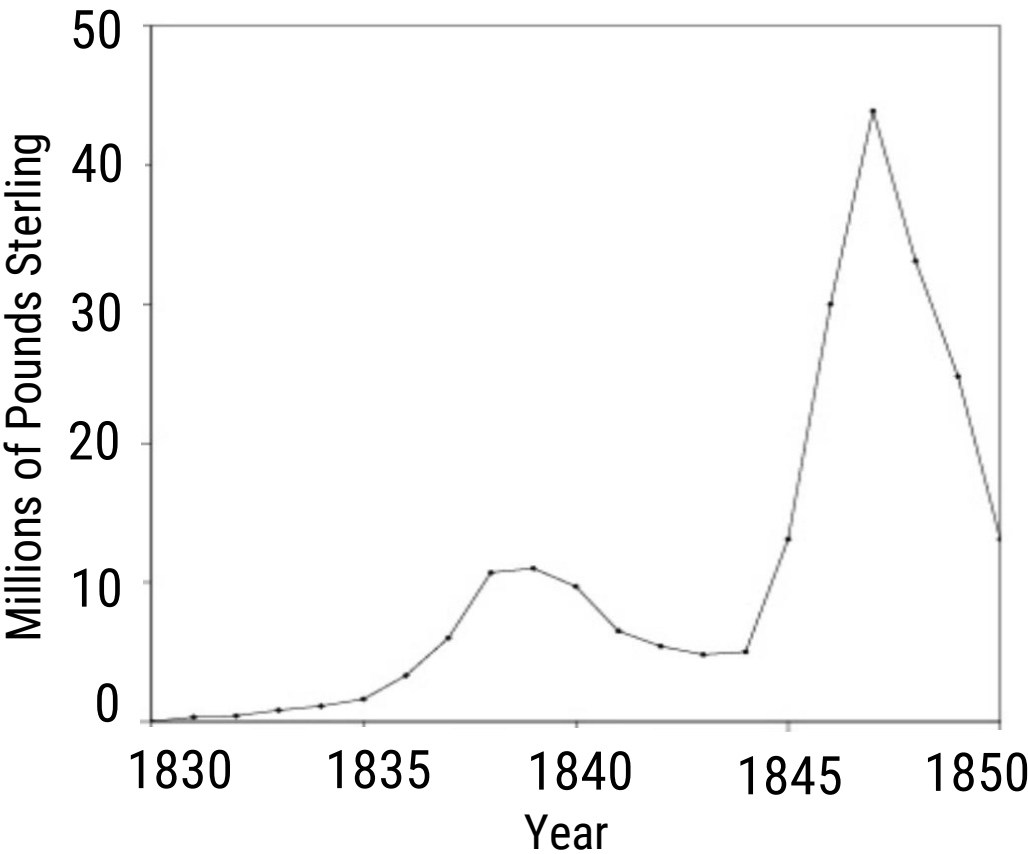
To invest in autos: one had to find Henry Ford but wait for him to be bankrupt twice before investing in Ford Motor Company. Plus, one would need to know that steam and electricity, not to mention the rotary engine, would all fail

To invest in computers: one would need to wait for Apple to appear, and exit before Microsoft attacked, own IBM until the arrival of Dell, remember to buy Apple again before the rise of the iPhone, etc.

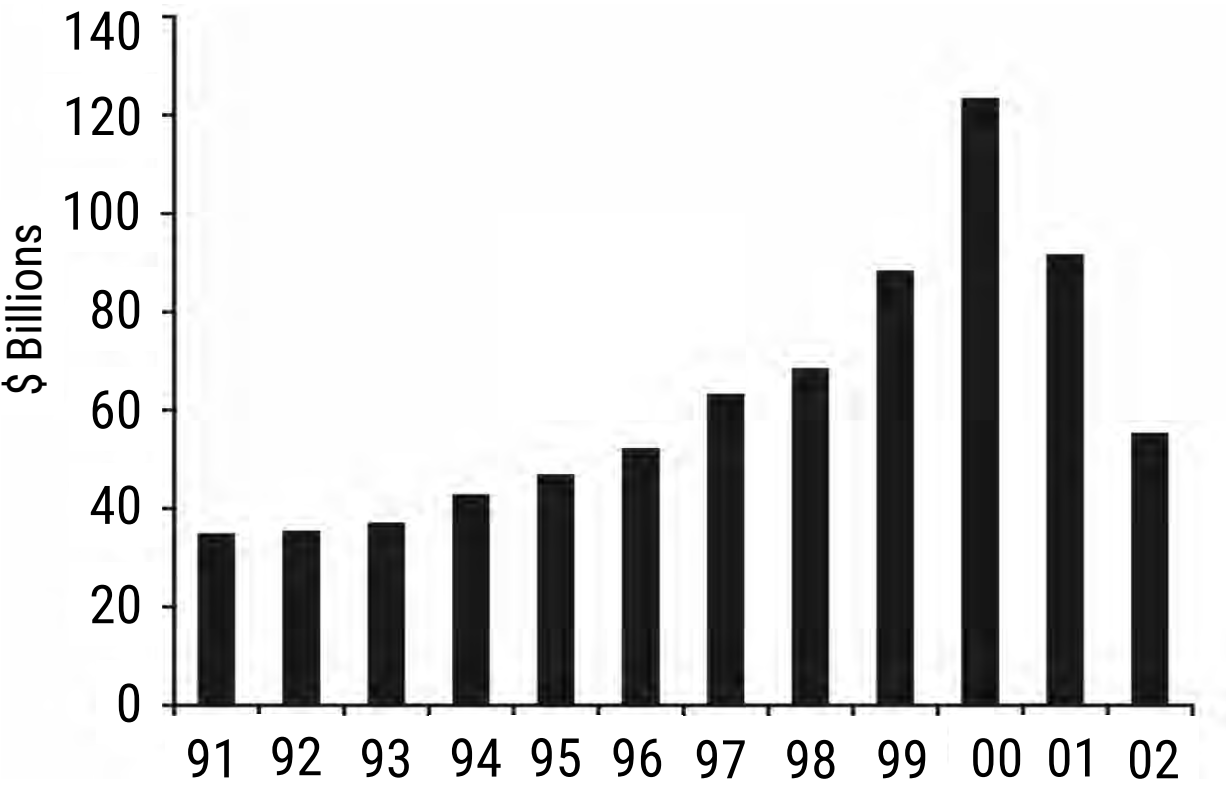
LESSON 6: BEWARE THE CAPITAL CYCLE

Booms led to busts

BRITISH RAILWAY CAPITAL INVESTMENT



CAPITAL SPENDING BY PUBLICLY TRADED TELECOMMUNICATIONS SERVICE PROVIDERS



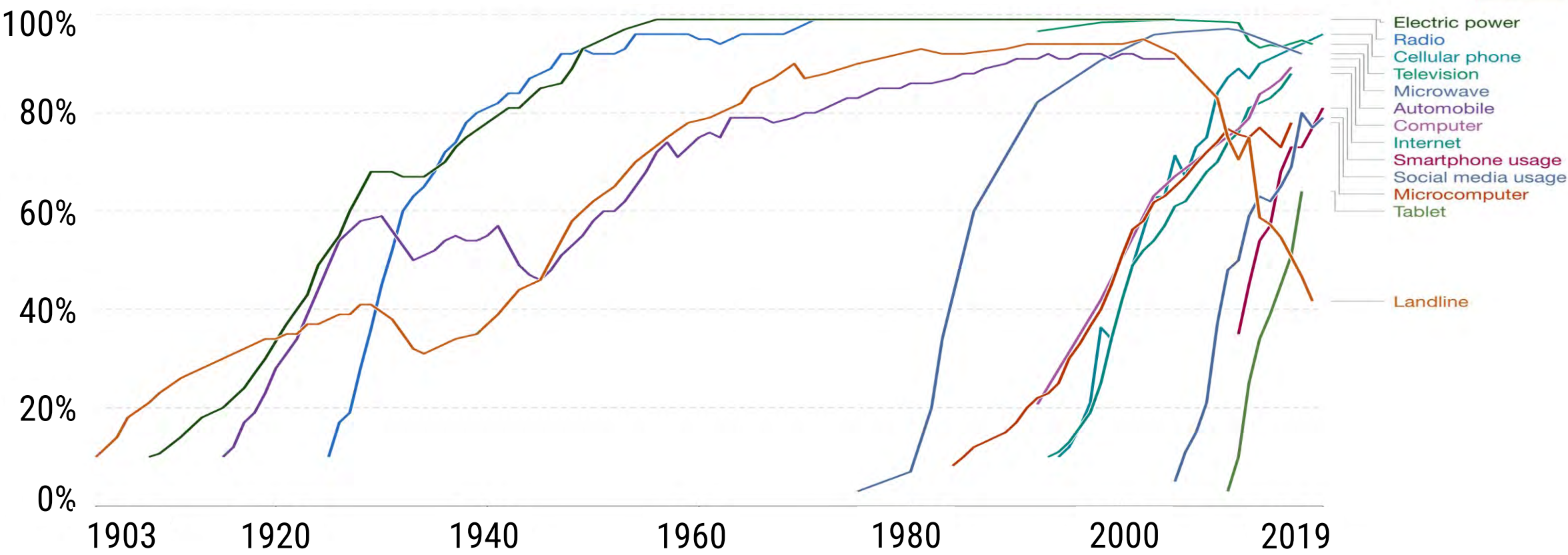
Railway Investment in the United Kingdom from 1830 – 1850

Source: Odlyzko, San Francisco Fed

LESSON 7: BENEFITS GO TO THE CONSUMER IN THE LONG TERM

Nothing lasts for ever: Consumers are the eventual winners in the technology waves. This can be postponed by patents or monopoly rights but has never yet been avoided.

SHARE OF UNITED STATES HOUSEHOLDS USING SPECIFIC TECHNOLOGIES



Source: Horace Dediu; Comin and Hobijn (2004); other sources collated by Our World in Data OurWorldInData.org/technological-change – CC BY

BACK TO AI



THE BIG MARKET DELUSION

Growth story

For nearly four decades, Moore's Law has been the governing dynamic of the computer industry, which in turn has impacted every industry. The exponential performance increase at constant cost and power has slowed. Yet, computing advance has gone to lightspeed. The warp drive engine is accelerated computing and the energy source is AI.

– Jensen Huang, CEO Nvidia (2003)

NVIDIA PRICE TO SALES RATIO

Nosebleed valuation



Source: Bloomberg

ANYONE REMEMBER THIS?

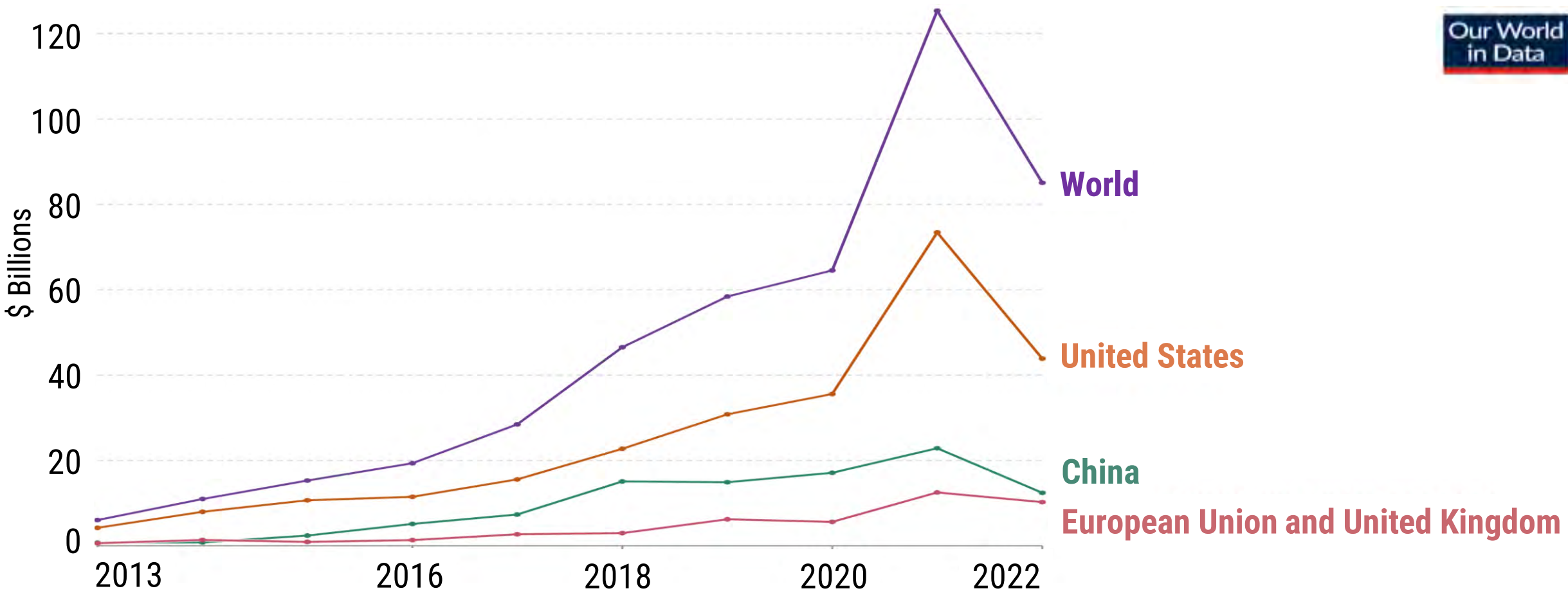
Scott McNealy (CEO, Sun Microsystems – speaking in 2002)

At 10 times revenues, to give you a 10-year payback, I have to pay you 100% of revenues for 10 straight years in dividends. That assumes I can get that by my shareholders. That assumes I have zero cost of goods sold, which is very hard for a computer company. That assumes zero expenses, which is really hard with 39,000 employees. That assumes I pay no taxes, which is very hard. And that assumes you pay no taxes on your dividends, which is kind of illegal. And that assumes with zero R&D for the next 10 years, I can maintain the current revenue run rate. Now, having done that, would any of you like to buy my stock at \$64? Do you realise how ridiculous those basic assumptions are? You don't need any transparency. You don't need any footnotes. What were you thinking?

CAPITAL CYCLE

ANNUAL PRIVATE INVESTMENT IN ARTIFICIAL INTELLIGENCE

Includes companies that received more than US\$1.5 million in investment, adjusted for inflation



Source: NetBase Quid via AI Index Report (2023), OurWorldInData.org/artificial-intelligence – CC BY
Note: Data is expressed in constant 2023 US\$. Inflation adjustment is based on the US Consumer Price Index (CPI)

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