Nasdaq Global Artificial Intelligence & Big Data™ Index

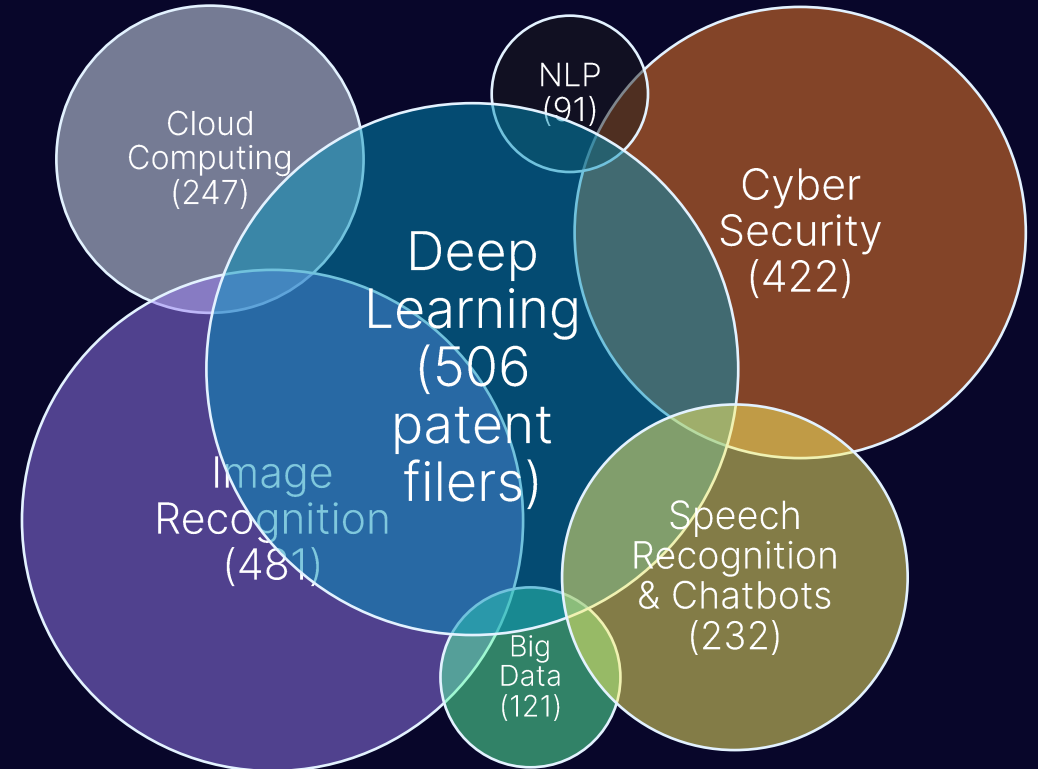Effective January 2025

Patent Methodology Overview

Nasdaq Global AI & Big Data™ Index (NYGBIG™)

NYGBIG is designed to track the performance of companies that are most active in filing patents relating to Deep Learning, Natural Language Processing (NLP), Image Recognition, Speech Recognition & Chatbots, Cloud Computing, Cyber Security, and Big Data. Of the 1,869 companies in the starting universe (NYDTB™), 774 filed patents in one or more of these areas; Deep Learning was most common with 506 companies filing related patents; 91 companies met all index criteria and were selected for NYGBIG inclusion
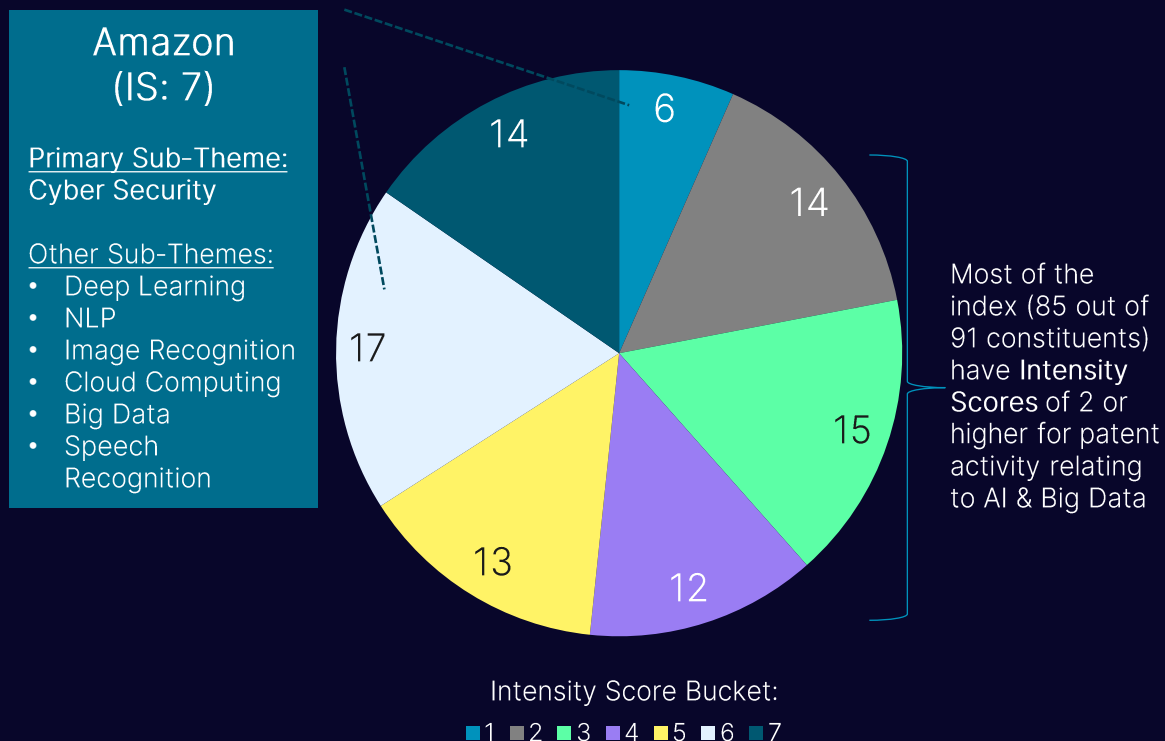
NYGBIG Broad Funnel

1,869 Companies w/ Patent Filings: Nasdaq Global Disruptive Tech Benchmark™ Index (NYDTB)

774 Companies w/ Patents Relating to AI & Big Data Themes

91 Companies (NYGBIG)
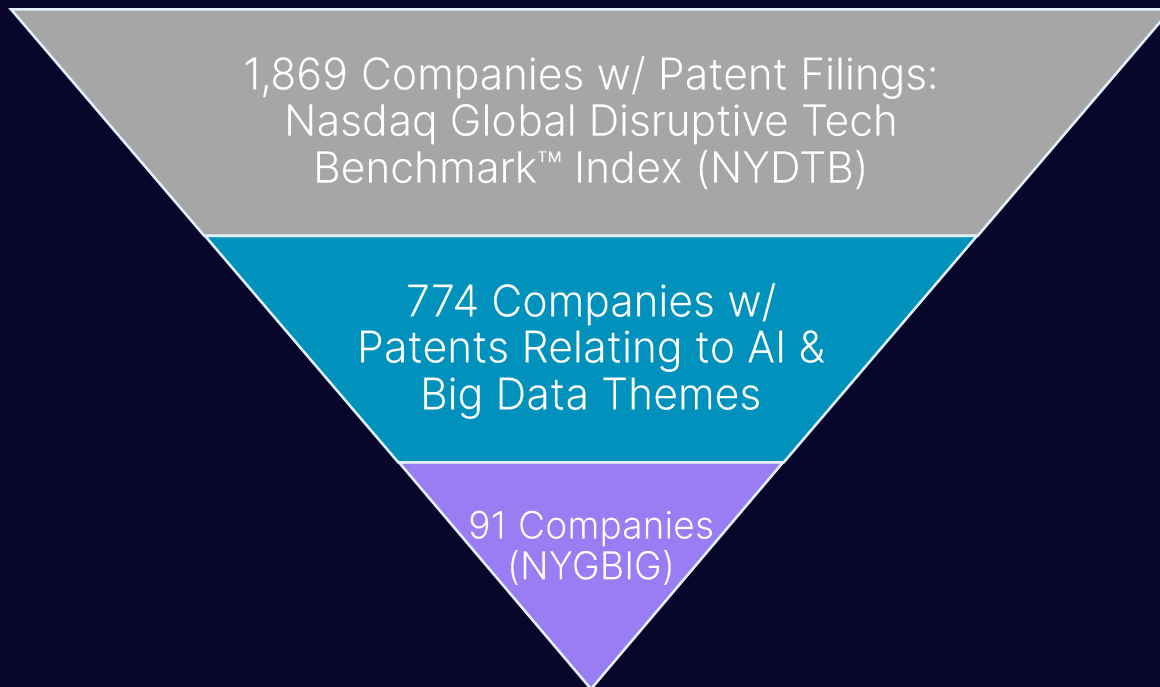
NYGBIG Eligible Constituents (774):

Cloud Computing (247)

NLP (91)

Cyber Security (422)

Deep Learning (506 patent filers)

Image Recognition (481)

Speech Recognition & Chatbots (232)

Big Data (121)

Patent Methodology Overview

Nasdaq Global AI & Big Data™ Index (NYGBIG™)

NYGBIG's universe of eligible constituents are assigned an Intensity Score, measuring the number of sub-themes (i.e. relevant technologies with patent filings) with a level of involvement (max score = 7, min = 1). Constituents are selected based on the strength of their Pure & Contribution scores (must be in the top 50th percentile to remain in the index, top 35th percentile for additions), as well as their Intensity Score. Preference is given to constituents that belong to ICB Subsectors determined as being most relevant to the theme, while also allowing a few other high-relevance, high-scoring stocks (e.g., Amazon) that are eligible irrespective of industry classification.

NYGBIG: # of Constituents per Intensity Score (IS)

Amazon (IS: 7)

Primary Sub-Theme:
Cyber Security

Other Sub-Themes:
• Deep Learning
• NLP
• Image Recognition
• Cloud Computing
• Big Data
• Speech Recognition

Pie chart values: 6, 14, 15, 12, 13, 17, 14

Most of the index (85 out of 91 constituents) have **Intensity Scores** of 2 or higher for patent activity relating to AI & Big Data

Intensity Score Bucket:
■ 1 ■ 2 ■ 3 ■ 4 ■ 5 ■ 6 ■ 7

NYGBIG Constituent Examples (Primary ICB Subsector):

Alphabet (IS: 7)

Primary Sub-Theme:
Deep Learning

Other Sub-Themes:
• NLP
• Image Recognition
• Speech Recognition
• Cloud Computing
• Big Data
• Cyber Security

Palantir Technologies (IS: 6)

Primary Sub-Theme:
Cyber Security

Other Sub-Themes:
• Image Recognition
• Speech Recognition
• Cloud Computing
• Big Data
• Deep Learning

AMD (IS:5)

Primary Sub-Theme:
Deep Learning

Other Sub-Themes:
• Big Data
• Image Recognition
• Cloud Computing
• Cyber Security

CrowdStrike (IS: 4)
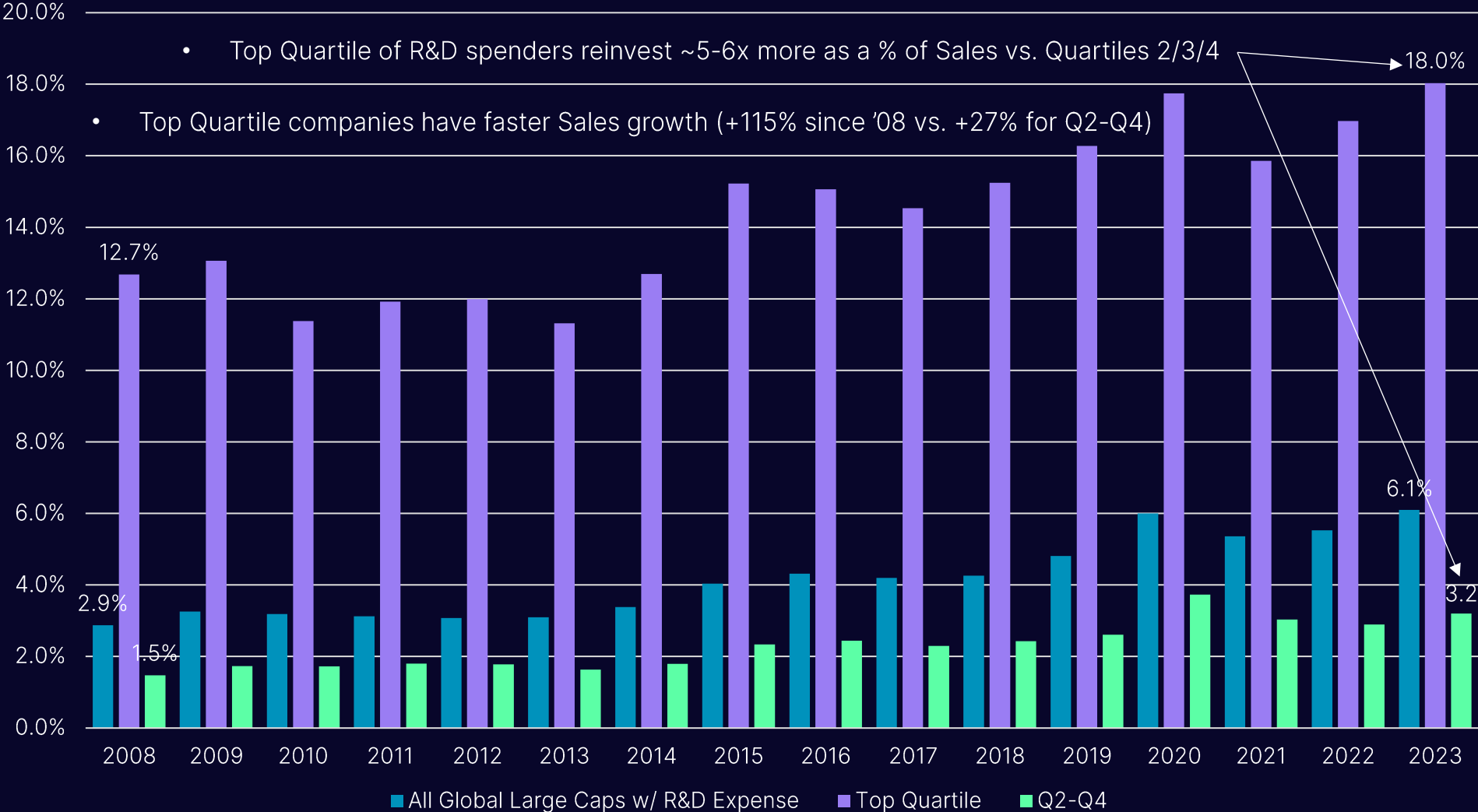
Primary Sub-Theme:
Cyber Security

Other Sub-Themes:
• Deep Learning
• Cloud Computing
• Image Recognition

Source: Nasdaq, Patent data as of 11/30/2024. Index data as of 1/21/2025.

Growth of R&D Spending among Global Large Caps

- Based on Nasdaq Global Large Cap Index universe of companies with some level of reported R&D (2023: 421 out of 1,015 companies)

- Annual R&D as % of Sales has steadily grown from ~3% in 2008 to ~5-6% in recent years among this group

- Top Quartile has increased R&D from ~12-13% of Sales to ~16-18% in recent years

- Rest of R&D spenders (Quartiles 2/3/4) has increased from ~1.5% to ~3-4%

- Total R&D across global large caps up from $342B in 2008 to ~$1T in 2023

Global Large Caps, Aggregate R&D as % of Aggregate Sales vs. Top Quartile vs. Q2-Q4

- Top Quartile of R&D spenders reinvest ~5-6x more as a % of Sales vs. Quartiles 2/3/4

- Top Quartile companies have faster Sales growth (+115% since '08 vs. +27% for Q2-Q4)

Legend: All Global Large Caps w/ R&D Expense, Top Quartile, Q2-Q4

R&D Leaders Outperform Laggards/Non-Spenders

Nasdaq Global Large Caps: Top Quartile R&D % Sales vs. Q2-Q4 vs. Zeros, Equal-Weighted (TR)
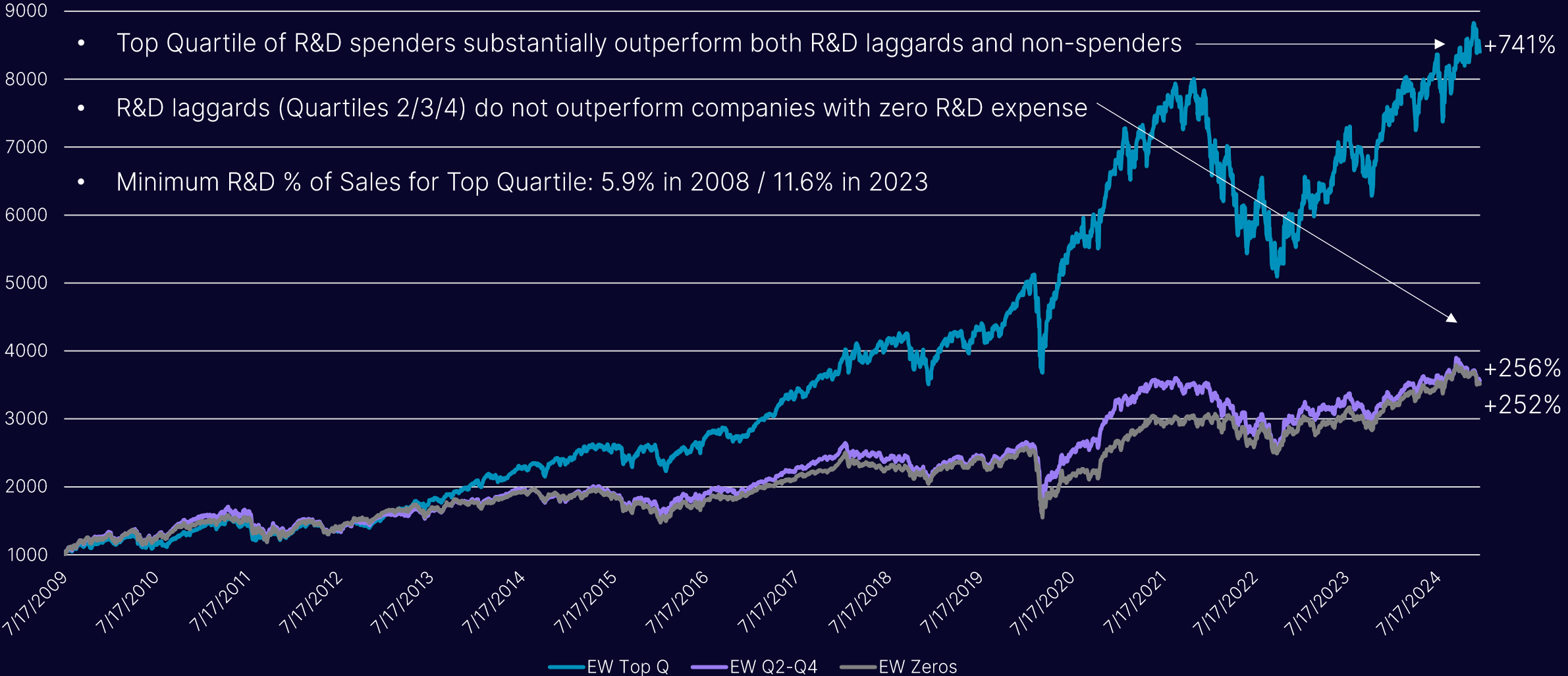
- Top Quartile of R&D spenders substantially outperform both R&D laggards and non-spenders → +741%

- R&D laggards (Quartiles 2/3/4) do not outperform companies with zero R&D expense

- Minimum R&D % of Sales for Top Quartile: 5.9% in 2008 / 11.6% in 2023
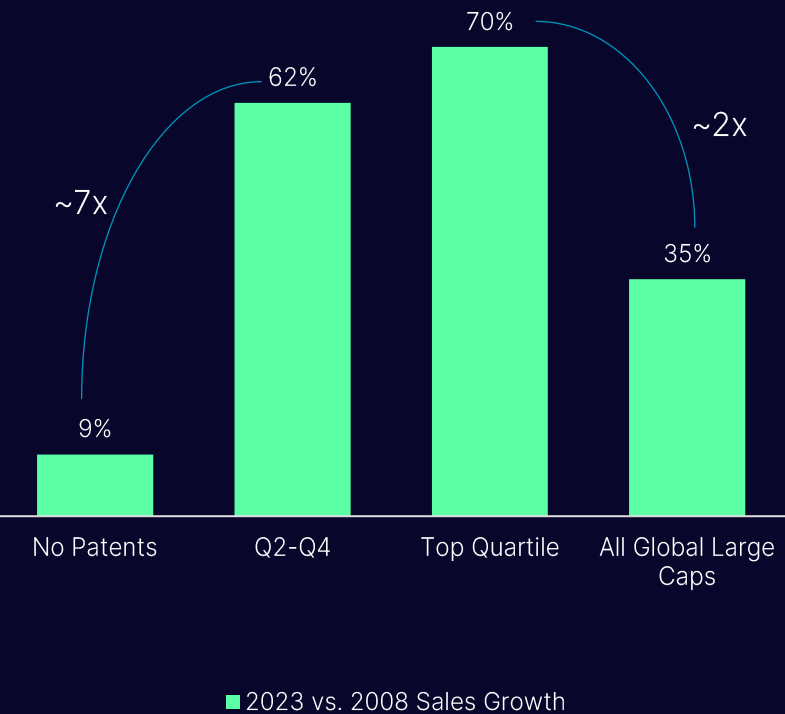
+256%
+252%

Legend: ▬ EW Top Q ▬ EW Q2-Q4 ▬ EW Zeros

X-axis: 7/17/2009, 7/17/2010, 7/17/2011, 7/17/2012, 7/17/2013, 7/17/2014, 7/17/2015, 7/17/2016, 7/17/2017, 7/17/2018, 7/17/2019, 7/17/2020, 7/17/2021, 7/17/2022, 7/17/2023, 7/17/2024

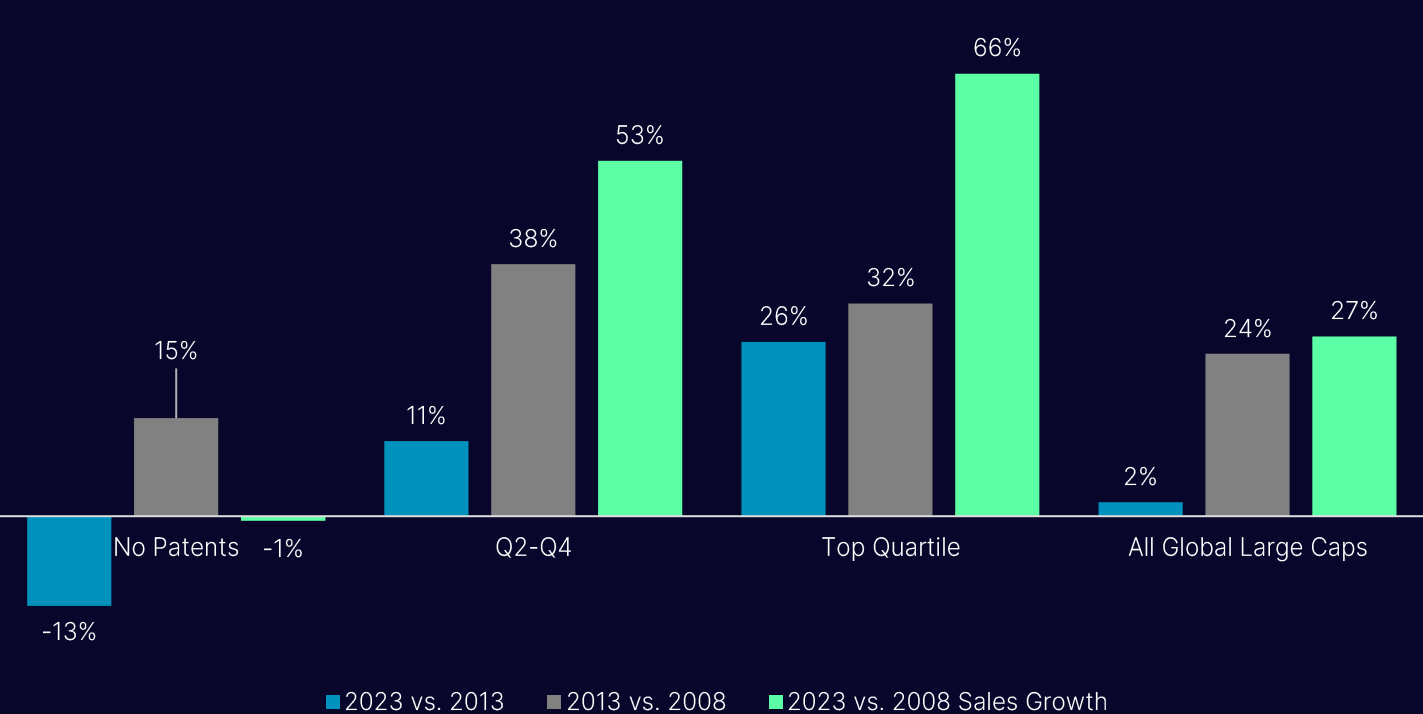Y-axis: 1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000, 9000

Patent Filings as a Growth Signal

Among global large caps in 2023, patent filers recorded the fastest sales growth over the past decade and a half, up ~60-70% regardless of the volume of patents, nearly 2x the average for the entire group of companies (35%). Those with no patent filings recorded growth of only 9%. Looking at the same groupings of companies as of 2013 market cap/patent rankings, patent filers would have also seen ~5-12x the rate of sales growth on a 10-year, go-forward basis, while non-filers saw negative sales growth.

2023 Patent Filers: Trailing 15-Year Aggregate Sales Growth

- No Patents: 9%
- Q2-Q4: 62%
- Top Quartile: 70%
- All Global Large Caps: 35%
- ~7x
- ~2x

■ 2023 vs. 2008 Sales Growth

2013 Patent Filers: Trailing 5-Year / 10-Year Forward Aggregate Sales Growth

- No Patents: -13% / 15% / -1%
- Q2-Q4: 11% / 38% / 53%
- Top Quartile: 26% / 32% / 66%
- All Global Large Caps: 2% / 24% / 27%

■ 2023 vs. 2013   ■ 2013 vs. 2008   ■ 2023 vs. 2008 Sales Growth

Disclaimer