S&P Dow Jones Indices

A Division of S&P Global

The Case for Indexing Thematics with the S&P Kensho New Economies

Contributors

Tim Edwards, PhD.
Managing Director
Index Investment Strategy
tim.edwards@spglobal.com

Anu R. Ganti, CFA
Senior Director
Index Investment Strategy
anu.ganti@spglobal.com

Srineel Jalagani, CFA
Senior Director
Strategy Indices
srineel.jalagani@spglobal.com

Pavel Vaynshtok, CFA
Managing Director
Global Head of Strategy Indices
pavel.vaynshtok@spglobal.com

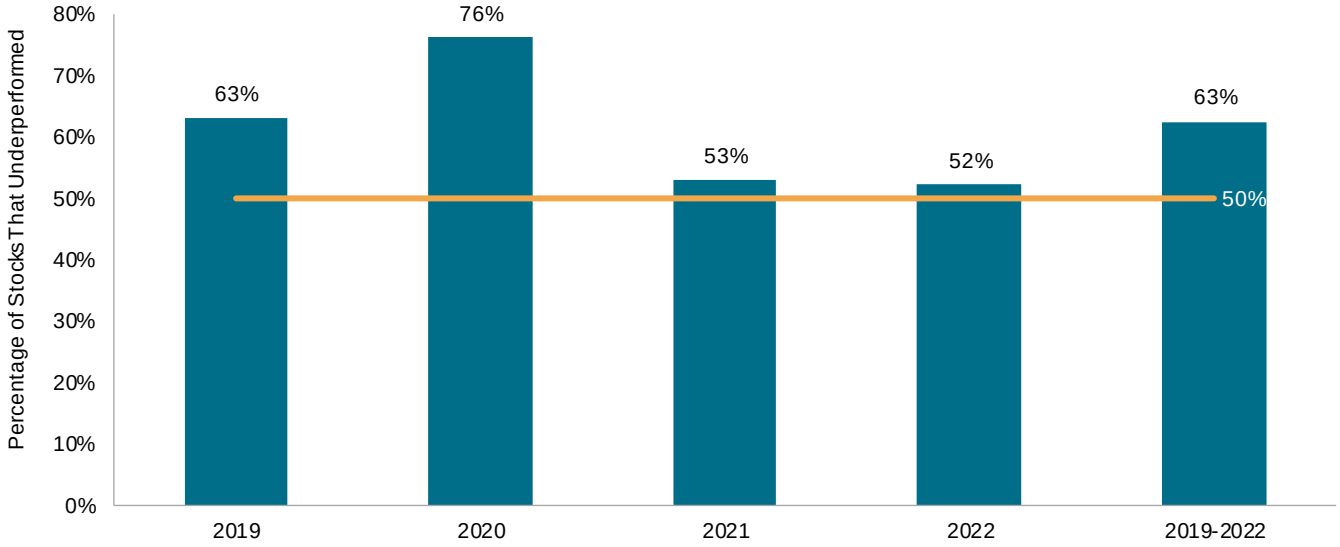
Offering an alternative to actively managed funds, index-based funds have played an increasingly important role in financial markets globally, particularly in the past two decades, in which **95%** of all actively managed large-cap U.S. funds lagged the S&P 500®.[1] As indexing has grown, many passive investors have benefited substantially by saving on fees and avoiding active underperformance. Underperformance in the world's largest equity market can be partly explained by factors such as positive skewness of equity markets, the professionalization of investment management and cost.[2]

However, the dynamics driving the relative performance of active funds in more narrow or specific markets, including so-called "thematic" funds, are less well understood. In this paper, we show that similar principles apply to the thematics space as well, along with some unique challenges, using the universe of the S&P Kensho New Economies Composite Index to frame our analysis. Underscoring the challenges of active thematic stock selection in this universe, and as Exhibit 1 illustrates, **63%** of included constituents underperformed this index over the past four years.

[1] Data as of June 30, 2022. Di Gioia, Davide, Tim Edwards, Anu R. Ganti., Craig J. Lazzara and Joe Nelesen, "SPIVA U.S. Mid-Year 2022 Scorecard," S&P Dow Jones Indices LLC, September 2022.

[2] Ganti, Anu R., and Craig J. Lazzara, "Shooting the Messenger," S&P Dow Jones Indices LLC, November 2022.

Exhibit 1: The Majority of Stocks Underperformed the S&P Kensho New Economies Composite Index Historically



Source: S&P Dow Jones Indices LLC and FactSet. One-year and four-year total returns for all constituents included in the index at any time during these periods with four-year history were used to calculate the percentage of stocks that outperformed. Data from Dec. 31, 2018, through Dec. 30, 2022. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

The Growth of Thematic Investing

The definition of "thematic" investing can vary from one market participant to another, but **by any reasonable classification, the category has grown exponentially in the past decade**, with an expansion of themes accompanying an emergence of innovative technologies, increased focus on societal changes, and resource and climate disruptions.

Arguably, the introduction of sector ETFs in the late 1990s marked the starting point for index-based thematic funds, giving a focused exposure to an economic sector in contrast to the more popular broad-based products tracking benchmarks like the S&P 500. But as new technologies (e.g., internet and e-commerce) evolved to span traditional industry classifications, single themes expanded to incorporate securities from diverse industries. For example, the recent shift to electric vehicles has expanded the value chain to also include firms from software and semiconductor equipment industries, as well as traditional automobile and component manufacturers. Another example can be seen with the rise of automation; an index focused on next-gen factories might now include components from not just the Industrials sector, but also from the Information Technology and Communication Services sectors. A proliferation of new data sources, and the application of artificial intelligence and machine learning techniques, has further led to the emergence of new business line classifications and product/theme revenue exposures at a company level.

According to Morningstar, the number of thematic funds has increased significantly, with 589 new thematic funds launched globally in 2021—more than double the previous record in 2020.[3] Meanwhile, in the two-year period ending in December 2021, assets under management in thematic funds, the majority of which are actively managed, almost tripled to USD 806 billion worldwide.[4] In the more narrow (but fast-growing) category of ETFs and other listed vehicles (ETPs), total assets had increased to USD 241 billion as of July 2022.[5]

Why Indexing in Thematics "Works"

The rise of passive investing has—in part—been a consequence of shortcomings in active performance, as our SPIVA® Scorecards[6] illustrate. At least in performance terms, the thematics space appears to be no exception: **in the long term, actively managed funds have found it difficult to outperform passive funds**.[7] There are a few key reasons why this might be so.

1. Positive Skewness and Downside Protection

The skewness of stock returns is an important cause of the consistent performance challenges of active managers.[8] To understand why, it is important to realize that **the cross-sectional distribution of stock returns is not "normal":** a stock can only go down by 100%, while it can appreciate much more than that. We observe that—particularly over longer-term horizons—**most equity markets are positively skewed.** By definition, every stock that an active manager might select has a 50/50 chance of being above *median*, but in a positively skewed distribution, the average is driven up by a small number of outperformers, and the manager has a *less* than 50/50 chance of being above average.[9] More broadly, in a universe where returns tend to be positively skewed, more concentrated portfolios are at greater risk of underperforming, while more diversified portfolios are relatively more likely to outperform.[10] In other words, **holding more stocks increases the likelihood of outperformance**, along with any additional diversification benefits. Since many active managers tend to run more concentrated portfolios relative to their benchmarks, **skewness helps us understand active underperformance.**

[3] Choy, Jackie, Monika Dutt, Ben Johnson, Andy Jung, Kenneth Lamont, Zunjar Sanzgiri, Lan Anh Tran and Yoki Wu, "Morningstar Global Thematic Funds Landscape 2022," Morningstar Manager Research, March 2022.

[4] "Morningstar Global Thematic Funds Landscape 2022," *op. cit.*

[5] Fuhr, Deborah, ""ETFGI reports net inflows of $1.51 billion into Thematic ETFs listed globally during July 2022," ETFGI, August 2022.

[6] Di Gioia, Davide, Tim Edwards, Anu R. Ganti, Craig J. Lazzara and Joe Nelesen, "SPIVA U.S. Mid-Year 2022 Scorecard," S&P Dow Jones Indices LLC, September 2022.

[7] Tran, Lan Anh, "Lessons Learned From Surviving Thematic Funds," Morningstar ETF Specialist, May 2022.

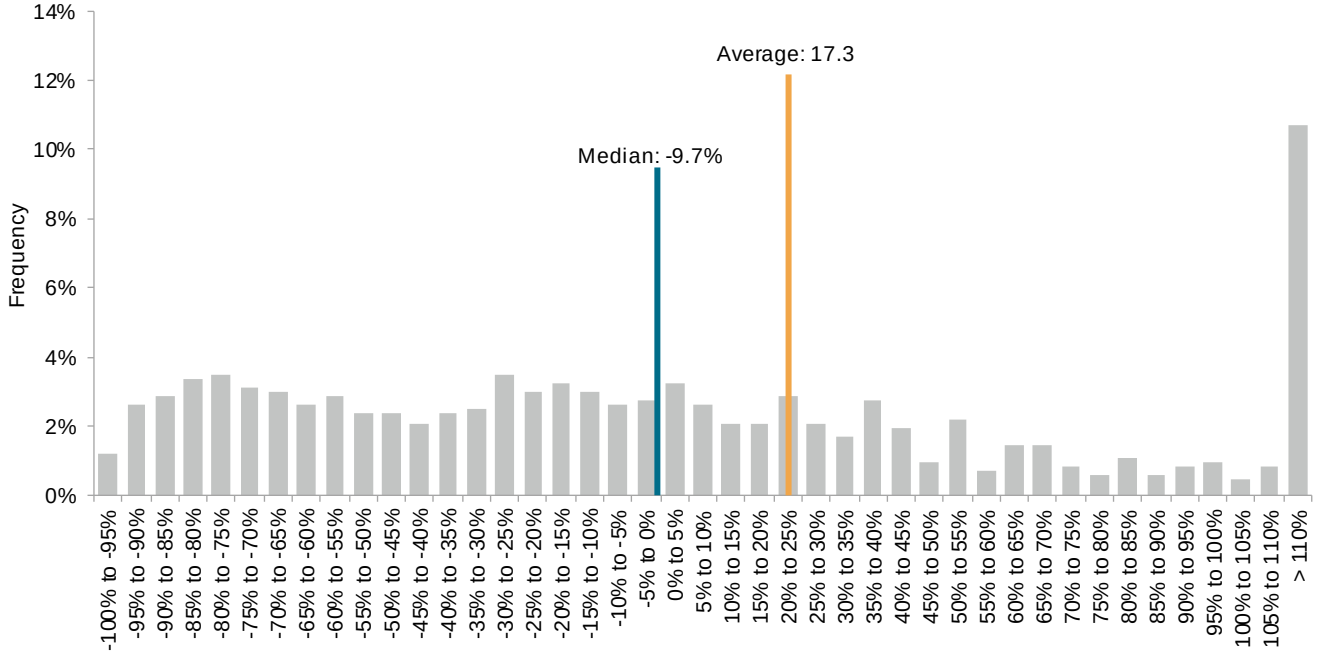
[8] Ganti, Anu, and Craig J. Lazzara, "Shooting the Messenger," *op. cit.*

[9] Lazzara, Craig J., "The Skew Is Not New," S&P Dow Jones Indices LLC, February 2018.

[10] Edwards, Tim, Craig J. Lazzara, "Fooled by Conviction," S&P Dow Jones Indices LLC, July 2016.

Exhibit 2 plots the distribution of cumulative returns for the constituent stocks of the S&P Kensho New Economies Composite Index for the past four years (see Appendix). The median return was -9.7%, far less than the average of 17.3%, illustrating that **the thematics space is characterized by positive skewness as well.** Over the four years shown, *only 37% of stocks outperformed the index*, highlighting the difficulty for thematic active managers to outperform the benchmark.

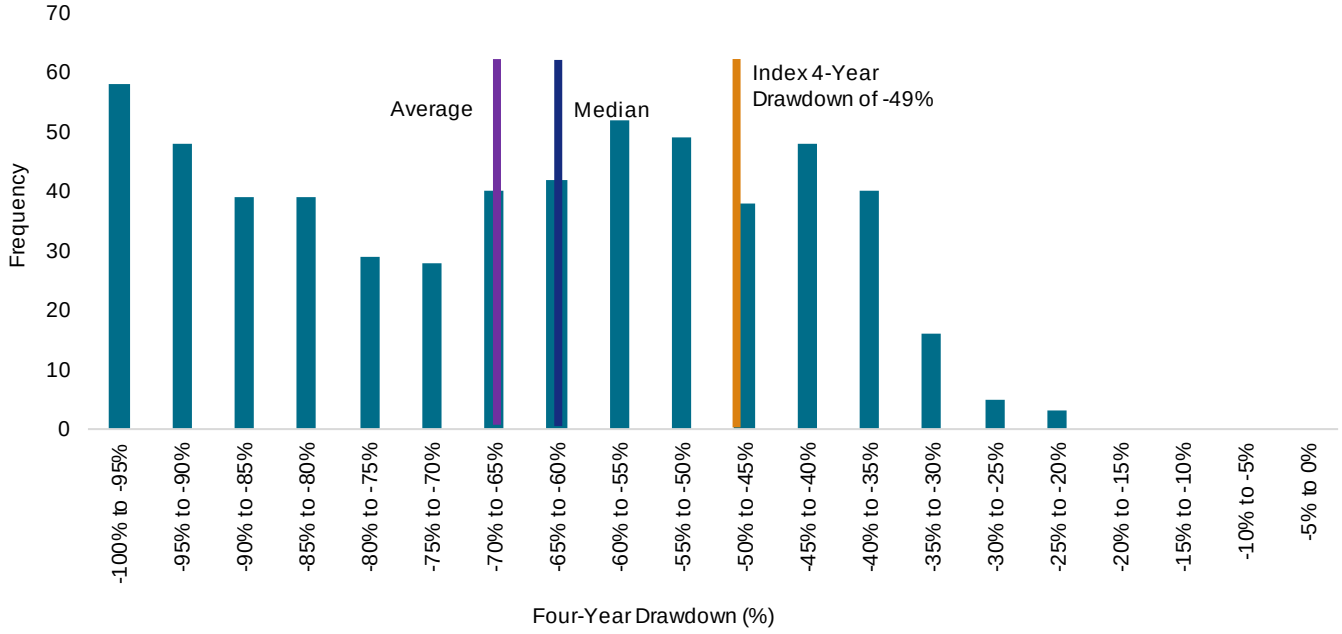
Exhibit 2: Only 37% of Stocks Outperformed the S&P Kensho New Economies Composite Index over a Four-Year Period



Source: S&P Dow Jones Indices LLC, FactSet. Data from Dec. 31, 2018, to Dec. 30, 2022. The frequency distribution shows the total returns of all S&P Kensho New Economies Composite constituents during the period of their index membership. Four-year returns for all constituents with four-year history were used to calculate the percentage of stocks that outperformed. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

The positively skewed returns distribution supports the *return* perspective for an index-based approach, but what about the risk considerations? In Exhibit 3, using the drawdown metric as a proxy for tail risk that focuses on the investing losses (versus using volatility as a risk metric that captures both the upside and downside), we also see an increased level of downside protection from indexing compared to single stock selection. The S&P Kensho New Economies Composite Index's recent four-year drawdown of -49% was less than that of its underlying constituents, which had -64.4% median and -66.2% average drawdown values during the same period.

Exhibit 3: Drawdowns for the S&P Kensho New Economies Composite Index Tended to Be Less Severe than Drawdowns of Its Corresponding Constituent Returns



Source: S&P Dow Jones Indices LLC. Four-year history with data ending on Dec. 30, 2022. All constituents included in the index at any time during this period with four-year history were used to plot the above histogram. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

2. Professionalization of Investment Management

Another reason why most active managers face challenges is that there is no natural source of outperformance; the outperformance of above-average managers is offset by the underperformance of below-average managers. An important factor is whether these are professional or retail active managers. If the number of professionals outpace the number of retail managers, then **the professionals are now competing against each other.**[11] The ascent of professional investors in the U.S reached a turning point by the mid-1970s, which coincides with the beginning of the development of index funds that track market benchmarks.[12]

Thematic investing gained momentum during the 2000-2010 period, as the number of themes expanded from 14 to 25, in areas such as robotics and fintech.[13] 2005 was a catalyst with the development of thematic ETFs, which propelled growth globally.[14]

[11] Ganti, Anu, and Craig J. Lazzara, "Shooting the Messenger," *op. cit.*

[12] Ellis, Charles D., "The Loser's Game," Financial Analysts Journal, July/August 1975.

[13] "Morningstar Global Thematic Funds Landscape 2022," *op. cit.*

[14] Johnson, Steve, "Thematic funds triple share of global investments in a decade," Financial Times, April 2022.

Since it is *relative* skill that matters in investment management, as opposed to absolute skill, the increasing amount of professional competition within the thematics space has simply made the game harder.

3. Cost

Lower cost is one of the most compelling reasons for the success of passive management. Before costs, passive and active portfolios should yield the same return, assuming that their aggregate portfolios are identical. However, active managers' costs are higher than those of passive managers, as they generally use more resources for research, trading, management fees, etc. As a result, "properly measured, the average actively managed dollar must underperform the average passively managed dollar, net of costs. Empirical analyses that appear to refute this principle are guilty of improper measurement."[15]

The average expense ratio for active U.S. equity mutual fund managers in 2021 was 0.68%, compared to only 0.06% for their passive counterparts.[16] It would seem that investors have an obvious advantage for choosing a passive manager compared to an active one as a result of this difference of 62 bps. Increasing competition from the growth of indexing has also been a key catalyst for the decline in the average expense ratios of both active and passive mutual funds.

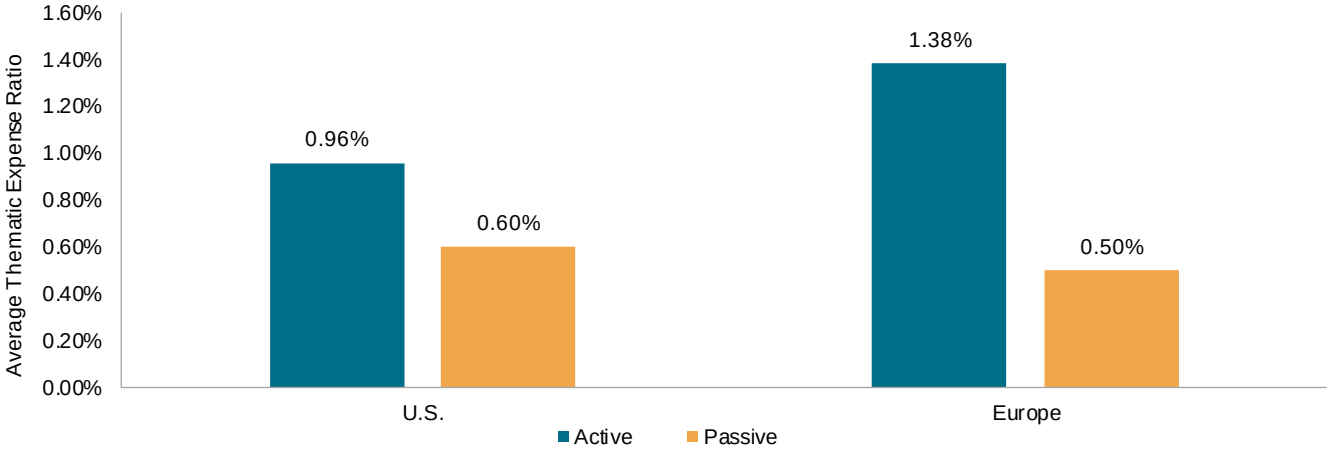
We observe in Exhibit 4 the same cost benefit in the thematics space, with active thematic fund expense ratios greater than that of passive thematic expense ratios in the U.S., and even more so in Europe.[17]

[15] Sharpe, William F., "The Arithmetic of Active Management," Financial Analysts Journal, January/February 1991, p. 7-9.

[16] Duvall, James, and Alex Johnson, "Trends in the Expenses and Fees of Funds, 2021," ICI Research Perspective, March 2022

[17] Boyadzhiev, Dimitar, Ben Johnson, Kenneth Lamont and Daniel Sotiroff, "Morningstar Global Thematic Funds Landscape 2021," Morningstar Manager Research, May 2021.

Exhibit 4: Average Active versus Passive Thematic Expense Ratios



Source: Morningstar Global Thematic Funds Landscape 2021. Data as of March 31, 2021. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

S&P Kensho New Economies and a Diversified Approach to Thematic Investing

The S&P Kensho New Economies is S&P DJI's thematics methodology that leverages machine learning (ML) techniques, particularly natural language processing (NLP) algorithms, to build thematic indices with an emphasis on innovation—indices that offer a comprehensive view of companies driving the so-called "Fourth Industrial Revolution."[18]

The S&P Kensho New Economies Composite Index is the headline broad benchmark within this ecosystem and incorporates firms from all the 25 underlying innovation subsectors. The principles behind this index's construction advocate for its credentials as the **innovation benchmark**. The S&P Kensho New Economies Composite Index is a diversified, investable index that covers the broad innovation spectrum across multiple disciplines (currently 25) and, crucially, lacks the common active managers' biases[19] (overconfidence effect, herding behavior, confirmation bias) that can be found within this space.

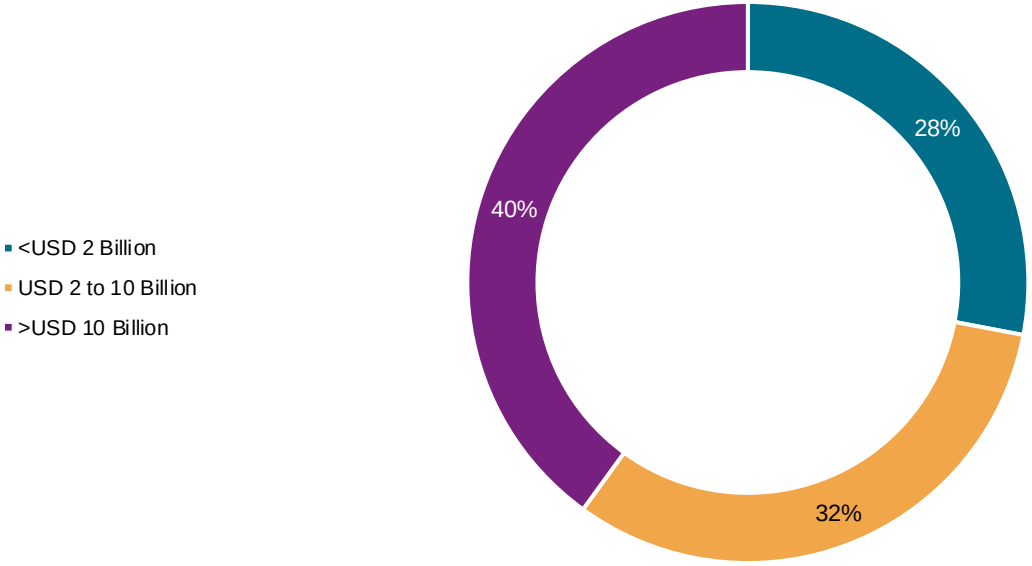
As of Dec. 30, 2022, the index's stock constituents spanned the market cap spectrum (see Exhibit 5), with large-cap stocks making up the bigger portion (40%), followed by mid- (32%) and small-cap (28%) stocks. Additionally, the index's stock constituents represent 10 of the 11 GICS® sectors (see Exhibit 6), and 5 of those 10 sectors have more than a 5% weight within the composite index. The relatively larger weights (versus common growth proxies such as the Nasdaq 100) in the Industrials and Utilities sectors (mostly at the expense of a reduced weight

[18] Klaus Schwab, "The Fourth Industrial Revolution: what it means, how to respond," World Economic Forum, January 2016.

[19] Baker, Kent, Greg Filbeck and Victor Ricciardi, "How Behavioural Biases Affect Finance Professionals," The European Financial Review, December-January 2017, pp. 25-29.

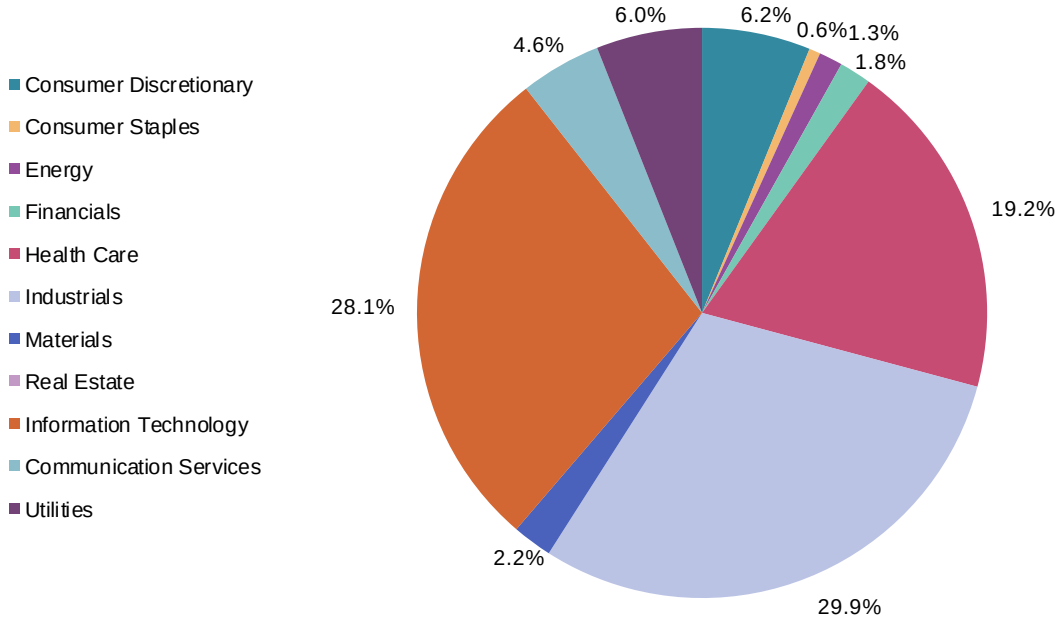
within the Information Technology and Communication Services sectors) reflect the breadth and comprehensive coverage of the index, which is focused on innovation beyond only tech-related sectors.

Exhibit 5: S&P Kensho New Economies Composite Index Breakdown of Capitalization Exposure



Source: S&P Dow Jones Indices LLC. Data as of Dec. 30, 2022. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

Exhibit 6: S&P Kensho New Economies Composite Index Breakdown of GICS Sector Exposure

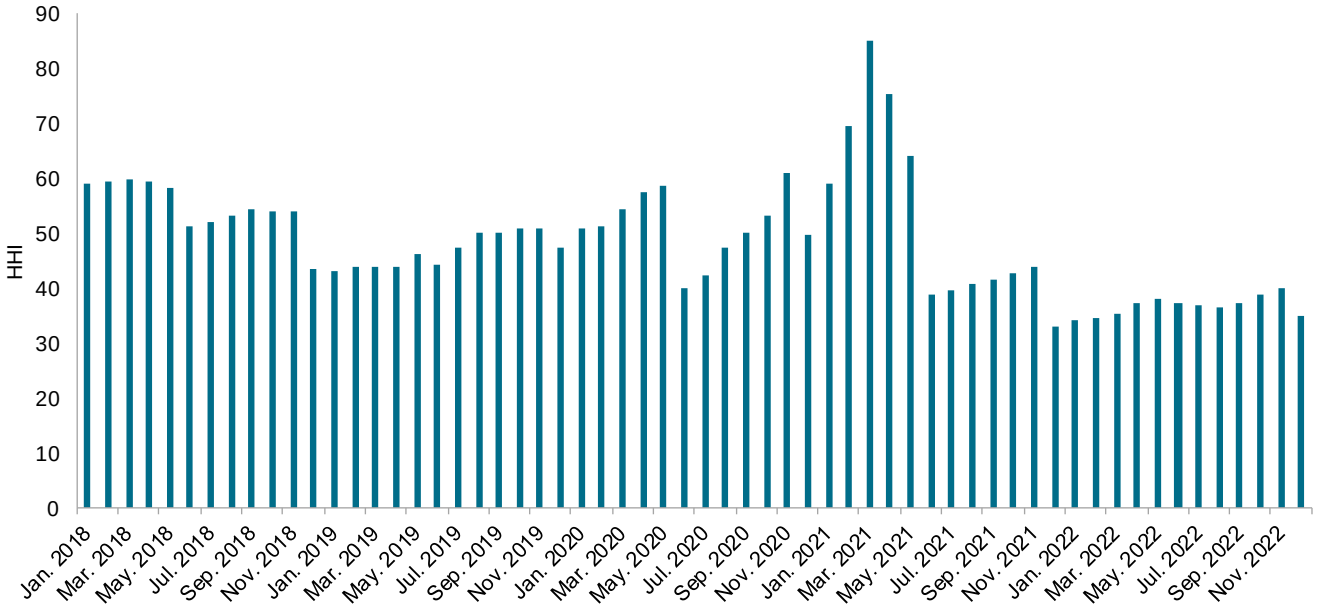


Source: S&P Dow Jones Indices LLC. Data as of Dec. 30, 2022. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

Concentration and the Benefit of a Modified Equal-Weight Approach

Concerns about the level of concentration in the market have arisen whenever mega-cap outperformance takes place, and this is especially relevant within the thematics space, given the granular nature of certain themes, some of which are more narrow than others.[20] The Herfindahl–Hirschman index (HHI) is a widely used concentration measure; it is defined as the sum of the squared index constituents' percentage weights.[21] For example, the HHI for an equally weighted 50-stock portfolio is 200 (50 x 2^2). When we calculate the historical HHI for the S&P Kensho New Economies Composite Index (see Exhibit 7), we find that concentration within the index has decreased in recent years, from 58 in January 2018 to 35 in December 2022, partly due to the increasing number of constituents within the index, which almost doubled from 290 in January 2018 to 559 in December 2022, as a result of the increase in the number of subsectors from 16 to 25.

Exhibit 7: S&P Kensho New Economies Composite Index Has Become Less Concentrated



Source: S&P Dow Jones Indices LLC. Data from Jan. 31, 2018, to Dec. 30, 2022. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

Another reason for the reduced level of concentration is the modified equal-weight approach used in the construction of the 25 Kensho subsectors that make up the S&P Kensho New

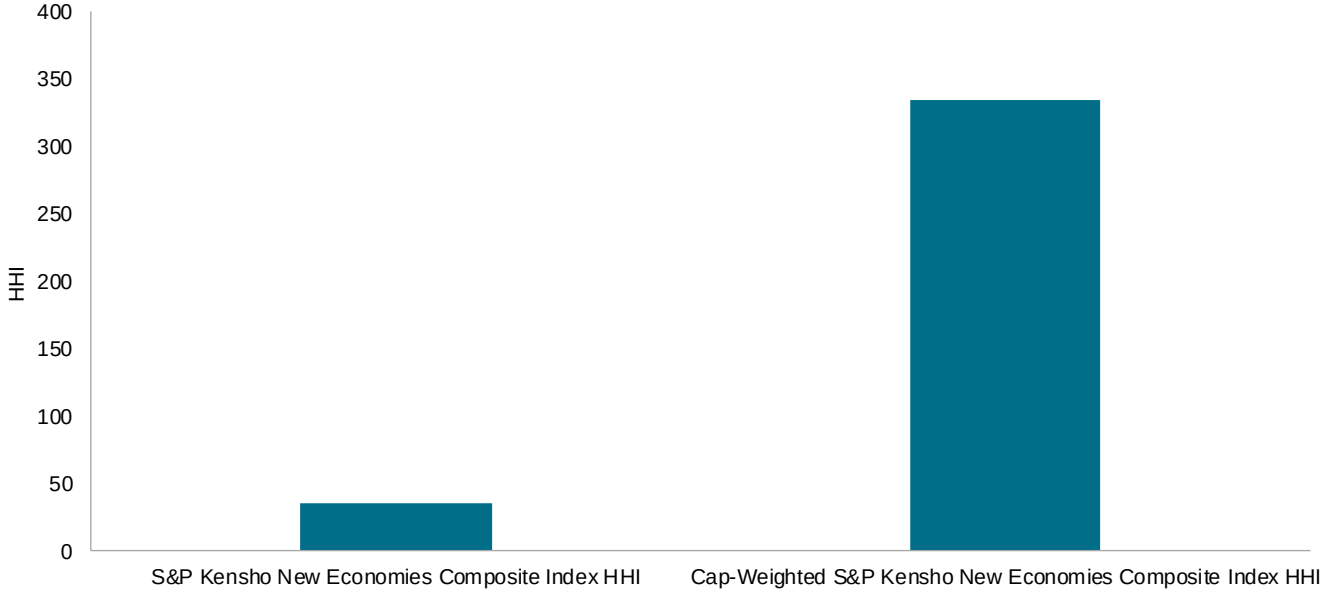
[20] Mika, Dan, "Global Thematic ETFs Lose 7% of AUM," ETF.com, May 2022.

[21] Federal Reserve Bank of St. Louis, "The Herfindahl-Hirschman Index," March 1993; see also Hirschman, Albert O., "The Paternity of an Index," American Economic Review, September 1964. Typically, individual constituent weights are stated as whole percentages; a stock with a 2% weight in an index is treated as 2.00, not 0.02. Thus, the maximum possible HHI (for a one-stock index) is 10,000.

Economies Composite Index.[22] The 25 subsector indices are weighted in proportion to their Sharpe ratios in the composite index. However, the modified equal-weight methodology applied within the subsectors plays the primary role in the individual stock weight distribution within the composite index.[23] With more than 500 stocks, the average deviation of individual stock weight in the composite index from an equally weighted subsectors version is low. The composite index also has maximum and minimum subsector weight constraints to ensure that all subsectors are well-represented, further pulling the stock weights closer to the methodology followed at the subsector index level, i.e., modified equal weight.

If the index were capitalization weighted, then its concentration would be drastically higher, by a multiplier of approximately 10, as we observe in Exhibit 8, highlighting the importance of index construction in providing a more diversified experience, while still maintaining theme purity and investability. Meanwhile, active thematic funds that focus on niche areas can face challenges to find a balance between purity of exposure versus diversification and liquidity. Applying solely a purist approach has the potential to increase concentration levels and thereby increase liquidity risk when it is most needed.[24]

Exhibit 8: Equal Weighting Helps to Mitigate Concentration Risks



Source: S&P Dow Jones Indices LLC. Data as of Dec. 30, 2022. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

In order to compare the level of concentration within the S&P Kensho New Economies Composite Index to that of active managers, we use a simple measure of adding up the weight

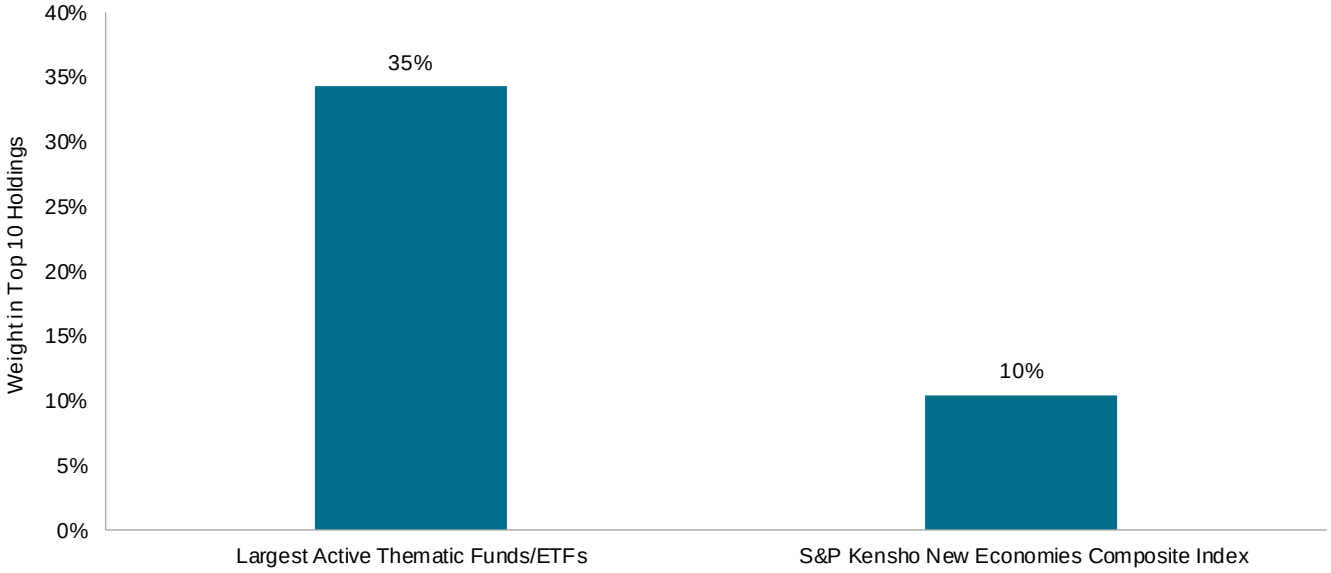
[22] Ganti, Anu, Craig J. Lazzara, "Concentration within Sectors and Its Implications for Equal Weighting," S&P Dow Jones Indices LLC, February 2022.

[23] S&P Kensho Indices Methodology, June 2022.

[24] Baxter, David, "Stark differences revealed under the bonnet of clean energy ETFs," Financial Times, August 2022.

of the 10 largest constituents within the index and compare that to an average of the largest active thematic funds' top 10 holdings. Exhibit 9 illustrates that the sampled active managers tended to be much more concentrated, with on average 35% of their portfolios' weight in the top 10 holdings, compared to only 10% of weight in the top 10 holdings for the index. These results show that the index is much less concentrated than many of its largest peers in the thematics space, showing the potential beneficial outcome of the index approach and specifically the modified equal-weight aspect of the S&P Kensho New Economies methodology.

Exhibit 9: S&P Kensho New Economies Composite Index Is Less Concentrated than the Largest Thematics Peers



Source: S&P Dow Jones Indices LLC, Financial Times, Citywire Selector and Morningstar Global Thematic Funds Landscape 2022. Data as of September 2022. Largest Active Thematic Funds/ETFs is an average taken from a sample of the twenty largest active thematic funds/ETFs globally. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

A Disciplined Approach

Investment philosophies vary and at their core are largely dependent on the market participant's characteristics; i.e., their tolerance for risk and investment horizon. **For many market participants, thematic investing is a long-term proposition to potentially financially benefit from structural trends that have a long lifespan**. Hence, the aim is for the value creation to accrue over time, and participants should account for possibilities of extreme short-term volatility.

It has been well documented[25, 26] that an active approach to long-term investing adds its own set of risks. A pure active approach to thematic investing has to contend with agency risk from

[25] Baker, Kent, Greg Filbeck and Victor Ricciardi, *op. cit.*

[26] Du, Mengqiao, Alexandra Niessen-Ruenzi, and Terrance Odean, "Stock Repurchasing Bias of Mutual Funds," May 2019.

differing time horizons for payoffs of managers and investors. Fund managers' style biases and relatively larger stock allocations can also add to the thematic strategy's volatility in the long run without corresponding outperformance. This points to the distinct benefits of a passive approach to thematic investing over a long-time horizon.

Arguably, the goal of staying committed to the long-term performance of a strategy can be better achieved with higher portfolio diversification, which is more likely to have smaller drawdowns and higher returns than individual stock picking. However, the selected stocks' relevance to a particular theme needs to be vetted objectively and updated regularly to account for the evolution of various themes during their lifecycle.

Ultimately, thematic investing can benefit from a disciplined approach that regularly updates a theme's scope and applies a rules-based framework with inputs from industry analysts to select target firms—such as can be encoded in an index methodology.

Final Thoughts

During the past couple of decades, thematic indices have been able to **indicize** thematic investing, or to provide, in passive form, a strategy formerly available only via active management.[27] The potential benefits of indexing in thematics via the S&P Kensho New Economies include a diversified exposure across the cap range and sectors, reduced concentration and potentially increased downside protection, along with the cost and transparency benefits of a passive approach.

Appendix

Background on S&P Kensho New Economies

The S&P Kensho New Economies is S&P DJI's thematics methodology that leverages ML techniques, particularly NLP algorithms, to build thematic indices with an emphasis on innovation.

The S&P Kensho New Economies' index construction methodology is aligned with our thematics investing philosophy of tracking evolution and innovation in long-term structural trends (see Exhibit 10). The main steps in the order of implementation are as follows:

- Industry Model: Defining a theme's scope is the primary objective of this stage. It involves an in-depth analysis of the theme, its constituent sub-themes and related topics that are driving or influenced by the theme. For example, consider cybersecurity, its widespread applications from home appliances to national defense networks forces a

[27] Lazzara, Craig J., "Coming Soon to a Dictionary Near You," S&P Dow Jones Indices LLC, November 2013.

need for a circumspect definition and well-defined boundaries, along with a decision framework to account for products that could fall into "gray areas."

- ML-Based Selection: Equipped with a comprehensive industry model, we apply NLP and ML techniques to identify companies from their annual SEC filings. These companies are most relevant to the industry definition set forth in the previous step. The annual filings (10-Ks,10-Fs, 40-Fs, S-1s) are documents that have text structured under pre-defined sections, increasing their ease of use and improving confidence in the matched results.

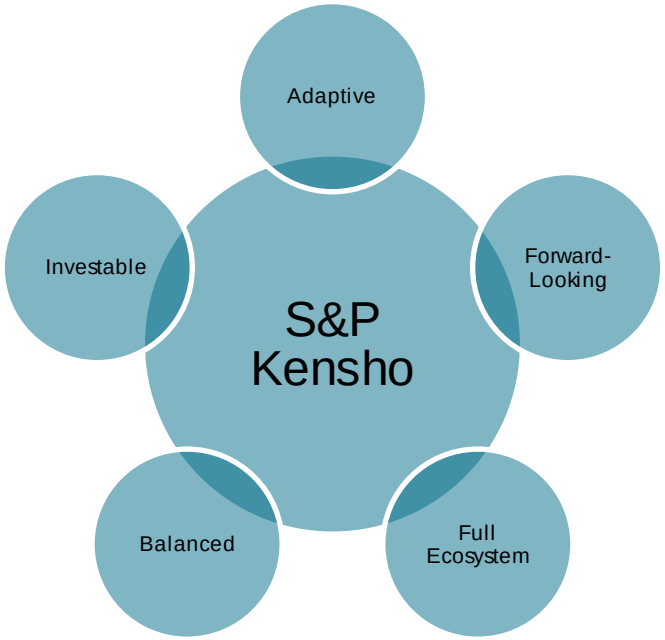
- Categorization: The S&P Kensho New Economies' process of creating a detailed industry model and then applying the appropriate algorithmic techniques generates coverage of relevant companies across the theme's **entire ecosystem**. Core and non-core categorizations are assigned to distinguish the pure-play stocks from their counterparts that are further down the theme's value chain. This bucketing of stocks into core and non-core segments is essential to our index construction process (next stage).

- Weighting: After deriving a basket of stocks most relevant to a theme, along with classification information for each security (core versus non-core), we get to the indexing stage, where **investability** and representation come into focus. We apply standardized liquidity and size filters to improve the tradability of this group of stocks. In addition, to increase the relevance and purity of the index to its stated theme, we overweight the core category of stocks in comparison to the non-core group. To keep the index construction methodology balanced and robust, we also apply a modified equal-weighting scheme[28] within each category/subsector. Specifically for the S&P Kensho New Economies Composite Index, we overlay a Sharpe ratio-based weighting scheme on the constituent 25 subsector indices.

- Verification: The final step involves another round of evaluation by index analysts who start with the industry model and corroborate the relevance of each stock in the final index to the theme. They follow the rules described in the methodology document within their analysis, along with an unbiased interpretation of the industry model document. This is a crucial step to ensure the objectivity of the entire index construction process, along with a clear understanding and validation of each stock constituent's relevance to the index theme.

[28] S&P Kensho Indices Methodology, *op. cit.*

Exhibit 10: Unique Insights for a Dynamic and Transformative Exposure



- Machine Learning Technology for creating next generation of Thematic indices
- Merging of Machine Learning with Industry Expertise
- Taxonomy and comprehensive framework of exponential innovation (Fourth Industrial Revolution)
- Benchmark for innovation

Source: S&P Dow Jones Indices LLC. Chart is provided for illustrative purposes.

An important purpose of the structured construction process described here is to explicitly account for evolution and innovation in the themes. This entire construction process is repeated at least once a year (**annual reconstitution**) to incorporate the latest trends (i.e., **adaptability**) within the theme. For example, cybersecurity, a theme that was initially mainly within the realm of desktop software, has now morphed to include cloud security software as a large component.

The ML selection step, which combs through the business objectives and other sections of the annual filings, overcomes the constraints of more traditional thematic index construction processes that are based on revenue or well-established business lines. This is a key strength of the S&P Kensho New Economies methodology, as it can select firms that focus on innovative technologies and are still in the early stages of growth and adoption (i.e., **forward looking**). Companies that intend to invest, operate and produce innovative products are more likely to be covered under a theme within the S&P Kensho New Economies framework compared with traditional approaches. The forward-looking aspect of ML is critical, particularly when assessing firms that generate little or no revenue from an identified innovative theme.

Our S&P Kensho New Economies process identifies stocks relevant to innovative themes, but what framework should be used to categorize these themes? The Fourth Industrial Revolution[29] is one lens through which we can analyze innovation. The S&P Kensho New Economies framework is a **taxonomy** of the Fourth Industrial Revolution. Using axes of

[29] Schwab, Klaus, "The Fourth Industrial Revolution: what it means, how to respond," World Economic Forum, January 2016.

innovation and innovation patterns[30] as a framework to infer the impact of transformative technologies on the world, we have identified 25 various subsectors that are then overlaid with 10 sectors to a form a thematic hierarchy that underpin this revolution.

The S&P Kensho New Economies Composite Index, which comprises these 25 different subsectors, avoids concentration in specific stocks, while accounting for innovation across a breadth of industries. Limiting stock-specific risk is key, as the performance of certain themes should not be dominated by individual securities. Moreover, the index is diversified across the market cap spectrum and focuses on securities across multiple exchanges. In short, this makes the S&P Kensho New Economies Composite Index an **innovation benchmark** that provides a broad measure across transformative themes that are expected to drive growth during the Fourth Industrial Revolution.

[30] Rook, Dane, and Adam Salvatori, "Innovation Patterns: Upgrading Sectoral Classification for the Fourth Industrial Revolution," March 2017.

General Disclaimer