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Does a Declining Number of Stocks Affect the Size Premium?

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Over the last two decades, the number of US-listed, publicly traded companies has halved. In 1997, there were more than 7,000 stocks while today there are roughly 3,400.[1] Does this mean there are fewer small cap stocks? What are the implications for investors pursuing the size premium?

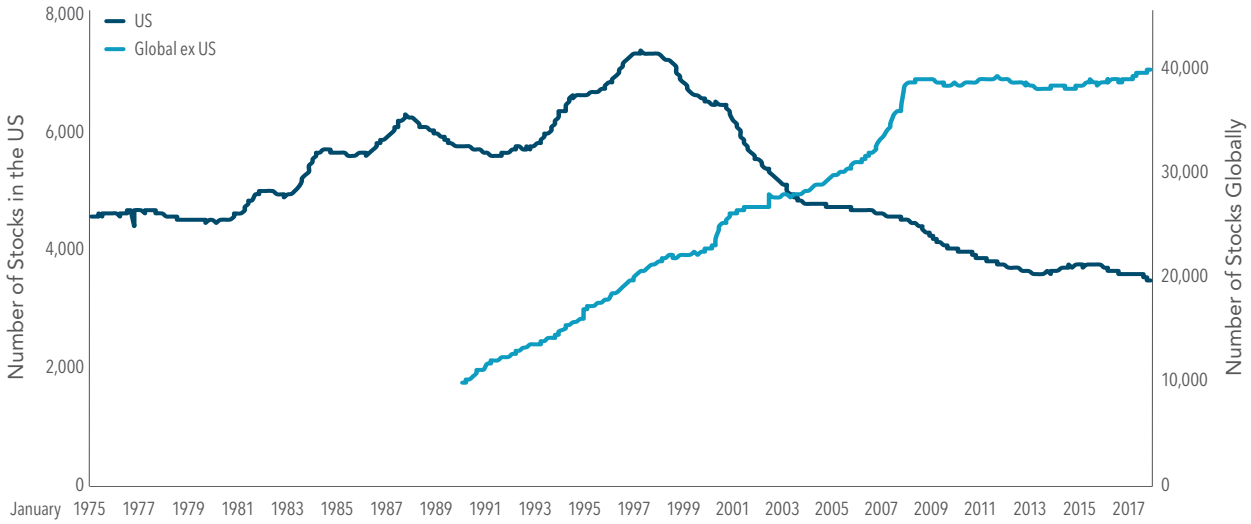
To answer these questions, we examined the size premium historically in the US and other markets around the globe. Since the number of stocks varies across markets and over time, our analysis provides useful insights into how such variation has affected the size premium. While the size premium can be volatile, we find no evidence that its existence or magnitude has been related to the number of listed stocks. Regardless of the number of stocks in a market universe, research shows that investors can rely on information in market prices to identify securities with higher expected returns, and investors should expect a positive size premium over the long term.

CHANGE IN NUMBER OF PUBLICLY LISTED STOCKS

To analyze the size premium as it relates to the number of stocks, it is helpful to begin with a broader perspective and examine the change in the number of publicly listed names over time in both the US and global markets. In the US, the size of the market peaked in 1997. From 1975–1997, the number of names in the US increased from 4,530 to more than 7,000. The number then declined over the last two decades to approximately 3,400. The same trend has not occurred globally, where the number of listed stocks has been on an upward trajectory for the full length of comprehensive data. Since 1990, the number of publicly listed stocks in countries outside the US increased from 9,739 to 39,333.[2] (See **Exhibit 1**.)

1. Includes US companies traded on the NYSE, NYSE American (formerly AMEX), and Nasdaq. Excludes non-US companies, REITs, UITs, and investment companies. Source: Dimensional using CRSP and Compustat data. Additional detail in Appendix.
2. Global data sourced from Dimensional using data from Bloomberg LP. Additional detail in Appendix.

Exhibit 1: Number of Stocks, *1975–2017*



SIZE PREMIUM ACROSS MARKETS

The cross-section of markets with different trends in number of listings provides a natural starting point to examine the relation between the size premium and the number of stocks in a market. We find the size premium has been pervasive across markets and the magnitude of the premium had no discernible relation with the number of stocks in each country.

Exhibit 2 displays the average monthly size premium across developed markets from January 1982–December 2017.[3] The countries are sorted from the market with the fewest stocks on average (Ireland) to the most (US).[4] The average number of stocks ranges widely across countries. For example, Ireland had 55 stocks on average and the highest average monthly size premium of 0.47%. Italy had an average of 233 stocks with a size premium of 0.15%, and the US had an average of 3,763 stocks with a size premium of 0.18%. In summary, the average size premiums observed across developed markets do not appear to be related to the average number of stocks in a country. The results for emerging markets, omitted for brevity, are similar.

WHAT IF WE ONLY HAD THE 3,400 LARGEST US STOCKS ALL ALONG?

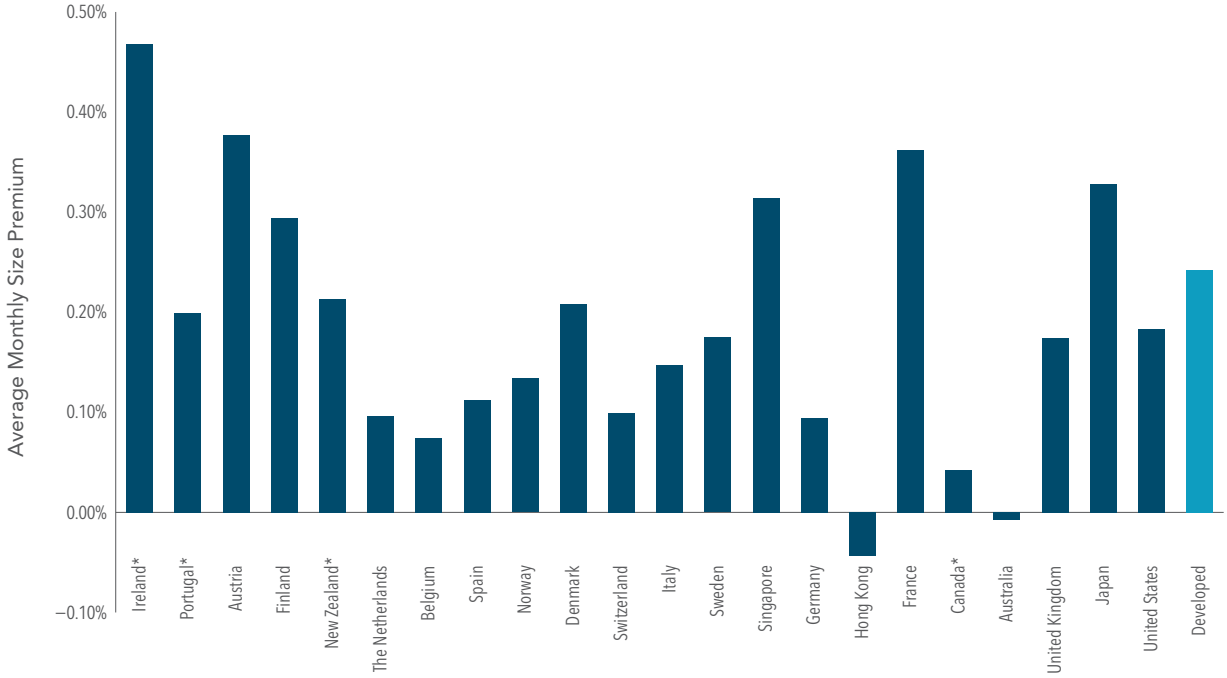
After examining the global evidence, we now focus our attention on the US market. While there has been a positive size premium in the US over the long term, even as the number of names has been declining in the latter part of the sample period, some investors may continue to wonder: Is the current number of names—at 3,447 as of December 2017—simply too few to observe a reliable size premium?

To explore this question, we conduct an experiment whereby, instead of examining the size premium across the entire US market, we examine the size premium within the largest 3,400 names. As shown in **Exhibit 3**, even when we exclude the smallest names and hold the number of names steady through time, we observe a statistically reliable size premium. Within a hypothetical universe of the 3,400 largest names, the size premium was 2.22% (annualized) from 1975–2017.[5]

3. Size premium is defined as the return difference between small cap and large cap securities in each country. Additional detail in Appendix. Average monthly size premium is from 1982–2017 unless otherwise noted. The returns used to calculate the size premiums are hypothetical and are not actual investment results. Filters were applied to data retroactively with the benefit of hindsight.
4. Average number of names is the average from 1990–2017, the period in which comparable data are available for all countries, and can be found in the Appendix. Additional detail in Appendix.
5. As of December 2017, there were 3,447 publicly listed securities in the US, including stocks listed on NYSE, NYSE MKT (formerly AMEX), and Nasdaq, excluding non-US companies, REITs, UITs, and investment companies. Source: Dimensional using CRSP and Compustat data. Large cap stocks are defined as those that comprise the top 90% of the market capitalization of the universe. Small cap stocks include the bottom 10% of market capitalization of the universe. Size premium is defined as the return difference between small cap and large cap securities in the US. The returns used to calculate the size premiums are hypothetical and are not actual investment results. Please see Appendix for additional disclosure.

Filters were applied to data retroactively with the benefit of hindsight. Past performance is no guarantee of future results.

Exhibit 2: Average Monthly Size Premium Across Developed Markets Ordered by Number of Stocks, *1982–2017*



*Average monthly size premium data for countries that include an * in the name begin in 1990. Please see Appendix for additional detail and disclosure.*

Based on hypothetical results. Filters were applied to data retroactively with the benefit of hindsight. Past performance is no guarantee of future results.

The evidence presented in Exhibit 3 suggests that the size premium exists in the continuum of market capitalization and is robust to a universe with fewer names. In fact, there is good reason why investors may want to exclude certain small cap names from their portfolios due to lower expected returns. A thorough analysis of the size premium that identifies such securities with lower expected returns requires us to consider the interaction between premiums. Research shows that small cap stocks with the highest relative price and lowest profitability have failed to deliver the size premium.[6] The size premiums presented in Exhibit 2 incorporate this information by excluding these stocks from the small cap universe.

Exhibit 3 illustrates the direct impact of the small growth low profitability stocks on the size premium in the US. As a group, they had an annualized return of 5.11% from January 1975–December 2017, underperforming all small cap stocks (14.53% per year) as well as large cap stocks (12.31% per year). After incorporating the interaction among different premiums and excluding the small growth low profitability stocks, the size premium increased to 3.44%, as shown in the last column of Exhibit 3. In fact, this is similar to the size premium of 3.48% for all stocks in the US market, i.e. the unrestricted universe, measured over the same period.[7] Similar patterns have been observed in developed ex US and emerging markets. By systematically identifying and excluding the small growth low profitability stocks from the small cap universe, one can improve the expected returns of small caps while maintaining broad diversification.

IS IT A CASE OF DISAPPEARING SMALL CAPS?

We have seen a reliable size premium even in a hypothetical US market limited to the largest 3,400 stocks. This is a conservative approach, because we assume that the reduction in listed stocks all occurred among the smallest stocks. However, the evidence suggests that this

6. Fama/French (1993); Clark/Rodríguez (2010); Rizova (2012); Fama/French (2015).
7. Includes 5,110 names on average in the US. Small stocks with the highest relative price and lowest profitability are excluded when measuring the size premium.

Exhibit 3: Summary Statistics, *1975–2017*

	Market (Top 3,400)	Large Caps	All Small Caps	Small Growth Low Prof	Small Caps ex Small Growth Low Prof
Annualized Compound Return	12.58	12.31	14.53	5.11	15.76
Annualized Standard Deviation	15.13	14.90	19.59	28.49	18.68
Annualized Premium (vs. Large Caps)	—	—	2.22	—	3.44
Annualized Tracking Error	—	—	9.93	—	9.29
Average Monthly Return	1.09	1.07	1.30	0.76	1.37
T-stat of average return difference vs. large caps	—		1.85		2.62
Average Number of Names	3,383	906	2,477	382	2,095

Please see Appendix for additional disclosure.

Results shown are hypothetical. Filters were applied to data retroactively with the benefit of hindsight. Past performance is no guarantee of future results.

is not the case. The overall distribution of large and small stocks across the size spectrum looks similar today as when the number of names reached its peak.

We examine the distribution of market capitalization as of May 1997, when the number of names peaked, and as of December 2017. More specifically, we sort all stocks in the universe into quintiles—each with an equal number of names—from large to small and calculate how much of the aggregate market capitalization is made up of each size quintile.

Exhibit 4 shows that the distribution of market capitalization across size quintiles was similar when there were 7,301 stocks in 1997 as when there were 3,447 stocks in 2017.[8] In other words, the decline in names has been happening across all size groups, rather than just in small caps, leading to little change in the overall size distribution. As shown in Exhibit 4, the bottom quintile with the smallest stocks made up 0.2% of total market cap in May 1997 and, similarly, 0.1% of total market cap in December 2017. The market cap weight of the biggest quintile has also stayed similar: 92.2% of total market cap in May 1997 vs. 89.9% in December 2017.

CONCLUSION

The size premium has been well established in academic literature over long periods of time and across many markets. The evidence presented here shows that the number of names in the market does not determine the existence, nor the magnitude, of the size premium. We observe a positive size premium in big markets, in small markets, in markets which naturally vary in size through time, and in a hypothetical market that does not vary in size at all. Taken together, this evidence suggests that while the size of the market and the performance of different asset classes will fluctuate across countries and over time, there is no compelling indication that a smaller number of publicly listed stocks is correlated with a smaller size premium. Instead, it is more important to consider all information in prices about expected returns, such as information contained in profitability and relative price, in addition to market capitalization.

Exhibit 4: Percent of Market Cap by Name Quintile

	Number of Names	Biggest 20% of Names	20–40% of Names	40–60% of Names	60–80% of Names	Smallest 20% of Names
May 1997	7,301	92.2%	5.2%	1.7%	0.7%	0.2%
December 2017	3,447	89.9%	7.1%	2.2%	0.7%	0.1%

8. The same conclusion holds if we sort stocks into quintiles each with equal market capitalization (i.e. 20% of the market capitalization of the universe) and calculate the percent of names in each quintile.

APPENDIX

Country	Average Monthly Size Premium	Average Number of Names
Ireland*	0.47%	55
Portugal*	0.20%	71
Austria	0.38%	93
Finland	0.29%	96
New Zealand*	0.21%	104
The Netherlands	0.10%	132
Belgium	0.07%	134
Spain	0.11%	140
Norway	0.13%	167
Denmark	0.21%	167
Switzerland	0.10%	201
Italy	0.15%	233
Sweden	0.17%	277
Singapore	0.31%	384
Germany	0.09%	600
Hong Kong	–0.04%	612
France	0.36%	640
Canada*	0.04%	1,006
Australia	–0.01%	1,019
UK	0.17%	1,245
Japan	0.33%	2,382
US	0.18%	3,763
Developed	0.24%	14,123

*Return data for countries that include an * in the name begin in 1990, and 1982 otherwise. Average number of names is calculated over the common time period since 1990.*

Based on hypothetical results. Filters were applied to data retroactively with the benefit of hindsight. Past performance is no guarantee of future results.

Exhibit 2: Size Premium in Developed Markets Detail

Developed Small Caps

January 1990–December 2017: Within each country, small stocks are defined as the bottom 12.5% of cumulative market cap ranked on firm size. The smallest 0.1% of market capitalization in each market is excluded, and the sample is restricted to exchange-traded stocks that meet minimum liquidity and listing requirements. Assumes annual rebalancing. Source: Dimensional using Bloomberg data.

January 1982–December 1989: Prior to 1990, index data are used in some countries due to limited data availability. In Australia and the UK—The same methodology is employed during the 1982–1989 period as from 1990–2017, reflecting the exclusion of the highest relative price and lowest profitability securities. In Japan, index data is used from 1982 and 1983; from 1984-1989, the same methodology is applied as from 1990-2017. In Italy, index data is used from 1982 through 1985; from 1986-1989, the same methodology is applied as from 1990-2017. For all other countries, small indexes are used due to data availability: Dimensional Global Small Index, Dimensional US Small Cap Index, Dimensional International Small Cap Index, and Dimensional Japan Small Cap Index (in 1982 and 1983). Returns of countries within the Dimensional indices are linked to hypothetical country returns for the countries identified in Exhibit 2 (except for Australia and the UK).

Within small caps, stocks with the highest relative price and the lowest profitability are excluded from 1990–2017 in all countries. Prior to this time, the Dimensional US Small Cap Index is the only Dimensional index used here that reflects this exclusion. Profitability is measured as operating income before depreciation and amortization minus interest expense scaled by book

Developed Large Caps

January 1990–December 2017: Within each country, large stocks are defined as the top 87.5% of cumulative market cap ranked on firm size. The smallest 0.1% of market capitalization in each market is excluded, and the sample is restricted to exchange-traded stocks that meet minimum liquidity and listing requirements. Assumes annual rebalancing. Source: Dimensional using Bloomberg data.

January 1982–December 1989: Fama/French US Large Index, country components of Fama/French International Index, and MSCI standard index returns (where Fama/French country indices are not available) combined at country market weights. Source: Fama/French and MSCI.

Exhibit 3

The eligible market is composed of securities of US companies traded on the NYSE, NYSE MKT (formerly AMEX), and Nasdaq. Exclusions: Non-US companies, REITs, UITs, and Investment Companies. Source: CRSP and Compustat. Large cap stocks are defined as those that comprise the top 90% of the market capitalization of the universe. Small cap stocks include the bottom 10% of market capitalization of the universe. Profitability is measured as operating income before depreciation and amortization minus interest expense scaled by book. Rebalanced in a staggered fashion, with one-twelfth of the universe rebalanced at the end of each month. Market (Top 3,400)

assumes the 3,400 largest securities of the market universe over time. Small caps ex Small Growth Low Profitability are small cap stocks excluding the highest relative price and lowest profitability securities. Small Growth Low Prof is the performance of the excluded securities. Profitability is measured as operating income before depreciation and amortization minus interest expense scaled by book.

Exhibit 2, 3, and Size Premium Calculations

Filters were applied to data retroactively with the benefit of hindsight. Backtested results are hypothetical and for illustrative purposes only. Past performance is no guarantee of future results. The results are not representative of indices, actual investments, or actual strategies managed by Dimensional. Assumes reinvestment of dividends and capital gains. Results do not reflect any costs or fees associated with actual investing. Actual investment returns may be lower or may differ significantly. Data is subject to numerous limitations. Start date of data is based on availability of data. Results for different time periods could differ, perhaps significantly, from the results shown. Premiums can be calculated using different methodology. Results could differ, perhaps significantly, when using different methodology. Size premiums are calculated as the return difference between small cap and large cap securities. Profitability is measured as operating income before depreciation and amortization minus interest expense scaled by book throughout the analysis.

Index Descriptions

The Dimensional and Fama/French Indices reflected above are not "financial indices" for the purpose of the EU Markets in Financial Instruments Directive (MiFID). Rather, they represent academic concepts that may be relevant or informative about portfolio construction and are not available for direct investment or for use as a benchmark. Their performance does not reflect the expenses associated with the management of an actual portfolio. Index returns are not representative of actual portfolios and do not reflect costs and fees associated with an actual investment. Actual returns may be lower.

Fama/French US Large Index

July 1926–Present: Fama/French US Large Cap Index. Courtesy of Fama/French from CRSP securities data. Simulated strategy of upper-half market cap NYSE securities (plus AMEX equivalents since July 1962 and NASDAQ equivalents since 1973). Source: Ken French website.

Fama/French International Index

January 1975–Present: Fama/French International Market Index. Source: Ken French website. Simulated from MSCI and Bloomberg data.

Dimensional Global Small Index

January 1990–Present: Dimensional Global Small Index Composition: Market-capitalization-weighted index of small company securities in the eligible markets excluding those with the lowest profitability and highest relative price within the small cap universe. Profitability is measured as operating income before depreciation and amortization minus interest expense scaled by book. The index monthly returns are computed as the simple average of the monthly returns of four sub-indices, each one reconstituted once a year at the end of each quarter of the year. Countries currently included are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Italy, Israel, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Switzerland, Sweden, UK, US. Exclusions: REITs and Investment Companies. Source: Bloomberg.

July 1981–December 1989: Dimensional US Small Cap Index and Dimensional International Small Cap Index combined using Small Portfolio Weights.

The Dimensional Global Small Index has been retrospectively calculated by Dimensional Fund Advisors and did not exist prior to April 2008. Accordingly, the results shown during the periods prior to April 2008 do not represent actual returns of the Index.

The calculation methodology for the Dimensional Global Small Index was amended in January 2014 to include profitability as a factor in selecting securities for inclusion in the index.

Dimensional US Small Cap Index

January 1975–Present: Dimensional US Small Cap Index Composition: Market-capitalization-weighted index of securities of the smallest US companies whose market capitalization falls in the lowest 8% of the total market

capitalization of the Eligible Market. The Eligible Market is composed of securities of US companies traded on the NYSE, NYSE MKT (formerly AMEX), and Nasdaq Global Market. Exclusions: Non-US companies, REITs, UITs, and Investment Companies and companies with the lowest profitability and highest relative price within the small cap universe. Profitability is measured as Operating Income before Depreciation and Amortization minus Interest Expense scaled by Book. Source: CRSP and Compustat

The Dimensional US Small Cap Index has been retrospectively calculated by Dimensional Fund Advisors and did not exist prior to March 1st, 2007. Accordingly, the results shown during the periods prior to March 1st, 2007 do not represent actual returns of the Index. Other periods selected may have different results, including losses.

The calculation methodology for the Dimensional US Small Cap Index was amended on January 1st, 2014 to include profitability as a factor in selecting securities for inclusion in the index.

Dimensional International Small Cap Index

January 1990–Present: Dimensional International Small Cap Index Composition: Market capitalization-weighted index of small company securities in the eligible markets excluding those with the lowest profitability and highest relative price within the small cap universe. Profitability is measured as operating income before depreciation and amortization minus interest expense scaled by book. The index monthly returns are computed as the simple average of the monthly returns of four sub-indices, each one reconstituted once a year at the end of each quarter of the year. Countries currently included are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Italy, Israel, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Switzerland, Sweden, UK. Exclusions: REITs and Investment Companies. Source: Bloomberg.

July 1981–December 1989: Created by Dimensional. Includes securities of MSCI EAFE countries in the bottom 10% of market capitalization, excluding the bottom 1%. All securities are market capitalization weighted. Each country is capped at 50%. Rebalanced semiannually.

The Dimensional International Small Cap Index has been retrospectively calculated by Dimensional Fund Advisors and did not exist prior to April 2008. Accordingly, the results shown during the periods prior to April 2008 do not represent actual returns of the Index.

The calculation methodology for the Dimensional International Small Cap Index was amended in January 2014 to include profitability as a factor in selecting securities for inclusion in the index.

Dimensional Japan Small Cap Index

January 1990–Present: Dimensional Japan Small Cap Index Composition: Market capitalization-weighted index of small company securities in the eligible markets excluding those with the lowest profitability and highest relative price within the small cap universe. Profitability is measured as operating income before depreciation and amortization minus interest expense scaled by book. The index monthly returns are computed as the simple average of the monthly returns of four sub-indices, each one reconstituted once a year at the end of each quarter of the year. Country included is Japan. Exclusions: REITs and Investment Companies. Source: Bloomberg.

July 1981–December 1989: Created by Dimensional. Includes securities in the bottom 10% of market capitalization, excluding the bottom 1%. Rebalanced semiannually.

The Dimensional Japan Small Cap Index has been retrospectively calculated by Dimensional Fund Advisors and did not exist prior to April 2008.

The calculation methodology for the Dimensional Japan Small Cap Index was amended in January 2014 to include profitability as a factor in selecting securities for inclusion in the index.

Backtested index performance is hypothetical and is provided for informational purposes only to indicate historical performance had the index been calculated over the relevant time periods. Backtested performance results assume the reinvestment of dividends and capital gains. The index is unmanaged and is not subject to fees and expenses typically associated with managed accounts or investment funds. Investments cannot be made directly in an index. Past performance is no guarantee of future results.

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