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## **Government Pension Fund Global – benchmark index for equities**

In autumn 2018, the Ministry initiated a review of the benchmark index for equities in the Government Pension Fund Global (GPFG).<sup>1</sup> As part of this work, the Ministry wishes to assess whether the number of companies in the benchmark index is appropriate or should be reduced.

The fund's benchmark index for equities is currently constructed on the basis of a global market-weighted index from FTSE Russell. The FTSE index represents the return from holding large-, mid- and small-cap stocks and as of the end of 2020 includes slightly less than 9,000 companies. The index's market coverage is 98 percent of the market value of the listed companies in the markets included. Around 5,000 of the companies in the index are classified as small caps. These account for around 10 percent of the market value of the benchmark index for equities.

As a basis for its assessment of the number of companies in the equity index, the Ministry asked Norges Bank in its letter of 3 November 2020 to analyse and evaluate the consequences of reducing the number of companies in the index, and to consider any implications for the operational management of the fund. Norges Bank was also asked to make recommendations for how the number of companies might be reduced, including what might be an appropriate reduction in market coverage, and to consider other adjustments to the benchmark that might facilitate cost-effective management of the fund. One of the matters previously raised in the review of the benchmark index for

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<sup>1</sup> See the Ministry's letter of 6 November 2018 and the Bank's reply of 21 August 2019.

equities is the possibility of switching index provider.<sup>2</sup> The Ministry therefore requested that the recommendations include benchmarks based on indices from both FTSE and MSCI.

### **A benchmark index with fewer companies**

The principle of diversification is an important starting point for the investment strategy of the GPFG.<sup>3</sup> This was one of the arguments used when small caps were first included in the benchmark index for equities in 2007. In its assessment, the Ministry noted that this expansion of the benchmark could improve the return-risk trade-off through diversification gains and the potential for higher returns.<sup>4</sup> At the same time, the Ministry emphasised that having a large number of small caps in the index could result in increased complexity and costs in other areas. In its letter of 3 November 2020, the Ministry notes that the GPFG's market value has grown considerably since 2007, and that liquidity has decreased in many equity markets. Against this background, Norges Bank was asked to consider the number of companies in the benchmark index.

### Return and risk

We have assumed in our calculations that the Ministry plans to retain a substantial portion of the small-cap universe by continuing to have an index that largely reflects the investment opportunities in the listed equity market. We have therefore only considered alternative benchmarks with a slightly lower market coverage than the current 98 percent. For illustrative purposes, however, we also present a benchmark without small caps.<sup>5</sup>

As requested by the Ministry, the calculations have been performed for broad equity indices from both MSCI and FTSE. The two indices are fairly similar but differ somewhat in which stocks are included and which weight they are given.<sup>6</sup> The index from FTSE contains almost 8,800 companies, whereas the index from MSCI contains around 8,500 companies, when adjusted for ethically motivated exclusions. With 95 percent market coverage, the indices contain 5,300 and 6,000 companies respectively.

Other than the number of companies, there are only marginal differences between the current benchmark index and indices with a lower market coverage, based on data from both FTSE and MSCI. Our analyses show that the benchmark's historical return and risk characteristics would have been little affected by reducing the number of companies to

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<sup>2</sup> See the Ministry's letter of 6 November 2018.

<sup>3</sup> See Report to the Storting No. 32 (2019-2020).

<sup>4</sup> See Report to the Storting No. 24 (2006-2007).

<sup>5</sup> See part 1 of the enclosure for an overview of the Bank's calculations.

<sup>6</sup> The difference between MSCI and FTSE is a result of the former targeting 99 percent market coverage at country level, and the latter targeting 98 percent market coverage at regional level. There are also some minor differences in which markets are included.



the extent considered in this letter. The same applies to the benchmark's sector and country composition.<sup>7</sup>

### Costs

To serve as a long-term yardstick for the choices made in the management of the fund, the equity benchmark index has been composed in such a way that it can be followed closely and at low cost. In its letter of 3 November 2020, the Ministry notes that the management of small-cap stocks is relatively more expensive than for larger companies. This is due particularly to small caps moving in and out of the index more frequently, but also to the cost of each transaction being higher for these stocks.

We find that ongoing transaction costs in the benchmark index may be slightly lower than today if market coverage is reduced to 97 percent. If market coverage is reduced further, our analyses show that ongoing transaction costs in the benchmark index increase somewhat. It should be noted, however, that the differences in transaction costs are relatively small, and that these calculations are associated with uncertainty.<sup>8</sup>

If the number of companies in the benchmark index is reduced, this will result in one-time costs both for selling the stocks of these companies and for buying more of the other stocks in the index. The more companies removed from the index, the higher these costs. There will also be one-time costs if the Ministry opts to switch index provider from FTSE to MSCI. The total one-time costs for reducing the number of companies in the benchmark index and switching index provider will, however, be lower if the changes are made simultaneously rather than separately.<sup>9</sup>

Our estimates of expected costs in the enclosure have been calculated using our model for transaction costs. Model-based calculations of this kind are uncertain, and the results must be interpreted with caution. The model we have used does not, for example, take account of the possibility of other changes to the index or the portfolio during the transition helping reduce the transaction volume significantly. The costs estimated in the enclosure must therefore be seen as an upper bound for the *expected* cost.<sup>10</sup> The *actual* costs incurred will depend on market developments and may differ considerably from the expected cost. We would report these costs after the completion of the transition.

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<sup>7</sup> Sector and country exposure to small caps will change slightly, with more technology and health care stocks and fewer financial and industrial stocks.

<sup>8</sup> See Part 2 of the enclosure for the Bank's calculations.

<sup>9</sup> The calculations in the enclosure are based on a benchmark index with new regional weights. These have not yet been implemented. It would be possible to reduce the total one-time costs slightly further if all possible changes to the benchmark index are made at the same time.

<sup>10</sup> The costs in the portfolio will probably also be lower in emerging markets than calculated, because we anticipate smaller portfolio changes there. See Part 3 of the enclosure for the Bank's calculations.



## **Consequences for the management of the fund**

The fund may be invested in any shares listed on a regulated and recognised marketplace, and currently has holdings in more than 1,000 companies that are not part of the benchmark index. We assume that a benchmark with reduced market coverage will not result in changes to the fund's investment universe.

It is reasonable to assume that an index with fewer companies will eventually be reflected in the portfolio, even with an unchanged investment universe. This applies above all to the part of the portfolio that is managed internally. Around 80 percent of the fund's investments in small caps are managed internally under an enhanced indexing strategy. There is therefore reason to expect the portfolio to change when the index changes.

The fund's other investments in small caps are managed externally. External managers manage the bulk of the fund's small-cap investments in emerging markets and around 10 percent of those in developed markets. The fund's external managers pursue active strategies and will probably not alter their portfolios greatly if the number of companies in the benchmark index is reduced.

We have previously found that changes to one or more of the index rules can have unintended consequences.<sup>11</sup> A reduction in the number of companies in the benchmark would be a step away from the index provider's standard product. A standard index product is subject to additional quality assurance in that other investors follow the index. The operational risk from using a bespoke index will probably be somewhat higher than from using the standard product. It is difficult to gain a full overview of the extent of challenges of this kind before the new index is in use. We believe these potential challenges will be manageable.

Standard index products include regular communication with users, enabling them to be tracked closely. In our day-to-day management of the fund, for example, we rely on products from FTSE that give us visibility on upcoming changes. This helps us manage the fund cost-effectively. If the benchmark index no longer follows the standard rules, it is important that the index provider can offer a product of equal quality tailored to the index defined by the Ministry. This will contribute to continued cost-effective management.

Following an index produced specially for the fund may also have advantages in our management of the fund. Having different cut-offs for when companies enter and exit the index may reduce ongoing transaction costs for following the index.<sup>12</sup> The buffers for inclusion and exclusion could potentially be wider in a bespoke index, which could

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<sup>11</sup> See the Bank's letter to the Ministry of 28 August 2020.

<sup>12</sup> See Part 3 of the enclosure for the Bank's calculations.



reduce ongoing transaction costs. In addition, there could be advantages associated with rebalancing at other times than the flagship index.

### **Responsible investment**

The Bank seeks to promote well-functioning markets and good corporate governance. Voting is one of the most important tools we have for exercising our ownership rights. We have drawn up voting guidelines to provide a basis for the way we vote, and this has enabled us to automate around 85 percent of our voting. A further 14 percent of our voting decisions concern our largest investments and are handled manually, often in consultation with portfolio managers. Only 1 percent of voting decisions require special consideration, and a reduction in the number of companies in the benchmark index would lead to somewhat fewer cases needing to be assessed individually. All in all, however, a reduction in the number of companies in the benchmark index would not result in a significant reduction in the resources required.

Having fewer companies in the benchmark index would increase the fund's average holding and voting rights in the companies in the portfolio, although the increase would be relatively modest.

We engage in regular dialogue with the companies the fund is invested in. In this work, we prioritise our largest investments and companies with little or no reporting on sustainability. We also follow up specific incidents and companies related to environmental, social and governance risks. Generally speaking, less information is available on small companies than on larger companies. Based on our activities in recent years, we have assessed whether this work would be affected by a decision to reduce the number of companies in the benchmark index. We find that the number of company meetings would not decrease to any great extent, but the amount of written communication would fall somewhat.

We have not assessed the consequences for the work of the Council on Ethics.<sup>13</sup> The Council issues recommendations on the observation and exclusion of companies in the fund's portfolio. A reduction in the number of companies in the fund's benchmark index would therefore affect the Council's work only if this reduction is reflected in the portfolio. In emerging markets, the portfolio would probably not be greatly affected if the number of companies in the benchmark is reduced.

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<sup>13</sup> The Ministry of Finance has in a letter to the Council of Ethics of 13 January 2021 asked the Council of Ethics to assess the consequences of a potential reduction in the number of companies in the reference index for the work on observation and exclusion of companies in GPFG.



## **Recommendation**

There is a broad consensus that the reduction in risk that an investor can achieve by expanding the number of stocks in a portfolio will decrease as the number of stocks increases. In keeping with this, we find in a historical analysis that the benchmark index's return and risk characteristics are little affected by reducing the number of companies to the extent considered in this letter. The analysis also shows that the cost of following the index closely is little affected by such a reduction. Furthermore, we find that a reduction in the number of companies to the extent considered in this letter does not greatly decrease the resources required for our ownership work. Going forward, if our ownership work was structured differently, the potential resource savings from investing in fewer companies could become larger.

Any reduction in the number of companies in the benchmark index will result in one-time costs and should therefore be implemented gradually to minimise these costs. The same applies if the Ministry decides to switch index provider from FTSE to MSCI. The one-time costs for such a switch will be greater than the one-time costs for reducing the number of companies in the index. If the Ministry decides to make both of these changes, the total one-time costs may be lower if the changes are made simultaneously rather than separately.

Operationally, there is nothing to prevent the fund from being managed on the basis of an equity index with fewer constituents or based on a different index provider. It is not possible at this time for us to have a full overview of the possible operational challenges that might arise with a transition to a new and more bespoke benchmark index, but we anticipate that they could be overcome. We assume that Norges Bank would be involved at an early stage in the planning process for how such a potential transition should be implemented.

Yours faithfully

Øystein Olsen

Nicolai Tangen

Enclosure



## Enclosure

In this enclosure we show the consequences of reducing the number of companies using benchmark indices based on both FTSE and MSCI. For both indices we look at the consequences of lowering market coverage from the current 98/99 percent coverage to 97, 96 and 95 percent. We also show an alternative excluding all small caps. All calculations are performed after applying the mandated adjustments from the Ministry of Finance (MoF) and new regional factors, see Report to the Storting 32 (2019-2020).

In the first part we show the portfolio characteristics of the different indices. We then illustrate how the indices have different turnover and calculate the costs of maintaining the respective indices. Lastly, we present calculations on trades and transaction cost related to the transition to the respective indices. The expected transaction cost numbers are based on our transaction cost model. Model-based calculations of this kind are uncertain, and the results must be interpreted with caution. The transaction cost numbers should also be interpreted as an upper bound for the *expected* cost of the transition, as they do not take into account changes that might occur in the index or the portfolio during the transition programme that might make the total volumes smaller. The *realised* transaction costs may deviate significantly due to market movements.



## Part 1: Portfolio characteristic of different indices

**Table 1:** Index composition of alternative benchmarks based on FTSE Global All Cap, 30<sup>th</sup> October 2020

	Benchmark <sup>1</sup>	97% coverage	96% coverage	95% coverage	Excl. small caps
<b>Concentration</b>					
Number of stocks	8765	7435	6585	5912	3808
Effective No of stocks	301	295	289	282	243
Top 10 security weight (%)	13.3	13.4	13.6	13.7	14.8
<b>Size Family Exposure</b>					
Large (%)	73.8	74.5	75.3	76.1	82.2
Mid (%)	16.0	16.2	16.3	16.5	17.8
Small (%)	10.2	9.3	8.4	7.5	-
<b>Number of countries</b>					
Total	46	46	46	46	46
Emerging Markets	22	22	22	22	22
Developed Markets	24	24	24	24	24

<sup>1</sup> Includes new MoF regional weights for Europe and North America and all other MoF adjustments

Source: FTSE and NBIM calculations. The estimation date is October 30<sup>th</sup>, 2020. The benchmark is based on the FTSE Global All Cap Index and includes MoF adjustments and new MoF regional weights for Europe and North America. Alternative benchmarks with lower market coverage are estimate by re-normalising weights in the FTSE Global All Cap on FTSE rebalancing dates, for each FTSE region, and selecting securities until the target market coverage level is reached. Changes to the index that occur outside of rebalancing dates are accounted for. All alternatives include equivalent MoF adjustments to the benchmark. Effective number of stocks is defined as the inverse of the Herfindahl index. Size family exposures may not sum to 100 due to rounding.





**Table 2:** Index composition of alternative benchmarks based on MSCI ACWI IMI, 30<sup>th</sup> October 2020

	Benchmark <sup>1</sup>	98% cov.	97% cov.	96% cov.	95% cov.	Excl. small caps
<b>Concentration</b>						
Number of stocks	8500	7478	6373	5670	5134	2867
Effective No of stocks	294	287	281	276	270	229
Top 10 security weight (%)	13.5	13.6	13.8	13.9	14.1	15.3
<b>Size Family Exposure</b>						
Large (%)	73.7	74.5	75.3	76.1	76.9	83.6
Mid (%)	14.5	14.7	14.8	14.9	15.1	16.4
Small (%)	11.8	10.6	9.8	8.9	8.0	-
<b>Number of countries</b>						
Total	47	47	47	47	47	47
Emerging Markets	25	25	25	25	25	25
Developed Markets	22	22	22	22	22	22

<sup>1</sup> Includes new MoF regional weights for Europe and North America and all other MoF adjustments

Source: MSCI and NBIM calculations. The estimation date is October 30<sup>th</sup>, 2020. The benchmark is based on the MSCI ACWI IMI index and includes MoF adjustments and new MoF regional weights for Europe and North America. Alternative benchmarks with lower market coverage are estimated by re-normalising weights in the MSCI ACWI All Cap index on MSCI rebalancing dates, for each MSCI market, and selecting securities until the target market coverage level is reached. Changes to the index that occur outside of rebalancing dates are accounted for. All alternatives include equivalent MoF adjustments to the benchmark. Effective number of stocks is defined as the inverse of the Herfindahl index. Size family exposures may not sum to 100 due to rounding and the inclusion of some micro-caps in alternatives.



**Table 3:** Country exposure of alternative benchmarks based on FTSE Global All Cap, 30<sup>th</sup> October 2020. Basis points

	Benchmark weight (%) <sup>1</sup>	Difference versus benchmark (basis points)			
		97% cov.	96% cov.	95% cov.	Excl. small caps
<b>Developed Markets</b>	<b>87.6</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>-23</b>
United States	48.3	2	2	5	-47
Japan	8.4	0	0	0	13
United Kingdom	5.2	-2	-5	-8	-7
Switzerland	3.8	2	4	6	17
France	3.5	2	5	7	26
Germany	3.4	1	2	3	15
Australia	2.2	1	2	2	1
Canada	2.2	-1	-3	-6	-29
Korea	1.8	-1	-2	-3	-7
Other	8.9	-2	-3	-5	-5
<b>Emerging Markets</b>	<b>12.4</b>	<b>-1</b>	<b>-2</b>	<b>-2</b>	<b>23</b>
China	6.0	0	1	1	36
Taiwan	2.0	-2	-4	-5	-16
India	1.3	1	2	3	1
Brazil	0.6	0	0	0	2
South Africa	0.5	0	-1	-1	3
Other	2.0	0	0	0	-2

<sup>1</sup> Includes new MoF regional weights for Europe and North America and all other MoF adjustments

Source: FTSE and NBIM calculations. The estimation date is October 30<sup>th</sup>, 2020. Countries are classified as Emerging or Developed using to the FTSE equity country classification framework. The benchmark is based on the FTSE Global All Cap Index and includes MoF adjustments and new MoF regional weights for Europe and North America. Alternative benchmarks with lower market coverage are estimate by re-normalising weights in the FTSE Global All Cap on FTSE rebalancing dates, for each FTSE region, and selecting securities until the target market coverage level is reached. Changes to the index that occur outside of rebalancing dates are accounted for. Weights may not sum to 100 due to rounding.



**Table 4:** Sector exposure of alternative benchmarks based on FTSE Global All Cap. October 30<sup>th</sup>, 2020. Basis points

	Benchmark weight (%) <sup>1</sup>	Difference versus benchmark (basis points)			
		97% cov.	96% cov.	95% cov.	Excl. small caps
Information Technology	20.3	13	27	37	83
Financials	17.9	-10	-17	-19	-32
Industrials	13.3	-10	-22	-34	-91
Consumer Services	12.9	0	0	2	13
Health Care	12.2	6	10	15	2
Consumer Goods	11.6	1	1	3	30
Basic Materials	4.2	-3	-5	-12	-27
Oil & Gas	2.7	-1	0	1	6
Utilities	2.7	2	3	2	-1
Telecommunications	2.4	2	3	5	18

<sup>1</sup> Includes new MoF regional weights for Europe and North America and all other MoF adjustments

Source: FTSE and NBIM calculations. The estimation date is October 30<sup>th</sup>, 2020. Companies are assigned to industries using the FTSE Industry Classification Benchmark (ICB) standard. The benchmark is based on the FTSE Global All Cap Index and includes MoF adjustments and new MoF regional weights for Europe and North America. Alternative benchmarks with lower market coverage are estimate by re-normalising weights in the FTSE Global All Cap on FTSE rebalancing dates, for each FTSE region, and selecting securities until the target market coverage level is reached. Changes to the index that occur outside of rebalancing dates are accounted for. Weights may not sum to 100 due to rounding.

**Table 5:** Risk and return characteristics of alternative benchmarks, based on FTSE Global All Cap. Sample period is December 30<sup>th</sup>, 2003 to October 30<sup>th</sup>, 2020. USD, annualised.

	Benchmark <sup>1</sup>	97% cov.	96% cov.	95% cov.	Excl. small caps
Annualised return, %	8.52	8.52	8.51	8.50	8.38
Annualised risk, %	15.90	15.85	15.82	15.80	15.69
Risk reward ratio	0.54	0.54	0.54	0.54	0.53
Max drawdown, %	-56.0	-56.0	-55.9	-55.9	-55.6
Value at Risk (VaR), %	-7.6	-7.6	-7.6	-7.6	-7.5
Conditional Value at Risk (CVaR), %	-12.7	-12.7	-12.6	-12.6	-12.3
Tracking error vs Benchmark (Col 1), bps	-	7	13	18	54

<sup>1</sup> Includes new MoF regional weights for Europe and North America and all other MoF adjustments

Source: FTSE and NBIM calculations. The sample period is December 30<sup>th</sup>, 2003 to October 30<sup>th</sup>, 2020. Returns are gross dollar returns. Return and risk are annualised. VaR and CVaR are 1-month estimates. The benchmark is based on the FTSE Global All Cap Index and includes MoF adjustments and new MoF regional weights for Europe and North America. Alternative benchmarks with lower market coverage are estimate by re-normalising weights in the FTSE Global All Cap on FTSE rebalancing dates, for each FTSE region, and selecting securities until the target market coverage level is reached. Changes to the index that occur outside of rebalancing dates are accounted for. Tracking error is annualised and relative to Benchmark in Column 1.



**Table 6:** Risk and return characteristics of alternative benchmarks, based on MSCI ACWI IMI index. Sample period is December 30th, 2003 to October 30th, 2020. USD, annualised.

	Benchmark <sup>1</sup>	98% cov.	97% cov.	96% cov.	95% cov.	Excl. small caps
Annualised return, %	8.52	8.52	8.51	8.50	8.49	8.31
Annualised risk, %	15.85	15.80	15.77	15.74	15.71	15.62
Risk reward ratio	0.54	0.54	0.54	0.54	0.54	0.53
Max drawdown, %	-55.8	-55.7	-55.6	-55.6	-55.5	-55.4
Value at Risk (VaR), %	-7.6	-7.6	-7.6	-7.6	-7.5	-7.5
Conditional Value at Risk (CVaR), %	-12.7	-12.6	-12.5	-12.5	-12.5	-12.3
Tracking error vs Benchmark (Col 1), bps	-	12	17	22	27	64

<sup>1</sup> Includes new MoF regional weights for Europe and North America and all other MoF adjustments

Source: MSCI and NBIM calculations. The sample period is December 30<sup>th</sup>, 2003 to October 30<sup>th</sup>, 2020. Returns are gross dollar returns. Return and risk are annualised. VaR and CVaR are 1-month estimates. The benchmark is based on the MSCI ACWI IMI index and includes MoF adjustments and new MoF regional weights for Europe and North America. Alternative benchmarks with lower market coverage are estimated by re-normalising weights in the MSCI ACWI All Cap index on MSCI rebalancing dates, for each MSCI market, and selecting securities until the target market coverage level is reached. Changes to the index that occur outside of rebalancing dates are accounted for. Tracking error is annualised and relative to Benchmark in Column 1.

**Table 7:** Factor exposures of alternative benchmarks based on FTSE Global All Cap. Sample period is December 30<sup>th</sup>, 2003 to October 30<sup>th</sup>, 2020. USD.

	Benchmark <sup>1</sup>	97% cov.	96% cov.	95% cov.	Excl. small caps
Intercept (annualised, %)	0.00	-0.02	-0.03	-0.04	-0.02
Benchmark <sup>1</sup>	1.00*	1.00*	1.00*	1.00*	0.99*
Value (HML)	0.00	-0.00*	-0.01*	-0.01*	0.01
Size (SMB)	0.00	-0.01*	-0.02*	-0.03*	-0.09*
Quality (QMJ)	0.00	0.00	0.00	0.00	-0.01
Momentum (UMD)	0.00	0.00*	0.00*	0.00*	-0.01*
N	203	203	203	203	203
Adjusted R-squared	0.99	0.99	0.99	0.99	0.99

<sup>1</sup> Includes new MoF regional weights for Europe and North America and all other MoF adjustments

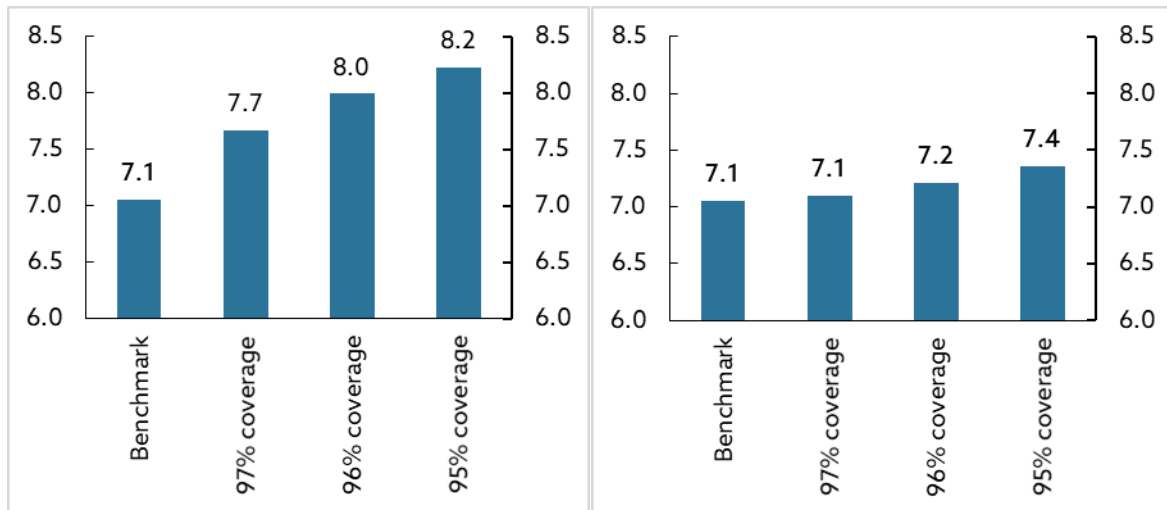
Source: FTSE, AQR, and NBIM calculations. The sample period is December 30<sup>th</sup>, 2003 to October 30<sup>th</sup>, 2020. Returns are monthly and in dollars. Factor returns are Global and sourced from the AQR data library. The benchmark is based on the FTSE Global All Cap Index and includes MoF adjustments and new MoF regional weights for Europe and North America. Alternative benchmarks with lower market coverage are estimate by re-normalising weights in the FTSE Global All Cap on FTSE rebalancing dates, for each FTSE region, and selecting securities until the target market coverage level is reached. Changes to the index that occur outside of rebalancing dates are accounted for. \* indicates significance at the 5 percent confidence level. Standard errors are robust using Newey West (3-month lag). The intercept is annualised and in percent. The market is proxied by the benchmark to isolate changes in factor exposures for changes in market coverage.

## Part 2: Index turnover for different market coverage

**Chart 1:** Index turnover of alternative benchmarks based on FTSE Global All Cap, percent annualised

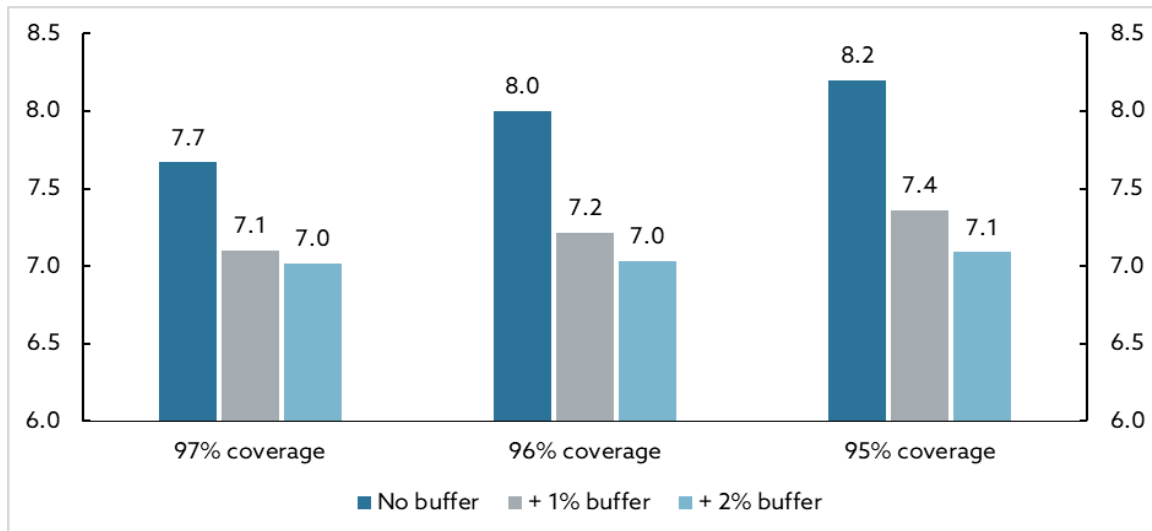
(a) without buffers

(b) with 1 percent buffer



Source: FTSE and NBIM calculations. The sample period is January 1st, 2015 to October 30th, 2020. Turnover is calculated as half the absolute difference in opening weights at time  $t$  and closing weights at time  $t-1$ . All numbers are annualised from daily data to capture changes in the index outside of rebalancing dates. Buffers are applied on index rebalancing dates. Existing constituents 1 percentage point outside the market coverage cut-off are kept in the index until the next rebalancing date. The 1 percent buffer only approximates actual index exit buffers. Actual FTSE index buffers are more complex. Benchmark and all alternatives include new MoF regional weights for Europe and North America and all other MoF adjustments.

**Chart 2:** Turnover reductions with different buffers based on FTSE Global All Cap, percent annualised

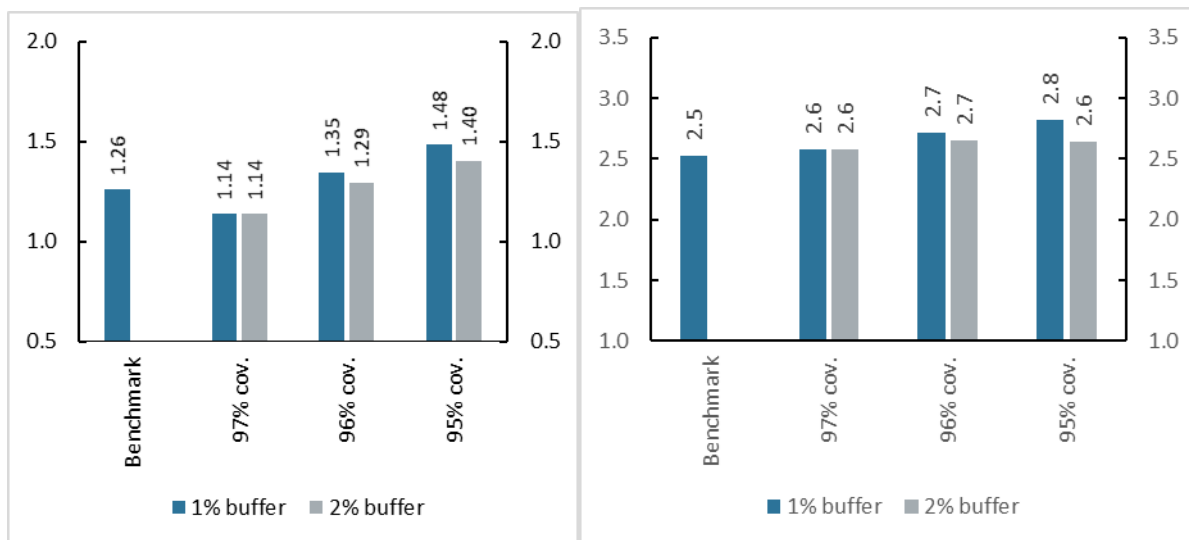


Source: FTSE and NBIM calculations. The sample period is January 1<sup>st</sup>, 2015 to October 30<sup>th</sup>, 2020. Turnover is calculated as half the absolute difference in opening weights at time  $t$  and closing weights at  $t-1$ . All numbers are annualised from daily data to capture changes in the index outside of rebalancing dates. Buffers are applied on index rebalancing dates. Existing constituents 1 or 2 percentage points outside the market coverage cutoff are kept in the index until the next rebalancing date. Benchmark and all alternatives include new MoF regional weights for Europe and North America and all other MoF adjustments.

**Chart 3:** Estimated cost of maintaining alternative benchmarks based on FTSE Global All Cap, 2019 FTSE rebalancing dates

(a) cost of rebalancing (bps of Fund NAV)

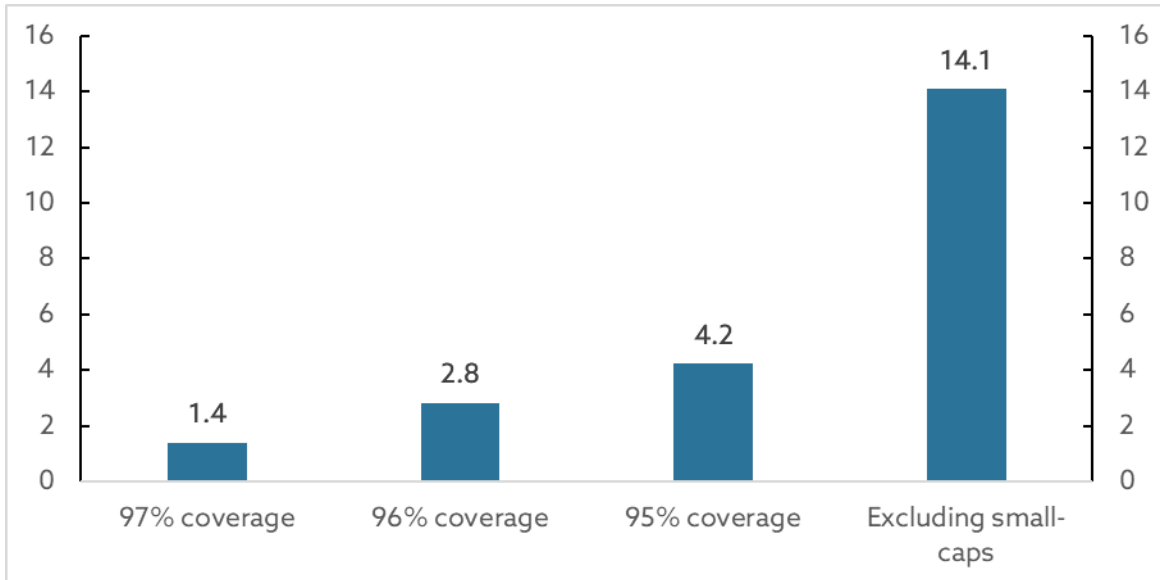
(b) one-way turnover over rebalancing dates, percent



Source: FTSE and NBIM calculations. Transaction cost and volumes are estimated over four FTSE rebalancing dates in March, June, September and December 2019, with fund equity NAV on December 31<sup>st</sup>, 2019. A 3% participation rate is used for all calculations. Turnover occurring outside of rebalancing dates is not included. Numbers are only representative, actual transaction costs may differ. The benchmark is based on the FTSE Global All Cap Index and includes MoF adjustments and new MoF regional weights for Europe and North America. The benchmark's buffer rules are more complex but more similar to a 1% than a 2% buffer.

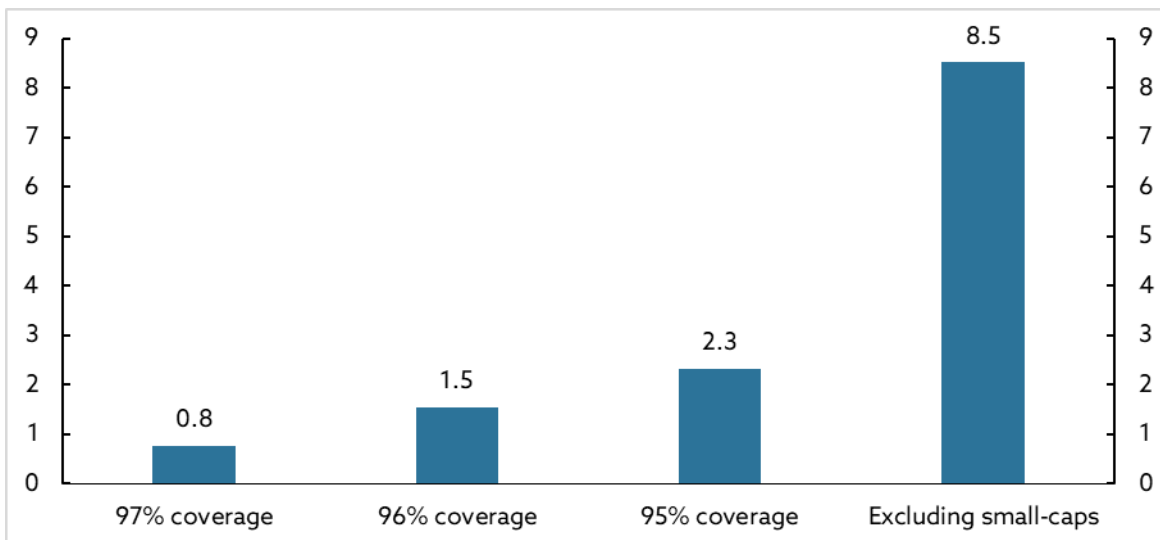
**Part 3: Trade and transaction costs for a transition to a potential new benchmark index**

**Chart 4:** Estimated one-time trade to reduce the number of stocks in the benchmark index, percent of fund NAV



Source: FTSE and NBIM calculations. The estimation date is October 30th, 2020. The trade is two-way and estimated from the FTSE Global All Cap with MoF adjustments including new MoF regional weights for Europe and North America. All alternatives include equivalent adjustments. The trade is shown in percentage points total fund NAV. Numbers are representative as market movements and additional netting opportunities will impact the total trade.

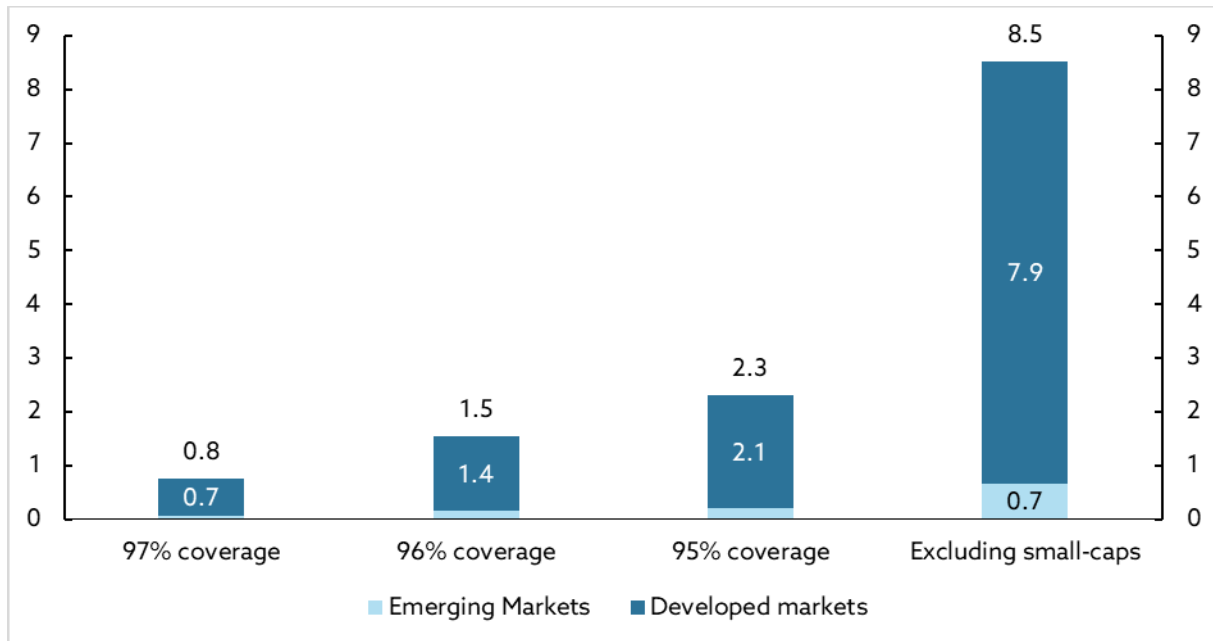
**Chart 5:** Estimated one-time cost to reduce the number of stocks in the benchmark index, basis points of fund NAV



Source: FTSE and NBIM calculations. The estimation date is October 30th, 2020. Transaction costs are estimated over a 365-day calendar period. Transaction costs are based on trading from the current MoF benchmark, with new MoF regional weights for Europe and North America, to each of the alternatives (with equivalent MoF adjustments). Estimates are sensitive to market conditions and rely on historical stock-level characteristics. Transaction costs are representative. Actual costs may differ.



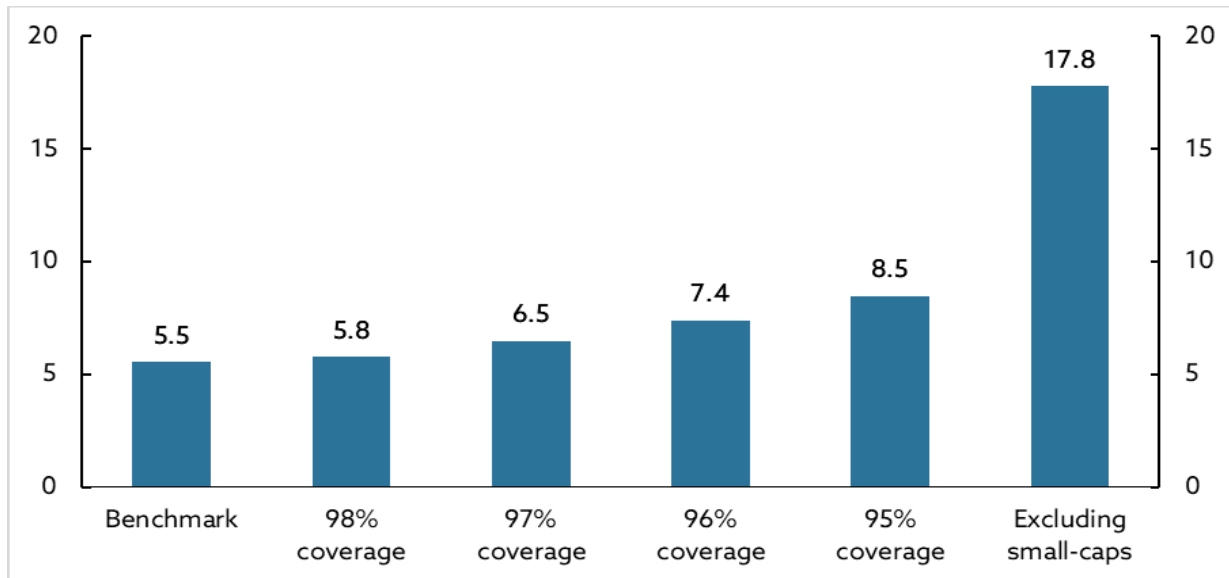
**Chart 6:** Estimated one-time cost to reduce the number of stocks in the benchmark index, split on emerging and developed markets, basis points of fund NAV



Source: FTSE and NBIM calculations. The estimation date is October 30th, 2020. Transaction costs are estimated over a 365-day calendar period. Transaction costs are based on trading from the current MoF benchmark, with new MoF regional weights for Europe and North America, to each of the alternatives (with equivalent MoF adjustments). Costs are shown in basis points of fund NAV, split on Emerging and Developed markets (following the FTSE country classification framework). Estimates are sensitive to market conditions and rely on historical stock-level characteristics. Transaction costs are representative. Actual costs may differ.



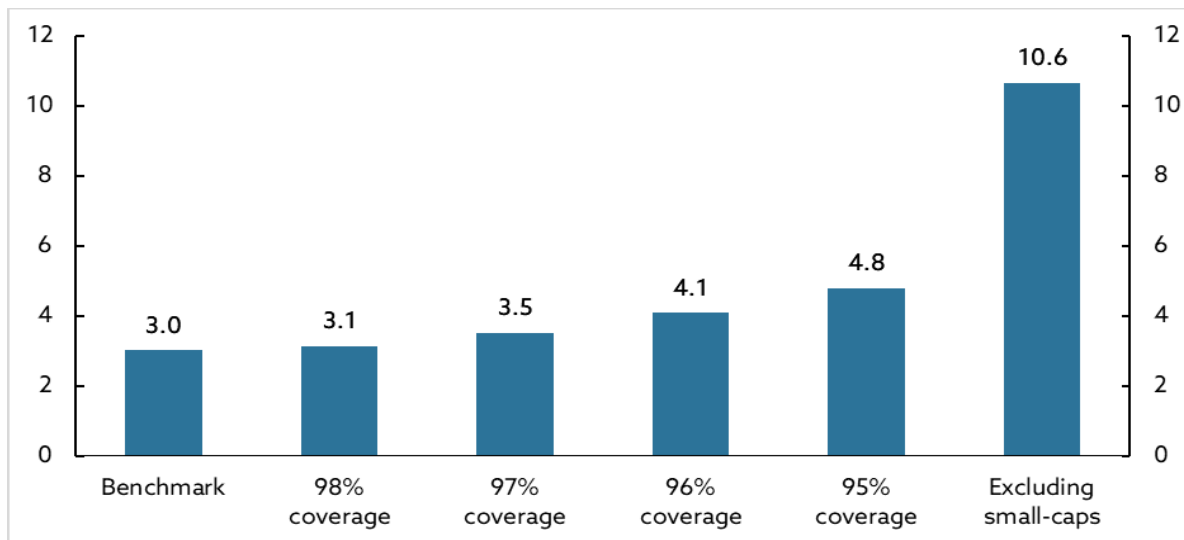
**Chart 7:** Estimated one-time trade to change index provider and reduce the number of stocks in the benchmark index, percent of fund NAV



Source: MSCI and NBIM calculations. The estimation date is October 30th, 2020. The trade is two-way and estimated from the MSCI ACWI IMI index with MoF adjustments including new MoF regional weights for Europe and North America. All alternatives include equivalent adjustments. The trade is shown in percentage points of total fund NAV. Numbers are representative as market movements and additional netting opportunities will impact the total trade.

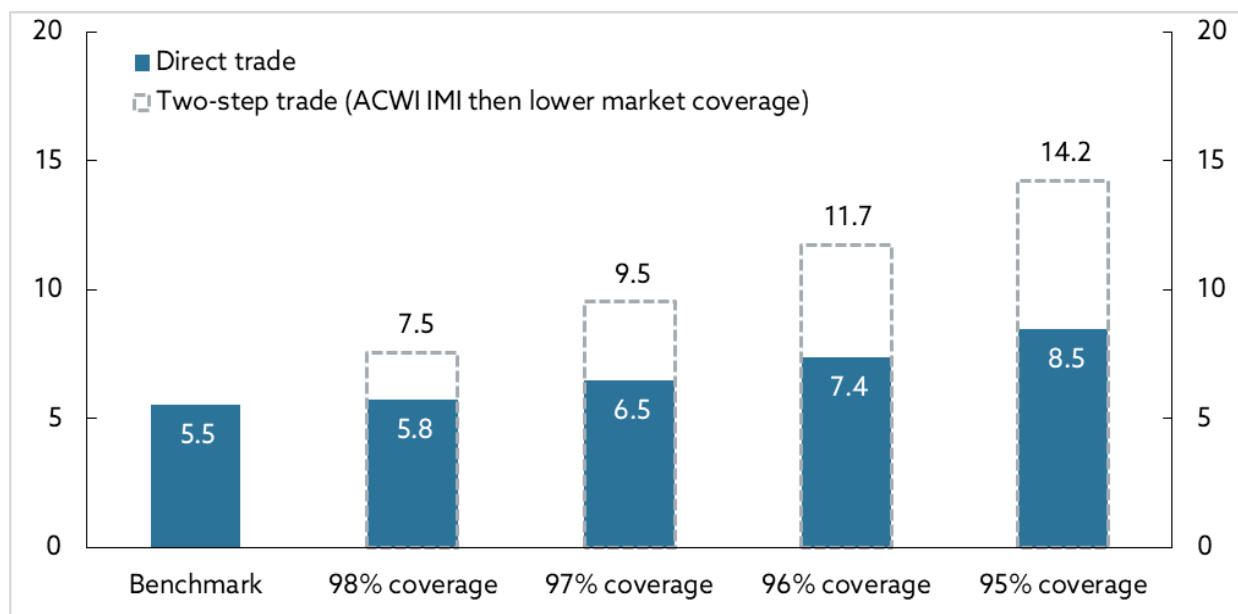


**Chart 8:** Estimated one-time cost to change index provider and reduce the number of stocks in the benchmark index, basis points of fund NAV



Source: MSCI and NBIM calculations. The estimation date is October 30th, 2020. Transaction costs are estimated over a 365-day calendar period. Transaction costs are based on trading from the current MoF benchmark, with new MoF regional weights for Europe and North America, to each of the alternatives. All alternatives are based on the MSCI ACWI IMI index and include equivalent MoF adjustments. Estimates are sensitive to market conditions and rely on historical stock-level characteristics. Transaction costs are representative. Actual costs may differ.

**Chart 9:** Turnover reduction from changing provider and reduce the number of stocks at the same time, percentage points of fund NAV



Source: MSCI and NBIM calculations. The estimation date is October 30th, 2020. The trade is two-way and estimated from the current MoF benchmark with new MoF regional weights for Europe and North America. The benchmark is MSCI ACWI IMI with equivalent MoF adjustments. All alternatives include equivalent MoF adjustments. Turnover is shown in percentage points of fund NAV. Turnover saving is the difference between trading from the MoF benchmark to MSCI ACWI IMI (with adjustments) and then lower market coverage against trading to lower market coverage directly. Numbers are representative as market movements and additional netting opportunities will impact the total trade.