

# Montana Board of Investments

## CEM Benchmarking Results

(for the 5-year period ending December 31, 2017)



Mike Heale, Principal  
[mike@cembenchmarking.com](mailto:mike@cembenchmarking.com)  
416 369-0468

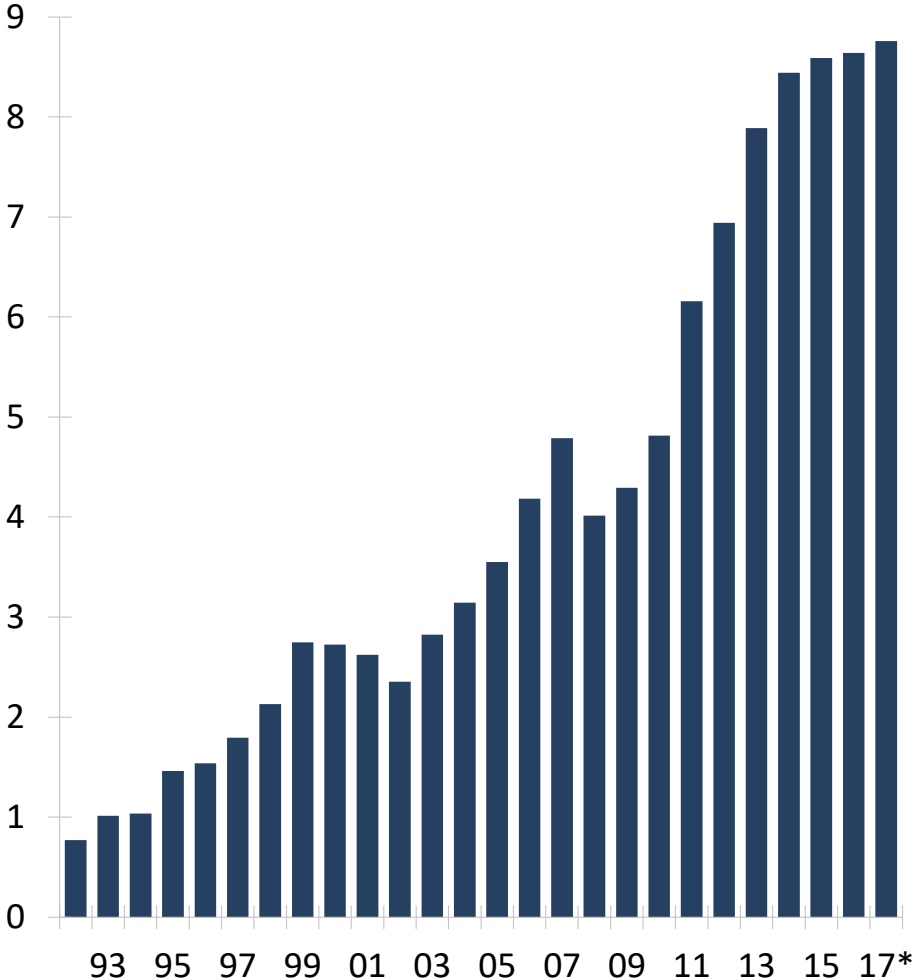
August 21, 2018

# This benchmarking report compares your cost and return performance to the 234 funds in CEM's extensive pension database.

- 135 U.S. pension funds participate. The median U.S. fund had assets of \$10.7 billion and the average U.S. fund had assets of \$21.3 billion. Total participating U.S. assets were \$2.9 trillion.
- 65 Canadian funds participate with assets totaling \$746.4 billion.
- 26 European funds participate with aggregate assets of \$2.4 trillion.
- 6 Asia-Pacific funds participate with aggregate assets of \$221.9 billion.

The most meaningful comparisons for your returns and implementation impacts are to the U.S. Public universe which consists of 52 funds.

Participating assets (\$ trillions)

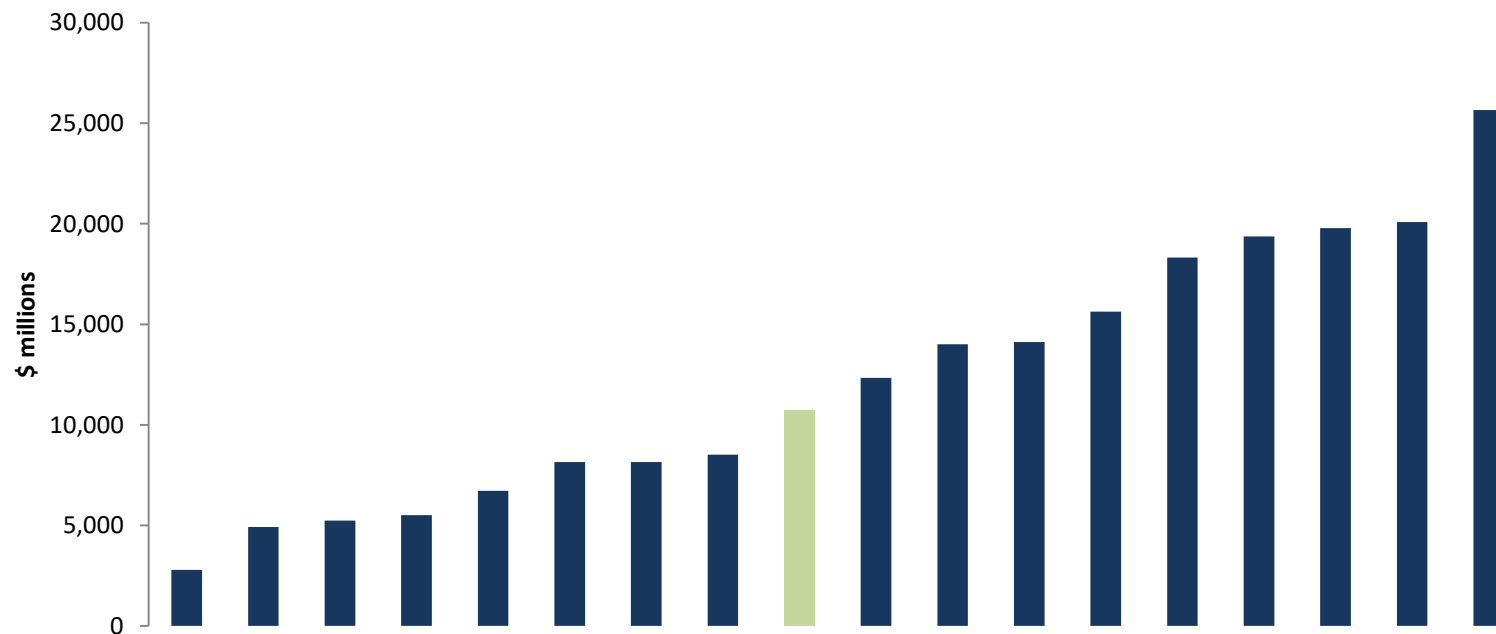


\*2017 assets includes both received and expected data.

# The most valuable comparisons for cost performance are to your custom peer group because size impacts costs.

## Peer group for Montana Board of Investments

- 18 U.S. Public public sponsors from \$2.8 billion to \$25.7 billion
- Median size of \$11.5 billion versus your \$10.7 billion



To preserve client confidentiality, given potential access to documents as permitted by the Freedom of Information Act, we do not disclose your peers' names in this document.

Peers are selected based on best-fit in terms of total fund size as well as maximum commonality in asset classes.

# What gets measured gets managed, so it is critical that you measure and compare the right things:

## 1. Returns

Why do total returns differ from other funds? What was the impact of your policy mix decisions? Asset mix is the most important driver of total returns.

## 2. Implementation impact

How does your implementation impact your total returns?

## 3. Costs

Are your costs reasonable? Costs matter and can be managed.

## 4. Cost effectiveness

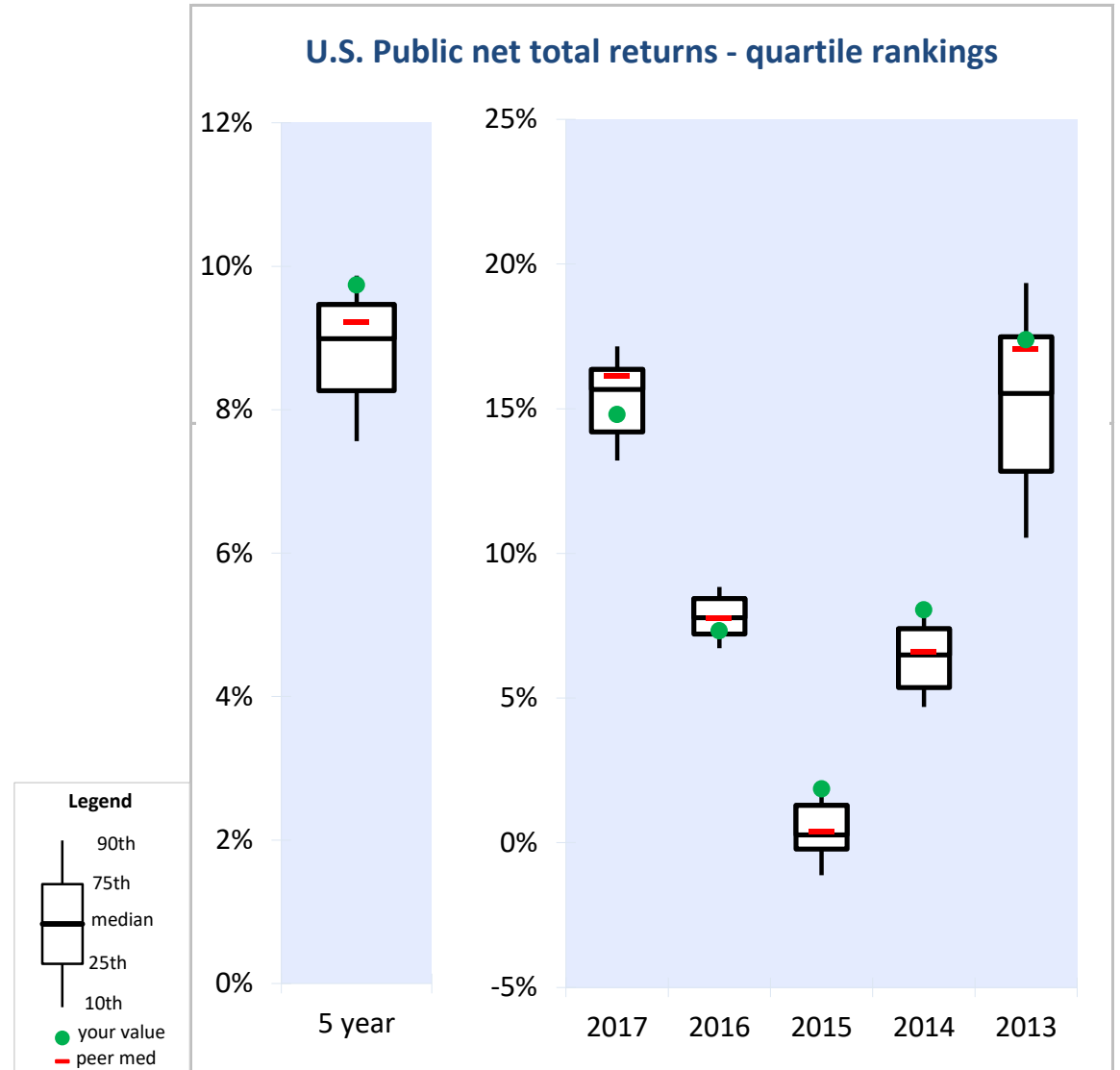
Implementation impact versus excess cost. Does paying more get you more?

## Your 5-year net total return of 9.7% was above both the U.S. Public median of 9.0% and the peer median of 9.2%.

Total returns, by themselves, provide little insight into the reasons behind relative performance. Therefore, we separate total return into its more meaningful components: policy return and implementation impacts.

	Your 5-year
Net total fund return	9.7%
- Policy return	10.4%
= Implementation impacts	-0.7%

This approach enables you to understand the contribution from both policy mix decisions (by far the most important driver of total return) and implementation impacts.



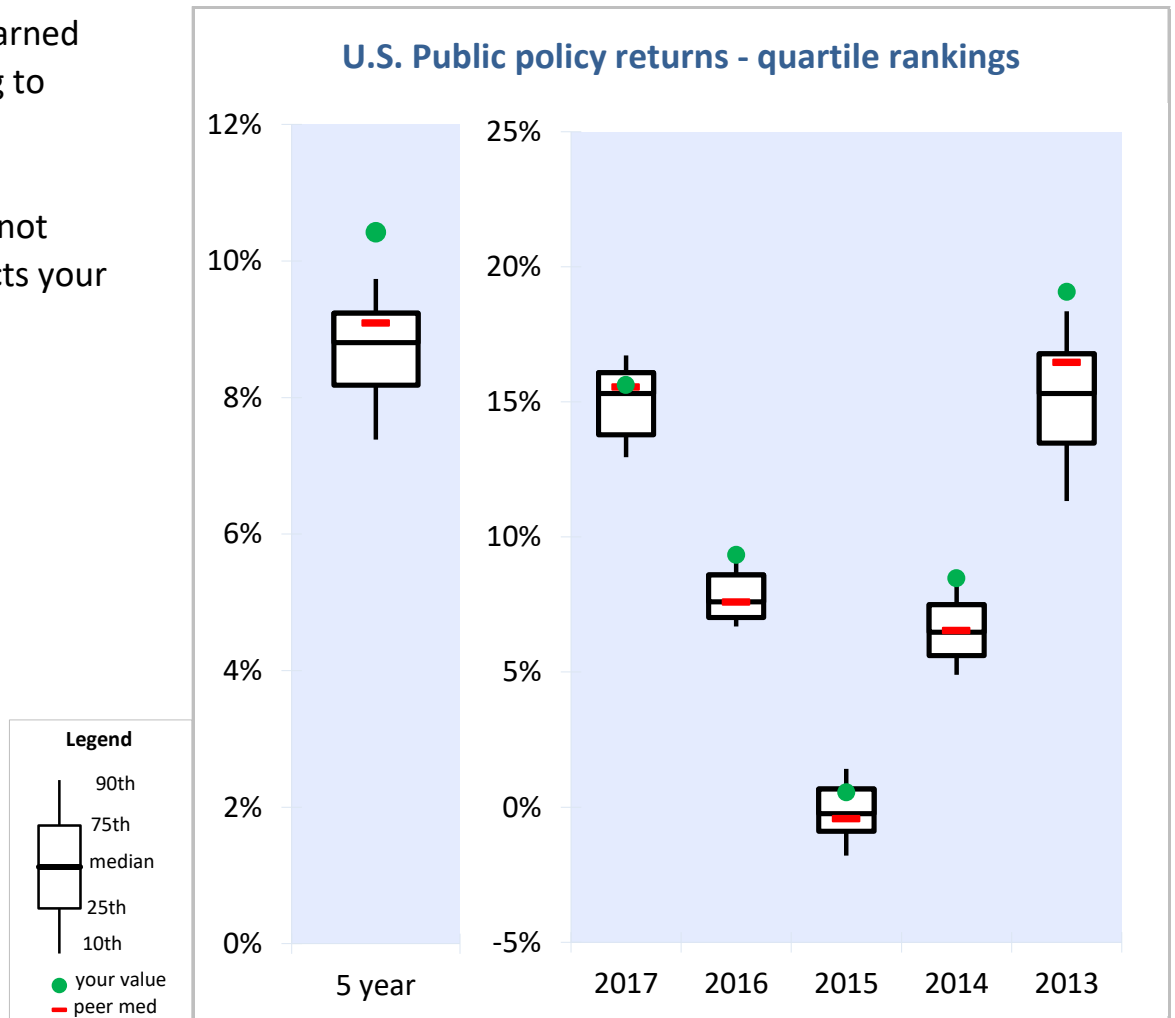
## Your 5-year policy return of 10.4% was above both the U.S. Public median of 8.8% and the peer median of 9.1%.

Your policy return is the return you could have earned passively by indexing your investments according to your policy mix.

Having a higher or lower relative policy return is not necessarily good or bad. Your policy return reflects your investment policy, which should reflect your:

- Long term capital market expectations
- Liabilities
- Appetite for risk

Each of these three factors is different across funds. Therefore, it is not surprising that policy returns often vary widely between funds.



To enable fairer comparisons, the policy returns of all participants, including your fund, were adjusted to reflect private equity benchmarks based on lagged, investable, public-market indices. Your custom benchmark composed of 20% Europe ex-UK, 10% Global, and 70% U.S. small cap equity with a lag of 85 days. Prior to this adjustment, your 5-year policy return was 10.8%, 0.4% higher than your adjusted 5-year policy return of 10.4%. Mirroring this, your 5-year total fund implementation impact would be 0.4% lower.

## Your 5-year policy return of 10.4% was above the U.S. Public median of 8.8% because of several different factors:

- The positive impact of your higher weight and your higher benchmark return in one of the best performing asset classes of the past 5 years: U.S. Stock (your 36% 5-year average weight versus a U.S. Public average of 21%).
- The positive impact of your lower weight in Inflation-indexed Bonds (your 0% 5-year average weight versus a U.S. Public average of 3%). Inflation-indexed Bonds were one of the worst performing asset classes over the past 5 years.
- You had a higher allocation to Private Equity, which was also one of the best performing asset classes over the past 5 years. Your 12% allocation compares to 9% for the U.S. Public average.
- Finally, your 0% allocation to Hedge Funds had a positive impact. The 5-year U.S. Public allocation was 6% on average.

	5-Year average policy mix <sup>1</sup>			5-year policy return	
	Your Fund	U.S. Public Avg.	More/ Less	Your Fund	U.S. Public Avg.
U.S. Stock	36%	21%	15%	15.9%	15.5%
EAFE/Global/Emerging	18%	27%	-9%	n/a <sup>3</sup>	n/a <sup>3</sup>
<b>Total Stock</b>	<b>54%</b>	<b>47%</b>	<b>6%</b>	<b>13.0%</b>	<b>11.8%</b>
U.S. Bonds	22%	17%	5%	2.1%	2.2%
Inflation Indexed Bonds	0%	3%	-3%	n/a <sup>3</sup>	1.0%
High Yield Bonds	3%	2%	1%	5.8%	5.5%
Fixed Income - Emerging	0%	1%	-1%	n/a <sup>3</sup>	2.3%
Fixed Income - Global	0%	2%	-2%	n/a <sup>3</sup>	2.0%
Other Fixed Income <sup>2</sup>	2%	1%	1%	n/a <sup>3</sup>	n/a <sup>3</sup>
<b>Total Fixed Income</b>	<b>26%</b>	<b>26%</b>	<b>0%</b>	<b>2.4%</b>	<b>2.9%</b>
Hedge Funds	0%	6%	-6%	n/a <sup>3</sup>	5.0%
Real Estate incl. REITS	8%	8%	0%	n/a <sup>3</sup>	n/a <sup>3</sup>
Other Real Assets <sup>2</sup>	0%	3%	-3%	n/a <sup>3</sup>	n/a <sup>3</sup>
Private Equity	12%	9%	3%	15.1%	15.2%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>0%</b>		

1. 5-year weights are based only on plans with 5 years of continuous data.

2. Other fixed income includes long bonds and private debt. Other real assets includes commodities, natural resources and infrastructure.

3. A value of 'n/a' is shown if asset class returns are not available for the full 5 years or if they are broad and incomparable.

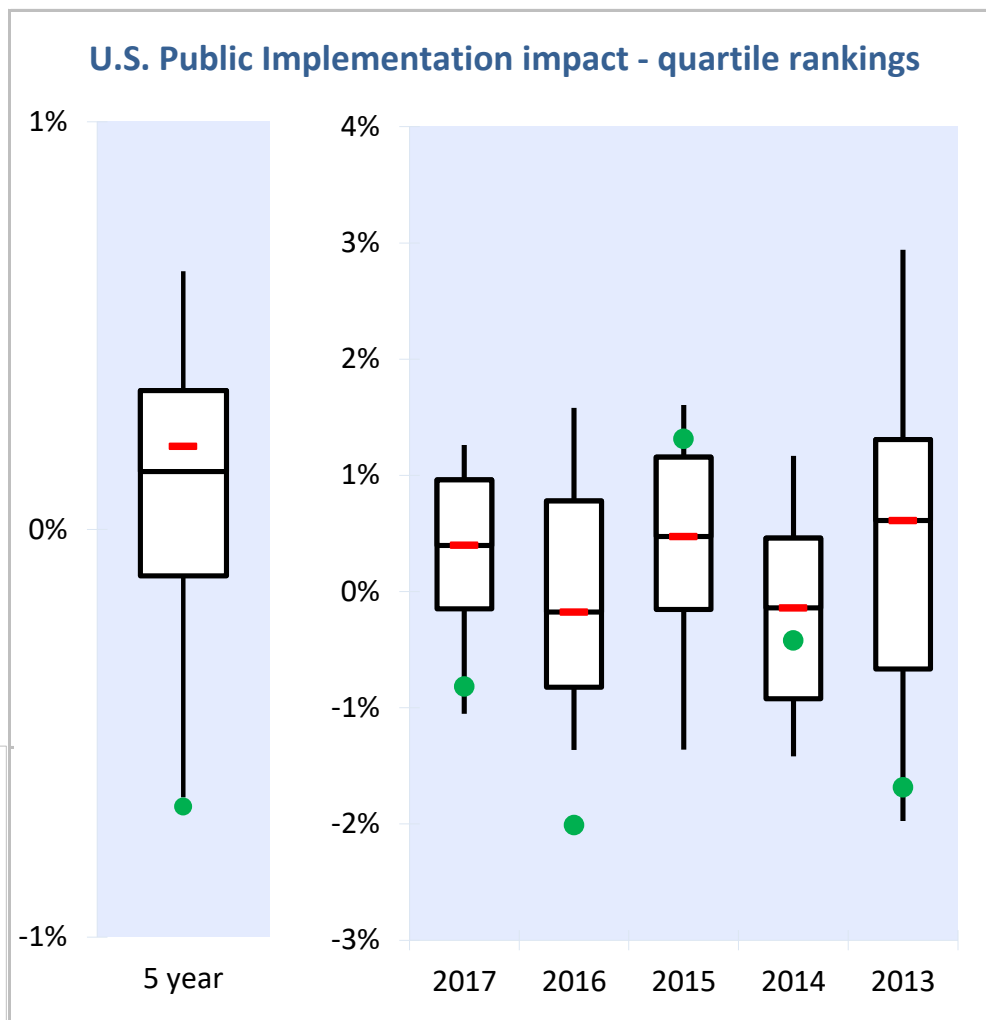
**Implementation impact is the difference between total net return and policy return. Your 5-year Implementation impact of -0.7% compares to a peer median of 0.2% and a U.S. Public median of 0.1%.**

**Implementation impact for Montana Board of Investments**

Year	Net Return	Policy Return	Impl. Impact
2017	14.8%	15.6%	-0.8%
2016	7.3%	9.3%	-2.0%
2015	1.9%	0.5%	1.3%
2014	8.0%	8.5%	-0.4%
2013	17.4%	19.1%	-1.7%
5-Year	9.7%	10.4%	-0.7%

Implementation typically has a modest impact on total fund returns. Implementation impacts are mainly due to:

- Differences in asset class benchmarks across funds.
- Differences between actual holdings and policy weights for asset classes. These differences may be due to tactical asset allocation or rebalancing policies.
- Net return relative to benchmark returns within asset classes.

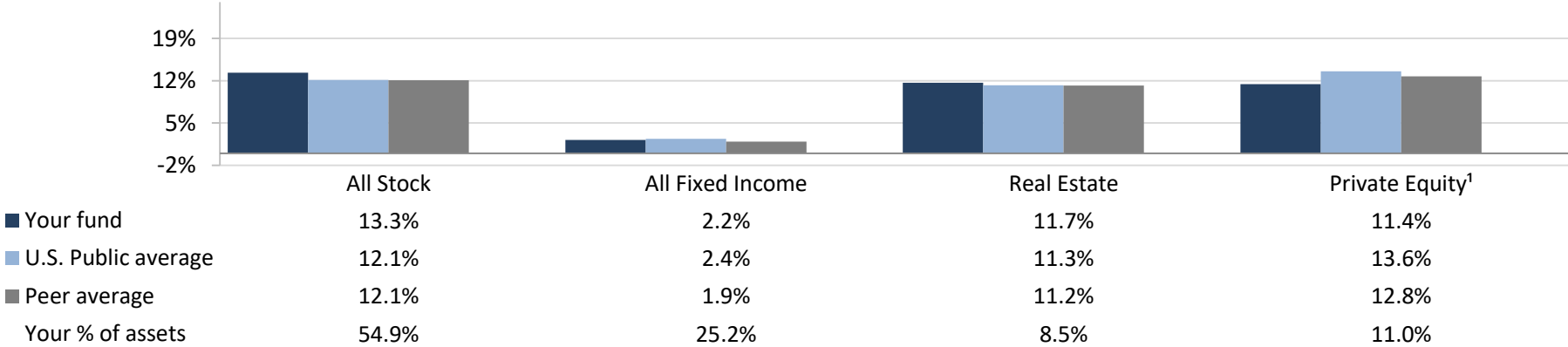


To enable fairer comparisons, the implementation impact for each participant including your fund was adjusted to reflect private equity benchmarks based on investable public market indices. Your custom benchmark composed of 20% Europe ex-UK, 10% Global, and 70% U.S. small cap equity with a lag of 85 days. Prior to this adjustment, your fund's 5-year total fund implementation impact was -1.0%.

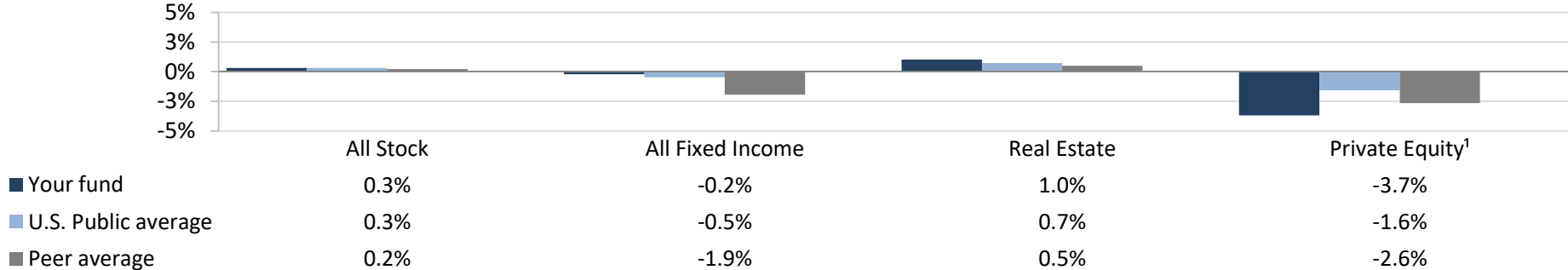


# Comparisons of your 5-year net return and implementation impacts by major asset class:

5-year average net return by major asset class



5-year average net return relative to benchmark<sup>2</sup> by major asset class



1. To enable fairer comparisons, the private equity benchmarks of all participants, including your fund were adjusted to reflect lagged, investable, public-market indices. Your custom benchmark composed of 20% Europe ex-UK, 10% Global, and 70% U.S. small cap equity with a lag of 85 days. Prior to this adjustment, your fund's 5-year private equity implementation impact was -6.8%.

2. For the U.S. Public universe and your peers, the difference shown is the difference between their average net return and their average benchmark return.

## The following cost types are included/excluded in the calculation of your total investment cost.

Asset class	Internal		External			
	In-house total cost	Transaction costs	Manager base fees	Monitoring & other costs	Perform. fees (active only)	Transaction costs
<u>Public</u> (Stock, Fixed income, commodities, REITs)	✓	✗	✓	✓	✓	✗
Derivatives/Overlays	✓	✗	✓	✓	✓	✗
<u>Hedge funds &amp; Global TAA</u>						
Hedge Funds	n/a	n/a	✓	✓	✓	✗
Global TAA	✓	✗	✓	✓	✓	✗
<u>Private equity</u> (Diversified private equity, venture capital, LBO, other private equity)	✓	✗	✓*	✓	✗	✗
<u>Private real assets</u> (Infrastructure, natural resources, real estate ex-REITs, other real assets)	✓	✗	✓*	✓	✗	✗

\* For limited partnerships, external manager base fees represent gross contractual management fees.

- ✓ indicates cost is included.
- ✗ indicates cost is excluded.
- CEM currently excludes external private asset performance fees and all transaction costs from your total cost because only a limited number of participants are currently able to provide complete data.

## Your investment costs were \$60.9 million or 56.9 basis points in 2017.

Asset management costs by asset class and style (\$000s)	Internal Mgmt		External Management			Total		
	Active	Overseeing of external	Passive fees	Active base fees	Perform. fees			
Stock - U.S. Broad/All		478	314	8,953		9,745		
Stock - ACWI x U.S.		378	1,222	4,249		5,850		
Fixed Income - U.S.	447	64		410		921		
Fixed Income - High Yield		85		1,108		1,193		
Cash	49					49		
Real Estate ex-REITs <sup>1</sup>		185		2,422		2,607		
Real Estate - LPs <sup>1</sup>		265		7,279		7,543		
Natural Resources - LPs <sup>1</sup>		60		4,179		4,240		
Diversified Private Equity - LPs <sup>1</sup>		547		18,646		19,194		
Diversified Private Equity - FoFs <sup>1</sup>		157		6,613		6,770		
Total excluding private asset performance fees						58,111	54.2bp	
<b>Oversight, custodial and other costs<sup>2</sup></b>								
Oversight of the fund						1,145		
Trustee & custodial						1,255		
Consulting and performance measurement						342		
Audit						74		
Other						0		
Total oversight, custodial & other costs						2,817	2.6bp	
Total investment costs (excl. transaction costs & private asset performance fees)						60,927	56.9bp	

### Footnotes

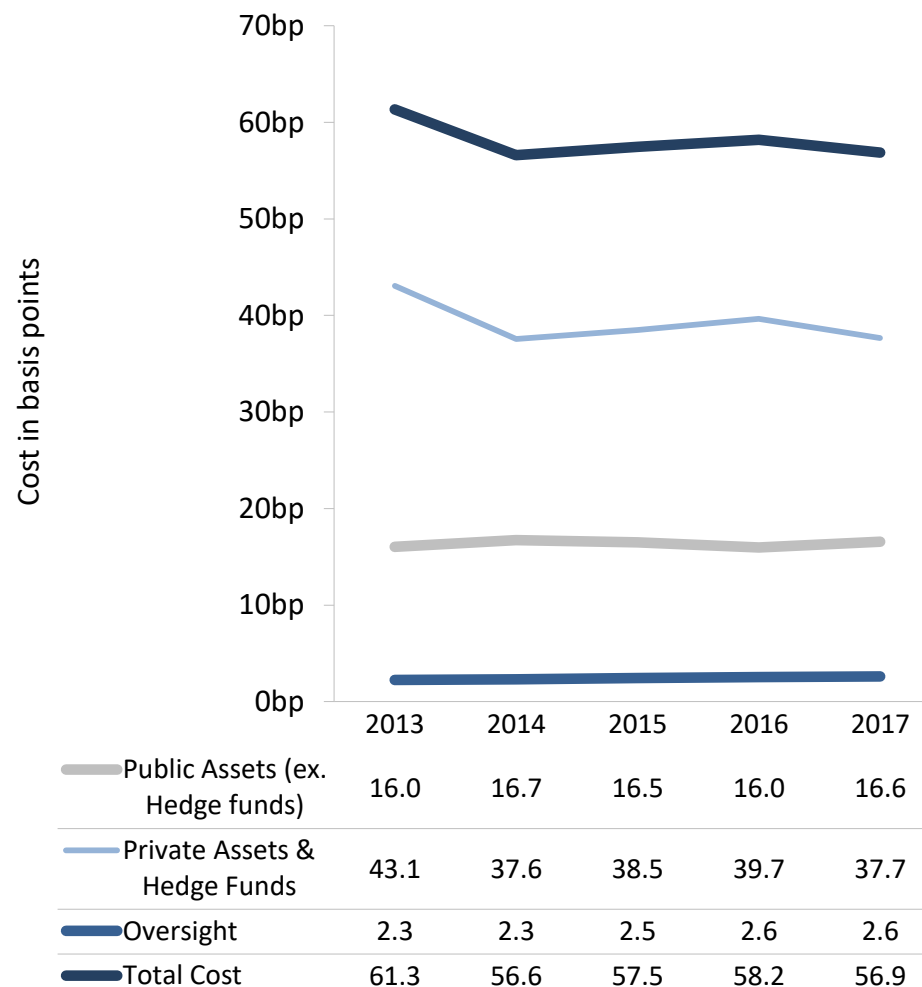
1. Total cost and subsequent benchmarking analysis excludes carry/performance fees for real estate, infrastructure, natural resources and private equity. Performance fees are included for the public market asset classes and hedge funds.
2. Excludes non-investment costs, such as benefit insurance premiums and preparing cheques for retirees.

## Your costs decreased slightly between 2013 and 2017.

Your costs decreased primarily because:

- You decreased your investment in the highest cost asset classes. Your holdings of private real assets and private equity decreased from 22% of assets in 2013 to 20% in 2017.
- You increased your use of lower cost passive and internal management from 52% of assets in 2013 to 54% in 2017.
- You decreased your use of funds of funds from 13% of private real assets and private equity in 2013 to 12% in 2017. Funds of funds are higher cost than direct funds.

Trend in your investment costs

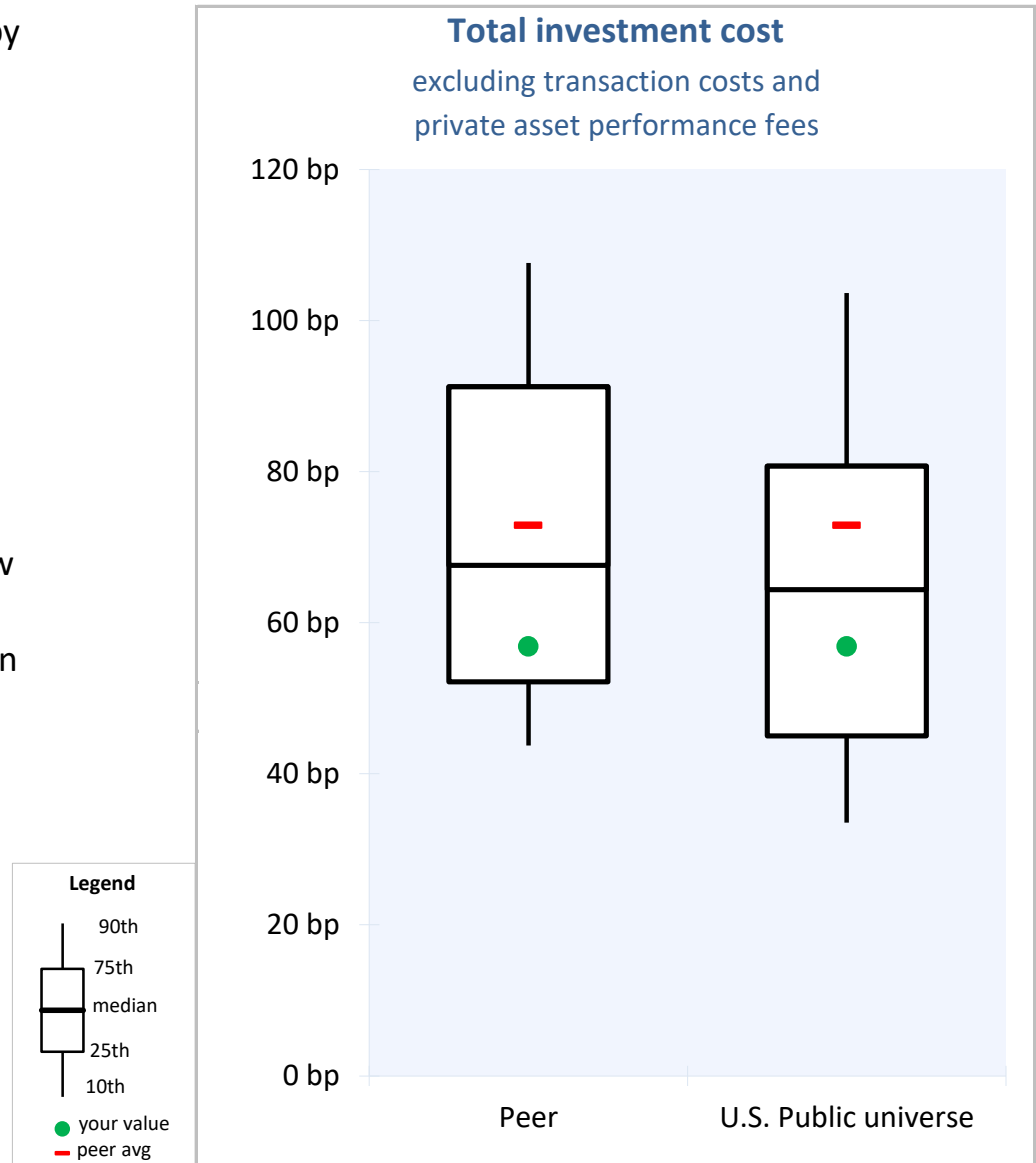


## Your total investment cost of 56.9 bps was below the peer median of 67.6 bps.

Differences in total investment cost are often caused by two factors that are often outside of management's control:

- Asset mix, particularly holdings of the highest cost asset classes: real estate (excl REITS), infrastructure, hedge funds and private equity. These high cost assets equaled 20% of your funds assets at the end of 2017 versus a peer average of 24%.
- Fund size. Bigger funds have advantages of scale.

Therefore, to assess whether your costs are high or low given your unique asset mix and size, CEM calculates a benchmark cost for your fund. This analysis is shown on the following page.



## Benchmark cost analysis suggests that, after adjusting for fund size and asset mix, your fund was slightly low cost by 2.5 basis points in 2017.

Your benchmark cost is an estimate of what Your cost would be given your actual asset mix and the median costs that your peers pay for similar services. It represents the cost your peers would incur if they had your actual asset mix.

Your total cost of 56.9 bp was slightly below your benchmark cost of 59.3 bp. Thus, your cost savings was 2.5 bp.

### Your cost versus benchmark

	\$000s	basis points
Your total investment cost	60,927	56.9 bp
Your benchmark cost	63,559	59.3 bp
Your excess cost	(2,632)	(2.5) bp

## Your fund was slightly low cost primarily because you had a lower cost implementation style.

### Reasons for your low cost status

	Excess Cost/ (Savings)	
	\$000s	bps
1. Lower cost implementation style		
• Less external active management (more lower cost passive and internal)	(1,687)	(1.6)
• More partnerships as a percentage of external	1,127	1.1
• Less fund of funds	(1,376)	(1.3)
• Less overlays	(590)	(0.6)
• Other style differences	78	0.1
	<u>(2,448)</u>	<u>(2.3)</u>
2. Paying less than peers for similar services		
• External investment management costs	(199)	(0.2)
• Internal investment management costs	(75)	(0.1)
• Oversight, custodial & other costs	90	0.1
	<u>(184)</u>	<u>(0.2)</u>
<b>Total savings</b>	<b>(2,632)</b>	<b>(2.5)</b>

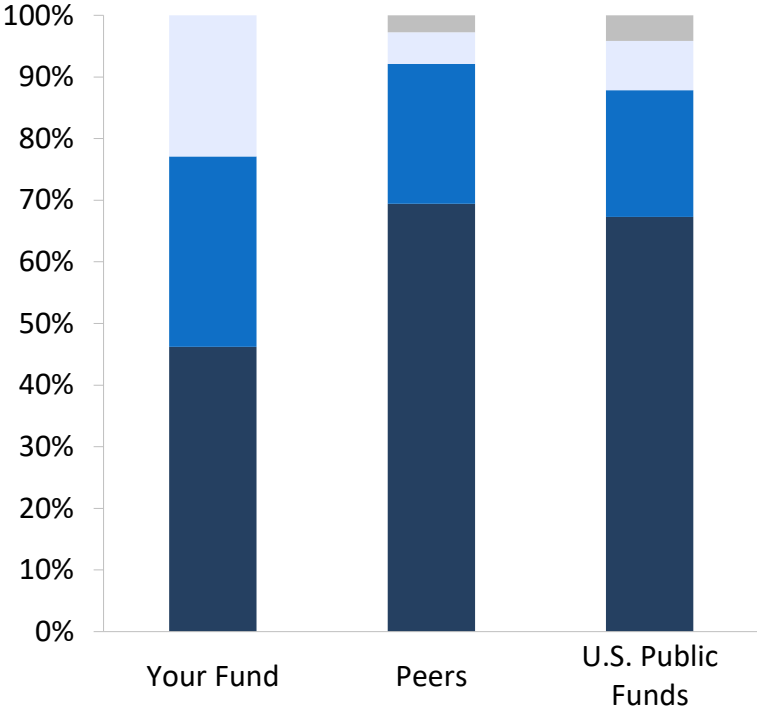
# Differences in cost performance are often caused by differences in implementation style.

Implementation style is defined as the way in which your fund implements asset allocation. It includes internal, external, active, passive and fund of funds styles.

The greatest cost impact is usually caused by differences in the use of:

- External active management because it tends to be much more expensive than internal or passive management. You used less external active management than your peers (your 46% versus 69% for your peers).
- Within external active holdings, fund of funds usage because it is more expensive than direct fund investment. You had less in fund of funds. Your 12% of hedge funds, real estate and private equity in fund of funds compared to 20% for your peers.

Implementation style<sup>1</sup>



Internal passive	0%	3%	4%
Internal active	23%	5%	8%
External passive	31%	23%	21%
External active	46%	69%	67%

1. The graph above does not take into consideration the impact of derivatives. Values in the graph are calculated using average holdings.



# Differences in implementation style saved you 2.3 bp relative to your peers.

## Calculation of the cost impact of differences in implementation style

Asset class	Your avg holdings in \$mils (A)	% External active			Premium vs passive & internal <sup>1</sup> (C)	Cost/ (savings)	
		You	Peer average	More/ (less) (B)		\$000s (A X B X C)	bps
Stock - U.S. Broad/All	3,852	42.7%	37.7%	4.9%	43.5 bp	824	
Stock - ACWI x U.S.	1,836	39.8%	56.1%	(16.2%)	40.4 bp	(1,206)	
Fixed Income - U.S.	2,250	10.7%	55.5%	(44.8%)	14.3 bp	(1,437)	
Fixed Income - High Yield	221	100.0%	95.0%	5.0%	14.6 bp	16	
Real Estate ex-REITs	916	100.0%	98.4%	1.6%	80.7 bp	116	
Impact of more/less external active vs. lower cost styles						(1,687)	(1.6) bp
		<u>LPs % of external active</u>			Premium vs. ea <sup>1</sup>		
Real Estate ex-REITs	916	64.8%	57.5%	7.3%	44.0 bp	292	
Natural Resources	301	100.0%	54.4%	45.6%	60.8 bp	835	
Impact of more/less partnerships as a percentage of external active						1,127	1.1 bp
		<u>Fund of funds % of LPs</u>			Premium vs. direct LP <sup>1</sup>		
Real Estate ex-REITs	593	0.0%	2.7%	(2.7%)	54.8 bp	(88)	
Diversified Private Equity	1,736	22.7%	33.3%	(10.6%)	70.2 bp	(1,288)	
Impact of more/less fund of funds vs. direct LPs						(1,376)	(1.3) bp
Impact of higher use of portfolio level overlays						(590)	(0.6) bp
Impact of mix of internal passive, internal active, and external passive <sup>2</sup>						78	0.1 bp
Total impact of differences in implementation style						(2,448)	(2.3) bp

1. The cost premium is the additional cost of external active management relative to the average of other lower cost implementation styles - internal passive, internal active and external passive.

2. The 'Impact of mix of internal passive, internal active and external passive' quantifies the net cost impact of differences in cost between, and your relative use of, these 'low-cost' styles.

3. Asset classes are not shown where you are implemented exactly the same as peers (i.e. cost/savings impact is zero).

## The net impact of paying more/less for external asset management costs saved 0.2 bps.

### Cost impact of paying more/(less) for external asset management

	Style	Your avg holdings in \$mils (A)	Cost in bps			Cost/ (savings) \$000s (A X B)
			Your Fund	Peer median	More/ (less) (B)	
<b>External asset management</b>						
Stock - U.S. Broad/All	passive	2,209	1.4	1.6	(0.1)	(32)
Stock - U.S. Broad/All	active	1,643	57.4	45.1	12.3	2,025
Stock - ACWI x U.S.	passive	1,104	11.1	5.9	5.2	575
Stock - ACWI x U.S.	active	731	63.3	46.3	17.0	1,241
Fixed Income - U.S.	active	241	19.7	16.5	3.2	77
Fixed Income - High Yield	active	221	53.9	40.6	13.3	295
Real Estate ex-REITs	active	323	80.8	80.8	0.0	0
Real Estate ex-REITs	LP	593	127.2	123.3	3.8	228
Natural Resources	LP	301	140.7	142.8	(2.0)	(61)
Diversified Private Equity	FoF	394	67.0	73.0	(6.0)	(236)
Underlying base fees	FoF	394	104.6	157.0	(52.4)	(2,065)
Diversified Private Equity	LP	1,342	143.1	159.8	(16.7)	(2,245)
Total impact of paying more/less for external management						(199)
Total in bps						(0.2) bp

# The net impact of paying more/less for internal asset management costs saved 0.1 bps.

## Cost impact of paying more/(less) for internal asset management

	Style	Your avg holdings in \$mils	Cost in bps			Cost/ (savings) \$000s
			Your Fund	Peer median	More/ (less)	
<b>Internal asset management</b>		(A)			(B)	(A X B)
Fixed Income - U.S.	active	2,009	2.2	2.6	(0.4)	(75)
Cash	active	444	1.1	Excluded	--	--
Total for internal management						(75)
Total in bps						(0.1) bp

'Excluded' indicates that the asset class was excluded from this analysis due to comparability concerns with peers.

## The net impact of differences in oversight, custodial & other costs added 0.1 bps.

### Cost impact of differences in oversight, custodial & other costs

	Your avg holdings in \$mils (A)	Cost in bps			Cost/ (savings) \$000s (A X B)
		Your Fund	Peer median	More/ (less) (B)	
Oversight	10,715	1.1	1.2	(0.1)	(151)
Consulting	10,715	0.3	0.6	(0.2)	(262)
Custodial <sup>1</sup>	10,715	1.2	0.5	0.6	687
Audit	10,715	0.1	0.1	(0.0)	(27)
Other <sup>2</sup>	10,715	0.0	0.1	(0.1)	(157)
Total for oversight, custodial, other					90
Total in bps					0.1 bp

1. Important additional information about your custodial fees relative to peers:

- a. The peer median of 0.5 bps is unusually low. The U.S. universe median custodial cost was 0.8 bps.
- b. You have a more complex structure than your peers. You have 9 plans on your platform, most peers have less than 2 plans.
- c. Specific services provided by custodians for funds vary somewhat. CEM does not collect detailed data related to specific custodial arrangements.

2. 'Other' typically includes legal fees and fiduciary manager fees that apply to the plan as a whole and cannot be allocated to specific asset classes.

**In summary, your fund was slightly low cost primarily because you had a lower cost implementation style.**

### Reasons for your low cost status

	Excess Cost/ (Savings)	
	\$000s	bps
<b>1. Lower cost implementation style</b>		
• Less fund of funds	(1,376)	(1.3)
• Less external active management (more lower cost passive and internal)	(1,687)	(1.6)
• Less overlays	(590)	(0.6)
• Other style differences	78	0.1
	<u>(2,448)</u>	<u>(2.3)</u>
<b>2. Paying less than peers for similar services</b>		
• External investment management costs	(199)	(0.2)
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• Oversight, custodial & other costs	90	0.1
	<u>(184)</u>	<u>(0.2)</u>
<b>Total savings</b>	<b>(2,632)</b>	<b>(2.5)</b>

# Key takeaways

## Returns

- Your 5-year net total return was 9.7%. This was above the U.S. Public median of 9.0% and above the peer median of 9.2%.
- Your 5-year policy return was 10.4%. This was above the U.S. Public median of 8.8% and above the peer median of 9.1%.

## Implementation impact

- Your 5-year implementation impact was -0.7%. This was below the U.S. Public median of 0.1% and below the peer median of 0.2%.

## Cost and cost effectiveness

- Your investment cost of 56.9 bps was below your benchmark cost of 59.3 bps. This suggests that your fund was slightly low cost compared to your peers.
- Your fund was slightly low cost primarily because you had a lower cost implementation style.