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Superannuation fund performance and fund fees

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Superannuation Fund Performance and Fund Fees[1]

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Abstract

Superannuation fees have come under public scrutiny in recent years with the belief that many are set too high. Using a comprehensive dataset of Australian superannuation funds, we examine the relationship between investment fees and fund performance. We find that the most expensive funds produce significantly higher after-fee raw returns than the cheapest funds. However, the most expensive funds do not earn significantly higher benchmark-adjusted returns after asset allocation adjustment, after fees, than the least expensive funds. Furthermore, we do not observe a strong relationship between benchmark-adjusted fund performance and their investment fees. These findings suggest that retirement balances will not be worse off if superannuation investors are to hold the more expensive funds.

Keywords: Investment fees, Performance evaluation, Superannuation funds

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1. Introduction

With a compulsory superannuation (pension) system in Australia since 1992, the size of the Australian superannuation industry, in terms of assets under management, is estimated at AUD 1.99 trillion as at September 2015,[4] making it the 3rd largest in the world and an imperative source of retirement income for Australians. Superannuation fund fees are potentially a major contributor to the erosion of superannuation savings over the working life of an individual (e.g. Commonwealth of Australia, 2010a, 2010b), hence it is important to recognise how these fees will affect the net wealth of investors, and whether investors are adequately rewarded for incurring higher fees. The importance of superannuation fees has been a focal point of the 2014 Australia Financial Systems Inquiry's review of the superannuation system (Commonwealth of Australia (2014)), with a consensus emerging that the industry is overpriced in terms of the fees investors are paying for fund products. Using a comprehensive Australian superannuation fund dataset that spans the period from April 2007 to March 2015, we examine the effects that fund fees have on their performance. This is the first study that rigorously examines the relationship between fund fees and performance using a comprehensive sample of for-profit, not-for-profit, and MySuper (default) Australian superannuation funds.

The empirical findings of this paper indicate that the most expensive group of funds charge almost three times the investment fee as the least expensive quintile of funds and that the raw after-fee returns of these funds are significantly greater than the least expensive funds. Part of the higher fees is because these funds hold riskier assets which cost more to manage. We find that the difference in after-fee abnormal performance is not significantly different between the group of funds with the highest and lowest fees. This suggests that investors are no better (or worse) off than they would be if they were to select high or low fee fund during our sample period.

[4] Soured from ASFA website: https://www.superannuation.asn.au/resources/superannuation-statistics

Despite our findings largely conflicting with much of the current literature, many of these studies fail to consider the range of asset classes that are typically held by superannuation funds, such as infrastructure and hedge funds, which are not common amongst other managed funds. They therefore neglect to assign benchmarks that appropriately capture superannuation fund benchmark-characteristics when evaluating performance. The incorporation of fund asset allocations in our analysis therefore provides a like-for-like fund comparison when examining this fee-performance relationship. Our paper further differs from previous studies that examine the fee-performance relationship of Australian superannuation funds in that we examine a larger sample of both for-profit and not-for-profit funds, as well as default and non-default options.

Our results are consistent with Coleman, Esho and Wong (2006) for Australian superannuation funds, who argue that fund fees are unrelated to risk-adjusted performance. It is also consistent with U.S. evidence from Tufano and Sevick (1997), Martínez Sedano and Gil-Bazo (2004), Geranio and Zanotti (2005), Korkeamaki and Smythe (2004) and Otten and Bams (2002). There is, however, an abundance of literature that conflicts with our findings. In the US, Lesseig, Long and Smythe (2002) and Berkowitz and Kotowitz (2002) show that funds with higher expense ratios outperform the less-expensive funds. These results are also found by Basu and Andrews (2014) when examining Australian industry superannuation funds except they use a smaller fund sample and earlier sample period from 2004 to 2012. US studies on mutual fund performance largely show an inverse relationship with respect to fund expenses, (see for example, Gruber (1996), Carhart (1997), Dellva and Olson (1998), Gil-Bazo and Ruiz-Verdú (2008), Haslem, Baker and Smith (2008), Gil-Bazi and Ruiz-Verdu (2009) and Cooper, Halling and Lemmon (2011)). Bechmann and Rangvid (2007) similarly show, in the Danish market, that the cheapest funds outperform the most expensive across long hold-out periods. For Australian retail superannuation funds, Drew (2003) argues that the abnormal returns of funds are negatively related the level of fees they charge. The Rice Warner Report (2012) shows high-fee superannuation funds underperform low-fee funds before and after expenses, whereas Chant West (2014) argue that the ten largest

MySuper funds significantly outperformed their benchmark in the long run after fees and taxes, and that the best performers were also the most expensive. They subsequently argue that expensive funds justify the higher fees that are charged to investors by having higher returns. Chant West (2014) differs to our analysis as they use the passive Vanguard Growth PST fund index as the benchmark rather than a benchmark based on the strategic allocations of funds.

Iannotta and Navone (2012) and Christoffersen and Musto (2002) suggest that underperforming mutual funds are able to set higher fees due to the performance in-sensitivity of the clientele they attract. In other words, lower performing funds are able to charge higher fees without the risk of incurring asset outflows. However, there is also evidence that wholesale funds such as plan sponsors in the US are performance sensitive (e.g. Sialm, Starks and Zhang (2015)). Gil-Bazi and Ruiz-Verdu (2009) similarly argue that poor performing mutual funds cannot compete for the same investors as the best performing funds, so they market themselves to be less sophisticated, less performance-sensitive investors and are thus able to charge higher fees. An alternative explanation as to why expensive funds underperform is that they provide additional non-financial benefits to investors relative to cheaper, better-performing funds, hence justifying their higher fees. Cooper, *et al.* (2011) contest this view by showing that no stark differences exist in the services provided by funds of varying expense levels.

Our paper represents a more comprehensive study of fees and performance than recent Australian studies on superannuation. First we use monthly returns data which is at a higher frequency than most studies. For example, Coleman *et al.* (2006) and Cummings (2015) use quarterly returns while Basu and Andrews (2014) use annual returns. An exception is Drew (2003) who also uses monthly returns. Granularity of returns is important, particular when testing for trading performance when information is short-lived (e.g. Kothari and Warner (2001), Chen, Gallagher and Lee (2016)).

We also use the strategic asset allocations of superannuation funds and divide the allocations into 12 distinct asset classes. This allows us to benchmark funds more accurately based on their changing asset allocations over time. Previous, only Basu and Andrews (2014) benchmark funds based on their strategic asset allocations however they use only six asset classes. Our 12 asset classes allows us to more properly benchmark funds especially in alternative assets where we obtain allocations separately for hedge funds, infrastructure and private equity. Prior studies such as Drew (2003), Coleman *et al.* (2006) and Cummings (2015) do not have information on the asset allocations of superannuation funds. Instead they attempt to decompose allocations through a regression of fund returns using less than seven asset class benchmarks. Such a decomposition is subject to error and may not accurately reflect the actual or strategic allocations of the funds.

The findings from this paper are important for investors and advisors when making informed investment decisions and when allocating funds between superannuation products. It is also relevant for superannuation fund managers when deciding on how to set fees in a competitive setting based on their asset allocations and peer relative performance. For example, funds with low risk allocations are expected to set low fees reflecting the ease of managing such assets. Lastly, the findings from this paper are relevant for policy makers, who in recent years have promoted greater competition in the superannuation industry and placed pressure on funds to reduce fees. Our recommendations from these findings are that investors should be cautious when making investment decisions based solely on fee levels because fees cannot be used to determine the ability and asset allocation decisions of fund managers. Furthermore, fund managers should not be forced to reduce fees to remain competitive, as this may lead to divestment from certain assets classes, which provide higher after-fee returns, thus adversely affecting retirement balances.

The remainder of this paper is set out as follows: Section 2 describes the data, section 3 describes the method used to examine the relationship between fees and performance. Section 4 discusses the empirical results, and section 5 concludes.

2. Data

A unique Australian superannuation fund dataset that spans the period from April 2007 to March 2015 is used in the empirical analysis of this paper. All superannuation fund data are sourced from fund surveys collected by Chant West.[5] The data extracted from these surveys include: portfolio returns after investment fees, strategic asset allocation, investment and administration fees, dollar fund size and family size and sector (consultants, corporate, industry, master and public sector funds). Benchmark accumulation index returns for the major asset classes invested in by the superannuation funds were retrieved from Thomson Reuters Tick History and Bloomberg. The return of the riskless-asset is the cash rate from the RBA website.

The benchmark indices that we use are in Appendix 1. Aside from the private equity and hedge fund indices, these indices are investible through a position in passive funds that benchmark against such indices. We were unable to obtain unlisted property and unlisted infrastructure fund benchmarks as these benchmarks are either not useful for benchmarking or difficult to obtain. For unlisted property, IPD has unlisted Australian and U.S. property indices. However, in the Bloomberg description of the indices it states that these indices are 'neither appropriate nor authorized for use as a benchmark for portfolio or manager performance.' As such, we use the equivalent REIT indices for unlisted property allocations. For infrastructure, the closest measure of unlisted infrastructure that we could find is in Bird et al (2014) who use an equal weighted net-of-fees return data series for ten unidentified unlisted infrastructure managers. As these data are not publicly available and may be subject to selection bias, we choose to use infrastructure REIT indices as benchmarks for unlisted infrastructure.

The final sample consists of 217 unique funds that are populated across monthly returns, investment fees, fund size and lagged month strategic asset allocations. This represents about half of funds in the Chant West surveys. As such, there may be concern that the sample we use is not

[5] Chant West is an independent superannuation research and consultancy firm established in 1997. Website: https://www.chantwest.com.au/.

representative of the fund universe. To understand if any biases exist in our sample we report summary statistics for the Chant West sample populated by monthly returns ('Full' sample), Chant West sample populated with monthly returns and investment fees ('IFee' sample) and the filtered sample that we use populated with monthly returns, investment fees and lagged month strategic asset allocations ('Filtered' sample'). Every month for each sample, an equally weighted average across funds is calculated for several key variables. Appendix 2 reports the average monthly variable and also the mean difference between the Full and Filtered; and IFee and Filtered sample (with *t*-stats). The variables are investment fee, monthly fund return and dummies for each fund type (consultants, corporate, industry, master trusts and public sector funds). Note that investment fee is not calculated for the full sample as not all funds have investment fee populated. We find that our filtered sample has a statistically significant, 0.003% higher investment fee than the IFee sample and statistically indistinguishable returns from the Full or IFee sample. In terms of fund type compositions, our filtered sample has between 0.8 to 1.5 percent more consultants, corporate and master trusts than the Full sample or IFee sample. Overall, we conclude that our sample is representative of the Chant West's data universe.

Table 1 reports summary statistics for our fund universe split into five groups by investment fee size. Every month we have on average 132 funds reporting and about 26 to 27 funds in each fee quintile group. Average investment fees per annum in the low fee group is 0.63 percent. High-fee groups charge almost triple (0.95 percent) that of the low-fee group (0.34 percent). Median investment fees are similar to the averages. There does not appear to be as much variability in administration fees across fee groups. The lowest fee group also have the lowest mean administration balances while the 2nd largest fee quintile group generally have the highest administration fees across balances. Variability of administration fees is greatest for $25,000 balances and least for $250,000 balances. MySuper funds comprise 6 percent of our sample with noticeably fewer MySuper funds in the low-fee group of 3 percent compared with 7 percent in the

high-fee group.[6] Industry funds (45 percent) and master trusts (27 percent) dominate the entire sample. However, these funds make up less of the low-fee group. Corporate and Public Sector funds are more predominant in the lowest fee group than in the highest fee group.

[Insert Table 1 here]

Overall, the funds have an average allocation of 26 percent in Australian shares, 23 percent in international shares, 10 percent in cash, 21 percent in fixed interest and 12 percent in alternative assets. Moving from the lowest to highest fee group there is a noticeable pattern, with the low-fee groups holding the less risky asset classes of bonds and cash while high-fee groups hold the riskier assets of Australian shares, international shares and alternative assets.

3. Method

The approach used to investigate the relationship between fund fees and performance is outlined in this section. Section 3.1 describes the construction process of fund portfolios with varying levels of fund fees. Section 3.2 describes how the fund-portfolio returns are benchmark adjusted, while section 3.3 describes the regression models used to estimate the relationship between fund performance, fees and other fund characteristics.

3.1 Fund-Fee-Sorted Portfolios Returns

To investigate the association between superannuation fund performance and their level of investment fees, we construct fee-sorted quintile portfolios from all superannuation funds with monthly returns, investment fees and one-month lagged strategic asset allocations.[7] For each portfolio, monthly equal-weighted returns are calculated over the period from April 2007 to March 2015. We obtain a monthly return time-series for each fund fee-group portfolio that is rebalanced monthly. Using this method, we simulate the average actual performance of unit holders/fund

[6] MySuper funds were introduced by the Australian government with the intention of being a low-fee, no-frills default option that could be easily compared across funds. From 1 January 2014, businesses are required to pay member contributions into a MySuper product for members who have not made a choice of fund.
[7] Using five groups is arbitrary. We also use three groups and it does not affect our main results.

members in high- or low-fee funds at a given point in time. As such, there is no hindsight bias in our estimation. Also, as funds are compared at a given point in time there is no need to correct for time trends in fees. For example, fees could be falling over time due to lower brokerage and research costs; this should be observed in all groups.

3.2 Benchmark Adjusted Returns

When adjusting superannuation fund returns for benchmarks, we rely on the strategic asset allocations of funds to create an asset allocation benchmark (AAB) for each fund. For the AAB, as the market return beta varies across funds, a special beta portfolio is created based on the lagged month strategic asset allocations of each fund. This adjustment allows for comparability of fund alphas with different asset allocations (e.g. a pure Australian equity fund has a different risk profile to a pure Australian bond fund). For each eligible fund, we calculate an AAB as being the sum of lagged strategic asset allocation multiplied by the respective asset-class benchmark return. To calculate benchmark adjusted fund returns, the following regression is estimated:

$$R_{p,t} - R_{f,t} = \alpha_p + \beta_{1,p}\left(AAB_{p,t} - R_{f,t}\right) + \varepsilon_{p,t}, \quad (1)$$

where $R_{p,t}$ is the portfolio return of fund fee group *p* during month *t*, $R_{f,t}$ is the risk free rate, $AAB_{p,t}$ is the fund fee-group portfolio weighted asset allocation benchmarks across funds.

In order to calculate the statistical difference between the benchmark adjusted returns of high- and low-fee funds, the following regression is estimated:

$$R_{High,t} - R_{Low,t} = \alpha_{HL} + \beta_{1,HL}\left(AAB_{High,t} - AAB_{Low,t}\right) + \varepsilon_{HL,t}, \quad (2)$$

where *High* and *Low* represent the highest and lowest fund-fee quintile portfolios, respectively, as described in section 3.1. The AAB has several distinct advantages to other forms of benchmarking. First, it is dynamic as it follows the changing asset allocations of a fund. The benchmark is therefore customised to each fund at each point in time so that it may account for differences in asset allocations of funds. In contrast, regressing returns on several benchmarks (such as in a factor

model) does not capture funds changing allocations over time. Second, because the AAB uses lagged strategic asset allocations as the benchmark, it simultaneously captures performance from increased returns by the fund switching asset allocations (tactical asset allocation), as well as capturing excess returns within individual asset classes (security selection).

3.3 Individual Fund Regression

Using fund fee-group portfolios ignores potential fund characteristics such as fund type that may also affect fund performance in addition to fund fees. As such, individual fund benchmark adjusted returns are regressed against investment fees and other fund characteristics to identify the relationship between superannuation fund performance and their investment fees. The full regression model that is estimated is:

$$\alpha_{i,t} = \omega_i + \beta_{1,i} Fee_{i,t} + \beta_{2,p} MySuper_i + \sum_{g=1}^{6} \gamma_{g,i} Group_{i,g} + F_i + T_t + \varepsilon_{i,t} , \quad (4)$$

where $\alpha_{i,t}$ is the excess return of fund *i* at time *t*, beyond its expected return during that month which is estimated from the AAB. *Fee* is the fund level investment fee in percentage per annum. We also measure Total *Fee* instead of *Fee* which is investment fees plus administrative fees as percentage per annum. Because administrative fees are a per year dollar amount and may differ depending on account balance, we calculate total percentage fees as investment fees and administrative fees using account balances of $20,000, $50,000, $75,000, $100,000, $150,000, $200,000 and $250,000. These account balances cover a broad range of actual member account balances. For example Clare (2015) finds the mean superannuation balance in 2013/2014 across age group categories 25 and above range from $16,441 to $214,121. *MySuper* is a dummy that takes the value of one if the fund is a MySuper fund, or zero otherwise. *Group*, is a vector of five dummies which take the value of one if the fund category-type is either one of a Consultant, Corporate Fund, Industry Fund, Master Trust or Public Sector Fund, or zero otherwise. F_i and T_t are fund- and time-fixed effects, respectively. ω_i is the intercept term and $\varepsilon_{i,t}$ is the error term. Standard errors are clustered by year/month.

4. Results

This section reports the findings from our empirical analysis. Section 4.1 reports the unadjusted portfolio returns for the different fund-fee groups. The benchmark adjusted return results are reported in section 4.2, and section 4.3 investigates the relationship between benchmark-adjusted returns and fees at the fund-level.

4.1 Unadjusted Returns of Fee Sorted Portfolios

Table 2 reports the average monthly unadjusted returns of fee-sorted portfolios for equal-weighted returns. We find that high-fee funds earn on average 0.049 percent per month (or 0.588 percent per annum) higher after-fee returns than low-fee funds. This difference is statistically significant at the five percent level. High fee funds charge 0.949 per annum in fees, almost triple that of low fee funds of 0.331 percent per annum. The difference in fees between high- and low-fee funds is 0.622 percent per annum. Returns monotonically increase across fund-fee groups with low-fee funds earning 0.40 percent per month and the high-fee group earning 0.445 percent per month. On a returns basis, it appears that high-fee funds do earn higher returns and that they commensurately charge higher fees. Clearly, this analysis does not take into account the risk-exposure of these funds, particularly when the high-fee funds, on average, hold riskier assets than the low-fee funds. We therefore investigate in the next section whether higher-fee funds also earn higher benchmark-adjusted returns.

[Insert Table 2]

4.2 Benchmark Adjusted Returns of Fee Sorted Portfolios

Table 3 reports benchmark-adjusted returns of equal weighted fee-sorted portfolios using AAB. We find that all funds earn positive benchmark-adjusted returns, as the intercept is positive and statistically significant at the ten percent level. We however do not find that high-fee funds

outperform low-fee funds.[8] High-fee funds earn benchmark-adjusted returns of 0.103 percent per month while low-fee funds earn 0.115 percent per month, both statistically significant at the ten percent level. The difference of -0.017 percent per month between high- and low-fee funds is not statistically significant. This suggests that after adjusting the returns for what would have been achieved from investing in the asset benchmark indices adjustment and after fees, the returns of low- and high-fee funds are similar.

[Insert Table 3]

4.3 Individual Fund Regressions

Table 4 reports the results for the individual fund regressions. The first column reports the regression where percentage investment fees without administrative fees is the independent variable of interest. Subsequent columns use fees including administrative fees based on increasing account balances. We find, with the exception of account balances of $20,000, that fees are not statistically related to benchmark-adjusted fund performance. This result is consistent with the previous section and suggests that including administrative fees does not affect our findings. In the following sections we test the robustness of our results.

[Insert Table 4]

4.4 Other Benchmark-adjusted Returns

In this section, we consider fee-sorted portfolios using other benchmark adjustments, i.e., an AAB with six factors and a factor asset pricing model. In the AAB with six factors we calculate benchmark-adjusted fund returns with the following regression:

$$R_{p,t} - R_{f,t} = \alpha_p + \beta_{1,p}\left(AAB_{p,t} - R_{f,t}\right) + \beta_{2,p}SMB_t + \beta_{3,p}HML_t + \beta_{4,p}UMD_t + \beta_{5,p}Default_t + \beta_{6,p}Option_t + \varepsilon_{p,t} \quad (5)$$

[8] In AAB, the high minus low AAB portfolio for '5 minus 1' is not the simply the difference in coefficients between high and low factors due to the AAB benchmark differing for high and low fee portfolios. As such the independent variable *AAB - rf* would be different for each portfolio including the '5 minus 1' portfolio.

The regression is the same as equation 1 except with the addition of factors that are used to explain asset returns. *SMB* 'small minus big', *HML* 'high minus low' and *UMD* momentum factors are the global returns factors obtained from Kenneth French's website. *Default* and *Option* are bond factor returns as used in Elton, Gruber and Blake (1995). *Default* is the iShares iBoxx High Yield Coporate Bond ETF return and less iShares 7-10 Year Treasury Bond ETF (with an adjustment to equalise fees in the two ETFs). *Option* is iShares mortgage backed securities return less a portfolio consisting of 75% iShares 71-0 Year Treasury Bond ETF and 25% iShares 20+ Year Treasury Bond ETF (with adjustment to equalise fees). The factors are all AUD hedged.

In the factor model the fund fee-group returns are simply regressed on all asset-class benchmarks in order to calculate alpha. This approach does not assume that funds have a particular asset allocation. The regression model that is estimated is:

$$R_{p,t} - R_{f,t} = \alpha_p + \sum_{b=1}^{B} \beta_{b,p}\left(R_{b,t} - R_{f,t}\right) + \beta_{2,p}SMB_t + \beta_{3,p}HML_t + \beta_{4,p}UMD_t + \beta_{5,p}Default_t + \beta_{6,p}Option_t + \varepsilon_{p,t}\,, \quad (3)$$

where R_b denotes an individual benchmark, as listed in Appendix 1. Cummings (2016) uses similar benchmarks although he does not adjust for asset factors. To test for the statistical difference in the benchmark-adjusted returns of the high-fee and low-fee portfolios, the same APT model is estimated, however, $R_{p,t} - R_{f,t}$ is replaced with $R_{High,t} - R_{Low,t}$.

Table 5 reports our results with the AAB with six factors in Panel A and the factor pricing model in Panel B. We find the benchmark adjusted return intercept is weaker in comparison with the simple AAB benchmark suggesting that the other benchmarks capture more of the systematic returns on the portfolios. For example for the factor model in Table 5 Panel B we do not find any statistically significant intercept coefficients. Also for both other benchmarks we do not find statistically indistinguishable returns between high and low fee portfolios using either benchmark adjusting approaches.

[Insert Table 5]

4.5 Three Group Sorted Portfolios

A possible criticism of using quintile portfolio sorts is the lack of funds per quintile (about 26 in each quintile as seen in Table 1). To check for robustness of results we also do tercile sorts, which results in about 43 funds in each fee group per month. Table 6 reports our results using AAB (Panel A), AAB with six factors (Panel B) and the factor model (Panel C). We find that across benchmark adjustment methods that the high fee minus low fee portfolio (3 minus 1) is statistically insignificant, consistent with our findings using quintile sorts.

[Insert Table 6]

4.6 Individual Fund regressions with Fund Size and using Alternative Benchmarks.

In this section, we rerun our individual fund regressions including log fund size and also alternative benchmarks. In our individual fund regression in Table 4, we did not control for size as we only have fund size information from July 2010 to March 2015. As such, Table 7 reports the modified individual fund regression for the shorter period. We find consistent with papers on fund performance and size, such as Berk and Green (2004), the *Size* coefficient is negative though not always statistically significant across benchmark specifications. With the exception of no administration fees using the factor model in Table 7 Panel C (statistically significant at the ten percent level) , we find no statistical relationship between fees and benchmark adjusted returns, even after controlling for size.

[Insert Table 7]

5. Conclusion

Using a comprehensive dataset of for-profit, not-for-profit, default and non-default Australian superannuation fund options, we show there is a positive relationship between investment fees and after-fee returns, and that high-fee funds on average produce significantly higher returns than low-fee funds. However, after adjusting returns for benchmark indices and asset pricing factors, we fail to observe a relationship between fund performance and fees and as such

high-fee funds are shown to perform indifferently from low-fee funds on a benchmark-adjusted basis and after fees. These findings are largely unaffected by the inclusion of administration fees and are best explained by high-fee funds having allocated a higher proportion of their assets to growth investments, which are typically more expensive to manage and are inherently more risky relative to conservative assets.

References

Basu, A., & Andrews, S. (2014). Asset Allocation Policy, Returns and Expenses of Superannuation Funds: Recent Evidence Based on Default Options. *Australian Economic Review, 47*(1), 63-77.

Bechmann, K. L., & Rangvid, J. (2007). Rating mutual funds: Construction and information content of an investor-cost based rating of Danish mutual funds. *Journal of Empirical Finance*, 14(5), 662-693.

Berk, J. B. & Green, R. C. (2004). Mutual Fund Flows and Performance in Rational Markets. *Journal of Political Economy*, 112(6), 1269-1295.

Berkowitz, M. K., & Kotowitz, Y. (2002). Managerial quality and the structure of management expenses in the US mutual fund industry. *International Review of Economics & Finance*, 11(3), 315-330.

Bird, R., Liem, H. & Thorp, S. (2014). Infrastructure: Real assets and real returns, *European Financial Management*, 20, 802-824.

Carhart, M. M. (1997). On persistence in mutual fund performance. *Journal of Finance*, 52(1), 57-82.

Chant West (2014). Active and Passive Management: Australian Super Industry Experience. *August 2014*.

Chen, Z., Gallagher, D.R. & Lee, A.D. (2016). Testing the effect of portfolio holdings disclosure in an environment absent of mandatory disclosure. *Accounting & Finance*, forthcoming.

Christoffersen, S. E., & Musto, D. K. (2002). Demand curves and the pricing of money management. *Review of Financial Studies*, 15(5), 1499-1524.

Clare, R. (2015). Superannuation account balances by age and gender, The Association of Superannuation Funds of Australia Limited, Sydney, Australia.

Coleman, A. D., Esho, N., & Wong, M. (2006). The impact of agency costs on the investment performance of Australian pension funds. *Journal of Pension Economics and Finance*, 5(03), 299-324.

Commonwealth of Australia, (2010a), "*Super System Review, Final Report: Part One. Overview and Recommendations*", Canberra, Australia.

Commonwealth of Australia, (2010b), "*Super System Review, Final Report: Part Two. Recommendation Packages*", Canberra, Australia.

Commonwealth of Australia, (2014), "*Financial Systems Inquiry Final Report*", Canberra, Australia.

Cooper, M., Halling, M., & Lemmon, M. (2011). Fee dispersion and persistence in the mutual fund industry. University of Utah Working Paper.

Cummings, J.R. (2016). Effect of fund size on the performance of Australian superannuation fund, *Accounting and Finance*, forthcoming.

Dellva, W. L., & Olson, G. T. (1998). The relationship between mutual fund fees and expenses and their effects on performance. *Financial Review, 33*(1), 85-104.

Drew, M. E., & Stanford, J. D. (2003). Principal and agent problems in superannuation funds. *Australian Economic Review,* 36(1), 98-107.

Elton, E.J., Gruber, M.J. & Blake, C.R. (1995). Fundamental Economic Variables, Expected Returns, and Bond Performance, *Journal of Finance,* 50(4), 1229-1256.

Geranio, M., & Zanotti, G. (2005). Can mutual funds characteristics explain fees? *Journal of Multinational Financial Management,* 15(4), 354-376.

Gil-Bazi, J., & Ruiz-Verdu, P. (2009). The relation between price and performance in the mutual fund industry. *The Journal of Finance,* 64(5), 2153-2183.

Gruber, M. J. (1996). Another Puzzle: The Growth in Actively Managed Mutual Funds. *The Journal of Finance,* 51(3), 783-810.

Haslem, J. A., Baker, H.K and Smith, D.M. (2008). Performance and characteristics of actively managed retail mutual funds with diverse expense ratios, Financial Services Review, 17(1), 49-68.

Iannotta, G., & Navone, M. (2012). The cross-section of mutual fund fee dispersion. *Journal of Banking & Finance,* 36(3), 846-856.

Kothari, S. P. & Warner, J.B. (2001). Evaluating Mutual Fund Performance. *Journal of Finance*, 56(5), 1985-2010.

Korkeamaki, T. P., & Smythe, T. I. (2004). Effects of market segmentation and bank concentration on mutual fund expenses and returns: evidence from Finland. *European Financial Management, 10*(3), 413-438.

Lesseig, V. P., Long, D.M. & Smythe, T.I. (2002). Gains to mutual fund sponsors offering multiple share class funds. *Journal of Financial Research,* 25(1), 81-98.

Martínez Sedano, M. Á., & Gil-Bazo, J. (2004). The black box of mutual fund fees. *Revista de Economía Financiera, 4*, 54-82.

Otten, R., & Bams, D. (2002). European mutual fund performance. *European Financial Management, 8*(1), 75-101.

Rice Warner Actuaries, (2012), "*Superannuation Fees Research*", Rice Warner Research Report.

Sialm, C., Starks, L. & Zhang, H. (2015). Defined Contribution Pension Plans: Sticky or Discerning Money? *Journal of Finance,* 70(2), 805-838.

Tufano, P., & Sevick, M. (1997). Board structure and fee-setting in the US mutual fund industry. *Journal of Financial Economics, 46*(3), 321-355.

Appendix 1
Benchmarks for Each Asset Class

The benchmarks indices used in the Asset Allocation Benchmark (AAB) and factor model regressions, which capture the risks associated with the asset classes that are typically held by Australian Superannuation funds, are listed in this table.

Asset Class	Benchmark
Australian Shares	S&P/ASX 300 Total Return
International Shares	MSCI World Ex-Australia Index Hedged $A
Australian Property	S&P/ASX 200 A-REIT Total Return Index
International Property	FTSE EPRA/NAREIT Developed Index Hedged $A
Cash	RBA Cash Rate
Australian Bonds	Bloomberg AusBond Composite Bond Index All Maturities
International Bonds	Barclays Global Aggregate Bond Index Hedged $A
Private Equity	AVCAL/Cambridge Associates Private Equity Net Return Index
Infrastructure	Thomson Reuters Global Infrastructure Total Return Index Hedged $A
Hedge Funds	Eureka Hedge Fund Index (equal weighted net of fees)
Commodities	S&P GSCI Total Return Index Hedged $A
Other Alternative Assets	Eureka Hedge Fund index (equal weighted net of fees)

Appendix 2
Comparison of Categories and Returns of Filtered Sample with Full Sample

The table reports summary statistics for the Chant West sample populated by monthly returns ('Full' sample), Chant West sample populated with monthly returns and investment fees ('IFee' sample) and the filtered sample that we use populated by monthly returns, investment fees and lagged month strategic asset allocation ('Filtered' sample'). Every month for each sample, the equal weighted variable (e.g. investment fee) across funds is calculated. The table reports the average monthly variable and also mean difference between the Full and Filtered; and IFee and Filtered sample (with *t*-stats). The variables are investment fee, monthly fund return and dummies for each fund type (consultants, corporate, industry, master and public sector funds). Note that investment fee is not calculated for the full sample as not all funds have investment fee populated. *t*-statistics are reported in parenthesis and *, ** and *** indicate statistical significance at ten, five, and one percent levels, respectively.

Variable	Full	IFee	Filtered	Full minus Filtered	*t*	IFee minus Filtered	*t*
Investment Fee (% p.a.)	.	0.622	0.624	.	.	-0.003	(-3.07)
Monthly Fund Return (%)	0.424	0.420	0.427	-0.003	(-0.20)	-0.007	(-1.22)
Category – Consultants	0.058	0.056	0.071	-0.013	(-15.35)	-0.015	(-28.45)
Category – Corporate Funds	0.046	0.041	0.049	-0.003	(-0.98)	-0.008	(-9.86)
Category – Industry Funds	0.423	0.471	0.451	-0.028	(-8.13)	0.020	(10.94)
Category – Master Trusts	0.334	0.264	0.272	0.062	(15.39)	-0.008	(-4.32)
Category – Public Sector Funds	0.139	0.168	0.157	-0.018	(-13.19)	0.011	(13.55)
Fund year/months	32359	18303	12658				
Number of Unique Funds	434	274	217				

Table 1
Summary Statistics

Descriptive statistics, including number of funds and investment fees, for the sample of Australian Superannuation funds over the period from April 2007 to March 2015 are presented in this table. Funds are sorted by investment fees into quintiles, with quintile one containing the lowest-fee funds and quintile five containing the highest-fee funds. Descriptive statistics for the entire sample of funds are reported in the last column. Admin fee is the dollar admin as a percentage of select account balances ($25,000, $50,000 or $250,000). The percentage of funds in each quintile that is classified as a MySuper fund are also reported , along with the percentage of funds contained in each quintile that are classified as belong to the category group; Consultants, Corporate funds, Industry funds, Master Trusts or Public Sector funds. Mean strategic asset allocations of the funds contained in each quintile are also reported for the major asset-classes.

	Fee Group					
Descriptive Statistic	1 (Lowest)	2	3	4	5 (Highest)	All
Number of Unique Funds	79	111	118	107	78	217
Mean Number of Funds per month	25.97	26.39	27.02	26.24	26.24	131.85
Mean Investment Fee (% p.a.)	0.34	0.50	0.62	0.72	0.95	0.63
Median Investment Fee (% p.a.)	0.35	0.50	0.62	0.72	0.87	0.62
Mean Admin Fee (25k balance, % p.a.)	0.54	0.60	0.62	0.63	0.59	0.60
Mean Admin Fee (50k balance, % p.a.)	0.41	0.47	0.47	0.51	0.46	0.47
Mean Admin Fee (250k balance, % p.a.)	0.28	0.33	0.34	0.39	0.34	0.34
MySuper Funds	0.03	0.05	0.08	0.08	0.07	0.06
Category – Consultants	0.03	0.02	0.11	0.09	0.09	0.07
Category – Corporate Funds	0.13	0.08	0.05	0.01	0.00	0.06
Category – Industry Funds	0.35	0.43	0.46	0.48	0.53	0.45
Category – Master Trusts	0.12	0.28	0.26	0.37	0.31	0.27
Category – Public Sector Funds	0.37	0.18	0.11	0.05	0.06	0.16
Mean Allocation – Australian Shares	17.94	23.06	27.34	29.97	33.46	26.37
Mean Allocation – International Shares	17.24	20.00	23.23	25.48	28.45	22.89
Mean Allocation – Australian Property	6.15	6.40	5.99	6.63	7.22	6.48
Mean Allocation – International Property	1.33	1.82	2.31	2.30	1.79	1.91
Mean Allocation – Cash	18.27	11.44	8.17	7.10	3.73	9.72
Mean Allocation – Bonds	31.77	26.99	20.23	15.00	10.07	20.79
Mean Allocation – Alternative Assets	7.25	10.07	12.43	13.26	14.79	11.58
Mean Allocation – Total Assets	100.00	100.00	100.00	100.00	100.00	100.00

Table 2
Unadjusted Returns of Fee-sorted Portfolios

Superannuation funds are sorted into quintiles according to their one-month lagged investment fee, over the period from April 2007 to March 2015, and are rebalanced monthly. Quintile one contains the lowest-fee funds and quintile five are the highest-fee funds. Mean monthly unadjusted fund returns and average investment fees across the sample period are reported for each quintile in both panels. Portfolio returns and investment fees are equal-weighted across each quintile. The difference in mean monthly unadjusted returns, and investment fees, between the high-fee and low-fee quintiles is also reported. *t*-statistics are reported in parenthesis and *, ** and *** indicate statistical significance at ten, five, and one percent levels, respectively.

Fee Group	Portfolio Return Net of Investment Fees (Equal Weighted)	Investment Fee (% p.a.)
1 (Low Fee)	0.401**	0.331
	(2.82)	
2	0.409**	0.498
	(2.43)	
3	0.435**	0.621
	(2.29)	
4	0.439**	0.721
	(2.13)	
5 (High Fee)	0.445**	0.949
	(2.02)	
High Fee minus Low Fee	0.049**	0.622***
	(1.98)	(210.21)
All Funds	0.435**	0.624
	(2.26)	

Table 3
Benchmark-adjusted Returns

Regressions results examining the performance of portfolios of Australian superannuation funds over the period from April 2007 to March 2015 are reported in this table. Funds are sorted monthly into equal-weighted portfolios according to their level of investment fees. The *Low* portfolio holds funds with the lowest fees, and *High* contain the highest-fee quintile of funds. A long-short portfolio that is long the highest-fee quintile of funds and short the lowest-fee quintile of funds ('5 minus 1'), and a portfolio containing all the funds in the sample, are also examined. The AAB model formulates a special market index AAB for each individual fund based on passive asset-class indices and the constituent funds' one-month lagged value-weighted strategic allocation to each of the respective asset classes. The asset-class indices used are listed in Appendix 1. All index returns are measured in excess of the risk-free asset. Alpha is the intercept term which represents the abnormal return of the fund portfolio respective to the regressions model. *t*-statistics are reported in parenthesis and *, ** and *** indicate statistical significance at ten, five, and one percent levels, respectively.

	1 (Low)	2	3	4	5 (High)	5 minus 1	All Funds
Intercept	0.115*	0.121*	0.122*	0.127**	0.103*	-0.017	0.122**
	(1.94)	(1.89)	(1.95)	(2.15)	(1.70)	(-0.44)	(2.04)
AAB – rf	0.583***	0.616***	0.663***	0.677***	0.661***	0.647***	0.662***
	(22.15)	(24.50)	(28.65)	(33.32)	(35.00)	(19.18)	(30.57)
Adjusted R^2	0.838	0.863	0.896	0.921	0.928	0.794	0.908
NOBS	96	96	96	96	96	96	96

Table 4
Individual Fund Regressions

Fund-level performance regressions are estimated for a sample of Australian superannuation funds over the period from April 2007 to March 2015 using monthly data. The dependent variables are fund-level monthly excess-returns beyond the expected fund return estimated using the Actual Allocation Benchmark (AAB). The independent variable of interset is either fund level *Investment Fee* (for first column), or *Total Fee* (for all other columns), which is calculated as investment fee plus administration fee, measured as percentage per annum of a member's balance. We estimate *Total Fee* using balances of $25,000, $50,000, $75,000, $100,000, $150,000, $200,000 and $250,000. Independent variables also include, a dummy that takes the value of one if the fund is a MySuper fund, *MySuper*, or zero otherwise, and six Category dummies, *Category*, which take the value of one if the fund category-type is either one of a Consultant, Corporate Fund, Industry Fund, Master Trust or Public Sector Fund, or zero otherwise. Regressions are estimated with fund-fixed effects and year/month fixed effects. All regressions are estimated with robust standard errors clustered by fund family and year/month. *t*-statistics are reported in parenthesis. *, ** and *** indicate statistical significance at ten, five, and one percent levels, respectively.

	Account Balance							
Model	No Admin	25k	50k	75k	100k	150k	200k	250k
Intercept	0.477***	0.42***	0.464***	0.463***	0.464***	0.466***	0.468***	0.491***
	(8.62)	(7.87)	(8.46)	(8.31)	(8.26)	(8.26)	(8.3)	(9.12)
Investment Fee/ Total Fee (% p.a.)	0.055	0.084***	0.051	0.059	0.062	0.063	0.062	0.035
	(0.81)	(2.71)	(1.43)	(1.33)	(1.23)	(1.11)	(1.04)	(0.82)
MySuper	-0.017	-0.018	-0.017	-0.017	-0.017	-0.017	-0.017	-0.017
	(-0.61)	(-0.64)	(-0.62)	(-0.62)	(-0.62)	(-0.62)	(-0.62)	(-0.6)
Category - Consultants	-0.107	-0.161*	-0.137	-0.131	-0.126	-0.12	-0.117	-0.125
	(-1.21)	(-1.76)	(-1.47)	(-1.41)	(-1.36)	(-1.31)	(-1.29)	(-1.29)
Category - Corporate Funds	-0.007	-0.016	-0.014	-0.012	-0.011	-0.01	-0.009	-0.013
	(-0.07)	(-0.16)	(-0.14)	(-0.13)	(-0.11)	(-0.1)	(-0.09)	(-0.13)
Category - Industry Funds	-0.027	-0.032	-0.026	-0.026	-0.027	-0.027	-0.027	-0.023
	(-0.37)	(-0.45)	(-0.36)	(-0.37)	(-0.38)	(-0.38)	(-0.38)	(-0.33)
Category - Master Trusts	0.113	0.071	0.088	0.092	0.096	0.101	0.104	0.098
	(0.95)	(0.59)	(0.72)	(0.76)	(0.8)	(0.84)	(0.86)	(0.79)
Adjusted R-squared	0.476	0.477	0.476	0.476	0.476	0.476	0.476	0.475
Number of Observations	11,390	11,390	11,390	11,390	11,390	11,390	11,390	11,390

Table 5
Alternative Benchmark-adjusted Returns

Regressions results examining the performance of portfolios of Australian superannuation funds over the period from April 2007 to March 2015 are reported in this table. Funds are sorted monthly into five equal-weighted portfolios according to their level of investment fees. The *Low* portfolio holds funds with the lowest fees, and *High* contain the highest-fee quintile of funds. A long-short portfolio that is long the highest-fee quintile of funds and short the lowest-fee quintile of funds, and a portfolio containing all the funds in the sample, are also examined. The Asset Allocation Benchmark (AAB) with 6 Factor model formulates a special market index AAB for each individual fund based on passive asset-class indices and the constituent funds' one-month lagged value-weighted strategic allocation to each of the respective asset classes. The asset-class indices used are listed in Appendix 1. *SMB*, *HML* and *MOM* are global returns factors obtained from Kenneth French's website. *Default* is the iShares iBoxx High Yield Coporate Bond ETF return and less iShares 7-10 Year Treasury Bond ETF (with an adjustment to equalise fees in the two ETFs). *Option* is iShares mortgage backed securities return less a portfolio consisting of 75% iShares 71-0 Year Treasury Bond ETF and 25% iShares 20+ Year Treasury Bond ETF (with adjustment to equalise fees). The factors are all AUD hedged. The Factor Model regresses portfolio returns against the excess returns of individual indices in Appendix 1. All index returns are measured in excess of the risk-free asset. Panel A reports coefficient estimates for the AAB with 6 Factor model. Panel B reports coefficient estimates for the Factor Model. *t*-statistics are reported in parenthesis and *, ** and *** indicate statistical significance at ten, five, and one percent levels, respectively.

Panel A. AAB with 6 Factor Model

	1 (Low)	2	3	4	5 (High)	5 minus 1	All Funds
Intercept	0.109	0.108	0.151*	0.146**	0.165**	-0.012	0.155**
	(1.52)	(1.38)	(1.98)	(2.03)	(2.29)	(-0.28)	(2.14)
AAB - rf	0.515***	0.562***	0.665***	0.698***	0.731***	0.503***	0.697***
	(8.49)	(9.12)	(11.72)	(14.03)	(15.60)	(9.51)	(12.67)
SMB	0.031	0.025	-0.006	-0.017	-0.047	4.832***	-0.024
	(1.17)	(0.82)	(-0.19)	(-0.58)	(-1.58)	(3.88)	(-0.79)
HML	-0.064*	-0.035	-0.025	-0.031	0.004	4.028	-0.025
	(-1.74)	(-0.86)	(-0.63)	(-0.8)	(0.09)	(1.62)	(-0.66)
MOM	-0.008	-0.004	-0.014	-0.002	0.005	1.707*	-0.004
	(-0.53)	(-0.24)	(-0.83)	(-0.11)	(0.28)	(1.68)	(-0.26)
Default	-3.69**	-3.62**	-4.354***	-3.85**	-4.618***	-0.449	-4.365***
	(-2.38)	(-2.15)	(-2.66)	(-2.49)	(-2.96)	(-0.45)	(-2.81)
Option	10.719***	11.885***	12.125***	11.643***	10.574***	-0.294	12.392***
	(3.08)	(3.10)	(3.25)	(3.29)	(2.96)	(-0.13)	(3.49)
Adjusted R^2	0.857	0.874	0.905	0.927	0.934	0.826	0.916
NOBS	96	96	96	96	96	96	96

Table 5 continued

Panel B. Factor Model

	1 (Low)	2	3	4	5 (High)	5 minus 1	All Funds
Intercept	0.091	0.118	0.075	0.068	0.033	-0.059	0.089
	(1.11)	(1.30)	(0.89)	(0.72)	(0.30)	(-0.81)	(1.02)
SMB	-0.219*	-0.202	-0.101	-0.12	-0.066	15.226	-0.154
	(-1.7)	(-1.44)	(-0.77)	(-0.81)	(-0.39)	(1.35)	(-1.13)
HML	0.084***	0.102***	0.091***	0.082**	0.088**	0.356	0.092***
	(3.01)	(3.33)	(3.19)	(2.55)	(2.39)	(0.14)	(3.10)
MOM	-0.015*	-0.008	-0.007	-0.004	-0.009	0.625	-0.007
	(-1.82)	(-0.91)	(-0.8)	(-0.43)	(-0.82)	(0.85)	(-0.82)
Default	0.291	-0.027	0.074	0.261	-0.237	-0.527	-0.131
	(0.37)	(-0.03)	(0.09)	(0.29)	(-0.23)	(-0.77)	(-0.16)
Option	3.749**	4.362**	3.235*	3.084	2.106	-1.643	3.919**
	(2.12)	(2.25)	(1.79)	(1.51)	(0.91)	(-1.06)	(2.09)
asx300 - rf	0.165***	0.193***	0.236***	0.264***	0.299***	0.134***	0.245***
	(11.66)	(12.46)	(16.31)	(16.15)	(16.1)	(10.77)	(16.32)
wrld exaus - rf	0.35***	0.357**	0.275**	0.318**	0.274	-0.075	0.336**
	(2.66)	(2.48)	(2.06)	(2.10)	(1.59)	(-0.66)	(2.42)
AREIT - rf	-0.059	-0.029	-0.029	-0.038	-0.049	0.011	-0.041
	(-1.63)	(-0.73)	(-0.78)	(-0.92)	(-1.02)	(0.33)	(-1.06)
intl lst prop -rf	0.082**	0.064	0.054	0.057	0.05	-0.032	0.059
	(2.22)	(1.58)	(1.44)	(1.34)	(1.03)	(-0.99)	(1.5)
hedge -rf	0.050***	0.068***	0.102***	0.125***	0.151***	0.101***	0.104***
	(3.34)	(4.15)	(6.72)	(7.27)	(7.73)	(7.74)	(6.6)
abond -rf	0.198***	0.018	-0.015	0.006	-0.006	-0.204***	0.023
	(4.25)	(0.36)	(-0.32)	(0.12)	(-0.10)	(-4.99)	(0.46)
ibond - rf	-0.007	-0.010*	-0.008	-0.004	-0.006	0.001	-0.008
	(-1.36)	(-1.69)	(-1.52)	(-0.66)	(-0.89)	(0.21)	(-1.44)
avcal - rf	0.068***	0.062**	0.090***	0.104***	0.153***	0.085***	0.097***
	(2.72)	(2.27)	(3.51)	(3.58)	(4.67)	(3.87)	(3.64)
infra - rf	0.031**	0.031**	0.033**	0.018	0.018	-0.013	0.026*
	(2.19)	(2.02)	(2.28)	(1.10)	(0.96)	(-1.07)	(1.73)
GSCI - rf	0.006	-0.003	-0.003	-0.001	-0.001	-0.006	-0.002
	(0.96)	(-0.43)	(-0.42)	(-0.22)	(-0.10)	(-1.25)	(-0.28)
Adjusted R^2	0.967	0.971	0.98	0.979	0.976	0.926	0.979
NOBS	96	96	96	96	96	96	96

Table 6
Fee-Sorted Portfolios in 3 Groups

Regressions results examining the performance of portfolios of Australian superannuation funds over the period from April 2007 to March 2015 are reported in this table. Funds are sorted monthly into three equal-weighted portfolios according to their level of investment fees. The *Low* portfolio holds funds with the lowest fees, and *High* contain the highest-fee quintile of funds. A long-short portfolio that is long the highest-fee quintile of funds and short the lowest-fee quintile of funds, and a portfolio containing all the funds in the sample, are also examined. The Asset Allocation Benchmark (AAB) formulates a special market index AAB for each individual fund based on passive asset-class indices and the constituent funds' one-month lagged value-weighted strategic allocation to each of the respective asset classes. The asset-class indices used are listed in Appendix 1. The AAB with 6 Factor further regresses on six asset factors. *SMB, HML* and *MOM* are global returns factors obtained from Kenneth French's website. *Default* is the iShares iBoxx High Yield Coporate Bond ETF return and less iShares 7-10 Year Treasury Bond ETF (with an adjustment to equalise fees in the two ETFs). *Option* is iShares mortgage backed securities return less a portfolio consisting of 75% iShares 71-0 Year Treasury Bond ETF and 25% iShares 20+ Year Treasury Bond ETF (with adjustment to equalise fees). The factors are all AUD hedged. The Factor Model regresses portfolio returns against the excess returns of individual indices in Appendix 1. All index returns are measured in excess of the risk-free asset. Panel A reports coefficeint estimates for the AAB. Panel B reports coefficient estimates for the AAB with 6 Factor model. Panel C reports coefficient estimates for the Factor Model. *t*-statistics are reported in parenthesis and *, ** and *** indicate statistical significance at ten, five, and one percent levels, respectively.

Panel A. AAB

	1 (Low)	2	3 (High)	3 minus 1	All Funds
Intercept	0.122**	0.118*	0.117**	-0.010	0.122**
	(2.04)	(1.86)	(2.02)	(-0.30)	(2.04)
AAB - rf	0.588***	0.668***	0.666***	0.657***	0.662***
	(22.71)	(29.17)	(35.23)	(18.37)	(30.57)
Adjusted R^2	0.844	0.899	0.929	0.78	0.908
Number of Observations	96	96	96	96	96

Panel B. AAB with 6 Factor Model

	1 (Low)	2	3 (High)	3 minus 1	All Funds
Intercept	0.11	0.138*	0.168**	-0.009	0.155**
	(1.52)	(1.79)	(2.40)	(-0.25)	(2.14)
AAB - rf	0.511***	0.688***	0.713***	0.453***	0.697***
	(8.39)	(12.07)	(15.20)	(8.57)	(12.67)
SMB	0.036	-0.017	-0.032	5.16***	-0.024
	(1.32)	(-0.54)	(-1.12)	(5.13)	(-0.79)
HML	-0.052	-0.025	-0.013	1.365	-0.025
	(-1.37)	(-0.62)	(-0.34)	(0.67)	(-0.66)
MOM	-0.005	-0.009	0.000	0.938	-0.004
	(-0.29)	(-0.52)	(0.02)	(1.11)	(-0.26)
Default	-3.723**	-3.974**	-4.471***	-0.284	-4.365***
	(-2.38)	(-2.4)	(-2.97)	(-0.35)	(-2.81)
Option	11.108***	12.286***	10.872***	-0.335	12.392***
	(3.15)	(3.25)	(3.15)	(-0.18)	(3.49)
Adjusted R^2	0.862	0.907	0.935	0.826	0.916
Number of Observations	96	96	96	96	96

Panel C. Factor Model

	1 (Low)	2	3 (High)	3 minus 1	All Funds
Intercept	0.098	0.090	0.05	-0.048	0.092
	(1.26)	(1.00)	(0.52)	(-0.91)	(1.05)
SMB	-0.192	-0.150	-0.076	11.631	-0.154
	(-1.59)	(-1.07)	(-0.51)	(1.42)	(-1.14)
HML	0.087***	0.101***	0.087**	-0.013	0.094***
	(3.26)	(3.28)	(2.64)	(-0.01)	(3.17)
MOM	-0.008	-0.007	-0.011	-0.277	-0.007
	(-0.98)	(-0.75)	(-1.07)	(-0.51)	(-0.79)
Default	0.003	0.16	0.086	0.083	-0.105
	(0.00)	(0.19)	(0.09)	(0.17)	(-0.13)
Option	3.973**	3.529*	2.271	-1.701	3.881**
	(2.37)	(1.82)	(1.1)	(-1.49)	(2.07)
asx300 - rf	0.17***	0.243***	0.280***	0.110***	0.245***
	(12.68)	(15.69)	(16.95)	(12.13)	(16.38)
wrld exaus - rf	0.334***	0.329**	0.281*	-0.052	0.338**
	(2.70)	(2.29)	(1.84)	(-0.62)	(2.44)
AREIT - rf	-0.038	-0.032	-0.055	-0.017	-0.043
	(-1.11)	(-0.79)	(-1.31)	(-0.74)	(-1.12)
intl lst prop -rf	0.066*	0.058	0.063	-0.003	0.061
	(1.89)	(1.42)	(1.46)	(-0.13)	(1.54)
hedge -rf	0.049***	0.094***	0.133***	0.083***	0.096***
	(3.32)	(5.46)	(7.21)	(8.22)	(5.76)
abond -rf	0.128***	-0.013	0.005	-0.123***	0.022
	(2.92)	(-0.26)	(0.09)	(-4.12)	(0.44)
ibond - rf	-0.008*	-0.009	-0.006	0.003	-0.009
	(-1.68)	(-1.57)	(-0.93)	(0.77)	(-1.59)
avcal - rf	0.058**	0.091***	0.136***	0.078***	0.097***
	(2.46)	(3.33)	(4.66)	(4.84)	(3.65)
infra - rf	0.025*	0.033**	0.018	-0.008	0.025*
	(1.91)	(2.12)	(1.07)	(-0.85)	(1.70)
GSCI - rf	0.001	-0.002	-0.001	-0.002	-0.002
	(0.24)	(-0.35)	(-0.08)	(-0.51)	(-0.26)
Adjusted R^2	0.972	0.978	0.979	0.942	0.979
Number of Observations	96	96	96	96	96

Table 7
Individual Regressions with Fund Size: Alternative Benchmarks

Fund-level performance regressions are estimated for a sample of Australian superannuation funds over the period from July 2010 to December 2014 using monthly data. The dependent variables are fund-level monthly excess-returns beyond the expected fund return estimated from either an AAB model (described in equation 1) or excess-returns beyond the expected fund return estimated from the APT model (described in equation 3). The independent variables are fund level investment fee, *Investment Fee* (column 1), or *Total Fee* (other columns), which is calculated as investment fee plus administration fee, measured as percentage per annum of a member's balance. We estimate *Total Fee* using balances of $25,000, $50,000, $75,000, $100,000, $150,000, $200,000 and $250,000. Independent variables also include; the natural log of *Size*, a dummy that takes the value of one if the fund is a MySuper fund, *MySuper*, or zero otherwise, and six Category dummies, *Category*, which take the value of one if the fund category-type is either one of a Consultant, Corporate Fund, Industry Fund, Master Trust or Public Sector Fund, or zero otherwise. The Asset Allocation Benchmark (AAB) formulates a special market index AAB for each individual fund based on passive asset-class indices and the constituent funds' one-month lagged value-weighted strategic allocation to each of the respective asset classes. The asset-class indices used are listed in Appendix 1. AAB with 6 Factors regresses further on six asset pricing factors: *SMB, HML* and *MOM* are global returns factors obtained from Kenneth French's website. *Default* is the iShares iBoxx High Yield Coporate Bond ETF return and less iShares 7-10 Year Treasury Bond ETF (with an adjustment to equalise fees in the two ETFs). *Option* is iShares mortgage backed securities return less a portfolio consisting of 75% iShares 71-0 Year Treasury Bond ETF and 25% iShares 20+ Year Treasury Bond ETF (with adjustment to equalise fees). The factors are all AUD hedged. The Factor Model regresses portfolio returns against the excess returns of individual indices in Appendix 1. Panel A estimates regressions using AAB, Panel B uses AAB with 6 factors , and Panel C uses the Factor model. Regressions are estimated with and without fund-fixed effects and year/month fixed effects. All regressions are estimated with robust standard errors clustered by fund and year/month. T-statistics are reported in parenthesis and *, ** and *** indicate statistical significance at ten, five, and one percent levels, respectively.

Panel A. AAB

	Account Balance							
Model	No Admin	25k	50k	75k	100k	150k	200k	250k
Intercept	0.744***	0.694***	0.734***	0.737***	0.738***	0.74***	0.741***	0.749***
	(5.79)	(5.44)	(5.57)	(5.59)	(5.61)	(5.65)	(5.68)	(5.94)
Investment Fee/ Total	-0.012	0.037	0.002	-0.001	-0.003	-0.006	-0.008	-0.006
	(-0.18)	(1.12)	(0.07)	(-0.02)	(-0.07)	(-0.12)	(-0.14)	(-0.18)
Log(Fund size)	-0.053**	-0.052**	-0.053**	-0.053**	-0.053**	-0.053**	-0.053**	-0.053**
	(-2.34)	(-2.3)	(-2.35)	(-2.34)	(-2.34)	(-2.34)	(-2.34)	(-2.36)
MySuper	-0.022	-0.023	-0.023	-0.023	-0.023	-0.022	-0.022	-0.022
	(-0.8)	(-0.81)	(-0.81)	(-0.81)	(-0.81)	(-0.81)	(-0.81)	(-0.80)
Category - Consultants	-0.033	-0.061	-0.036	-0.034	-0.033	-0.032	-0.032	-0.031
	(-0.33)	(-0.63)	(-0.36)	(-0.34)	(-0.33)	(-0.32)	(-0.32)	(-0.3)
Category - Corporate	0.196	0.187	0.195	0.195	0.195	0.196	0.196	0.196
	(1.32)	(1.27)	(1.32)	(1.32)	(1.32)	(1.32)	(1.32)	(1.32)
Category - Industry	0.216*	0.203*	0.213*	0.214*	0.214*	0.215*	0.215*	0.214*
	(1.73)	(1.68)	(1.75)	(1.74)	(1.74)	(1.74)	(1.73)	(1.76)
Category - Master	0.096	0.072	0.092	0.094	0.095	0.096	0.096	0.098
	(0.79)	(0.59)	(0.75)	(0.77)	(0.78)	(0.78)	(0.79)	(0.79)
Adjusted R-squared	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.509
Number of Observations	6,862	6,862	6,862	6,862	6,862	6,862	6,862	6,862

Table 7 continued

Panel B. AAB with Five Factor Model

	Account Balance							
Model	No	25k	50k	75k	100k	150k	200k	250k
Intercept	0.777***	0.727***	0.767***	0.766***	0.767***	0.769***	0.77***	0.794***
	(5.97)	(5.36)	(5.67)	(5.74)	(5.79)	(5.85)	(5.88)	(5.91)
Investment Fee/ Total	0.036	0.063	0.036	0.041	0.043	0.043	0.042	0.028
	(0.47)	(1.48)	(0.87)	(0.86)	(0.8)	(0.70)	(0.65)	(0.66)
Log(Fund size)	-0.024	-0.023	-0.025	-0.025	-0.025	-0.024	-0.024	-0.025
	(-0.91)	(-0.87)	(-0.92)	(-0.91)	(-0.91)	(-0.91)	(-0.91)	(-0.93)
MySuper	-0.008	-0.008	-0.008	-0.008	-0.008	-0.008	-0.008	-0.008
	(-0.22)	(-0.21)	(-0.21)	(-0.22)	(-0.22)	(-0.22)	(-0.22)	(-0.21)
Category - Consultants	-0.579**	-0.621**	-0.599**	-0.595**	-0.591**	-0.587**	-0.585**	-0.592**
	(-2.3)	(-2.53)	(-2.44)	(-2.40)	(-2.37)	(-2.35)	(-2.33)	(-2.41)
Category - Corporate	-0.12	-0.131	-0.124	-0.123	-0.123	-0.122	-0.122	-0.123
	(-0.61)	(-0.67)	(-0.63)	(-0.63)	(-0.62)	(-0.62)	(-0.62)	(-0.62)
Category - Industry	-0.215	-0.226	-0.213	-0.215	-0.215	-0.216	-0.216	-0.21
	(-1.24)	(-1.33)	(-1.24)	(-1.25)	(-1.25)	(-1.25)	(-1.25)	(-1.21)
Category - Master	-0.028	-0.059	-0.046	-0.043	-0.040	-0.036	-0.034	-0.041
	(-0.16)	(-0.35)	(-0.27)	(-0.25)	(-0.23)	(-0.21)	(-0.2)	(-0.24)
Adjusted R-squared	0.322	0.322	0.322	0.322	0.322	0.322	0.322	0.316
Number of Observations	6,862	6,862	6,862	6,862	6,862	6,862	6,862	6,862

Panel C. Factor Model

	Account Balance							
Model	No Admin	25k	50k	75k	100k	150k	200k	250k
Intercept	0.290	0.442	0.492	0.394	0.345	0.305	0.292	0.517
	(0.46)	(0.73)	(0.82)	(0.65)	(0.56)	(0.49)	(0.46)	(0.89)
Investment Fee/ Total	0.788*	0.284	0.318	0.479	0.574	0.667	0.709	0.256
	(1.72)	(1.32)	(1.19)	(1.38)	(1.48)	(1.57)	(1.61)	(0.97)
Log(Fund size)	-0.072	-0.079	-0.085	-0.082	-0.079	-0.077	-0.076	-0.086
	(-0.86)	(-0.95)	(-1.01)	(-0.97)	(-0.95)	(-0.92)	(-0.90)	(-1.03)
MySuper	0.108	0.127	0.124	0.12	0.117	0.114	0.112	0.124
	(1.24)	(1.5)	(1.45)	(1.39)	(1.36)	(1.32)	(1.29)	(1.44)
Category - Consultants	1.109**	0.973	0.972	0.956	0.965	0.993*	1.015*	1.028*
	(2.09)	(1.65)	(1.62)	(1.61)	(1.65)	(1.75)	(1.81)	(1.73)
Category - Corporate	0.744**	0.742**	0.749**	0.737**	0.733**	0.733**	0.734**	0.756**
	(2.14)	(2.09)	(2.11)	(2.08)	(2.07)	(2.08)	(2.09)	(2.11)
Category - Industry	1.559**	1.630**	1.667**	1.636**	1.615**	1.594**	1.584**	1.693**
	(2.33)	(2.48)	(2.57)	(2.49)	(2.45)	(2.40)	(2.38)	(2.64)
Category - Master	-0.038	-0.074	-0.115	-0.142	-0.142	-0.127	-0.111	-0.083
	(-0.07)	(-0.13)	(-0.18)	(-0.23)	(-0.23)	(-0.21)	(-0.19)	(-0.13)
Adjusted R-squared	0.506	0.506	0.506	0.506	0.506	0.506	0.506	0.521
Number of Observations	6,862	6,862	6,862	6,862	6,862	6,862	6,862	6,862