Working Paper

Risk and return of illiquid investments: A trade-off for superannuation funds offering transferable accounts

Dr James Richard Cummings and Dr Katrina Ellis – November 2011

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Abstract: This paper examines the pattern of investment by Australian defined-contribution superannuation funds in illiquid assets. Not-for-profit funds allocate more of their portfolios to illiquid assets, on average, than retail funds. Their allocations reflect fund size, net cash inflows and member age — factors relevant to a fund's liquidity requirements. Furthermore, the allocations reflect the extent of the fund's in-house investment management. In contrast, there is no significant relationship between these factors and allocations by retail funds. Not-for-profit funds with more illiquid investments experience higher risk-adjusted returns, which suggests they capture a return premium for investing in these assets.

Acknowledgements: The authors thank APRA's Statistics Unit for providing the superannuation data and Bruce Arnold, Catherine Bennett, Owen Brailsford, Roger Brown, Greg Brunner, Aimee Burnage, Keith Chapman, Peter Chong, Kevin Dent, John Dow, Peter Edney, Doug Foster, Joel Grant, Ross Jones, Charles Littrell, Kevin Liu, Bessy Ma, Craig Roodt and Irene Shiu for their comments and suggestions.

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Executive summary

Most superannuation fund assets are liquid, which means they are able to be converted into cash within a few days, and are able to be valued using market prices. In recent years, however, many superannuation funds have increased their allocations to illiquid assets, in the expectation that these assets would yield sufficiently large returns to compensate for their illiquidity. This paper examines the investment by Australian defined-contribution superannuation funds in illiquid assets, in particular, the amount invested in these assets and the impact on portfolio performance. These assets include directly held property, unlisted property trusts, infrastructure investments, private equity and hedge funds.

Illiquid assets may provide diversification benefits and an opportunity for some funds to leverage off their existing investment expertise. At the same time, superannuation funds have liquidity demands — including those relating to members' right to transfer their balances to other funds — which cannot necessarily be met by regular cash inflows. Illiquid assets are less functional in meeting these demands, insofar as the secondary markets for these assets are less active than those for the traditional assets of stocks and bonds. In this respect, the decision to invest in illiquid assets represents a trade-off between possible favourable return characteristics and unfavourable liquidity characteristics.

This study finds not-for-profit superannuation funds allocate more of their portfolios to illiquid assets, although there is a considerable range in allocations among both not-for-profit and retail funds. In the period from September 2004 to June 2010, not-for-profit funds with more illiquid investments experienced higher risk-adjusted returns, which suggests they captured a return premium for investing in these assets. However, this result does not guarantee that funds with illiquid portfolios will always outperform funds with more liquid portfolios and nor does it obscure the risks of investing in illiquid assets.

Given the risks, certain superannuation fund characteristics may lend themselves to larger allocations to illiquid assets. This paper finds that not-for-profit funds which are larger, have greater net cash inflows and have younger members — all factors which tend to reduce liquidity needs — allocate a greater proportion of their portfolios to illiquid assets. The results are not the same for retail funds: there is no significant relationship between fund size, fund flows or member age and investment in illiquid assets.

Introduction

The ability of a superannuation fund to meet payment obligations to members and beneficiaries in a timely and efficient manner, without incurring significant unexpected costs, depends upon the marketability of its investments as well as the other cash flows into and out of the fund. In this paper we investigate the extent to which defined contribution superannuation funds in Australia invest in illiquid asset classes and look at the characteristics that may influence these investment decisions, as well as the performance impacts of these investments.

The debate on an appropriate allocation to illiquid investments for pension funds has been ongoing for several decades, mostly with a focus on defined benefit pension funds. On one hand there are those that support the Yale endowment investment strategy pioneered by David Swensen which advocates a very high allocation to illiquid investments. This is argued on the basis that endowment funds have very long investment horizons and reasonably predictable cash outflows, and thus are not as sensitive to illiquidity as other investors (see Swensen, 2000). On the other hand, researchers argue that despite illiquid asset classes appearing attractive in a Markowitz mean-variance investment framework due to low correlation with standard assets such as equities and bonds, illiquid assets have other risks, and are thus unattractive investments for pension funds. These additional risks include transaction risk (the risk that it can take an uncertain time to sell the asset, at an uncertain price) and valuation risk (the risk that the assets cannot be accurately valued).

In the past two decades, there has been a steady shift away from defined benefit superannuation funds to defined contribution superannuation funds and coverage has extended to most of the Australian workforce (Broadbent, Palumbo and Woodman, 2006). More mobile workers find defined contribution funds advantageous because benefits in these funds accrue more evenly through their careers and are entirely portable when the worker leaves an employer or temporarily leaves the workforce. As a consequence, these funds place a greater emphasis on liquidity than defined benefit funds. Hence, there is a need to examine how modern defined contribution funds manage the trade-off between short-term liquidity requirements and investment returns. This is why we consider characteristics relevant to the liquidity requirements of defined contribution funds which may influence their decision to invest in illiquid assets.

Historically, superannuation funds in Australia have not relied on selling their investments in order to meet short-term liquidity requirements. Strong growth in assets and membership, mandatory employer contributions (currently 9 per cent of wages) and positive investment returns have meant that benefit payments and outward rollovers to other funds have been met from regular net cash inflows rather than from asset realisation. Based on current estimates, industry-wide outflows are projected to increase at a faster rate than inflows as the Australian superannuation system matures over the next twenty years (see Rothman and Tellis, 2008: 20-23). There is likely to be an increasing need for liquidity risk management to ensure that benefit payment obligations can continue to be met as the post-war 'baby boomer' generation approaches retirement. Funds with older members who are approaching retirement can be expected to have a greater reliance on the realisation of their investments for meeting future payment obligations. This paper tests whether funds facing this condition are more restrained in the extent to which they hold illiquid investments.

Trade-off between portfolio liquidity and investment returns

Portfolio selection theory suggests that efficiently diversified balanced portfolios have allocations to illiquid assets which are imperfectly correlated with the traditional assets of stocks and bonds. Standard mean-variance portfolio optimisation is used to justify, for example, allocations to real estate in the range of 10 to 15 per cent (Ennis and Burik, 1991a) and private equity in the range of 2 to 9 per cent (Chen, Baierl and Kaplan, 2002). Studies generally conclude that holdings of illiquid assets benefit pension funds by improving diversification and thereby increasing return per unit of risk incurred. This paper investigates how these results compare with the actual practices of Australian superannuation funds and whether investment in illiquid assets has in fact delivered risk/return benefits of the type reported in previous studies.

Counteracting any diversification benefits, investors face liquidity drawbacks when they make a decision to invest in illiquid assets. Finding a buyer or seller can be difficult, trading is infrequent and transaction costs can be large relative to those associated with marketable securities. Portfolio liquidity is restricted when investors agree to invest for a minimum period of time or the consent of other investors is required to redeem units in a trust. Development assets in property, infrastructure and private equity may impose additional cash flow obligations, where several capital contributions are required to be made over a multi-year period.

For superannuation funds in particular, there may be insufficient trading liquidity in illiquid assets for the fund to meet any unanticipated cash flow obligations which cannot be met by regular cash flows (that is, contribution inflows and investment income). These obligations include making benefit payments to members, facilitating transfers to other funds within agreed timeframes and facilitating switches between investment options within the same fund. Increased market volatility and declining investment returns from July 2007 to June 2009 may have induced a reaction by members to reassess their risk exposures and switch investment options or superannuation funds.[1] The inability to dispose of illiquid investments in a timely manner may mean that it is impractical to rebalance the fund to its target asset allocation. Cash flow obligations and rebalancing requirements are likely to impose significant unexpected costs on the fund, if it has insufficient liquidity to cover these requirements.[2] This paper tests whether funds with smaller and more unpredictable fund flows have smaller allocations to illiquid assets.

Legislative changes introduced to make the Australian superannuation system more flexible place greater demands on the liquidity position of superannuation funds. Most superannuation funds offer a choice of investments and allow members to choose the most appropriate strategy to suit their needs. The expansion of investment choice, together with legislation permitting investors to switch their retirement savings between fund providers, has increased the likelihood of member balances moving between options within a fund and from one fund to another.[3] This creates a potential liquidity shortfall for superannuation funds, when they experience periods of unexpectedly high redemption volume (see Taylor, 2009). In broad terms, a superannuation fund under current switching legislation may be subject to 'run' risks similar to those that have long existed in banking.

1 Market volatility can have a further impact on the cash flow obligations of funds with currency hedges in place. The Association of Superannuation Funds of Australia (2009: 6) reports that some funds had insufficient liquidity to cover hedging collateral requirements in response to the dramatic decrease in the Australian dollar in late 2008.

2 Section 67 of the *Superannuation Industry (Supervision) Act 1993* (SIS Act) prohibits superannuation funds from borrowing money, except in limited circumstances and for a short term to pay members' benefits or settle a transaction.

3 With the introduction of Choice of Fund legislation from 1 July 2005, employees are entitled to choose which superannuation fund receives their compulsory contributions. Trustees are obliged under *Superannuation Industry (Supervision) Regulations 1994* to redeem a member's investment and transfer it to another fund when they receive a member's rollover request.

Methodology

Data and sample

This study focuses on 146 large superannuation funds operating in Australia with at least twelve quarters of relevant data in the period from September 2004 to June 2010. These funds represent about three-quarters of the assets in APRA-regulated superannuation funds. Quarterly data are obtained from APRA's statistical data collections on fund flows and income, total net assets, directly held investments, expenses and taxes.[4] Annual collections data are also obtained on the age and gender of members, the average account balance, the number of investment options offered, the value of member funds in the default investment option, the asset allocation of the default option and other fund characteristics.

Information on the asset allocation of the whole fund is obtained from a compulsory investment performance survey administered by APRA in late 2006.[5] Given that the data period ends in June 2006, recent changes in asset allocation are not captured in this survey.[6] A detailed description of the superannuation investment performance survey can be found in Ellis, Tobin and Tracey (2008).

The analysis is restricted to accumulation superannuation funds and hybrid superannuation funds.[7] Defined benefit funds with all members having defined benefits are excluded.[8] The data cover superannuation funds with total assets of at least $200 million at 30 June 2005.[9] Funds are also required to have at least twelve quarters of reported fund flows

4 Gross returns are total income before expenses and tax divided by cash flow adjusted net assets. Net returns are net earnings after expenses and before tax divided by cash flow adjusted net assets.

5 Observations for two funds with greater than 80 per cent of assets reported as other investments (including hedge funds, unlisted equities) are excluded from the sample. A review of product disclosure statements for these funds makes it clear they are predominantly invested in shares and fixed income.

6 The data for the default investment strategy suggest that the allocation to illiquid assets of the average not-for-profit fund increases steadily over the sample period, while the allocation to these assets of the average retail fund decreases steadily. However, the empirical analysis in this paper focuses on the cross-sectional differences in allocations between funds, rather than on the time-series trends.

7 An accumulation superannuation fund is a superannuation fund where the benefit a member receives is the total of specifically defined contributions to the superannuation fund plus earnings on those contributions, minus expenses and tax. A hybrid superannuation fund represents a superannuation fund which consists of a combination of both accumulation and defined benefit members.

8 A defined benefit superannuation fund is a superannuation fund where the formula for calculating the retirement benefit is specified, usually in terms of years of service with the employer and average salary level over the last few years prior to retirement. The employer sponsor/contributor to a defined benefit superannuation fund carries the investment risk.

9 Approved deposit funds (ADFs), eligible rollover funds (ERFs), pooled superannuation trusts (PSTs), self-managed superannuation funds (SMSFs) and small APRA funds (SAFs) are excluded from the sample.

and income. This additional restriction is imposed to be able to reliably estimate the strength and volatility of fund flows for each fund.[10]

All trustees of APRA-regulated superannuation funds have, from 1 July 2006, been required to hold a Registrable Superannuation Entity (RSE) licence. The trustees of many funds existing prior to that date decided not to apply for an RSE licence and made arrangements for the transfer and wind-up of the funds under their trusteeship. Industry consolidation has continued with a series of fund mergers initiated after the introduction of the new trustee licensing system. For the dataset in this study, transfers and wind-ups are identified and the wound-up fund and the successor fund for the transfer are combined into a single fund from the beginning of the quarter in which the transaction occurs. Specifically, fund flows and income, total net assets, directly held investments, expenses and taxes of the wound-up fund and successor fund are summed to obtain the data for the combined fund. This approach ensures the results pertaining to the impact of portfolio liquidity on fund performance are not driven by large mergers between funds.

In addition to the asset allocations, this study uses trading volume and market capitalisation data for each asset class to measure the liquidity of each fund's asset portfolio. Dollar trading volume and market capitalisation for each asset class were obtained from a number of data sources. The market data are described in table 1.

Table 1

DATA SOURCES FOR TRADING VOLUME AND MARKET CAPITALISATION

Asset class	*Representation*	*Source*
Cash	Bank-accepted bills, certificates of deposit	AFMA
Fixed income	Commonwealth government bonds	AFMA
Australian shares	S&P ASX 200 Index constituent stocks	Bloomberg
International shares	United States S&P 500 Index constituent stocks	Bloomberg
Unlisted property	Units in unlisted property trusts	ABS
Other investments	Units in unlisted equity trusts	ABS

Abbreviations: AFMA Australian Financial Markets Association, ABS Australian Bureau of Statistics.

[10] The analysis is replicated without this restriction. The results are unchanged.

Liquidity measures

This study constructs two liquidity measures for each fund's portfolio. The first measure focuses on illiquid investments, while the second measure is calibrated across all the asset classes held in a fund's portfolio.

Liquidity measure 1 — Illiquid investments

A potential consequence of the inability to redeem illiquid investments is that the fund may be unable to meet its cash flow or rebalancing requirements in a timely manner. The first liquidity measure for a fund's portfolio is based on holdings of illiquid investments. More specifically, *LLI* is defined as the percentage of unlisted property and other investments in a fund's portfolio:

$$LLI = \frac{w_5 + w_6}{\sum_{i=1}^{6} w_i} \tag{1}$$

where w_1 is the dollar value of cash, w_2 is the dollar value of fixed income, w_3 is the dollar value of Australian shares, w_4 is the dollar value of international shares, w_5 is the dollar value of unlisted property and w_6 is the dollar value of other investments.

Liquidity measure 2 — Average holding period

The cost of contacting potential trading partners and the risk borne by the investor while searching and delaying the trade execution are expected to be higher for any asset that is infrequently traded. Amihud and Mendelson (1986a; b) show that investors such as pension funds with long investment horizons will tend to hold more illiquid investments, because they can amortise their transaction costs over longer holding periods. The second liquidity measure, *AHP*, is defined as the weighted average holding period of all asset classes held in a fund's portfolio:

$$AHP = \frac{\sum_{i=1}^{6} w_i HoldingPeriod_i}{\sum_{i=1}^{6} w_i} \tag{2}$$

where w_i is the dollar value of asset class *i* and $HoldingPeriod_i$ is the average market capitalisation divided by the average daily dollar trading volume of asset class *i* over the entire sample period.

Role of trustees and members

The above measures of portfolio liquidity are calculated for the default investment strategy and for the whole fund.[11] Portfolio liquidity of the default investment strategy can be attributed to decisions taken by the fund trustees. The default investment strategy is the investment option where members' superannuation benefits are invested when the members themselves provide no direction regarding their choice of strategy. In superannuation and trust law, the trustee is solely responsible for setting the default investment strategy, including the extent to which the default strategy assets are held in illiquid investments.[12]

Portfolio liquidity of the whole fund can be attributed to decisions taken by both trustees and members. In the first instance, the fund trustee decides what choice of investment strategy the fund will offer. This offer of investment strategy choice is not mandatory; although nearly all public offer superannuation funds offer these choices as an integral selling feature of their products. The individual investment options may have varying levels of exposure to illiquid investments at the discretion of the trustee. From that point, members play a role in determining the fund's effective asset allocation. In particular, members are permitted to give directions to the trustee in relation to their choice of investment strategy. As a consequence, both trustees and members influence the extent to which the whole-of-fund assets are held in illiquid investments.

[11] LLI and AHP for the whole fund are calculated based on the average asset allocation from September 2004 to June 2006.

[12] Regulation 4.09 of the *Superannuation Industry (Supervision) Regulations 1994* requires the trustee of a superannuation fund to formulate an investment strategy that has regard to all the circumstances of the fund including the liquidity of the fund's investments and its expected cash flow requirements.

Results

Descriptive statistics

Table 2 presents descriptive statistics for not-for-profit funds (panel A), retail funds (panel B) and all sample funds as a group (panel C).[13] The entire group is divided into tertiles based on their holdings of illiquid investments (LLI). These portfolios are rebalanced as funds enter and exit the sample each quarter. In addition to summary statistics for each fund type, summary statistics for each tertile are also reported. For each data item (for example, operational expense ratio), first the asset-weighted average across all funds for each quarter from September 2004 to June 2010 is calculated; and then a simple time-series average of the cross-sectional averages is reported. Figures in this table are presented in annual terms.

In each quarter, there are on average 139 funds comprising 96 not-for-profit funds and 43 retail funds. Not-for-profit funds have substantially higher holdings of illiquid investments than retail funds, with 40 funds (42.0%) in the highest tertile (table 2 panel A), whereas retail funds have only 6 funds (13.6%) in the highest tertile and 30 funds (68.6%) in the lowest tertile (panel B). The average total net assets of all sample funds is $3.3 billion. The average fund size is larger for retail funds than for not-for-profit funds ($5.2 billion compared with $2.4 billion). Among not-for-profit funds, those with the highest allocations to illiquid investments tend to be larger funds.

Not-for-profit funds have a younger membership than retail funds. The average proportion of members close to preservation age (aged 50 years and over) is 22.6% for not-for-profit funds, compared with 35.8% for retail funds.[14] Funds with the highest allocations to illiquid investments tend to have a smaller proportion of members aged 50 years and over.

[13] Retail funds are established by banks, fund managers and other superannuation providers and offer superannuation products to the public on a commercial basis. Not-for-profit funds include industry, corporate and public sector funds and are typically established by employer groups or trade unions to serve members in specific workplaces or industries.

[14] Preservation age is 55 years for people born before 1 July 1960 and increases incrementally to 60 years for people born after 30 June 1964.

Table 2

DESCRIPTIVE STATISTICS

Panel A: Not-for-profit funds

Data item	*Illiquid investments tertile*			*Total sample*
	1 (low)	*2*	*3 (high)*	
Number of funds	16	39	40	96
Total net assets $mil	625	2,311	3,329	2,448
Preservation age %	23.8	23.9	21.6	22.6
Average balance $000	62.2	67.0	43.2	53.3
Fund age years	26	29	26	27
Investment choices	7	14	11	12
Default strategy %	39.1	37.6	51.4	45.6
Internally managed %	7.0	8.6	10.1	9.4
Operational expense %	0.64	0.38	0.43	0.42
Inflow %	16.2	13.6	18.0	16.2
Outflow %	10.9	7.9	10.4	9.5
Cash %	7.2	5.8	5.9	5.9
Fixed income %	24.1	19.5	14.9	17.1
Australian shares %	41.0	38.3	33.3	35.6
International shares %	25.1	25.6	24.0	24.7
Unlisted property %	1.5	3.8	8.7	6.5
Other investments %	1.1	6.9	13.2	10.2
Default strategy				
LLI %	10.0	16.7	24.6	20.9
AHP days	357	440	526	485
Whole-of-fund				
LLI %	2.6	10.8	21.9	16.7
AHP days	292	379	496	442

This table presents the summary statistics for fund characteristics. The sample period is September 2004 to June 2010. The sample excludes defined benefit funds and funds with total net assets less than $200 million. LLI and AHP are liquidity measures as defined in equations (1) and (2) respectively.

Table 2 *continued*

Panel B: Retail funds

Data item	*Illiquid investments tertile*			*Total sample*
	1 (low)	*2*	*3 (high)*	
Number of funds	30	8	6	43
Total net assets $mil	5,922	3,485	4,130	5,239
Preservation age %	36.6	37.1	32.6	35.8
Average balance $000	66.9	79.3	44.8	65.1
Fund age years	13	13	16	13
Investment choices	216	39	376	212
Default strategy %	7.9	24.5	10.2	10.1
Internally managed %	3.5	1.1	8.9	3.7
Operational expense %	0.61	0.38	1.53	0.68
Inflow %	27.4	24.4	22.0	26.5
Outflow %	21.6	19.8	19.3	21.1
Cash %	12.1	7.4	10.9	11.4
Fixed income %	16.8	17.3	11.8	16.3
Australian shares %	51.0	44.3	38.2	48.9
International shares %	18.3	22.1	17.1	18.6
Unlisted property %	0.6	1.4	0.3	0.6
Other investments %	1.2	7.7	21.7	4.2
Default strategy				
LLI %	6.7	28.2	7.9	9.4
AHP days	287	487	310	313
Whole-of-fund				
LLI %	1.8	9.0	22.0	4.8
AHP days	285	355	444	311

This table presents the summary statistics for fund characteristics. The sample period is September 2004 to June 2010. The sample excludes defined benefit funds and funds with total net assets less than $200 million. LLI and AHP are liquidity measures as defined in equations (1) and (2) respectively.

Table 2 *continued*

Panel C: All funds

Data item	*Illiquid investments tertile*			*Total sample*
	1 (low)	*2*	*3 (high)*	
Number of funds	46	47	46	139
Total net assets $mil	4,021	2,501	3,429	3,312
Preservation age %	35.4	26.8	23.3	28.2
Average balance $000	66.5	69.7	43.3	58.5
Fund age years	14	25	24	20
Investment choices	204	19	66	109
Default strategy %	9.7	34.7	44.9	28.2
Internally managed %	3.7	6.9	9.8	6.6
Operational expense %	0.61	0.38	0.61	0.55
Inflow %	26.8	16.0	18.7	21.3
Outflow %	21.0	10.6	11.9	15.2
Cash %	11.8	6.2	6.7	8.6
Fixed income %	17.2	19.0	14.4	16.7
Australian shares %	50.5	39.7	34.0	42.0
International shares %	18.7	24.8	23.0	21.7
Unlisted property %	0.6	3.3	7.4	3.6
Other investments %	1.2	7.1	14.5	7.3
Default strategy				
LLI %	6.9	19.3	22.1	15.4
AHP days	291	451	494	402
Whole-of-fund				
LLI %	1.8	10.4	21.9	10.9
AHP days	286	374	488	378

This table presents the summary statistics for fund characteristics. The sample period is September 2004 to June 2010. The sample excludes defined benefit funds and funds with total net assets less than $200 million. LLI and AHP are liquidity measures as defined in equations (1) and (2) respectively.

Retail funds offer the largest number of investment choices to members, with an average of 212 options per fund. In comparison, not-for-profit funds have an average of twelve investment options per fund. Not-for-profit funds hold a greater proportion of assets (45.6%) in the default investment strategy than retail funds (10.1%). For not-for-profit funds, the percentage of fund assets that are managed internally increases with the percentage holding of illiquid investments.

Retail and not-for-profit funds have exposure to different types of illiquid investments. Among superannuation funds with substantial allocations to illiquid investments (those in the second and third tertiles), not-for-profit funds hold a higher percentage of unlisted property and retail funds hold a higher percentage of other investments including private equity. For example, the average not-for-profit fund in the highest illiquid investments tertile holds 8.7% unlisted property and 13.2% other investments, whereas the average retail fund in the same tertile holds 0.3% unlisted property and 21.7% other investments.

Turning attention to the liquidity measures, the LLI is 15.4% and the AHP is 402 days for the average default strategy. Default strategies of not-for-profit funds have higher LLI and longer AHP, which suggests they are more illiquid than default strategies of retail funds. The LLI is 10.9% and the AHP is 378 days for the average fund as a whole. The weighted-average holding period increases with the holding of illiquid investments. For example, the AHP is roughly sixteen months (488 days) for the highest illiquid investments tertile; however, it is less than ten months (286 days) for the lowest illiquid investments tertile. This relationship reflects the longer average holding period for unlisted property and other investments than for other asset classes (see appendix 1). The disparity in liquidity between the fund types at the whole-of-fund level is similar to their default strategies; not-for-profit funds have higher LLI and longer AHP, which suggests they are more illiquid than retail funds.

Table 3 presents the correlations between liquidity measures and various fund characteristics. A simple time-series average for each data item is calculated and then the cross-sectional correlations of the time-series averages are reported. Two liquidity measures for the default investment strategy and two liquidity measures for the whole fund are positively correlated with each other. Larger funds, funds that manage more of their assets internally and funds with higher net fund flows tend to invest in less liquid assets. Funds with older members, larger member balances and more unpredictable fund flows are inclined to hold more liquid assets.

Table 3

CROSS-SECTIONAL CORRELATIONS

	LOGSIZE	*PRSAGE*	*LOGAAB*	*FNDAGE*	*INTMAN*	*OPEXP*	*FLOW*	*VFLOW*	LLI_{dis}	AHP_{dis}	LLI_{wof}	AHP_{wof}
LOGSIZE	1.00											
PRSAGE	0.07	1.00										
LOGAAB	-0.02	0.53**	1.00									
FNDAGE	-0.26**	-0.21**	0.13	1.00								
INTMAN	-0.08	0.13	-0.01	0.05	1.00							
OPEXP	-0.08	0.10	-0.28**	-0.27**	0.01	1.00						
FLOW	0.21**	-0.24**	-0.31**	-0.21**	0.03	0.18**	1.00					
VFLOW	-0.05	0.07	-0.03	-0.08	-0.10	0.12	-0.05	1.00				
LLI_{dis}	0.20**	-0.25**	-0.25**	0.00	0.13	-0.19**	0.34**	-0.16	1.00			
AHP_{dis}	0.14	-0.43**	-0.26**	0.13	0.04	-0.30**	0.33**	-0.23**	0.89**	1.00		
LLI_{wof}	0.17**	-0.30**	-0.24**	0.02	0.17**	-0.02	0.26**	-0.16**	0.62**	0.62**	1.00	
AHP_{wof}	0.15	-0.39**	-0.20**	0.10	0.06	-0.05	0.30**	-0.25**	0.62**	0.70**	0.93**	1.00

This table presents the correlations between various fund characteristics including liquidity. The sample period is September 2004 to June 2010. The sample excludes defined benefit funds and funds with total net assets less than $200 million. LOGSIZE is the difference in logarithms between fund total net assets and minimum total net assets for sample funds of $200 million. PRSAGE is the proportion of members aged 50 years and over. LOGAAB is the logarithm of the average account balance. FNDAGE is the logarithm of fund age. INTMAN is the percentage of fund assets that are managed internally. OPEXP is the total operating expenses divided by cash flow adjusted net assets. FLOW is the percentage new fund flow into the superannuation fund over the quarter. VFLOW is the standard deviation of new fund flow into the superannuation fund over the quarter. LLI_{dis} and AHP_{dis} are liquidity measures for the default investment strategy. LLI_{wof} and AHP_{wof} are liquidity measures for the whole fund. The liquidity measures are defined in equations (1) and (2) respectively. ** indicates significance at the 5% level.

Illiquid investments and fund characteristics

In this subsection, the relation between the liquidity of a fund's portfolio and various fund characteristics is examined. A cross-sectional regression approach is used. Specifically, a simple time-series average for each data item is calculated and then a cross-sectional regression of liquidity on the various fund characteristics is run.

The specification of the cross-sectional regression is as follows:

$$LIQHOLDING_i = \alpha + \beta_1 \times LOGSIZE_i + \beta_2 \times PRSAGE_i + \beta_3 \times INTMAN_i + \beta_4 \times FLOW_i + \beta_5 \times VFLOW_i + \varepsilon_i \quad (3)$$

where $LIQHOLDING_i$ is the liquidity measure (LLI_{dis}, AHP_{dis}, LLI_{wof} or AHP_{wof}), $LOGSIZE_i$ is the difference in logarithms between fund total net assets and minimum total net assets for sample funds of $200 million, $PRSAGE_i$ is the proportion of members aged 50 years and over, $INTMAN_i$ is the percentage of fund assets that are managed internally, $FLOW_i$ is the percentage new fund flow over the quarter and $VFLOW_i$ is the standard deviation of new fund flow over the quarter.

Table 4 reports the coefficient estimates from the cross-sectional regressions for not-for-profit funds (panel A) and retail funds (panel B). The dependent variables of the regressions are the four liquidity measures, LLI_{dis}, AHP_{dis}, LLI_{wof} and AHP_{wof}, respectively. For not-for-profit funds (panel A), larger funds and funds with higher net fund flows hold portfolios with more illiquid investments and longer average holding periods. The coefficients on net fund flow are larger and more statistically significant for the default investment strategy (LLI_{dis} and AHP_{dis}) than for the whole fund (LLI_{wof} and AHP_{wof}). Funds with stable fund flows hold fewer liquid assets. These results are consistent with the idea that high contributions and low benefit payments reduce the need for funds to hold cash and other liquid investments for meeting payment obligations.[15]

[15] Additional analysis is undertaken based on an enlarged sample that includes both defined contribution and defined benefit funds. Defined contribution funds are found to hold more liquid portfolios than defined benefit funds. This result is consistent with the portability associated with the benefits of defined contribution funds and the fact that most defined contribution funds permit participants to switch investment options.

Table 4

FUND CHARACTERISTICS AND PORTFOLIO LIQUIDITY

Panel A: Not-for-profit funds

	Dependent variable			
	Default strategy		*Whole-of-fund*	
Independent variables	LLI_{dis}	AHP_{dis}	LLI_{wof}	AHP_{wof}
Intercept	13.452**	404.441**	10.115**	388.091**
	(4.75)	(14.09)	(3.87)	(13.86)
Log size	2.609**	27.120**	2.161**	20.038**
	(3.40)	(3.49)	(3.06)	(2.64)
Preservation age	-0.174**	-1.606	-0.116	-1.468
	(-2.14)	(-1.95)	(-1.55)	(-1.83)
Internally managed	0.192**	1.746**	0.174**	1.518**
	(3.02)	(2.71)	(2.97)	(2.41)
Fund flow	1.752**	17.809**	0.954	9.554
	(2.73)	(2.74)	(1.61)	(1.51)
Volatility of fund flow	-0.355	-3.680	-0.161	-1.842
	(-1.03)	(-1.05)	(-0.51)	(-0.54)
R^2	0.35	0.34	0.25	0.22
***F*-statistic**	10.35**	9.91**	6.50**	5.34**
Observations	101	101	101	101

This table examines the relation between portfolio liquidity and various fund characteristics. The sample period is September 2004 to June 2010. The sample excludes defined benefit funds and funds with total net assets less than $200 million. LLI_{dis} and AHP_{dis} are liquidity measures for the default investment strategy. LLI_{wof} and AHP_{wof} are liquidity measures for the whole fund. The liquidity measures are defined in equations (1) and (2) respectively. Numbers in parentheses are *t*-statistics. ** indicates significance at the 5% level.

Table 4 *continued*

Panel B: Retail funds

	Dependent variable			
	Default strategy		*Whole-of-fund*	
Independent variables	LLI_{dis}	AHP_{dis}	LLI_{wof}	AHP_{wof}
Intercept	6.769 (1.12)	366.916** (5.64)	7.497** (2.03)	351.111** (9.45)
Log size	0.415 (0.27)	2.590 (0.16)	0.289 (0.31)	3.607 (0.38)
Preservation age	0.029 (0.27)	-1.441 (-1.27)	-0.047 (-0.74)	-0.746 (-1.15)
Internally managed	-0.088 (-0.61)	-2.666 (-1.71)	-0.027 (-0.31)	-1.942** (-2.19)
Fund flow	0.966 (0.99)	8.636 (0.82)	0.223 (0.37)	8.328 (1.39)
Volatility of fund flow	-0.034 (-0.06)	-3.861 (-0.66)	-0.053 (-0.16)	-6.109 (-1.84)
R^2	0.04	0.16	0.03	0.26
***F*-statistic**	0.36	1.53	0.24	2.81**
Observations	45	45	45	45

This table examines the relation between portfolio liquidity and various fund characteristics. The sample period is September 2004 to June 2010. The sample excludes defined benefit funds and funds with total net assets less than $200 million. LLI_{dis} and AHP_{dis} are liquidity measures for the default investment strategy. LLI_{wof} and AHP_{wof} are liquidity measures for the whole fund. The liquidity measures are defined in equations (1) and (2) respectively. Numbers in parentheses are *t*-statistics. ** indicates significance at the 5% level.

Not-for-profit funds that manage more of their assets internally have higher percentage holdings of illiquid investments. On average, a two-standard deviation increase in not-for-profit fund assets that are managed internally is associated with an increase in illiquid investments of 4.6%. This result suggests that some funds may be seeking to develop their in-house investment expertise when deciding to invest in illiquid assets.[16] For example, funds that employ expert in-house staff can avoid commingled structures, exercise greater control over property investments and take a more active role in negotiating manager compensation and investor protections (Ennis and Burik, 1991b). Not-for-profit funds with a greater proportion of members approaching preservation age hold more liquid portfolios. This is consistent with the idea that older members are likely to impose additional liquidity demands on the fund as they drawdown retirement benefits in the future.

The results are not the same for retail funds (panel B). For retail funds, there is no significant relationship between fund size and percentage holdings of illiquid investments or the average holding period of the asset classes held in the fund's portfolio. These results imply that larger retail funds do not use their scale to increase their allocation to illiquid assets. The coefficients that account for net fund flow are statistically insignificant in all four regressions; the level of exposure to illiquid investments of retail funds is relatively insensitive to the strength of their cash flows.

In the analysis of differences in portfolio liquidity between retail funds, there is no significant relationship between member age and investment in illiquid assets. Based on this analysis, the smaller allocations to illiquid investments of retail funds are not explained by their older membership profile. There is no significant relationship between the percentage of fund assets that are managed internally and investment in illiquid assets; in contrast to not-for-profit funds, retail funds do not appear to employ in-house investment managers to select and manage illiquid investments.

Overall, the results suggest that not-for-profit and retail superannuation funds take different approaches to illiquid investments. Not-for-profit funds allow a role for illiquid investments in the fund's strategic asset allocation. The level of exposure reflects the fund size, the strength of its cash flows, the extent of its in-house investment management and the age profile of its members. Retail funds more often let their members decide on an individual basis. The level of exposure to illiquid investments in the default option and at the

[16] An alternative explanation for this result is that superannuation funds have no choice except to establish the in-house capability, due to a scarcity of external managers who specialise in these asset classes. However, the data suggest that this alternative explanation is less plausible: 92.0 per cent of the illiquid asset holdings of superannuation funds are placed with external investment managers.

whole-of-fund level exhibits no clear relation with the characteristics which proved relevant to not-for-profit funds.

The effect of illiquid investments on fund performance

In the empirical analysis in this subsection, a cross-sectional regression approach is used to examine the effect of liquidity on fund performance. Specifically, risk-adjusted fund returns (that is, alphas) are regressed on various fund characteristics including measures of liquidity. Using this approach mitigates a concern that the relation between liquidity and performance may be driven by their mutual relations with other fund characteristics.

This section calculates benchmark return series for two multi-asset class market portfolios, representing the investment opportunity set of superannuation funds in Australia and worldwide, respectively. Table 5 describes the return series used. In the Australian market, four indices are used to represent the return on domestic asset classes. In the world market, an index is used to represent the return on overseas common stock (in addition to the four domestic indices). The aggregate value of investments in each asset class by managed funds is sourced from the Australian Bureau of Statistics. The multi-asset class market portfolio indices are formed by using the return series of each asset class, weighted by the asset class's proportion of the aggregate value of all asset classes at the beginning of each quarter. This creates a market return for CAPM regressions.

Table 5

DATA SOURCES FOR ASSET CLASSES

Domicile	*Asset class*	*Representation*
Australia	Fixed income	Citigroup Australian Broad Investment-Grade Bond Index in local currency (AusBIG)
	Shares	S&P ASX 200 Accumulation Index
	Unlisted property	Mercer Unlisted Property Funds Index Pre-Tax
	Other investments	Cambridge Associates Australia Private Equity and Venture Capital Index
World	Shares	MSCI Total Return Net World ex-Australia Index in local currency

Tertile rankings based on percentage holdings of illiquid investments (LLI_{wof}) are used to calculate loadings to the multi-asset class market portfolios, in order to ensure the benchmark return for each fund takes account of any additional non-diversifiable risk contributed by illiquid investments. All sample funds are divided into three tertiles based on their LLI_{wof}. These portfolios are rebalanced each quarter. Equal-weighted quarterly net returns are then computed for each tertile. The loadings of these portfolios to non-diversifiable risk are estimated by using two multi-asset class interpretations of the CAPM. Specifically, the Australian CAPM and the world CAPM are used. Ennis and Burik (1991a) propose a multi-asset class interpretation of the CAPM to account for the diverse investment opportunity set of pension funds:[17]

$$r_{p,t} - r_{f,t} = \alpha_p + \beta_p \times (MKT_t - r_{f,t}) + \varepsilon_{p,t} \tag{4}$$

where $r_{p,t}$ is the net return on one of the three LLI_{wof}-sorted superannuation fund portfolios, $r_{f,t}$ is the 90-day bank bill interest rate and MKT_t is the return on the multi-asset class market portfolio index. For each quarter, each fund inherits the loading ($\hat{\beta}_p$) of the LLI_{wof} tertile that it belongs to.[18] The expected fund return is then calculated by using this LLI_{wof} tertile factor loading along with the realised returns on the risk-free asset and the multi-asset class market portfolio index. The risk-adjusted return for fund *i* is calculated as the difference between the realised fund return and the expected fund return:

$$\alpha_{i,t} = r_{i,t} - [r_{f,t} + \hat{\beta}_p \times (MKT_t - r_{f,t})] \tag{5}$$

The cross-sectional regression of the relationship between liquidity and returns includes a control variable used by Chen, Hong, Huang and Kubik (2004): the operational expense ratio. In addition, we use control variables specific to our sample of Australian superannuation funds: the fund types and average account balance. A simple time-series average of each variable for each fund is used in the cross-sectional regression.

[17] The regression model given in equation (4) is estimated for each superannuation fund portfolio using the entire time series of realised returns on the portfolio, the realised returns on the multi-asset class market portfolio and the risk-free rate. The estimated risk parameter ($\hat{\beta}_p$) obtained from this regression will understate the systematic risk of a portfolio if superannuation funds are able to forecast general market movements and adjust their asset allocations accordingly (see Jensen, 1968).

[18] Appendix 2 reports the loadings of the three LLI_{wof}-sorted superannuation fund portfolios using the Australian CAPM and the world CAPM.

The specification of the cross-sectional regression is as follows:

$$\alpha_i = \delta_1 \times NFP_i + \delta_2 \times RTL_i + \gamma_1 \times NFP_i \times LIQHOLDING_i + \gamma_2 \times RTL_i \times LIQHOLDING_i + \gamma_3 \times LOGAAB_i + \gamma_4 \times OPEXP_i + \varepsilon_i \quad (6)$$

where α_i is the risk-adjusted fund return, NFP_i is a zero-one dummy variable which equals one if the fund is a not-for-profit fund, RTL_i is a zero-one dummy variable which equals one if the fund is a retail fund, $LIQHOLDING_i$ is the liquidity measure (LLI_{wof} or AHP_{wof}), $LOGAAB_i$ is the logarithm of the average account balance and $OPEXP_i$ is the fund's operational expense ratio.

Table 6 reports the results. The first column presents the results for the Australian CAPM alpha. The impact of illiquid investments on risk-adjusted returns is far more pronounced for not-for-profit funds than for retail funds. For not-for-profit funds, the coefficient in front of the portfolio liquidity measure is positive and significant in both regressions. This result is statistically significant at the 5 per cent level regardless of which liquidity measure is used. The effect of portfolio liquidity on the performance of not-for-profit funds is also economically significant. For example, a two-standard deviation increase in the holding of illiquid investments by not-for-profit funds is associated with an increase in fund performance by 13 basis points per quarter, which translates to 50 basis points per annum. For retail funds, the coefficient in front of the portfolio liquidity measure is insignificant in both regressions. The results suggest that the average retail fund did not capture positive risk-adjusted returns from illiquid assets.

In assessing the impact of portfolio liquidity on net returns, the coefficients on the liquidity measures account for the extent to which illiquid investments are more expensive to manage than the traditional investments of stocks and bonds. This follows because investment management fees and transaction costs are deducted from income and hence net returns. In addition, fund performance is significantly positively related to the average member balance. This finding is consistent with the idea that funds with large member balances may be able to reduce variable costs such as those associated with marketing and distribution. Fund performance is negatively related to operational expense. The operational expense reported by superannuation funds accounts for management (other than investment management), administrative and directors/trustees fees.

Table 6

THE EFFECT OF ILLIQUID INVESTMENTS ON FUND PERFORMANCE

	Dependent variable			
	Australian CAPM α		*World CAPM α*	
Independent variables	*(1)*	*(2)*	*(1)*	*(2)*
Not-for-profit	-1.5964** (-6.10)	-1.8808** (-6.30)	-1.2576** (-5.13)	-1.5287** (-5.47)
Retail	-1.8305** (-7.19)	-1.7631** (-6.45)	-1.4974** (-6.28)	-1.4562** (-5.69)
Not-for-profit × LLI_{wof}	0.0072** (2.35)		0.0063** (2.20)	
Retail × LLI_{wof}	0.0015 (0.30)		0.0011 (0.24)	
Not-for-profit × AHP_{wof}		0.0008** (2.88)		0.0008** (2.83)
Retail × AHP_{wof}		-0.0004 (-0.83)		-0.0003 (-0.69)
Log AAB	0.0903** (4.04)	0.0935** (4.25)	0.0936** (4.47)	0.0971** (4.71)
Operational expense	-0.3868** (-1.98)	-0.3245 (-1.66)	-0.4315** (-2.35)	-0.3800** (-2.07)
R^2	0.39	0.41	0.43	0.45
***F*-statistic**	18.27**	19.32**	21.38**	22.58**
Observations	146	146	146	146

This table examines the relation between liquidity and fund performance. The sample period is September 2004 to June 2010. The sample excludes defined benefit funds and funds with total net assets less than $200 million. LLI_{wof} and AHP_{wof} are liquidity measures for the whole fund as defined in equations (1) and (2) respectively. Numbers in parentheses are *t*-statistics. ** indicates significance at the 5% level.

The results of this study provide an additional explanation for the under-performance of retail superannuation funds relative to not-for-profit superannuation funds documented in previous literature. Previous empirical research attributes differences in performance to agency costs associated with non-representative trustee boards (Coleman, Esho and Wong, 2006), higher embedded expenses incurred by investment vehicles of retail funds (Ellis, Tobin and Tracey, 2008) and higher fees paid to related-party service providers (Liu and Arnold, 2010). In the sample period for the present study (based on the Australian CAPM alpha), not-for-profit funds outperform retail funds on a risk-adjusted basis by an average of 144 basis points per annum. The regression results imply that around one-quarter (35 bps) of this performance difference can be attributed to the greater positive impact of illiquid investments on the net returns of not-for-profit funds compared to retail funds.[19, 20] Similar results hold based on the world CAPM alpha.

The finding that not-for-profit funds with higher percentage holdings of illiquid investments and longer average holding periods experience higher risk-adjusted returns may be specific to this time period and does not guarantee that funds with illiquid portfolios will always outperform funds with more liquid portfolios. Nonetheless, it corroborates evidence from previous studies that holdings of illiquid investments can benefit superannuation funds by improving diversification and increasing risk-adjusted returns.

[19] This component of risk-adjusted return represents $207 per annum in additional earnings for a member with the average account balance of $58,500.

[20] This estimate of the additional return captured by not-for-profit funds relative to retail funds takes account of both their higher illiquid asset allocations and the positive risk-adjusted returns they generate from these investments. Using the estimated coefficients in the first column of table 6, the average not-for-profit fund earned a risk-adjusted return from illiquid investments of $\hat{\gamma}_1 \times \overline{LLI}_{wof}(nfp)$ = 0.0072 × 13.4 = 10 bps per quarter, or 39 bps per annum. The average retail fund earned a risk-adjusted return from illiquid investments of $\hat{\gamma}_2 \times \overline{LLI}_{wof}(rtl)$ = 0.0015 × 6.0 = 1 bps per quarter, or 4 bps per annum. The difference between these risk-adjusted returns is 9 bps per quarter or 35 bps per annum.

Conclusion

This paper examines the extent to which defined contribution superannuation funds in Australia invest in illiquid asset classes and the characteristics that may influence these investment decisions, as well as the performance impacts of illiquid investments. The main findings are that, across both retail and not-for-profit funds, there is a broad cross-section of investment in illiquid assets; however, not-for-profit funds have a higher illiquid asset allocation on average. Retail and not-for-profit funds have exposure to different types of illiquid investments: not-for-profit funds have higher allocations to unlisted property, whereas retail funds have higher allocations to private equity-type investments. In the period from September 2004 to June 2010, not-for-profit funds with more illiquid investments experienced higher risk-adjusted returns, which suggests they captured a return premium for investing in these assets.

Not-for-profit funds which invest more in illiquid assets tend to have characteristics which support reduced fund liquidity. Funds with a larger amount of assets under management and funds with larger positive fund flows adopt a more aggressive approach to illiquid investments. Not-for-profit funds that manage more of their assets internally have higher percentage holdings of illiquid investments. This finding suggests that some funds may be seeking to develop their in-house investment expertise when deciding to invest in illiquid assets. In contrast, not-for-profit funds with erratic fund flows and a greater proportion of members approaching preservation age adopt a more conservative approach and hold larger cash balances to manage the risk of large withdrawals.

The approach to illiquid investments of retail funds is more often a simple aggregation of the choices of individual members. Though retail funds are considerably larger on average than not-for-profit funds, they have lower percentage holdings of illiquid investments. The level of exposure of retail funds to illiquid investments is relatively insensitive to the strength of their cash flows. For retails funds, there is no significant relationship between fund size or member age and their level of exposure to illiquid investments. In this regard, the higher level of engagement of retail fund members (and their financial advisors) in retirement investment decisions (evidenced by fewer members in default strategies) may create a constraint on these funds. The typical member and financial planner are arguably more comfortable with well-known and liquid assets classes, than with illiquid asset classes.

This study demonstrates that, in a period when illiquid investments experience positive returns, superannuation funds with allocations to these investments, taking into account the characteristics of the fund and its members, are more likely to benefit from their exposures to these investments. Discussions with APRA supervisors who are responsible for superannuation funds make it clear there is considerable heterogeneity in the approaches to illiquid assets: some funds undertake more detailed analysis than others to ensure their illiquid asset allocations are consistent with the needs of their members, and to leverage their existing investment expertise and organisational structure. The ability of the fund trustee to manage the transaction and valuation risks associated with illiquid investments is likely to be critical to the success or failure of an investment strategy which includes exposure to these investments. For example, trustees generally rely on third-party valuation experts to value illiquid investments, who should be independent of those who manage the investments. Future research could investigate the decision-making processes of trustees to better understand the issues they take into consideration when making and holding illiquid investments in their portfolios.

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Appendix 1
Characteristics of assets classes

Table A1.1

CHARACTERISTICS OF ASSET CLASSES

Data item	*Cash*	*Fixed income*	*Australian shares*	*International shares*	*Unlisted property*	*Other*
Average return %	1.41	1.50	2.19	0.71	2.11	3.52
Return volatility %	0.34	1.74	9.24	8.96	3.12	6.55
Average holding period (AHP_i) days	30	70	354	369	1,582	1,058
Fund holdings $mil	40,183	77,645	196,032	101,384	16,978	34,152
Fund holdings (HLD_i) %	8.6	16.7	42.0	21.7	3.6	7.3

This table presents the summary statistics for asset classes. The sample period is September 2004 to June 2010. Returns on cash, fixed income, Australian shares, international shares, unlisted property and other investments are represented by the UBS Bank Bill Index, the Citigroup Australian Broad Investment-Grade Bond Index in local currency, the S&P ASX 200 Accumulation Index, the MSCI Total Return Net World ex Australia Index in local currency, the Mercer Unlisted Property Funds Index Pre Tax and the Cambridge Associates Australia Private Equity and Venture Capital Index respectively. Average return is calculated as the mean of quarterly returns. Return volatility is calculated as the standard deviation of quarterly returns. AHP_i is the average holding period, defined as the average assets divided by the average daily dollar trading volume. HLD_i is the percentage holding of asset *i* for all sample funds.

Appendix 2
Fund performance benchmarks

Table A2.1

LOADINGS CALCULATED USING THE CAPM

	Australian CAPM		*World CAPM*	
Portfolio	*Alpha*	*AMRF*	*Alpha*	*WMRF*
1 (low)	-0.79**	0.85**	-0.46**	0.74**
2	-0.63**	0.91**	-0.28	0.79**
3 (high)	-0.58**	0.82**	-0.26	0.71**

This table reports the loadings of three (equal-weighted) LLI_{wof}-sorted fund portfolios on market factors. AMRF is the return on the Australian market portfolio in excess of the ninety-day bank bill rate. WMRF is the return on the world market portfolio in excess of the ninety-day bank bill rate. Loadings are calculated using the Australian CAPM and the world CAPM. The sample period is from September 2004 to June 2010. The sample excludes defined benefit funds and funds with total net assets less than $200 million. Numbers in parentheses are *t*-statistics. ** indicates significance at the 5% level.

Notes

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