South African Reserve Bank Working Paper Series WP/22/17

Characteristics of the South African retirement fund industry

Neryvia Pillay and Johannes Fedderke

15 December 2022

South African Reserve Bank

South African Reserve Bank Working Papers are written by staff members of the South African Reserve Bank and, on occasion, by consultants under the auspices of the South African Reserve Bank. The papers deal with topical issues and describe preliminary research findings, and develop new analytical or empirical approaches in their analyses. They are solely intended to elicit comments and stimulate debate.

The views expressed in this Working Paper are those of the author(s) and do not necessarily represent those of the South African Reserve Bank or South African Reserve Bank policy. While every precaution is taken to ensure the accuracy of information, the South African Reserve Bank shall not be liable to any person for inaccurate information, omissions or opinions contained herein.

South African Reserve Bank Working Papers are externally refereed.

Information on South African Reserve Bank Working Papers can be found at
https://www.resbank.co.za/en/home/publications/Papers/working-papers

Enquiries relating to the Working Paper Series can be addressed to:
Head: Economic Research Department
South African Reserve Bank
P O Box 427
Pretoria 0001

Tel. +27 12 313 3911

Characteristics of the South African retirement fund industry

Neryvia Pillay* and Johannes Fedderke†

15 December 2022

Abstract

Using administrative data, we examine the fund design and efficiency of the South African retirement fund industry over the period 1996–2018. Like many other countries, the retirement fund industry in South Africa is dominated by defined contribution funds. Total assets per member have been declining for defined benefit funds, which are now dominated by unclaimed benefit members. We find that South African retirement funds are not operating at an efficient scale. There are strong significant economies of scale present in the industry, with total administrative costs increasing by only 72% when the total number of fund members doubles. Preservation funds and retirement annuities are found to be most efficient and operating at an efficient scale. None of the benefit structures are operating efficiently but hybrid funds are the most efficient.

JEL classification: G23, G28

Keywords: retirement funds, pensions, cost efficiency, fund design

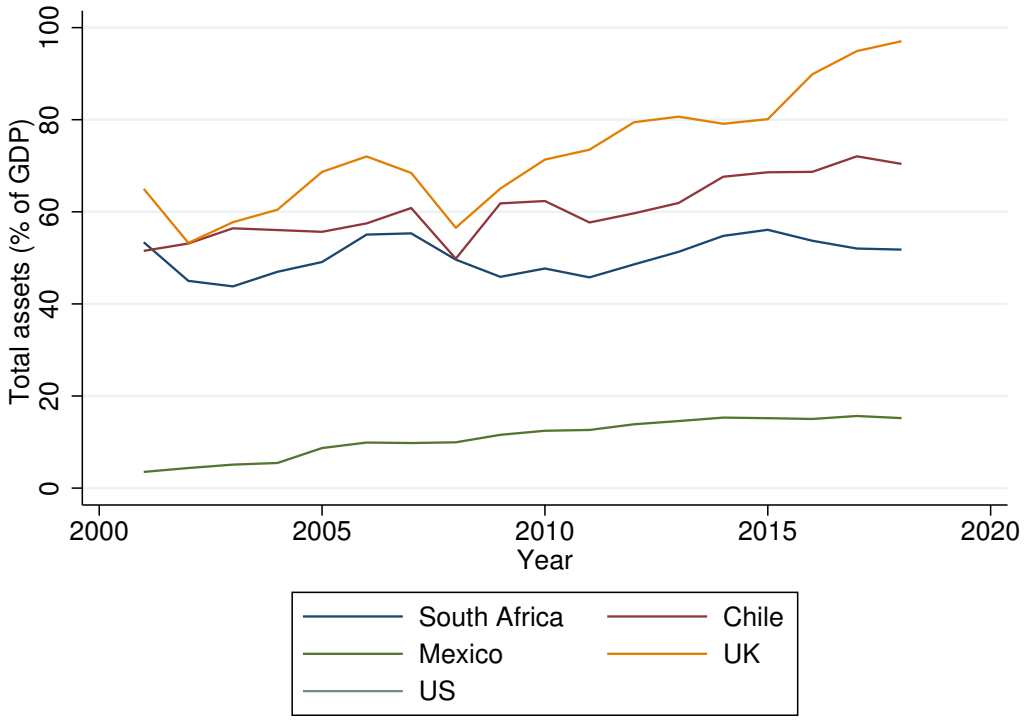
*Corresponding author. University of Cape Town, SARB and ERSA. Email: neryvia.pillay@uct.ac.za
†Pennsylvania State University

1 Introduction

South Africa has a well-developed private occupational retirement fund system, but this system does not cover the majority of the population (Hendrie et al. 2007). Low-income individuals rely on the means-tested state old-age pension grant for their retirement, while higher-income individuals are covered by a contributory private pension system that is tax incentivised. These private funds are particularly important for household wealth: pension funds and life insurance constitute the largest category of individuals' private wealth, comprising 36% of total private assets, which is higher than in many advanced economies (Orthofer, Du Plessis, and Reid 2019). Further, pension funds, along with insurance companies, are the largest institutional investors in global financial markets (Boeri et al. 2006). In South Africa, pension funds own about 40% of the assets on the Johannesburg Stock Exchangee (IFC 2013). Given the importance of private retirement funds in both financial markets and household wealth, it is important to ensure that the system functions well.

The South African retirement fund system is large, with total assets equivalent to about 50% of the country's gross domestic product (GDP). Despite the significant assets of the system, only 23% of the working-age population is covered (Organisation for Economic Co-operation and Development (OECD) 2011). The size of the industry – in terms of assets – is much larger than in Mexico, but smaller than in the United Kingdom (UK), the United States (US) and Chile (Figure 1). However, the growth of the retirement fund industries in the UK, the US, Chile and Mexico appears to be greater than that of South Africa's over the last decade.

Figure 1: Size of retirement fund industries across countries



Source: OECD (2022)

In this paper we study the trends in the South African retirement fund industry over the period 1996–2018. We use administrative data to examine fund design and the industry's efficiency. While there may not be agreement on the nature of an optimal retirement fund system, these characteristics are important for understanding how the system functions.

Given South Africa's high inequality and the low coverage of the private retirement fund system, there have been proposals for a national social security fund with multiple pillars of support, including government provision and voluntary private provision. The results in this paper can inform debates around a national security system by shedding light on the nature and evolution of the private retirement fund system.

The remainder of the paper is structured as follows. In section 2, we discuss the data and provide background information on the South African retirement fund system. Sections 3 and 4 examine fund design and efficiency, respectively. Section 5 concludes.

2 Data and background

2.1 Data

We use administrative data provided by the Financial Sector Conduct Authority (FSCA) that cover all retirement funds falling under the regulatory responsibility of the Financial Services Board (FSB) over the period 1996–2018. The data contain detailed information on administrative expenses, membership, assets, fund type (private or underwritten), fund subtype (ordinary, preservation or umbrella), fund class (pension, provident or retirement annuity), fund status, and benefit structure (defined benefit, defined contribution or hybrid). Public sector funds, such as the Government Employees Pension Fund (GEPF) and municipal funds, are not included in the dataset. Bargaining council and union funds are included if they fall under the regulatory responsibility of the FSB. For comparisons with other countries over time, we use data from the OECD.

Despite the detail available, there are some limitations to the data. Since individuals can belong to more than one fund, there is some double counting of members that we are unable to identify. We are unable to identify 'back-to-back' funds, where a pension and provident fund have the same members but all costs are reported under the provident fund. This leads to obvious double counting of members but will also overstate the costs of some provident funds and understate the costs of some pension funds. We are unable to split umbrella funds into Type A (open and thus more complex) and Type B (employer linked and thus less complex) and so have to group them together. This conceals the differences between the types of umbrella funds.

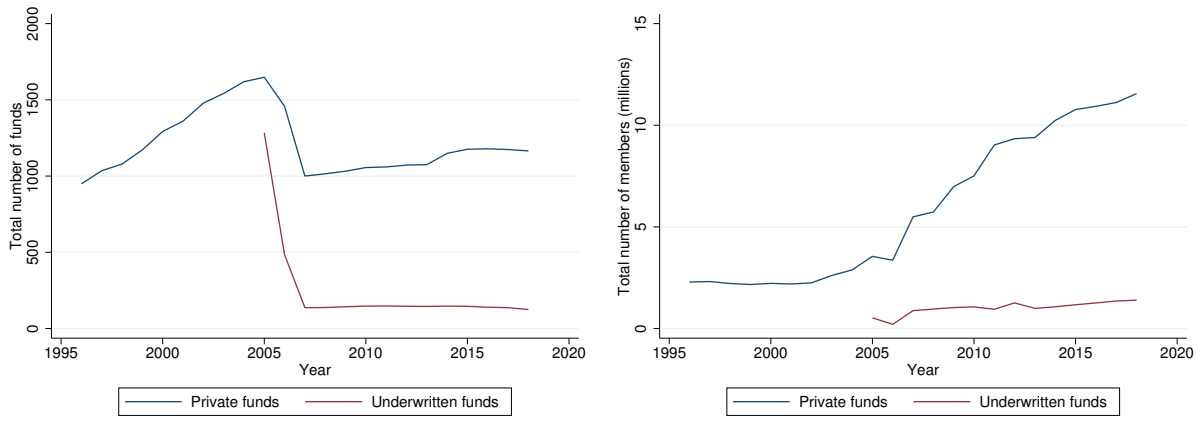
We restrict the sample to include only those funds with a normal active status that report positive member numbers and administrative expenses. Underwritten funds are only reported in the dataset from 2005 onwards, so, where appropriate, underwritten funds are excluded from the analysis. Typically when looking at changes over time, we exclude underwritten funds so that the results are not distorted by their appearance from 2005 onwards.

2.2 Background

There are private and underwritten retirement funds in South Africa. Private funds are allowed to invest in any assets (subject to the provisions of the Pension Funds Act 24 of 1956) and pay benefits from the fund's assets based on its own rules. The only assets of underwritten funds are insurance policies. Contributions are paid directly to the insurer and the insurer pays benefits when they become payable by the fund. Underwritten funds were exempt from reporting data to the FSB before 2005 and so only appear in the dataset from 2005 onwards.

Figure 2: Number of funds and total members by fund type, 1996–2018

(a) Number of funds **(b) Total members**



Notes: Sample includes all normal active funds with positive member numbers and administrative expenses.

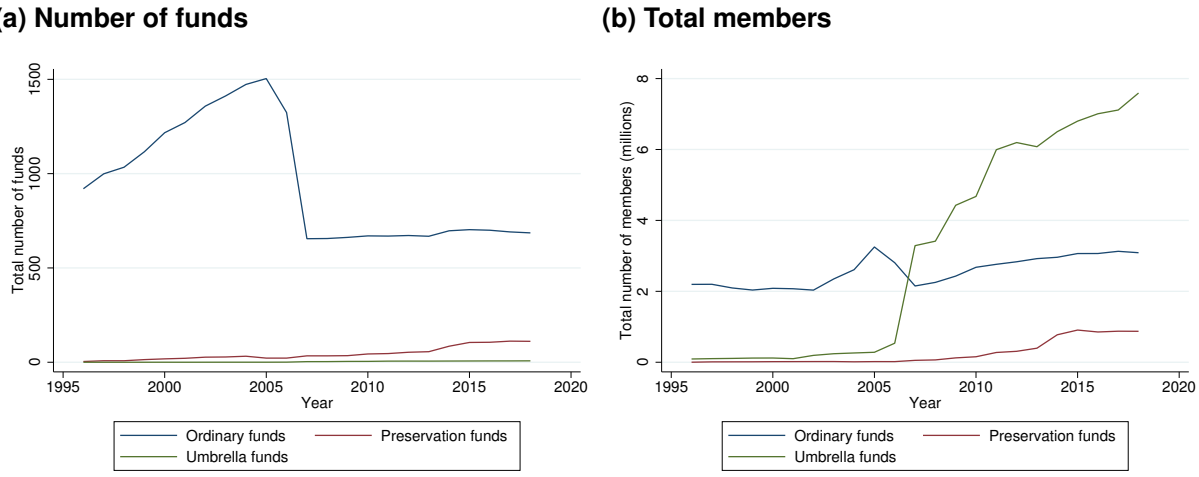
Figure 2 shows the number of funds in Panel (a) and the total number of members in Panel (b) broken down by fund type (private and underwritten funds). As previously mentioned, data on underwritten funds are only available from 2005 onwards. It is clear that most funds are private funds and the vast majority of retirement fund members belong to private funds. The sharp decline in the number of underwritten funds after 2005 was expected due to the removal of the reporting exemption. There are significant compliance costs involved in submitting audited returns to the FSB, and consolidation within the underwritten funds was expected in response to the removal of the exemption. Despite the large decline in the number of underwritten funds shown in Panel (a), Panel (b) indicates that the number of underwritten fund members has been relatively stable. Almost all of the growth in retirement fund membership has been in private funds.

A further distinction is made between ordinary, preservation and umbrella funds. A preservation fund is one to which benefits are transferred from another retirement fund when a member leaves the other fund. The transferred funds are kept and invested by the preservation fund until the member reaches retirement age. An umbrella fund is also known as a multi-employer fund and is a fund to which employees of a number of employers belong. Some umbrella funds are open only to employers from a certain sector, while others are open to any group of employees.

Figure 3 shows the number of funds in Panel (a) and the total number of members in Panel (b) broken down by fund subtype (ordinary, preservation and umbrella). There has been a decrease in the number of ordinary funds while the number of preservation and umbrella funds has remained relatively stable over time. The number of members in ordinary and

preservation funds has slightly increased over time, but there has been a significant growth in the number of umbrella fund members. This may be due to umbrella funds' advantage of economies of scale in terms of administration, particularly reporting requirements.

Figure 3: Number of funds and total members by fund subtype, 1996–2018



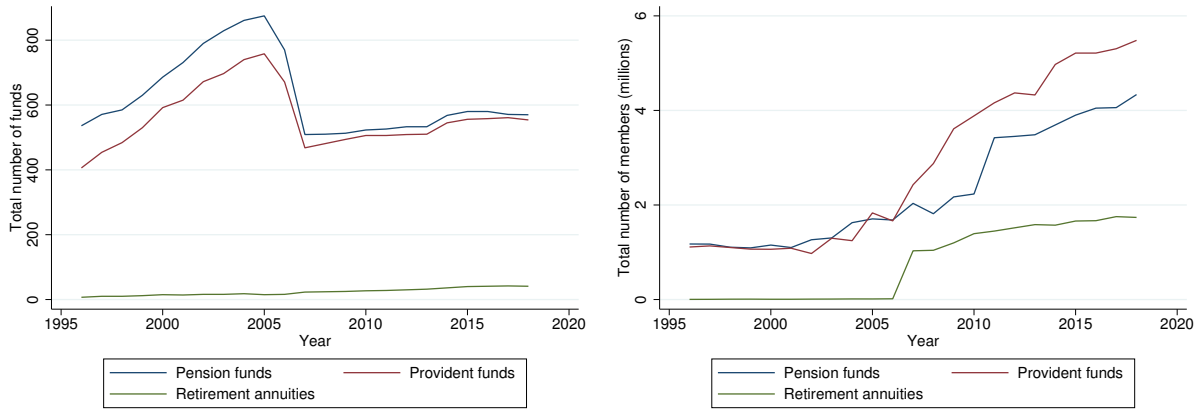
Notes: Sample includes all normal active funds with positive member numbers and administrative expenses. Underwritten funds are excluded.

Retirement funds are either compulsory or voluntary. Compulsory funds are occupational funds that an employee belongs to as part of their conditions of employment. The two types of compulsory funds are pension and provident funds, with the main difference between the two being how the member receives their benefit on retirement. A pension fund may only pay out up to one third of the pension benefits as a lump sum, with the remaining two thirds paid in the form of an annuity ('pension'). A provident fund pays out the entire benefit as a cash lump sum when a member retires. Retirement annuities are voluntary funds that a member joins of their own accord and to which the employer does not contribute. Like a pension fund, the maximum that may be paid out as a lump sum on retirement is one third. National Treasury has proposed moving towards a two-pot system, with one pot (two thirds) being preserved until retirement and the second pot (one third) accessible before retirement (National Treasury 2021). This would allow individuals to access some of their retirement savings in times of financial need without having to resign from their jobs, while also preserving retirement savings.

Figure 4 shows the number of funds in Panel (a) and the total number of members in Panel (b) broken down by fund class (pension funds, provident funds and retirement annuities). There are relatively few retirement annuities compared to pension and provident funds. The low number of retirement annuities is expected since under South African law, retirement annuity funds are registered as retirement funds. They are typically set up by financial intermediaries, such as fund managers and insurers, in order to hold the assets and liabilities of their retirement annuity accounts, and the assets are often held in the form of insurance policies. The number of pension and provident funds decreased after 2005 and has remained relatively stable since then. The total number of members across pension and provident funds was very similar until 2007, when provident funds started gaining more members relative to pension funds. Retirement annuities also experienced growth in the number of members from 2007 onwards.

Figure 4: Number of funds and total members by fund class, 1996–2018

(a) Number of funds **(b) Total members**



Notes: Sample includes all normal active funds with positive member numbers and administrative expenses. Underwritten funds are excluded.

3 Fund design

Pension fund design has important implications for risk sharing, both from the perspective of assets matching liabilities and from the point of view of participants. Defined benefit (DB) schemes determine the benefit payment that will accrue to the member on retirement, for example 70% of their annual salary, and set contributions at a level which should fund this future liability. Funding stability is a concern for DB funds since assets are not guaranteed to equal liabilities. In a defined contribution (DC) fund, the contribution is set (usually as a percentage of annual salary), and this is then invested. When a member retires, they are paid out the amount they have contributed, as well as any investment return. With DC funds, funding stability issues do not arise since assets are always equal to liabilities.

Between 2000 and 2002, pension funds worldwide became significantly underfunded, which raised concerns about the ability to meet future obligations and accelerated the shift away from DB to DC funds (IMF 2004). Low interest rates were one factor underlying this shift: as interest rates fall, liabilities rise and shorter-duration assets do not increase as much, leading to mismatched assets and liabilities. Lower interest rates also result in higher costs of a given level of DB fund benefits, and employers are potentially unwilling to pay these increased costs, contributing to a shift towards DC funds. This shift towards DC funds reduces funding stability concerns in the retirement fund system.

Even before this deterioration in funding levels, DB schemes had begun to look less attractive due to their relative inflexibility, unsuitability for more mobile employees who prefer greater portability of pension benefits, and an increase in perceived volatility due to a move to market-based accounting principles (IMF 2004). This shift towards DC funds means that participants face increasing pension risks. Employers are responsible for funding and investment management of DB plans, whereas employees take on these responsibilities (and risks) under DC plans. Thus, an increase in DC plans reallocates risk from the corporate sector to the household sector and has implications for financial stability.

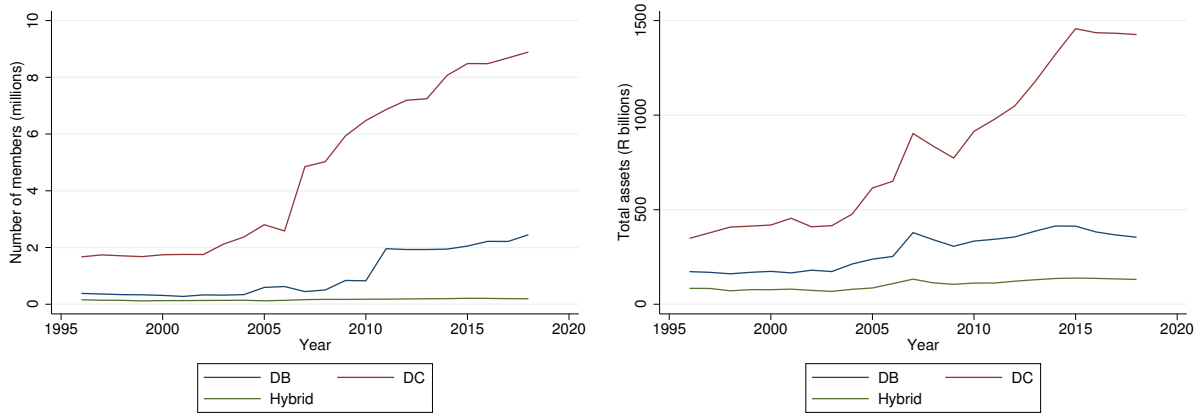
There are also newer hybrid plans which incorporate elements of both DB and DC plans.

In these schemes, employers typically make contributions and bear some of the investment or guaranteed return risk while employees will usually still have an individual account and receive a lump sum payment at retirement. Hybrid plans provide some of the benefits of DB plans to employees in terms of guarantees and assurance while also providing the portability and relatively earlier accrual of benefits of DC plans that is more attractive to an increasingly mobile workforce. Blommestein, Kortleve, and Yermo (2009) find that these hybrid plans might be more efficient and sustainable forms of risk sharing than DB and DC plans.

Figure 5 shows the total number of members and assets by benefit structure over the full sample period 1996–2018. Underwritten funds are excluded from this graph since data is not available for these funds over the full sample period.

Figure 5: Number of members and total assets by benefit structure, 1996–2018

(a) Number of members **(b) Total assets**



Notes: Sample includes all normal active funds with positive member numbers and administrative expenses. Underwritten funds are excluded. Total assets are in constant 2016 rands.

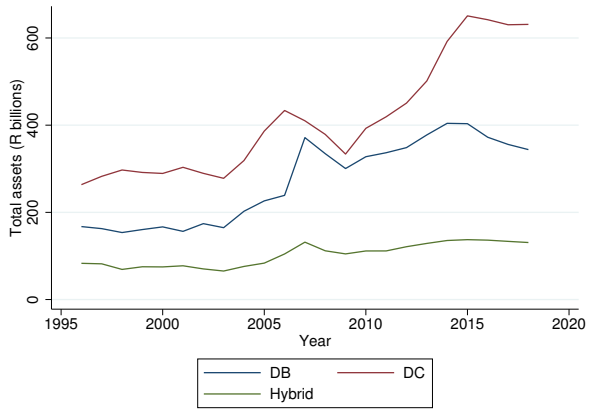
It is evident that DC funds have always had the most members and assets of the three benefit structure types over the sample period. Further, the growth in the size of the retirement fund industry has been driven by DC funds, both in terms of number of members and total assets. Similar to global trends, there has been a steady increase in the prevalence of DC funds after 2002. The growth of DC funds in South Africa matches that seen in other countries like the US and the UK (IMF 2004; Boeri et al. 2006).

There has also been some growth in DB funds over the period, but this is dwarfed by the growth in DC funds. Despite the potential advantages of hybrid funds they do not have large numbers of members or assets and have not grown much over the sample period. It is clear that the retirement fund industry in South Africa is dominated by DC funds.

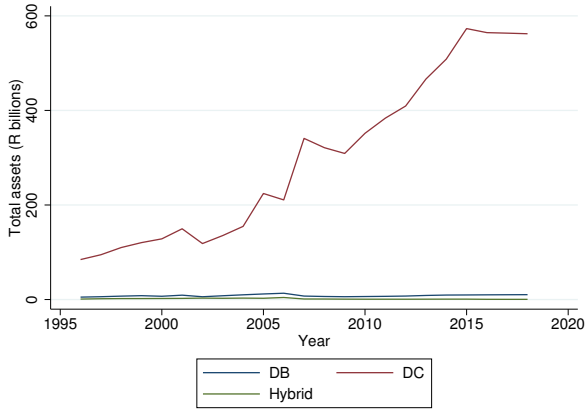
Figure 6 shows the total assets by benefit structure across the three fund classes: pension funds in Panel (a), provident funds in Panel (b), and retirement annuities in Panel (c).

Figure 6: Total assets by benefit structure and fund class, 1996–2018

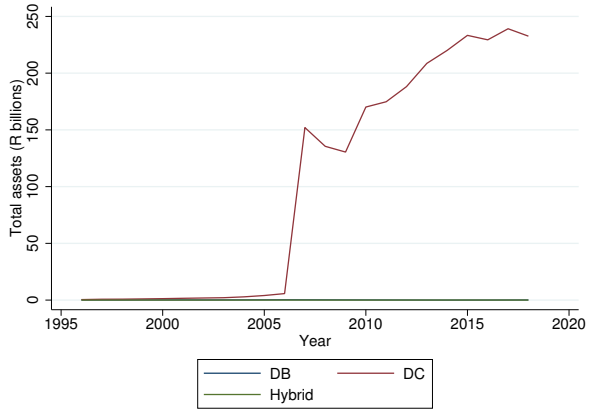
(a) Pension funds



(b) Provident funds



(c) Retirement annuities

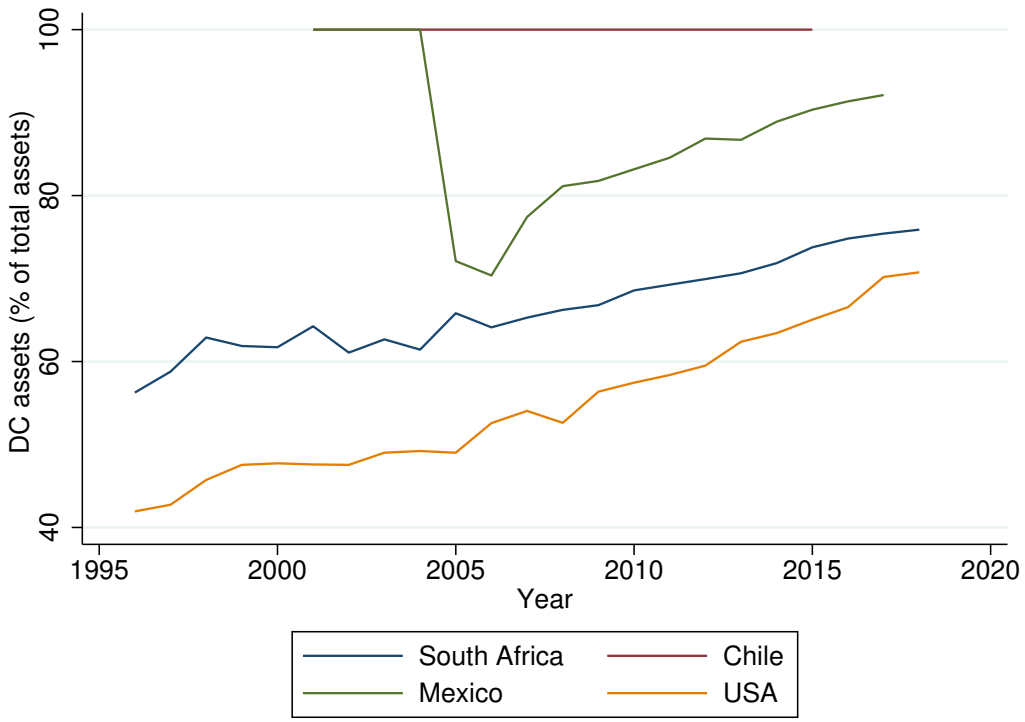


Notes: Sample includes all normal active funds with positive member numbers and administrative expenses. Underwritten funds are excluded. Total assets are in constant 2016 rands.

Provident funds and retirement annuities largely consist of DC funds, with DB and hybrid funds making up a relatively small proportion of assets under management for these fund classes. On the other hand, pension funds have relatively large assets under DB and hybrid plans, although DC plans are still the largest. For pension funds, there has been growth across all three benefit structures over the sample period, with DC plans having particularly grown over the last decade. For provident funds and retirement annuities, almost all of the growth has been in DC funds.

In Figure 7 we compare the benefit structure of the South African retirement fund industry with selected other countries. As can be seen, the increasing proportion of DC assets seen in South Africa is matched by the trends seen in these countries. Chile and Mexico had 100% of pension assets managed under DC schemes following earlier pension reforms in these countries. This proportion has since fallen below 100% in Mexico, but has been increasing in the last few years and is higher than in South Africa. The proportion of assets in DC schemes has also been increasing in the US over the same period, but the proportion of DC assets is higher in South Africa than in the US.

Figure 7: DC assets as a percentage of total assets across countries



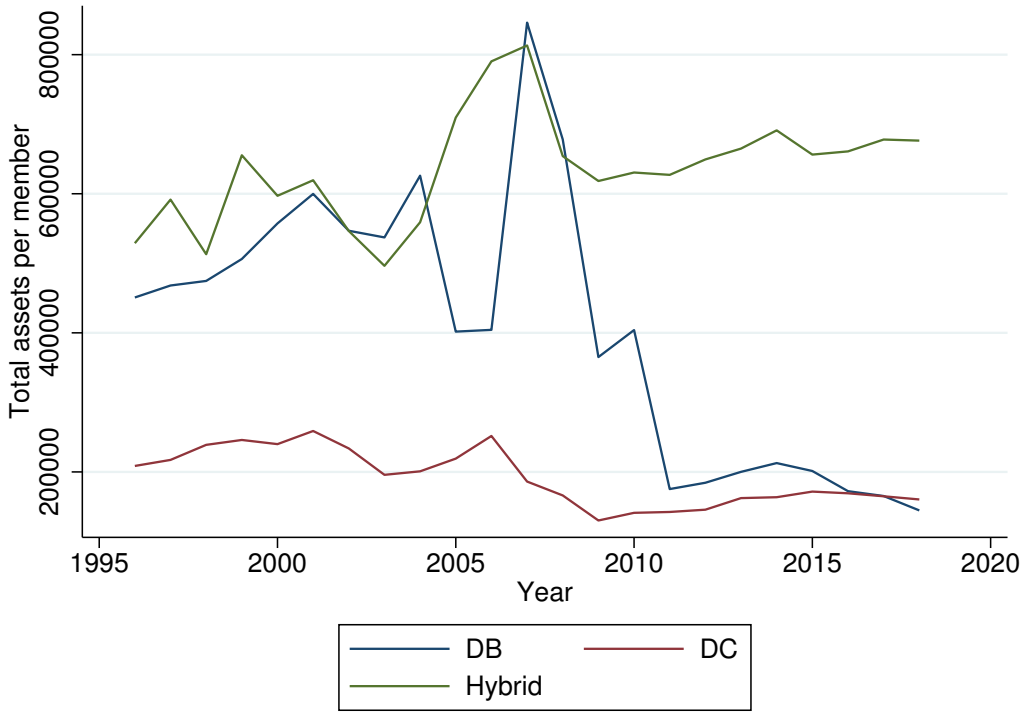
Sources: OECD and authors' own calculations using FSCA data
Notes: South African sample includes all normal active funds with positive member numbers and administrative expenses. Underwritten funds are excluded.

The increasing prominence of DC funds in the South African retirement fund industry means that more funds do not face funding stability concerns, but households bear greater responsibility for securing their retirement. This transfer of risk raises the question of how well equipped households are to bear these risks and what the appropriate level of risk sharing is between households and other sectors.

Funding stability is a concern for DB funds since their assets are not necessarily equal to their liabilities, unlike for DC funds. Unfortunately, our data do not contain information on retirement fund liabilities so we are unable to examine funding stability. Instead, we explore changes in assets and the numbers of active contributing members, deferred benefit members, pensioners in receipt of regular payments, dependants and nominees in receipt of regular payments, and persons entitled to unclaimed benefits over time. While these numbers are not sufficient to determine exactly whether funds are over- or under-funded, they do shed light on the risks and how these have evolved over time.

Figure 8 shows that assets per member are the highest for hybrid funds, while they have been falling for DB funds. These declines in assets per member could reflect worsening funding ratios for DB funds, but without data on liabilities, it is not possible to say for sure.

Figure 8: Total assets per member by benefit structure, 1996–2018

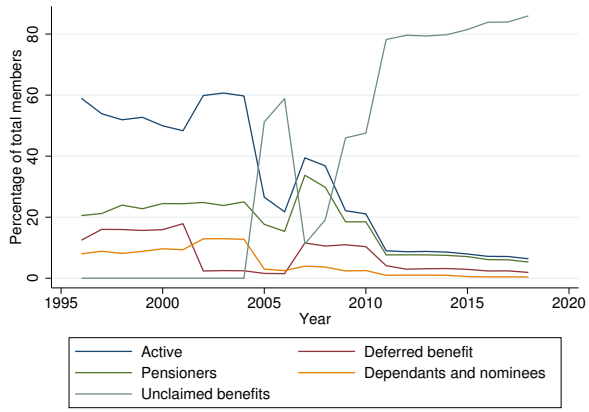


Notes: Sample includes all normal active funds with positive member numbers and administrative expenses. Underwritten funds are excluded. Total assets per member are in constant 2016 rands.

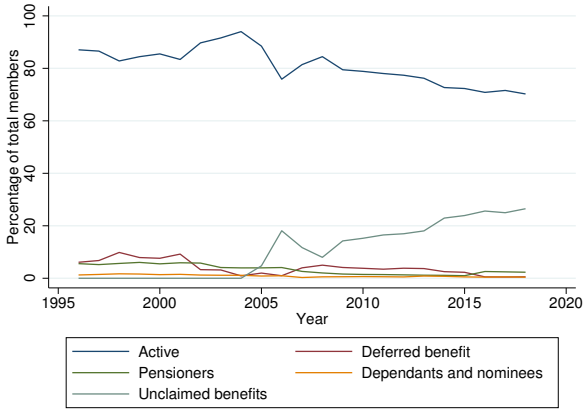
Examining the membership structure of retirement funds can provide an indication of liabilities. Fund members comprise active contributing members, deferred benefit members, pensioners in receipt of regular payments, dependants and nominees in receipt of regular payments, and persons entitled to unclaimed benefits. Figure 9 reveals that DC and hybrid funds consist largely of active contributing members. On the other hand, the proportion of unclaimed benefits members has been increasing over time for DB funds so that the large majority of DB members are unclaimed benefits members. A benefit becomes unclaimed if it has not been claimed by a member or beneficiary within two years of it becoming due and represents a liability to the fund.

Figure 9: Membership structure by benefit structure, 1996-2018

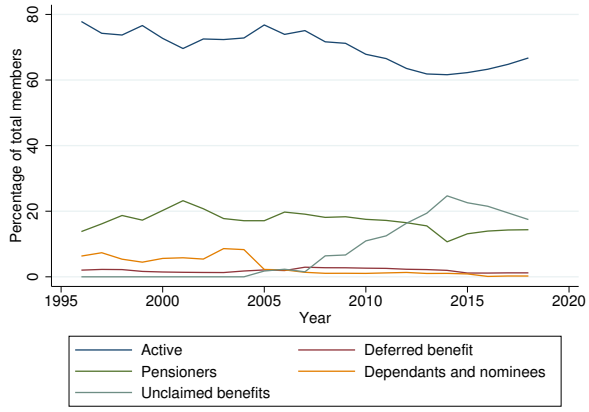
(a) Defined benefit funds



(b) Defined contribution funds



(c) Hybrid funds

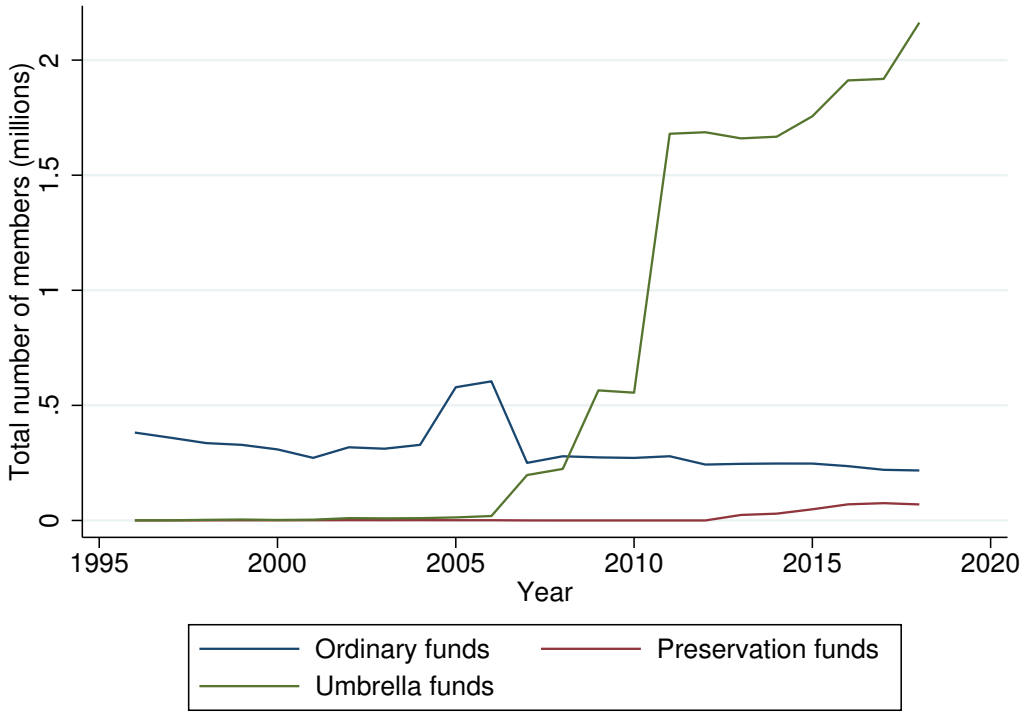


Notes: Sample includes all normal active funds with positive member numbers and administrative expenses. Underwritten funds are excluded.

Fund administrators have set up special unclaimed benefits funds, which are preservation funds to which a retirement fund can transfer its accumulated unclaimed benefits for preservation until claimed by the beneficiary. In 2018, preservation funds had around 80% of their membership as persons entitled to unclaimed benefits while 43% of umbrella fund members and 6% of ordinary funds members were those entitled to unclaimed benefits. This indicates that unclaimed benefits are concentrated among the preservation funds, as expected.

In Figure 10, we examine the number of members across the fund subtypes for DB funds only. It is clear that the growth in DB funds has come primarily from umbrella funds and this growth seems to match the pattern seen for unclaimed benefits members. For DB funds, it appears that the unclaimed benefits are in umbrella funds rather than in preservation funds.

Figure 10: Total members by fund subtype for DB funds, 1996–2018



Notes: Sample includes all normal active funds with positive member numbers and administrative expenses. Underwritten funds are excluded.

The industry has been trying to trace beneficiaries and the FSCA has a dedicated webpage where individuals can determine whether they are entitled to unclaimed benefits. The FSCA has also proposed a centralised fund to house unclaimed benefits. Despite these efforts it is possible that a large number of unclaimed benefits will remain unclaimed as 26.5% of them have a value of less than R250, and many of the unclaimed benefits date back to the apartheid era and finding these beneficiaries is difficult (Hesse 2021).

The proposed two-pot system has significant implications for funding stability. DC funds have separate accounts with specific assets purchased from an individual's contributions, so they can easily track the two pots and make available an individual's one-third contribution when requested. However, DB funds typically invest a greater proportion of their assets in long-term illiquid investments to meet their future annuity obligations. In order for one third of future contributions to be accessible at any point, DB funds may need to shift more of their assets into shorter-term liquid investments, which typically have lower rates of return. This could lead to a decline in funding stability for DB funds.

4 Efficiency

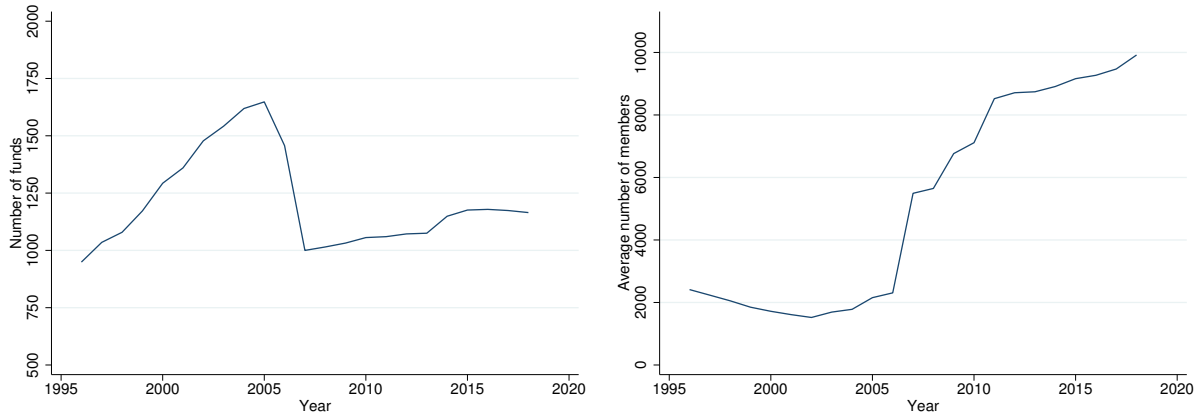
Administrative costs affect the net rate of return on retirement fund contributions and directly impact the ability of retirees to attain adequate income. We define administrative costs as the sum of actuarial fees, admin fees, amount allocated to UB, audit fees, consultancy fees, depreciation at cost, depreciation at valuation, fidelity cover, levies, other, office expenses,

operating lease payments, penalties, principal officer, staff expenses, secretarial fees, and trustee fees. Investment management fees are not included.[1]

In this section, we examine economies of scale of administrative costs in the South African retirement fund industry, building on earlier work by Touna Mama, Pillay, and Fedderke (2011), who found that there were between 25% and 30% of unused scale economies in the retirement fund industry, with an optimal fund size of about 220 000 members. This finding was based on data from 1996 to 2006. Since then, the number of funds has decreased and the average fund size has increased significantly, as shown in Figure 11.

Figure 11: Number of funds and average fund size, 1996–2018

(a) Number of funds **(b) Average fund size**



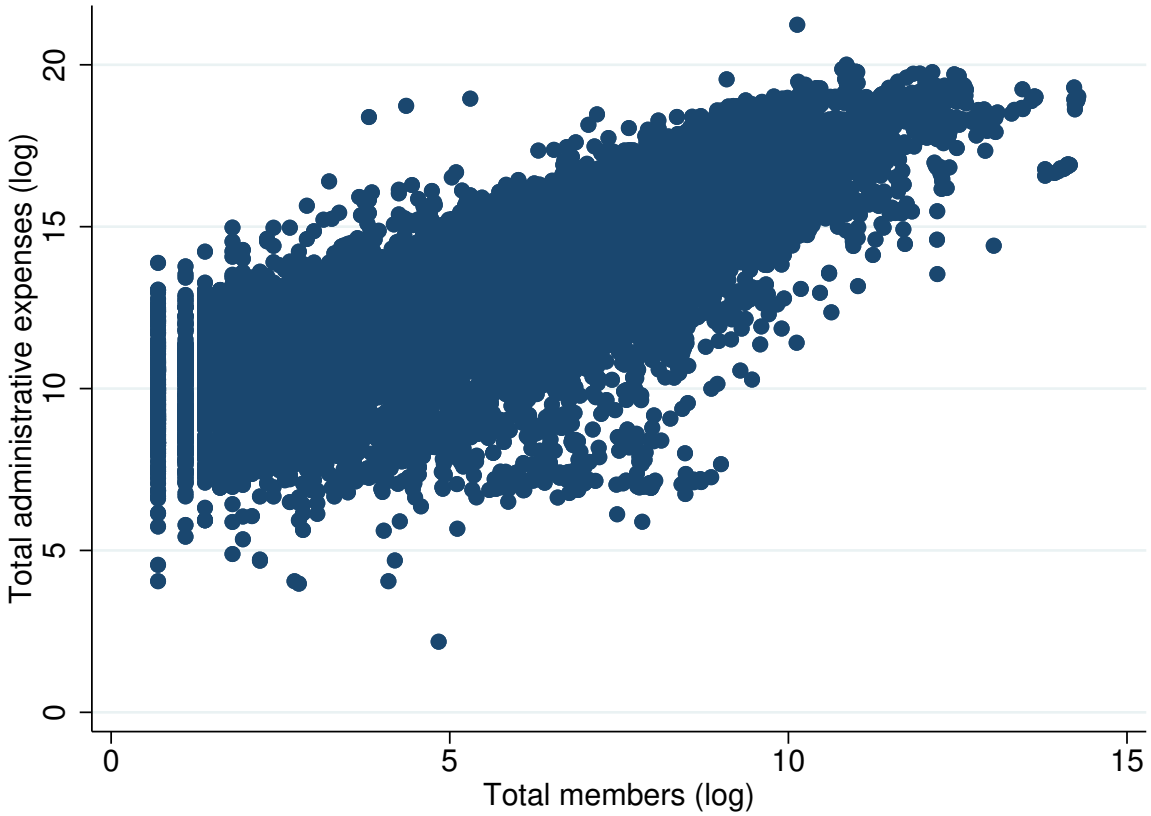
Notes: Sample includes all normal active funds with positive member numbers and administrative expenses. Underwritten funds are excluded.

These changes in the industry warrant an updated investigation into economies of scale in retirement funds. Our dataset contains data on retirement funds through 2018 and allows us to study the effects of these industry changes on administrative expenses and economies of scale.

Figure 12 shows total administrative expenses by fund size, measured by the number of total members, over the full sample period 1996–2018. It is evident from this figure that smaller funds have much greater variation in average expenses than larger funds. There are also comparatively fewer large funds in the South African retirement fund industry.

[1] On average, administrative costs are 60% of total costs (defined as the sum of administrative costs and investment management fees). Thus, while administrative costs dominate costs, investment management fees could have an important impact on efficiency.

Figure 12: Administrative expenses by fund size, 1996–2018



4.1 Estimation of economies of scale

We estimate the effect of fund size on administrative costs using a translog function and controlling for other potential determinants of administrative expenses:

$$ln(Cost_{it}) = \beta_0 + \beta_1 ln(Members_{it}) + \gamma X_{it} + \delta_t + \varepsilon_{it} \quad (1)$$

where $Cost_{it}$ is fund i's administrative expenses in year t and $Members_{it}$ is the total number of fund members. X_{it} contains a set of additional fund characteristics that may affect administrative costs – fund subtype dummies (preservation or umbrella, with ordinary as the reference category), fund class dummies (provident or retirement annuity, with pension as the reference category), benefit structure dummies (defined benefit or hybrid, with defined contribution as the reference category), assets per member, percentage deferred members, percentage pensioners, percentage beneficiaries and percentage unclaimed benefits. When underwritten funds are included in the sample, an indicator for underwritten is also included in X_{it}. δ_t is a full set of year dummies to flexibly control for time trends. The specification in equation (1) is identical to that in Touna Mama, Pillay, and Fedderke (2011).

We use the log of administrative costs and number of members to reduce the impact of heteroskedasticity and to enable the measurement of scale economies. The coefficient β_1 measures the cost elasticity and reflects economies of scale (indicated by $\beta_1 < 1$) or diseconomies

of scale (indicated by $\beta_1 > 1$).[2] A null hypothesis of $\beta_1 = 1$ is equivalent to the hypothesis that administrative expenses rise proportionally with fund size, that is, there are neither economies nor diseconomies of scale. Thus, in all results we present the t-statistic from a hypothesis test that $\beta_1 = 1$. Standard errors are clustered at the pension fund level throughout.

Table 1 gives the results of estimating equation (1) for the sample excluding underwritten funds in columns (1)–(3), and including underwritten funds in columns (4)–(6). Column (1) of Table 1 replicates the main estimate in Touna Mama, Pillay, and Fedderke (2011) and our estimate of 0.705 is very close to their estimate of 0.697, and the small difference could be due to slight changes in the data. In column (2) we estimate economies of scale over the more recent period 2007–2018, and it is evident that the cost elasticity has increased somewhat in the latter period relative to the earlier period – the scale coefficient β_1 increases from 0.705 over 1996–2006 (Table 1 column (1)) to 0.731 over 2007–2018 (Table 1 column (2)). Over all years, the estimate of the cost elasticity is 0.715 (Table 1 column (3)).

Columns (4)–(6) of Table 1 include underwritten funds, which were excluded in Touna Mama, Pillay, and Fedderke (2011) because they are only reported in the dataset from 2005 onwards. Including underwritten funds does not change the estimates of the cost elasticity much, and the estimates are slightly larger in two of the three cases.

In all the estimates, the scale coefficient β_1 of the number of members is significantly different from the constant returns-to-scale value of 1. There are strong and significant economies of scale in the South African retirement fund industry – total administrative costs increase by only 72% when membership doubles (Table 1 column (6)). This is equivalent to 28% potential economies of scale.

The estimated scale coefficient is similar to that estimated for the Netherlands (64% by Bikker and De Dreu (2009), and 69% by Bikker, Steenbeek, and Torracchi (2012)) and Australia (74% by Bikker, Steenbeek, and Torracchi (2012)). The South African retirement fund industry thus has similar economies of scale to the Dutch and Australian industries. On the other hand, the estimated scale coefficient is much smaller than Bikker, Steenbeek, and Torracchi (2012) estimate for the US (0.79) and Canada (0.95, and not statistically significantly different from 1). South African retirement funds are not as efficient as those in the US and Canada. In particular, Canadian retirement funds are operating at an efficient scale.

Looking at fund characteristics, we see that underwritten funds have lower administrative costs than private funds. Preservation funds have significantly higher administrative costs than ordinary funds. Over 1996–2006, umbrella funds had significantly lower administrative costs than ordinary funds, but this difference is no longer there over 2007–2018 and when looking over the entire sample period. Since more than one employer can participate in an umbrella fund, we might expect umbrella funds to have lower administrative costs, but this does not appear to be true in all sample periods. There does not appear to be a significant difference in administrative costs between pension and provident funds. Some of the coefficient estimates for retirement annuity funds are statistically significant, indicating that retirement annuity funds may have higher administrative costs than pension funds. This may be because retirement annuity funds collect contributions by directly debiting members' bank accounts and this is likely to be more expensive than the payroll deductions used by pension and provident funds. Both defined benefit and hybrid funds have significantly higher administrative costs than defined contribution funds.

[2]Note that economies of scale are equal to 1 minus the cost elasticity.

Table 1: Estimates of economies of scale using linear specification

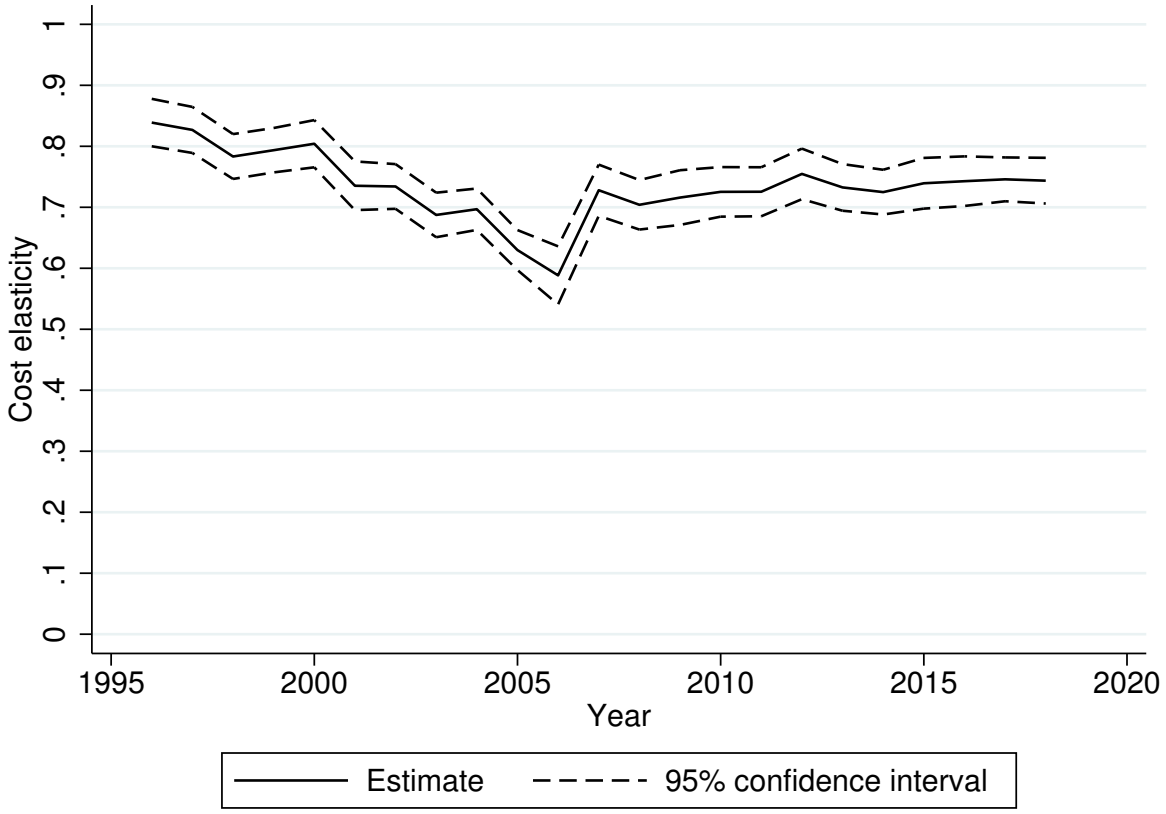
	Excluding underwritten funds			All funds		
	1996–2006	2007–2018	All years	1996–2006	2007–2018	All years
	(1)	(2)	(3)	(4)	(5)	(6)
Total members (log)	0.705***	0.731***	0.715***	0.701***	0.736***	0.719***
	(0.014)	(0.015)	(0.013)	(0.013)	(0.014)	(0.012)
Underwritten				-0.699***	-0.328***	-0.487***
				(0.053)	(0.077)	(0.057)
Preservation	0.898***	0.574***	0.632***	0.844***	0.511***	0.578***
	(0.175)	(0.140)	(0.129)	(0.168)	(0.130)	(0.120)
Umbrella	-0.183**	0.018	-0.018	-0.170**	0.044	0.010
	(0.074)	(0.066)	(0.054)	(0.072)	(0.063)	(0.052)
Provident	-0.062	0.062	-0.002	-0.063	0.037	-0.017
	(0.047)	(0.065)	(0.047)	(0.042)	(0.061)	(0.043)
Retirement annuity	0.335	0.391*	0.365*	0.278	0.314	0.304
	(0.235)	(0.222)	(0.203)	(0.231)	(0.208)	(0.192)
Defined benefit	0.255***	0.334***	0.303***	0.282***	0.329***	0.329***
	(0.062)	(0.127)	(0.068)	(0.060)	(0.109)	(0.063)
Hybrid	0.443***	0.350***	0.403***	0.466***	0.347***	0.421***
	(0.105)	(0.102)	(0.082)	(0.106)	(0.100)	(0.082)
Total assets per member (R10 000s)	0.001**	0.001***	0.001***	0.001**	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Deferred members, percentage	-0.001	-0.006**	-0.004**	-0.011***	-0.006***	-0.010***
	(0.003)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)
Pensioners, percentage	0.006***	0.003*	0.005***	0.006***	0.003*	0.005***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)
Beneficiaries, percentage	0.011***	0.007*	0.009***	0.009***	0.006*	0.008***
	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)	(0.002)
Unclaimed benefits, percentage	-0.002	-0.012***	-0.012***	-0.004	-0.013***	-0.013***
	(0.003)	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)
Constant	8.943***	8.959***	8.851***	8.979***	8.947***	8.843***
	(0.084)	(0.103)	(0.080)	(0.079)	(0.099)	(0.077)
t-statistic: $\beta_1 = 1$	-21.468***	-17.740***	-22.556***	-23.913***	-18.896***	-24.147***
Number of observations	13,652	12,853	26,505	15,408	14,515	29,923
R-squared	0.626	0.646	0.642	0.689	0.669	0.688

Notes: Sample includes all normal active funds with positive member numbers and administrative expenses. Columns (1)–(3) exclude underwritten funds while columns (4)–(6) include them. All estimates include a full set of year dummies in addition to the variables shown in the table. Clustered standard errors are in parentheses. *** significant at the 1% level, ** at the 5% level, * at the 10% level.

The results in Table 1 suggest that the cost elasticity over the period 2007–2018 is higher than over the earlier period 1996–2006. In order to examine this further, Figure 13 illustrates the scale coefficients when equation (1) is estimated separately for each year. We exclude underwritten funds in these estimations since they are only reported in the data from 2005 onwards, but the results including underwritten funds are very similar.

Looking at Figure 13, it is clear that the cost elasticity was indeed falling over the period 1996 to 2006 and then increased slightly over the years 2007 to 2018. In 2018, the estimated cost elasticity was 0.74, which is equivalent to 26% potential economies of scale. In all years, the scale coefficient is statistically significantly different from the constant returns-to-scale value of 1.

Figure 13: Estimates of cost elasticity by year, 1996–2018



Notes: Sample includes all normal active funds with positive member numbers and administrative expenses. Underwritten funds are excluded.

4.2 What is the optimal fund size?

In order to determine the optimal fund size, we estimate two specifications that allow economies of scale to vary with fund size. The first is a quadratic specification and the second uses dummies for different fund size categories. Both specifications are useful to determine if larger funds have larger cost elasticities and to ascertain the optimal fund size.

The quadratic specification allows economies of scale to vary by introducing a squared membership term:

$$ln(Cost_{it}) = \beta_0 + \beta_1 ln(Members_{it}) + \beta_2 [ln(Members_{it})]^2 + \gamma X_{it} + \delta_t + \varepsilon_{it} \quad (2)$$

In this specification, the cost elasticity now depends on the fund size and is given by $\beta_1 + 2\beta_2 ln(Members)$.

The second specification uses a set of indicator variables for fund size to allow a more flexible relationship between fund size and the cost elasticity:

$$ln(Cost_{it}) = \beta_0 + \sum_{s=0}^{14} \beta_{1s} [Size_{it}(s, s+1) \times ln(Members_{it})] + \gamma X_{it} + \delta_t + \varepsilon_{it} \quad (3)$$

where $Size_{it}(s, s+1)$ is an indicator variable that is equal to 1 if $s < ln(Members_{it}) \leq s+1$ and is 0 otherwise.

Table 2 gives the results of estimating equation (2) for the full sample including underwritten funds in columns (1)–(3), and for the sample of 23-year funds only in columns (4)–(6). The 23-year funds in particular might be more useful for determining the optimal fund size since they represent the sample of funds that have survived entry and competition and therefore might better reflect efficiency in the industry.

Looking at all funds in columns (1)–(3) of Table 2, the statistical significance of the quadratic terms indicates that the cost elasticity is not constant and economies of scale decrease as fund size increases. When looking at only the 23-year funds in columns (4)–(6), the quadratic term is signficant over the years 2007–2018. For the 23-year funds, there is no effect of fund size on cost elasticity over the years 1996–2006 and over the full sample period.

We can use the estimates in Table 2 to determine the optimal fund size. When the cost elasticity is equal to 1, there is constant returns to scale and the fund has reached its optimal size. Based on the estimates for the full sample (column (3) of Table 2), the optimal fund size is just under 21 million members. However, 21 million far exceeds the sample maximum fund size of 1.6 million members, as well as the sample total number of members of 13 million in 2018. Thus, this estimate is of limited usefulness and we instead look at the 23-year funds to determine the optimal fund size. Based on the estimates for the 23-year funds over the period 2007–2018, the optimal fund size is 300 000 members. This is larger than the optimal fund size of 220 000 members estimated by Touna Mama, Pillay, and Fedderke (2011) for the 11-year funds over 1996–2006.[3]

[3]Touna Mama, Pillay, and Fedderke (2011) cover the years 1996–2006 and so use a sample of 11-year funds that represents those funds that appear in every year in their dataset.

Table 2: Estimates of economies of scale using quadratic specification

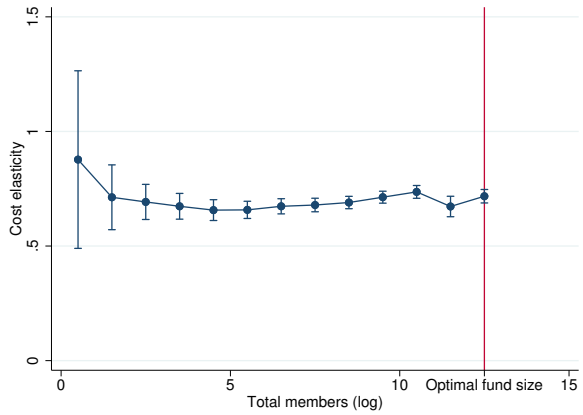
	All funds			23-year funds		
	1996–2006	2007–2018	All years	1996–2006	2007–2018	All years
	(1)	(2)	(3)	(4)	(5)	(6)
Total members (log)	0.521***	0.615***	0.562***	0.887***	0.319*	0.492***
	(0.047)	(0.061)	(0.045)	(0.218)	(0.186)	(0.189)
Total members (log), squared	0.016***	0.009*	0.013***	-0.005	0.027**	0.018
	(0.004)	(0.005)	(0.004)	(0.015)	(0.012)	(0.012)
Underwritten	-0.749***	-0.351***	-0.528***			
	(0.055)	(0.076)	(0.057)			
Preservation	0.805***	0.494***	0.545***	0.228*	1.541***	0.854***
	(0.169)	(0.132)	(0.121)	(0.116)	(0.115)	(0.108)
Umbrella	-0.181**	0.028	-0.021	-0.098	0.108	0.040
	(0.072)	(0.064)	(0.053)	(0.190)	(0.083)	(0.086)
Provident	-0.069*	0.037	-0.022	-0.158	0.086	-0.036
	(0.042)	(0.060)	(0.043)	(0.122)	(0.112)	(0.109)
Retirement annuity	0.287	0.275	0.251	-0.140	0.015	-0.052
	(0.234)	(0.209)	(0.194)	(0.429)	(0.596)	(0.522)
Defined benefit	0.283***	0.315***	0.318***	0.145	0.099	0.074
	(0.059)	(0.108)	(0.061)	(0.099)	(0.110)	(0.083)
Hybrid	0.457***	0.344***	0.414***	0.341*	0.211	0.215
	(0.103)	(0.098)	(0.079)	(0.173)	(0.163)	(0.141)
Total assets per member (R10 000s)	0.001**	0.001***	0.001***	0.010***	0.002***	0.004***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Deferred members, percentage	-0.012***	-0.007***	-0.012***	-0.006**	-0.002	-0.003
	(0.001)	(0.002)	(0.001)	(0.003)	(0.005)	(0.004)
Pensioners, percentage	0.006***	0.003*	0.005***	-0.003	0.005***	0.005**
	(0.001)	(0.002)	(0.001)	(0.003)	(0.002)	(0.002)
Beneficiaries, percentage	0.008***	0.006*	0.008***	0.010*	0.011***	0.014***
	(0.003)	(0.003)	(0.002)	(0.005)	(0.003)	(0.003)
Unclaimed benefits, percentage	-0.006*	-0.013***	-0.013***	-0.012**	-0.008***	-0.007***
	(0.003)	(0.001)	(0.001)	(0.006)	(0.002)	(0.002)
Constant	9.434***	9.337***	9.289***	7.929***	10.406***	9.569***
	(0.145)	(0.208)	(0.147)	(0.776)	(0.714)	(0.694)
Number of observations	15,408	14,515	29,923	2,134	2,328	4,462
R-squared	0.691	0.670	0.689	0.747	0.785	0.745

Notes: Sample includes all normal active funds with positive member numbers and administrative expenses. Underwritten funds are included in the sample of all funds in columns (1)–(3). Columns (4)–(6) contain only the 23 year funds and there are no underwritten funds among this sample. All estimates include a full set of year dummies in addition to the variables shown in the table. Clustered standard errors are in parentheses. *** significant at the 1% level, ** at the 5% level, * at the 10% level.

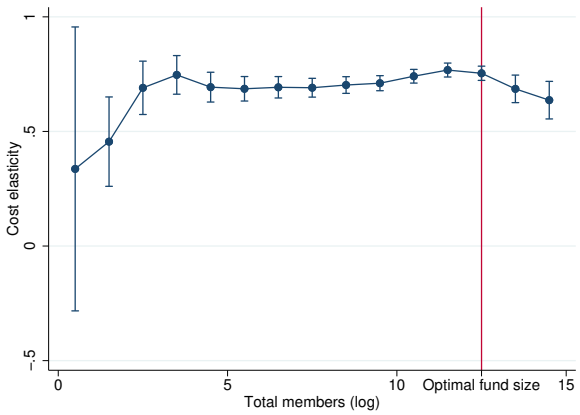
Figure 14 illustrates the estimated cost elasticities from equation (3) with standard error bars. The vertical lines indicate the optimal fund size of 300 000 from the quadratic specification. For 1996–2006, there are no values of ln(total members) above 14. For 2007–2018 and the full sample period, the results shown here confirm that 300 000 is the optimal fund size. The cost elasticity is generally increasing as fund size increases, but starts to decrease past the optimal fund size.

Figure 14: Cost elasticity by fund size 1996–2018

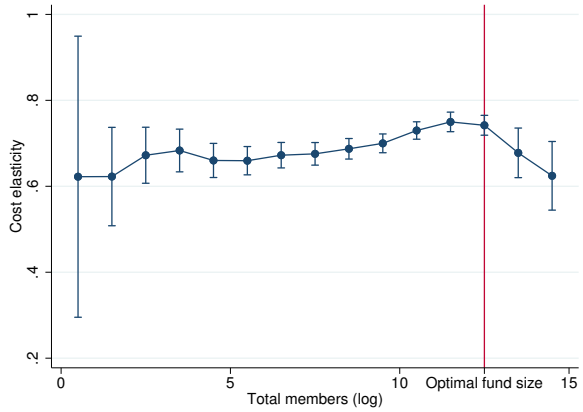
(a) 1996–2006



(b) 2007–2018



(c) All years



Notes: Sample includes all normal active funds with positive member numbers and administrative expenses. Underwritten funds are included.

4.3 Do economies of scale vary with fund characteristics?

The results in Table 1 indicate that there are some differences in administrative costs across the fund characteristics. To test whether economies of scale vary by fund characteristic, we estimate the following specification:

$$\begin{aligned} ln(Cost_{it}) = \beta_0 + \beta_1 ln(Members_{it}) + \sum_{j=1}^{2} \beta_{1j}[ln(Members_{it}) \times Char_j] + \gamma X_{it} \\ + \sum_{j=1}^{2} \gamma_j [X_{it} \times Char_j] + \delta_t + \sum_{j=1}^{2} [\delta_t \times Char_j] + \varepsilon_{it} \end{aligned} \tag{4}$$

where each variable in equation (1) is interacted with a set of indicators for fund characteristics. The three fund characteristics examined are fund subtype, fund class and benefit structure, and $Char_j$ takes on values that reflect the different categories under each characteristic. For example, when examining fund subtype $Char_j$ is a set of dummies that indicate whether a fund is preservation or umbrella (with ordinary as the omitted category). This specification allows us to compare economies of scale across different fund subtypes, classes and benefit structures.

Table 3 gives the results from estimating equation (4) on the sample of all funds over the full sample period. Panel A compares the cost elasticity across fund subtype, Panel B across fund class and Panel C across benefit structure. The estimated cost elasticity is given in column (1).

Panel A of Table 3 reveals that preservation funds are the most efficient funds, followed by umbrella funds, with ordinary funds being the least efficient. There are 30% potential economies of scale for ordinary funds and 24% potential economies of scale for preservation funds. The estimated scale coefficient is not significantly different from 1 for preservation funds (Table 3 Panel A column (2)), indicating that preservation funds are operating at an efficient scale.

Comparing fund classes in Panel B, we see that there are 32% potential economies of scale for pension funds and 25% potential economies of scale for provident funds. However, retirement annuities are operating at an efficient scale since the estimated scale coefficient is not significantly different from 1 (Table 3 Panel B column (2)).

Finally, Panel C indicates that hybrid funds are the most efficient, followed by defined contribution funds, and defined benefit funds are the least efficient. There are 19% potential economies of scale for hybrid funds, 28% for defined contribution funds, and 32% for defined benefit funds. None of the benefit structures are operating at an efficient scale.

Table 3: Economies of scale and fund characteristics

	β_1	t-stat: $\beta_1 = 1$	N
	(1)	(2)	(3)
Panel A: Fund subtype			
Ordinary	0.695***	-23.148***	23,485
	(0.013)		
Preservation	0.990***	-0.305	1,099
	(0.034)		
Umbrella	0.764***	-11.822***	5,339
	(0.020)		
Panel B: Fund class			
Pension	0.683***	-18.550***	15,027
	(0.017)		
Provident	0.754***	-19.437***	14,305
	(0.013)		
Retirement annuities	0.910***	-0.973	591
	(0.092)		
Panel C: Benefit structure			
DB	0.681***	-13.843***	4,295
	(0.023)		
DC	0.722***	-22.724***	24,877
	(0.012)		
Hybrid	0.808***	-6.043***	751
	(0.032)		

Notes: Column (1) gives the estimate of the cost elasticity, β_1, column (2) gives the t-statistic from a test that $\beta_1 = 1$, and column (3) gives the number of observations. Sample includes all normal active funds with positive member numbers and administrative expenses. Underwritten funds are included in all estimates. All estimates include controls for fund subtype, fund class, benefit structure, assets per member, percentage deferred members, percentage pensioners, percentage beneficiaries, percentage unclaimed benefits, and a full set of year dummies. Clustered standard errors are in parentheses. *** significant at the 1% level, ** at the 5% level, * at the 10% level.

This section has revealed that there are differences in efficiency across fund subtype, fund class and benefit structure. In particular, preservation funds and retirement annuities are operating at an efficient scale although these represent the smallest categories of funds in terms of numbers.

4.4 Robustness check: fixed effects specification

One concern with the ordinary least squares (OLS) specification in (1) is that there may be unobserved fund characteristics that affect both fund size and administrative costs, such as organisational structure or operational efficiencies, which would result in bias in the OLS estimation. In order to address these concerns, we estimate the following regression that includes pension fund fixed effects with α_i:

$$ln(Cost_{it}) = \beta_0 + \beta_1 ln(Members_{it}) + \gamma X_{it} + \delta_t + \alpha_i + \varepsilon_{it} \quad (5)$$

where all the other variables are defined as in equation (1), except that the fund fixed effects also absorb fund characteristics that do not vary over time and which appear in the OLS specification – fund subtype dummies (ordinary, preservation or umbrella), fund class dummies (pension, provident or retirement annuity) and benefit structure dummies (defined contribution, defined benefit or hybrid).

The advantage of the fixed effects estimation is that it addresses concerns about omitted variable bias that may be present in the OLS estimation. Further, the fixed effects specification exploits the variation within funds and allows us to estimate the average effect of fund size changes on costs within funds. However, one concern is that the fixed effects specification wipes out the effect of fund size, thereby causing a downward bias in the estimates of economies of scale (Bikker, Steenbeek, and Torracchi 2012).

Table 4 gives the results of estimating the fund fixed effects specification in equation (5) on the sample excluding underwritten funds in columns (1)–(3), and including underwritten funds in columns (4)–(6). The estimated scale coefficients in Table 4 are all smaller than those estimated using OLS in Table 1, which could be due to the downward bias caused by the fund fixed effects mopping up the effect of fund size.

However, the broad conclusions of the main results are confirmed by the fund fixed effects estimation. The scale coefficient is greater over the later period 2007–2018 than over the earlier period 1996–2006, suggesting that funds have become more efficient over time. In all periods and samples, the scale coefficient is statistically significantly different from 1 indicating that retirement funds are not operating at an efficient scale.

Table 4: Estimates of economies of scale using fund fixed effects specification

	Excluding underwritten funds			All funds		
	1996–2006	2007–2018	All years	1996–2006	2007–2018	All years
	(1)	(2)	(3)	(4)	(5)	(6)
Total members (log)	0.592***	0.680***	0.645***	0.587***	0.707***	0.657***
	(0.037)	(0.031)	(0.022)	(0.036)	(0.029)	(0.021)
Total assets per member (R10 000s)	0.000***	0.001***	0.000***	0.000***	0.001***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Deferred members, percentage	-0.004***	-0.009**	-0.007***	-0.004**	-0.008**	-0.006***
	(0.002)	(0.004)	(0.002)	(0.002)	(0.003)	(0.002)
Pensioners, percentage	-0.005***	0.004*	-0.002	-0.005***	0.003	-0.002
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)
Beneficiaries, percentage	0.003	-0.002	-0.000	0.003	-0.001	-0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)
Unclaimed benefits, percentage	-0.006**	-0.010***	-0.010***	-0.006**	-0.011***	-0.011***
	(0.003)	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)
Constant	9.673***	9.392***	9.378***	9.565***	9.189***	9.223***
	(0.214)	(0.209)	(0.144)	(0.204)	(0.194)	(0.134)
t-statistic: $\beta_1 = 1$	-11.143***	-10.352***	-16.120***	-11.396***	-10.050***	-16.365***
Number of observations	13,652	12,853	26,505	15,408	14,515	29,923
R-squared	0.273	0.354	0.321	0.264	0.358	0.319

Notes: Sample includes all normal active funds with positive member numbers and administrative expenses. Columns (1)–(3) exclude underwritten funds while columns (4)–(6) includes them. All estimates include fund fixed effects and a full set of year dummies in addition to the variables shown in the table. Clustered standard errors are in parentheses. *** significant at the 1% level, ** at the 5% level, * at the 10% level.

5 Conclusion

Using administrative data, we have examined the fund design and efficiency of the South African retirement fund industry over the period 1996–2018. Understanding these characteristics is crucial for determining the optimal retirement fund system for the country. Like many other countries, the retirement fund industry in South Africa is dominated by DC funds. Total assets per member have been declining for DB funds, which are now dominated by unclaimed benefits members. We find that South African retirement funds are not operating at an efficient scale. There are strong significant economies of scale present in the industry, with total administrative costs increasing by only 72% when the total number of fund members doubles. Preservation funds and retirement annuities are found to be most efficient and operating at an efficient scale. None of the benefit structures are operating efficiently but hybrid funds are the most efficient.

Despite the risk-sharing benefits of hybrid plans, the retirement fund industry in South Africa is dominated by DC funds. The increasing prominence of DC funds in the South African retirement fund industry means that more funds do not face funding stability concerns, but households bear a greater risk which they may not be equipped to withstand. Determining the appropriate level of risk-sharing between households and other sectors is key to ensuring a well-functioning retirement system.

We find that there has been a significant decrease in assets per member for DB funds, which could reflect decreasing funding ratios in the retirement fund system. However, this cannot be

conclusively stated without data on retirement fund liabilities, and further research is needed in this area. DB funds are now primarily composed of unclaimed benefits members, but they do not appear to be in preservation funds.

These results provide insight into the functioning of the South African retirement fund industry and can inform debates around a national social security system. Further research could examine the nature and evolution of retirement fund liabilities and the optimal level of risk sharing between households and other sectors. Our paper has focused on administrative costs, but future work could determine the effect of investment management fees and its effect on the optimal fund size. The proposed two-pot system will have implications for both households and retirement funds and future research could study this in greater detail.

References

Bikker, J A and De Dreu, J. 2009. 'Operating costs of pension funds: the impact of scale, governance, and plan design'. *Journal of Pension Economics & Finance* 8(1): 63.

Bikker, J A, Steenbeek, O W and Torracchi, F. 2012. 'The impact of scale, complexity, and service quality on the administrative costs of pension funds: a cross-country comparison'. *Journal of Risk and Insurance* 79(2): 477–514.

Blommestein, H J, Kortleve, N and Yermo, J. 2009. 'Evaluating the design of private pension plans: costs and benefits of risk-sharing'. OECD Working Papers on Insurance and Private Pensions.

Boeri, T, Bovenberg, L, Coeure, B and Roberts, A. 2006. 'Dealing with the new giants: rethinking the role of pension funds'. International Center for Monetary and Banking Studies.

Hendrie, S, Smith, A, Hobden, T and Musa, O. 2007. 'Risk benefit provision through provident and pension funds'. Genesis Research Report.

Hesse, M. 2021. 'FSCA proposes a central fund for unclaimed pension benefits'. IOL, 7 September. https://www.iol.co.za/personal-finance/retirement/fsca- proposes-a-central-fund-for-unclaimed-pension-benefits-6d01e6e2-3bdd- 41bc-b1e8-222587b2fbad.

IFC. 2013. 'Promoting sustainable investing in South Africa's $500 billion pension fund market and beyond'. https://www.ifc. org/wps/wcm/connect/topics _ ext _ content/ifc _ external _ corporate _ site/sustainability-at-ifc/publications/sba-project-south-africa-pension-fund.

IMF. 2004. 'Risk management and the pension fund industry'. Global Financial Stability Report No. 2004/004.

National Treasury. 2021. 'Encouraging South African households to save more for retirement'. https://www.treasury.gov.za/comm_media/press/2021/2021121401%20Two-pot%20system%20retirement%20proposal%20and%20auto%20enrolment.pdf

Organisation for Economic Co-operation and Development (OECD). 2011. 'Pensions at a glance 2011: retirement-income systems in OECD and G20 countries'. Paris: OECD Publishing.

Orthofer, A, Du Plessis, S and Reid, M. 2019. 'Private wealth in a developing country: evidence from South Africa'. *Review of Income and Wealth* 65(3): 632–656.

Touna Mama, A, Pillay, N and Fedderke, J W. 2011. 'Economies of scale and pension fund plans: evidence from South Africa'. ERSA Working Paper 214.