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Exit Strategy: Projected Lifetime Returns for Current and Legacy Retirement Schemes in the Australian Defense Force

March 2023

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Prepared for the Naval Postgraduate School, Monterey, CA 93943.

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ABSTRACT

Incentives matter. Retirement savings after a lifetime of service are arguably the single largest windfall that most military members will ever see; yet curiously, estimating their worth as a labor incentive seems distant and obscure. This thesis quantifies Australian military retirement savings in both the legacy-defined benefit scheme (MilitarySuper) and the replacement-defined contribution scheme (ADFSuper). Comparative retirement savings were generated under different financial market conditions and for different rank cohorts.

This research finds that over a lifetime of service, even modest market growth is sufficient for ADFSuper to significantly exceed the maximum returns possible in MilitarySuper. However, the range of possible solutions is wide, albeit dependent only on a few variables. Conversely, MilitarySuper's range of outcomes is narrower, delivering greater certainty to members. However, it is more strongly impacted by factors exogenous to both the employee and the employer. This makes making modeling MilitarySuper more complex and the task of communicating its benefits more difficult. While the benefits of ADFSuper are readily communicable, the scheme does constitute a greater risk exposure for the member but not for the employer. The exact nature of this risk may be poorly understood by members of both schemes. Finally, this thesis postulates the effects that distant and obscure incentives may have on military recruitment and retention.

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TABLE OF CONTENTS

LIST OF FIGURES

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LIST OF TABLES

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LIST OF ACRONYMS AND ABBREVIATIONS

ABS	Australian Bureau of Statistics
ACF	Age Conversion Factor
ADF	Australian Defence Force
AGA	Australian Government Actuary
APSC	Australian Public Service Commission
ASX	Australian Stock Exchange
ATO	Australian Taxation Office
AWOTE	Average Weekly Ordinary Times Earnings
BRS	Blended Retirement System
CPI	Consumer Price Index
CRA	Compulsory Retirement Age
CSC	Commonwealth Superannuation Corporation
DFRDB	Defence Force Retirement and Death Benefits plan
DFRT	Defence Force Remuneration Tribunal
DOD	Depart of Defence (Australia)
DVA	Department of Veterans' Affairs
EBM	Employer Benefit Multiple
FAS	Final Average Salary
FY	Financial Year
MSBS	Military Superannuation Benefits Scheme
MBL	Maximum Benefit Limit
PG	Pay Group
PDS	Product Disclosure Statement
WRA	Workplace Remuneration Agreement
SG	Super Guarantee
YoS	Years of Service

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I. INTRODUCTION

> It is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner, but from the regard to their own self interests.
>
> —Adam Smith, Book1, Chapter 2, *Wealth of Nations*

Military planners can no longer speak only of their own necessities but must communicate the advantages of all aspects of military remuneration if they wish to meet the rising global demand for military labor. In this thesis, I seek to quantify and compare the value of retirement benefits available to serving members of the Australian Defence Forces (ADF). Comparisons are drawn between various ADF cohorts examining the effect of changes in investment market performance and salary upon retirement entitlements. The primary options considered is whether MilitarySuper members would be financially advantaged to switch to ADFSuper or to remain in their current scheme. Features of civilian superannuation schemes are also discussed. Comparisons between the two military schemes will inform retention policies for serving military members. Comparisons with civilian retirement benefits will aid recruitment and military remuneration policies in general. This thesis does not examine organizational costs and benefits of the current retirement schemes; instead, it concentrates on the members' perspective. I compare benefits across MilitarySuper, ADFSuper and generic civilian superannuation as outlined in Figure 1.

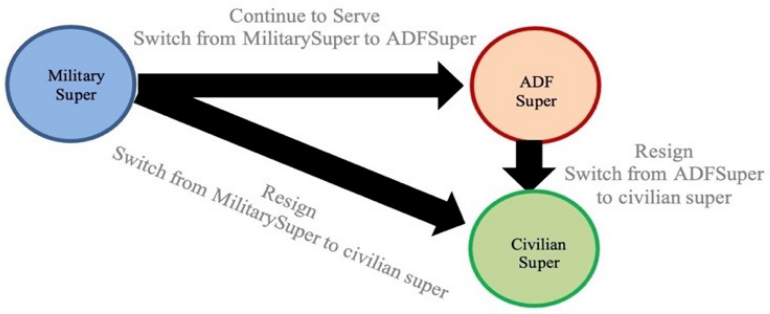

Figure 1. Three possible ADF member retirement strategies

A. WHY THIS TOPIC IS IMPORTANT

There are two undisputable trends projected for global militaries over the next decade. These are an increase in the demand for both personnel and equipment. Globally, western militaries are facing increasing pressures to attract and retain sufficient personnel in order to execute their primary mission sets. To meet the rising complexity of its tasks, the demand for Australian military personnel is projected to grow to over 101,000 in the next two decades (Department of Defence [DOD], 2022a). At the same time governments everywhere are faced with rising funding shortfalls due to demographic challenges that threaten the sustainability of publicly funded retirement schemes (Chai & Kim, 2018). Over the last thirty years the fiscal remedy for both governments and private industry has been to switch from internally funded fixed retirement benefits schemes to ones that offer greater growth potential through the use of external financial investments (Rothman, 2012; BLS, 2012).

The recent introduction in 2017 by U.S. Department of Defense of the Blended Retirement System (BRS) represents a logical step along this journey that combines elements of fixed benefits and market investment options into a hybrid scheme. It is important to note that most of the main features of BRS's hybrid retirement scheme were pioneered in reforms introduced as early as 1991 by the ADF when it introduced the Military Superannuation and Benefits Scheme (MSBS). MSBS has since been renamed MilitarySuper. In 2016 the ADF implemented the next logical progression in retirement reform and switched to an almost entirely market-based solution called ADFSuper.

I think that it will be illuminating for readers globally to see a demonstration of the quantifiable aspects of these changes as viewed from the perspective of Australian military members.

B. PROBLEM DEFINITION

My hypothesis is that estimating future retirement values is incredibly obscure and the benefits for the decision maker seem distant. The range of possible outcomes,

the "solution space," is too diverse and too sensitive to initial conditions to be informative.

The two of the largest factors affecting retirement returns are future salary and market performance, and both are largely outside a member's control. Risks like salary variation and fluctuating market returns are known variables that can be estimated, given enough effort. However, many of the variables affecting the value of retirement incomes are entirely exogenous and uncertain. These are unknown not only to the member as the employee, but also to the employer. Examples of these kinds of uncertainties include lifespan, future disability, inflation, and changes to government policy. The structural features built into military retirement schemes vary in their responses to emerging conditions and shocks, and as a result, the two Australian military superannuation schemes, MilitarySuper and ADFSuper monetize the passage of time very differently.

Due to the complexities involved, decisions about retirement investments when made early in a career may be based on nothing more than a few financial truisms. Only as variables begin to crystalize with the passage of time does the solution space shrink sufficiently for informative modelling to occur. Consequently, accurate retirement predictions cannot not feature in young recruits' thinking in any truly informed way, despite the potentially huge sums involved. This also means that efforts to leverage the benefits of ADF retirement entitlements may be better suited towards retention of senior personnel rather than recruitment.

C. RESEARCH OBJECTIVE

The research objective is to quantify the effects of changes in financial market performance and salary on retirement incomes for members of MilitarySuper and ADFSuper. The results can be seen in Figures 2, 3, 4 and 6.

D. SCOPE AND LIMITATIONS

Australian superannuation is extremely complex. In order to constrain the possible solution space the following limitations have been assumed.

- This is not a cost benefits analysis from the government's perspective. This paper is restricted to the members' financial perspective only.
- Complex salary arrangements will not be considered. Amongst the exclusions that will affect the validity of results are, leave without pay, foreign service, pre-1999 contributions, spousal contributions, income garnishing or other family law rulings, Reserve duty, leaving and rejoining the ADF.
- Complex superannuation taxation strategies will not be considered.
- The opportunity cost of alternative lump sum re-investment by retiring members will not be considered.
- The assumed preservation age will be 60. Exemptions for members eligible for preservation ages below 60, i.e., those born after 01 July 1964, will not be considered.
- All government welfare interactions will be excluded, such as co-contributions, low-income contributions, and the Age Pension.
- No comparison to actual civilian market products will be made. Only the generic provisions mandated by law will be considered when describing civilian options.
- Comparison to other national military retirement schemes such as the Blended Retirement System will not be considered.
- Death and disability provisions will only be covered briefly.
- Numerical assumptions such as the size of wage rises, speed of promotion or CPI will be explicitly defined for each comparison made.

E. SUMMARY OF RESULTS

The main findings of this thesis are:

- Accurately modelling military retirement returns relies on conditions that are distant and obscure. Marketing the benefits of military superannuation will be difficult if it is to be truthful and the level of financial literacy required is high.
- MilitarySuper is closed to new members and therefore can only play a role in retention and not in recruitment.
- ADFSuper is a market-based accumulation fund while MilitarySuper is a hybrid of market accumulation and defined benefit. Accumulation funds are easier to model and therefor easier to understand and market to members.
- ADFSuper will outperform MilitarySuper even at modest levels of market growth. However, ADFSuper does constitute a greater exposure to risk while MilitarySuper delivers greater certainty to members.
- Final retirement returns in MilitarySuper are career path independent. A late promotion in the last three years of service will deliver the same returns as a member with longer service at the same rank and pay grade.
- The unit price mechanism involved in the fortnightly retirement purchases made by members operates in the same way as stock prices. These prices are path independent and only the price at withdrawal matters. ADFSuper members have a greater exposure to this form of risk.
- MilitarySuper has Maximum Benefit Limits while ADFSuper does not. These limits represent discontinuities when modelling defined benefit returns. Their effect varies according to factors exogenous to the employer and employee. Small changes in timing can produce very different outcomes even for members that appear otherwise similar.

- The effects of taxation on final returns are too complex to be generalizable and threaten to undo most projections. Broadly speaking however, excessive entitlements will be capped or heavily taxed.
- The competitive advantage that the currently higher employer contribution rates in ADFSuper offer over civilian superannuation employer contribution (16.4% vs. 9.5%) is being eroded annually by 0.5% as increases in the national Super Guarantee climb to 12.5% in 2025.
- Civilian employment will have to offer ~50% higher salaries to produce the same retirement income as ADFSuper. This differential will fall to ~30% by 2025.
- There are no major differences between MilitarySuper and ADFSuper with regard to death and disability entitlements. This is a deliberate design feature in order to remove uncertainty for ADF service personnel during times of tragedy, regardless of their choice of retirement scheme. Both schemes offer these befits as defined benefits only.
- There are no major differences between MilitarySuper and ADFSuper with respect to fees and costs.
- Both MilitarySuper and ADFSuper can be described as generous by civilian standards.
- A novel method for increasing ADF retention through the purchase of Chapter V.

The next section introduces key aspects of Australian superannuation in order to contextualize the assumptions underpinning the methodologies in Section III. Section III explains the mathematics of how models were constructed. Sections IV presents the results of three models. The first model examines retirement fund returns with changes in market performance, which is an examination of one form of risk. The

second model examines how outcomes change with salary. This is an examination of one form of uncertainty, namely rank progression. The final model dispenses with risk and uncertainty and instead it is a retrospective analysis of what would have happened if a MilitarySuper member had switched to ADFSuper on the day of its inception. Section V will summarize these effects and postulate some consequences for ADF recruitment and retention. Throughout this paper, most relevant calculations are in the appendices.

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II. BACKGROUND

A. INSTITUTIONAL BACKGROUND

In 1991 the *Military Superannuation and Benefits Act* established the Military Superannuation and Benefits Scheme (MSBS) exclusively available to serving members of the ADF. MSBS replaced an earlier retirement scheme called the Defence Force Retirement and Death Benefits (DFRDB) plan which operated from 1972 until it was closed to new members in 1991. MSBS has since been renamed MilitarySuper. On 01 July 2016, following the introduction of the *Australian Defense Force Superannuation Act 2015*, the Australian Defence Force also closed MilitarySuper to new entrants. Today, new ADF recruits are offered membership in a scheme called ADFSuper although they are not obliged to enroll and can continue in their existing fund if they have one. Both MilitarySuper and ADFSuper are managed by the same organization, the Commonwealth[1] Superannuation Corporation (CSC). MilitarySuper continues to operate for members that have chosen not to switch to ADFSuper just as DFRDB continued to operate for those members who chose not to switch to MSBS in 1991. As of 2020, DFRDB had 987 remaining contributors, MilitarySuper 40,968 still serving and contributing members and the new ADFSuper scheme had risen to 18,569 (Commonwealth Superannuation Corporation [CSC], 2022a; CSC, 2021a). To place these figures into context, in 2022 the ADF consisted of 59,803 full-time personnel (DOD, 2022a).[2] Full figures are available in Appendix A. I will not compare the benefits of DFRDB because of the small number of remaining contributors and because elections to switch schemes closed for them one year after MilitarySuper's inception in 1991.

B. RETIREMENT SCHEME STRUCTURES

The primary function of retirement schemes is to provide members with income after they retire from the workforce. In addition, military retirement schemes also provide

[1] In this paper the employer will for ADF personnel, be variously referred to as the Commonwealth, the Department of Defence , the ADF or simply "the employer."

[2] 15,442 (Navy), 29,321 (Army) and 15,040 (Air Force) and 21,229 (Active Reserve serving) (DOD, 2022)

death and disability benefits. Both MilitarySuper and ADFSuper provide death and disability coverage while civilian superannuation schemes do not necessarily include such coverage. For civilian superannuation, if death and disability provisions are included then typically additional contributions or fees must be paid by the member. I will focus primarily on comparing retirement incomes only. An in-depth analysis of the value of death and disability schemes across military and civilian employment is not feasible due to the vast array of commercial insurance products available. However, I will include a brief outline of death and disability benefits available in MilitarySuper and ADFSuper because their automatic inclusion in MilitarySuper and ADFSuper is a major point of distinction pertinent to serving military members.[3]

There are nine fundamental ways in which superannuation funds in Australia can differ from one another. These include, *inter alia,* the funding structure of the fund, the methods for calculating employer and employee contributions and various conditions regarding how and when payments can be received such a lump sum, pension and death and disability payments etc. Each of these nine areas will be described more fully in the remainder of Chapter II, with further detail provided in the supporting appendices. A summary of the major differences between MilitarySuper, ADFSuper and a generic civilian alternative is given in Table 1.

[3] Summaries of the main differences between MilitarySuper and ADFSuper can be made by comparing the two product disclosure statements available at (CSC, 2022c) and (CSC, 2022m).

Table 1. Features of MilitarySuper, ADFSuper and civilian superannuation. Adapted from CSC (2022c) and CSC (2022m).

	MilitarySuper	ADFSuper	Generic Civilian Super
Type	Hybrid Defined Benefit (employer) and Accumulation fund (employee)	Accumulation fund only for both employer and employee contributions	Accumulation fund only for both employer and employee contributions
Employer Contribution	0-7 years 18% FAS 7-20 years 23% FAS 20 years to MBL 28% FAS Final Average Salary (FAS) calculated at and dependent on transition/preservation age	16.4% of on-going Salary	10.5% of on-going Salary Rising to 12% by 2025
Employee Contribution	Mandatory Minimum 5% Maximum 10%	Voluntary Can be greater than 10%. Maximum contributions depend on taxation law	Voluntary Can be greater than 10%. Maximum contributions depend on taxation law
Lump Sum	Yes, 55 at the earliest	Yes, 60 at the earliest	Yes, 60 at the earliest
Pension	Yes, 55 at the earliest	No	Custom annuity options are available but not included in comparison
Limits on Growth	Maximum Benefit Limits Apply	Nil	Nil
Portable	No	Yes	Yes
Decision Date	Must make a choice by 65. Take lump sum or pension or roll-over to another superannuation fund	Can remain in fund indefinitely with partial withdrawal possible	Can remain in fund indefinitely with partial withdrawal possible
Death and Disability Cover	Yes – Defined Benefit	Yes – Defined Benefit, Very similar to MilitarySuper but small differences exist	Custom Insurance Cover Will incur additional costs
Indexation	Resign early – Employer contributions at CPI until preservation age Pension if taken – CPI for life	Resign Early- market performance until maturity Nil pension option	Resign Early- market performance until maturity Nil pension option
Investment Options	For member contributions only N/A for employer contributions Cash Income Focused Balanced Aggressive	On both employer and member contributions Cash Income Focused Balanced Aggressive Very similar to MilitarySuper but small differences exist	On both employer and member contributions Custom risk profiles for each fund but will be broadly similar in nature to CSC
Fees and Costs	No administrative or switching fees.	Monthly administration fee two free investment switches per year.	Depends on Fund can be exorbitant but with legislative protections

1. Defined Benefit vs. Accumulation Schemes

The biggest structural difference between types of Australian retirement funds is the distinction between defined benefit and accumulation funds. In a defined benefit arrangement, employees are promised a defined amount based on some pre-determined formula that typically interacts some measure of productivity such as Years of Service (YoS) with a member's age and income at or around retirement. Each defined benefit scheme will have its own formula for calculating the final amounts paid to retirees, as well as rules around how payments are to be made over time and for how long. Defined benefits schemes distinguish themselves from other types of retirement schemes by providing an exact and stable range of possible outcomes to its members and represents a reduction in uncertainty for their members.

Accumulation funds on the other hand, as the name suggests, are funds that accumulate over time. In accumulation funds, employers and frequently employees as well, make continuous fixed contributions over the lifetime of the employee's employment. For this reason, accumulation funds are also called defined contribution funds. These contributions are invested by the retirement fund managers into various market traded financial instruments, such as equities and bonds. Unlike defined benefit funds, these accumulated investments can increase or decrease with market conditions and so carry with them an increased level of risk.

This distinction between defined benefit and accumulation funds leads to a crucial difference between how such funds meet their projected financial obligations. In theory defined benefits schemes, at least for government operated public sector schemes, can be wholly unfunded. Potentially no actual monies are put aside by the Commonwealth until the employee retires, unlike accumulation funds which must be fully funded. The continued use of unfunded retirement provisions can lead to uncertainty in calls upon on the national budget when future retirement liabilities are eventually met.[4] In terms of retirement income provisions, a particular feature of MilitarySuper is that it is a hybrid

[4] In 2006 the Australian government created the sovereign-wealth Future Fund in order to offset some of these government employee retirement and other welfare liabilities. However, because the assets of the Future Fund are not reserved or even apportioned for CSC retirement liability purposes, MilitarySuper and DFRDB should be considered as unfunded (AGA, 2020)

scheme that contains both a largely unfunded defined benefit portion as well as a fully funded accumulation portion. Retirement provisions in ADFSuper and civilian schemes are on the other hand fully funded.[5] There is also one added complication that should be pointed out. In MilitarySuper (only) there is a small, fully funded employer component called the "Productivity Benefit" which will be discussed after a few other terms are introduced.[6]

It should also be noted, that both MilitarySuper and ADFSuper also provide death and disability coverage through unfunded defined benefit methods. This choice of mechanism provides military members an assured level of coverage and reduced uncertainty during times of tragedy, at the cost of increasing uncertainty for the Commonwealth's future liabilities. The next most visible difference between MilitarySuper, ADFSuper and generic civilian superannuation is that different schemes have different employer and employee contribution rates.

2. Employer, Employee and Super Guarantee Contributions

Employer Contributions. All superannuation schemes in Australia require the employer to make mandatory contributions on behalf of their employees. The *Superannuation Act, 1992* which covers all Australian retirement funds, sets a minimum level of employer contribution, called the Super Guarantee (SG). This is a national figure that all employers must meet. It is currently set at 10.5% of the annual employee wages and must be paid into a regulated retirement fund on top of the employee's salary. This minimum employer contribution figure will rise by 0.5% every year to level out at 12% by July 2025 (ATO, 2022a). MilitarySuper is arguably exempted from the strict

[5] The topic of funding is only included here to introduce the terminology and to provide a partial insight into the motivation of governments to switch from defined benefit to accumulation schemes. Greater detail of the budgetary implications of these two approaches is available at (AGA, 2020), (AGA, 2017) and (AGA, 2014).

[6] In MilitarySuper the actual funding arrangement between the DOD, CSC and the Commonwealth is complex, but it involves a small on-going payment (3% of salary) for each ADF employee paid by the formal employer, the DOD to CSC. This is called the Productivity Benefit or Productivity Contribution. These payments are held by CSC until the member retires and are then returned to the Commonwealth as part of Consolidated Revenue (which is the federal pool consisting of federally collected taxes and royalties). Actual retirement benefits paid to the member then come from Consolidated Revenue which can be considered as an inexhaustible supply. (AGA, 2020) The existence of this productivity contribution greatly complicates accurate modelling of final post tax retirement returns for MilitarySuper members.

requirement for such minimum 10.5% employer contributions because as an unfunded defined benefit scheme, no actual monies are deposited by the Commonwealth.[7] Instead, in MilitarySuper a baseline figure for the total owed by the Commonwealth in employer-like contributions is calculated only when the member separates from the ADF. The growth of this entitlement obligation is then frozen and adjusted for inflation in a process called "preservation." For ADFSuper and civilian superannuation, all employer contributions are preserved until the individual reaches at age 60 or greater and paid as a lump sum.[8]

MilitarySuper meets the intent of the national Super Guarantee in that its provision are underwritten and therefore "guaranteed" by the Commonwealth and are in fact more generous than 10.5%.[9] A simplified summary of MilitarySuper employer-like contributions is that each of the first seven YoS is awarded a multiplier of 0.18. This multiplier then rises to 0.23 for 7–20 YoS and to 0.28 for more than 20 YoS. When the member separates from the ADF, all employer contributions cease and the multiples for each year served are summed to yield a what called the Employer Benefit Multiple (EBM). This multiple is then multiplied with the member's Final Average Salary (FAS) taken over the preceding 3 years (1095 days). This defines the total size of the employer contribution at the time of separation.

For example, assuming a member serves for 28 years and has a salary, when averaged over their final three years of $170,00, the EBM would be 6.49. An example is provided in Table 2. The total employer contribution owed to the member is then FAS

[7] A small exception is the 3% Productivity Benefit.

[8] However, unlike all other schemes considered here, MilitarySuper does allow employer contributions to be paid to members as early as age 55, so long as they are taken as a pension and not a lump sum.

[9] Recent changes to MilitarySuper have also devised a new set of calculations to compare whether in any given financial year, a member's employer contribution technically falls below what would have been paid to them as a civilian, namely that the full financial year (FY) employer contributions must equal or exceed 10.5%). There is a complex set of calculations to determine this amount because of the way in which (historically) military pay was divided into salary and allowances. Most of these have been simplified with recent changes to the ADF wage structure that rolled a large part of military pay and allowances into a single salary for superannuation purposes. The nature of SG top-up payments is too complex to be generalizable and will be ignored for the purpose of this paper, but it does go some way in leveling the benefits between MilitarySuper, ADFSuper and civilian employment when occasional shortfalls do occur. It is unlikely that this obscure quirk of the military's superannuation system will even be considered by anyone other than superannuation professionals.

times EMB or in this case $1,103,300. This figure is "frozen" [10] as the employer contribution baseline which is then indexed until the date it is eventually paid at which point it is also taxed. An important qualitative distinction for MilitarySuper members is that this employer contribution, at least in gross pre-tax terms will never decrease nominally from the baseline for the member once they have separated. Hence the name "defined benefit."

Table 2. MilitarySuper Employer Benefit Multiple (EBM) example. Adapted from CSC (2011).

YoS	**Employer Benefit Multiple**
0-7 Years	0.18
7-20 Years	0.23
20+ Years	0.28
Example: After 28 Years of Service If FAS= $170,000 Final Defined Benefit = FAS * EBM	7 x 0.18 = 1.26 13 x 0.23 = 2.99 8 x 0.28 = 2.24 Total Multiple = 6.49 (EBM)Total Employer Contribution = 6.49 x $170,000 = $ 1,103,300

Final Average Salary. A major difference between MilitarySuper and all accumulation schemes is that MilitarySuper's employer-like contributions are not calculated using ongoing salaries as they are earned. Rather they are a function of their FAS. Thus, for MilitarySuper members, their final entitlement is not related to a member's accumulated pay nor their time in rank. This means employer entitlements can be viewed as career path independent. Any financial penalties of slow career progression

[10] Technically this "freezing" occurs when employer contributions cease. It is then re-calculated in further complex calculations when funds begin to be drawn by the member. Employer contributions most frequently cease when a member separates due to resignation, discharge, compulsory age-based retirement, disability or death. However, in MilitarySuper contributions can cease earlier when if one of two Maximum Benefit Limits (MBL) is reached. MBLs will be examined in much greater detail.

can potentially be ameliorated by some final late promotion, provided it occurs in the last three years of a member's career.[11]

In terms of employer contributions, ADFSuper and civilian superannuation use the same methodology. Employer contributions are calculated and accumulated as fixed percentages of employee salaries on an ongoing basis. ADFSuper however is more generous, collecting 16.4% employer contributions for its members which is above the minimum mandated 10.5% Super Guarantee applicable to all civilian superannuation. Again, it follows that unlike MilitarySuper members, for ADFSuper and civilian superannuation members, their final employer entitlements are not independent of their career-path. The final value of retirement funds is entirely dependent on the duration, frequency and number of rank/pay rises experienced. Crucially, these valuations also depend on the exact timing of when CSC investments are made. More specifically the value depends on the difference between the initial purchase price and the final selling price of those investments whenever the member chooses to draw their funds. This fact alone, sufficiently demonstrates how the passage of time is monetized very differently in different funds.

Productivity Employer Contributions. Variously called Productivity Benefit or Productivity Contributions. This is a sub-set of employer contributions and applies only to MilitarySuper. This benefit is particularly confusing because unlike the bulk of MilitarySuper employer obligations which are unfunded and calculated at the time of retirement, this benefit is paid on an on-going basis by the employer, the Australian Department of Defense (DOD) to the superannuation fund CSC. CSC invests these contributions into the same investment instruments available to CSC superannuation members.[12] Eventually, when total employer entitlements are finalized, these investments and their market earning are paid back to the Commonwealth Government

[11] It may help readers to think of "path independence" in the same way that an object's gravitational potential is determined only by an object's final height above the earth's center and not the path it took to get there. The mathematical concept here is that of a line integral. The concept of path independence will be re-visited further in this paper.

[12] Employer productivity contributions however cannot be managed by members in the same way as they can manage their own contributions. Productivity contributions must remain in the default "balanced" risk portfolio. An explanation of risk levels in CSC investments is provide in Appendices H1 and H2.

who, in turn, ultimately pays MilitarySuper's defined benefit obligations from Consolidated Revenue.

Ultimately, productivity contributions must be equivalent to 3% of the wages for a given pay period and consequently will vary as salary changes. This final aggregate is then subtracted from the final employer obligation amount (FAS x EBM) prior to any indexation that may occur between resignation and receipt of retirement benefits. To reiterate, it is not paid in addition to employer total employer contribution, it is a subtraction; despite what the name suggests. A more complete description of this form of employer contribution is included in Appendix B where it will be shown that productivity benefits can introduce considerable variation in outcomes when modeling final returns. This is because, not only do they change in value on the market, but they also incur different tax obligations for the member upon retirement.[13]

Employee Contributions. Other than employer contributions, the other source of retirement savings is contributions made by the employee. Nationally all employee contributions are based on an accumulation-type structure. The biggest difference between schemes is that in MilitarySuper employees must contribute a minimum of 5% of salary while in ADFSuper, as with ordinary civilian superannuation, such member contributions are voluntary.[14] In MilitarySuper these employee contributions can only be increased in 1% increments up to 10% and are paid automatically from post-tax earnings through payroll. That is to say, the employee pays income tax on these contributions before they are diverted to individual member retirement accounts. The result is that upon maturity, these employee contributions are not taxed again.

By comparison, in ADFSuper and civilian superannuation, all employee contributions are voluntary. These and can be made pre- or post-tax. Greater detail on the taxation of superannuation contributions is provided in Appendix C. A simple summary

[13] This complication is only pertinent for MilitarySuper members that elect to take a lump sum instead of a pension.

[14] The MilitarySuper 5% employee contribution minimum is reminiscent of the 5.5% mandatory contribution required by the previous DFRDB scheme. The similarity was presumably chosen to ease with the transition from DFRDB to MilitarySuper. Incentives for ADFSuper and civilian superannuation members to make voluntary contributions are provided through lower taxation, and for low-income earners through additional government co-contributions (CSC, 2022b) and (ATO, 2022b).

of retirement tax obligations is that if tax was not paid prior to the contribution being diverted to the fund, then additional tax will be due upon maturity. The fact that taxation regimes on superannuation deposits can and do change with the government of the day represents another level of uncertainty in any attempt to predict the final value of any accumulation fund. For the purposes of this comparison, because of the mandatory member contribution requirement in MilitarySuper, I will assume the same 5% employee contributions are made in each scheme.[15] Furthermore, because of the large range of possible tax outcomes, this paper will only compare lump sum returns prior to any required tax adjustments.[16]

Ancillary Contributions. The final form of contributions is called ancillary and will be described further in Appendix D. This is a group term for six different types of additional welfare, employer or member contributions that are accepted by superannuation funds. I will not model any forms of ancillary contributions.

Table 3 provides a summary of the main features of Australian military and civilian superannuation.

[15] All MilitarySuper contributions are made after tax. ADFSuper and civilian superannuation members can choose whether to make pre-tax contributions called "salary sacrificing" or post-tax contributions which are called additional "Personal Contributions." Either way, if tax was not levied on monies entering the fund, they will be taxed on the way out. More detail is available at (ATO, 2019a) and (ATO, 2022c).

[16] I do not have access to the chosen percentages nor taxation methods of voluntary superannuation payments made in ADFSuper. However, without this assumption no comparison can be made. This 5% figure is a reasonable enough for most military service personnel who, without access to a large accumulation of savings (i.e., hundreds of thousands of dollars) will mostly select some form of prudent and simple, regular on-going contribution made through the payroll system. That is if they chose to make any contributions at all. However, the exact manner in which advantageous contributions could be made will be a recurring matter for consideration for ADF members of dual high-income households, as well as very low-income households or where one partner may have no superannuation at all: and in cases of significant windfalls or inheritances.

Table 3. Various types of superannuation contributions. Adapted from CSC (2022c) and CSC (2022m).

	MilitarySuper	ADFSuper	Generic Civilian Super
Employer Contribution	**YoS** **Employer Benefit Multiple (EBM)** 0-7 years 0.18 x FAS 7-20 years 0.23 x FAS 20 years to MBL 0.28 x FAS Final Average Salary of last 3 years served. Final entitlement is the (sum of EBM) x FAS	16.4% of on-going salary	10.5% of on-going salary Rising to 12% by 2025
Productivity Benefit	3% of salary paid by employer to CSC This is not paid on top of the above entitlement. It is just the funded part used to defray final costs for the Commonwealth when member retires Does not increase member's final gross entitlement but will complicate net take-home calculations for lump sum recipients.	Not applicable	Not applicable
Employee Contribution	Mandatory Minimum 5% Maximum 10%	Voluntary No maximum but with significant tax implications	Voluntary No maximum but with significant tax implications
Ancillary Contributions	Not considered But Productivity Benefits will count toward individual annual contribution caps and therefore a member's tax benefit/liability. This complication applies only to MilitarySuper members	Not considered	Not considered

3. Lump Sum, Pension, and Income Streams

One of the biggest differences between defined benefit and accumulation schemes is the strength of the distinction made between the contributions collected from the employer vs. those from the employee. Further detail is provided in the following section, but in simple terms, because of the mixture of both funded and unfunded sources in MilitarySuper, this scheme has very strong distinctions between employee and employer contributions. ADFSuper and civilian schemes do not. MilitarySuper members must take their employee contributions as a single lump sum, but they have the option of taking their employer portion as a lump sum, a life-long pension or a mix of the two so long as a

minimum of 50% of the employer contribution is taken as a pension. Different age restrictions also apply depending on the choice made. While there are exceptions to the rules regarding preservation age that arose from the history of legislative changes, for the purposes of this paper, that preservation age is 60.[17]

Furthermore, MilitarySuper members can only ever make this decision once and must do so at very particular points in the retirement process. On the other hand, ADFSuper and civilian superannuation do not make a strong distinction whether funds originally came from employers or from members. In ADFSuper and in civilian superannuation, both sources are combined into a single invested portfolio and members are free to decide what fraction to retain in the fund and what fraction they wish to take as a lump sum. In a sperate process, they can also derive regular income streams from these funds, so long as withdrawals do not out-pace the fund's continued performance.

Eligibility to drawn upon employee contributions. In MilitarySuper, ADFSuper and civilian superannuation, a member's own accumulated contributions must be retained in a regulated superannuation fund until such time as the member becomes eligible to draw upon this portion of their entitlement. The act of retaining these funds is called "preservation" and the earliest age any member of any scheme can draw on such funds is their preservation age. The preservation age for MilitarySuper and ADFSuper as well as all civilian superannuation schemes is 60. This means that all preserved employee contributions will continue to perform in line with their respective fund until age 60, no matter at what age the member chooses to separate from the ADF.

Crucially however, for MilitarySuper members these employee accumulations must be withdrawn from CSC before their 65th birthday. This withdrawal of employee contributions can take the form of a lump sum, or they can be rolled over (as a lump sum) into a civilian superannuation fund of their choosing. By contrast, for ADFSuper and civilian superannuation members there is no upper age limit and funds can continue to be invested with CSC indefinitely.

[17] This is acceptable because the remaining ADF members who would be allowed a lower preservation age are those born before 01 July 1964, and the number of ADF members over the age of 58 today is small.

Eligibility to drawn upon employer contributions.[18] In all superannuation schemes, employer contributions are in the first instance calculated as a lump sum entitlement. MilitarySuper members have the option of converting this lump sum into a life-long pension or a mix of the two. MilitarySuper members must however make an irrevocable choice as to how they wish to receive their employer benefits. Different taxation formulas apply depending on the exact division between lump sum and pension, the age of the member at the time the policy is paid out, as well as what fraction of the combined employee and employer sums were already taxed prior to being submitted to CSC. Once again, determining the exact tax implication of from the range of possible options is not generalizable and will not be attempted.

Although tax considerations will inevitably change the final value of benefits derived by the member, a simple distinction between the MilitarySuper and ADFSuper, as well as between MilitarySuper and all civilian accumulation schemes is the ability to receive a life-long pension. MilitarySuper pensions in fact continue until the death of the member's spouse, albeit at a lower rate (67%). This open-ended arrangement is the reason why the Commonwealth cannot nominate the exact liability incurred by each MilitarySuper pension policy.

While the Commonwealth may not be able to price the exact cost of each MilitarySuper pension, members on the other hand can generate very accurate estimates of pre-tax pension entitlements. This certainty is a major consideration when balancing risk and uncertainty for the member. The pension formula depends (broadly speaking) only on the EMB x FAS employer contribution, which is frozen at the time of separation and indexed for CPI until payments begin.[19] A member's starting pension is this amount divided by an Age Conversion Factor (ACF) which is determined by the age of the member at the start of their pension (not the age at separation). Appendix E, Table 13 lists all applicable ACFs.

[18] A visual summary of MilitarySuper preserved benefits is available at (CSC, 2022n)

[19] The existence of Maximum Benefit Limits in MilitarySuper technically invalidates this statement as the timing of when an MBLs was crossed in a member's career will alter the final employer entitlement paid.

An example pension calculation is provided here:

> *A member retires on their birthday at age 57 after 28 YOS and a FAS of $170,000. They elect to delay their pension until they are 59. Their EMB is 6.49 and their employer contributions total $1,103,300. This is indexed at a rate equivalent to 2% pa for the two years until the pension starts at age 59. Their ACF at age 59 is 11.2. Therefore, their pre-tax pension (down to the penny) in the first year before any further CPI indexation is applied will be*:

$$\frac{(\$170{,}000 \times 6.49)\ 1.02^2}{11.2} = \$\ 102{,}488.68 \quad per\ annum,\ \ CPI\ indexed\ for\ life. \ (Eq\ 1)$$

The availability of an open-ended pension in MilitarySuper should be one of the simplest mathematical distinctions when comparing the value of any two retirement schemes, however this simplification is quickly undone. The joint effect of a discount rate (inflation), the opportunity cost of not taking a lump sum as well as the manner in which pensions are indexed once payments begin will move the point of equivalence between pensions and lump sums forwards or backwards in time.[20]

The difficulty for the decision maker rests of course on the horns of the age-old dilemma of choosing between the certainty of the present and weighing it against the uncertainties of the future. To aid with this, a rough approximation of the break-even point when pensions will outweigh lump sums is 11 to 13 years after choosing to take the pension over the lump sum.[21] This observation is also likely to be one of the most readily discoverable to anyone attempting to model the differences between a pension and a lump sum option. In this this paper, my calculations will only focus on differences in lump sum values. Some minimal analysis of the pension option is included, but it suffices to say, baring hyperinflation, there will always be a point, if the member lives long enough, at which the future-value of aggregated pension payments will outweigh the value of the initial lump sum that generated them.

[20] Comparing the opportunity costs of not taking the lump sum will not be attempted. The range of possible outcomes is large as it depends on CSC's applied rate of CPI as well as the market performance of the lump sum's re-investment strategy. It will also vary greatly depending on several other factors such as expected annual draw-down rate for the retiree which determines the remaining annual balance of the lump sum and consequently also its tax liability, which may also include any decision to supplement future income by re-starting employment, even at a minimal level.

[21] As a rule of thumb, it is the relevant ACF figure expressed in years adjusted for any indexations applied.

4. Maximum Benefit Limits

MBLs apply only to MilitarySuper and not to ADFSuper in any way. This represents a major difference between the two types of structure. Importantly, MBLs apply to the sum of the value of the employee plus the employer contributions, at any point in time, and not just the employer contributions as might have been wrongly assumed. This cap in entitlements however applies only to MilitarySuper and not to ADFSuper or other civilian accumulation funds. Thus, MBLs only affect the decision to switch from MilitarySuper to ADFSuper or a civilian accumulation fund and not the decision to switch from ADFSuper to civilian employment. For new ADF recruits who are already enrolled in ADFSuper without these limits, MBLs are entirely moot.

In MilitarySuper, the Commonwealth is faced with a two-fold open-ended liability. Firstly, the use of the (FAS x EBM) or (FAS x EMB)/ACF formulas means that the potential range of liabilities for the Commonwealth can be very large. For example, notional pension entitlements will escalate quickly near the tail end of a member's service as the numerator in equation 1 continues to increase with FAS and EBM, while the denominator decreases with age. Secondly, the existence of the pension-for-life option in MilitarySuper represents another open-ended dimension to this undefined liability because for any given case, the Commonwealth does not know how long that member and their spouse will live. As a consequence, the Commonwealth seeks to cap this risk by imposing a Maximum Benefit Limit on the total value of a member's entitlement.[22]

MBLs also come in two forms, either a lump sum MBL or a pension MBL. Lump sum limits are lower than the pension limit and will be reached first by the member as the value of their total benefit grows. MBLs are also defined in absolute nominal dollar terms and are derived as multiples of FAS. Table 4 shows one example of a MBL for a single range of FAS from $133,411 to $247,480. The full list of MBLs is listed in Appendix F.

[22] The concept was derived from an earlier national pension and taxation practices that existed until 2007 called Reasonable Benefit Limits (ATO, 2022d)

Table 4. MBLs for one exemplar range of FAS in FY 2022–23. Adapted from CSC (2022j).

Final Average Salary	Lump Sum MBL FY 22–23	Pension MBL FY 22–23
$133,411 to $247,480	$266,820 plus FAS x 6	$400,230 plus FAS x 7

Three important features should be noted. Firstly, there is considerable confusion with the nomenclature. Even though these two limits refer to the terms "lump sum" and "pension," crossing an MBL threshold does not reduce a member's choice whether to receive a lump sum or a pension. While a member will always reach the lump sum MBL first, that does not mean they are reached any maximum lump sum payout value. Instead, the lump sum MBL marks the first time when a member may choose to stop making member contributions. Employer contributions will continue until the pension MBL is reached, at which point all contributions from members and employers must cease.[23] Members however retain the right to be paid in a lump sum or a pension no matter if they have exceeded either MBL. These limits do not limit the payment options, they only limit the amount of money going into the fund, and the way in which additional entitlements are calculated. It has nothing to do with the final choice of payout method.

The second point is that MBLs are re-calculated at the start of each new Australian Financial Year (FY), on 01 July every year. They are adjusted in line with changes in national Average Weekly Ordinary Time Earnings (AWOTE) and are thus independent of market performance and also entirely exogenous to the member and the ADF.[24] Thirdly, once a limit is reached it triggers certain conditions that can never be reversed.

Taking these three points together, MBLs represent permanent internal "shocks" to the MilitarySuper retirement system, the finality of which can have far-reaching

[23] MilitarySuper members can continue to make voluntary contributions after reaching the pension MBL but must do so in an external fund. They are then at liberty to choose if these are made pre or post tax, making computation of lifetime returns even more complicated.

[24] Large changes in AWOTE can be viewed as exogenous external shocks to the system that manifest as internal shocks (MBLs) to the value of a MilitarySuper members entitlements. While AWOTE shocks can re-occur over time, MBL shocks are singular permanent distortions to the solution space.

consequences on both the numerical value of benefits and on the potential behavior of affected members, particularly members close to a promotion decision or one of these limits.

Once an MBL is reached it is completely irreversible by anything short of an act of parliament. There is nothing the member or even the employer (the Department of Defense in this case) can do to change this. Once the pension MBL is triggered, not only do all employee and employer contributions cease, but this also freezes the EBM used for final lump sum and pension calculations. It is therefore easy to understand why affected long-serving personal contributing to MilitarySuper may feel as if they have effectively received a 28% "pay cut" once the final pension MBLs is crossed. Although Appendix E will show that this is not accurate, I still expect that this facet of MilitarySuper, may represents a disincentive to pursue promotion once the pension MBL is reached. Either way, MBLs do in all cases lead to a final entitlement smaller than would have been the case had the MBL not been imposed. Appendix E contains three scenarios that will help illustrate how MBLs work in practice, although many more permutations are possible.

While the onset of an MBL event is publicized to imminently affected individuals within MilitarySuper,[25] its exact mechanisms are buried in the minutia of the fund's workings. Although MBL information is available on the CSC website, the CSC's 2022 MilitarySuper Product Disclosure Statement (PDS) (CSC, 2022c) does not contain the phrase "Maximum Benefit Limit".[26] What is even less well understood is that MBLs are calculated on the total value of a member's entire retirement entitlement. Thus, members can inadvertently trigger their MBLs early by growing their member portion too quickly if they have elected to contribute more than 5% early in their careers. Equally, any periods of

[25] CSC MilitarySuper members will receive notification and information as soon as the lump sum MBL is exceeded and well before the pension limit is reached.

[26] By way of contrast, the previously published and now lapsed *MilitarySuper Book, 2011* (CSC, 2011) made ample mention of this extremely important limitation.

unexpected market growth that inflates the accumulation portion will also hasten the on-set of the MBLs.[27]

Examining the MBL formulas in Appendix E, one can see that the only way a member can delay triggering an MBL is for the member to try to increase their FAS which ordinarily can only result from a promotion in rank. However, converse to the notion that MBLs stifle the benefits of promotion, (they do not, they just reduce what could have been), it is also possible that the impending triggering of any one of the two MBLs may spur MilitarySuper members to gain promotions before the MBL is triggered. Needless to say, MBLs add yet another layer of complexity anyone attempting to project future retirement returns for ADF personnel. The most crucial thing to remember is that MBL do not exist in ADFSuper or civilian superannuation schemes.

5. Portability

An important feature that distinguishes MilitarySuper form both ADFSuper and civilian funds is portability. Portability is the ability for the employee to continue to invest in the same retirement fund even after changing employer. MilitarySuper is not portable and only serving ADF members can continue to make investments into MilitarySuper. There are complex rules governing how and when retired ADF members still within MilitarySuper can transfer their retirement funds to other managed superannuation funds. However, any change is only possible after reaching preservation age, which in most cases will be 60. It is important to realize that the exact timings of when a transfer to a market fund occurs will have a large effect upon the eventual value of the benefit because of the way profits are made in accumulating funds vs. defined benefit funds. Put simply, in times of plenty, a MilitarySuper member will be unable to move to a potentially more profitable high-

[27] While 5% remains minimum mandatory member contribution rate prior to reaching lump sum MBL, any member approaching their pension may be well advised to switch their member investment to a lower performing tier like cash, in order to prolong the period of continued employer contributions, or at least await the next annual published MBL increase which might forestall the trigger for another year. Longer periods of employer contributions are desirable because under the pension option, the annual pension is derived entirely from calculations based on the employer contribution only. Hence while a well performing market might ensure a great member portion in the short run, in the long run a bigger pension entitlement will overtake any gain in value in the member portion more quickly.

performing market fund until the age of 60. Equally in lean times they are relatively protected, at least as far as the employer contributions are concerned.

Another key consequence of the lack of portability for MilitarySuper is the inability to bring in pre-existing superannuation funds from elsewhere. This aspect forces MilitarySuper members to manage several funds if they have amassed any superannuation prior to enlistment. This may have been a potential disincentive to enlist and (forcibly) join MilitarySuper but as the scheme is now closed, this disadvantage is now moot. Equally however, any early MilitarySuper retirees are forced to open a new superannuation fund with their new employer if they choose to resign early and continue working, since the defined benefit employer part of MilitarySuper is unfunded and thus is definitely not portable. This could potentially also serve as a disincentive to retire early.

By contrast, ADFSuper is fully portable. In November 2021 national superannuation reforms designed to reduce the number of lost superannuation accounts, meant that every Australian employee's existing superannuation fund is "stapled" to that employee as they change employment (APSC, 2021). These amendments to the *ADFSuper Act 2015* have forced changes to the default opt-in settings for all CSC enrollees. Consequently, today new and existing ADFSuper members have the option of nominating non-CSC civilian retirement schemes if they choose not to join ADFSuper at all.

Similarly, today early resigning MilitarySuper members can take their employee contributions out of MilitarySuper and place them in ADFSuper or indeed in any regulated commercial superannuation fund of their choosing, but they cannot take the employer part of MilitarySuper with them. The key take-away is that because eventually the employer's contributions make up the bulk of any member's retirement fund means that any the benefits from buoyant market conditions will not be available to mid- and late career MilitarySuper members.

To partly compensate for the fact that MilitarySuper members cannot move the employer part of their entitlement once they retire or resign, the employer part is indexed according to changes in the national Consumer Price Index (CPI) twice annually. A more detailed account of indexation used is given in Appendix G. It should be noted that this

indexation also partially offsets the notion that MBLs prevent a member's entitlement from growing.

6. Death, Disability, and Other Support Payments

With regard to death benefits, different rules apply whether a member died during active service, post-resignation and/or whether they have already begun accessing their retirement entitlement. In any case, both MilitarySuper and ADFSuper will pay a member's entire (remaining) retirement entitlement to a member's nominated beneficiaries upon their death if they have already retired and stopped contributing. This is not a point of contrast with civilian schemes because nationally all superannuation funds have mandated distribution mechanisms for disbursement of accumulated retirement funds to nominated beneficiaries or estates in the event of the death of the member.

Two differences however do separate military retirement schemes from civilian schemes. The first is the automatic inclusion of death and disability cover (CSC, 2022o) and (CSC, 2021b). Fortunately for ADF members this is done invisibly and at rates unlikely to be truly commensurate with their elevated risk of injury or death through their military service. Therefore, crucially, and unlike civilian life and disability insurance, no explicit premiums are charged to ADF members in either scheme (CSC, 2022o) and (CSC, 2021b).

The second, and perhaps more poignant difference with civilian superannuation is made possible by the fact that both CSC schemes offer death and disability payments as defined benefits, drawn from Commonwealth Consolidated Revenue (AGA, 2020). Both MilitarySuper and ADFSuper will, in the event of a member's death during active service, pay the surviving beneficiary an estimated lump sum (or life-long pension) equivalent to the amount due to someone eligible for a Class A disability pension.[28] This is important because while Class A invalidity pensions use a FAS x EBM centered formula, and the FAS used is the FAS at the time of death, but the EBM used is calculated as if the member had served until the compulsory retirement age of 60. If the surviving spouse elects the pension option, then the pension paid is also calculated utilizing an Age Conversion Factor of 11.0 and not the ACF for the deceased member's age. This means in the event of a death during

[28] An easy-to-read guide to disability pension is available at DVA (2019).

active service, both CSC schemes bypass any age and YoS adjustments that normally apply to the calculation of employer benefits. Furthermore, in the event of a member's death, spouses are entitled to take a 100% pension option rather than the usual 67% pension that is available when an already retired pensioned member passes away (CSC, 2020a, CSC, 2022d). Further generosities are also available to children of deceased active service members that exceed the usual entitlements (CSC, 2022e).

Once again there are complex and minute differences in eligibility and payment methods between MilitarySuper and ADFSuper but, in the interests of brevity, a more complete description of all the variations of death and invalidity pensions between CSC schemes is not offered here. However, putting it simply, because both MilitarySuper and ADFSuper operate as defined benefit schemes, their death and disability payments entitlements are broadly similar for all similar tragedies.[29] The result is that there are very few measurable differences that would incentivize a member to opt for one CSC scheme over the other, but there are large differences with their civilian counterparts.[30]

7. Fund Performance and Investment Options

Any ADF member considering switching from MSBS to ADFSuper will naturally want to know how these funds perform over time. All MilitarySuper accumulated member contributions and all ADFSuper employee and employer contributions are invested in "pooled' super trusts managed by the CSC. The performance of these pooled funds is updated once a day and is publicly available on the CSC website. Performance of the funds is expressed as a daily "unit price," based on growth from a nominal value of $1 AUD fixed

[29] ADFSuper ordinarily does not have a pension option, so the death of the member during active service is the only way I know how to make the reverse switch from an accumulation fund back into a defined benefit structure.

[30] Much like George Bailey in Frank Capra's *It's a Wonderful Life*, a member may indeed be worth more dead than alive. It's a sobering lesson to realize that financially speaking, the fastest way to ensure a large entitlement is to die in active service. One could argue that because FAS is frozen at the time of death and only the EBM is offered this generous increase, that it may still be better to continue earning each year until the age of 60 and then collect a pension, and then live for a long time. But, for a member who may have reached their terminal rank and will likely only ever increase their FAS through annual wage increases, their surviving spouse pension will increase with CPI and will cover or even exceed annual wage growth. On top of that, the surviving spouse receives 100% of the pension and not just 67%. Thus, for the spouse at least, death of the member of service, followed by a long life as a widow/widower is the fastest and most risk-free financial option.

at the time the fund started. For MilitarySuper that inception date is 01 July 2003 and for ADFSuper that date is 01 July 2016. Thus, for MilitarySuper, a unit price of $3.80 on 30 June 2022 represents a 380% increase in the underlying "asset" over a 19-year period. Even though the same pooled super trusts are used, ADFSuper unit prices are lower since their prices are escalated only over a 6-year period.

Percentage performance data, rather that unit price data is also available to the public, but this too is normalized to the fund's inception date. CSC online tools and financial reports are also available to present percentage performance data in a customizable time scales, typically as past financial years. However, as will be demonstrated in the Section IV and Appendix M, percentage returns can be misleading because of how the unit price mechanism works. Indeed, the performance results in Figure 9 in Appendix H1 are percentage returns but there are normalized to a single starting point. Only over the very long term will a member's own portfolio performance resemble that of the CSC fund as a whole. The point to be made here is that interpreting CSC performance data when comparing MilitarySuper to ADFSuper requires additional effort.[31] A fuller description of the asset classes and their intended and historic returns on investment for CSC pooled investments is provided in Appendix H1.

To further complicate matters, both MilitarySuper and ADFSuper have the same four risk-level investment options structure. These are Cash, Income Focused, Balanced and Aggressive. Members can choose to apportion any percentage they choose of their market-based funds into any one or combination of these four categories. While both schemes have investment options with the same name, they are technically slightly different asset pools and merely resemble each other in risk exposure.[32] Understanding that the two funds, despite similar sounding products, perform differently and also report differently is yet

[31] The daily performance figures are provided to members in four risk categories, but members would have to perform their own calculations if assets are divided between categories. Fortunately, online services are available that allow CSC members to look at the value of their particular portfolio at any time.

[32] For example, while the pool of cash and equities assigned to MilitarySuper and ADFSuper "Aggressive" funds are the same, the weightings for each share or cash holding are slightly different. Additionally, because pre-tax contributions are taxed in a different way to post-tax contributions, the daily performance figures listed in the daily unit price returns is also subtly different. All ADFSuper unit prices are adjusted downwards to account for the 15% tax liability that such pre-tax contributions would incur. MilitarySuper unit prices which are mostly purchased post-tax do not have this feature.

another hurdle faced by anyone trying to compare fund performances. An example of the slight difference between these similar investment grades can see seen in Appendix H2.

8. Inflation and Indexation

Compensating for inflation is available only on the employer contribution of MilitarySuper, and occurs only once funds are being preserved, either due to early resignation, or when the pension MBL has been triggered. The rate of indexation is bi-annual using March and September national quarterly CPI figures as published by the Australian Bureau of Statistics (ABS, 2022). CPI indexation also occurs bi-annually on all defined benefit payments such as MilitarySuper pensions and death and disability payments for both CSC schemes, once payments have started.

No CSC accumulation funds are ever indexed or adjusted for inflation regardless of scheme. This means MilitarySuper employee contributions, and ADFSuper employee and employer continue to perform only in-line with market conditions until withdrawal. A summary of CSC indexations is listed in Table 5 and in Appendix G.

Table 5. CSC indexation methods

MilitarySuper		**ADFSuper and Civilian Funds**	
Accumulation fund **Employee Contributions**	Market performance	Accumulation fund **Employee Contributions**	Market performance
Defined benefit **Employer Contributions** MBLs apply	Indexed at CPI	Accumulation fund **Employer Contributions** No MBL	Market performance
Pensions (Once started)	Indexed at CPI	Lump sum only (made as a single payment only)	N/A
Death and disability benefits (Once started)	Indexed at CPI	Death and disability benefits (Once started)	Indexed at CPI

In this paper I will not consider all the different ways in which changes in CPI could affect MilitarySuper's defined benefits. In order to preserve a common baseline

of comparison, all retirement entitlements will be treated as lump sums derived from members retiring under the same conditions, i.e., the same YoS and the same age at separation and viewed at the same moment in time and without CPI escalations.

9. Fees and Costs

Technically both MilitarySuper and ADFSuper have fees and costs, however in MilitarySuper these are entirely invisible to members. Crucially there are no frequency limits, nor any additional fees charged for changing the market investment options. In ADFSuper there is not only an on-going administration fee, but there are also monthly frequency limits and direct transaction fees for switching from one investment risk category to another. It should be pointed out that these fees and costs are modest when compared to the wide range on offer in civilian retail superannuation funds, however over a compounding period of decades, even small deductions can potentially cause significant reductions in the final nominal value of the entitlement. A list of fees and cost for MilitarySuper and ADFSuper is given in Appendix I.

What is of note, is that switching fees may serve as potential disincentive for ADFSuper members to actively manage their investments. MilitarySuper members can change their risk exposure as frequently as they wish without penalty. The second order effects of switching fees potentially take two forms. It could be argued that such fees act as barriers to an ADFSuper member's financial autonomy; ignoring whether it is advisable to chase short term gains and losses based on daily market fluctuations [33]Alternatively, because ADFSuper members can switch not just their member portion but also the employer portion, this could be seen as a wise behavioral "nudge" against recklessness. Of course, predicting the optimal rate of switching for portfolios distributed variously across global equity and bond markets is well beyond the ability of this or indeed any other author and no such strategies will be presented. However, in an effort to promote greater financial literacy amongst its military membership, CSC should cautiously "remind" members of their ability to switch investment risk

[33] Daily price signals being the smallest unit of change possible in a CSC scheme.

categories in times of great market turmoil. Naturally neither CSC nor the ADF proffer investment advice, ever.

10. Risk, Uncertainty and Retirement Strategy

In this paper the term "risk" refers to the estimated operating range of known variables. Uncertainty refers to unknown and therefore unquantifiable variables. Both risks and uncertainties can be endogenous to the member or entirely exogenous. There is no exact delineation between the four distinctions that I have made, but some broad exemplars of each are given in Table 6. This paper will necessarily be confined to modeling risk only as it is trivial to say, exogenous uncertainties will not be modelled. Some of the ways risks and uncertainties manifest in retirement products will be discussed in part where applicable.

Table 6. Some examples and differences between risks and uncertainties in superannuation

	Risk (historic range of known variables)	**Uncertainty** (unforeseen or inestimable factors)
Endogenous to Decision Maker	Future salary via career choice and work ethic	Lifespan of member/beneficiaries Accident or Disability
Exogenous to Decision Maker	Historic ADF Workplace Renumeration Agreements Career progress (competition & promotion evaluations) Historic market performance Historic inflation	Unprecedented monetary inflation Unprecedented wage inflation/deflation Changes in superannuation law Changes in taxation law Changes in family law Changes in the welfare safety net

The reason these four distinctions are being made is to highlight the four cardinal directions in which any one decision maker could be swayed and why choosing between MilitarySuper, ADFSuper and civilian funds is difficult to model. The remaining sections of this paper will demonstrate the complexities of the calculations involved even when restricted to known knowns and demonstrate why settling on one strategy may involve a level of financial literacy and foresight that is simply not available to the average person.

As will be shown in the sample calculations, the biggest lever that an individual member has to influence their retirement entitlement while serving is by increasing their

salary. In the ADF, a member's salary follows from their choice of career specialization and their work ethic. Therefore, it could be argued that a member's optimum retirement strategy is simple, work hard and get promoted as quickly as possible. However, the exact way in which the other three quadrants of risk and uncertainty affect the nine dimensions of superannuation listed in this section will lead to a very wide range of possible futures. As government employees, a member's influence upon actualized future salary is also diluted by external factors such as collective wage bargaining and promotion competition. Ultimate, final member retirement entitlements are also determined in-part by factors exogenous even to the employer such as market investment returns and CPI. That said, in all cases, MilitarySuper, ADFSuper and civilian superannuation receiving a higher salary will almost always lead to higher final entitlements.[34]

[34] However, some exceptions to this maxim may occur, particularly near one of the edges or corners of the solution space such as just prior to reaching an MBL when paired with imminent retirement, just before or after a CPI of AWOTE indexation occurs, or near some extreme in YoS or age.

III. ANALYTIC METHODS

A. OVERALL APPROACH

I will first compare the effects of market performance on scheme returns. Then I will compare the effect of changes in salary on scheme returns. Finally, I will conduct a "what-if" analysis, examining whether a MilitarySuper member faced with the choice of changing to ADFSuper at its inception would have actually been better off today by remaining, or by switching.

I will model the returns of MilitarySuper's defined (employer) benefit scheme exactly in accordance with the schemes' Product Disclosure Statement (CSC, 2022c). In all cases, I will only model solutions up to the point of retirement and when taken as a lump sum. In order to generate lifetime returns, retirement will occur at the Compulsory Retirement Age (CRA) of 60 after 42-years of service. An analysis of aggregated value of pension income streams after retirement will not be conducted. Additionally, I will not need to model the effects of inflation on entitlements because they only apply after preservation, which in this case coincides with retirement. I will model all accumulations schemes as ordinary annuities (paid in arrears), the method for which is provided in Appendix J.[35]

B. MARKET PERFORMANCE AND THE VALUE OF MONEY

A fundamental concept in understanding the value of investments made is the *time value of money*. Two related aspects of the time value of money are the present value and the future value. Present value informs us on how much of today's money needs to be invested in order to generate certain value in the future, and future value informs us how much each dollar invested today will be worth at some time in the future. In this analysis I will be using a variation of future value and not present value analysis. The reason for this is because in MilitarySuper only a small amount of discretion is allowed in changing investment quantities. Members can only change their member

[35] I will use annuity mathematics when modelling the growth of member contributions for both MilitarySuper and ADFSuper as well as the growth of employer contributions in ADFSuper.

contribution amounts from 5% up to 10%. While members can also change the level of risk they are exposed to, remembering that the member's accumulated employee contribution constitutes the minority share of a member's total entitlement, the notion that a military member would choose the amount they would need to invest today in order to generate a certain return in the future, is most probably not reflected in most praxis. At least not for MilitarySuper members.[36]

In reality, superannuation investment, particularly in the restrictive ADF/CSC construct, occurs largely by default, and as is the hypothesis of this paper; truly informed decision making about future returns are clouded by distance and uncertainty. It is my contention that most ADF members, and MilitarySuper members in particular, do not generally calculate the required level of investment today (at present value) partially because their actual range of options and their impact appear minimal. Instead, members relate more closely with the notion of what their entitlement will be worth when they retire. Indeed, this forward-looking perspective is a typical feature in superannuation advertising literature.[37] CSC members can log into their portfolio and get estimates on the projected value of their entitlement, but all available CSC tools and calculators return predicted future results in nominal future terms only.[38] Members are not able to reverse the calculation to work out how much money they should be investing today to reach some future target, at least not in dollar terms. They can however amend the size of

[36] Indeed, any MilitarySuper member thinking of increasing member contributions above 5%, should think again. Unless they are enamored with CSC's low fee structure or the wisdom of their investment performance in the various risk portfolios, members will be better served putting the extra member contributions in a separate fund. This is because any gains in member contributions will contribute to MBL calculations and therefore any gain by the member will lead to a reduction in employer contributions.

[37] Present value perspectives are usually only invoked at the next step of reasoning, if and when members realize that their savings may be inadequate. Present-value type analysis is the domain of financial advisers, who advise members on "how much to put away today for a rainy day tomorrow." These advisers are at an advantage because they are able to circumvent most of the difficulties with uncertainty by tailoring their advice to individuals by including enough personally unique variables so as to reduce the scope of the possible solutions. The solution space also shrinks dramatically as retirement gets closer, which is also typically the first time when such professional advice is finally sought by members.

[38] Of course, these online estimates are stripped of all the truly personalized financial and demographic variables (apart from age) that would allow for a bespoke and much more accurate projections to be made; especially in regard to precise future tax liabilities.

personal contributions percentages and observe the projected estimates. This is the reason I will only produce results in future value terms.[39]

In this paper I will also not apply a discount rate to adjust the future value of retirement returns for inflation.[40] While this may seem curious for an analysis covering such large time scales, the reasoning is simple. The vast bulk of superannuation funds in Australia are accumulation funds and operate, at least structurally, without any reference to inflation.[41] Accumulated funds like ADFSuper vary only with the size of contributions and withdrawals and of course market returns, but not inflation.[42] The forementioned online tools yield only a future value. There is a functionality that allows a member to enter a single, assumed-to-be constant inflation rate, but this type of present value discounting can only be applied once the future value of the fund's returns has been calculated, and before it is translated into present day "purchasing power."

MilitarySuper is of course a defined benefit fund. It is not a necessary feature of defined benefit structures that inflation escalations are built into them, but fortunately for its members, CSC has included these in MilitarySuper (and all death and disability pensions for both schemes). However, this is not the quite the same thing as discounting the value of future returns. Instead, inflation via national CPI figures, is used as an acceptable mechanism for escalating the value of preserved funds and pensions. In theory

[39] Members can use the CSC online tools to input a chosen rate of inflation and thereby "discount" the value of their (nominal) future returns, but this is not quite the same thing a reversing future-value into net present values.

[40] The effects of inflation a can be treated as universal and affect potential decision makers all in exactly the same way, regardless of their chosen superannuation scheme. One future dollar retained in a CSC fund in 2030 will be worth exactly the same amount to a member of MilitarySuper as that same future dollar is worth to a member of ADFSuper. All figures will be in expressed purely nominal terms for the calendar year, or YoS, in question.

[41] Only defined benefit schemes have any references to CPI. Strictly speaking, MilitarySuper only applies CPI inflation to preserved funds, meaning CPI applies only between when a member ceases contributions and when a member begins to receive their entitlement; at 55 for pensions at the earliest, or 60 for the lump sum. Pensions then receive further ongoing bi-annual CPI increases. Remembering that MilitarySuper members cease contributions either by resigning early or by continuing to serve after they have crossed at least one of the two MBLs.

[42] At least not in terms of first order effects. Longer term stock market, and especially bond market returns will of course experience a second order macro-economic effects from inflation. Modelling the exact impact of inflation on those markets over various timeframes has however foxed even the most illustrious laureate.

it could have been any type of indexing, it is just that CPI is a universally understood metric. Indeed, it is an open question whether CPI or AWOTE should be used to truly reflect changes in the cost of living and its interconnection with changing living standards.

In fact, MilitarySuper relies on both. It escalates preserved funds in accordance with CPI, but it varies MBL in-line with AWOTE.[43] Readers can sympathize how this may seem confusing to members. In order to avoid the variations in outcomes that that changes in CPI will entail, I will restrict my comparison to temporally simultaneous cases. That is to say, any two cases compared may vary in market performance or age or rank and therefore FAS, but they will be set in the same year in the future. This analysis is not attempting to see how much retirements are worth in today's dollars, but instead always looking at what they will be worth in the future. In summary, I will not model the effects of inflation.

C. WHO IS REPRESENTED? CAREER TYPES AND WAGES

The two largest input levers that an ADF member has a free choice in changing that will affect the outcome of their chosen retirement scheme are their salary and their chosen retirement age.[44] In this analysis, in order to head off the complexities that arise from comparing different members at different starting ages, especially at different points in time in the market, comparisons will be judged over the entire "lifetime" solution space of 42 YoS. This is because in the ADF, 18 is the minimum entry age and 60 is the Compulsory Retirement Age (CRA).[45] Consequently, the selected models will run for 42 years.

[43] It would be grounds of fertile research to map out exactly what combinations of FAS, YoS, CPI and AWOTE allows for one scheme to exceed the other. I will point out though that these solutions do represent the edges and corners of the solution space, and the vast majority of fund members will never encroach upon these regions of the solution space.

[44] I am referring here to the inputs into a given scheme. Members can of course change the output by varying their investment strategy say from cash to aggressive. Remembering that ADFSuper members can do this for their entire entitlement while MilitarySuper members can only amend their member portion.

[45] As with everything, there are of course exceptions to this. Members can apply to extend their CRA and equally in some states like Queensland, due to differences in early kindergarten starting ages, some school leavers may still be 17 when they join the ADF.

An analysis will be conducted on the effect of variations in salary (or its proxy, promotion) on fund returns. However, the nature of the equations in Appendix J, show that the future value calculations for accumulations funds modelled as annuities are entirely scalable. One dollar invested produces exactly the same percentage returns as $1000. The are no marginal effects built into accumulations funds. The benefits accrued by the admiral are the same, dollar for dollar, as those accrued by the sailor. For this reason, I will use a nominal starting salary of $100,000, with an annual pay rise of 2% pa, to begin my comparison. This also allows for reasonably long careers, because as the reader can imagine, a 2% pay rise over 42 years will add up. In order to implement this kind of scalable result, I have modelled all CSC accumulation funds as ordinary annuities, see Appendix J.[46]

D. THREE MODEL SUMMARY

The effect of market performance on fund returns. It is a standard feature in the conduct of any *ceteris paribus* type analysis, that typically only one variable is changed at a time, while all others are assumed to be unchanging (not necessarily a constant value, but unchanging). The use of a fixed $100,000 starting salary above examines how changes in market performance affect the value of final entitlements in the two CSC schemes. I will compare fund performances at the historical ASX (Australian Stock Market) average of 5.8% per annum[47] with a conservatively low figure of 1% pa, while ignoring the effects of MBLs.

[46] A key assumption of annuities is that they operate at a fixed rate of return. Indeed, this is how CSC online tool calculate predicted returns for its members. Members, input their own prediction for long term market performance into these tools. Making assumptions about future returns, is also how professional advisers frame their predictions to anyone seeking to estimate future returns for accumulated funds. As will be shown, the fact that actual equity markets do not have constant growth rates, means that actual market returns can be quite different than those made under the constant growth assumption.

[47] There are many ways to express average market returns. One could take the Ordinary Least Squares linear approximation of the whole data set, essentially the gradient of the line of best fit that runs through the dataset. I have instead simply taken the ASX's closing value on 01 Dec 2022 (7,503) and divided by the closing value on 01 Jan 1985 (792.3) to obtain a multiple of 8.47053. Taken over 458 months, then annualized this to a growth rate of 5.771% pa. For interest the OLS solution 5.5%. I have chosen the higher figure because: (a) using the actual closing figure is closer to the mechanics of the stock market, where only the closing price matters and not the average price, and (b) to accentuate the effects of higher returns when compared with the 1% option. ASX closing data is publicly available at numerous open-source websites.

My initial simplified model has the following features:

1. Future-Value Ordinary Annuity in Arrears
2. 1095-month periodicity over 42 years [48]
3. Starting income of $100,000
4. Annual Salary increases of 2%
5. 5% Member contribution rate for ADFSuper and MilitarySuper
6. 16.4% Annual employer contribution rate or ADFSuper
7. YOS x FAS x EBM employer contribution rate for MilitarySuper
8. Variable rates of market performance, 1% pa vs. 5.8% pa
9. No MBLs applied

The effect of wages on fund returns. In the second comparison, I will examine how changes in salary affect final returns. Following on from the lessons of the first model, in ADFSuper returns scale with salary directly, and so varying ADFSuper salaries is a trivial extension of the first model. Consequently, the second model will only model MilitarySuper and its various discontinuities. To achieve this, I have generated four career-wage profiles representing quickly and slowly promoted officers and enlisted ranks, see Appendix K. I will again assume a long-term market performance figure of 5.8%. As salaries are now the focus, I will include MBLs in this analysis for MilitarySuper members. MBLs are escalated at 3.8% pa, the historical AWOTE rate at which MBLs have increased over the last decade (ATO, 2022g). As this comparison is forward looking it begins in 2022 and I will assume baseline salaries in line with the current ADF Workplace Renumeration Agreement (WRA), (DFRT, 2020). I will escalate wages at 2% pa. This is very close to the historical average of ADF wage rises in the past decade (See Appendix K). The annuity model used in this comparison case will be

[48] The reasons why I selected a monthly periodicity for my annuity model is provided in Appendix J.

shortened from the previous 1,095 monthly period to 42 annual periods.[49] This is representative of fund returns at ages 18 to 60, or alternatively 1 to 42 YoS. Being annuities paid in arrears, fund returns are notionally aligned to the 31st of December in every year.[50]

Gedanken Experiment. The final comparison is a what-if scenario designed to highlight the struggle an ADF member, indeed anyone, has with retirement planning in the face of both risks and uncertainty. This is the titular decision at the heart of this paper, should MilitarySuper members switch to ADF or stay in MilitarySuper. As will be demonstrated, the complexities of the schemes' structures (see all of the appendices) and the assumptions made about the model and about wage progression can produce seemingly contradictory results across the entire solution space. A strategy that works well for one salary, age, rank combination may prove disadvantageous to a different combination of these same factors, especially when taken at a different point in time.

Therefore, I feel that one of the most informative solutions that can be distilled from the entire solution space is not an examination of extreme the upper and lower ranges of possible outcomes, but rather what actually happened once many of the oft loose assumptions were forced to crystalize by the passage of real events. This is of course the power of retrospect and is necessarily entirely unavailable to any decision maker at the time of their decision. Nonetheless, in this way I will seek to travel back to the inception date of ADFSuper 01 July 2016 and ask what would have happened had a MilitarySuper member switched to ADFSuper on that day. Perhaps they were influenced by a level of optimism as would be generated if they had conducted analyses similar to the two constant growth comparisons listed above. For this reason, in my third and final comparison I will put aside the constant growth rate assumption and input the historical

[49] For reasons discussed in Appendix J, this increase in period length will result in a 3% to 4% loss of accuracy in the estimate of end-of-year annual returns. However, as long as all models in any one comparison have the same periodicity, general scheme behaviours will be revealed. In any case and for reasons given in Appendix M, actual fund returns will, due to market fluctuations within the year, be quite different than those predicted by constant annual growth assumptions.

[50] This entails that each period starts on 01 January each year. This will cause some alignment issues as pay rises occur in November, AWOTE rises to MBLs are applied in July and for the next model the decision date to switch to ADFSuper was also mid-year, in July of 2016.

CSC market performance. In order to accelerate the impact of any variations in the market in this thought experiment, I will use the "aggressive" CSC fund profile. The construct of this final what of scenario is laid out in Appendix L.

In order to reduce the number of possible alternative members to compare, I generated the generic officer wage profile listed in Appendix K. This same wage-YoS profile will be used in all what-if models. I chose this more highly paid profile in order to produce a rising FAS profile that will trigger the MilitarySuper lump sum MBL but still leave enough YoS before retirement without breaching the pension MBL.[51] I will again assume a 2% annual pay increase in all cases.

The fictitious member in this thought experiment is therefore in the unenviable position in early July 2016 of having just been informed that they have triggered their lower MilitarySuper lump sum MBL. It is now up to them to elect whether to cease contributions, whether to continue onwards to the pension MBL, or whether to do something radical such as dispense with MBLs altogether by switching their all their future entitlements to ADFSuper.[52] I will only examine the last alternative. I will not attempt to model strategies for delaying MBLs by reducing member contributions, although should the argument come down in favour of remaining in MilitarySuper, this would be the very next step that I would advise this fictitious member to undertake.

[51] This combination of pay rises and rank progression was chosen rate so as to be broadly in line with my experience, that senior members of the ADF begin to traverse their two MBLs between 25 and 35 YoS.

[52] Readers should also be aware that none of the models in Section IV include the added complexities that arise from how the employer Productivity Contributions are actually paid to CSC. Remembering that the EBM x FAS derived employer contribution in MilitarySuper includes this 3% productivity contribution rather than in addition to. Furthermore, this 3% is calculated on on-going salary rather than FAS and it is always invested in the market and cannot be changed from the default "balanced" investment profile. This means it would accrue at a different rate than the "aggressive" models I have used. This additional complexity has not been modelled in any of the comparisons that will be made. Appendix B explains why this complication can be largely disregarded, and why the productivity contribution really on affects government liabilities and not the member.

IV. RESULTS AND DISCUSSION

A. UNCAPPED LUMP SUM COMPARISON

The preceding sections have sketched the many ways in which the nine structural dimensions of Australian retirement funds can interact and the impact that broad assumptions can have. However ,without making assumptions it would be impossible to produce any meaningful interpretations from the enormous range of outcomes available in the solution space. Most of my assumptions attempt to constrain factors that relate to risk, as opposed to uncertainty. For reasons set out earlier in Section I, I will not examine aspects of retirement returns that are sensitive to uncertainties such as lifespan. All results in this section refer only to the initial lump sum valuation of an entitlements.

Figure 2 is the absolute simplest form of comparison possible. Figure 2 is a plot of the returns for ADFSuper and MilitarySuper modelled as ordinary annuities paid in arrears for two sets of investment market conditions. These conditions are constant a 1% annual growth and the long-term ASX average of 5.8%. The value of each scheme has been expressed as a lump sum before fees and taxes. Crucially, MBLs have not been applied to the MilitarySuper curves. A notional starting salary of $100,00 with a constant 2% pa increase is the starting baseline at YoS=0. Where applicable for MilitarySuper, FAS calculations are used to calculate the employer benefit.

As this model does not involve any of the potential non-linearities caused by MBLs, all entitlements in this model scale proportionate to salary. For example, a doubling of the starting salary to $200,00 starting salary will result in all four curves being twice as high. This is because doubling the input values to an annuity doubles the return and doubling the starting salary in MilitarySuper will also double the final FAS.

Although expressed in dollars terms, the vertical axis in Figure 2 can therefore also be interpreted as the ratio of final entitlements to starting salary if divided by 100,000. For example, after forty years of service an ADFSuper member's total entitlement will be approximately eight and a half times their starting salary if the market

returns 5.8% per annum, or two and a half times their starting salary at 1% pa market returns.

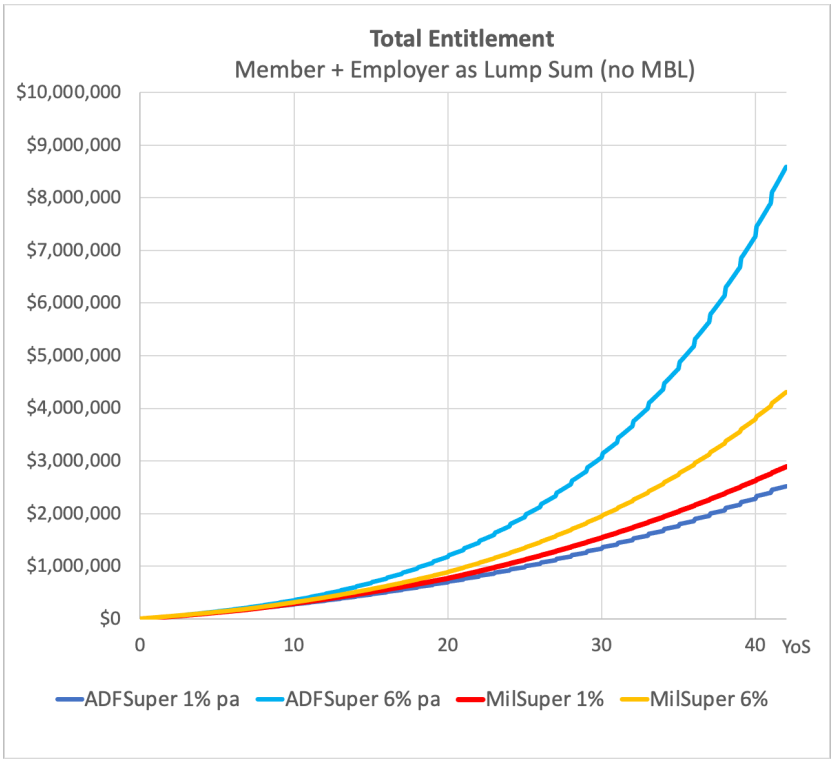


Figure 2. Total retirement entitlements for ADFSuper and MilitarySuper [53]

We can see that the orange high (5.8% pa) and the red low (1% pa) returns for MilitarySuper sit in between the pair of blue high and low ADFSuper curves. Using numerical methods, the point of equivalence for 42 YoS when ADFSuper returns match those of MilitarySuper can be found to be at ~1.735%. If the long-term average of market returns of a member's chosen investment option exceeds 1.74% ,[54] then ADFSuper will outperform MilitarySuper.

[53] It is worth remembering at this point that there can never be a decision to switch from ADFSuper to MilitarySuper since the scheme is now closed. This means that in many ways the audience for both models will only ever be MilitarySuper members. Of course, the uncapped model will still be informative for ADFSuper members, they just have to ignore the red and orange lines.

[54] Arguably due to some of the assumptions and approximations made, a better figure would be 2% pa.

The lack of MBLs also means that the gains in ADFSuper are uncapped. To date, all CSC investment portfolios have exceeded this 1.74% figure apart from the ADFSuper "Cash" portfolio which has average returns of 0.97% pa since 2016 (See Appendix H). MilitarySuper "Cash" has returned 2.9% pa, but this is because it has been averaged over a longer time period (since 2003) during which fixed income deposit rates were higher. If global bond markets return to their very-long term historic averages and rises above their recent "quantitative easing" low points, then I expect all CSC portfolios to exceed 1.74% pa and ADFSuper will outperform MilitarySuper over the (very) long run.[55]

The reason why ADFSuper outperforms MilitarySuper at even modest rates of growth is because its performance is compounded over the entire value of the member's entitlement, employer contributions plus member contributions. In MilitarySuper the member can only capitalize on market growth using their much smaller member's portion. However, the impact of the assumption of constant growth cannot be overlooked. In real markets these growth lines are anything but smooth, see Appendix L. This means that if a member is approaching retirement, just as a downturn occurs, which does happen roughly every decade in some form, then 3 to 5 years' worth of growth can be eliminated in a very short period. For MilitarySuper members this risk is much smaller, but then so are the potential payoffs. It should also be noted that only a tiny fraction of ADF member's ever serve for the maximum of 42 years, but the finding that ADFSuper will outperform MilitarySuper is true for all YoS, provided one is using the assumption of constant growth. The next result will introduce MBL non-linearities while still maintaining this constant growth assumption.

B. CAPPED LUMP SUM COMPARISON

In order to examine the effect that the size and rate of salary increases has upon a MilitarySuper member's final entitlement, I have replaced the previous single $100,000 salary with four representative ADF cohorts. The following four graphs in Figure 3 compare MilitarySuper (only) performance over 42 YoS for fast and slow progressing

[55] Although this figure may seem modest, stock markets do crash seemingly never to recover. As of Dec 2022, the Nikkei 225 is still almost ~28% below its all-time high of 38,957 on 29 Dec 1989, thirty-three years later. A constant growth assumption at 5.8% pa for 33 years yields expected returns of +640%.

ADF personnel, in two broad earning classes: officers and enlisted. A description of these cohorts is in Appendix K. All salaries and MBL limits are baselined to November 2022. Salaries are indexed at 2% pa and MBLs at 3.87 % pa in line with historical AWOTE data. Accumulated member and employer contributions are presumed to grow at the historical ASX average of 5.8% pa. Readers should note however, if the market preforms less than this, the MBLs will remain unchanged but the red "uncapped" total benefit lines in figures 2 and 3 will shift downwards. This means the intersection between the red line and either of the two MBL lines will move to the right (i.e., members will cross an MBL later in their careers). Once a member crosses the pension MBL, all contributions cease, and their employer portion no longer increases with EBM. Instead, if they continue to serve, their employer entitlement will track the pension MBL, as denoted by the green lines marked "Final Benefit".[56] This Final-Benefit-MBL will continue to increase every year as annual pay rises will increase FAS. It will also increase if the member gets promoted.[57]

The reason why there are no ADFSuper equivalents included in this second model is firstly because: MBLs do not exist in ADFSuper, and secondly because scaling ADFSuper when using a compounding annuity model is very straight forward. Indeed, the blue line in the previous model does precisely this. If one wanted to know what happens if all salary ever earned is doubled, we can just double the previous outcome. If one wanted to model the four cohorts from this second model in ADFSuper rather than MilitarySuper it can also be done. The resulting curve would approximate the relevant cohort's salary progression curve super-imposed upon the smooth blue curve shown in the first model.

[56] The green lines are closer to the true shape that the middle pair of red (5.8%) and orange (1%) lines in Figure 2 will take if MBLs had been included in the first model. The best way to consider the green "final benefit" lines is to think of them as an upper limit, a constraint, on the previous uncapped model. However, readers should be cautious because the four green lines have been generated under a particular set of salary, market performance and AWOTE assumptions that are not present in the first model. Including these extra degrees of freedom is not possible in a two-dimensional graphic, which is why MBLs were not included in the first model.

[57] If instead the member separates at this point, their employer component will increase only with CPI. In my model however separation (retirement) and CRA coincide at 42 YoS, and therefore the modelled member would not be able to continue to serve. Which is why I have not modelled CPI.

Without MBLs or productivity contributions there is nothing more to advise an accumulation fund holder other than get to promoted as fast as possible and put away as much money into superannuation as the tax regulations will allow. For the sake of brevity, modelling the effect of varying member contribution rates was not attempted and is explicitly ruled out of scope.

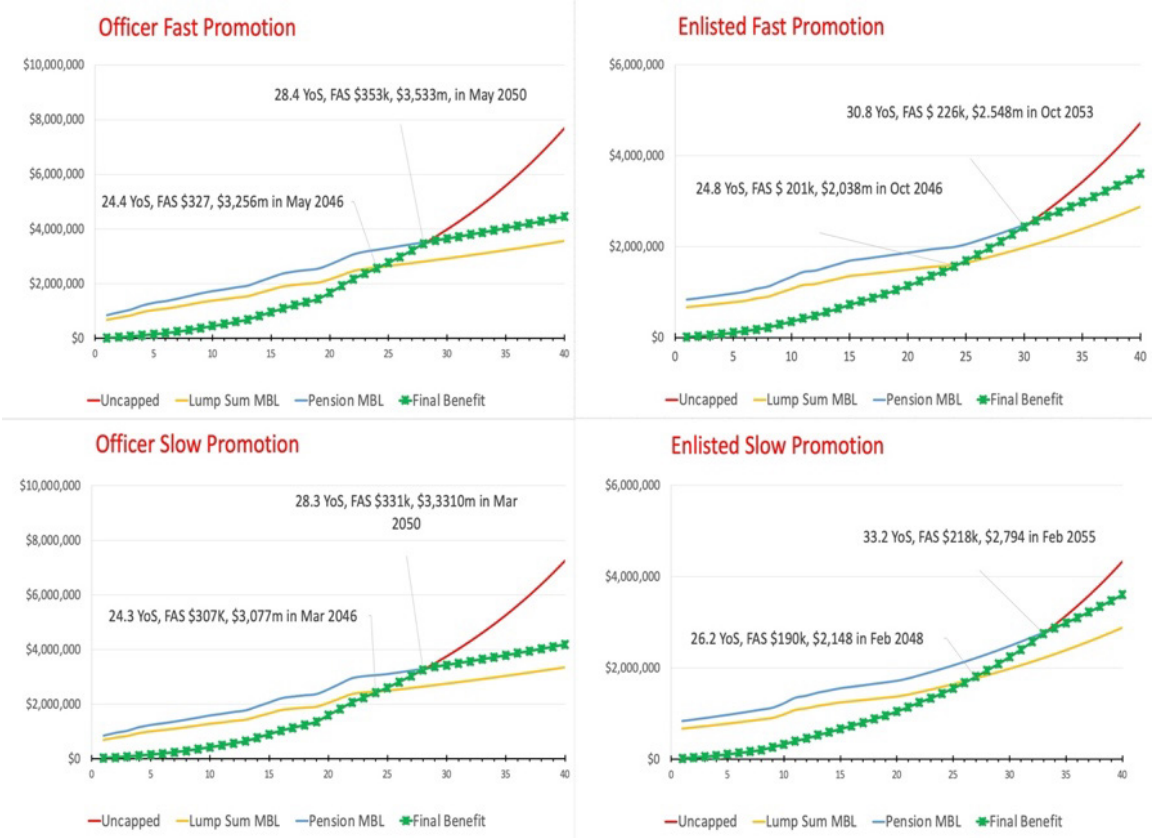


Figure 3. MilitarySuper MBL limits for fast and slow promotions (2022 as base year)

Figure 3 shows that in most cases faster promotion does not lead to drastically different outcomes. That is to say the different green lines intersect with the lump sum and pension MBLs after approximately the same YoS. Readers should compare the lump sum and pension MBL crossover points for Fast vs. Slow Officers in Figure 3, to see this. In that pair-wise comparison case, the faster promotion still yields approximately the same answer for when the member will cross the lump sum MBL, which is after

approximately 24 YoS. True, the lower FAS for the slower officers does result in a lower total benefit and a lower MBL, but the fast and slow total benefit trends do behave in the same general fashion. The reason for this is that both the fast and slow officer do not cross an MBL tier boundary during their post MBL service.[58] This is partially due to the fact that in all of these selected cohorts, all four pension MBLs occurred either years after their last promotion, or as is the case for slow officers, their last promotion came at almost the same time as the MBL, and therefore did not raise the member's FAS sufficiently to affect the outcome.

That said, should a member's rising FAS or abrupt changes in the AWOTE cause a member to trip from one MBL tier to another, then any pair-wise comparison will witness the two profiles diverge. Figure 4 is one way of visualizing this effect. Figure 4 is a plot of the lump sum and pension MBLs to FAS ratios for each of the four cohorts. A numerical way of visualizing these graphs is given in Appendix M. Readers can see that Fast Officer (FO) and Slow Officers (SO) continue to track on top of each other at FAS multiples of 8 and 10 respectively (the blue and green set of lines)[59] .[60]

Readers can see from the text boxes in Figure 3 that the final benefit for FOs and SOs was exactly ten times FAS. However, for Fast Enlisted (FE) and Slow Enlisted (SE) ranks we see a slightly different result. Their final benefit to FAS multiples are greater than ten at the point when contributions cease and this multiple continues to rise with each additional YoS.

The reason for this is because AWOTE is rising faster than FAS, 3.8% vs. 2%. This pushes lower earning members down from a higher MBL tier to a lower MBL tier. This is beneficial for lower paid members as they then have access to a greater MBL

[58] See Appendix B for a list of these MBL tiers.

[59] I have not been able adequately explain the occasional dips below the FAS/MBL ratios 8 and 10. They may be artifacts of my calendar alignment between FAS and AWOTE or possibly a genuine feature of this particular combination. I actually suspect the latter rather than the former.

[60] In Figure 4, the lump sum MBL/FAS multiple lines (ratio ~ 8) are included next to the pension MBL/FAS multiple (ratio ~ 10) to show that the same patterns emerge over time at both the higher and the lower MBL limits and that this is not just something that occurs at the pension MBLs. Technically the lump sum MBLs have no bearing on this model because I have assumed that the member continues to contribute 5% even after crossing this lower MBL. I have included them just to visualize the effect.

multiple. Conversely, while higher paid members might feel short-changed as they get pushed into a higher tier and therefore have access to smaller MBL-FAS multiples, but those members are still going to take home larger entitlement in absolute terms.[61]

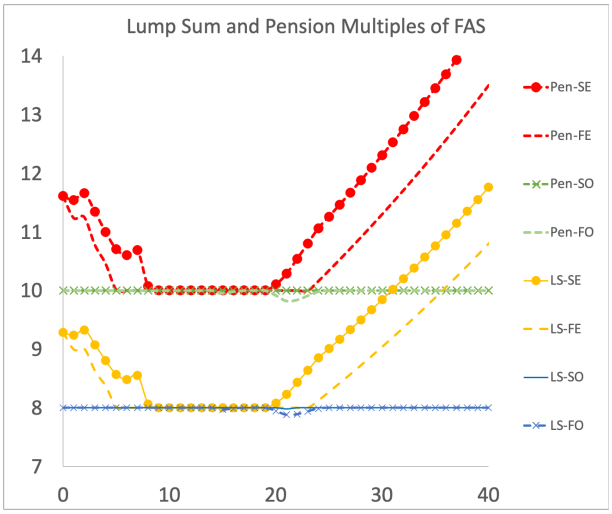


Figure 4. MilitarySuper MBL limits for four selected cohorts (2022 as base year)

A more exact way in which MBLs increase with promotion after contributions cease is shown in Appendix B. Roughly, speaking however, if a post pension MBL member were to receive a $5,000 pay rise for each of their three final years of service, their total entitlement would increase by $50,000 which is 10 x $5,000 because the member is in the second MBL tier.[62]

C. RETROSPECTIVE LUMP SUM COMPARISON

Finally, we come to the question at the heart of this paper. Should a member switch from MilitarySuper to ADFSuper. The second question of whether a member of

[61] Whether this represents financial justice in the form of equity or equality I will leave for the reader to decide, but overall rising total benefit packages it is yet another way to dilute the sense of injustice that senior MilitarySuper members might feel once their employer informs them that they will cease all employer contributions after they reach the pension MBL. It is too simplistic to describe the effect of pension MBLs as a 28% pay cut to their remuneration.

[62] By way of digression, any annual pension if taken would increase by approximately by $450 (~$5,000/11) because the ACF at age 60 is 11.0.

either CSC scheme should resign and become a civilian will be answered at the very end of this section.

The first uncapped model essentially focused on risks, the known knowns. It compared a notional $100,000 "investment" (or rather salary) at different exogenous risk levels. It would have been equally as instructive had I used one dollar. That outcome was clear. Constant compounding even at the most modest levels of market growth will beat almost any defined benefit structure, even one as generous as MilitarySuper, which after all has its own compounding features. That uncapped model best suits the young early career members who has not collected enough personally unique variables to constrain the solution space. All they get from the model is a general direction and this is sufficient given the broad range of initial conditions possible. Providing anything more precise could be argued as being either deliberately, or negligently misleading.

The second model attempts to account for some of the uncertainties that can grossly affect outcomes, the largest of which is the quantity, rate and timing of salaries earned. The second model introduced different career paths and the concept of MBLs, however it only applies to late career MilitarySuper members, which is the notional opposite of the young members who would find the first model useful. The second model only serves to constrain the MilitarySuper results of the first model. Taken together, the two models would inform two different audiences, one young and one old.

Based on the second model MilitarySuper members can take solace from the fact that no matter what the uncertainties lie in their careers, the very same mechanisms that cap any outrageous gains for high salaries, also serve to mitigate losses for those lower down the scale. Additionally, a smaller proportion of their final entitlement is exposed to (market) risk than would be under ADFSuper. In the end, all members of the MilitarySuper community, rich and poor will receive generous entitlements that are largely risk and uncertainty free.[63]

[63] They will however have to contend with the opportunity-cost of missing out on even more generous payments, should the most optimistic projections of ADFSuper come to pass.

My third model is not a future-value model at all. It is a retrospective "anti-model" and consequently it can never actually be used to resolve dilemmas *in situ*. Instead, it looks at what happened *ex-post.* Retrospective models are only ever going to be informative if enough genuinely similar conditions arise in the next dilemma, which given the range and scope of possible retirement variables is not likely to occur by anything other than sheer happenstance. Nonetheless, I'm sure the reader is keen to find out what would have happened had a MilitarySuper member actually switched all of their future member and employer contributions to accumulate in ADFSuper from the 1st of July 2016.

This retrospective perspective still requires many of the open-ended variables such as salary, the various types and rates of growth to be preselected. As descried in Appendix L, I have deliberately chosen a salary profile of a member whose projected total benefit will remain between the two MBLs for the period of interest, namely 01 July 2016 to 01 July 2022. Figure 5 shows that the lump sum MBL is crossed at 24.5 YoS and that would equate to July 2016, marking a career that started in January 1991 (YoS=0). The right-hand side of the graph marks July 2022 (YoS=30.5).

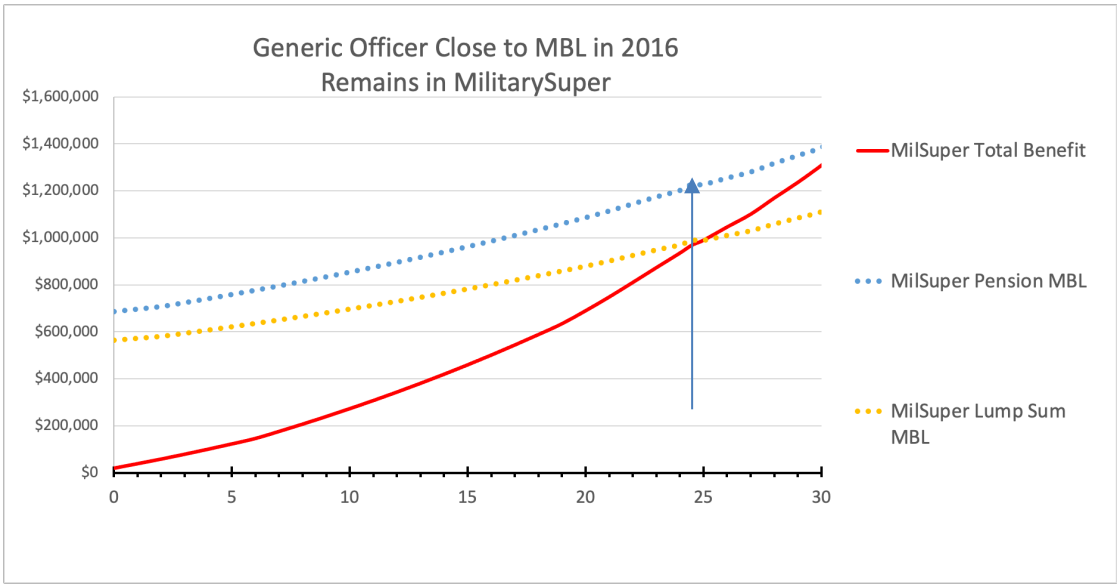


Figure 5. Generic MilitarySuper MBLs after 24.5 YoS

Figure 5 is included to show where the MBLs for a member continuing in MilitarySuper would be. For the sake of visual clarity, the MBLs are shown in Figure 5 but not shown in Figure 6, although the same MBLs apply.

Figure 6 contains four lines. The top dashed green line is not actually applicable to a MilitarySuper decision maker in 2016 because it starts at YoS equal to zero. It is however what anyone at the very start of their career who uses an unconstrained model similar to the one in figures 2 and 3 might come to expect. Using a compounding model and inputting the ASX's historical 5.8% pa constant growth rate, a decision maker might get the impression that, when taken over thirty years of service, ADFSuper would essentially "double their money" as it were.[64] Consequently, it might still influence a decision maker in 2016 because it purportedly shows that no matter where one is in the model in terms of YoS, ADFSuper should be more generous.

The dashed purple line in Figure 6 is what an unconstrained compounding model would predict if the growth rate assumption was dropped to a more modest 3%.[65] The red line is the same red line as in Figure 5, except the MBLs are not displayed.

The black line is the actual outcome of the decision to switch all future member and employer contributions to the ADFSuper "aggressive" portfolio on 01 Jul 2016. We can see that is in fact the lowest of all four lines, and crucially it is below the red line, the "remain" option. The results are also summarized in Table 7.

[64] Readers will notice that in Figure 3 the green lines are approximately half a million below the 5.8% blue line in Figure 2. This is because a different career/salary progression used; namely one with a starting salary well below $100,000 used in model 1. Equally the red lines in Figure 5 and Figure 6 also represent different salary profiles, which is why I only referred to "similar "compounding models in the paragraph above.

[65] This 3% has not been chosen arbitrarily. It is the actual annualized rate of return for CSC aggressive for July 2016 to July 2022, see Appendix N. The reason this still does not yield the actual outcome (the black line) is due to the stochastic and path independent nature of CSC market investments. See footnote 106

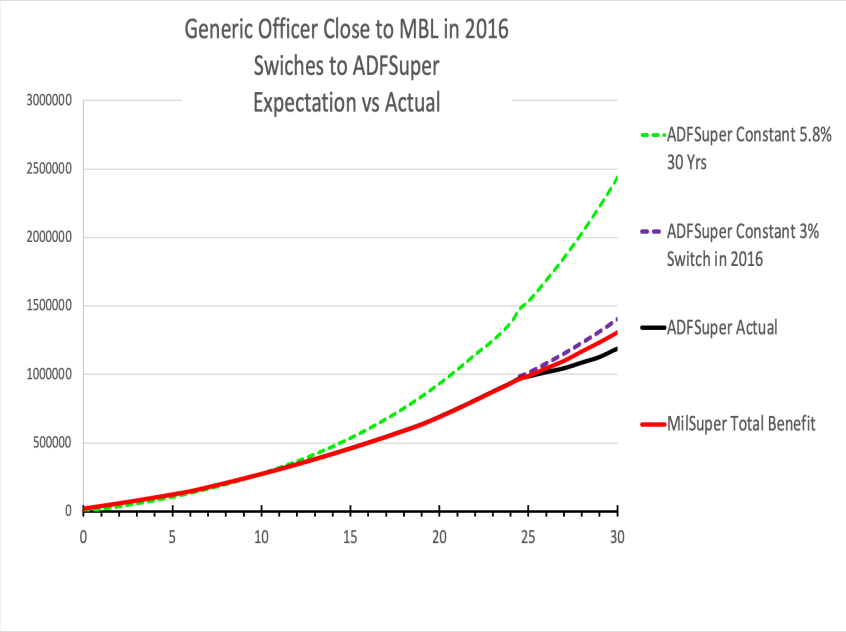


Figure 6. Changes in total benefits when changing from MilitarySuper to ADFSuper in July 2016

Table 7. Final benefit valuations for various switching options

Strategy	Switched in June 2016	Member Contribution	Employer Contribution	Lum Sum MBL	Total Benefit	Pension MBL
Remains in MilitarySuper Jun16- Dec 22 **Actual Outcome**	No	$277,451[67] **(Aggressive)**	$1,352,862 (EBM x FAS)	$1,110,854	$1,352,862	$1,384,936
Switches to ADFSuper Jun16 – Dec 22 **Actual Outcome**	Yes	$277,417[66] **(Aggressive)**	$917,868 **(Aggressive)**	N/A	$1,195,285	N/A
Switches to ADFSuper Jun16 – Dec 22 **Predicted Market Outcome for last 6yrs at constant 3% pa**	Yes	$278,288 (Constant)	$1,125,750 (Constant)	N/A	$1,403,803	N/A
Lifelong ADFSuper **Theoretical Market Outcome for 30 years at constant 5.8% pa**	N/A	$601,587 (Constant)	$1,973,205 (Constant)	N/A	$2,574,793	N/A

[66] Note the slight difference in member contributions. Although both are accumulated at 5% of the same ongoing salary, this variation is due to the small differences in equity weightings between ADFSuper and the MilitarySuper "aggressive" portfolios. This difference will increase with each passing year.

So should a MilitarySuper member have switched to ADFSuper on July 2016? The simple answer is no. The reader may well ask, why is the actual outcome, the black line, below that indicated by the dashed purple line, if that 3% growth rate is what the CSC aggressive portfolio actually yielded on an annualized basis. The answer lies in the stochastic nature of the investments made. The annualized figure is the closing price for a unit share of aggressive on 30 June 2022 divided by the opening price on 01 July 2016, expressed as an annualized rate. This is the linear approximation of the historical return rate. The same method was used to derive the ASX rate of 5.8% pa. However, to yield that return the entire investment sum would have to be deposited on 01 July 2016 and sold on 30 June 2022.

Instead, CSC investments occur every payday, fourteen days apart. Due to the use of the unit price mechanism in CSC investments, the growth or loss incurred by all these separate purchases at some arbitrary point in the future (date-X) is the purchase price divided by the price on date-X. In this case 30 June 2022. Any two units purchased at the same price, regardless of when in the seven years (2016-2022) the purchase was made, will yield the same return. In theory a member could not make any purchases for the entire period and if for some reason they were able to buy at the 01 July 2016 price on the 29th of June 2022, they will reap the same dividend on their investment.[67] The lesson here is that not only are the accumulation portions of CSC superannuation funds invested for members on the stock market, the unit price mechanism operates like a stock on the stock market.[68] An extract from the investment returns data is shown in Appendix N to demonstrate how this price mechanism works.

In short, the unit price mechanism is not compounding at all in nature and looking at annual percentage changes can be misleading. In fact, it becomes ever more misleading

[67] Indeed, over the space of seven years, both CSC aggressive portfolios have undergone hundreds of pair-wise price reversals, meaning a member could have bought the same investment on a later day at a lower price than they paid for them previously.

[68] Buying CSC units is not like buying a bond. Technically, there is zero guarantee of a nominal figure (the par value) being met. That means CSC customers have to worry about unit prices first and then worry about inflation next. Bond traders only have to worry about inflation, which is why returns are lower. True in the lowest CSC risk portfolios the translation from "units" back to cash is practically lossless, but technically speaking it still has to occur at a given price, and ultimately it is only the unit price, in real dollars, on the day of sale that matters.

the shorter the time frame. Over a 42-year career this nuance may well wash out as stochastic functions approach their smooth approximations, but even on scale as long as seven years the results from a naive compounding model and reality can be radically different. Astute readers will of course realize that the CSC unit price mechanism is exactly the same as buying stocks, which is why it is also wrong to think of stock purchases in compounding terms. One unit in the CSC aggressive portfolio, much like a single stock in a company is only worth whatever its daily face-value is, no more no less.

Another way of describing this type of valuation mechanism is that it is path independent. It makes absolutely no difference what price the CSC units reach in between purchase and sale, which covers the entire period remaining up to retirement. All that matters is the difference between each of the fortnightly purchase prices and the price on the day the entitlement is cashed in. There is no sense that the gains of yesterday are truly compounded into today's prices. The best way of visualizing the effect of the unit price mechanism is that it is very sensitive to shocks and sudden changes in fortune, in a way that defined benefits or even term deposits and true annuities are not.

There is more than a touch of irony to the fact that in transitioning from MilitarySuper to ADFSuper, a member will have effectively swapped the comfort that the path independence of their career afforded them in MilitarySuper for the risk, or more specifically the uncertainty, that the path-independence of unit prices can unleash. This is why when trying to model lifetime retirement outcomes in accumulation funds, it is absolutely a question of timing, rather than solid compounding. This is the difference that lies at the heart of the ADFSuper risk structure when compared to MilitarySuper. A market collapse on the morning of one's retirement can wipe out decades of hard work, accumulation funds do not really accumulate at all. Once again this shows why modeling final retirement returns nigh on impossible, and certainly pales when contrasted with the ability for defined benefit members to forecast their incomes down to the penny. It also demonstrates why the level of sophistication required to understand the structures and mechanisms is well beyond the average ADF member.

One last question remains. What about the other two choices mooted at the start of this paper, namely the decision by either a MilitarySuper member or an ADFSuper

member to separate from the ADF and start civilian employment. All basic civilian superannuation, at least those one without additional income streams or some form of sophisticated income insurance, will suffer from exactly the same predictability short comings as ADFSuper, because all market invested accumulation funds do. That means a comparison between MilitarySuper and civilian superannuation can be reduced to its logical corollary. If it can be proven above that M > A and if it can be proven that A > C, then it follows that M > C. While providing a clear winner between MilitarySuper (M) and ADFSuper (A) is no easy task, the question of whether ADFSuper (A) is better than civilian superannuation (C) is simple: Yes. How much better? It is simply the difference in employer contribution rates.

Currently in Dec 2022, with the Super Guarantee at 10.5% and ADFSuper employer contributions at 16.4% civilian employment would have to pay 56.2% more in order to generate the same employer contributions. However, this number is falling each year and when the Super Guarantee reaches its current legislated maximum at 12.5% this differential will only be 31.3%.[69] The ongoing benefit of the higher weekly take-home pay that such a lucrative civilian job would yield is of course not included in this retirement perspective. I do caution any reader that is thinking along those lines that these figures are before tax, and some of this difference will be reduced by the fact that Australia's marginal income tax system will deduct a larger share of tax from higher income earners. Thus, the final take-home differences will always be less than 32%-56%, and in the case of salaries that happen to be on either side of a tax boundary, the take home wages could be substantially less.

[69] In dollar terms the generic O4-PG6 in the thought experiment earning $147,771 pa would need to find civilian employment at $230,803 at the current ADFSuper employer vs. SG differential. If there were no pay rises between now and 2025 (when max SG=12.5%), this figure drops to $193,875. While this may seem to the DOD to be an unlikely scenario, for enlisted ranks (E5, Pay Group 5, Tier-2 on $93,413) the equivalent figures when SG reaches its maximum will only be $122,557.

V. CONCLUSION

One thing is clear. The nine dimensions of ADF superannuation scheme design conspire to produce a bewildering array of possibilities that even professionals will struggle to understand. My concluding remarks will not focus on these nuances. Instead, I want to return to the central tension that lies between risk and uncertainty when making predictions.

Risk. Switching from MilitarySuper to ADFSuper involves an increase in risk exposure in three major dimensions. *Ceteris paribus*, ADFSuper members are making (a) bigger bets, (b) over a larger range of possible outcomes, (c) without a safety net. On the upside, the lack of any MBLs means the potential payoffs are much higher than in MilitarySuper over the long term. Provided that long-term returns remain at or above a modest 2% pa ADFSuper will outperform MilitarySuper. However, the fact that the prices used to determine the monetary value of market accumulation funds are path independent means an ADFSuper member is exposing their entire retirement entitlement to a one-way bet that starts on the day of their first CSC purchase. Only the unit prices on the day of purchase and the day of retirement will count. ADFSuper members cannot bank any gains along the way, meaning that for an ADFSuper member, the risk to the value of their entitlement lies squarely in the future at all times, regardless of when the analysis is conducted. It could all change for that member tomorrow.

MilitarySuper members on the other hand make smaller bets, arguably over the same range of market returns, since both schemes use almost identical CSC investment vehicles. MilitarySuper member are also placing these smaller bets with the assurance of a safety net. Approximately three quarters of all retirement gains (i.e., the employer share) is banked. The only risk that portion faces is a sovereign default by the Commonwealth. The remaining one quarter of entitlements however are risk-exposed in exactly the same way as ADFSuper funds are. For a MilitarySuper member each passing year means more of their risk is retired squarely into the past. The price they pay for this relief is having a cap placed upon their maximum payout.

Uncertainty. The focus above has been on risk, which in this analysis is exemplified by investment market fluctuations. Historical fluctuations can however be quantified, and informed approximations of future aggregate market performance can be made. Perhaps not with enough accuracy to help a member on any particular day, or even in the very short term, but definitely over the long run. There are however hidden features that differentiate how the two schemes deal with uncertainty. The largest single uncertainty is lifespan. For members with the same retirement lump sum, there will always be a lifespan long enough that any pension paid will exceed the value of the lump sum that generated it. Although pensions have not been extensively analyzed in this paper, the availability of the pension option in MilitarySuper goes a long way to providing relief for what is ironically actually one of life great certainties, death.

This paper has not focused heavily on pensions and death or disability benefits. Instead, uncertainty in this paper revolves mainly around the inputs to retirement savings rather than the scheme's structure (changes to the tax system notwithstanding). These uncertain inputs are salaries and their military proxy, career progression. MilitarySuper member's entitlements are technically immune to this type of uncertainty because a late promotion and ensuing pay rise, at any time three years before retirement, will boost their entire employer portion in perpetuity. Even though it may not be all that likely in the real world, at least there is nothing in the scheme's structure that would mute the long-term benefits of very late promotion. For MilitarySuper members their entitlements are essentially career path independent. For ADFSuper members on the other hand, ignoring the fact that valuations technically only materialize at the point of sale, they have to accrue their investment every single fortnight. For them the uncertainties around the speed and path their career take will greatly determine the outcome.

By retirement financial metrics alone, transitioning to civilian employment will either be neutral or much more likely, entirely negative. For the same salaries, generic civilian superannuation will never outperform ADFSuper due to the difference in employer contribution rates (10.5% vs. ADFSuper's 16.4%). This competitive advantage is however being eroded each year, as the nation's Superannuation Guarantee raises civilian employee contributions to 12.5% by 2025. Despite this, the buffer in salary dollar

terms is still between 31% and 56%,[70] meaning civilian jobs have to pay at least a third or even half more in order to be competitive. The only way the comparison can be neutral is when switching between MilitarySuper and civilian superannuation and the member has very few years of service and a low final average salary. That is unlikely to be the case as all MilitarySuper members have now served at least seven years. The larger the MilitarySuper entitlement becomes with each passing year, the further behind any civilian comparison falls. An alternate perspective would be that an ever-greater increase in civilian pay would be required just to achieve a neutral result. In short, as far as retirement benefits are concerned, there is no reason to pursue civilian employment and that is without even considering pensions, death and disability provisions, all of which are lacking in civilian employment unless explicitly paid for at additional expense.

Retention and Recruiting. If the benefits on offer in military superannuation are to be leveraged to assist in recruitment and retention, then these benefits have to be modellable if this leverage is to be truthful. However just because individual results cannot be well constrained does not mean that the ADF should shy away from marketing the relative generosity of its retirement schemes, but it must be transparent about the risks and uncertainties involved.

The first thing to realize is that changes to MilitarySuper will have no bearing on ADF recruitment because the scheme is closed to new members. Regardless of whether accumulation funds do or do not out-perform defined benefit schemes, the closure of MilitarySuper does mark the loss of one major point of difference from civilian employment. Also lost was any marketing cache that this difference would attract with recruits that favor certainty over risk. To be clear however, the possibility of a re-introduction to the ADF of a defined benefit retirement mechanism in the future is essentially zero. This is largely because of the unfunded and open-ended nature of defined benefit liabilities for the Australian taxpayer. Equally, changes to how MilitarySuper operates, in particular how Maximum Benefit Limits apply, are just as unlikely to ever be enacted. There are two reasons for this. Firstly, the scheme's structure

[70] This is because 16.4/10.5 = 1.56 and 16.4/12.5 = 1.31, therefore the salaries earned to generate these contributions have to be larger in dollar terms by this ratio.

is defined by an act of parliament, but then again so is ADFSuper. The second reason is that MilitarySuper is much more complex than ADFSuper, and the effort required to extrapolate and then explain the consequences of any changes to legislators will out-weigh the benefits as they begin to apply to an ever-decreasing number of members. Although MilitarySuper contains many more potential control variables than does ADFSuper, most of these many settings are withing the ADF's purview to control. Consequently, using MilitarySuper to target the retention of particular ranks and skills is not recommended. Taken together this means that efforts to leverage the benefits of MilitarySuper must be restricted to the broad retention of serving members. Crucially ADF strategies will need to account for the fact that MilitarySuper rules are not going to change.

To aid retention of MilitarySuper members, the ADF should increase education around how Maximum Benefit Limits operate. The notion that MBLs cause employer entitlements to be frozen is false and should be quashed. Additionally, the fact that late promotions can pay large retirement dividends is a feature unique to MilitarySuper and should be marketed amongst mid to late career members who might feel disenfranchised by MBLs. This feature should also be leveraged to re-invigorate members to re-engage with the promotion system. The ADF should capitalize on the attractiveness of the relatively risk-free nature of defined benefits and emphasize the compounding nature of the EMB x FAS computation, especially if the pension option is taken.

ADFSuper on the other hand is much more straight forward with very few variables and no discontinuities from age or benefit limits. The lack of discontinuities means that changes to the ADFSuper system will be shared more universally than changes in the heavily tiered MilitarySuper scheme. The small number of control variables also means that small changes in single variables such as the employer contribution rate can be more easily modelled, and a strong value case made to legislators. Consequently, with ADFSuper the ADF should be able to generate strategies that do include changes to how the scheme operates, and because ADFSuper is the current scheme, it will have a bearing on both recruitment as well as retention.

As the level of employer contribution is the only intrinsic variable that the ADF as employer can control, its strategy options are largely limited to this one variable. To aid recruitment the ADF should investigate the possibility of raising the base rate of employer contributions for all ADFSuper members. This option is becoming more urgent as national increases in the Super Guarantee continue to erode the ADF's competitive advantage.

The ADF should also investigate ways to differentiate some of the universality that a blanket employer contribution change would entail. If deemed legal, by adding tiered strategies some of the time-compounding benefits of MilitarySuper can be re-introduced by offering larger employer contributions with years of service. Such a strategy can also be used to target individual skill sets, something not well suited to the tailoring of employer benefits in MilitarySuper.

One solution that could apply to both schemes because they both involve CSC investments could be the purchase of additional CSC units by the ADF for the member. This would re-cast the current definition of employer contributions as being only ever calculated as a percentage of salary. In theory the ADF could purchase CSC investments and transfer them to targeted sub-populations or even individuals. This would have several benefits. Firstly, the amounts would be more readily customizable as they could be defined in nominal dollar terms rather than salary percentages.[71] Secondly, the bulk of final benefit at maturity will be funded by market growth and not additional Commonwealth liabilities. Thirdly, this mechanism, particularly if correctly implemented, could deliver some of the compounding retention loyalty that defined benefit systems enjoy. Again, if deemed legal the proposed unit transfers could be contracted to only mature after a certain number of years of service. Because ADFSuper

[71] The idea of treating retirement benefits as valued in present day dollar terms rather than as percentage of on-going salary is in fact more in keeping how the ATO treats its annual limits on superannuation contributions. These caps are defined in dollars terms only, thus these "bonus units" may have to be rationed so as to remain under any ATO caps, should they apply. This complication may make the proposal unfeasible for the ADF to implement given the way individual taxation outcomes can vary. That said, annual superannuation contribution caps usually refer to a cap on member contributions. I am not aware if strict nominal or percentage-based caps exist for maximum lifetime, or indeed annual employer contributions. There are caps on the concessional contributions, but exceeding these just implies a deadweight loss, but the member still ultimately benefits.

only pays out as a lump sum at age 60 or later, unlike cash bonuses, this form of benefit payment cannot be diverted by the member, further ensuing retention. It also would not suffer some of the marginal tax losses that cash bonuses incur when paid directly to the member.

The final benefit of this option is that it locks in the starting unit price of the incentive on the day of purchase making it more communicable to member. The value of bonuses purchased at a single moment in time as opposed to over the course of a changing market (i.e., fortnightly with salary) will be more easily appraisable because of the way in which the unit price mechanism works. While the future value will still be dependent upon the final price, at least with this method, all units have the same baseline value. The earlier in time that this baseline is set will typically lead to higher returns given historical growth of CSC products. Essentially this reward mechanism could operate similarly to how "stock options" operate in civilian employment. In theory many more key performance indicators could be tied to such unit purchases rather than just additional years of service. Examining the costs and benefits of this proposal could be the basis of future research on this narrow topic.[72]

To further assist both schemes, the ADF should examine ways to increase financial literacy amongst Australian military personnel about their current entitlements. Applicable to the aggressive marketing of both schemes to serving members is however also the caution that the ADF needs to be transparent in describing which aspects of retirement planning constitute known risks and which constitute genuine uncertainties. Any education campaign must also be clear on which variables are under the member's control, which can be changed by the employer, and which are exogenous to both.

[72] Presumably one limitation would be that such purchases will be considered ancillary contributions, and therefore would be considered as part of the contributions cap. This is what occurs in MilitarySuper (only) with the annual Productivity Benefits "purchased" on behalf of the member and used to defray costs for the Commonwealth. These are considered part of an individual's annual concessional contributions cap. This would limit any annual bonus purchases to $27,500 (ATO, 2022f). This is still a considerable bonus particularly if made over several years and then escalated over decades.

APPENDIX A: CSC SCHEME MEMBERSHIPS 2020

Table 8. Number of 2020 CSC contributors. Adapted from AGA (2017) and AGA (2014).

Scheme (at 30 June 2020)	Number	Contributed Salaries* ($m pa)	Notes
DFRDB			
Male Officers	366	60	
Female Officers	19	3	
Male Enlisted	584	65	
Female Enlisted	18	2	
Total DFRDB	**987**	**129**	1.6% of all CSC scheme totals
Down from 1,740 and $213m (pa) in 2017			
MilitarySuper			
Male Officers	9,562	1,281	
Female Officers	2,447	311	
Male Enlisted	24,504	2,181	
Female Enlisted	4,384	373	
Cadets	71	5	
Total MilitarySuper	**40,968**	**4,152**	67.7% of all CSC scheme totals
Down from 52,371 and $4,598m (pa) in 2017			
ADF Super/Cover			
Male Officers	1,559	153	
Female Officers	559	50	
Male Enlisted	11,022	737	
Female Enlisted	3,907	260	
Cadets	1,522	81	
Total ADF Super/Cover	**18,569**	**1,281**	30.7% of all CSC scheme totals
Up from 5,839 and $269m (pa) in 2017			
Total for All Schemes	**60,524**	**5,562**	
Up 59,950 and $5,081 (pa) in 2017			

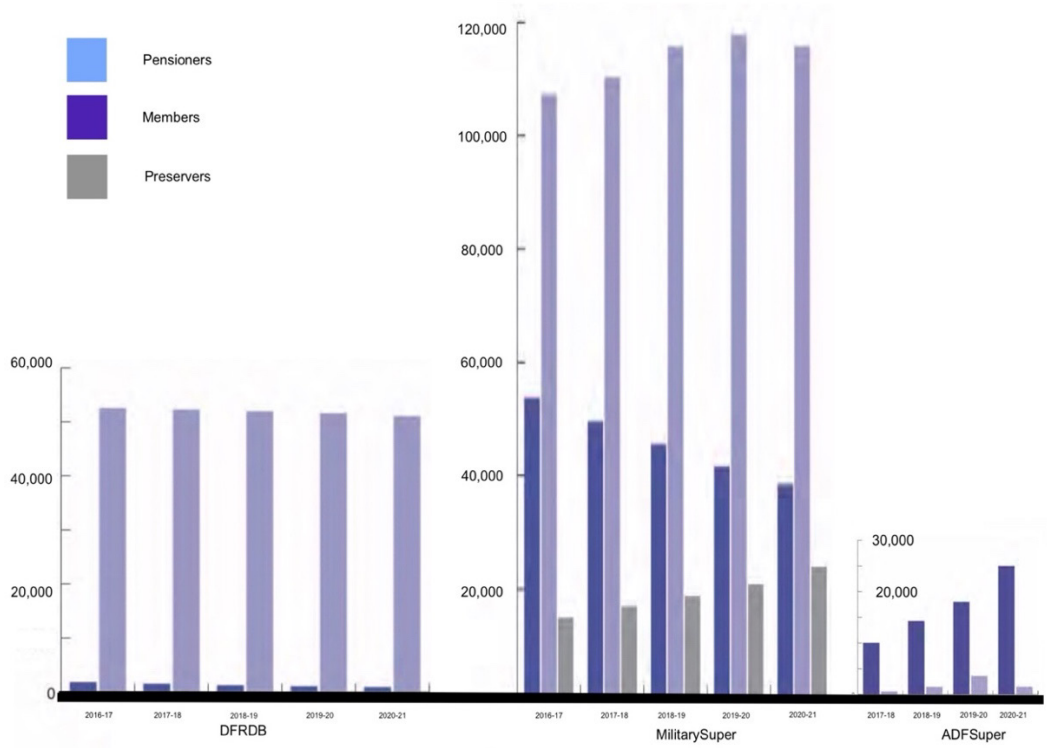
* Contributed salaries indicate the value of member contributions associated with these remaining serving members. Note: some of these contributors will have ceased making payments due to the impact of Maximum Benefit Limits.

Table 9. Number of 2020 CSC pensioners. Adapted from AGA (2020) and AGA (2017).

Scheme (at 30 Jne 2020)	Number	Pension Values ($m pa)	Notes
DFRDB			
Age Pensioners	40,197	1,257	
Invalid Pensioners	2,123	98	
Surviving Beneficiary Pensions	8,320	187	
Family Law Split Beneficiary Pensions	776	11	
Total DFRDB	**51,416**	**1,552**	
Numbers are down from 52,347 in 2017 but nominal values are up from $1,467m (pa) in 2017			
MilitarySuper			
Age Pensioners	7,340	254	
Invalid Pensioners	12,736	622	
Surviving Beneficiary Pensions	604	16	
Family Law Split Beneficiary Pensions	169	2	
Total MilitarySuper	**20,849**	**894**	
Up from 14,933 and $541m (pa) in 2017			
ADF Super/Cover			
Age Pensioners	0	0	
Invalid Pensioners	317	13	
Surviving Beneficiary Pensions	0	0	
Family Law Split Beneficiary Pensions	0	0	
Total ADF Super/Cover	**317**	**0**	
Up from 3 and $0m (pa) in 2017			
Total for All Schemes	**74,543**	**2,495**	
Up from 69,767 and $2,051m (pa) in 2017			

The figures in Table 8 and Table 9 are from the Australian Government Actuary (AGA) reports into Military Superannuation Schemes. These reports are not published every year and the data are taken from the 2017 AGA report (AGA, 2017), just after ADFSuper was started and the latest AGA report in 2020 (AGA, 2020). AGA data does not include the number of preservers in each scheme. Preservers are members that have resigned and have stopped contributing but will be due a payment in the future. Preserver data is available from CSC but not with any exactitude. Figure 7 is the best available

representation of the changes in DFRDB, MilitarySuper and ADFSuper since 2016. They are available variously in the CSC annual reports.



Note all three graphs have different vertical scales and have been reproduced here to the best approximation of similar magnitudes.

Figure 7. The sizes of all CSC managed schemes 2016–2021. Adapted from CSC (2021a).

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APPENDIX B: MILITARYSUPER PRODUCTIVITY BENEFIT

Productivity benefit contributions by the Commonwealth will continue only for as long as the member continues to make contributions.[73] Even though the figure seems relatively small, 3% of all salary earned, because this productivity benefit is fully funded and therefore invested in the market, the effect of compounding market returns may mean that this portion grows to a significant amount before it is it is subtracted from the total employer contribution. This means the remaining unfunded component of the employer's obligations may be significantly reduced, which after all is the intention of this particular complication, i.e., to defray the final costs associated with unfunded liabilities for the Commonwealth.[74]

Ultimately, whether the productivity benefit grows, or shrinks will only affect the amount of the employer obligation that remains unfunded and therefore will be of primary interest to the Commonwealth rather than the member. To the MilitarySuper member, the nominal figure of their EBM x FAS derived employer entitlement will not change, however different tax regimes do apply to the unfunded employer component and the funded productivity component because the latter has technically generated earnings.

Employer productivity contributions are deemed to have been derived from a "taxed" source" and therefore attract between 15% and 20% tax in the rare case when the lump sum is taken before the age of 60. After the age of 60 the rate is zero. The unfunded component was never taxed and will be taxed at the marginal tax rate when claimed as a lump sum (CSC, 2022f). Typically, in a growing market this should mean that as the accumulated productivity portion grows to become an ever-larger portion of the total entitlement, and that the tax burden to the member is reduced, however this does depend

[73] There are numerous reasons why a member might end their contributions even though these are mandatory in MilitarySuper. The most obvious is separation from the military but it will also occur when a member reaches their Maximum Benefit Limit.

[74] A further exacerbation of the notion that MilitarySuper members are not truly able to truly manage their superannuation's performance arises from the fact that MilitarySuper members are not at liberty to choose the investment risk level for the productivity component. It must remain at the default "Balanced" option.

on the exact earnings rate of the market, the CPI rate used to index the untaxed portion and the age at which the entitlement is taken.

On the other hand, if a member takes the pension, this difference in funding sources becomes somewhat invisible because the taxable amounts change only as the pension progresses. Pensioned members will pay the applicable marginal tax rate less a 15% offset on the productivity portion of their entitlement. An offset reduces the taxable amount before the marginal rate is applied. A 15% offset it is not equivalent to a 15% reduction in tax rate, nor is it a 15% tax rate. The exact value of the final tax paid will depend on the amount remaining after the offset is subtracted. In any case, with the pension option, much as just with the lump sum option, at the age of 60 the tax liability on the productivity contribution also falls to zero. On the unfunded portion of their total entitlement that remains after the offset, pensioned MilitarySuper members always pay the applicable marginal tax rate. Whether the on-going marginal tax rate paid in the pension option is above or below the 15% figure that most member have in mind when they conceive of taxation of retirement incomes will ultimately depend on their total income from other sources, and the total exact size of their pension. In simple terms, the effect of the productivity benefit for pensions and on lump sums, is that as members age, their tax burden is reduced but in slightly different ways.

As should be evident to the reader, the existence of MilitarySuper productivity contributions greatly complicates matters when trying to accurately model post-tax incomes streams for MilitarySuper members. The simplest solution is to wait until age 60 when the productivity related tax liabilities fall to zero, however the benefit of early access to the pension for the member cannot be discounted just to simplify one's tax liability. It is also doubtful whether this is obscure quirk is even visible to anyone but professionals or perhaps at best, to only to members in the very last stages of retirement planning. Thankfully, the added complications that the productivity "benefit" brings do not exist in ADFSuper or civilian superannuation because all funds are fully funded and paid in an on-going manner.

APPENDIX C: TAXATION

This paper will not present any after-tax computations of retirement entitlements. This is because of the immense complexity involved and secondly due the fact that tax policies are exogenous not only to the member but also to the employer. Although this paper will not present any after-tax comparisons, it is important to remember that the use of national tax polices is instrumental in creating the incentive schemes that drives much of superannuation behaviour.

In order to encourage national retirement savings, significant tax advantages are available to military personnel and civilians alike. This is achieved by diverting monies, be they from weekly payroll or from private savings into superannuation funds, provided individuals are willing to forgo access to these funds until retirement or age 60. There is a lot of complexity involved in superannuation taxation, but at its most basic, instead of being taxed at the marginal rates which for typical military salaries is 32.5% to 37%,[75] superannuation contributions are taxed at 15%. Depending on the exact mechanism of how these contributions are made, the tax liability may be levied either before the contributions enter the fund or upon withdrawal. A more complete sketch of the Australian superannuation taxation system is not offered here other than a brief outline of some of the factors that highlight why making long-range superannuation projections is difficult and moreover, obscure. Since the exact tax benefit cannot be well forecast, it follows that the opportunity cost faced by a member willing to tie up any additional contributions until the age of 60 can also not be easily modelled.

Adding to the complexity with superannuation, additional further voluntary employee contributions can be made either pre-tax (concessional contributions) or post tax (non-concessional). Again, there are complex rules that apply to members of any superannuation fund about lifetime member contribution totals, annual limits, low-income tax-offsets that vary depending on whether contributions were concessional or

[75] Australian marginal income tax rates for FY22-23 are $0 to $18,200 – 0%, $18,201 to $45,000 19%, $45,001 to $120,000 – 32% $120,001 to $180,000 – 37% and 45% for every dollar above $180,000. (ATO, 2022e)

non-concessional, as well with a person's age and also when in the history of the legislation contributions were made. (ATO, 2022f). In any case, exceeding these contributions caps means the tax benefits of additional contributions essentially evaporate and may actually lapse into disincentive (ATO, 2022c). Importantly, in MilitarySuper the fund itself will not accept more than 10% of annual (post-tax) earnings through member contributions which means that for the vast bulk of MilitarySuper members, exceeding these national caps is something that only occurs if they have additional super funds alongside MilitarySuper. All members of the ADF are free to contribute to additional superannuation arrangements if they chose to, however their combined totals of all contributions across all funds will be used for tax assessment purposes.

A comparison of the different taxation rates in Table 10 and Table 11 shows that broadly speaking the taxation rules for monies entering or leaving the two CSC schemes are very similar between schemes and between lump sum and pension options. This is of course because constitutionally (tax) law should produce similar results for all citizens under similar conditions. What will differ between MilitarySuper and ADFSuper is the fraction of final entitlements that are generated as a result of market earnings, versus those defined by formulaic decree. Earnings from market returns, that is to say the profit made on the underlying investment in an accumulation fund are taxed differently than defined benefits. However, in both cases the underlying asset, i.e., the money going in is taxed similarly.

Another taxation difference is that in ADFSuper, because only the lump sum option is available, tax is only paid once (on withdrawal), while in MilitarySuper, if the pension option is chosen, taxes will be ongoing at marginal tax rates. (CSC, 2022i) The true benefits of tax minimization strategies, and they are numerous, most of which involve additional contributions, are only ever calculable for individuals with a small set of starting values. Consequently, other than the distinction between lump sum and pension there is no generalizable difference between ADFSuper and MilitarySuper.

What must be stressed to the reader is that when comparing any two pre-tax retirement outcomes, any apparent advantage or disadvantage can easily be swayed in the other direction by effects of taxation, potentially invalidating any conclusions. All results

in Section IV are pre-tax. A summary of the different types and levels of contributions is given in Table 10.

Table 10. Taxation rules for contributions made to any Australian super fund. Adapted from ATO (2018), CSC (2022f), CSC (2022g), and CSC (2022p).

Transaction	When this would occur	Tax Rule (Contribution Caps)
After-Tax (non-concessional contribution)	At any time from savings Can be made on behalf of spouse as well	**0%** tax as income tax has already been paid in salary **Capped at $110,00 per annum** provided that the total accumulation is below $1.65m. Otherwise top marginal rate at 45%. There are complex rules about age limits, exemptions and how many years one can lump together (3 years max) in making these payments.
Before-Tax (concessional contributions)	Typically, out of payroll on on-going basis as "salary sacrifice." Employer productivity and ancillary payments are also included in the cap and so may vary adding some additional uncertainty	**15%** (instead of one's marginal tax rate) **Amount is capped at $27,500 per annum**. Some unused portion of previous years may be used to increase this cap in any given year. Any annual contributions above this amount count back towards the members assessable income and will be taxed at the applicable marginal income rate. An overall income tax offset of 15% (i.e., a reduction in in total assessable income) is applicable to allow for the fact that contributions tax was collected and paid by the fund itself.
Transfers from other funds	**Not possible in Military Super** but is possible in ADFSuper and civilian schemes.	**0%** on already taxed amounts 15% on previously untaxed contributions
Investment Earnings	Tax on earnings is deducted from CSC unit prices.	Up to 15% but invisible to members

This is a list of definitions that are applicable to taxation of superannuation arrangements adapted from (CSC, 2022f) and (CSC, 2022g).

Tax-Free Component. Employee contributions and any superannuation co-contributions made by the government (to low-income earners). Where applicable (ADFSuper and civilian superannuation) will include transfers in from other superannuation funds .

Taxable Component from a taxed source. The 3% Employer Productivity Contributions. These are derived from a taxed source namely the member's salary. Any

fund earning on generated by member contributions and productivity benefit are also included.

Taxable Component from an untaxed source. The unfunded employer contributions. These have never been deposited and so have never been taxed, nor have they ever generated any earnings.

Table 11 lists the ATO tax rates applicable when the pension option is taken in MilitarySuper and Table 12 lists the tax rates applicable when MilitarySuper members elect to be paid in a lump sum rather than in a pension.

Table 11. MilitarySuper pension tax rates. Adapted from CSC (2022i).

MilitarySuper PENSION	% Tax Payable on taxed source		% Tax Payable on untaxed source	
	Tax-Free Component	Taxable Component	Tax-Free Component	Taxable Component
Pensions issued under preservation age; this covers most invalidity pensions	0%	Marginal tax rate	N/A Derived from EBM No Untaxed Sources	Marginal tax rate
Between preservation age and 59	0%	Marginal tax rate Less a 15% Tax Offset		Marginal tax rate
60 and over	0%	0%		Marginal tax rate
For the over 60, these tax concessions as applied to regular pension are limited to defined benefit amounts below $106,250 per annum (FY22-23). Because some of this defined benefit may include addition employer payments such as productivity benefit or other SG ancillary contributions. All already taxed sources are considered first when counting forward to $106,250. Thereafter 50% of any benefit above this figure will be counted as ordinary assessed income and any benefit from untaxed source (i.e., the bulk of employer contributions) will not be eligible for a 10% tax offset.				

Table 12. MilitarySuper lump sum tax rates. Adapted from CSC (2022f).

ADFSuper and MilitarySuper LUMP SUM	% Tax Payable on taxed source		% Tax Payable on untaxed source	
	Tax-Free Component	Taxable Component	Tax-Free Component	Taxable Component
If member applies to receive a lump sum while under preservation age	0%	20% plus Medicare Levy (~2%)	0%	30% plus Medicare Levy (~2%). If greater than $1.65m top marginal tax rate (45%)
Between preservation age and 59 and Lump Sum < $230,000	0%	0%	0%	15 % plus Medicare Levy (~2%)
Between preservation age and 59 and Lump Sum > $230,000	0%	15% plus Medicare Levy (~2%)	0%	30% plus Medicare Levy (~2%). If greater than $1.65m top marginal tax rate (45%)
60 and over	0%	0%	0%	15% plus Medicare Levy (~2%). If greater than $1.65m top marginal tax rate (45%)
Death (at any age) Benefit paid as a lump sum to a eligible dependent	0%	0%	0%	0%

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APPENDIX D: ANCILLARY CONTRIBUTIONS

Ancillary Contributions. In all forms of superannuation there is an additional way that funds can be added to a members retirement investments called ancillary contributions. CSC accepts six types of ancillary payments (CSC, 2022i) and (ATO, 2019a). These are pre-tax salary sacrificing contributions, post-tax personal contributions, spousal contributions, two forms of government contributions and superannuation rollovers. Because the incentive mechanisms behind ancillary payments are based on leveraging the difference between lower superannuation tax rate of 15% and an individual's marginal tax rate, there are caps placed by the Australian Tax Office (ATO) on the maximum allowable amounts of additional annual voluntary contributions. These apply to all Australian taxpayers regardless of their superannuation fund. These are primarily designed to prevent high-income individuals from sheltering their taxable income in superannuation funds by making large pre-tax voluntary contributions (known as salary sacrificing). Such strategies may even make some high-income earner eligible for additional welfare payments.

One of the most impactful types of ancillary contributions are funds "rolled-over" from one superannuation fund to another. Transferring funds into MilitarySuper is not allowed in any form, although with recent legislative changes member contributions funds can now be transferred out. MilitarySuper members have always been free to set up additional superannuation funds if they wished. Transferring funds in and out of ADFSuper is now also possible. Such transfers were always a feature available in civilian superannuation. I will not consider any options that involve the roll-over of funds to or from other superannuation accounts in any part of my analysis.

Three of the remaining types of ancillary contributions involve mechanisms that leverage the fact that superannuation payments are taxed at 15%, which is significantly below the marginal income tax rate for most ADF members. Different rules apply depending on whether these contributions are made from pre or post income tax earnings, or if they are made to boost spousal superannuation. Due to the enormous second order tax complexities involved; I will not examine the additional benefits offered by these

various forms of personal ancillary contributions. I will instead assume everywhere in my comparisons that no such payments are made.

There are however two types of ancillary contributions that come from sources other than the member. Firstly, there are additional government co-contributions aimed at boosting retirement savings for low-income earners (ATO, 2019b) and (ATO, 2022b).[76] I will not consider these because they would apply only to a small minority of ADF members. Nonetheless, additional co-contributions are still worth bearing in mind, especially when any comparison between any two options begins to narrow. Any small additional early contributions, when compounded over decades may potentially add tens of thousands of dollars to the final figures at retirement.

The final ancillary contributions are employer contributions used to ensure that the 10.5 % Super Guarantee has been met for any given FY. In the case of ADFSuper, the employer contributions of 16.5% are already in excess of 10.5% and therefore this mechanism is not frequently applicable.[77] In civilian superannuation this mechanism is frequently used to reconcile and shortfall between estimated Super Guarantee labilities and actual final employer liabilities.

That said, the caps on ancillary contributions are notorious for their ever-changing income and age eligibility criteria, depending on the government of the day and budgetary conditions. In MilitarySuper, the added complication is that the 3%

[76] Government Co-contributions only occur when the member chooses to make additional superannuation contributions which are then "matched" by the government as an incentive. In FY 2022–23 the threshold was below $58,000 pa. Some junior ADF member will qualify for this, particularly if they have only just joined the ADF without any other income in their first FY, but only if they choose to make such additional contributions. There is also an additional Low Income Super Tax Offset, which is a maximum $500 payment made by the Government to incomes below $37,000. Both these forms of government superannuation supplements are calculated automatically by the ATO with no additional effort for members.

[77] There are many ways employers can calculate their obligation with respect to the Super Guarantee, in that they can contribute a certain amount each pay or an estimated amount in the case of varying income. Whatever the method, the total annual employer contribution has to equal 10.5% of total earnings paid to the employee in that financial year. Final reconciliation typically involves some form of balancing top-up at the end of the FY. It typically affects lower income employees or recently added or irregular employees, all of which are technically possible in the ADF but do not constitute the bulk of the ADF. Additional SG payments are due when 10.5% of salary is deemed no enough in nominal terms and there is also an upper limit beyond which the additional SG payments no longer apply (the maximum contribution base salary). This is mentioned because for MilitarySuper members, these balancing contributions may generate earnings and may be taxed differently at retirement than the bulk of their defined benefit.

Productivity Benefit is counted as part of this contribution cap. (CSC, 2022i) and (CSC, 2013). This means that MilitarySuper member will have less incentives to make additional contributions, or at least the total additional voluntary contributions they can make will be smaller by roughly 3% of their salary. Additionally, because Productivity Benefit is calculated as 3% of salary but the ATO caps are set as fixed nominal amounts, this 3% reduction in remaining allowable additional voluntary contributions will affect higher ADF salary earners more than lower salary earners. A more precise estimation of the disincentive effects of the Productivity Benefit is not possible in my comparison.

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APPENDIX E: AGE CONVERSION FACTORS

Table 13. Age Conversion Factors for MilitarySuper pension calculations. Adapted from CSC (2011).

Age at pension start	Age Conversion Factor	Age at pension start	Age Conversion Factor
45	14.0	55	12.0
46	13.8	56	11.8
47	13.6	57	11.6
48	13.4	58	11.4
49	13.2	59	11.2
50	13.0	60	11.0
51	12.8	61	10.8
52	12.6	62	10.6
53	12.4	63	10.4
54	12.2	64	10.2
		65	10.0

Age Conversion Factors can be worked out according to age in years and days. At the date of the decision to elect the pension option. A member aged 55 years and 67 days would yield:

$$ACF_{55y\ 67d} = 12.2 - \frac{(\ 67\ x\ 0.2\ )}{365.25} = 12.163$$

The formula used is:

$$Final\ ACF = ACF\ at\ Last\ Birthday - \frac{(\ Days\ since\ Last\ Birthday\ x\ 0.2\ )}{365.25}$$

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APPENDIX F: MAXIMUM BENEFIT LIMITS

Maximum Benefit Limits apply only to MilitarySuper and do not apply to ADFSuper or ordinary civilian market-based accumulation funds. There are two MilitarySuper Maximum Benefit Limits. A lower lump sum MBL which will be crossed first and a higher pension MBL. There are important differences that arise depending on the exact sequence of retirement, the MBL involved and any changes to FAS. Three of the most common sequences will be explained at the end of this appendix.

The most important feature of MBLs is that they are calculated using the sum total of both the employee and employer contributions. It is the total value of a member's retirement benefits that is important, not just the employer component it was designed to limit. Secondly, triggering an MBL is irreversible. As the mechanisms of MilitarySuper are defined in an act of parliament, there is nothing the employer (DOD,) nor CSC nor the member can do once an MBL is crossed. This means that any extraordinary growth of a member's portfolio on the market can irreversibly trigger an MBL. While reaching the upper end of a defined benefit scheme may be a "nice problem to have" this mechanism may lead to changes in behaviour by senior members close to an MBL.

Lump Sum MBL. Once a member reaches the lump sum MBL the member can choose notify CSC in choosing one of the two following options: (1) continue to make member contributions at any level between 5% and 10%, or (2) stop making contributions. The default option if no formal choice is made is to continue making the same member contributions until the pension MBL is reached. Members choosing to continue making contributions after the lump sum MBL is reached can at any time elect to cease contributions however when the higher pension MBL is reached they must stop. Most importantly, any decision made to cease member contributions at any time constitutes a formal election under the provisions of the *Military Superannuation and Benefits Act 1991* and can never be reversed. A reduction in contributions below 5% is also not possible. Crucially, if a member ceases to make contributions the Commonwealth will also cease to make the 3% productivity contribution, and the

member's EBM is frozen, after which all employer funds are preserved.[78] A new formula for how preserved funds will continue to grow will then be applied. Three worked examples are provided in scenarios 1,2 and 3 below.

Pension MBL. Once a member reaches their pension MBL they cannot make any more contributions. Much more importantly however, all employer contributions will also cease at this point. Mathematically this means the YoS based EBM will stop accruing and become preserved. Crossing a pension MBL is irreversible, not matter what change in personal or national circumstances occur. As with an election to voluntarily cease member contributions, all preserved employer contribution will continue to grow but by a formula that uses the frozen EBM and FAS very differently.[79]

Table 14. MilitarySuper Maximum Benefit Limits. Adapted from CSC (2022j).

Final Average Salary	**Lump Sum MBL FY 22–23**	**Pension MBL FY 22–23**
Less than $83,560	$666,499	$832,930
$83,560 to $133,410	FAS x 8	FAS x 10
$133,411 to $247,480	$266,820 plus FAS x 6	$400,230 plus FAS x 7
Greater than $247,480	$1,009,260 plus FAS x 3	$1,142,670 plus FAS x 4
MBLs apply to MilitarySuper only, there is no equivalent in ADFSuper or Civilian superannuation MilitarySuper MBL apply to the sum of the current market value of ALL EMPLOYEE contributions and the defined benefits EMB x FAS EMPLOYER contributions. Once triggered no more employer or employee contributions can be made but the preserved amount is still indexed every year for CPI.		

[78] Ancillary contributions by the Commonwealth such as any shortfall from the national Super Guarantee may continue to be made as they are derived from a different piece of legislation. It is highly unlikely that senior MilitarySuper members entitled to 28% employer contributions will experience a SG shortfall and thus ancillary contributions at this late stage are the exception. However, as is always the case, entirely un-foreseen impacts of changes to national superannuation policy may occur at any time and those are likely to be resolved using the ancillary contributions mechanism.

[79] It is even mathematically possible that a well-timed late demotion in the latter part of the three-year FAS cycle, or a change of career specialization and subsequent reduction in pay, will extend the period for which employer contributions continue to be received for long enough that a member, who elects to receive their benefit as a life-long pension, may be better off in the long run! Particularly if the AWOTE used to calculate the MBLs were to increase substantially at the very next increment.

Thus, a frequent complaint of MilitarySuper members who have had triggered their pension MBLs is that they are working for less than they were before. In a gross sense this is true, the member will be at a disadvantage when compared an alternative where the MBL did not exist. However, as the worked examples in the scenarios below show, the notion that MBL constitute a 28% reduction overall remuneration is an overstatement. This is because MBLs are increased every year according to changes in the Average Weekly Ordinary Times Earnings (AWOTE) and FAS should continue to grow as well.[80] ADFSuper members of course are not similarly affected as there are no MBL limits in ADFSuper. Ultimately, the precise sequence in which members reach their MBL, what they do next and any changes in their FAS will greatly complicate the seeming simplicity of the MBL limits described in Table 14. Just three common scenarios are presented here, to illustrate to the reader, yet another reason why modeling retirement returns is difficult and why any generalities are easily overwhelmed by personal circumstances. Table 15 lists the definitions of terms used to calculate an MBL.

Table 15. MBL calculation definitions. Adapted from CSC (2022j).

TB	Total market value of member contributions plus EBM calculated employer contributions at the time when MBL is triggered (or more technically, at the time when member contributions cease). This is because a member might cease contributions at any time been the lump sum MBL and the pension MBL.
MB	Total market value of member contributions at the time member contributions cease, not at the time of retirement
EB	Employer benefit at time the member retires. This is the most important of all MilitarySuper figures.
LS MBMC	Lump sum maximum benefit multiple t the time member contribution cease. Multiples are calculated by dividing the MBLs listed in Table 14 by the FAS at the time the member stops contribution, their FASC (and not their final FAS when they actually retire, their FASR).
LS MBMR	Lump sum maximum benefit multiple at the time member actually retires, this will invariably be higher than LSMBMC
PMBMC	Pension Maximum Benefit Limit at the time member contributions cease
PMBMR	Pension Maximum Benefit limit at the time member retires
FASC	Final Average Salary for the last 3 years of service (1095 days) at time member contributions cease
FASR	Final Average Salary for the last 3 years of service (1095 days) at time member retires

[80] AWOTE has increased by an annualized rate of 3.8% pa since 2016 (ATO, 2022g).

Equations of MilitarySuper:

$$Lump\ Sum\ EB = \left(\underbrace{LSMCMR \times FASR}_{\text{Conditions at retirement}} \times \underbrace{\left(\frac{TB}{FASC \times LSMBMC}\right)}_{\text{Conditions at member contribution cessation}}\right) - MB$$

$$Pension\ EB = \left(PSMCMR \times FASR \times \left(\frac{TB}{FASC \times PSMBMC}\right)\right) - MB$$

These can be re-written as the equations below. This formulation allows us to see that the mechanism at work is the ratio of values of the conditions at retirement divided by the conditions at cessation. We can see that the employer benefit will grow by the compound of the ratio of salaries and the ratio of MBLs at the two points in time.

$$Lump\ Sum\ \ EB = TB\left(\frac{LSMBMR}{LCMBMC} \times \frac{FASR}{FASC}\right) - MB$$

$$Pension\ \ EB = TB\left(\frac{PSMBMR}{LCMBMC} \times \frac{FASR}{FASC}\right) - MB$$

Scenario 1.

January 2020, member reaches lump sum MBL and elects to cease contributions

- FASC = $80,000
- MB = $190,000
- Employer Benefit = $425,000
- TB = $ 190,000 + $425,000 = $642,000
- Lump Sum MBL from Table 14 = 8 times FAS = 8 x $80,000 = $640,000

- ∴ LSMBMC is the inverse calculation $640,000 ÷ $80,000 = 8

January 2025, member resigns from the ADF

- FASR = $90,000
- Lump Sum MBL from Table 14 = 8 times FAS = 8 x $80,000 = $640,000
- ∴ LSMBMR is the inverse calculation $640,000 ÷ $80,000 = 8

$$EB = \$642{,}000\left(\frac{8}{8}\times\frac{\$90{,}000}{\$80{,}000}\right) - \$190{,}000 = \$532{,}250$$

The member will also collect their member benefit at a time of their choosing, but before age 65, at future market value. By then this should be larger than the MB quoted above. Their total lump sum benefit will be greater than $722,250 ($532,50 plus $190,000+). We can see the employer benefit portion has risen from $425,000 to $532,250, or 25.24% in five years. This is an annual growth of 4.6%, slightly under the market average of 5.8%. Arguably, had these funds been on the market at 5.8%, the employer benefits would be worth $563,400, or $31,150 more. Of course, this projected increase comes with a great deal of risk while EB calculations are relatively stable. They are however not risk free. Changes in AWOTE will affect these results. The greater the disparity between the stock market and average wage increases the greater the difference will be. That observation also applies to the following two scenarios.

The other point to contemplate is what the uncapped EBM x FAS valuation would have been if MBLs did not exist. Given that the EB in 2018 was $425,000 and the FASC was $80,000, then the EBM must have been 5.3125. This is equal to 23 Years and 290 days of service. An extra 5 years would have added (5 x 0.28) to the EBM. The new EBM = 6.7125. Thus, the final employer benefit would have been $90,000 x 6.7125 = $604,125. This would have been a spectacular increase of $179,125 from the original employer benefit of $425,000. This is the equivalent 42.147% or 7.287% pa, beating the long-term market performance by almost a quarter increase. This seemingly outrageous increase is of course precisely why defined benefit schemes have been curtailed and why MBLs exist. It is the doubly compounding effect of an increasing numerator since both

FAS and EBM increase annually. These figures assume that FAS increases at 2% pa, and each additional year of service increases the EBM a nominal 0.28.[81]

Taking the pension option is potentially even more acceleratory. Pensions involve dividing FAS x EBM by the Age Conversion Factor, which falls with each passing year. That formula is triply compounded, twice in the numerator and once in the denominator. For illustration, if this member had joined at age 22, their age at the original MBL trigger would have been only 45.8. This is just for arguments sake, as it is not actually possible to take the pension at this early age. Nonetheless, their pension (FAS x EMB / ACF) would be worth $$80,000 x 5.3125 / 13.84 =$30,708. If they serve another five years this would be $604,125/12.84 =$47,050 or a 53.2% increase in pension. If the member were to try to generate this improvement from a market annuity, that annuity would have to be scaled up by 53.2%. Or put another way it would have to grow through the addition of extra funds into the annuity by 8.9% pa (presumably from the market returns derived from some other investment). 8.9% growth would be an even greater outpacing of the long-term market. At CRA, in a further 15 years, the member's FAS would have reached approximately $121,000, their EMB after 38 years of service would be 9.29 and their ACF 11.0. Their pension would then be $102,190. This represents a growth of 332% from 20 years previously when the member was, for exercise purposes, "entitled" to a pension of $30,708. This is a growth of 6.19% per annum every year for 20 years, at zero risk; a record that any stock market investor would be proud of.

The above scenario is but one possible combination of variables. In the interest of brevity, these alternative world comparisons wherein MBLs do not exits will not be repeated in the scenarios below. Suffice to say the lesson here is that if MBLs did not exist, defined benefit schemes would be extremely lucrative to the member, so much so the scheme itself could potentially become unsustainable, although Consolidated Revenue is a very, very large pot.

[81] Notably, as a percentage the EBM increase is shrinking every year. For example, going from 25 to 26 years is a rise in EBM from 5.56 to 5.93 or a 5.03% increase. Going from 30 YoS to 31Yos the EBM rises from 7.05 to 7.33, which is a rise of only 3.97%. The EBM rises, and only ever rises, for every day of service right up until the moment it is frozen.

Another note is that similar strain on government coffers would occur (but to a lesser degree) even with MBLs continuing if CRA is ever lifted. There would be more cases where EMB, FAS and ACF could compound for longer even, although the numbers of potential members this would affect is now getting smaller every day since MilitarySuper is closed.

Scenario 2.

In January 2018, after 31 YoS, member reaches pension sum MBL, all contributions must cease.

- FASC = $145,000
- MB = $307,105
- Employer Benefit = $145,00 x EMB (7.33) = $1,062,850
- TB = $ 1,369,955
- Lump Sum MBL (2018) = $ 354,956 [82] plus 7 times FAS = $1,369,956 (same as TB)
- ∴ PMBMC is the inverse calculation $1,369,955 ÷ $145,00 = 9.447965

After 33 YoS, member resigns reached CRA

- FASR = $150,858 (at 2% pa)
- Lump Sum MBL from Table 14= $387,589 plus 7 times FAS = $1,443,595
- ∴ PMBMR is $1,456,236 ÷ $150,858 = $ 9.5692
- $EB = \$1{,}369{,}955\left(\frac{9.5692}{9.4479} \times \frac{\$150{,}858}{\$145{,}000}\right) - \$307{,}105 = \$1{,}136{,}489$

The member will also collect their member benefit at a time of their choosing, but before age 65, at future market value, which should be larger than the MB quoted above. Their total lump sum benefit will be more than $1,443,594 ($1,136,489 plus $307,105+). We can see here that the employer benefit has risen by 6.93% from $1,062,850 in two

82 This can be deduced from changes in AWOTE. 2023 AWOE is $1,769.80. January 2018 (December Quarter Y17-18) AWOTE was $1,569.60 (ATO, 2022g). Therefore, the pension MBL figure is likely to have been $1,569/$1,769 * $400,230 = $354,956. In 2020, the same figure would be $1,713.90/ 1769.80 * $400,230 = $ 387,588 Once again the reader can understand why modelling CSC pensions is obscure and difficult.

years, or 3.41% annually. Much like the previous example, this is below the long-term market rate of 5.8%. The shortfall from market rates is however larger and occurs sooner than in scenario 1, which is another demonstration to the reader of how the actual solution space is heavily reliant on personal circumstances and is not easily generalizable.

Scenario 3.

This scenario is particularly pertinent to retention considerations. It goes to the heart of the notion that MBLs stifle career motivations. Despite MBLs, it remains true that the best way for an ADF member to increase their overall entitlement is to be promoted and thereby collect a larger salary.

In March 2018, a member reaches pension sum MBL, and all contributions must cease.

- FASC = $115,000
- MB = $280,000
- Employer Benefit = $ $872,000
- TB = $ 1,152,000
- Lump Sum MBL (2018) = 10 x FASC = $1,150,000
- ∴ PMBMC = 10

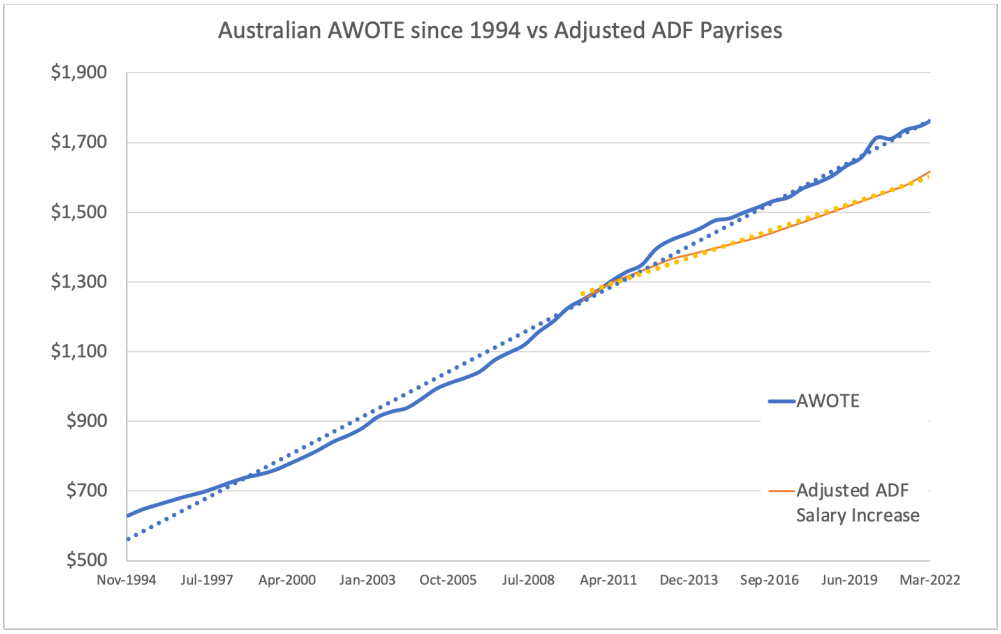
In January 2019, the member is promoted. By November 2019 they resign.

- FASR = $123,000
- Lump Sum MBL = $367,500 [83] plus 7 times FAS = $1,228,500
  The member is now in a higher tier than their original 10 x FAS MBL bracket
- ∴ PMBMR is $1,228,500 ÷ $123,000 = $ 9.9878
- $EB = \$1{,}152{,}000\left(\frac{9.9878}{10} \times \frac{\$123{,}000}{\$115{,}000}\right) - \$280{,}000 = \$950{,}641$

[83] In January 2019 AWOTE was $1,605 (ATO, 2022g). Therefore, the pension MBL figure is likely to have been $1,605/$1,769 * $400,230 ~ $367,500 remembering to de-escalate the FAS bands. The promotion has pushed the member from the x10FAS MBL band into the next higher tier. However, the value in Table 4 cannot be used as they are the current FY 22–23 values. The tier FAS values need to be de-escalated using the same AWOTE method as above.

The member will also collect their accumulated member benefit. Their total lump sum benefit will be greater than $1,230,641 ($950,641, plus $280,000+). The employer benefit has grown from $872,000 or 9.01 % in one year and 11 months, or 4.61% pa. This growth is again below the historic rate of market growth had these funds been in ADFSuper. $872,000 invested at 5.8% pa would grow to $971,510, or 2.2% pa more.

As discussed, MBL are calculated from an interaction between FAS, EMB and AWOTE. In some sense, many MilitarySuper members are caught in a race between rises in their FAS and rises in AWOTE. Changes in FAS are mostly exogenous to the member although their own work ethic will play apart. Changes in AWOTE are entirely exogenous to the member, the DOD and indeed exogenous to the entire Commonwealth government; and therefore, represent a true uncertainty. Figure 8 compares ADF pay rises with changes in AWOTE. ADF pay rises since 2011 have increase at an average annualized rate of 2.2% while AWOTE have increase at an average annualized rate of 3.86%. We can see this difference in the steeper AWOTE gradient.



The AWOTE figures in blue are actual earnings in Australian dollars (ATO, 2022f). The orange line is not an actual ADF salary. Rather ADF annual pay rises since 2011 have been applied to the AWOTE 2011 figure, and for each subsequent year, in order to visualize the difference in gradients. The ADF pay rise figures are taken from Table 35 in Appendix K.

Figure 8. Australian Weekly Ordinary Times Earnings vs. ADF pay rises

The reason why I am discussing trends in AWOTE compared to FAS, is because if member's FAS rises faster than AWOTE this pushes their employer benefit closer to their applicable MBL. For members in the second MBL tier ($83,560 to $133,410) their limits are simple integer multiple of FAS. AWOTE's will never be an issue for them as any increase in FAS pushes the MBL further away.[84] For members in the next tier ($133,410 to $247,480) the range of MBL multiples falls from 8 to 7.07 for the lump sum, and from 10 to 8.61 for the pension MBL, when considered across that range of salaries. It is the inclusion of the two initial constants of $266,820 and $400,230 in the third MBL tier, that link FAS with AWOTE.[85] For those members, should their FAS rise

[84] Except of course for the unlucky few that may just trip over the minimum FAS figure, just before the AWOTE figures are updated on 01 July each year. Although the MBL multiple in the first tier are a little less than 8 and 10, anyone earning such a low FAS is unlikely to be working long enough in the ADF to impinge on their MBL, but it is technically possible.

[85] MBL multiples actually begin to fall at $133,410 and then fall smoothly from tier 3 to 4. Tier 4 multiples simply start where Tier 3 ends, hence the MBL step-function actually occurs from Tiers 2 to 3.

faster than AWOTE, the onset of the MBL will be hastened by an MBL figure that is rising too slowly. The data in Figure 8 shows however that is unlikely to be the mechanism triggering real-world MBLs, because AWOTE is rising faster than FAS. Instead, it is the combination of 2% increases in FAS, coupled with the typical 0.28 EBM multiple for late career members that is causing MBL to be triggered.

A word of caution though. Any constantly applied increase will lead to a classic exponential curve. Figure 8 however looks remarkably linear for both AWOTE and ADF salary increases. This however is likely to be an artifact of the small increases involved and the relatively short time frames. Even though the AWOTE data is taken over 28 years (56 observations), readers will notice that in the early decades the curve indeed did appear to be have begun to show signs of trending exponentially. This was reversed with the wage stagnation of the last two decades. The ADF data looks stagnant, because of the small number of observations and the fact that ADF wages rises are even smaller than AWOTE. Over a 42-year career I would expect the ADF data to become more exponential, especially under the constant 2% assumption. However, AWOTE increases, or decreases cannot be reliably predicted over such a large timeframe.

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APPENDIX G: INDEXATION

ADFSuper and civilian superannuation employee and employer contributions are not indexed. Bi-annual indexation is applied to MilitarySuper preserved funds between the time a member separates and when retirement payments are made. All pensions, once started, whether they are MilitarySuper pensions, or death and disability pensions paid from either MilitarySuper or ADFSuper are also indexed using these figures. Table 16 lists the historical values of CPI used to index CSC superannuation products.

Table 16. Historical CSC CPI indexations. Adapted from CSC (2022k) and ABS (2022).

		Indexation (6 monthly)	12-month rate Jan x July	ABS CPI Index base
Jan 2023	FY22-23	3.6%	7.23%	128.4
July 2022	Across two FY	3.5%	5.05%	123.9
Jan 2022	FY21-22	1.5%	2.62%	119.7
July 2021	Across two FY	1.10%	1.10%	117.9
Jan 2021	FY20-21	0.0%	1.00%	116.2
July 2020	Across two FY	1.0%	2.11%	116.6
Jan 2020	FY19-20	1.1%	1.61%	115.4
July 2019	Across two FY	0.5%	1.30%	114.1
Jan 2019	FY18-19	0.8%	1.91%	113.5
July 2018	Across two FY	1.1%	1.91%	112.6
Jan 2018	FY17-18	0.8%	1.81%	111.4
July 2017	Across two FY	1.0%	1.91%	110.5
Jan 2017	FY16-17	0.8%	1.91%	109.4
July 2016	Across two FY	1.0%		108.2

If CPI falls pensions are not reduced
Example Calculation
Jan 23 is (128.4-123.9)/123.9 (x100) = 3.63 (rounded to nearest first decimal)
Note: Jan 22 is the change over six months from Sept 21 to March 22 and July 22 is the change from March 22 to Sep 22. Consequently, the July figures cross financial years which start 01 July – 30 Jun.

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APPENDIX H.1: CSC INVESTMENT CHOICES

MilitarySuper and ADFSuper have four investment options that members can choose to invest their accumulated funds in. These are Cash, Income Focused, Balanced and Aggressive. ADFSuper members can choose how to invest both their member contributions as well as their employer contributions because both are accumulated funds. MilitarySuper members can only choose how to invest their accumulated member contributions. In MilitarySuper, the 3% Productivity Benefit is held in the Balanced option and members cannot change this investment strategy. MilitarySuper member can change investments free of cost. ADFSuper member get two free changes per financial year and $20 per change thereafter. Below is a description of the investment objectives of each investment option as well as a description of their performance since the fund's inception. While MilitarySuper and ADFSuper have very similar sounding investment options, technically they have slightly different weightings of the same assets in each portfolio. Figure 9 shows the historical growth for the two CSC schemes.

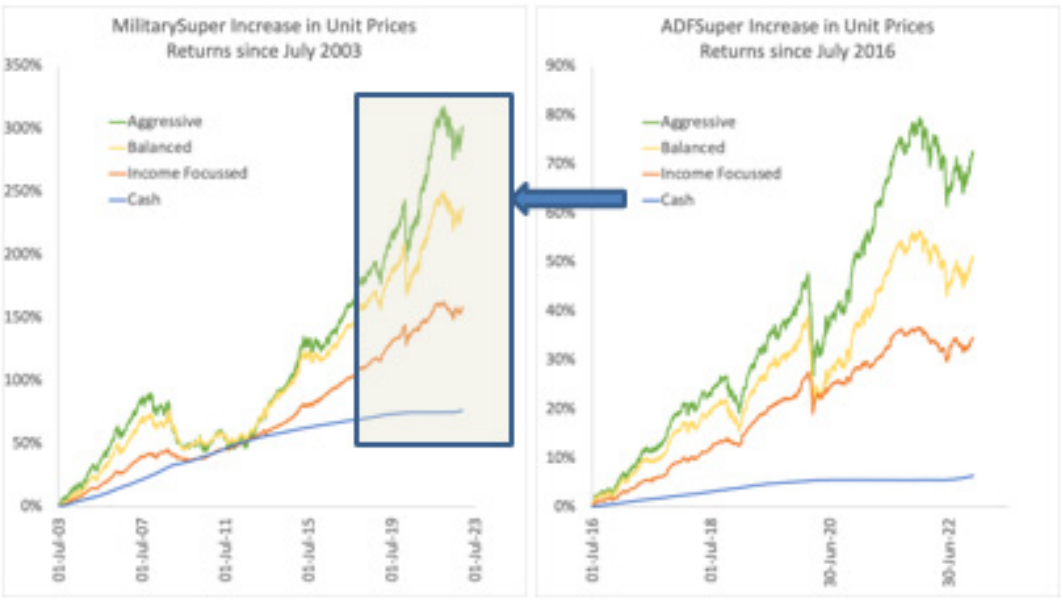


Figure 9. CSC investment portfolio historical returns since MilitarySuper and ADFSuper inception

Cash

Investment Objective: "To preserve its capital and earn a pre-tax return close to that of the Bloomberg AusBond bank bill index"

Risk Profile – SRM Band 1 (very low)

Target Asset Allocation – 100% Cash assets

Performance since fund inception – Red Boxes compare to ADFSuper Start Date

For Tables 17 to 24: Red boxes indicate how MilitarySuper was performing at the time of ADFSuper inception. Annual returns are shown in the orange column. Cumulative performance is in the green column, and current performance at 28 Nov 2022 in the yellow row.

Table 17. MilitarySuper Cash portfolio performance 2003–2022

FY Start	Unit Price ($)	FY End	Unit Price ($)	1 Year	3-Year	5-Year	7-Year	10-Year	15-Year	Since Start	Annualised	Years
01-Jul-03	1	30-Jun-04	1.044388	4.44%						4.44%	4.44%	1
01-Jul-04	1.044394	30-Jun-05	1.089529	4.32%						8.95%	4.38%	2
01-Jul-05	1.08962	30-Jun-06	1.151684	5.70%	4.82%					15.17%	4.82%	3
01-Jul-06	1.151684	30-Jun-07	1.214122	5.42%	5.15%					21.41%	4.97%	4
01-Jul-07	1.214122	30-Jun-08	1.28856	6.13%	5.75%	5.20%				28.86%	5.20%	5
01-Jul-08	1.288875	30-Jun-09	1.348084	4.59%	5.39%	5.24%				34.81%	5.10%	6
01-Jul-09	1.348203	30-Jun-10	1.39666	3.59%	4.78%	5.09%	4.89%			39.67%	4.89%	7
01-Jul-10	1.396819	30-Jun-11	1.458702	4.43%	4.21%	4.84%	4.89%			45.87%	4.83%	8
01-Jul-11	1.459134	30-Jun-12	1.518361	4.06%	4.04%	4.57%	4.85%			51.84%	4.75%	9
01-Jul-12	1.518361	30-Jun-13	1.561477	2.84%	3.78%	3.91%	4.44%	4.56%		56.15%	4.56%	10
01-Jul-13	1.561607	30-Jun-14	1.595507	2.17%	3.02%	3.43%	3.98%	4.33%		59.55%	4.34%	11
01-Jul-14	1.595607	30-Jun-15	1.628569	2.07%	2.36%	3.12%	3.40%	4.10%		62.86%	4.15%	12
01-Jul-15	1.628654	30-Jun-16	1.656451	1.71%	1.98%	2.57%	2.99%	3.70%		65.65%	3.96%	13
01-Jul-16	**1.656539**	30-Jun-17	1.683049	1.60%	1.79%	2.08%	2.70%	3.32%		68.30%	3.79%	14
01-Jul-17	1.683049	29-Jun-18	1.70691	1.42%	1.58%	1.80%	2.27%	2.85%	3.63%	70.69%	3.63%	15
02-Jul-18	1.707172	28-Jun-19	1.735073	1.63%	1.56%	1.69%	1.92%	2.55%	3.44%	73.51%	3.50%	16
01-Jul-19	1.735209	30-Jun-20	1.747891	0.73%	1.27%	1.42%	1.62%	2.27%	3.20%	74.79%	3.34%	17
01-Jul-20	1.747897	30-Jun-21	1.74857	0.04%	0.80%	1.09%	1.32%	1.83%	2.82%	74.86%	3.15%	18
01-Jul-21	1.748567	30-Jun-22	**1.749696**	0.06%	0.28%	0.78%	1.03%	1.43%	2.47%	74.97%	2.99%	19
01-Jul-22	1.749754	28-Nov-22	1.763235	**Final Whole of Scheme Performance**						76.32%	2.82%	20.4107

Table 18. ADFSuper Cash portfolio performance 2016–2022

FY Start	Unit Price ($)	FY End	Unit Price ($)	1 Year	3-Year	5-Year	7-Year	10-Year	15-Year	Since Start	Annualised	Years
01-Jul-16	1.00006	30-Jun-17	1.016326	1.63%						1.63%	1.63%	1
03-Jul-17	1.016442	29-Jun-18	1.031235	1.46%						3.12%	1.55%	2
02-Jul-18	1.031396	28-Jun-19	1.048013	1.61%	1.57%					4.80%	1.57%	3
01-Jul-19	1.048093	30-Jun-20	1.055488	0.71%	1.26%					5.54%	1.36%	4
01-Jul-20	1.05549	30-Jun-21	1.055363	-0.01%	0.77%	1.08%				5.53%	1.08%	5
01-Jul-21	1.05536	30-Jun-22	1.055927	0.05%	0.25%	0.77%				5.59%	0.91%	6
01-Jul-22	1.055962	28-Nov-22	1.064089	Final Whole of Scheme Performance						6.40%	0.97%	6.41

Income Focused

Investment Objective: "To outperform CPI by 1.5% pa, after fees & taxes, over 10 years"

Risk Profile – SRM Band 4 (medium)

Target Asset Allocation:

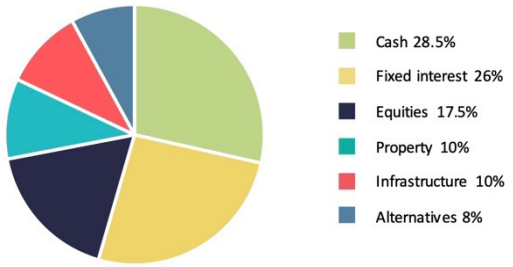


Table 19. MilitarySuper Income Focused portfolio performance 2003–2022

FY Start	Unit Price ($)	FY End	Unit Price ($)	1 Year	3-Year	5-Year	7-Year	10-Year	15-Year	Since Start	Annualised	Years
01-Jul-03	1	30-Jun-04	1.080587	8.06%						8.06%	8.06%	1
01-Jul-04	1.079689	30-Jun-05	1.164356	7.84%						16.44%	7.91%	2
01-Jul-05	1.165041	30-Jun-06	1.275052	9.44%	8.44%					27.51%	8.44%	3
01-Jul-06	1.275052	30-Jun-07	1.393861	9.32%	8.89%					39.39%	8.66%	4
01-Jul-07	1.393861	30-Jun-08	1.430446	2.62%	7.08%	7.42%				43.04%	7.42%	5
01-Jul-08	1.431001	30-Jun-09	1.378598	-3.66%	2.64%	5.01%				37.86%	5.50%	6
01-Jul-09	1.378213	30-Jun-10	1.380573	0.17%	-0.32%	3.45%	4.71%			38.06%	4.71%	7
01-Jul-10	1.379742	30-Jun-11	1.454421	5.41%	0.54%	2.67%	4.35%			45.44%	4.79%	8
01-Jul-11	1.456216	30-Jun-12	1.514856	4.03%	3.20%	1.68%	3.82%			51.49%	4.72%	9
01-Jul-12	1.514856	30-Jun-13	1.584447	4.59%	4.72%	2.06%	3.15%	4.71%		58.44%	4.71%	10
01-Jul-13	1.582056	30-Jun-14	1.674709	5.86%	4.77%	3.97%	2.66%	4.49%		67.47%	4.80%	11
01-Jul-14	1.673287	30-Jun-15	1.794976	7.27%	5.82%	5.40%	3.29%	4.42%		79.50%	5.00%	12
01-Jul-15	1.796765	30-Jun-16	1.905514	6.05%	6.40%	5.53%	4.74%	4.10%		90.55%	5.08%	13
01-Jul-16	1.906693	30-Jun-17	2.015121	5.69%	6.39%	5.87%	5.56%	3.75%		101.51%	5.13%	14
01-Jul-17	2.015121	29-Jun-18	2.14096	6.24%	6.02%	6.24%	5.66%	4.11%	5.21%	114.10%	5.21%	15
02-Jul-18	2.14246	28-Jun-19	2.302414	7.47%	6.49%	6.59%	6.16%	5.27%	5.18%	130.24%	5.35%	16
01-Jul-19	2.306247	30-Jun-20	2.381585	3.27%	5.73%	5.80%	6.02%	5.61%	4.88%	138.16%	5.24%	17
01-Jul-20	2.38224	30-Jun-21	2.545091	6.84%	5.91%	5.95%	6.17%	5.74%	4.72%	154.51%	5.33%	18
01-Jul-21	2.544867	30-Jun-22	2.500498	-1.74%	2.73%	4.41%	4.83%	5.14%	3.97%	150.05%	4.94%	19
01-Jul-22	2.507223	28-Nov-22	2.581533	Final Whole of Scheme Performance						158.15%	4.76%	20.4107

Table 20. ADFSuper Income Focused portfolio performance 2016–2022

FY Start	Unit Price ($)	FY End	Unit Price ($)	1 Year	3-Year	5-Year	7-Year	10-Year	15-Year	Since Start	Annualised	Years
01-Jul-16	0.999169	30-Jun-17	1.051389	5.23%						5.23%	5.23%	1
03-Jul-17	1.051418	29-Jun-18	1.117398	6.28%						11.83%	5.75%	2
02-Jul-18	1.118184	28-Jun-19	1.201021	7.41%	6.33%					20.20%	6.33%	3
01-Jul-19	1.203019	30-Jun-20	1.241353	3.19%	5.69%					24.24%	5.58%	4
01-Jul-20	1.241698	30-Jun-21	1.326411	6.82%	5.86%	5.83%				32.75%	5.83%	5
01-Jul-21	1.3263	30-Jun-22	1.303533	-1.72%	2.71%	4.39%				30.46%	4.53%	6
01-Jul-22	1.307034	28-Nov-02	1.344068	Final Whole of Scheme Performance						34.52%	4.73%	6.41

Balanced -Default Option in MilitarySuper and ADFSuper

Investment Objective: "To outperform CPI by 3.5% pa, after fees & taxes, over 10 years"

Risk Profile – SRM Band 6 (high)

Target Asset Allocation

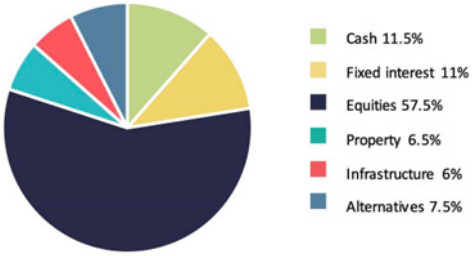


Table 21. MilitarySuper Balanced portfolio performance 2003–2022

FY Start	Unit Price ($)	FY End	Unit Price ($)	1 Year	3-Year	5-Year	7-Year	10-Year	15-Year	Since Start	Annualised	Years
01-Jul-03	0.980262	30-Jun-04	1.131927	15.47%						15.47%	15.47%	1
01-Jul-04	1.128192	30-Jun-05	1.26202	11.86%						28.74%	13.47%	2
01-Jul-05	1.263703	30-Jun-06	1.457119	15.31%	14.13%					48.65%	14.13%	3
01-Jul-06	1.457119	30-Jun-07	1.690217	16.00%	14.42%					72.43%	14.59%	4
01-Jul-07	1.690217	30-Jun-08	1.655674	-2.04%	9.42%	11.05%				68.90%	11.05%	5
01-Jul-08	1.656972	30-Jun-09	1.462881	-11.71%	0.13%	5.33%				49.23%	6.90%	6
01-Jul-09	1.461291	30-Jun-10	1.490661	2.01%	-4.10%	3.36%	6.17%			52.07%	6.17%	7
01-Jul-10	1.488975	30-Jun-11	1.564354	5.06%	-1.90%	1.43%	4.78%			59.59%	6.02%	8
01-Jul-11	1.567457	30-Jun-12	1.548563	-1.21%	1.95%	-1.74%	2.95%			57.97%	5.21%	9
01-Jul-12	1.548563	30-Jun-13	1.741838	12.48%	5.37%	1.00%	2.58%	5.92%		77.69%	5.92%	10
01-Jul-13	1.736013	30-Jun-14	1.935829	11.51%	7.29%	5.79%	1.96%	5.55%		97.48%	6.38%	11
01-Jul-14	1.935432	30-Jun-15	2.177992	12.53%	12.04%	7.90%	3.98%	5.59%		122.18%	6.88%	12
01-Jul-15	2.185586	30-Jun-16	2.217064	1.44%	8.49%	7.18%	6.14%	4.29%		126.17%	6.48%	13
01-Jul-16	**2.217571**	30-Jun-17	2.424567	9.33%	7.80%	9.38%	7.21%	3.67%		147.34%	6.68%	14
01-Jul-17	2.424567	29-Jun-18	2.650266	9.31%	6.64%	8.83%	7.79%	4.81%	6.86%	170.36%	6.86%	15
02-Jul-18	2.651595	28-Jun-19	2.857107	7.75%	8.81%	8.10%	9.14%	6.93%	6.39%	191.46%	6.91%	16
01-Jul-19	2.868171	30-Jun-20	2.82617	-1.46%	5.24%	5.28%	7.21%	6.62%	5.51%	188.31%	6.43%	17
01-Jul-20	2.828962	30-Jun-21	3.312767	17.10%	7.70%	8.36%	7.98%	7.77%	5.63%	237.95%	7.00%	18
01-Jul-21	3.311891	30-Jun-22	**3.229163**	-2.50%	4.03%	5.90%	5.73%	7.63%	4.41%	229.42%	6.48%	19
01-Jul-22	3.242272	28-Nov-22	3.370627	Final Whole of Scheme Performance						243.85%	6.24%	20.4107

Table 22. ADFSuper Balanced portfolio performance 2016–2022

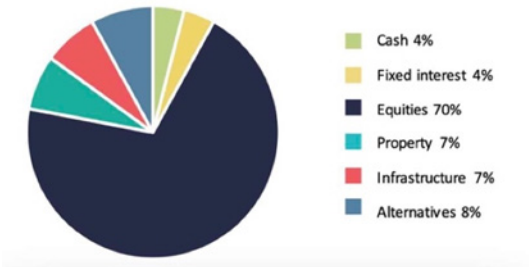
Date	Unit Price ($)	Date	Unit Price ($)	1 Year	3-Year	5-Year	7-Year	10-Year	15-Year	Since Start	Annualised	Years
01-Jul-16	**0.998731**	30-Jun-17	1.089322	9.07%						9.07%	9.07%	1
03-Jul-17	1.08923	29-Jun-18	1.190983	9.34%						19.25%	9.20%	2
02-Jul-18	1.191581	28-Jun-19	1.282484	7.63%	8.69%					28.41%	8.69%	3
01-Jul-19	1.287447	30-Jun-20	1.267186	-1.57%	5.17%					26.88%	6.13%	4
01-Jul-20	1.268437	30-Jun-21	1.481621	16.81%	7.53%	8.21%				48.35%	8.21%	5
01-Jul-21	1.481229	30-Jun-22	**1.445038**	-2.44%	3.92%	5.82%				44.69%	6.35%	6
01-Jul-22	1.450903	28-Nov-22	1.506196	Final Whole of Scheme Performance						50.81%	6.62%	6.41

Aggressive

Investment Objective: "To outperform CPI by 4% pa, after fees & taxes, over 10 years"

Risk Profile – SRM Band 6 (high)

Target Asset Allocation



For tables 23 and 24, red Boxes compare to ADFSuper Start Date. Annual returns (orange column), cumulative performance (green column) and current performance at 28 Nov 2022 (Yellow)

Table 23. MilitarySuper Aggressive portfolio performance since 2003–2022

FY Start	Unit Price ($)	FY End	Unit Price ($)	1 Year	3-Year	5-Year	7-Year	10-Year	15-Year	Since Start	Annualised	Years
01-Jul-03	1	30-Jun-04	1.188956	18.90%						18.90%	18.90%	1
01-Jul-04	1.183916	30-Jun-05	1.351856	14.19%						35.19%	16.27%	2
01-Jul-05	1.354272	30-Jun-06	1.589921	17.40%	16.71%					58.99%	16.71%	3
01-Jul-06	1.589921	30-Jun-07	1.839491	15.70%	15.82%					83.95%	16.46%	4
01-Jul-07	1.839491	30-Jun-08	1.782624	-3.09%	9.59%	12.26%				78.26%	12.26%	5
01-Jul-08	1.784896	30-Jun-09	1.463625	-18.00%	-2.72%	4.33%				46.36%	6.55%	6
01-Jul-09	1.462231	30-Jun-10	1.437878	-1.67%	-7.88%	1.21%	5.33%			43.79%	5.33%	7
01-Jul-10	1.4322	30-Jun-11	1.559711	8.90%	-4.40%	-0.38%	4.02%			55.97%	5.71%	8
01-Jul-11	1.565276	30-Jun-12	1.501299	-4.09%	0.88%	-3.98%	1.48%			50.13%	4.62%	9
01-Jul-12	1.501299	30-Jun-13	1.736513	15.67%	6.63%	-0.55%	1.27%	5.67%		73.65%	5.67%	10
01-Jul-13	1.729825	30-Jun-14	1.958656	13.23%	7.76%	6.02%	0.90%	5.16%		95.87%	6.30%	11
01-Jul-14	1.957989	30-Jun-15	2.275871	16.24%	14.88%	9.71%	3.53%	5.33%		127.59%	7.09%	12
01-Jul-15	2.28563	30-Jun-16	2.318737	1.45%	10.26%	8.18%	6.81%	3.85%		131.87%	6.68%	13
01-Jul-16	**2.318971**	30-Jun-17	2.584615	11.46%	9.70%	11.48%	8.80%	3.46%		158.46%	7.02%	14
01-Jul-17	2.584615	29-Jun-18	2.857246	10.55%	7.72%	10.56%	8.98%	4.82%	7.25%	185.72%	7.25%	15
02-Jul-18	2.857857	28-Jun-19	3.134039	9.66%	10.56%	9.86%	11.09%	7.92%	6.71%	213.40%	7.40%	16
01-Jul-19	3.147976	30-Jun-20	3.189936	1.33%	7.27%	6.89%	9.14%	8.34%	5.88%	218.99%	7.06%	17
01-Jul-20	3.195899	30-Jun-21	3.894297	21.85%	10.87%	10.92%	10.32%	9.54%	6.15%	289.43%	7.85%	18
01-Jul-21	3.89353	30-Jun-22	**3.806754**	-2.23%	6.54%	8.05%	7.56%	9.75%	4.97%	280.68%	7.29%	19
01-Jul-22	3.82362	28-Nov-22	4.005076	Final Whole of Scheme Performance						300.51%	7.03%	20.4107

Table 24. ADFSuper Aggressive portfolio performance since 2016–2022

FY Start	Unit Price ($)	FY End	Unit Price ($)	1 Year	3-Year	5-Year	7-Year	10-Year	15-Year	Since Start	Annualised	Years
01-Jul-16	**0.998606**	30-Jun-17	1.110324	11.19%						11.19%	11.19%	1
03-Jul-17	1.110841	29-Jun-18	1.228664	10.61%						23.04%	10.92%	2
02-Jul-18	1.228922	28-Jun-19	1.346326	9.55%	10.47%					34.82%	10.47%	3
01-Jul-19	1.352306	30-Jun-20	1.371748	1.44%	7.29%					37.37%	8.26%	4
01-Jul-20	1.374312	30-Jun-21	1.670622	21.56%	10.78%	10.84%				67.30%	10.84%	5
01-Jul-21	1.670293	30-Jun-22	**1.635371**	-2.09%	6.54%	8.04%				63.77%	8.57%	6
01-Jul-22	1.642614	28-Nov-22	1.717901	Final Whole of Scheme Performance						72.03%	8.83%	6.41

Asset Classes

The broad asset classes that CSC will invest in include Cash, Fixed Interest, Equities, Property, Infrastructure and Alternatives (CSC, 2022*l*). The allowable allocations in each asset class are shown in Table 25. Their assigned Standard Risk Measures (SRM) are shown in Table 26. SRM is a risk interpretation methodology recommended by the Australian Prudential Regulation Authority (APRA), the Australian

Securities and Investment Commission (ASIC, the Australian Association of Superannuation Funds (ASFA) and the Financial Services Council (FSC). SRMs help visualized how different risk classes are expected to impact on investor return.

Cash. Bank Deposits, Short term money markets, A1 rated short-term securities (which technically can turn negative).

Fixed Interest. Government Bonds and Corporates Credit

Equities (including dividend payments). Australian ASX listed shares, International publicly traded shares. This exposes members to foreign currency risk. Private equities, Australian and International are also included.

Property. Property trusts and property holding companies including commercial real estate and large-scale residential developments.

Infrastructure. Public works, toll roads, airport, energy and water utilities, telecommunications, and data facilities.

Alternatives. Hedge funds, equities and bonds, including derivatives.

Table 25. CSC allowable target allocation ranges. Adapted from CSC (2022*l*).

Asset Type	**Cash**	**Income Focused**	**Balance**	**Aggressive**
Cash	100%	10-100%	0-65%	0-35%
Fixed Interest	-	10-100%	0-65%	0-35%
Equities	-	0-40%	15-75%	20-29%
Property	-	0-35%	5-25%	0-50%
Infrastructure	-	0-35%	0-20%	0-50%
Alternatives	-	0-70%	0-30%	0-70%
Foreign Currency Hedge Ratio	-	0-100%	0-100%	0-100%

Table 26. Standards Risk Measure (SRM). Adapted from CSC (2022*l*).

Risk Band	Risk Label	Estimated number of negative annual returns over a 20-year period.
1	Very Low	Less than 0.5
2	Low	0.5 to less than 1
3	Low to Medium	1 to less than 2
4	Medium	2 to less than 3
5	Medium to High	3 to less than 4
6	High	4 to less than 6
7	Very High	6 or greater

APPENDIX H.2: INVESTMENT PORTFOLIO WEIGHTINGS

Table 27 and Table 28 are extracts adapted from CSC's MilitarySuper and ADFSuper aggressive investment portfolios (CSC, 2022q). The reader will notice that despite the similar portfolio similar, in each fund the number of units held, and the weighting for each investment are different. This leads to similar but not identical performance, complicating the comparison process.

Table 27. CSC MilitarySuper Aggressive investment portfolio holdings.

Portfolio Holdings Information for MILITARYSuper Aggressive

Asset class	Type	Name	Units held	Value (AUD)	Weighting (%)
Cash		Australia & New Zealand Group	0	13968480.45	0.009981446
Cash		BNP Paribas SA	0	127214.64	9.09E-05
Cash		BNP Paribas SA	0	-1462.62	-1.05E-06
.....continued					
Fixed Income		Challenger Investment Solutions	0	2851011.08	0.002037245
Fixed Income		HRL Morrison & Co (Australia)	0	4879103.35	0.003486457
.....continued					
Total				**37124292.84**	**0.026527875**
Equity	Listed	29Metals Ltd	52473.91	91042.23	6.51E-05
Equity	Listed	3M Co	683.78	128682.38	9.20E-05
Equity	Listed	3i Group PLC	2225.21	44354.26	3.17E-05
Equity	Listed	908 Devices Inc	918.33	27497.15	1.96E-05
.....continued					
Total				**255045178.4**	**0.182247423**
Property	Listed	Abacus Property Group	7897.85	21028.02	1.50E-05
Property	Listed	Alexandria Real Estate Equities Inc	242.76	51632.4	3.69E-05
.....continued					
Total				**22279568.33**	**0.015920293**
Property	Unlisted	AXA Investment Managers	0	30153981.51	0.021547106
Property	Unlisted	Apollo Real Assets	0	47212.65	3.37E-05
Total				105548077.8	0.075421403
Infrastructure	Listed	APA Group	178039.27	2056353.59	0.001469407
Infrastructure	Listed	Transurban Group	462618.41	6772733.52	0.004839587
.....continued					
Total				**10798727.87**	**0.007716438**
Infrastructure	Unlisted	Asset Adjustment	0	-690406.59	-0.000493343
Infrastructure	Unlisted	Stonepeak Infrastructure Partners	0	32105645.38	0.022941705
.....continued					
Total				**88410661.81**	**0.063175534**
Alternatives	Unlisted	Anchorage Capital Offshore Fund	0	1827230.93	0.001305683
Alternatives	Unlisted	Bridgewater Associates, Inc	0	26096543.73	0.018647786
Alternatives	Unlisted	Thebes Partners Offshore	0	2512321.13	0.001795227
Alternatives	Unlisted	VesperMare Capital, LP	0	1628831.31	0.001163913
.....continued					
Total				**78386743.29**	**0.056012751**
Total Investment Items				**1413630684**	**1.010136913**

Table 28. CSC ADFSuper Aggressive investment portfolio holdings

Portfolio Holdings Information for **ADF Super Aggressive**

Asset class	Type	Name	Units held	Value (AUD)	Weighting (%)
Cash		Australia & New Zealand Group	0	941783.15	0.007335657
Cash		BNP Paribas SA	0	11845.81	9.23E-05
Cash		BNP Paribas SA	0	-136.52	-1.06E-06
….....*continued*					
Fixed Income		Challenger Investment Solutions	0	266102.84	0.002072706
Fixed Income		HRL Morrison & Co (Australia)	0	455397.47	0.003547143
….....*continued*					
Total				**3310219.18**	**0.025783677**
Equity	Listed	29Metals Ltd	4897.72	8497.54	6.62E-05
Equity	Listed	3M Co	63.82	12010.74	9.36E-05
Equity	Listed	3i Group PLC	207.69	4139.86	3.22E-05
Equity	Listed	908 Devices Inc	85.71	2566.48	2.00E-05
….....*continued*					
Total				**23804973.91**	**0.185419675**
Property	Listed	Abacus Property Group	737.16	1962.68	1.53E-05
Property	Listed	Alexandria Real Estate Equities Inc	22.66	4819.18	3.75E-05
….....*continued*					
Total				**2079492.55**	**0.016197406**
Property	Unlisted	AXA Investment Managers	0	2814461.12	0.021922161
Property	Unlisted	Apollo Real Assets	0	4406.65	3.43E-05
Total				9851467.26	0.07673421
Infrastructure	Listed	APA Group	16617.53	191932.44	0.001494984
Infrastructure	Listed	Transurban Group	43179.09	632141.91	0.004923826
….....*continued*					
Total				**1007913.34**	**0.007850753**
Infrastructure	Unlisted	Asset Adjustment	0	-64440	-0.000501931
Infrastructure	Unlisted	Stonepeak Infrastructure Partners	0	2996622.28	0.023341035
….....*continued*					
Total				**8251924.39**	**0.064275187**
Alternatives	Unlisted	Anchorage Capital Offshore Fund	0	170546.98	0.00132841
Alternatives	Unlisted	Bridgewater Associates, Inc	0	2435754.91	0.018972375
Alternatives	Unlisted	Thebes Partners Offshore	0	234490.76	0.001826475
Alternatives	Unlisted	VesperMare Capital, LP	0	152029.09	0.001184172
….....*continued*					
Total				**7316328.8**	**0.056987725**
Total Investment Items				**129710681.5**	**1.010331392**

APPENDIX I: FEES AND COSTS

Table 29 shows the fees and cost for the two CSCS schemes. Civilian superannuation schemes have a wide variety of fees and costs that are not listed here. In general, two types of civilian funds are on offer in Australia. Industry funds run as not-for-profit funds designed to benefit members only, and for-profit funds (retail funds) available from financial advisers. A third category would be self-managed superannuation funds. The possible range of returns, fees and structures available between industry, retail and self-managed fund is too large to be considered here. For context however, the fees in Table 29 are very modest by retail fund standards, which as a rule are, higher than CSC and industry funds. The lesson here is that fees and cost are not a major discriminator between MilitarySuper and ADFSuper, however the existence of switching fees on ADFSuper can be seen as a disincentive for ADFSuper members to switch investment with changing market conditions. It is an open question whether this is a prudent or a punitive feature.

Table 29. CSC fees and costs. Adapted from CSC (2022c), CSC (2022m) and CSC (2021c).

Type of Fee/Cost	**MilitarySuper**		**ADFSuper**
Administration Fee	$ 0.00		$ 7.00 per month
Investment Fee	Cash	0.07%	0.07%
	Income Focused	0.52%	0.50%
	Balanced	0.76%	0.77%
	Aggressive	0.80%	0.79%
Transaction Costs	Cash	0%	0%
	Income Focused	0.13%	0.12%
	Balanced	0.14%	0.11%
	Aggressive	0.16%	0.12%
Switching Fee	$ 0.00 no frequency limit		2 per FY $20.00 per switch thereafter
Example on a Balanced Portfolio of $100,000	Admin @ $0 month $ 0 pa Investments @ 0.76%. $ 760 pa Transactions @ 0.11%. $ 140 pa No Switching $ 0 Total $ 900 pa		Admin @ $7 month $ 84 pa Investments @ 0.77%. $ 770 pa Transactions @ 0.11%. $ 110 pa No Switching $ 0 Total $ 964 pa

There are however real costs (outgoings) in all schemes, civilian and military which paid to the financial investment firms for day-to-day handling of superannuation portfolios. These are not disclosed directly but instead expressed as an "incurred cost ratio." These losses are reflected in the published unit prices for each day that already have these costs subtracted. These costs must be added to the fees and cost listed in Table 29. Incurred cost ratio figures for MilitarySuper are available in (CSC, 2021c) and are listed at 1.18%. pa of the average of net assets in a Balanced portfolio. On $100,000 this would mean the actual cost are $1,180 and not just the $900 explicitly listed in Table 29.

ADFSuper indirect cost ratios were not easily discoverable on the CSC website but it is assumed due the similarity in the investment mechanisms (Appendix H2) that both ADFSuper and MilitarySuper have the very similar, but perhaps not identical incurred costs. Civilian funds will have at times very different incurred costs on top of explicit fees. Confusingly for the member however, there is no rule of thumb that a lower incurred cost ratio necessarily means lower net cost because of how some costs are n-going and some are activity based. Some funds with high explicit costs but low incurred cost may if fact outperform funds with the reverse position.

While fees and costs are important considerations as changes in net contributions due to these deductions may lead to measurable drops in the final value of the investment, particularly in retail funds with exotic fee structures. However, as stated CSC fees are modest. Consequently, fees and cost, much like disability and death benefits are not likely to a key discriminator between CSC products but may be between civilian options.

APPENDIX J: FUTURE VALUE AND ANNUITY CALCULATIONS

The formula for the future value and its inverse, the present value of money, are given by :

$$F_n = P(1+r)^n$$

$$P = \frac{F_n}{(1+r)^n}$$

Where:

$$F_n = (accumulated)\ Future\ Value$$

$$P = Principal\ Invested\ (today)$$

$$n = Number\ of\ investment\ periods$$

$$r = Rate\ of\ retrun\ in\ \%\ per\ investment\ period$$

The above formula for future value is the return for a single investment at a single rate of return for a fixed number of periods. The obvious problem is that superannuation consists of a number of periodic investments over an unknown number of periods at a rate of return that will vary. In order to be able to model superannuation returns, I will use a related equation called Ordinary Annuity (in arrears). This annuity in arrears is the best approximation for modelling superannuation investments with some caveats.[86]

This method usually uses printed compounding tables used to escalate input values. The tables give the expected returns for one dollar invested over a fixed period and at a fixed rate. The utility of these tables is that they scale for every dollar. In this way the results for a single dollar invested can be doubled in order to obtain the returns for two dollars invested. The user of such tables still has to fix the rate of return before selecting the number of periods, but that choice can be tailored for each comparison as applicable. My results will be derived from annuities using various periodicities such as

[86] Technically an annuity entails equally spaced payments, to the holder of the principal, of equal amounts. If either the periodicity of payments or the amount paid changes then the returns are an income stream and not annuity. Annuity in arrears are annuities that pay at the end of the investment period. (Stickney & Weil, 2007, pp 713–727).

annual, monthly etc. These will always be counted over the longest possible periods of ADF service careers, the 42 years from ages 18 to 60. My results will be generated in a spreadsheet. Just one exemplar of an annuity returns table is listed in Table 30 for a small number of periods and for only two of the possible rates of return, 1% per annum and 5.8 % per annum. Caution should be exercised as six significant figures is not sufficient for very high periodicity calculations. For a typical human lifespan, high frequency would be anything faster than an annual periodicity.

Table 30. Future Value (in arrears) of an Ordinary Annuity for 1$ invested

Percentage Returns per Period	**Use for Annual Investments**	**Use for Annual Investments**	**Use for Monthly Investments**	**Use for Fortnightly Investments**	**Use for Daily Investments**
Period (n)	**r = 5.8%** per period	**r = 1%** per period	**r = $\frac{1}{12}$%** per period	**r = $\frac{1}{26}$%** per period	**r = $\frac{1}{365}$%** per period
1	1.00000	1.00000	1.00000	1.00000	1.00000
2	2.05800	2.01000	2.00083	2.00038	2.00002
3	3.17736	3.03010	3.00250	3.00115	3.00008
4	4.36165	4.06040	4.00500	4.0023	4.00016
5	5.61462	5.10100	5.00834	5.0038	5.00027
7	8.34281	7.21353	7.01752	7.0081	7.00058
10	13.0576	10.46221	10.0375	10.0173	10.0012
15	22.9244	16.0968	15.0878	15.0404	15.0029
20	36.0044	22.0190	20.1591	20.0732	20.0052
25	53.3438	28.2432	25.2516	25.1157	25.0082
30	76.3298	34.7849	30.3653	30.1680	30.0119
42	166.823	51.8790	42.7255	42.3329	42.0236
504 (monthly)			626.034	556.047	507.4888
1095 (fortnightly)				1361.34	1111.58
15330 (daily)					19051.28

Table 30 contains example rates representing a range of annual market returns from a low 1% to relatively high 5.8%.[87] The righthand three columns represent a low 1% pa rate of return as the period is decreased from annual to monthly, then fortnightly and finally daily. In order to use an annuity method, I have adapted the equation used to generate the annuity return multiples above to receive varying investment inputs. Even though in my comparison, inputs as a percentage of salary do not change (members always contribute at 5% in both schemes and employers contribute at a fixed 16.4%), the actual value of these investment will change as pay rises annually. The factors for varying investment values in Table 30 can be generated by adapting the single dollar investment equation, in the following way.

$$Investment\ of\ \$1\ at\ 5.8\ \%\ per\ period$$

$$Period\ 1\ Return\ Multiple\ = (1\ \times 1.058)^0 \qquad = 1.00000$$

$$Period\ 2\ Return\ Multiple\ = (1\ \times 1.058)^0 + (1\ \times 1.058)^1 \qquad = 2.05800$$

$$Period\ 3\ Return\ Multiple\ = (1\ \times 1.058)^0 + (1\ \times 1.058)^1 + (1\ \times 1.058)^2 \qquad = 3.17736$$

$$Investment\ of\ \$2\ at\ 5.8\ \%\ per\ period$$

$$Period\ 1\ Return\ Multiple\ = (2\ \times 1.058)^0 \qquad = 2.00000$$

$$Period\ 2\ Return\ Multiple\ = (2\ \times 1.058)^0 + (1\ \times 1.058)^1 \qquad = 4.11600$$

$$Period\ 3\ Return\ Multiple\ = (2\ \times 1.058)^0 + (1\ \times 1.058)^1 + (1\ \times 1.058)^2 \qquad = 6.35472$$

Looking at Table 30, readers will notice that as the periodicity increases, the values of the multiples asymptote towards the number of periods 'n'. For a very high frequency investments such a daily investment occurring for 42 years (15,330), the daily percentage returns are very small, but the compound effect is large. This point is made to demonstrate the acute sensitivity any model will have towards the correct selection of returns and periodicity. In general, the greater the uncertainty in periodic returns, the

[87] The left-hand column of relatively high returns of 5.8% pa actually represents the average market returns (before fees and taxes) for ASX investments from 1985 to 2022 (see footnote 49).

longer the periodicity used should be. For example, for wildly fluctuating daily rates of returns an annual or even three- or five-year periodicity may be more suitable.

This tradeoff is difficult to visualize because the larger multiple for high periodicity appears to be so different from the low periodicity multiple. For example, for an annual rate of 1% taken annually, the 42-year multiple is 51.879, but over the same 42 years the monthly multiple is 626.034. 626.034 is close to 12 x 51.879 but not quite. The difference arises because as periods become smaller, the solution approximates a continuously compounding function, rather than a series of steps. It is actually irrelevant what period lengths are chosen; they just have to always be consistently spaced. Annuity models could use hours, seconds or centuries, all that will change is the accuracy of the final figure. Smaller period models will generate more accurate solutions, but these smaller intervals may not resemble what is actually occurring in the real world, since many transaction time frames are daily or fortnightly in CSC's case. Anyone attempting to model superannuation returns is thus faced with trading off the uncertainty in long term returns which pushes for a longer periodicity with the accuracy gained from a smaller period. A derivation of the idealized continuously compounded annuity function is provided below.

There are also other factors that complicate matters. The arrears method produces the value of the investment only after the end of the period. If the periodicity is very long, say 5 years cycles, then the model will not produce any values for years 1 to 5. Only at the start of the sixth year will the returns output of the model be valid. This is a problem even with a shorter periodicity of one year, which is a tempting choice as salary rises and market investment returns are usually expressed on a one-year cycle. It means that annuity model will appear to be "out of synch" by one year from what members might intuitively expect.

It may be confusing for members to visualize why their superannuation investments have not produced the expected annual return after one year when annual growth figures are quoted. The simple answer is because not all of their money was invested at the start of the year, and also any earning were not re-invested until the end of the year. With the annuity in arrears method, a rough approximation is to say the total

investment will yield something equivalent to investing half of that money for the whole period or the same amount of money for half the period. Thus, an expected return of 10% looks as if, in this method, it only yielded 5%.

For example, a member might be expecting a 10% return on their investments of $100 per month over the year. However, in late December of that first year their statement shows a yield of zero because the annuity has not paid out yet. This also means the annuity earnings cannot be reinvested until the start of the following year. In the second year it shows an apparent yield of only half that, something closer to 5%. As the total number of periods grows, the apparent annual returns of ~5% will approach the expected returns of 10% but never quite match. Table 31 illustrates the beginning of this convergence, but it is far from comprehensive.

Table 31. Returns from an annuity in arrears investment model

Year	Cumulative Investment (1)	Year At end of the year (2)	10% Growth compounded annually but paid in arrears	Nominal Market Returns (2) – (1)	Total Returns as %	Annualized Return
1	12 x $100= $1,200	$1200	$1,200 x $(1.1)^0$ = $1,200	$0	0%	0%
2	24 x $100 = $2,400	$2,520	$1,200 x $(1.1)^1$ + 1200 = $2,520	$120	5.00%	2.5%
3	36 x $100= $3,600	$3,972	$1,200 x $(1.1)^2$ + $1,200 x $(1.1)^1$ 1200 = $3,972	$372	10.33%	5.04%
4	36 x $100= $4,800	$5,569	$1,200 x (1.1)3 + 1,200 x $(1.1)^2$ + $1,200 x $(1.1)^1$ 1200 = $5,569	$769	16.03%	5.08%

The way to solve this apparent mismatch this is to choose a shorter period and to adjust the compounding rate as was done in Table 30. I could choose a daily rate because market returns are calculated and issued by CSC daily. Indeed, a member actively managing their superannuating will no doubt be watching for daily changes in market

prices and update the value of their accumulated funds daily .[88] Another candidate is fortnightly, because technically members pay into superannuation every fortnight. Conducting analysis on a 14-day cycle while more accurate than annual cycles, is very difficult to present because all the data has to be re-synchronized to the unit of years and there is an odd number of fortnights in a year. Indeed, a similar issue occurs with daily analysis due to leap years. I have selected a compromise by using monthly analysis. This improves the apparent mismatch between the arears method and annual returns by increasing the frequency and it also synchronizes with market return data, which for large indexes is available daily, monthly or annually. The difference between monthly results and the idealized solution is negligible, given the other vagaries of this sport.

One way of validating if the choice of period is correct is to compare the model results with the ideal continuously compounding model, one with an infinitely small compounding period. The derivation of the ideal continuously compounding method is shown here:

[88] Indeed, the smallest reportable unit of change in accumulated funds is a daily price change. However, I caution anyone attempting to respond to daily price changes when attempting to self-manage CSC funds. This is for several reasons. The biggest reason is that there is lag between any leading market indicator and CSC enacting the portfolio change on the member behalf. A choice has to made by the switching member by 2pm Eastern Standard Time in order to lock in the closing unit price and at that time unpublished price, for that day. That means that if the market is falling, all the member ends up doing is locking in the entire fall from the previous day's closing price. Effectively, the member is selling at a lower price. Equally if the market is rising the member is going to miss the daily rise as it will be over by closing time, and the member ends up buying at a higher price. This apparent asymmetry is because the rational strategy for change is deeply asymmetric. A member will only rationally change to a rising market from a lower risk category, e.g., from cash to aggressive, and not the other way around. Equally a member responding to falling daily unit prices will rationally only ever switch from high risk to low risk in response e.g., from aggressive back to cash. The lag however ensures that the member will miss that price signal entirely. In fact, the regression to the mean that occurs in any large, aggregated prices signals such as whole of market indexes, means that this high frequency but lagged response will always deliver negative results, due to the compounding losses of this asymmetry. The member is effectively enacting a ludicrous "*Sell Low, Buy High*" strategy. Add to this the fact that daily prices for the last two weekdays may only appear three or even four days later and the fact that markets can change dramatically in the hours between a 2pm choice and the 4pm closing for the ASX, and not to mention factoring a hole day and half potential lag for internationally exposed stocks, and one can see why this is a recipe for disaster. Switching should only ever be because members feel the long-term trend is up or down and the minimum time unit used for that analysis should annual if not longer, and quarterly at the very shortest. By the time they get the price signal it is too late, and the switching member will have to accept making a loss that day in order to enact a long term strategy (the cost of doing business, as it were). In hindsight it is easy to see a recession coming, and perhaps that timeline could, with further study be shortened to one or two quarters. Ultimately the only way to use superannuation is in the very long term, and then the choice is obvious. Aggressive options have always paid out the most in the long run, provided the member is not forced to cash out in the middle of a downturn. This is a possibility in MilitarySuper as there is a 65-year age limit to participation. No such problem exists in ADFSuper.

For a given period from x to $x + \Delta x$

Let $V(x)$ be the final value of the inevstment

Given that $V(x + \Delta x)$

assuming a market return of (r)
and a member contibutes to thier investment a regalr ammount (m)

$V(x + \Delta x)$ then aproximates to $V(x)\,(1 + r\,\Delta x) + m\,(\Delta x)$

Multiplying through and collectingterms we get

$$\frac{V(x + \Delta x) - V(x)}{\Delta x} = r\,V(x) + m$$

As Δx tends to zero and takling the limit we get

$$\frac{dV}{dx} = rV + m$$

Separate the variables and setting the initial inevstment ammount $V(0)$ to zero

$$\int_{V(0)}^{V(n)} \frac{dV}{m + r\,V} = \int_0^n dx \;\rightarrow \frac{1}{r}\log\left(\frac{m + r\,V(t)}{m + r\,(0)}\right) = n$$

$$V(n) = \left(\frac{m}{r} + V(0)\right)e^{rt} - \frac{m}{r}$$

In our example where a member contribute $1200 dollars a year for 3 years
compunded continously with zero initial investment

$V(n) = \left(\frac{1200}{0.1} + 0\right)e^{0.1\,x\,3} - \frac{1200}{0.1} =$ $4,198 vs. $3,972 in Table 31.

This is the absloute maximum return a member could get if returns were compunded continously

I compared the results for continuously compounding models using daily, fortnightly, monthly and annual returns over a 42-year career to see if the error generated by selecting the monthly periodicity is acceptable. Remembering that the analytic solution involves a steady income stream, so pay rises are not included. Using a base salary of $100,000 and a 5% member contribution yields the following result, included in Table 32. These results are included to show that any choice of periodicity would work (the result which agree to two decimal places in all four instances).

Table 32. Continuously compounded returns over 42 years at with various periodicities

	Continuous Annual	Continuous Monthly	Continuous Fortnightly	Continuous Daily
Contribution (m)	$5,000.00	$416.67	$192.31	$13.70
Rate of Return (r)	2.0000%	0.1667%	0.0769%	0.0055%
Period (n)	42	504	1092	15330
Starting Value V(0)	$0	$0	$0	$0
Total	**$329,091.74**	**$329,091.74**	**$329,091.74**	**$329,091.74**

When comparing the continuous result with the periodic results we also need to look at the last two payments (rows) in each model in order to determine its utility. This is due to the "apparent" synchronization discrepancy in returns that the arrears method yields (see Table 31). In an annual model these last two (of 42) rows represent a jump of one year. In a monthly model, one month, and so on. The arears method is confusing because that jump always sandwiches the correct (analytic) answer somewhere between the last two rows of the model. This is the same sandwich that contains the actual returns of over just over 5% and the expected result of 10% in Table 31. As was the case in Table 31, as the number of periods is increased that sandwich gets slimmer and slimmer. The actual returns in the far-right column of Table 31 rise (slowly) from 5% to 5.04% to 5.08% and would approach 10% eventually, for a very high number of periods. While this sandwiching effect is true for all models, the gap in an annual model over the last two rows can be excessive. Table 33 compares the last two rows of every model and shows that only models with periodicity of less than one year produce a result that is within less than 1% of the true answer. Given the uncertainty that already exists in the input parameters and other assumption such as salary rises and market performance. I feel that this is entirely acceptable.[89]

[89] While uncertainty exists in the input parameters, at least this ensures that the model is not adding to these vagaries. The monthly model is also the shortest model in terms of number of spreadsheet rows that need to be handled while still maintaining an error rate of <1%.

Table 33. Model error compared to analytic solution for various periodicities

	Second Last Row	Analytic Solution	Last Row	Result Range	% Difference from Analytic
Daily	$329,078	$329,092	$329,110	$32	0.01%
FT	$328,905	$329,092	$329,349	$444	0.13%
Monthly	$328,687	$329,092	$329,651	$964	0.29%
Annual	$324,311	$329,092	$335,797	$11,486	3.49%

This mathematical detail has been included to illustrate to the reader why I have selected a monthly periodicity model for my comparisons. It should be noted that the result range for the annual model was over 3%. In this case approximately $11,000. Once salary rises are included, the error margin will not change, but the nominal value will increase. I point this out because if an attempt is made to model in which year a member might trigger an MBL using the annual 42 period model, it is likely that an annual model will be wrong by at least one half of one year; and that is ignoring the uncertainty around how MBL limits might progress over time since they are set by AWOTE. This might not seem like much, but for members that are close to an MBL and are in Tier 2, their MBLs are pure multiples of FAS, and it is possible in theory at least to remain just under the MBL indefinitely with the right combination of FAS rises and AWOTE rises. For those members a nominal error in the tens of thousands of dollars, or put another way, a six month to 12-month error margin in predicting MBL crossover points, will be unacceptable. As promised, long-range retirement modelling is distant and obscure.

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APPENDIX K: WAGES AND WAGES RISES IN THE ADF

Table 34 is a history of all ADF wage rises covering the whole of the period since the inception of ADFSuper 01 July 2016.

Table 34. Historical wage rises in the Australian Defence Force

Wage Rise	Start Date	Reference
4%	10 Nov 2011	DFRT (2011)
2.5%	8 Nov 2012	
2.5%	7 Nov 2013	
1.5%	6 Nov 2014	DFRT (2014)
1.5%	5 Nov 2015	
1.5%	3 Nov 2016	
2.0%	2 Nov 2017	DFRT (2017)
2.0%	1 Nov 2018	
2.0%	6 Nov 2019	DFRT (2019)
2.0%	13 May 2020	Final increase originally due 12 Nov 20 Delayed 6 months to 13 May 21 due to COVID national budget repair measures
2.0%	11 Nov 2021	DFRT (2020)
3.0%	10 Nov 2022	

ADF Workplace Remuneration Arrangements (WRA) are issued every three years and provide three annual rates per WRA. For example, the WRA listed in (DFRT-3) begins on 02 Nov 2017 and describes pay rises beginning in Novembers 2017, 2018 and 2019 and expires in November 2020. Since the inception of ADFSuper on 01 Jul 2016, pay rises have been steady at 2%. However macro-economic factors have forced two unprecedented changes. Firstly, due to the COVID pandemic in 2020, pay rises scheduled for November 2020 were delayed by 6 months to May 2021. Secondly, due to rising inflation in 2022, the November 2022 pay rise was increased from 2% to 3%. Ordinarily when escalating 2017 pay figures to 2022, one would compound consecutive annual pay rises to generate a seven-year rate.[90] However, the longer 18-month period from Nov 2019 to May 2021 and the shorter 6-month period from May 2021 to Nov 2021

[90] There have been seven ADF pay rises since July 2016

will complicate this. I have however not corrected for these two small anomalies in duration.

Furthermore, ADF wage increases occur on the first pay Thursday in November each year. In order to simplify this presentation, I have re-aligned these pay rises to occur in January of the following year. In this manner, all of the November 2017 to November 2020 wage rises are treated here as having occurred during the period 01 Jan 2018 to 31 Dec 2020. The five-month gap between the start of ADFSuper on 01 July 2016 and the end of DFRT-2 in November 2016 has been accommodated by this realignment and is now a half year gap. Hence, the base salary applied to mark the start of ADFSuper includes the November 2016 pay rise but not the November 2017 rise. Using the values from Table 34, the seven-year rate is the compound of 1.5%, 2%, 2%, 2%, 2%, 2% and 3% = 15.2461% or an annual rate of 2.071%. Using all values since 2011 the results is 2.206%. Hence, I believe the use of 2% annual pay rise is justified in my model. Table 35 lists the compound effect of the historical ADF pay rises taken from Table 34.

Table 35. Compound effect of last seven ADF pay rises.

Year		% Rise	Realigned to	Index	Comment
2016	Jul			1	Inception ADFSuper Jul 2016
2016	Nov	1.5 %			
2017	Jan		1.5 %	1.015	November pay rises
2017	Nov	2 %			re-aligned to
2018	Jan		2 %	1.035	January of the next year
2018	Nov	2 %			
2019	Jan		2 %	1.056	
2019	Nov	2 %			
2020	Jan		2 %	1.077	
2020	Nov		0 %		November 2020 delayed to May 2021
2021	Jan				
2021	May	2 %			
2021	Jul		2 %	1.099	Delayed pay rise
2021	Nov	2 %			
2022	Jan		2 %	1.121	
2022	Nov	3 %			
Total Rise 2016–2022					
2023	Jan		3 %	1.15246	Total seven-year wage rise

Table 36. ADF Wages for Officer and Enlisted valid for 10 Nov 2022.

Pay-Group Rank	PG1	PG2	PG 3	PG 4	PG 5	PG 6	PG 7	PG 8	PG 9	PG 10
O6 – 1	$170,293	$175,124	$180,698	$185,528	$190,916	$196,952	$203,016	$209,569	$216,129	$220,514
O6 – 0	$165,470	$170,299	$175,878	$180,704	$186,092	$192,131	$198,186	$204,748	$211,309	$215,689
O5 – 1	$145,567	$150,400	$155,980	$160,808	$166,193	$172,229	$178,290	$184,851	$191,408	$195,791
O5 – 0	$140,838	$145,669	$151,247	$156,078	$161,463	$167,502	$173,559	$180,120	$186,679	$191,063
O4 – 2	$121,112	$125,941	$131,518	$136,348	$141,735	$147,771	$153,832	$160,391	$166,947	$171,331
O4 – 1	$117,795	$122,629	$128,203	$133,033	$138,418	$144,459	$150,517	$157,076	$163,637	$168,015
O4 – 0	$114,470	$119,304	$124,878	$129,707	$135,094	$141,133	$147,192	$153,753	$160,311	$164,693
O3 – 5	$108,955	$113,789	$119,366	$124,194	$129,582	$135,619	$141,679	$148,240	$154,800	$159,179
O3 – 4	$105,801	$110,634	$116,211	$121,043	$126,428	$132,465	$138,523	$145,082	$151,644	$156,023
O3 – 3	$102,640	$107,470	$113,046	$117,875	$123,264	$129,303	$135,362	$141,920	$148,481	$152,858
O3 – 2	$99,494	$104,330	$109,904	$114,732	$120,121	$126,157	$132,214	$138,778	$145,338	$149,717
O3 – 1	$96,350	$101,180	$106,755	$111,586	$116,974	$123,011	$129,068	$135,627	$142,187	$146,571
O3 – 0	$93,193	$98,021	$103,596	$108,426	$113,814	$119,850	$125,912	$132,471	$139,027	$143,412
O2 – 3	$87,819	$92,647	$98,223	$103,054	$108,436	$114,473	$120,536	$127,097	$133,655	$138,040
O2 – 2	$85,220	$90,051	$95,627	$100,455	$105,843	$111,881	$117,941	$124,501	$131,061	$135,440
O2 – 1	$82,667	$87,497	$93,076	$97,906	$103,289	$109,326	$115,387	$121,950	$128,507	$132,889
O2 – 0	$80,222	$85,051	$90,629	$95,459	$100,845	$106,884	$112,941	$119,499	$126,061	$130,442
O1 – 1	$78,123	$82,955	$88,533	$93,360	$98,746	$104,786	$110,842	$117,402	$123,963	$128,344
O1 – 0	$76,023	$80,857	$86,430	$91,260	$96,647	$102,684	$108,746	$115,302	$121,864	$126,245
E9 Tier C	-	-	-	-	-	-	-	$137,887	$143,770	$150,115
E9 Tier B	-	-	-	$118,423	$122,746	$127,412	$132,448	$137,887	$143,770	$150,115
E9 Tier	$105,017	$107,906	$111,611	$115,606	$119,927	$124,591	$129,632	$135,071	$140,948	$147,296
E9 Tier	$103,183	$106,069	$109,772	$113,775	$118,094	$122,754	$127,795	$133,237	$139,112	$145,460
E8 – 0	$98,001	$100,887	$104,591	$108,592	$112,912	$117,575	$122,613	$128,056	$133,932	$140,279
E7 – 0	$96,308	$99,195	$102,902	$106,900	$111,220	$115,885	$120,924	$126,366	$132,240	$138,589
E6 – 0	$93,620	$96,507	$100,209	$104,210	$108,530	$113,195	$118,232	$123,671	$129,549	$135,898
E5 – 2	$78,501	$81,388	$85,089	$89,090	$93,413	$98,075	$103,111	$108,555	$114,428	$120,778
E5 – 1	$77,193	$80,080	$83,784	$87,785	$92,105	$96,767	$101,807	$107,248	$113,122	$119,469
E5 – 0	$75,911	$78,798	$82,502	$86,501	$90,819	$95,487	$100,526	$105,965	$111,843	$118,194
E4 – 0	$71,114	$74,000	$77,700	$81,705	$86,024	$90,687	$95,723	$101,167	$107,040	$113,391
E3 – 0	$69,976	$72,863	$76,568	$80,567	$84,887	$89,554	$94,588	$100,029	$105,907	$112,252
E2 – 0	$68,861	$71,750	$75,451	$79,452	$83,772	$88,437	$93,476	$98,915	$104,791	$111,142
Other	Academy-4	$67,112	Academy-3	$60,643	Academy-2	$54,174	Academy-1	$47,705	Recruit	$52,815

Table 36 lists the current ADF Officer and Enlisted wages, effective 10 Nov 2022. DOD (2022b).

Table 37. Exemplar of fast Officer progression to from O2 to O6 – 25 Years

RANK Pay-Group	PG 1	PG 2	PG 3	PG 4	PG 5	PG 6	PG 7	PG 8
O6 – 1	$170,293	$175,124	$180,698	$185,528	$190,916	$196,952	$203,016	$209,569
O6 – 0	$165,470	$170,299	$175,878	$180,704	$186,092	$192,131	$198,186	$204,748
O5 – 1	$145,567	$150,400	$155,980	$160,808	$166,193	$172,229	$178,290	$184,851
O5 – 0	$140,838	$145,669	$151,247	$156,078	$161,463	$167,502	$173,559	$180,120
O4 – 2	$121,112	$125,941	$131,518	$136,348	$141,735	$147,771	$153,832	$160,391
O4 – 1	$117,795	$122,629	$128,203	$133,033	$138,418	$144,459	$150,517	$157,076
O4 – 0	$114,470	$119,304	$124,878	$129,707	$135,094	$141,133	$147,192	$153,753
O3 – 5	$108,955	$113,789	$119,366	$124,194	$129,582	$135,619	$141,679	$148,240
O3 – 4	$105,801	$110,634	$116,211	$121,043	$126,428	$132,465	$138,523	$145,082
O3 – 3	$102,640	$107,470	$113,046	$117,875	$123,264	$129,303	$135,362	$141,920
O3 – 2	$99,494	$104,330	$109,904	$114,732	$120,121	$126,157	$132,214	$138,778
O3 – 1	$96,350	$101,180	$106,755	$111,586	$116,974	$123,011	$129,068	$135,627
O3 – 0	$93,193	$98,021	$103,596	$108,426	$113,814	$119,850	$125,912	$132,471
O2 – 3	$87,819	$92,647	$98,223	$103,054	$108,436	$114,473	$120,536	$127,097
O2 – 2	$85,220	$90,051	$95,627	$100,455	$105,843	$111,881	$117,941	$124,501
O2 – 1	$82,667	$87,497	$93,076	$97,906	$103,289	$109,326	$115,387	$121,950
O2 – 0	$80,222	$85,051	$90,629	$95,459	$100,845	$106,884	$112,941	$119,499

Table 36 contains all ADF officer and enlisted salaries effective 10 Nov 2022. ADF members are paid according to the number of years in rank and their skill Pay-Group (PG). The yellow cells in Table 37 show an exemplar 25-year fast officer progression. Career progression involves not only promotion but also increases in pay group as professional mastery is achieved. This exemplar is only one of an almost infinite number of possible combinations of rank and pay group progressions.[91] It also ignores all forms of specialist and deployment pay.[92] This fast model will be combined with a slow

[91] This progression is loosely based upon an amalgam of Royal Australian Navy Maritime Warfare Officer, Aviation Officer and Engineering Officer recommended career progression rates with the assumption of minimal time in rank. Notably however flying pay and sea going pay are not included.

[92] It should be noted that most officers neither reach the rank of O6 nor do they have 25-year careers, this is an illustrative example only used to project possible lifetime returns.

officer progression model, also over 25 years, as well as an academy officer model to generate a generic "Combined" officer career path.[93] This model career can be used to approximate a lifetime earnings figure for ADF officers. Where applicable, this officer model will be compared to a similar combined enlisted model; also built from combining three types of enlisted careers. The Combined Officer wage progression is listed in the right and column of Table 38.

Table 38. Exemplar Officers next 25-year, career earnings starting 2022

OFFICER FAST					OFFICER SLOW				OFFICER ACADEMY				Combined Officer
YoS	Rank	PG	2023	Indexed	Rank	PG	2023	Indexed	Rank	PG	2023	Indexed	Indexed
25	O-6-1	PG-8	$209,569	$337,079	O-6	PG-6	$196,952	$316,785	O-6	PG-8	$209,569	$337,079	$322,873
24	O-6-1	PG-8	$209,569	$330,469	O-6	PG-6	$196,952	$310,573	O-6	PG-8	$204,748	$322,867	$315,022
23	O-6-1	PG-8	$209,569	$323,989	O-6	PG-6	$196,952	$304,484	O-6	PG-7	$198,186	$306,392	$306,816
22	O-6-1	PG-8	$209,569	$317,637	O-6	PG-6	$196,952	$298,514	O-5	PG-7	$178,290	$270,228	$294,769
21	O-6-1	PG-8	$209,569	$311,409	O-6	PG-6	$196,952	$292,660	O-5	PG-7	$178,290	$264,930	$288,989
20	O-6-0	PG-7	$198,186	$288,720	O-6	PG-6	$192,131	$279,899	O-5	PG-7	$178,290	$259,735	$276,748
19	O-5-1	PG-7	$178,290	$254,642	O-5	PG-5	$166,193	$237,365	O-5	PG-7	$178,290	$254,642	$242,548
18	O-5-1	PG-7	$178,290	$249,649	O-5	PG-5	$166,193	$232,710	O-5	PG-7	$178,290	$249,649	$237,792
17	O-5-1	PG-7	$178,290	$244,754	O-5	PG-5	$166,193	$228,147	O-5	PG-7	$173,559	$238,259	$231,830
16	O-5-1	PG-7	$178,290	$239,955	O-5	PG-5	$166,193	$223,674	O-4	PG-7	$153,832	$207,038	$221,975
15	O-5-1	PG-7	$178,290	$235,250	O-5	PG-5	$166,193	$219,288	O-4	PG-7	$153,832	$202,978	$217,622
14	O-5-0	PG-7	$173,559	$224,517	O-5	PG-5	$161,463	$208,870	O-4	PG-6	$147,771	$191,158	$206,892
13	O-4-2	PG-7	$153,832	$195,096	O-4	PG-5	$141,735	$179,754	O-4	PG-6	$147,771	$187,409	$182,819
12	O-4-2	PG-7	$153,832	$191,271	O-4	PG-5	$141,735	$176,230	O-4	PG-6	$144,459	$179,617	$178,411
11	O-4-2	PG-6	$147,771	$180,132	O-4	PG-4	$136,348	$166,207	O-4	PG-6	$141,133	$172,040	$168,766
10	O-4-2	PG-6	$147,771	$176,600	O-4	PG-4	$136,348	$162,948	O-3	PG-6	$135,619	$162,077	$164,139
9	O-4-1	PG-6	$144,459	$169,257	O-4	PG-4	$133,033	$155,869	O-3	PG-5	$126,428	$148,131	$155,660
8	O-4-0	PG-6	$141,133	$162,117	O-4	PG-4	$129,707	$148,993	O-3	PG-5	$123,264	$141,592	$148,825
7	O-3-5	PG-6	$135,619	$152,729	O-3	PG-4	$124,194	$139,863	O-3	PG-5	$120,121	$135,276	$140,232
6	O-3-4	PG-5	$126,428	$139,587	O-3	PG-4	$121,043	$133,641	O-3	PG-5	$116,974	$129,149	$133,337
5	O-3-3	PG-5	$123,264	$133,425	O-3	PG-4	$117,875	$127,592	O-3	PG-3	$103,596	$112,136	$125,084
4	O-3-2	PG-5	$120,121	$127,473	O-3	PG-4	$114,732	$121,755	Academy	ADFA-	$67,112	$71,220	$112,219
3	O-3-1	PG-5	$116,974	$121,700	O-3	PG-4	$111,586	$116,094	Academy	ADFA-	$60,643	$63,093	$106,054
2	O-3-0	PG-3	$103,596	$105,668	O-3	PG-3	$103,596	$105,668	Academy	ADFA-	$54,174	$55,257	$95,586
1	O-2-0	PG-2	$85,051	$85,051	O-2	PG-2	$85,051	$85,051	Academy	ADFA-	$47,705	$47,705	$77,582

Assuming a continued rate of 2% per year, every year, the figures in Table 38 contain the projected wages earned each year for a fast officer career path. Readers will notice that the yellow cells in Table 37, which are all in 2022 dollars, are now listed in

[93] This does mean that in all likelihood, very few officers will actually progress and earn at this rate, however it represents some form of mean (not median) income progression.

fourth column of Table 38, marked "2023." A similar method was applied to slow officers as well as fast and slow enlisted. The indexed column on the far right is a combination of the three blue columns taken from fast, slow and the academy officers. This is used to generate a single generic "Combined" officer wage progression figure. Weightings will be used in an attempt to be representative of actual ADF officer wage distributions; to which I do not have any access. I have estimated that generic officer earning comprises: 10% Fast 70% Slow and 20% Academy.

Table 39. Exemplar Enlisted next 25-year, career earnings starting 2022

ENLISTED FAST					ENLISTED SLOW				SAILOR CHANGEOVER				Combined Enlisted
YoS	Rank	PG	2023	Indexed	Rank	PG	2023	Indexed	Rank	PG	2023	Indexed	Indexed
25	E9	PG-8	$128,056	$205,970	E8	PG-7	$117,575	$189,112	O5	PG-8	$180,120	$289,712	$210,918
24	E9	PG-8	$128,056	$201,931	E8	PG-7	$117,575	$185,404	O4	PG-8	$160,391	$252,920	$200,560
23	E9	PG-8	$128,056	$197,972	E8	PG-7	$117,575	$181,769	O4	PG-8	$160,391	$247,961	$196,627
22	E9	PG-8	$128,056	$197,972	E8	PG-7	$117,575	$181,769	O4	PG-8	$157,076	$242,836	$195,602
21	E9	PG-8	$128,056	$194,090	E8	PG-7	$117,575	$178,204	O4	PG-8	$153,753	$233,038	$190,760
20	E8	PG-8	$128,056	$190,284	E8	PG-7	$117,575	$174,710	E9	PG-8	$137,887	$204,893	$182,304
19	E8	PG-8	$128,056	$186,553	E8	PG-7	$117,575	$171,285	E9	PG-8	$137,887	$200,875	$178,730
18	E8	PG-8	$128,056	$182,896	E8	PG-7	$117,575	$167,926	E9	PG-8	$137,887	$196,937	$175,225
17	E8	PG-8	$128,056	$179,309	E8	PG-7	$117,575	$164,633	E9	PG-8	$137,887	$193,075	$171,789
16	E8	PG-8	$128,056	$175,793	E8	PG-6	$117,575	$161,405	E8	PG-8	$128,056	$175,793	$165,722
15	E8	PG-8	$128,056	$172,347	E8	PG-6	$117,575	$158,240	E8	PG-8	$128,056	$172,347	$162,472
14	E8	PG-8	$128,056	$168,967	E8	PG-6	$117,575	$155,138	E8	PG-8	$128,056	$168,967	$159,287
13	E8	PG-8	$128,056	$165,654	E8	PG-6	$117,575	$152,096	E8	PG-8	$128,056	$165,654	$156,163
12	E6	PG-7	$118,232	$149,947	E6	PG-6	$113,195	$143,559	E6	PG-7	$118,232	$149,947	$145,475
11	E6	PG-7	$118,232	$147,007	E6	PG-6	$113,195	$140,744	E6	PG-7	$118,232	$147,007	$142,623
10	E6	PG-7	$118,232	$144,124	E6	PG-5	$108,530	$132,297	E6	PG-7	$118,232	$144,124	$135,845
9	E6	PG-7	$118,232	$141,298	E6	PG-5	$108,530	$129,703	E6	PG-7	$118,232	$141,298	$133,182
8	E5	PG-6	$98,075	$114,910	E5	PG-5	$89,090	$104,383	E5	PG-6	$98,075	$114,910	$107,541
7	E5	PG-6	$98,075	$112,657	E5	PG-5	$87,785	$100,837	E5	PG-6	$98,075	$112,657	$104,383
6	E5	PG-6	$96,767	$108,975	E5	PG-5	$87,785	$98,860	E5	PG-6	$96,767	$108,975	$101,895
5	E5	PG-5	$90,819	$100,272	E5	PG-4	$86,501	$95,504	E5	PG-5	$90,819	$100,272	$96,934
4	E3	PG-5	$84,887	$91,884	E3	PG-4	$80,567	$87,208	E3	PG-5	$84,887	$91,884	$88,611
3	E3	PG-4	$80,567	$85,498	E3	PG-3	$76,568	$81,255	E3	PG-4	$80,567	$85,498	$82,528
2	E3	PG-4	$80,567	$82,178	E3	PG-3	$76,568	$78,099	E3	PG-4	$80,567	$82,178	$79,323
1	E2	PG-3	$71,750	$71,750	E2	PG-3	$71,750	$71,750	E2	PG-3	$71,750	$71,750	$71,750

A similar approach will be carried out to generate enlisted career earnings using fast enlisted, slow enlisted and change-over enlisted. Change over enlisted are senior sailors that have changed over to become officers. Career enlisted earnings comprises:

30% Fast 60% Slow 10% Changeover. The Combined Enlisted wage progression is listed in the right and colin of Table 39.

The two generic profiles will be used to show the effect of market performance on the MBL cross over points for Officers and enlisted in the second model. The reason why the generic profile has been created is in order to reduce the number of free variables such as promotion rate, while still being able to show how the result is broadly speaking income dependent. This is because the MBLs partially scale with FAS and partially with AWOTE.

Figure 10 and Figure 11 show MBL cross over points as market performance rises for generic officer and enlisted profiles listed in Tables 38 and 39. These crossover timings are also summarized in Table 40.

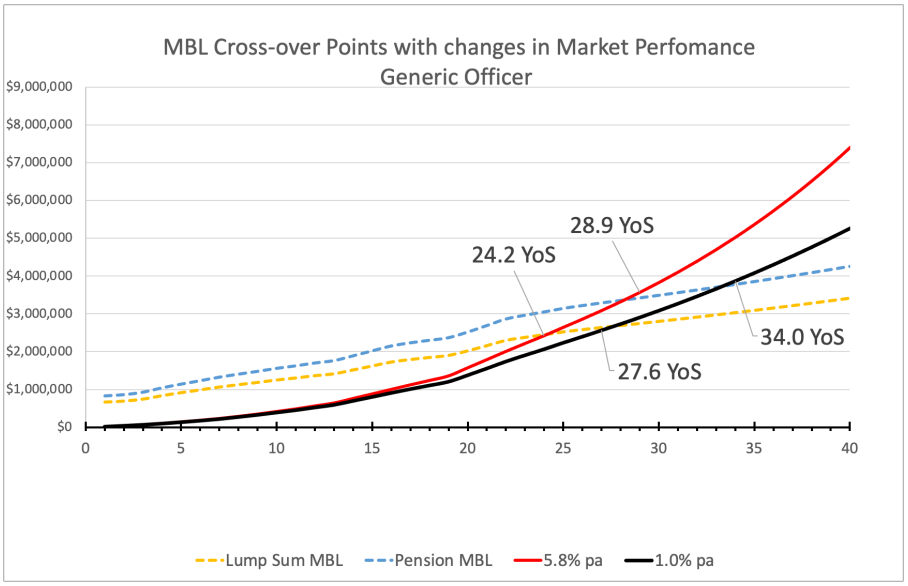

Figure 10. The effect of market performance on MBL crossover points for officers

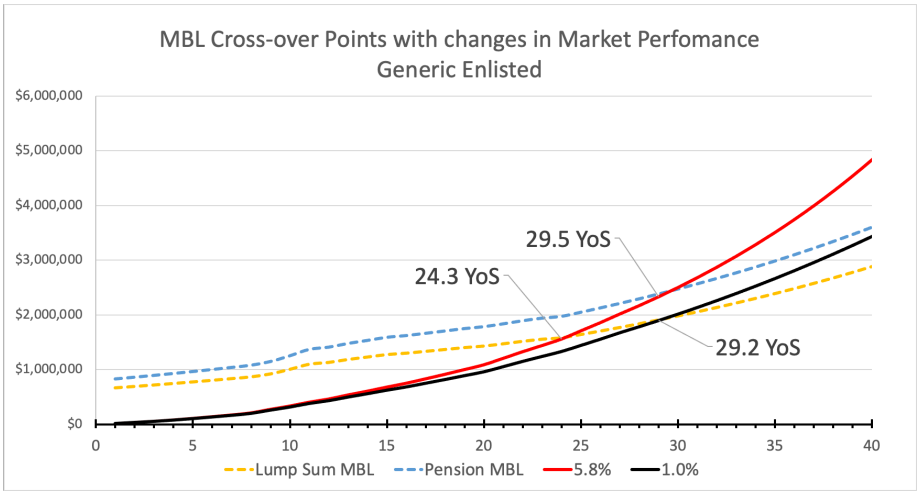

Figure 11. The effect of market performance on MBL crossover points for enlisted

Table 40. Numerical values for officer and enlisted MBL crossover points.

	YOS	Interval	Salary	FAS	Member Benefit	Employer Benefit	Total Benefit	LS-MBL	Pen-MBL
Officer 5.8% LS-MBL	24.2		$316,635	$307,100	$792,949	$1,663,851	$2,456,800	$2,456,800	
Officer 5.8% Pen-MBL (A)	28.9	4.7	$341,799	$341,799	$1,230,088	$2,187,902	$3,417,990		$3,417,990
Officer 1.0% LS-MBL	27.6		$340,117	$333,491	$570,910	$2,097,021	$2,667,932	$2,667,932	
Officer 1.0% Pen-MBL (B)	34.0	6.4	$378,345	$378,345	$776,690	$3,006,762	$3,783,453		$3,783,453
Enlisted 5.8% LS-MBL	24.3		$202,556	$199,563	$513,456	$1,083,048	$1,596,504	$1,596,504	
Enlisted 5.8% Pen-MBL	29.5	5.2	$242,550	$242,550	$845,713	$1,579,788	$2,425,501		$2,425,501
Enlisted 1.0% LS-MBL	29.2		$245,210	$240,433	$386,997	$1,536,469	$1,923,466	$1,923,466	
Enlisted 1.0% Pen-MBL	-	NA	-	-	-	-	-		

All values are future dollars, beginning in 2022. Therefore, a salary at 24.2 YoS is the expected salary (at 2% pa) in 2042. The full salary profile is taken from the green columns in Table 38 and Table 39. Note: The figures in the green columns are annual salary. These must be converted to FAS before generating the MBLs. Additionally, Table 40 values extend past the 25 years listed in Table 38 and Table 39.

Interval refers to the time between lump sum MBL and pension MBL for any given cohort. For officers earning 5.8% pa, they have 4.7 years until their pension MBL is crossed.

The results in Table 40 reveal that as market performance increases, the time between crossing the lump sum MBL and crossing the pension MBL shrinks for all cohorts. Readers should remember that MBL limits change only with FAS and AWOTE. Changes in market performance do not affect the MBLs.[94] A more important observation is that the member earning a lower rate on the market will, at the point of crossing the pension MBL have a larger total entitlement.

Compare at the point of reaching their pension MBL, Officer A on 5.8% with $3.417m and Officer B, on 1.0% with $3.783m; the two red figures. At first glance this seems counter intuitive until we realize that the lower figure occurs after 28.9 YoS while the higher figure after 34.0 YoS. A difference of 5 years and 1 month. What is less obvious however is the difference in employer benefit. Officer A has an employer benefit of $2.19m and Officer B has $3.01m. By crossing the pension MBL early, the Officer A will freeze their EMB at a substantially lower figure.

It might seem that they are being generously compensated by the market, because Officer A's member benefit ($1,230m) is 36.8% larger than Officer B's ($0.777m), and that additionally it is arriving over five years earlier. However, two facts should be noted. Firstly, officer B's employer benefit is larger than Officer A's by a similar 37.4%; but this is 37% of a much larger amount. The difference in member benefits is the $453,397 (A > B), and the difference in employer benefits and $818,860 (B > A). Subtracting one from the other we see that this difference, $365,463 which is the difference in total benefits.

Secondly, pensions are paid using the employer benefit. If we calculate the exact employer benefit when Officer A reaches YoS 34.0 the derived pension would be 14%

[94] The dashed MBL lines rise with YoS, and therefor FAS, but for each cohort they remain in the same location under both market conditions.

smaller than Officer B after the same YoS=34.0 at the same salary.[95] What has happened is a case of robbing Peter to pay Paul. Officer A's stock market successes today will rob their future self, particularly if they plan to live longer than 13 years past beginning the pension[96] It goes without saying, the market has saved the Commonwealth a lot of money, 365,463 dollars to be precise, and a lot more than that if pensions are taken. This is the *raison d'etre* why MBLs exist and by extension it is also the reason why defined benefit schemes like MilitarySuper have been replace by accumulation funds.

[95] Using the MBL methods from Appendix F, assuming Officer A continues to serve until 34.0 YoS when Officer B crosses their pension MBL, and assuming they are both the same age, and this happens to be 55 when the ACF=12.0. The escalated employer benefit for Officer A is $2,68m (up from $2,187m). The respective pensions would be $219,045 (A) and $250,564 (B) in 2056 dollars. Officer B's pension is and will remain regardless of CPI, 14.4% larger than Officer A. I'll leave it to the reader to calculate the exact opportunity cost around investing the additional $453,397 for 5.1 years earlier, but roughly speaking, at a miraculous 5.8% pa, Officer A would need to wait fifteen years before cashing in the invested funds in order to recoup the cumulative pension difference, which is a decade after Officer B retires (15–5.13 years).

[96] Thirteen being the approximate point of equivalence between a single lump sum and the pension.

APPENDIX L: WHAT-IF SCENARIO CREATION

At the very heart any member's struggle to predict their financial future, are assumptions about growth. Members and financial professionals must make some sort of assumptions about rates of growth and typically opt for a constant rate of growth model.[97] The constant rate of growth can be fixed over a day, a month, a year or even a decade. Most financial literature uses per annum growth rates. This relatively long-period model is this the simplest to model and understand. It aggregates daily variations in the underlying asset into annualized returns. I think that in forecasting, inputting any pattern of growth other than a relatively long-period constant growth rate implies a level for clairvoyance that I feel cannot be defended, other than by sheer happenstance.[98] So let us dispense with growth assumptions altogether and look at what actually happened. I realize that epistemologically speaking, knowledge of the past does not resolve the fundamental problem with human uncertainty, but she is our only tutor.

I will examine what would have happened if a MilitarySuper member had switched to ADFSuper on 01 July 2016, remembering that they can only switch accumulated member contributions but not their existing employer contributions. Those have to remain preserved in MilitarySuper. However, all future contributions by the member and the employer will be made to ADFSuper. To make things interesting, I have chosen the ADFSuper aggressive portfolio.

In order to perform this final comparison, I start with an arbitrarily selected baseline salary selected from the 2022 WRA. Ultimately the exact figure is irrelevant, it only needs to be high enough to trigger the lump sum MBL but low enough that even

[97] By constant growth I mean a constant rate of growth over a fixed and repeated period, in percent per period. Technically this compounding of a constant rate leads to exponential growth in the value of the underlying asset as the annuity return equations in Appendix J show. The term "constant" refers to the rate of growth and not the asset value.

[98] Indeed, already assuming a simple constant level of growth suggests some degree of hubris, but without such an assumption, no model at all can be constructed. All constant growth rate models should, however, be extracted from markets with at least similar conditions, and derived, as well as applied over the longest possible time periods. For ASX 200 shares, I am fairly confident in a growth rate of close to 5% per year (±1%) when the time period is measured in multiples decades (i.e., close to the 42-year span in the prediction), or a seven-fold (~5 to ~10 fold) increase over four decades in the underlying value of the asset.

after a 20+ year career it will not cross the pension MBL for another seven years. I have chosen an O4 in PG-6 ($147,771).[99] Next I de-escalated wages from the current Nov 2022 WRA by 2% pa back to July 2016.[100] Lump sum and pension MBLs have been de-escalated by 3.8% pa, in line with their historical average rise in AWOTE. This provides me with what the MBLs would have been at these lower 2016 salaries, and for every year in between. MilitarySuper employer entitlements are calculated for every year using relevant YOS/EBMs and the de-escalated salaries expressed as FAS. The member's EBM is however frozen on 30 June 2016 for the fictitious member switching to ADFSuper, because contributions cease once they exit that CSC scheme. Their preserved EMB-FAS defined employer benefit has been indexed every year using the historical bi-annual CSC CPI increases, applied annual or bi-monthly as required, as taken from (CSC, 2022k).[101]

Finally, I include the actual historical CSC MilitarySuper daily aggressive performance for both MilitarySuper and ADFSuper, which although they sound the same, have very slightly different performance figures (see Appendix L). I have used the daily CSC "aggressive" unit price changes, starting on Friday 01 July 2016 and overlayed how actual fortnightly investments would need to be made. These would be purchases of CSC aggressive units by the member equivalent to 5% of the applicable wages at the time, and 16.4% of wages invested by the employer, made every 14 days. I add these regular purchases to the large rolled-over amounts of member contributions had on 01 July 2016.

The baseline member in this thought experiment, the one who remains in MilitarySuper, has all the usual calculations for EMB, FAS and MBL all de-escalated to 2016 and then increased annually as appropriate. Perfect synchronization of the November ADF pay-rises, the mid-year AWOTE MBL rises, and the market performance was not conducted. Instead pay rise were moved two moths forward to align with the new year. Equally both members are assumed to have their birthdays on 01 July

[99] Incidentally, this is close to the average of salaries earned in the two generic wages models for officers and enlisted after 20 years of service, in 2022 dollars listed in the last columns of Tables 38 & 39.

[100] Remembering that WRAs only begin in the month of November each year, the ADF salary in July 2016 is the in accordance with of the "middle year" of the 2014–2017 WRA, i.e. Nov 2015 to Nov 2016.

[101] In this particular case, CPI escalation alone added approximately $83,000 to the employer benefit (between $7,000 and $16,000 depending on the FY).

so as to synchronize their birthdate with YoS. All MilitarySuper calculations use a member's FAS for the three years previous, while all ADFSuper calculations use the salary for the year. Table 41 is one extract for a MilitarySuper member who by November 2016 would have triggered their MBL.[102]

Table 41. Annual Benefits for a MilitarySuper member who elects to remain in MilitarySuper

	YOS	Salary	FAS	EBM Annual	EBM Total	Employer	Member	Total Benefit	Lump Sum MBL	Pension MBL
1991	0	$79,598	$79,598	0.18	0.18	$14,328	$4,480	$18,807	$564,070	$686,910
etc	etc	.....	.....	.....	.....	.....	.....	.....	.....	.....
2015	24	$128,022	$126,140	0.28	5.65	$712,688	$222,829	$935,517	$969,828	$1,202,463
2016 June	24.5	$129,942	$128,032	0.14	5.79	$741,303	$227,302	$968,605	$989,331	$1,227,933
2016 Dec	25	$129,942	$128,032	0.14	5.93	$759,227	$230,869	$990,097	$989,331	$1,227,933
2017	26	$132,541	$130,112	0.28	6.21	$807,996	$238,229	$1,046,225	$1,010,277	$1,255,191
2018	27	$135,192	$131,905	0.28	6.49	$856,061	$244,825	$1,100,886	$1,029,818	$1,280,918
2019	28	$137,896	$135,210	0.28	6.77	$915,370	$254,556	$1,169,927	$1,058,773	$1,317,739
2020	29	$140,654	$137,914	0.28	7.05	$972,294	$264,267	$1,236,561	$1,084,470	$1,350,876
2021	30	$143,467	$140,672	0.28	7.33	$1,031,128	$278,288	$1,309,416	$1,110,854	$1,384,936
2022 June	30.5	$147,771	$143,964	0.14	7.47	$1,075,411	$277,451	$1,352,862	$1,140,815	$1,423,294

[102] Compare the column marked Total Benefit with the column marked Lump Sum MBL to see that this occurs between the June 2016 and Dec 2016 rows. Note also that by June 2022 they have not crossed the pension MBL.

Table 42. Annual Benefits for a MilitarySuper member who elects to switch to ADFSuper[103]

	YOS	Salary	FAS	EBM	EBM	Employer	Member	Total Benefit	Lump Sum MBL	Pension MBL
1991	0	$79,598	$79,598	0.18	0.18	$14,328	$4,480	$18,807	$564,070	$686,910
etc	etc	.....	.....	.....	.....	.....	.....	.....	.....	.....
2015	24	$128,022	$126,140	0.28	5.65	$712,688	$222,829	$935,517	$969,828	$1,202,463
2016 June	24.5	$129,942	$128,032	0.14	5.79	$741,303	$227,302	$968,605	~~$989,331~~	~~$1,227,933~~
2016 Dec	25	$129,942	$128,032	0.14	5.93	$760,406	$230,866	$991,273	~~$989,331~~	~~$1,227,933~~
2017	26	$132,541	$130,112	0.28	6.21	$790,667	$238,225	$1,028,892	~~$1,010,277~~	~~$1,255,191~~
2018	27	$135,192	$131,905	0.28	6.49	$813,311	$244,820	$1,058,131	~~$1,058,773~~	~~$1,317,739~~
2019	28	$137,896	$135,210	0.28	6.77	$842,831	$255,167	$1,097,998	~~$1,084,470~~	~~$1,350,876~~
2020	29	$140,654	$137,914	0.28	7.05	$879,186	$264,275	$1,143,461	~~$1,110,854~~	~~$1,384,936~~
2021	30	$143,467	$140,672	0.28	7.33	$917,239	$278,246	$1,195,485	~~$1,110,854~~	~~$1,384,936~~
2022 June	30.5	$147,771	$143,964	0.14	7.47	$917,868	$277,417	$1,195,285	~~$1,140,815~~	~~$1,423,294~~

Table 41 and Table 42 show that the bulk of the difference in final entitlement value is driven by the changes in the red column, the employer contribution. The two blue columns of member contributions are almost the same for a MilitarySuper member and an ADFSuper member as they are both CSC aggressive products. The reader can however observe the slight difference between the two funds despite the similar name. This disparity will only get larger over time as tiny variations in weightings force these two asset pools to diverge from each other. Readers should also note the additional rows for the half year adjustments in 2016 and 2022 to allow for the fact that ADFSuper starts in July while the rest of the panel is synchronized Jan to Dec.

As has been stated before, due to the simplifying assumption that members in both schemes contribute the same 5% annually, the choice of member contributions

[103] The values in the right hand columns are crossed out because they no longer apply once the member switches to ADFSuper. They are taken from the previous remaining member and are included for comparative purposes only.

cancel out between the two options. Of course, in real life a member switching to ADFSuper can change this to any number they wish, so long as the total nominal value of all member contributions is below the annual caps and limits imposed by the tax system. Noting also that those annual taxation contribution limits are declared by the ATO in nominal dollar terms and not in relative salary percentage terms, which is why no attempt has been made anywhere in this paper to examine the effects of varying member contributions from 5%. At 5% of annual salary, all serving ADF members should not encroach on any ATO limits unless they have access to additional monies. MilitarySuper members of course can only ever raise their contributions (up to 10%) but can never set them to zero unless they have crossed their lump sum MBL. This raises the other major difference between the two options, in that MBLs do not apply to ADFSuper members.

In addition to these two outcomes which are modeled on historical CSC daily unit price changes, I also include two constant growth rate models. The first additional model uses an annualized CSC growth figure of 3%. This figure is the effective growth for the whole period 01 Jul 2016 to 28 Nov 2022 expressed as an annualized figure.[104] . This difference that this change in assumptions from daily price changes to annualized growth should be enough to highlight the dangers of the constant growth rate assumption, when compared with the unit price mechanism.

To emphasize this point further, I have also included a generic constant growth model set at the long-term ASX average return rate of 5.8%. That data series is de-escalated back to 1991. I have chosen 1991, because this marks the year this fictitious member would have had to join the ADF in order to be on the verge of triggering their MBL in July of 2016. When making their decision 2016, the member might be tempted to look back and model their whole career on a very simple constant growth model based on the ASX long term average. In some sense, once freed of having to deal with MBLs, it does not really matter whether the member actually deescalates their wages back to1991 as I have. Even without this extra de-escalation detail, they might look only at the

[104] MilitarySuper aggressive unit prices rose from 2.318971 to 3.78639 and ADFSuper aggressive rose from 0.998606 to 1.626434. The total growth for the whole period was 22.992% for MilitarySuper and 22.839% for ADFSuper. The annualized rate of return required for each of the seven years in the period is 2.992% and 2.982%. These have been rounded to 3% to produce the constant rate of growth figure used.

proportional increases in the two funds after 25 years of compound growth, much as I did in Figure 2, and from that alone they might conclude that ADFSuper will always outperform MilitarySuper.

APPENDIX M: MILITARYSUPER PENSION MBL MULTIPLES

In Table 43, the white areas denote members in MBL Tier 2 where the FAS-MBL ratio is 8 for the lump sum MBL and 10 for the pension MBL. Most of the four cohorts spend most of their time in this tier. Red areas denote times when a member has been pushed into the next higher MBL tier, in this case Tier 3. The green areas represent times when the member has been pushed back down to Tier 1.

Members will move tiers due to the fact that FAS and AWOTE change at different rates (2% pa vs. 3.8% pa). Only a full three years after a promotion, will FAS actually have increased by 2% from the baseline, but seeing that pay-rises are annual, over multiple and consistent 2% pay rises, FAS will also climb by 2% per year.[105] In general, the lower the FAS the more likely a member is to be pushed into a lower tier. This is a good thing. In general, it means that lower paid members have access to entitlements larger than they would have, had they remained at a higher tier. Witness the ratios above 10 in Figure 4.

If AWOTE rises much faster than FAS, everybody will be pushed down. If FAS rises too fast everyone will be pushed up a tier. Counter-intuitively, however, this is also a good thing because it means the overall value of the total entitlement is also larger than it would have been if the FAS increase had not happened. The only real losers are those members who happen to find themselves at the exact margin cross over point but due to bad timing have a tier change imposed on them right before a pay rise that could have delayed it. A pay rise occurring just before MBLs are increased is one, but not the only way this delay can happen. I have not created cohorts to demonstrate this, I leave it to the reader to discover those oddities for themselves.[106] Readers should also be warned that the exact behavior shown in this paper is an ultimately an artifact of the 2% to 3.8% FAS

[105] This is not true for shocks to the system like promotions. The effect of promotion on FAS will take 3 years to fully materialize, which is why any senior members in MilitarySuper needs to be promoted at least three years before separation for the long-term benefits of promotion on retirement incomes to remain an effective incentive.

[106] Although it should still be pointed out that, for the same salary and career profile, in a market that performs at 5.8%for 40+ years, an ADFSuper member will, all things being equal, outperform anyone facing one of these MilitarySuper MBLs.

to AWOTE ratio. In reality, both FAS and AWOTE will also change from year to year. FAS is only stable here because there are almost no late promotions and I have assumed a constant set of wage increases; and predicting AWOTE changes, well that's anybody's guess.

Table 43. MBL-FAS multiples for various ADF cohorts

	Lump Sum MBL				Pension MBL			
YoS	Officer FAST	Enlisted SLOW	Officer FAST	Enlisted SLOW	Officer FAST	Enlisted SLOW	Officer FAST	Enlisted SLOW
0	8	8	9.288	9.288	10	10	11.609	11.609
1	8	8	8.990	9.235	10	10	11.236	11.542
2	8	8	9.001	9.325	10	10	11.251	11.656
3	8	8	8.621	9.075	10	10	10.775	11.343
4	8	8	8.367	8.801	10	10	10.458	11.001
5	8	8	8.010	8.567	10	10	10.012	10.708
6	8	8	8	8.484	10	10	10	10.604
7	8	8	8	8.551	10	10	10	10.688
8	8	8	8	8.061	10	10	10	10.075
9	8	8	8	8	10	10	10	10
10	8	8	8	8	10	10	10	10
11	8	8	8	8	10	10	10	10
12	8	8	8	8	10	10	10	10
13	8	8	8	8	10	10	10	10
14	8	8	8	8	10	10	10	10
15	7.970	8	8	8	9.955	10	10	10
16	7.988	8	8	8	9.982	10	10	10
17	8	8	8	8	10	10	10	10
18	8	8	8	8	10	10	10	10
19	8	8	8	8	10	10	10	10
20	7.946	8	8	8.083	9.919	10	10	10.102
21	7.882	7.982	8	8.227	9.822	9.974	10	10.283
22	7.894	8	8	8.431	9.841	10	10	10.538
23	7.941	8	8	8.639	9.911	10	10	10.798
24	7.988	8	8.127	8.851	9.982	10	10.157	11.063
25	8	8	8.272	9.009	10	10	10.339	11.261
26	8	8	8.420	9.171	10	10	10.524	11.463
27	8	8	8.571	9.335	10	10	10.713	11.668
28	8	8	8.725	9.502	10	10	10.905	11.877
29	8	8	8.881	9.672	10	10	11.100	12.090
30	8	8	9.040	9.846	10	10	11.299	12.306
31	8	8	9.202	10.022	10	10	11.501	12.527
32	8	8	9.367	10.202	10	10	11.707	12.751
33	8	8	9.534	10.384	10	10	11.917	12.979
34	8	8	9.705	10.570	10	10	12.130	13.212
35	8	8	9.879	10.760	10	10	12.348	13.448
36	8	8	10.056	10.952	10	10	12.569	13.689
37	8	8	10.236	11.148	10	10	12.794	13.934
38	8	8	10.419	11.348	10	10	13.023	14.184
39	8	8	10.606	11.551	10	10	13.256	14.438
40	8	8	10.796	11.758	10	10	13.494	14.697
41	8	8	10.989	11.969	10	10	13.735	14.960

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APPENDIX N: CSC UNIT PRICE MECHANISM EXAMPLE

Table 44. Exemplar of CSC Aggressive portfolio purchasing sequence

		Unit Price ($) Military Super. Aggressive (1)	% From 01 Jul 16	5% of Salary (2)	Units Purchased (2) ÷ (1)	16.4 % of Salary (3)	Units Purchased (3) ÷ (1)
Start	01-Jul-	2.318971 (G)	0.00%	$245.52	105.88	$805.31	347.27
Saturday	02-Jul-	2.318971	0.00%	No Purchase			
Sunday	03-Jul-	2.318971	0.00%	No Purchase			
Monday	04-Jul-	2.318215	-0.03%	No Purchase			
Tuesday	05-Jul-	2.31587	-0.13%	No Purchase			
Wednesday	06-Jul-	2.308869	-0.44%	No Purchase			
Thursday	07-Jul-	2.313318	-0.24%	No Purchase			
Friday	08-Jul-	2.316018	-0.13%	No Purchase			
Saturday	09-Jul-	2.316018	-0.13%	No Purchase			
Sunday	10-Jul-	2.316018	-0.13%	No Purchase			
Monday	11-Jul-	2.331067	0.52%	No Purchase			
Tuesday	12-Jul-	2.33132	0.53%	No Purchase			
Wednesday	13-Jul-	2.334894	0.69%	No Purchase			
Thursday	14-Jul-	2.340319	0.92%	$245.52	104.91	$805.31	344.10
Member and employer purchases made every second Thursday at 5.0% and 16.4% of ongoing salary							
Thursday	28-Jul-	2.374099	2.38%	$245.52	103.42	$805.31	339.21
Thursday	11-	2.368585	2.14%	$245.52	103.66	$805.31	340.00
Thursday	25-	2.386943	2.93%	$245.52	102,86	$805.31	337.38
Thursday	26-	3.966618	71.05%	$275.14	69.36	$902.47	227.52
Thursday	09-	3.946769	70.19%	$275.14	69.71	$902.47	228.66
Thursday	23-	3.78639 (H)	63.28%	$275.14	72.67	$902.47	238.34
			Sum of columns	$40,789 value (W)	13,245 units (Y)	$133,816 value (Y)	43,442 units (Z)

Note * – Looking at just the unit price change from 2016 to 2022 it looks like a total return of 63.28% (H) ÷ (G),
or an annualized rate of 7.2552% pa. However, the actual return is the total value of monies invested divided by the final value of the portfolio (W+Y) ÷ (H) x (X + Z)
($40,789 + $133,816) ÷ ($3.78639 x (12,245 units + 43,442 units) = $174,614 ÷ $214,640 = 1.2292
Appendix J also explains similarly why returns do not match simple ratios methods.

In this case there is an actual total return $40,026 or 22.92% over the total monies invested ($174,614) covering the whole seven years. This figure annualized = 2.9922% pa, which has been **rounded to 3% pa** in the graphs and calculations as the actual return on investment for a fortnightly investor in ADFSuper between Jul 16 and Jul 22.

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LIST OF REFERENCES

Australian Bureau of Statistics. (2022). *Consumer price index.* Retrieved 26 Oct 2022 from https://www.abs.gov.au/statistics/economy/price-indexes-and-inflation/consumer-price-index-australia/sep-quarter-2022/640101.xlsx

Australian Government Actuary. (2014, 30 June). *Military superannuation schemes review of long term costs*. https://aga.gov.au/sites/aga.gov.au/files/publications/mil_super_2014/downloads/Mil_Super_2014.pdf

Australian Government Actuary. (2017, 30 June). *Military superannuation schemes review of long term costs.* https://aga.gov.au/publications/superannuation/2017-military-superannuation-schemes-review-long-term-costs

Australian Government Actuary. (2020, 30 June). *Military superannuation schemes review of long term costs.* https://aga.gov.au/sites/aga.gov.au/files/sites/aga.gov.au/files/publications/2021-09/Mil_Super_2020.pdf

Australian Public Service Commission. (2021, June). Circular 2021/06: Superannuation stapling. *Guidance for Commonwealth employers on the Government's Your Super, Your Future reforms*. https://www.apsc.gov.au/sites/default/files/2021-10/Circular 2021–06 – Superannuation Stapling.pdf

Australian Taxation Office. (2018, 28 November). *Tax on contributions*. https://www.ato.gov.au/Individuals/Super/Growing-your-super/Adding-to-your-super/Tax-on-contributions/

Australian Taxation Office. (2019a, 08 August). *Adding to your super*. https://www.ato.gov.au/Individuals/Super/Growing-your-super/Adding-to-your-super/

Australian Taxation Office. (2019b, 01 July). *Low income super tax offset.* https://www.ato.gov.au/Individuals/Super/In-detail/Growing-your-super/Low-income-super-tax-offset/

Australian Taxation Office. (2022a, 21 September). *Super guarantee percentage*. https://www.ato.gov.au/rates/key-superannuation-rates-and-thresholds/?anchor=Superguaranteepercentage – Superguaranteepercentage

Australian Taxation Office. (2022b, 19 May). *Super co-contributions.* https://www.ato.gov.au/individuals/super/in-detail/growing-your-super/super-co-contribution/

Australian Taxation Office. (2022c, 11 July). *Super contributions – Too much can mean extra tax*. https://www.ato.gov.au/Individuals/Super/In-detail/Growing-your-super/Super-contributions---too-much-can-mean-extra-tax/

Australian Taxation Office. (2022d, 21 September). *Reasonable benefit limit*. https://www.ato.gov.au/rates/key-superannuation-rates-and-thresholds/?page=36

Australian Taxation Office. (2022e, 01 July). *Marginal tax rates FY 2022–2023*. https://www.ato.gov.au/rates/individual-income-tax-rates/

Australian Taxation Office. (2022f, 21 September). *Concessional contributions cap*. https://www.ato.gov.au/Rates/Key-superannuation-rates-and-thresholds/?anchor=Concessionalcontributionscap–Concessionalcontributionscap

Australian Taxation Office. (2022g, 21 September). *Average weekly ordinary time earnings.* https://www.ato.gov.au/rates/key-superannuation-rates-and-thresholds/?page=39

Bureau of Labor Statistics. (2012). *Retirement costs for defined benefit plans higher than for defined contribution plans*, in Beyond the Numbers, Vol 1,No 21, Dec 2012. https://www.bls.gov/opub/btn/volume-1/pdf/retirement-costs-for-defined-benefit-plans-higher-than-for-defined-contribution-plans.pdf

Chai H. & Kim J., (2018). IMF Working Paper, Demographics, Pension Systems and the Saving Investment Balance WP/18/95, International Monetary Fund.

Commonwealth Superannuation Corporation. (2011). *MilitarySuper Book, A summary of the Military Superannuation and Benefits Scheme*, issued 30 June 2011. https://archive.dfwa.org.au/files/original/b427fcaf97452a621f882c660240a865.pdf

Commonwealth Superannuation Corporation. (2013, July). *MilitarySuper the productivity benefit, MB13 07/13*. CSC The productivity benefit download

Commonwealth Superannuation Corporation. (2020a, November). *ADFSuper death benefits, ADFC01 11/20*. https://csc.sitecorecontenthub.cloud/api/public/content/758273f4dd404255ba71855369f49deb?v=396bf553

Commonwealth Superannuation Corporation. (2021a, 29 September). *Annual report 2020–2021*. https://csc.sitecorecontenthub.cloud/api/public/content/9163d64a3fe84d6899290af53152adc3?v=c0f806b6

Commonwealth Superannuation Corporation. (2021b, July). *Life Plus Protect, Insurance in superannuation key facts sheet, LLPF01*. https://csc.sitecorecontenthub.cloud/api/public/content/cbce894f7b4945e8894448e593a69ea0?v=a877e5b9

Commonwealth Superannuation Corporation. (2021c, 18 May). *MilitarySuper, Update to fees and costs*. https://csc.sitecorecontenthub.cloud/api/public/content/d1ad00c18bfd4873a9e0c63cbf826dae?v=b65e3a2c

Commonwealth Superannuation Corporation. (2022a, 28 September). *Annual Report 2021–2022*, Australian Government. https://csc.sitecorecontenthub.cloud/api/public/content/1f78025157724f19811a5c477fef7ce2?v=5c08a9be

Commonwealth Superannuation Corporation. (CSC 2022b, 01 December). *Government contributions.* https://www.csc.gov.au/Members/Superannuation/Maximising-your-super/Add-extra-money-to-your-super/Government-contributions

Commonwealth Superannuation Corporation. (2022c, 30 September). *MilitarySuper Product Disclosure Statement, 8th Ed*. https://csc.sitecorecontenthub.cloud/api/public/content/769dc68630a14a798542ed40e444849b?v=14a1c593

Commonwealth Superannuation Corporation. (2022d, 30 September). *MilitarySuper death and invalidity benefits*. https://csc.sitecorecontenthub.cloud/api/public/content/0911e72c78694e17bdc20a8786c54b7c?v=817d9519

Commonwealth Superannuation Corporation. (2022e, July). *MilitarySuper death and dependents' benefits*, MB07/22. https://csc.sitecorecontenthub.cloud/api/public/content/71cd72f4874b46edb19e7b91ff3a9f13?v=8cfd9ada

Commonwealth Superannuation Corporation. (2022f, 30 September). *Tax and your MilitarySuper*. https://csc.sitecorecontenthub.cloud/api/public/content/99d2d36f16e742f09cb77eec0af865f4?v=d1458af7

Commonwealth Superannuation Corporation. (2022g, 23 September). *Tax and your ADFSuper*. https://csc.sitecorecontenthub.cloud/api/public/content/517234e9962e49869a3f35ef202f1e6e?v=03a55492

Commonwealth Superannuation Corporation. (2022h, May). *Tax and your MilitarySuper pension MS08 05/22*. https://csc.sitecorecontenthub.cloud/api/public/content/dcf49317088b4fb98be9df9fd6c0712e?v=bb282191

Commonwealth Superannuation Corporation. (2022i, June). *MilitarySuper ancillary benefit, MD20 06/22*. https://csc.sitecorecontenthub.cloud/api/public/content/943007e66f6f4381b8e6055593357d72?v=c10a4bc5

Commonwealth Superannuation Corporation. (2022j, June). *MilitarySuper maximum benefit limits (MBLS), MS31 06/22*. https://csc.sitecorecontenthub.cloud/api/public/content/2f4e5404607e4bb6a72eec5fdd6ab582?v=749c0463

Commonwealth Superannuation Corporation. (2022k, 10 November). *CPI (2022) How the CPI rate affects your pension*. https://www.csc.gov.au/Members/Retirement/Pensioners/How-the-CPI-rate-affects-your-pension

Commonwealth Superannuation Corporation. (2022*l*, 30 September). *Investment options and risk*. https://csc.sitecorecontenthub.cloud/api/public/content/eb5616cbcdca44ae9856c0a0a0b88769?v=98acce38

Commonwealth Superannuation Corporation. (2022m, 23 September). *ADFSuper product disclosure statement*, 7th Edition. https://csc.sitecorecontenthub.cloud/api/public/content/3ce3a58b8448409cadf65265fe408a05?v=864397bd

Commonwealth Superannuation Corporation. (2022n, February). *Preserved benefits summary, MSC02 02/22*. https://csc.sitecorecontenthub.cloud/api/public/content/b17802e9a6fd421082e870e0a4ec4cfb?v=70051ece

Commonwealth Superannuation Corporation. (2022o, 23 September). *Insurance and your ADFSuper*. https://csc.sitecorecontenthub.cloud/api/public/content/ee499380098a43cc86b3c425637ed8c3?v=1f23820b

Commonwealth Superannuation Corporation. (2022p, September). *MilitarySuper, taxation of lump sums, MB09/22*. https://csc.sitecorecontenthub.cloud/api/public/content/a9786c2bc88e4a03949acb16e4f666b6?v=ed72a9e5

Commonwealth Superannuation Corporation. (2022q). Portfolio Holdings at 30 June 2022, Aggressive (CSV-file). Retrieved 01 Oct 2022 from Australian Government. https://www.csc.gov.au/-/media/Files/Data/PHD/2022-06-PHD-MS-Aggressive.csv?sc_lang=en&hash=D1E0A3DF31EB2ADF7C2801892F2CD128

Defence Force Remuneration Tribunal. (2011). *ADF Workplace Remuneration Arrangement 2011–2014 matter 9 of 2011 decision*. https://www.dfrt.gov.au/matters/adf-workplace-remuneration-arrangement-2011

Defence Force Remuneration Tribunal. (2014). *ADF Workplace Remuneration Arrangement 2014–2017 matter 9 of 2014 decision.* https://www.dfrt.gov.au/sites/default/files/2021-01/DFRT-WRA-decision.pdf

Defence Force Remuneration Tribunal. (2017). *ADF Workplace Remuneration Arrangement 2017–2020 matter 6 of 2017 decision*. https://www.dfrt.gov.au/sites/default/files/2020-11/WRA-2017-2020-decision-as-issued.pdf

Defence Force Remuneration Tribunal. (2019). *Defence Force Remuneration Tribunal Determination No 9 of 2019, ADF Workplace Remuneration Arrangement 2017–2020.* https://www.dfrt.gov.au/sites/default/files/2020-11/WRA-2017-2020-decision-as-issued.pdf

Defence Force Remuneration Tribunal. (2020). *ADF Workplace Remuneration Arrangement 2020–2023, matter 12 of 2020 decision*. https://www.dfrt.gov.au/sites/default/files/2020-10/decision_-_wra.pdf

Department of Defence (Australia). (2022a). *Annual Reports Budget 2022–23, Portfolio budget statements 2022–23 budget related paper No 1.4A, Defence portfolio.* https://www.defence.gov.au/about/information-disclosures/budgets/budget-2022-23

Department of Defence (Australia). (2022b). *ADF Military salary – Permanent rates (non star ranks) – 10 Nov 2022*. https://pay-conditions.defence.gov.au/sites/default/files/2022-11/Pay-tables-Nov22_20221121.pdf

Department of Veterans' Affairs. (2019, 25 September). *Military Superannuation and Benefits Scheme*. https://clik.dva.gov.au/military-compensation-mrca-manuals-and-resources-library/incapacity-policy-manual/9-superannuation/96-military-superannuation-and-benefits-scheme

Rothman, G. (2012). *Modelling the sustainability of Australia's retirement income system*, Retirement and Intergenerational Modelling Analysis Unit, Department of the Treasury, Australian Government.

Stickney C. & Weil R. (2007). *Financial accounting, an introduction to concepts, methods and uses* (12th ed.). Cengage.

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