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Long-run performance of backdoor-listed firms
PETER LAM and KELLY CHAN
We examine the long-run performance of a sample of firms going public through backdoor listing on the ASX during the 1994–2013 period. When benchmarked with a control sample of IPOs, backdoor-listed firms underperformed in the aftermarket. Over the three years after listing, they raised less equity capital and were less profitable and more financially distressed than their IPO counterparts. They also performed poorly in terms of buy-and-hold returns against the matched IPO firms and broad-based market indices. Our results tend to corroborate findings in the US and Canada but are inconsistent with their assertion that lax regulatory oversight is the major cause of underperformance since Australian backdoor listings have to comply with essentially the same listing requirements as IPOs.

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Long-run survival and performance of Australian dotcom IPOs
ADAM STEEN and JAMES MURRAY
This paper explores the long-run survival and share market performance of companies which made an Initial Public Offering (IPO) around the time of the share market correction in 2000, widely known as the dotcom or internet crash. We find that dotcom stocks failed no more frequently than non-dotcom stocks and our results were not sensitive to listing pre- or post-correction. Further, we find that non-dotcom stocks did not significantly outperform those of dotcom stocks. These findings challenge the conventional wisdom on the dotcom bubble.

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Problems with using EBITDA-based valuations in capital-intensive industries
WAYNE LONERGAN SF FIN and HUNG CHU SF FIN
In view of the significant commercial, tax and regulatory implications of the valuation outcome, this paper alerts valuers and market participants to the inherent dangers in the uncritical use of the EBITDA multiple-based method in valuing capital-intensive businesses. We show that equity valuations of established capital-intensive firms by EBITDA multiples are more susceptible to distortions than those based on NPAT multiples. These distortions arise from the inherent tendency of the former to overlook idiosyncratic, value relevant, differences below the EBITDA line between the subject company and the ‘comparables’ from which multiples are derived.

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Protecting retirement wealth: A survey of Australian products
ANTHONY VASSALLO, LANCE FISHER and GEOFFREY KINGSTON
With the changes to the age pension assets test thresholds set to take effect in January 2017, we examine possible features of an ideal Comprehensive Income Product for Retirement. This paper provides a survey of the long-term derivative instruments (warrants) being offered by Australian institutions to elderly Australian investors. We focus on products other than plain vanilla life annuities, and there are currently four active products, with varying guarantee terms. Early exercise is typically permissible yet subject to penalties. Benefits are mostly lump sum but can be income streams.
**SPECIAL SECTION: SUPERANNUATION**

**Guest Editor’s introduction**
DEBORAH RALSTON SF FIN

**40**
Superannuation drawdown behaviour
THOMAS SNEDDON, ANDREW REESON, ZILI ZHU, ALEC STEPHENSON, ELIZABETH V HOBMAN and PETER TOSCAS

This paper provides a longitudinal study of withdrawals from account-based pensions from superannuation savings to provide a better understanding of drawdown patterns in retirement. Our analysis of the data indicates that most retirees in their 60s and 70s draw down on their account-based pensions at modest rates, close to the minimum amounts each year. Indeed, if these drawdown rates were to continue, most retirees would die with substantial amounts unspent. These findings are consistent with empirical evidence to date that suggests retirees are inclined to draw down their wealth relatively slowly.

**63**
Patterns of voluntary contributions to superannuation: A longitudinal analysis
JUN FENG and PAUL GERRANS

This paper is the first to provide an empirical analysis of long-term trends in voluntary contributions to superannuation in Australia using employer-level administrative data. We assess the role of demographic and socio-economic factors in predicting contribution behaviours. We also examine participation in pre-tax (salary sacrifice) and post-tax savings separately, and explore the inter-relationship between both choices. Our results indicate a decline in participation in both pre-tax contributions and post-tax contributions between 2002−03 and 2011−12 due to lower participation among new members. Participation in pre-tax contributions is higher for males and increases with age and income, whereas participation in post-tax contributions reduces with income and is lower for males.

**54**
Investment strategy on retirement savings: An analysis of the experience of fund members
PAUL GERRANS, MARIA STRYDOM, CARLY MOULANG and JUN FENG

This paper examines the extent to which demographic and social factors are associated with changes to individual wealth accumulation trajectories in retirement savings. Specifically, we investigate member-initiated investment changes to their superannuation accounts, distinguishing between investment changes to future contributions and the accumulated balance. Our findings indicate large gender differences across both types of investment changes and that members with higher balances, larger contributions and greater time in the fund are more likely to make changes.

**72**
Modelling the macroeconomic effects of an increase in superannuation contributions
JAMES A GIESECKE, PETER B DIXON and MAUREEN T RIMMER

In this paper we describe a new type of computable general equilibrium (CGE) model that integrates detail of the economy’s financial sector with a traditional real-side CGE model. We use the model to explore the macroeconomic effects of the superannuation sector in Australia by simulating a one percentage point increase in the ratio of superannuation contributions to the national wage bill. This simulation has relevance to current policy debate on the merits of further increases in the compulsory contribution rate. Our results indicate that a rise in the superannuation contribution rate increases long-run real GDP, largely via an increase in the savings rate. At the same time, the structure of the superannuation sector’s activities, relative to other savings vehicles, boosts short-run employment and housing investment.
KEVIN DAVIS SF Fin, Professor of Finance, University of Melbourne
Research Director, Australian Centre for Financial Studies and Professor of Finance, Monash University

With interest rates remaining close to zero in global capital markets and the search for yield continuing, this issue of JASSA canvasses a range of equity markets listing and valuation issues as well as some of the key determinants of retirement wealth.

The special section in this issue of the journal includes four papers on superannuation issues with important implications for policy makers and practitioners. The papers are based on longer papers prepared by the CSIRO-Monash Superannuation Research Cluster (see www.superresearchcluster.com) and Guest Editor, Professor Deborah Ralston SF Fin, Monash University, has written an introduction to these papers at the beginning of the special section. While not subject to the usual double-blind process, each of these papers was reviewed by a member of the Editorial Board and by me prior to inclusion.

In the first paper in the main section of the journal, Peter Lam and Kelly Chan examine the long-run performance of a sample of firms that went public through backdoor listing (BDL) on the ASX during the 1994–2013 period. Despite a similar regulatory process for both backdoor and front-door listings in Australia, the authors document significant long-run underperformance for a sample of non-financial BDLs relative to a controlled sample of IPO firms. They find that BDLs tend to raise less equity capital and be less profitable and more financially distressed than their IPO peers. While these findings may not be consistent with the assertion in the literature that lax regulatory oversight is the main reason for the underperformance of backdoor-listed firms in the aftermarket, it seems that the negative image associated with backdoor listings may be warranted.

In the next article, which also has an equity markets listing theme, Adam Steen and James Murray explore the long-run survival and share market performance of companies which made an Initial Public Offering (IPO) around the time of the share market correction in 2000, widely known as the dotcom or internet crash. With investors currently being attracted by so-called ‘unicorns’, privately held high-tech start-up companies often with valuations over $1 billion, the authors suggest it is an opportune time to revisit the aftermath of the 2000 dotcom crash in search of useful lessons for today’s investors. Their findings, which challenge the conventional wisdom on the dotcom bubble, were that dotcom stocks failed no more frequently than non-dotcom stocks and that non-dotcom stocks did not significantly outperform dotcom stocks.

Next, Wayne Lonergan SF Fin and Hung Chu SA Fin highlight what they see as the inherent dangers in the uncritical use of the EBITDA multiple-based method in valuing capital-intensive businesses. They show that equity valuations of established capital-intensive firms by EBITDA multiples (i.e. based on a measure of earnings higher up in the profit and loss account) are more susceptible to distortions than those based on net profit after tax (NPAT) multiples. Lonergan and Chu suggest that distortions arise from the tendency of the former to overlook idiosyncratic, value relevant, differences below the EBITDA line between the subject company and the ‘comparables’ from which multiples are derived. They argue that valuation based on EBITDA multiples should not be used in isolation unless all material relevant facts about the entity being valued and the ‘comparable’ companies are known or reasonably allowed for.
Finally, with the changes to the age pension assets test thresholds set to take effect in January 2017, Anthony Vassallo, Lance Fisher and Geoffrey Kingston examine possible features of an ideal Comprehensive Income Product for Retirement (CIPR). Their paper provides a survey of long-term retirement products offering risk protection (other than plain vanilla life annuities) being offered by Australian institutions to elderly Australian investors. The authors argue that the ideal CIPR would probably insure at least partly against estate-planning, market and inflation risks — and longevity risk. They note that a key issue for CIPRs in Australia is the fact that the market for lifetime annuities is thin and another is the absence of a requirement that part of an individual’s retirement wealth be annuitised.

We aim to attract high-quality, topical and relevant papers for practitioners, policy makers and those in academia, and I would encourage anyone with interesting research or analysis on the latest developments and issues in applied finance to contact us at membership@finsia.com about contributing to the journal. While submitted papers go through a standard double-blind refereeing process, the journal also publishes invited or commissioned articles and welcomes proposals for such articles. These could, for example, involve analysis of financial market developments, brief surveys explaining the import of recent academic research for practitioners, or policy-related papers.

2015 JASSA Prize
In this issue, we are delighted to announce the winners of the 2015 JASSA Prize.

Awarded annually since 1987, the prize recognises the best original article published in JASSA. The criteria for the award are topicality, originality, practicality and readability. Overall contribution to the industry’s literature is also considered.

Of the papers published in 2015, we are pleased to recognise Andrew Ferguson, Professor of Accounting, Business School, University of Technology Sydney and Peter Lam, Senior Lecturer in Accounting, Business School, University of Technology Sydney for their paper ‘Backdoor listings in Australia’. This paper, published in issue 1 of 2015, has been awarded the 2015 JASSA Prize valued at $1000.

Additionally, we extend our congratulations to Kathleen Walsh, Associate Professor, Research School of Finance, Actuarial Studies and Applied Statistics, ANU College of Business and Economics for her paper ‘Renminbi trade invoicing: Benefits, impediments and tipping points’. This paper, published in issue 2 of 2015, has been awarded the 2015 JASSA Merit Award valued at $350.

Both papers were reviewed by JASSA’s Editorial Board, and deemed overall to make the most impactful insights into contemporary Australasian financial service industry issues.
LONG-RUN PERFORMANCE
of backdoor-listed firms

PETER LAM, Senior Lecturer in Accounting, University of Technology Sydney Business School
KELLY CHAN, Lecturer in Accounting, University of Technology Sydney Business School

We examine the long-run performance of a sample of firms going public through backdoor listing on the ASX during the 1994–2013 period. When benchmarked with a control sample of IPOs, backdoor-listed firms underperformed in the aftermarket. Over the three years after listing, they raised less equity capital and were less profitable and more financially distressed than their IPO counterparts. They also performed poorly in terms of buy-and-hold returns against the matched IPO firms and broad-based market indices. Our results tend to corroborate findings in the US and Canada but are inconsistent with their assertion that lax regulatory oversight is the major cause of underperformance since Australian backdoor listings have to comply with essentially the same listing requirements as IPOs.

Backdoor listings (BDL), in which a private firm achieves a listing status via the corporate shell of an already listed company, have been highly prevalent in capital markets around the globe including in Australia in recent decades. Evidence presented by Ferguson and Lam (2015) shows BDLs represent 13 per cent of all firms going public during the 1994–2014 period. Indeed, BDLs accounted for close to 30 per cent of all going-public transactions at the height of the global financial crisis in 2009, making them a real alternative to listing through the front door (via an initial public offering, IPO).

Despite their popularity, backdoor listings have been met with scepticism, and widely seen as being high risk and inferior in quality. For instance, the recent surge in high-tech BDL activity using the shells of failing junior explorers has attracted warnings from the corporate regulator.1 Anecdotal evidence on the poor performance of backdoor-listed firms also abounds in the media, urging investors to be cautious.2 Empirical studies on the US market (e.g. Gleason et al. 2006; Adjei et al. 2008) and Canadian market (e.g. Carpentier et al. 2012) have found BDLs underperform their IPO counterparts in the aftermarket. They generally attribute this underperformance to the lax regulations and oversight over the backdoor listing process in those markets.

In contrast to other markets, Ferguson and Lam (2015) find the vast majority (roughly 75 per cent) of Australian BDLs are required by the Australian Securities Exchange (ASX) to re-comply with the listing requirements, including Listing Rules Chapter 1 and 2 and a long-form prospectus, before the merged entity can be re-admitted to quotation. This unique regulatory setting makes backdoor listings in Australia very similar to the IPO process. Because of the more stringent requirement imposed on BDLs in Australia, it is conceivable that their aftermarket performance would be comparable to that of the front-door listed firms. After all, they also have to meet either the profit or asset test as their IPO counterparts do. This paper examines the long-run performance of ASX-listed BDLs to shed light on this issue.

Data and method
In defining backdoor listings, it is critical that the owners of the private firm gain control of the listed shell entity through a reverse takeover; otherwise, the transaction is merely a change in the nature or scale of the business of the shell (Brown et al. 2013). We adopt the same procedures as Ferguson and Lam (2015) in identifying an initial sample of completed BDLs over the 1994–2013 period through newspaper search and examination of related corporate announcements made by the listed shell companies. Because of the need to examine long-run (three years) performance after listing, we exclude BDLs that were completed after December 2013. We further restrict our sample to firms in the non-financial sector as financial firms typically have distinctive
characteristics and financial statement items. Pooling them together with non-financial firms would render the interpretation of results difficult. Applying these procedures leaves a total of 251 BDLs in our final sample. For benchmarking purposes, we construct a control sample of IPOs based on information available on the Connect4 database. Specifically, we match every BDL case in the sample with one IPO based on year of listing, industry sector (2-digit GICS code) and size (total assets).  

Table 1 presents the distribution of our BDL sample by year and industry sector. The annual number of non-financial BDLs has largely been maintained at double-digit figures over the 20-year period, except for the earlier years before the dotcom era. The number peaked in 2000 with a total of 29 BDLs in that year alone. By industry breakdown, Materials (20.3 per cent of all cases), Information Technology (18.3 per cent) and Health Care (13.5 per cent) are the three most popular sectors for backdoor listings while Utilities (0.4 per cent) and Consumer Staples (3.2 per cent) are the least popular. It is interesting to note while the Materials sector is the largest supplier of shells for technology companies to go public through the backdoor, it is also the largest user of shells in the backdoor-listing process.

### TABLE 1: Distribution of BDL sample by year and industry sector

<table>
<thead>
<tr>
<th>Year</th>
<th>Energy</th>
<th>Materials</th>
<th>Industrials</th>
<th>Consumer discretionary</th>
<th>Consumer staple</th>
<th>Health care</th>
<th>Information technology</th>
<th>Telecomunication</th>
<th>Utilities</th>
<th>All sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>8</td>
<td>(3.2%)</td>
</tr>
<tr>
<td>1995</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>(2.0%)</td>
</tr>
<tr>
<td>1996</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>5</td>
<td>(2.0%)</td>
</tr>
<tr>
<td>1997</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>5</td>
<td>(2.0%)</td>
</tr>
<tr>
<td>1998</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>7</td>
<td>(2.8%)</td>
</tr>
<tr>
<td>1999</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>6</td>
<td>1</td>
<td>0</td>
<td>(5.2%)</td>
</tr>
<tr>
<td>2000</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>5</td>
<td>0</td>
<td>3</td>
<td>13</td>
<td>5</td>
<td>29</td>
<td>(11.6%)</td>
</tr>
<tr>
<td>2001</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>(5.6%)</td>
</tr>
<tr>
<td>2002</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td>(7.6%)</td>
</tr>
<tr>
<td>2003</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>(7.6%)</td>
</tr>
<tr>
<td>2004</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>7</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>(7.6%)</td>
</tr>
<tr>
<td>2005</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>(11.4%)</td>
</tr>
<tr>
<td>2006</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>(10.4%)</td>
</tr>
<tr>
<td>2007</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>(3.6%)</td>
</tr>
<tr>
<td>2008</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>(4.0%)</td>
</tr>
<tr>
<td>2009</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>(5.6%)</td>
</tr>
<tr>
<td>2010</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>(5.6%)</td>
</tr>
<tr>
<td>2011</td>
<td>7</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>(6.4%)</td>
</tr>
<tr>
<td>2012</td>
<td>2</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>(10.4%)</td>
</tr>
<tr>
<td>2013</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>(5.6%)</td>
</tr>
<tr>
<td>All years</td>
<td>30</td>
<td>51</td>
<td>31</td>
<td>30</td>
<td>8</td>
<td>34</td>
<td>46</td>
<td>20</td>
<td>1</td>
<td>251</td>
</tr>
</tbody>
</table>

(12.0%) (20.3%) (12.4%) (12.0%) (3.2%) (13.5%) (18.3%) (8.0%) (0.4%) (100%)

To gauge their aftermarket performance, we examine four facets of these backdoor-listed firms, including their access to capital, operating performance, survival status, and stock market performance. Data on capital raisings and survival status are manually collected from Morningstar’s DatAnalysis database. Data on accounting variables for computing operating performance are retrieved from Morningstar’s Aspect Financials database, while stock price data are from the Share Prices and Price Relatives (SPPR) database of SIRCA.
Access to capital

Companies need capital for growth and expansion. Being able to access the market for equity capital is one of the major reasons for private firms to go public. Since capital is relatively scarce, the ability of firms to attract capital can be used as a gauge of their underlying performance and future prospects as perceived by the market. Table 2 reports the aggregate access to equity capital by the sample of BDL firms in the three years following going public. Both the frequency and dollar amount of the capital raisings are reported, with details partitioned by the type of issue and year. For comparison purposes, similar data for the matched IPO sample is also reported.

At the time of the going-public transaction, BDL firms raised a lot less equity capital than their IPO counterparts. A total of 165 BDL firms (out of 251) conducted one or more forms of equity issue, raising aggregate cash proceeds of $1,468 million (an average of $5.8 million per firm). The median BDL firm raised $2.2 million at listing. By issue type, public offers ($692 million) and private placements ($663 million) are the predominant forms of capital raisings. Shareholders participated in 13 rights issues conducted by the BDL firms, contributing a total of $112 million. Two BDL firms also raised capital through share purchase plans ($0.7 million) from their existing shareholders. In contrast, 250 matched IPO firms raised an aggregate of $5,749 million from public offers at the time of going public, with average proceeds of approximately $22.9 million per offer and a median offer size of $10.5 million. This amount raised is roughly 3.9 times the total capital raised in BDL going-public transactions from all issue types.

Over the three-year period after listing, BDL firms seem more active in accessing capital, raising a total of $5,726 million as compared to $3,885 million by the matched IPO sample. Moreover, this difference in capital raising activity is mainly observed in the first year after going public. Counting all capital raised during the going-public transaction and the subsequent three years in the aftermarket, the BDL sample still raised less capital ($7,194 million) than the control sample of IPO firms ($9,634 million). By issue type, private placements made up close to 70 per cent of all proceeds raised by BDL firms, followed by rights issues (16.1 per cent) and public offers (12.2 per cent). For the matched IPO sample, public offers accounted for 60.9 per cent of all proceeds raised. Private placements are also a significant component of capital raisings for the IPO sample in subsequent years (31.6 per cent), with rights issues accounting for 5.5 per cent of all proceeds raised.

Overall, results suggest BDL firms tend to raise the bulk (42.5 per cent) of their equity capital in the year following their going-public transaction, predominately through private placements. In contrast, the matched IPO firms raised the majority of their proceeds (59.7 per cent) during their initial public offers. This evidence is consistent with the claim (e.g. Kuo and Humphrey 2002) that BDLs generally lack the publicity and marketing event associated with an IPO, making them less able to raise capital in the going public process.
### TABLE 2: Capital raisings by BDL and matched IPO firms

#### Panel A: Breakdown by issue type

<table>
<thead>
<tr>
<th>Issue Type</th>
<th>BDL (M)</th>
<th>Go public</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Years 1-3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public offer</td>
<td>692.0</td>
<td>167.0</td>
<td>1.1</td>
<td>15.5</td>
<td>183.6</td>
<td>875.5</td>
<td></td>
</tr>
<tr>
<td>N &gt; 0</td>
<td>100</td>
<td>17</td>
<td>2</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private placement</td>
<td>663.3</td>
<td>2533.8</td>
<td>951.4</td>
<td>849.7</td>
<td>4340.9</td>
<td>5004.2</td>
<td></td>
</tr>
<tr>
<td>N &gt; 0</td>
<td>77</td>
<td>125</td>
<td>118</td>
<td>107</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rights issue</td>
<td>111.8</td>
<td>321.2</td>
<td>108.7</td>
<td>613.8</td>
<td>1043.7</td>
<td>1155.5</td>
<td></td>
</tr>
<tr>
<td>N &gt; 0</td>
<td>13</td>
<td>25</td>
<td>29</td>
<td>31</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Share purchase plan</td>
<td>0.7</td>
<td>27.0</td>
<td>39.4</td>
<td>55.3</td>
<td>121.7</td>
<td>122.4</td>
<td></td>
</tr>
<tr>
<td>N &gt; 0</td>
<td>2</td>
<td>14</td>
<td>15</td>
<td>23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dividend reinvestment plan</td>
<td>0</td>
<td>3.0</td>
<td>15.9</td>
<td>17.2</td>
<td>36.1</td>
<td>36.1</td>
<td></td>
</tr>
<tr>
<td>N &gt; 0</td>
<td>0</td>
<td>4</td>
<td>9</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1467.7</td>
<td>3058.0</td>
<td>1116.6</td>
<td>1551.4</td>
<td>5726.0</td>
<td>7193.7</td>
<td></td>
</tr>
<tr>
<td>N &gt; 0</td>
<td>165</td>
<td>146</td>
<td>135</td>
<td>126</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Panel B: Summary statistics by year

<table>
<thead>
<tr>
<th>Year</th>
<th>BDL (M)</th>
<th>Go public</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Years 1-3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>5748.7</td>
<td>29.2</td>
<td>76.1</td>
<td>14.6</td>
<td>119.9</td>
<td>5868.6</td>
<td></td>
</tr>
<tr>
<td>N &gt; 0</td>
<td>250</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: Capital raisings are expressed in millions of dollars, converted to 2015 constant dollar terms using the Consumer Price Index (all capital cities) published by the Australian Bureau of Statistics. Numbers in parentheses represent the number of firms with capital raisings in a particular issue type or year.
Operating performance
We employ two measures of firm size (market value of equity and total assets) and a total of eight accounting-based metrics to gauge the operating performance of BDL firms for up to three financial years after listing. Various performance attributes, including growth potential (MTB), profitability (ROA, ROE and NPM), balance sheet liquidity (CASH), leverage (LEV), retained earnings (RE) and financial distress (Altman’s Z-score), are explored. Market-to-book ratio (MTB) is measured as market capitalisation divided by book value of equity. Return on assets (ROA) is income before interest and tax divided by total assets. Return on equity (ROE) is net income divided by book value of equity. Net profit margin (NPM) is net income divided by sales revenue. CASH is cash and cash equivalents divided by total assets. LEV is total debt divided by total assets. RE is retained earnings divided by total assets. Altman’s Z-score is a proxy for financial distress, as discussed in Altman (1968).

Table 3 presents results on the operating performance of the backdoor-listed firms, along with the corresponding measures for the matched IPO sample. In almost all of the measures examined, the large discrepancy observed between the mean and median values indicates the distribution of these metrics is highly skewed and non-normal. Because of this reason, our analysis and inference are based primarily on the median value, instead of the mean, as the measure of central tendency for the two samples.

**TABLE 3: Operating performance of BDL and matched IPO firms**

<table>
<thead>
<tr>
<th>Level Year-on-year change</th>
<th>BDL — IPO Mean Median (1) (2) (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Panel A: Post-listing year 1</strong></td>
<td></td>
</tr>
<tr>
<td>MVE ($m)</td>
<td>67.58 80.96 −0.55</td>
</tr>
<tr>
<td></td>
<td>17.19 21.81 −2.19**</td>
</tr>
<tr>
<td>Assets ($m)</td>
<td>79.26 70.42 1.20</td>
</tr>
<tr>
<td></td>
<td>19.76 20.79 −0.71</td>
</tr>
<tr>
<td>MTB</td>
<td>2.35 2.75 −0.55</td>
</tr>
<tr>
<td></td>
<td>1.12 1.44 −3.11***</td>
</tr>
<tr>
<td>ROA</td>
<td>−2.94 −0.61 −0.96</td>
</tr>
<tr>
<td></td>
<td>−0.17 −0.07 −4.74***</td>
</tr>
<tr>
<td>ROE</td>
<td>−1.27 −0.41 −1.38</td>
</tr>
<tr>
<td></td>
<td>−0.22 −0.08 −4.68***</td>
</tr>
<tr>
<td>NPM</td>
<td>−65.45 −279.28 1.26</td>
</tr>
<tr>
<td></td>
<td>−0.95 −0.10 −2.73***</td>
</tr>
<tr>
<td>CASH</td>
<td>0.21 0.29 −3.66***</td>
</tr>
<tr>
<td></td>
<td>0.12 0.19 −3.52***</td>
</tr>
<tr>
<td>LEV</td>
<td>0.40 0.39 0.05</td>
</tr>
<tr>
<td></td>
<td>0.22 0.25 −0.08</td>
</tr>
<tr>
<td>RE</td>
<td>−5.00 −1.26 −1.50</td>
</tr>
<tr>
<td></td>
<td>−0.73 −0.13 −7.54***</td>
</tr>
<tr>
<td>Altman’s Z</td>
<td>−4.82 9.58 −1.25</td>
</tr>
<tr>
<td></td>
<td>1.96 3.61 −3.31***</td>
</tr>
<tr>
<td><strong>Panel B: Post-listing year 2</strong></td>
<td></td>
</tr>
<tr>
<td>MVE ($m)</td>
<td>68.60 83.74 −0.99</td>
</tr>
<tr>
<td></td>
<td>14.09 20.62 −2.53**</td>
</tr>
<tr>
<td>Assets ($m)</td>
<td>79.57 81.28 −0.20</td>
</tr>
<tr>
<td></td>
<td>18.10 21.84 −2.23**</td>
</tr>
<tr>
<td>MTB</td>
<td>3.04 −1.06</td>
</tr>
<tr>
<td></td>
<td>1.84 3.04 −0.47</td>
</tr>
<tr>
<td>ROA</td>
<td>−30.64 4.06 −1.15</td>
</tr>
<tr>
<td></td>
<td>−0.18 −0.11 −2.16**</td>
</tr>
</tbody>
</table>

**Note:** The table includes the mean and median values for the BDL and IPO samples, as well as the t-stat and Wilcoxon Z-values for the BDL—IPO differences. The significance levels are indicated by **(p < 0.1), *** (p < 0.05), and ***(p < 0.01).
### Panel B: Post-listing year 2 (cont.)

<table>
<thead>
<tr>
<th>Metric</th>
<th>Level</th>
<th>Year-on-year change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BDL</td>
<td>Mean</td>
</tr>
<tr>
<td>ROE</td>
<td>-2.734</td>
<td>4.43</td>
</tr>
<tr>
<td></td>
<td>-0.27</td>
<td>-0.13</td>
</tr>
<tr>
<td>NPM</td>
<td>-45.22</td>
<td>-140.19</td>
</tr>
<tr>
<td></td>
<td>-0.63</td>
<td>-0.22</td>
</tr>
<tr>
<td>CASH</td>
<td>0.23</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td>0.12</td>
<td>0.18</td>
</tr>
<tr>
<td>LEV</td>
<td>3.08</td>
<td>0.76</td>
</tr>
<tr>
<td></td>
<td>0.25</td>
<td>0.27</td>
</tr>
<tr>
<td>RE</td>
<td>-91.38</td>
<td>-5.06</td>
</tr>
<tr>
<td></td>
<td>-1.24</td>
<td>-0.31</td>
</tr>
<tr>
<td>Altman’s Z</td>
<td>-214.29</td>
<td>17.67</td>
</tr>
<tr>
<td></td>
<td>1.16</td>
<td>3.25</td>
</tr>
</tbody>
</table>

### Panel C: Post-listing year 3

<table>
<thead>
<tr>
<th>Metric</th>
<th>Level</th>
<th>Year-on-year change</th>
</tr>
</thead>
<tbody>
<tr>
<td>MVE ($m)</td>
<td>69.82</td>
<td>102.11</td>
</tr>
<tr>
<td></td>
<td>13.03</td>
<td>19.70</td>
</tr>
<tr>
<td>Assets ($m)</td>
<td>93.21</td>
<td>101.64</td>
</tr>
<tr>
<td></td>
<td>17.84</td>
<td>20.76</td>
</tr>
<tr>
<td>MTB</td>
<td>120.62</td>
<td>3.69</td>
</tr>
<tr>
<td></td>
<td>1.19</td>
<td>1.34</td>
</tr>
<tr>
<td>ROA</td>
<td>-2.38</td>
<td>-0.61</td>
</tr>
<tr>
<td></td>
<td>-0.17</td>
<td>-0.14</td>
</tr>
<tr>
<td>ROE</td>
<td>-0.07</td>
<td>-2.05</td>
</tr>
<tr>
<td></td>
<td>-0.24</td>
<td>-0.17</td>
</tr>
<tr>
<td>NPM</td>
<td>-194.48</td>
<td>-77.12</td>
</tr>
<tr>
<td></td>
<td>-0.48</td>
<td>-0.32</td>
</tr>
<tr>
<td>CASH</td>
<td>0.24</td>
<td>0.24</td>
</tr>
<tr>
<td></td>
<td>0.15</td>
<td>0.13</td>
</tr>
<tr>
<td>LEV</td>
<td>1.94</td>
<td>0.46</td>
</tr>
<tr>
<td></td>
<td>0.33</td>
<td>0.34</td>
</tr>
<tr>
<td>RE</td>
<td>-263.84</td>
<td>-2.95</td>
</tr>
<tr>
<td></td>
<td>-1.52</td>
<td>-0.42</td>
</tr>
<tr>
<td>Altman’s Z</td>
<td>-365.52</td>
<td>5.85</td>
</tr>
<tr>
<td></td>
<td>0.71</td>
<td>2.47</td>
</tr>
</tbody>
</table>

Note: The dollar amount for market value of equity (MVE) and total assets (Assets) have been converted to 2015 constant dollar terms. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

#### Levels analysis

Table 3 shows firms going public through the backdoor are relatively small in size, with a mean (median) market capitalisation of $67.6m ($17.2m) and total assets of $79.3m ($19.8m) by the end of the first financial year after listing. Compared with the matched IPO sample, BDL firms have a significantly lower median MVE (at the 5 per cent level) in year 1, which persists into the second and third year. In terms of total assets, firms from the two samples are not statistically different in both the mean and median value of ASSETS in the first year. This suggests we have a reasonable matching of BDL and IPO firms in terms of total assets. In year 2 after listing, the BDL sample exhibits a significantly smaller median value of ASSETS than the IPO sample, but the difference disappears in the third year after listing.
Based on median values, all eight performance measures of the BDL firms (column 1) are consistently lower than those of the matched IPO firms (column 2). This indicates BDL firms generally have lower growth potential and are less profitable, less liquid, and more financially stressed than their IPO counterparts. The Wilcoxon signed-rank test of difference in median values (column 3) confirms that in the first year post-listing, all of the operating performance measures, except for LEV, are significantly different (two-tailed test) at the 1 per cent level. In year 2 after listing, the median value of all but the CASH and LEV measures are significantly different between the two groups. In year 3, BDL firms are significantly lower than the IPO control sample in terms of MTB, NPM, RE and Altman's Z-score only but not the other measures. Overall, BDL firms seem to have underperformed their IPO counterparts consistently on growth potential (MTB), profitability measures (ROA, ROE and NPM), retained earnings (RE) and financial distress measure (Altman’s Z-score). The only favourable sign is they tend to be comparable with their IPO counterparts in terms of leverage (all three years) and balance sheet liquidity (in years 2 and 3), consistent with relatively more capital raising activity conducted by BDL firms in subsequent years.

**Year-on-year changes**

We conduct additional tests to investigate the year-on-year changes in these accounting measures over time. Results from Table 3 (column 4) show in the second year post-listing for the BDL sample, the change in both ROA and ROE, though still negative, is no longer significant at conventional levels. Moreover, the change in NPM becomes positive and statistically significant (at the 1 per cent level). BDL firms are experiencing an increase in LEV and a deteriorating RE and Altman’s Z-score. In year 3, except for a significant increase in LEV and worsening RE and financial distress measure, no significant decline in the other operating measures can be detected.

Compared with their BDL counterparts, IPO firms tend to exhibit a different pattern of changes in operating performance. Column 5 of Table 3 reveals that in both the second and third year of operations, IPO firms suffer a significant drop in ROA and ROE, increase in leverage, and a worsening accumulated losses and Altman’s Z-score measure. There is also a significant drop in balance sheet liquidity, which is not seen in the BDL sample. This declining trend in ROA, ROE and CASH is in contrast to the trend observed for the BDL firms. In column 6, we report results for testing differences in the year-on-year change in accounting measures between the BDL and IPO control firms. The only statistically discernible difference is the improvement in balance sheet liquidity for the BDL sample relative to the IPO firms in both years 2 and 3. This is again consistent with the findings that BDL firms are more active in accessing the equity market for capital in the post-listing years.

In sum, results from Table 3 show BDL firms underperform in terms of operating measures in the aftermarket when compared to the IPO control firms. Nevertheless, evidence also suggests the operating performance of BDL firms tends to improve (or at least stop deteriorating) over longer horizons, as compared to their IPO counterparts. The year-on-year results are in contrast to those reported by Gleason et al. (2006), which indicate a continued significant decline in ROA, ROE and balance sheet liquidity of US reverse takeover firms over the two years after going public. One implication of our results is that the poorer operating performance of the BDL firms in the years post-listing is partly a reflection of the performance gap that exists at the time of going public. Judging from the year-on-year changes, the operating performance of IPO firms deteriorates more than that of the BDL firms in the aftermarket.
Survival status

We report the long-run survival status of the BDL and IPO sample firms in Table 4. Within the three-year period after listing, the same number (19 or 7.6 per cent) of BDL and matched IPO firms were de-listed from the official list of ASX. A breakdown of the reasons for de-listing indicates one firm from each of the two groups was taken private, three (two) of the BDLs (IPOs) de-listed were related to financial distress, with the remaining de-listing cases occurring following compulsory acquisition by or merger through a scheme of arrangement with other firms. This is in sharp contrast to Adjei et al. (2008), who report a de-listing rate of 31 per cent (4 per cent) by the end of the 12-month and 43 per cent (27 per cent) by the end of the 36-month period (for negative reasons) from their US reverse mergers (IPO) sample. The evidence seems to suggest the more stringent regulatory requirement for backdoor listing on the ASX has resulted in a lower failure rate in terms of de-listing from the exchange.

**TABLE 4: Survival status of BDL and matched IPO firms**

<table>
<thead>
<tr>
<th>Panel A: BDL firms</th>
<th>Frequency counts</th>
<th>Cumulative unique firms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year 1</td>
<td>Year 2</td>
</tr>
<tr>
<td>De-listed</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Acquired</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>RTO</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Administrator/receiver</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Going concern</td>
<td>61</td>
<td>74</td>
</tr>
<tr>
<td>Distressed</td>
<td>118</td>
<td>130</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel B: Matched IPO firms</th>
<th>Frequency counts</th>
<th>Cumulative unique firms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year 1</td>
<td>Year 2</td>
</tr>
<tr>
<td>De-listed</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Acquired</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>RTO</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Administrator/receiver</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Going concern</td>
<td>46</td>
<td>55</td>
</tr>
<tr>
<td>Distressed</td>
<td>72</td>
<td>83</td>
</tr>
</tbody>
</table>

Notes: De-listed means being removed from the official register of ASX. Acquired is taken over by another company. RTO is reverse takeover. Administrator/receiver is when firms are under voluntary administration or receivership. Going concern is a qualified or modified audit opinion as to the continuation of a firm as a going concern. Distressed is financial distress based on a firm’s Altman’s Z-score falling below 1.81.

BDL firms seem to have a lower tendency than their IPO counterparts to be targeted in mergers and acquisitions activity. A total of 15 BDLs, versus 23 matched IPOs, were acquired in takeovers in the first three years. We note all the BDLs that were taken over proceeded to compulsory acquisition and de-listing while only 16 out of the 23 IPOs acquired did so. The higher rate of IPOs being takeover targets may indicate they are higher quality firms or in possession of more attractive assets than firms that went public through the back door. This conjecture seems to be supported by further data analysis which reveals the subsample of IPOs being taken over has higher profitability (ROA, ROE and NPM) and growth potential (MTB) than the subsample of BDLs acquired, both in terms of mean and median measures, though no formal statistical significance has been assessed because of the small sample size. IPO firms are also more active on the reverse takeover front, with 12 of them being targeted as shells in backdoor listings as compared with only five from the BDL sample.

We also examine how well firms survive in terms of their financial health in the aftermarket. A clear sign of financial trouble is when an administrator or receiver is appointed to a firm or its subsidiaries. In this regard, a total of 14 (or 5.6 per cent) cases from the BDL sample, in contrast to 12 (or 4.8 per cent) cases from the IPO control sample, were under administration or receivership at some point in time during the three-year period. Firms that are not under administration may still be subject to financial distress to various extents. Within the three years after listing, there were 120 (or 47.8 per cent) and 90 (or 35.9 per cent) unique firms in the BDL and IPO sample, respectively, which received at least one going concern qualification from auditors. In terms of the total number of qualifications, the BDL sample has an aggregate of
218 instances, while the IPO sample has 153. As another indicator of financial trouble, we follow Altman (1968) and classify firms with a Z-score of below 1.81 as being under distress. Table 4 shows a total of 183 (or 72.9 per cent) BDL firms fell under this category, as compared with 129 (or 51.4 per cent) firms in the matched IPO sample. Overall, the evidence tends to suggest a larger proportion of BDL firms are under financial distress than their IPO counterparts.

**Stock market performance**

As our last performance measure in the aftermarket, we examine buy-and-hold abnormal returns (BHARs) of backdoor-listed firms. Following Ritter (1991), Spiess and Affleck-Graves (1995) and others in the literature, long-run holding-period returns are calculated for each firm for up to three years (36 months) after the completion of the BDL transaction. Three performance benchmarks are employed for computing the BHARs. These benchmarks represent the corresponding holding-period returns on (1) the matched IPO firms, (2) the SPPR value-weighted market index or VMI, and (3) the SPPR equal-weighted market index or EMI. For each BDL firm i, the buy-and-hold abnormal return (benchmark-adjusted) for each holding interval T in the post-listing period is calculated as the difference between its buy-and-hold return and the corresponding buy-and-hold return of the benchmark:

\[
BHAR_{i,T} = \frac{\prod_{t=1}^{T} \left( \frac{P_{i,t}}{P_{i,t-1}} \right) - \prod_{t=1}^{T} \left( \frac{B_t}{B_{t-1}} \right)}{T}
\]

where \(P_{i,t}\) is the closing stock price of firm \(i\) in month \(t\), \(B_t\) is the closing price of the benchmark in month \(t\), and \(T\) is the duration of the holding period ranging from 1 to 36 months after listing. Note that the matched IPO benchmark would be subject to the same missing observation problem as their BDL peers, but the two market-wide benchmarks are not affected. To compute an average buy-and-hold abnormal return across the sample of BDL firms, we employ both an equal-weighted (EW) scheme and a value-weighted (VW) scheme based on the market capitalisation of the BDL firms at the time of going public.

Figures 1 and 2 plot, respectively, the EW and VW long-run buy-and-hold abnormal returns for the BDL firms in the sample. One striking pattern revealed is that all three measures of BHARs are predominantly negative over the three-year period, except perhaps for the first six (EW) and 15 (VW) months against the matched IPO benchmark. Benchmarking against the matched IPO sample and the EMI produces the least and most negative returns, respectively, with the VMI-adjusted BHARs lying in between. Specifically, by the end of the 36-month period, the equal-weighted BHARs are −22.9 per cent, −67.0 per cent and −86.1 per cent and the value-weighted BHARs are −13.4 per cent, −49.0 per cent and −65.0 per cent against the matched IPO, VMI and EMI benchmarks, respectively. Recall that the IPO control sample is constructed by matching on year, industry and size. In addition, both BDL and IPO firms represent firms that are newly listed. Thus a smaller BHAR would be expected using matched IPO firms as a control. Holding-period returns for the EMI are tilted towards smaller firms because of the equal-weighted scheme used. Due to the survivorship problem inherent in constructing market indices, the return on the EMI would tend to be biased upward, making it a tougher benchmark to beat. VMI, on the other hand, would be dominated by larger firms and so the benchmark return would tend to be more moderate.

**FIGURE 1: Equal-weighted average buy-and-hold abnormal returns of backdoor-listed firms**
To ascertain if BDL firms underperform their IPO control firms in terms of buy-and-hold returns, we test if the BHARs (IPO adjusted) by the end of 12, 24 and 36 months are significantly different from zero. Table 5, which reports test results (two-tailed tests) on both the mean and median weighted BHARs, reveals all but the mean 12-month value-weighted BHAR are negative in sign. Tests of sample means indicate the equal-weighted BHAR is significantly different from zero for the 24-month (at the 1 per cent level) and 36-month (at the 10 per cent level) holding period while the value-weighted BHAR is only marginally significant (at the 10 per cent level) for the 24-month holding period only. On the other hand, median tests suggest BHARs are significantly different from zero for both equal- and value-weighted measures and for all three holding periods. These test results are, however, inconsistent with Gleason et al. (2006) who essentially find no significant difference in mean and median buy-and-hold returns between reverse takeover firms and IPO control firms in the US market. We interpret our results as evidence of long-run underperformance of Australian BDL firms relative to the matched IPO sample. Yet, there are also signs that the negative trend of the BHARs has started to reverse or, at least, level off towards the last six months of the three-year period.

TABLE 5: Tests of underperformance of long-run BHARs (matched IPO-adjusted) of backdoor-listed firms

<table>
<thead>
<tr>
<th>Holding period</th>
<th>N</th>
<th>Mean</th>
<th>Median</th>
<th>t-test</th>
<th>Wilcoxon Z</th>
<th>Equal-weighted BHARs</th>
<th>Value-weighted BHARs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>Median</td>
<td>t-test</td>
<td>Wilcoxon Z</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12-month</td>
<td>246</td>
<td>-0.040%</td>
<td>-0.096%</td>
<td>-1.31</td>
<td>-3.64***</td>
<td>0.009%</td>
<td>-0.034%</td>
</tr>
<tr>
<td>24-month</td>
<td>222</td>
<td>-0.109%</td>
<td>-0.032%</td>
<td>-2.62***</td>
<td>-2.54**</td>
<td>-0.086%</td>
<td>-0.013%</td>
</tr>
<tr>
<td>36-month</td>
<td>195</td>
<td>-0.117%</td>
<td>-0.050%</td>
<td>-1.77*</td>
<td>-3.18***</td>
<td>-0.069%</td>
<td>-0.019%</td>
</tr>
</tbody>
</table>

Note: The BHARs reported are the sample mean and median based on the distribution of equal- and value-weighted returns of individual firms. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Conclusion

Despite a very similar regulatory process for both backdoor and front-door listings in Australia, we document significant long-run underperformance for a sample of non-financial BDL relative to a controlled sample of IPO firms. Specifically, backdoor-listed firms tend to raise less equity capital and be less profitable and more financially distressed than their IPO peers. They also exhibit negative buy-and-hold returns when benchmarked against the matched IPO firms and broad-based market indices. This finding is not consistent with the assertion in the literature that lax regulatory oversight is the major culprit for the underperformance of backdoor-listed firms in the aftermarket. Nevertheless, our results suggest the negative image associated with backdoor listings may seem justified.
Despite a very similar regulatory process for both backdoor and front-door listings in Australia, we document significant long-run underperformance for a sample of non-financial BDL relative to a controlled sample of IPO firms. Specifically, backdoor-listed firms tend to raise less equity capital and be less profitable and more financially distressed than their IPO peers. They also exhibit negative buy-and-hold returns when benchmarked against the matched IPO firms and broad-based market indices. This finding is not consistent with the assertion in the literature that lax regulatory oversight is the major culprit for the underperformance of backdoor-listed firms in the aftermarket. Nevertheless, our results suggest the negative image associated with backdoor listings may seem justified.

Acknowledgement
The authors would like to thank Philip Brown, Andrew Ferguson and an anonymous referee for helpful comments.

Notes
3. There are a few instances in which we cannot match a BDL firm with an IPO firm from the same industry sector. In such cases, we broaden the definition of industry sectors and collapse all the non-financial sectors into extractives and industrials only.
4. All amounts are expressed in millions of dollars, deflated to 2015 constant dollar terms using the Consumer Price Index (all capital cities) published by the Australian Bureau of Statistics.
5. There was one matched IPO firm which did not involve any public offer of shares at the time of going public.
6. For the purposes of auditor’s going concern opinion, a qualified opinion and ‘emphasis of matter’, which explicitly makes reference to a going concern uncertainty, are treated as the same.
7. The number of firms included for calculating holding-period returns may vary over time. Firms may be excluded for a certain month because of suspension of trading by ASX or if they do not have a valid price due to a lack of trading. Where a BDL firm de-lists before its IPO control firm does prior to the end of the event window, we drop both firms from the calculation of average portfolio BHAR from the de-listing month onwards, and similarly if an IPO control firm de-lists before its corresponding BDL firm does. We note any portfolio of BDLs that we form does not represent an implementable investment strategy as the timing of the BDL transactions is widely dispersed in calendar time throughout the sample period.
8. One caveat of the results in Figure 1 and 2 is that the BHARs only provide a direct measure of ‘investor experience’ of investing in backdoor-listed firms. They are nonetheless subject to the bad-model problem as discussed by Fama (1998). To the extent that the IPO firm matching approach does not sufficiently control for all systematic risk factors in stock returns, the finding of long-run underperformance of BDL firms could be spurious.
References


LONG-RUN SURVIVAL AND PERFORMANCE of Australian dotcom IPOs

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This paper explores the long-run survival and share market performance of companies which made an Initial Public Offering (IPO) around the time of the share market correction in 2000, widely known as the dotcom or internet crash. We find that dotcom stocks failed no more frequently than non-dotcom stocks and our results were not sensitive to listing pre- or post-correction. Further, we find that non-dotcom stocks did not significantly outperform those of dotcom stocks. These findings challenge the conventional wisdom on the dotcom bubble.

So-called 'unicorns', privately held high-tech start-up companies often with valuations over $1 billion, are currently attracting investors' attention. Whether these valuations are justified, or signal another market correction, is yet to be determined. In the meantime it seems an opportune time to revisit the aftermath of the 2000 dotcom crash in search of useful lessons for today's investors.

The late 1990s were marked by the founding of numerous internet-based companies commonly referred to as dotcoms. Given the poor performance of investments in dotcom companies noted in other countries such as the US, this paper considers the long-run survival and investment return of Australian dotcom IPOs. A study of Australian dotcom issuers is warranted due to the significant differences between the US and Australian markets in terms of listing rules, issue procedures and issue size. While several studies have looked at short-run IPO performance, we consider whether investors would have been better or worse off over time if investing in Australian dotcom IPOs as opposed to non-dotcom IPOs.

The commonly held perception is that most of the dotcoms were a poor investment with few companies providing significant long-term returns. That many dotcoms failed is beyond dispute. In 2002, Fortune noted that 135 US dotcoms went bankrupt or shut down in 2000 (see Mahajan et al. 2002). Several possible reasons have been advanced for these failures including investor overenthusiasm, a lack of viable business models, questionable profit forecasts, and a lack of both adequate assessment valuation models and management expertise.

The last technology boom
In the late 1990s and early 2000 vast sums of money were invested in dotcoms. Low interest rates, widely available venture capital and increasing stock prices stimulated investment frequently via an IPO. Despite often not having generated any revenue prior to IPO, issues began trading at prices significantly above their subscription prices. By the beginning of 2000, many investors and commentators believed that stock prices, particularly those of dotcom stocks, were inflated and that a market correction was imminent (Steen and Turpie 2000). In mid-April of that year the market correction (also popularly known as the ‘tech wreck’) occurred. While the price of virtually all dotcom IPOs subsequently crashed, several of the dotcom IPOs from that time have gone on to become corporate giants.
Hot IPO markets
Ibbotson and Jaffe (1975) noted evidence of ‘fads’ in the US market for IPOs. They called these events ‘hot issue markets’ and noted that such markets are characterised by numerous offerings, the concentration of new issues in particular industries, a preponderance of smaller issues, frequent oversubscription and abnormally high initial returns. Ritter (1984) investigated the initial returns of IPOs in the US ‘hot issue’ market of January 1980 to March 1981 and reported significantly higher initial returns for IPO stocks that went public in ‘hot’ rather than ‘cold’ markets. The high initial returns were almost entirely confined to IPOs of resource stocks. Other researchers have linked investor sentiment or overconfidence in a particular industry’s future profitability to IPO underpricing in ‘hot’ markets including Helwege and Liang (2004), Derrien (2005) and Ivanov and Lewis (2008).

International studies consistently report high positive initial returns for dotcom IPOs made in the period prior to the stock market correction and subsequent negative returns in the post-correction period. In a study of US online retailers that went public, Mahajan et al. (2002) found that by the end of 2000 only one IPO still had a stock price higher than the offer price. Likewise, Coakley et al. (2008) found significant underperformance after listing in high-technology IPOs which went public in the ‘hot’ UK market at the time.

Evidence of Australian dotcom IPO performance is rather limited. Steen and Turpie (2000) examined the initial post-listing stock price returns for dotcom IPOs relative to all IPOs in Australia during 1999. By the close of the first day of trading, subscribers to the IPOs of dotcom companies would have earned an average market-adjusted return of 60.84 per cent, compared with 35.52 per cent for an investment in non-dotcom IPOs.

Hot markets and long run returns
While initial subscribers may gain high short-term returns, research suggests that over the long-run IPOs on average earn lower returns than comparable existing or seasoned firms. Ritter (1991) found that from their issue date to the third anniversary of their listing, US IPOs on average substantially underperformed a matched sample of seasoned firms. This finding included significant variation in performance depending on the year of issue and the issuer’s industry; companies that went public in high volume or ‘hot’ years performed the worst. However, using a larger sample and longer return period Helwege and Liang (2004) found no significant difference in post-issue operating performance between IPOs listed in ‘hot’, ‘cold’ or ‘neutral’ markets.

A high proportion of poor quality IPOs made in ‘hot’ markets should translate over time into higher failure rates compared to IPOs made in ‘cold’ markets. Further the returns of IPOs made in the ‘hot’ industry should adjust other underperforming stocks downward over the long-term. Cook et al. (2003), examining US IPOs listing between 1980 and 2002, found IPOs during ‘hot’ markets were less likely to survive in comparison to firms making IPOs in ‘cold’ markets. However, more recent research by Nguyen et al. (2015) finds that US dotcoms did not fail more frequently than other firms.

Australian studies have also found poor long-run IPO returns. Both Mustow (1994) and Allen and Patrick (1996) document underperformance in post-listing returns of IPOs over a three-year period after listing of −25.38 per cent and −116.11 per cent, respectively. These two studies differed in the sample period analysed, 1984 to 1988 versus 1974 to 1984, respectively. Greater underperformance following the earlier post-listing period is consistent with the after-effects of a ‘hot issue’ market. While there have been a number of studies into the stock market performance of dotcom IPOs, few consider the long-term survival and stock market performance of Australian dotcom IPOs.

Data and methodology
The sample consisted of all new listings on the ASX between 1 January 1999 and 31 August 2001, as listed on the Connect4 database. Each IPO was examined to determine whether it was a true IPO in the sense that it was the first equity issue to the market at large. Investment and property trusts, relistings, spin-offs, compliance listings, companies currently listed on a foreign exchange and issues of convertible securities were excluded from our sample. The period was chosen to obtain a split of approximately 16 months either side of the 14 April 2000 stock market correction. Share prices were obtained from the SIRCA database. Company-specific data were obtained from company prospectuses and the Connect4 database.
Of the 299 IPOs listed during the period, 98 were classified as dotcom companies, determined from the description of the company’s business activities in the prospectus and confirmed in the company details section of the Aspect DatAnalysis database. From the description we formed a judgement as to whether the company’s main activities were focused on the development of internet-based technologies and applications and, hence, were classified as dotcoms. We also cross-checked our decisions against the GICS classification (451010 Internet Software and Services) index for each company. Some notable companies that were thus identified as dotcoms included: domain name registration company Melbourne IT; online travel booking company travel.com.au; online accounting software company Reckon; digital advertising and online marketing company Emitch; and IT infrastructure company eCORP.

Performance measures
Following accepted methodology, the abnormal return for each IPO, $i$, over the period $t-1$ to $t$ is defined as $\AR_{it}$, where:

$$\AR_{it} = \frac{P_{it} - I_{t}}{P_{t-1} - I_{t-1}}$$

and

- $P_{it} =$ the closing price of share $i$, $t$ periods after the initial offering, where $t =$ day 1 to day 21 and months 2 to 120, and $t_{0}$ is the offer date,
- $I_{t} =$ the value of the All Ordinaries Accumulation index $t$ days or months after the offering.

The Average daily market Adjusted Return, $\AAR_{t}$ (calculated to accumulate the abnormal returns for a portfolio of $N$ companies at time $t$) is given as:

$$\AAR_{t} = \frac{\sum_{i=1}^{N} \AR_{it}}{N}$$

The sample mean $\AAR_{t}$ is a performance index reflecting the return (in excess of the market return) on an investment, divided equally among the $N$ issues in the sample.

The Cumulative market Adjusted Return ($\CAR_{t}$) for the sample for months 2 to 120 is:

$$\CAR_{t} = \sum_{t=1}^{T} \AAR_{t}$$

The most commonly used criteria for identifying ‘hot’ issues markets are high IPO volume or high level of initial returns. These two criteria are related as shown by Lowry and Schwert (2002). They investigated the relationship between volume and underpricing or high initial returns over ‘hot’ and ‘cold’ markets and found that periods of high underpricing were typically followed by high IPO volume. In addition to these two indicators of IPO market activity, Coakley et al. (2008) use a non-negative autocorrelation in the number of yearly IPOs to capture the momentum generated by investor sentiment in ‘hot’ markets. This additional criteria requires that the number of IPOs in a ‘hot’ market year be no lower than that in the previous calendar year. As this study considers a 16-month period either side of a clearly identified market correction, we define the hot market as the period of high levels of initial returns prior to the stock market correction.
Results
US stock markets experienced a major correction on Friday 14 April 2000. While the markets had been experiencing a degree of higher than usual volatility in the preceding weeks, this date marked the most significant correction for several years. The Australian market followed, falling 5.68 per cent when the market closed on the following Monday. This correction has become known as the ‘tech wreck’. Table 1 shows descriptive statistics of dotcom and non-dotcom IPOs pre and post 14 April 2000. The table indicates that, on average, pre-crash and post-crash dotcom IPOs raised less funds than non-dotcom IPOs, however, the difference was not statistically significant. In terms of total assets, dotcoms were on average larger than non-dotcoms pre-crash, but the difference was statistically insignificant. Post-crash non-dotcom IPOs were significantly larger but this may be somewhat distorted by a particularly large IPO. In the wake of the ‘tech wreck’ the number of IPOs listing did not fall although fewer dotcoms listed post-correction (43 as opposed to 55 pre-correction).

**TABLE 1: Descriptive statistics IPOs, pre and post 14 April 2000**

<table>
<thead>
<tr>
<th>IPO type</th>
<th>Pre/Post</th>
<th>Number of IPOs</th>
<th>Amount raised (mean $m)</th>
<th>Total net assets (mean $m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-dotcom</td>
<td>Pre</td>
<td>81</td>
<td>33.64</td>
<td>7.32</td>
</tr>
<tr>
<td>Dotcom</td>
<td>Pre</td>
<td>55</td>
<td>24.08</td>
<td>8.67</td>
</tr>
<tr>
<td>Total</td>
<td>Pre</td>
<td>136</td>
<td>29.77</td>
<td>7.86</td>
</tr>
<tr>
<td>Non-dotcom</td>
<td>Post</td>
<td>120</td>
<td>26.52</td>
<td>41.10*</td>
</tr>
<tr>
<td>Dotcom</td>
<td>Post</td>
<td>43</td>
<td>23.68</td>
<td>23.04</td>
</tr>
<tr>
<td>Total</td>
<td>Post</td>
<td>163</td>
<td>25.76</td>
<td>35.92</td>
</tr>
<tr>
<td>Total sample</td>
<td></td>
<td>299</td>
<td>27.62</td>
<td>22.37</td>
</tr>
</tbody>
</table>

*Includes Australian Wheat Board with assets of around $2.7 billion.

Table 2 shows initial returns for all IPOs were dramatically lower post-correction (10.46 per cent) than pre-correction (58.69 per cent) and that the difference was statistically significant at the one per cent level. This supports the notion of a ‘hot’ issue IPO market. Mean returns pre-correction for dotcom stocks (80.21 per cent) were far greater than non-dotcom stocks (44.08 per cent). These results were reversed post-correction with dotcom stocks returns (5.60 per cent) substantially lower than non-dotcom stocks (12.21 per cent).

**TABLE 2: Initial market-adjusted returns, January 1999 to August 2001**

<table>
<thead>
<tr>
<th></th>
<th>Pre market correction</th>
<th>Post market correction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Whole sample</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (std. dev.)</td>
<td>58.69 (108.52)</td>
<td>10.46 (44.93)</td>
</tr>
<tr>
<td>Minimum</td>
<td>-49.00</td>
<td>-74.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>730.00</td>
<td>289.00</td>
</tr>
<tr>
<td><strong>Non-dotcom IPOs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (std. dev.)</td>
<td>44.08 (100.09)</td>
<td>12.21 (41.90)</td>
</tr>
<tr>
<td>Minimum</td>
<td>-49.00</td>
<td>-53.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>730.00</td>
<td>289.00</td>
</tr>
<tr>
<td><strong>Dotcom IPOs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (std. dev.)</td>
<td>80.21 (117.50)</td>
<td>5.60 (52.70)</td>
</tr>
<tr>
<td>Minimum</td>
<td>-29.00</td>
<td>-74.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>610.00</td>
<td>199.00</td>
</tr>
</tbody>
</table>

We examine the performance of dotcom IPOs over a 10-year time horizon. While this is a long period for most capital market studies it is relevant in the Australian context given the long-term nature of equity market investment particularly in the form superannuation. Figure 1 illustrates the long-run CARs of dotcom, non-dotcom and all IPOs listed for a period of two to 120 months post-listing. CARs of dotcom IPOs fall dramatically after month four and by the end of the year had lower returns than non-dotcom IPOs. This indicates that dotcom stocks were initially overpriced compared with non-dotcom stocks, and when the market re-evaluated their future, prices fell accordingly. Statistically, the difference between the CARs of dotcom and non-dotcom IPOs was significant for the first five months of trading. Unlike those of the dotcom stocks, CARs of non-dotcom IPOs were in excess of 20 per cent for the full 12 months.
At month 120, CARs of non-dotcom IPOs were approximately 60 per cent while those of dotcoms were just over 50 per cent. The difference between CARs of the two groups was statistically insignificant and hence dotcom stocks did not underperform non-dotcom stocks.

Table 3 indicates the listing status of the IPOs as at the end of December 2010. It shows that a substantial percentage of firms had delisted in the 10 years following the crash. To investigate the survival of dotcom versus non-dotcom IPOs we employ a Hazard model. Hazard models estimate the effect of variables on an event, in this case delisting, at a given time. Time, from IPO to delisting was used as the variable of interest. Independent variables used are: logSIZE, the log of a company’s nominal size at listing, in millions; PRECRASH, a dummy variable coded 1 if the company listed before the crash or zero if listed afterward; MISPRICE, the listing day return; and DOTCOM, a dummy variable coded one for tech companies and zero for all others. Data is right censored as at 31 December 2010.

Table 4 shows that size is statistically significant in all models. Curiously, larger firms were more likely to delist in any given month, when we might normally expect smaller companies to be more at risk of failure or takeover. The non-dotcom model also indicates that the more underpriced companies were at listing, the more likely they were to experience delisting. In addition a cox regression for the estimated survival function revealed that dotcom IPO company survival rates were no different to non-dotcom IPO companies’ rates.

**TABLE 3: Status of IPOs listed January 1999 to August 2001, as at 31 December 2010**

<table>
<thead>
<tr>
<th>Period</th>
<th>IPO Type</th>
<th>Listed</th>
<th>Delisted</th>
<th>% Delisted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-crash</td>
<td>Non-dotcom</td>
<td>52</td>
<td>29</td>
<td>55.8</td>
</tr>
<tr>
<td></td>
<td>Dotcom</td>
<td>38</td>
<td>17</td>
<td>44.7</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>90</td>
<td>46</td>
<td>51.1</td>
</tr>
<tr>
<td>Post-crash</td>
<td>Non-dotcom</td>
<td>84</td>
<td>36</td>
<td>42.9</td>
</tr>
<tr>
<td></td>
<td>Dotcom</td>
<td>29</td>
<td>14</td>
<td>48.3</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>113</td>
<td>50</td>
<td>44.2</td>
</tr>
</tbody>
</table>

**TABLE 4: Cox proportional hazard models of time to delisting**

<table>
<thead>
<tr>
<th></th>
<th>Non-dotcom</th>
<th>Dotcom</th>
<th>Full sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coefficient</td>
<td>p-value</td>
<td>Coefficient</td>
<td>p-value</td>
</tr>
<tr>
<td>logSIZE</td>
<td>0.1559</td>
<td>0.038**</td>
<td>1.0763</td>
</tr>
<tr>
<td>PRECRASH</td>
<td>0.1106</td>
<td>0.671</td>
<td>0.2119</td>
</tr>
<tr>
<td>MISPRICE</td>
<td>0.2368</td>
<td>0.028*</td>
<td>-0.3011</td>
</tr>
<tr>
<td>DOTCOM</td>
<td>-0.0105</td>
<td>0.964</td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>0.024</td>
<td>0.085</td>
<td></td>
</tr>
<tr>
<td>Wald test</td>
<td>10.79</td>
<td>0.013</td>
<td>8.77</td>
</tr>
<tr>
<td>Sample size</td>
<td>201</td>
<td>98</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 1% level; **Significant at 5% level
Concluding comments

Over the long run, investors in non-dotcom stocks earned a return in excess of 20 per cent for the entire period. On average, returns on dotcom stocks initially declined but investors would have still seen a gain of around 20 per cent on their initial investment during most of the first 12 months. Those that stayed clear of investing in dotcom IPOs would have fared much better after the initial year of listing. This, of course, is predicated on the presumption that they were lucky enough to get an allocation of the float in the first place.

It may be that dotcoms took considerable time to establish their businesses — much longer than was ever envisaged, particularly at the time of the ‘bubble’. Those that survived became profitable and desired investments over the long run. Consistent with the most recent international evidence, we find no statistically significant difference between the survival of dotcom and non-dotcom companies which made an IPO either before or after the stock market correction of 2000.

Notes

1. Our process was required as some companies that were not classified under the 451010 GICS code were clearly ‘dotcoms’, as in the case of purely online retailers.

2. In this paper delisting indicates company failure. While not all companies that delist ‘fail’ in the sense of financial collapse, the vast majority did. Approximately 40 per cent of delisted companies entered voluntary administration, went into receivership or were liquidated. Approximately 60 per cent that delisted were taken over. In an overwhelming number of cases shareholders in the IPO made either a negligible return or a loss on their initial investment. In a handful of cases shareholders of acquired companies earned large cumulative positive returns. There was no significant difference between the CARs of acquired dotcom and non-dotcom stocks that listed either before or after the correction.

References


PROBLEMS WITH USING EBITDA-BASED VALUATIONS
in capital-intensive industries

WAYNE LONERGAN SF Fin and HUNG CHU SF Fin, Directors, Lonergan Edwards & Associates Limited

In view of the significant commercial, tax and regulatory implications of the valuation outcome, this paper alerts valuers and market participants to the inherent dangers in the uncritical use of the EBITDA multiple-based method in valuing capital-intensive businesses. We show that equity valuations of established capital-intensive firms by EBITDA multiples are more susceptible to distortions than those based on NPAT multiples. These distortions arise from the inherent tendency of the former to overlook idiosyncratic, value relevant, differences below the EBITDA line between the subject company and the ‘comparables’ from which multiples are derived.

In practice, the theoretically correct and widely used method of equity valuation is the discounted cash flow (DCF) method whereby future cash flows that the asset is expected to generate are discounted to a present value using an appropriate risk-adjusted discount rate. However, when valuing established capital-intensive industrial companies which exhibit an established and relatively predictable earnings stream, it is common practice to use the capitalisation of future maintainable earnings method. This surrogate method of valuation for the DCF method is based on earnings multiples from ‘comparable’ companies. Alternative measures of earnings include net profit after tax (NPAT), earnings before interest and tax (EBIT) and earnings before interest, tax and depreciation (EBITDA).1

The key valuation trap in applying the earnings multiple method lies in treating common earnings measures of the ‘comparable’ companies and that of the subject company as homogeneous when they are not, thus ignoring value relevant idiosyncratic differences.

In this paper, we show that EBITDA capitalisation, (based on a measure of earnings higher up in the profit and loss account), is more likely to result in equity valuation distortions than NPAT capitalisation. This is principally because idiosyncratic value relevant differences between the subject company and the so-called ‘comparable’ are more likely to be overlooked by the EBITDA multiple-based method than the NPAT multiple-based method which is closer to a pure DCF approach to equity valuations. This undesirable tendency is further entrenched by the difficulty in accessing information on some of these value relevant differences.

Our paper contributes to the extant valuation literature in the following ways. First, it identifies and analyses the inherent conceptual shortcomings of the EBITDA multiple-based method compared to the NPAT multiple method in equity valuations. Second, it highlights the practical circumstances in which equity valuations in capital-intensive industries are likely to be distorted by the use of the EBITDA multiple-based method compared to a DCF or NPAT multiple approach. These are shown in Table 1 and explained in detail in the section on Traps in EBITDA-based valuations.
TABLE 1: Why DCF valuations are more reliable

<table>
<thead>
<tr>
<th>Issue taken account of</th>
<th>DCF Valuation</th>
<th>EBITDA valuation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asset age differences</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Method of fixed asset financing differences</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Owned asset/equity in leased asset differences</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Differences in depreciation of owned fixed assets (critical) and their replacement cost</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Method of working capital funding differences</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Deferred tax assets/liabilities differences</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Differentiating capital reimbursements from profits</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Growth differences</td>
<td>✗</td>
<td>✓</td>
</tr>
</tbody>
</table>

**Capitalisation of NPAT versus capitalisation of EBITDA**

The capitalisation of future maintainable NPAT method, commonly known as the capitalisation of future maintainable earnings method (CFME), is based on the assumption that future maintainable NPAT is a practical surrogate for cash flows to equity holders. It is a widely used valuation method for established industrial companies.

For these types of businesses, where annual changes in working capital requirements are relatively minor and annual depreciation charges closely reflect replacement capex, NPAT closely reflects free cash flows to equity (i.e. the cash flows after allowing for the necessary reinvestments in the business to maintain its profit generating capacity as a going concern). The link between DCF and multiples-valuation techniques can be recognised by noting that many professional investors, institutions and acquirers use DCF valuations to perform their equity valuation assessments and thus influence market prices. In these cases, the Price Earnings Ratio (PER) of the ‘comparables’ reflects market values of equity determined by the theoretically correct DCF method and the NPAT of comparables. In contrast with EBITDA multiples discussed below, both the ‘P’ component and the ‘E’ component of the PER reflect an allowance for the reinvestments in maintaining the going concern profit generating capacity of the business.

The use of PER requires the subtraction of value relevant items below the EBITDA line (i.e. depreciation charges, interest expenses and tax). It is this subtraction that brings to the fore the important value relevant differences between entities and triggers the need to allow for these differences in making informed judgements as to the appropriate PER to apply. Alternatively, it is necessary to revert back to the DCF method to explicitly allow for valuation issues that are unable to be transparently and sufficiently dealt with through the assessed PER (e.g. fixed asset age difference and resultant timing differences of replacement capex).

In contrast, the use of EBITDA multiples is devoid of this subtraction and the critical review of the subtracted items associated with it. It therefore glosses over what underpins the EBITDA of an individual entity and the quality of its EBITDA relative to the quality of the EBITDA of a ‘comparable’ entity. For example, an entity with older assets may have the same EBITDA as the EBITDA of an entity with newer assets, but the quality of the EBITDA of the former is lower than the quality of the EBITDA of the latter due to the earlier timing of the asset replacement and the value decrement associated with it.

As EBITDA-based equity valuations only subtract interest-bearing debt from the capitalised EBITDA value to derive the value of the subject equity, this conceals the need to collect and analyse information about, and to allow for, the items below the EBITDA line. The lack of such information and the resulting unidentified and unsupported comparability of the so-called ‘comparables’ highlights the extreme caution that needs to be exercised in interpreting and using EBITDA multiples.
As EBITDA-based equity valuations only subtract interest-bearing debt from the capitalised EBITDA value to derive the value of the subject equity, this conceals the need to collect and analyse information about, and to allow for, the items below the EBITDA line. The lack of such information and the resulting unidentified and unsupported comparability of the so-called ‘comparables’ highlights the extreme caution that needs to be exercised in interpreting and using EBITDA multiples.

Due to the inherent reliance on or ‘anchoring’ at the EBITDA line, which is higher up the profit and loss account, the use of EBITDA multiples has a natural but dangerous tendency to treat the EBITDA of different entities as homogeneous. It also ignores the inter-entity differences in depreciation charges which, putting aside for the moment idiosyncratic accounting convention, reflect, in economic substance, the periodic costs of maintaining the cash flow generating capacity of the business as a going concern. In addition, in contrast with the ‘E’ component of the PER ratio and the EBIT multiple, the ‘E’ component of the EBITDA multiple does not reflect an allowance for such periodic costs, and is therefore inconsistent with its ‘P’ component.

In this regard, we note that our view on the traps in the use of EBITDA multiples resonates with the following statement by Warren Buffet:

> Every dime of depreciation expense we report (at Berkshire Hathaway) is a real cost. And that’s true at almost all other companies as well. When Wall Streeters tout EBITDA as a valuation guide, button your wallet.

**Traps in EBITDA-based valuations**

The use of EBITDA multiples for equity valuation conventionally involves capitalising future maintainable EBITDA at an EBITDA multiple to obtain Enterprise Value from which interest-bearing debt and finance lease obligations are subtracted to arrive at equity value.

Traps in EBITDA-based valuations stem directly from the tendency to treat the EBITDA of different entities as homogenous and the inherent failure of EBITDA to allow for the periodic costs of maintaining the cash flow generating capacity of the subject business as a going concern. These traps are particularly present in cases where the subject entity and the ‘comparables’ have differences in:

- fixed asset age
- fixed asset financing method
- proportion of owned fixed assets
- proportion of equity in leased fixed assets
- deferred tax assets and liabilities
- proportion of equity funded working capital
- growth rates.

They are exacerbated by the fact that reliable information about some of these value relevant issues in the so-called ‘comparable companies’ may not be known.

**Differences in fixed asset age**

Under the EBITDA multiple-based method, depreciation charges on finance leases and owned assets are recognised after the EBITDA line. Thus, to the extent that the depreciation charges of the subject entity and the ‘comparables’ convey relevant information about the fixed asset age of the respective entities, the EBITDA being capitalised inherently overlooks age differences, which is one of the critical value drivers of capital-intensive businesses. This valuation trap is best demonstrated by an exaggerated example.
Assume Company A has an average fixed asset age of one year, and an otherwise identical Company B has an average fixed asset age of nine years. Both own all their fixed assets which have a maximum economic life of 10 years. The fixed assets have the same acquisition costs which are depreciated on a straight-line basis. Accordingly, the EBITDA of the two companies are apparently similar and a mechanistic application of the multiples approach would produce a similar Enterprise Value for these two companies.

It is a matter of common sense that a business with newer fixed assets will be more valuable than one with older fixed assets (other things being equal). Similarly, it is clearly wrong to apply an EBITDA multiple from one company with newer fixed assets to a company with older fixed assets, or vice versa. This is because by doing so, the value of the company with the older fixed assets will be overstated (or the company with the newer fixed assets understated).

**Differences in fixed asset financing method**

To demonstrate further why the EBITDA multiple-based method can produce unreliable valuation outcomes, consider three identical transport companies whose only difference is that Company A owns its vehicle fleet, Company B finance leases its vehicle fleet, and Company C finances its vehicle fleet with operating leases. Details are shown in Table 2.

<table>
<thead>
<tr>
<th>TABLE 2: Examples of how capitalising EBITDA distorts equity values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Company A</strong></td>
</tr>
<tr>
<td>Revenue</td>
</tr>
<tr>
<td>Less expenses:</td>
</tr>
<tr>
<td>Fuel and wages</td>
</tr>
<tr>
<td>Service and maintenance costs</td>
</tr>
<tr>
<td>Operating lease costs&lt;sup&gt;(1)&lt;/sup&gt;</td>
</tr>
<tr>
<td>EBITDA</td>
</tr>
<tr>
<td>Depreciation</td>
</tr>
<tr>
<td>EBIT</td>
</tr>
<tr>
<td>Less interest</td>
</tr>
<tr>
<td>PBT&lt;sup&gt;(3)&lt;/sup&gt;</td>
</tr>
<tr>
<td>Tax</td>
</tr>
<tr>
<td>NPAT</td>
</tr>
</tbody>
</table>

Note:
1. These costs are not disclosed in many financial reports as they are in this simplified example.
2. The finance lease costs for Company B are made up of depreciation ($30) and interest ($10). Given that service and maintenance costs are generally covered under operating leases, but not under finance leases, the operating lease costs for Company C is the finance lease costs for B plus service and maintenance costs.
3. Profit before tax.

The mechanistic application of the EBITDA multiple-based method tends to apply the same EBITDA multiple to the EBITDA of these companies and then, where applicable, deduct interest-bearing debt and finance lease liabilities from the capitalised EBITDA in arriving at the assessed value of equity. Table 3 shows the consequences.

<table>
<thead>
<tr>
<th>TABLE 3: Calculation of equity value based on EBITDA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Company A</strong></td>
</tr>
<tr>
<td>Enterprise value — EBITDA times (say) 5</td>
</tr>
<tr>
<td>Less finance lease debt</td>
</tr>
<tr>
<td>Equity value</td>
</tr>
</tbody>
</table>

<sup>(1)</sup> $10 interest at 6.7% interest implies a loan value of $150.
The following observations can be made in relation to the preceding tables:

- capitalising the EBITDA of Company A would overstate the cash flows available to equity owners and hence equity value because it fails to recognise that the depreciation cost of owned assets normally has to be reinvested in acquiring a replacement vehicle fleet and is not available for distribution to equity owners. It is clearly incorrect to capitalise the value of EBITDA as if all this cash flow went to equity (even though the company has no debt).

- the Enterprise Value of Company B and Company C (regardless of whether vehicles are finance leased or operating leased) should be the same. Thus, the equity values (obtained by deducting finance or operating lease costs) should also be the same. However, applying the same EBITDA multiple of Company B to the EBITDA of Company C (which is after operating lease payments) is inherently flawed because the EBITDA of Company C is much lower. Yet the reality is that the only substantive difference between the two companies is the form of lease finance adopted.

Differences in the proportion of owned fixed assets

For regulated infrastructure type assets the allowable regulatory tariff includes a return of capital on assets employed to be passed on to users. In some other industries, e.g. the bus industry, the government effectively funds the capital costs of fixed assets by reimbursing fixed asset costs by an annual payment based on back-to-back (theoretical) finance lease costs. The end result is that these allowable tariffs or reimbursements cover finance and interest costs as if all fixed assets were leased. However, some industry participants own a significant proportion of fixed assets and this is a source of distortions when the EBITDA multiple-based method is applied.

For example, distortions arise when the EBITDA multiple of a Company A whose fixed assets are entirely funded by finance leases and debt is inadvertently applied to the EBITDA of a Company B which owns a significant proportion of fixed assets. In this case, deducting only the outstanding principal on finance leases from the capitalised value of EBITDA of the Company B overstates equity value because it fails to recognise the cost of depreciation and replacement of owned assets. Deducting both the outstanding principal on finance leases and other interest-bearing debt from the capitalised value of EBITDA of the Company B in this case still does not overcome this fundamental valuation deficiency and still overstates equity value because doing so still ignores the portion of owned asset replacement cost funded by equity.

Differences in the proportion of equity in leased assets

Where there is a material difference in the respective equity in leased assets of the subject company and the so-called ‘comparable company’, the same valuation distortion as for owned assets arises.

Differences in the proportion of equity funded working capital

The cash flow generating capability of a business depends not only on the reinvestment in fixed assets but also reinvestments in net working capital. Under the EBITDA multiple-based method, the deduction made from Enterprise Value to calculate equity value is limited to interest-bearing debt and finance lease outstanding principal. Such a deduction makes no allowance for differences between the subject company and the ‘comparable’ company in terms of the extent to which net working capital assets are funded by equity capital. In simple terms, this potential distortion is similar to that arising from differences in the proportion of owned fixed assets discussed earlier.

Differences in deferred tax liability

Inherently, the EBITDA multiple-based method does not allow for different values of deferred tax liabilities or deferred tax assets. This is an issue particularly in industries where the allowable tax depreciation period for assets is materially shorter than their actual economic life.

This is also likely to be an issue when the so-called ‘comparable’ transaction is a sale of a business and the subject valuation is the value of shareholder equity in a company (or vice versa). This is because in the case of a sale of a business, the tax consequences to the vendor are generally not known and/or are subject to other idiosyncratic tax factors.
Growth differences

EBITDA-based equity valuations also generally fail to allow for the interrelationship between different growth prospects and asset replacement needs. A higher growth rate requires either earlier asset replacement from greater use and/or the need to finance asset base expansion, thereby bringing forward significant replacement capex and reducing the net present value of the net cash flows from the business (other things being equal). Capitalising EBITDA of companies with different growth prospects at the same multiple ignores the important cash flow consequences of different growth relativities.7

Conclusion

The use of EBITDA multiples may not cause material valuation distortions in non-capital-intensive industries, or where all the facts about the comparables are known or reasonably allowed for, or if the valuation result is cross-checked to other methods. However, its use fails to allow for many value relevant differences in capital-intensive industries. It can also incorrectly treats pass-through capital cost reimbursement for periodic depreciation charges as part of free cash flows to equity. This method of valuation should not be used in isolation unless all material relevant facts about the entity being valued and the ‘comparable’ companies are known or reasonably allowed for. In many cases, they are not.

Unless the subject company being valued and the comparable company are (virtually) identical in all material respects, an EBITDA-based valuation may hide many significant value differences in capital-intensive industries.

It naturally follows that as:
> homogeneity is highly unlikely in a capital-intensive industry,
> all the facts about so-called ‘comparable’ transactions are generally not known, and
> even less is likely to be known about business sales.

EBITDA multiples should not be applied in capital-intensive industries without recognising and allowing for the inherent shortcomings.

Notes

1. Historically, EBITDA multiples were used to eliminate valuation distortions arising from the amortisation of goodwill and the widespread practice of minimising goodwill recognition for accounting purposes. As goodwill is no longer amortised, other than in impairment situations, the historical rationale for its use is no longer relevant.
2. Obviously, this is not always so.
3. For established industrial businesses where depreciation charges closely reflect replacement capex, the EBIT multiple (if properly calculated) also reflects such an allowance.
4. Some readers may question how a PER multiple-based valuation better deals with this. The short answer is ‘better, but not perfectly’. Essentially this occurs because NPAT is an ‘all in’ measurement of profit.
5. The same applies to finance lease assets but this is allowed for by deducting finance lease debt from Enterprise Value when valuing equity.
6. Deferred tax assets and liabilities are disclosed in the accounts albeit not necessarily at market value.
7. A discussion of price earnings growth ratios is outside the scope of this paper.
PROTECTING RETIREMENT WEALTH: A survey of Australian products

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In view of the changes to the age pension assets test thresholds set to take effect in January 2017, we examine possible features of an ideal Comprehensive Income Product for Retirement. This paper provides a survey of the long-term derivative instruments (warrants) being offered by Australian institutions to elderly Australian investors. We focus on products other than plain vanilla life annuities, and there are currently four active products, with varying guarantee terms. Early exercise is typically permissible yet subject to penalties. Benefits are mostly lump sum but can be income streams.

Retirement wealth is protected to the extent that it has put-option features. The products offering these features can be described as variable annuities with guarantees. We survey the supply side of the Australian market. Retirees of middle means are the natural customers.1

With the assets taper rate of the age pension set to double in January 2017, homeowner couples with modest levels of assessable wealth will find that the effective level of government-provided portfolio insurance, via the age pension, increases at the margin. On the other hand, homeowner couples with assessable wealth greater than $823,000 will lose the pension altogether. Moreover, households still in accumulation mode will tend to try harder for self-funded retirements. In these ways, the age pension will tend to become submarginal for better-off households, bringing about a rise in their demand for protected products.

Another reason to survey Australian products is to come up with suggestions for a Comprehensive Income Product for Retirement (CIPR). At present the centerpiece of the emerging designs for CIPRs is longevity insurance in the form of deferred lifetime annuities.2 However, future CIPR designs may seek to incorporate some downside protection against market risk.3 More controversially, future designs may seek to accommodate estate-planning motives on the part of retirees, at least in part.

Retirement wealth products

We are interested in Australian retirement products that guarantee against market, longevity, inflation and estate-planning risks. Variable annuities (VAs) with guarantees are obvious contenders. In 2010, US savers invested US$1.5 trillion in VAs in the US, but only invested US$660 billion in fixed annuities.4
The meaning of the term variable annuity has shifted over time. Bodie et al. (1989) defined VAs as periodic payments linked to the investment performance of an underlying portfolio. They also set out a simple algorithm whereby investment risk can be passed from the insurance company through to the policyholder. The corresponding term in Commonwealth countries used to be with-profit annuities. Life annuities were the only associated derivative instrument. The view that the defining characteristic of VAs is variability of either the account balance or the income stream drawn from it continues to have adherents. On the other hand, VAs have increasingly become associated with embedded options. Thus, Ledlie et al. (2008) define a VA as ‘a unit-linked or managed fund vehicle which offers optional guarantee benefits as a choice for the customer.’ One way to define VAs is simply to list the four main types:

- **Guaranteed Minimum Death Benefits** — GMDBs guarantee a return of the principal invested upon the death of the policyholder. This product pays out the maximum of the principal invested and the amount of the underlying unit-linked account.

- **Guaranteed Minimum Accumulation Benefits** — GMABs guarantee that on specified policy anniversaries, the value of the contract will be the maximum of the principal invested and the amount of the underlying unit-linked account.

- **Guaranteed Minimum Income Benefits** — GMIBs guarantee that on the annuitisation date, a minimum income stream such as a life annuity is paid out. The guaranteed benefit may be fixed at the start of the policy, or it could be expressed as a percentage of the premiums invested, or some function of the amount of the underlying unit-linked account at the annuitisation date.

- **Guaranteed Minimum Withdrawal Benefits** — GMWBs guarantees that a minimum income stream can be regularly withdrawn for a fixed term. For example, the guarantee might provide annual withdrawals of 5 per cent of the principal invested for 20 years. There are also Lifetime Guaranteed Minimum Withdrawal Benefits where the guarantee term is the lifetime of the policyholder.

The typical pay-off profile of these product types involves upside capture potential combined with downside protection, i.e. portfolio insurance. Accordingly, the type of market risk addressed is not the overall volatility of returns, but capping downside market losses that might otherwise be unbounded. VAs of the GMDB variety do not even provide longevity insurance. Rather, GMDBs provide life insurance, its mirror image. However, the other three VA types do offer at least partial insurance against the double contingency of poor long-term returns to growth assets and a long life. There is not just a concern with capping losses; guarantees may also include uplift provisions such as ratchets (reset of the benefit base to equal the growth of the underlying unit-linked account at policy anniversaries) and roll-ups (guaranteeing the principal invested will grow at a specified minimum roll-up rate).

Matterson (2015) briefly lists the guaranteed solutions market in Australia as at December 2014. See Table 1.

**TABLE 1: Guaranteed products**

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Product</th>
<th>Active?</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMP</td>
<td>North</td>
<td>Yes</td>
</tr>
<tr>
<td>BT Financial Group</td>
<td>Wrap Capital Protection</td>
<td>Yes</td>
</tr>
<tr>
<td>Challenger</td>
<td>Liquid Lifetime</td>
<td>Yes</td>
</tr>
<tr>
<td>MetLife</td>
<td>RetireSafe</td>
<td>No</td>
</tr>
<tr>
<td>MLC</td>
<td>Investment Protection</td>
<td>Yes</td>
</tr>
<tr>
<td>OnePath</td>
<td>Money 4 Life</td>
<td>No</td>
</tr>
</tbody>
</table>

There are other products mentioned by Matterson (2015) that offer some protection (but not account balance protection) such as the Mercer LifeTime Plus (Pooled Longevity Solution) product.
Active products
Details of the active products in Table 1 are discussed below.

1. North, AMP
There are two types of guaranteed products: Protected Investment guarantee; and Protected Growth guarantee. Both are of the GMAB variety.

The Product Disclosure Statement of North’s investment guarantee states that the guarantee applies to investments (net of upfront fees, less any withdrawal, advice fees or taxes paid) at the end of a nominated term. By terminating prior to the end of the selected term, the investment is subject to ordinary market risk; although the Protected Growth guarantee entitles the policyholder to a portion of the guarantee benefit, which varies depending on how far you are into the policy term. Six or eight-year terms are available for the Protected Investment guarantee product, and 10 or 20-year terms for the Protected Growth guarantee product.

There is an additional feature in these products that locks in growth in the account value as a result of positive investment performance, if the account value is greater than the protected balance. For the Protected Investment guarantee product, the growth is locked in every two years; it is locked in annually for the Protected Growth guarantee product.

The account value is subject to market risk and will decrease as a result of fees, management costs and withdrawals. The protected balance is not subject to market risk, and will not decrease as a result of fees and management costs, but will decrease with withdrawals. The total amount that can be received from these products at the end of the selected term will be at least equal to the protected balance.

Figure 1 illustrates the main features of the Protected Investment guarantee product.

FIGURE 1: Protected Investment

The blue line indicates a simulation of the account value, while the red line illustrates the protected balance with the lock-in growth at years 2 and 4. Note that the account value fluctuates with investment performance. In this example, the initial contribution is $100,000 and the selected term is six years. For this simulation, the policyholder will receive $142,425 at the end of six years, even though the account value is only $129,000. Of course, this favourable outcome is presented merely to illustrate how the product works. It is entirely possible that the relevant embedded option could finish out of the money.
Figure 2 illustrates the main features of the Protected Growth guarantee product.

**FIGURE 2: Protected Growth**

The green line represents the available balance, the blue line indicates a simulation of the account value and the red line illustrates the protected balance with the lock-in growth at years 1, 2, 3, 4, 8 and 9. Note that the account value fluctuates with investment performance. In this example, the initial contribution is $100,000 and the selected term is 10 years. For this simulation, the policyholder will receive $195,074 at the end of 10 years, even though the account value is only $176,681. The available balance is the amount paid if the policy is terminated prior to the end of the chosen term. For example, the policy will pay out $138,400 at the end of year 7, even though the account value is only $129,007.

**Who should consider this product?** The North product offers partial longevity insurance in the sense explained earlier. In particular, its pay-off profile squares with theories of consumer behaviour whereby people want a floor rate of consumption that ratchets upwards through time, in response to rises in individual or community wealth. North could also suit investors seeking to leave a significant estate. Like all but one of the other active products, however, there is no direct protection against inflation risk. Depending on the term and investment strategy selected for the North product, the guarantee fee varies between 1.55 per cent to 2.45 per cent p.a. for the Protected Investment Guarantee and 0.8 per cent to 1.85 per cent p.a. for the Protected Growth Guarantee. For any additional investments made into the North product, an additional fee up to 7 per cent is payable.

**Aligned with CIPR objectives?** The North product does not offer full longevity insurance, and that is not in the spirit of the CIPR concept. Moreover, there is a tension between CIPR thinking and catering to bequest motives, as a deferred annuity requires an outlay in early retirement that depletes the resources available for an estate. By the same token, North does offer partial longevity insurance, especially its Protected Growth variant.

2. *Wrap Capital Protection, BT Financial Group*

Wrap Capital Protection is another GMAB product. It protects any investment in eligible managed funds, while still allowing investors to benefit from growth when the chosen funds perform well. Assuming no withdrawals are made and all distributions are reinvested, the product is designed to ensure that at the end of the selected term, the amount of the investment is at least equal to the amount invested at the start of the protection. The term of the protection can vary approximately between five and 10 years.
Basically investments are parked into two funds: the Investment Fund and the Capital Protection Fund. The combined holdings in these two funds are referred to as the Protection Portfolio. There are options on what classes of investments are available in each fund. The basic protection is provided by redeeming, from time to time during the protection term, some of the holding on the Investment Fund and investing these holdings into the Capital Protection Fund, and vice versa. This holding change is referred to as Rebalancing in the BT Capital Protection Fund Product Disclosure Statement. Rebalancing is triggered on the basis of a specified formula. In accordance with the rebalancing formula, there are two factors that will likely lead to a rebalance:

> a significant change in the Investment Fund’s performance. (The better the performance in the Investment Fund, the more funds are invested in this fund)
> the length of time remaining in the Protection Term. (The closer to the Protection Term, the more funds are invested in the Capital Investment Fund.)

Note that in case of a severe and sudden fall in the unit price of the Investment Fund due to market movements, an extra layer of protection is provided (by Deutsche Bank) by way of a Protection Payment.

The protected account balance is the account balance of the amounts invested in the protected fund. Note that the protected account balance will move with the market. According to the BT Capital Protection Fund Product Disclosure Statement, ‘This the minimum dollar value that the Protection Contract is designed to ensure your Protection Portfolio is worth at the end of your Protection Term. When your protection is initially set up, your Minimum Outcome is equal to the amount of your investment, e.g. if you invest $10,000 from your Wrap Platform Cash Account (also called Cash Account in this PDS), your Minimum Outcome is set at $10,000. The Minimum Outcome may not keep up with inflation, but it can increase if your Protection Portfolio increases in value during the Protection Term.’ There are some circumstances when the Minimum Outcome may not be received or be reduced.

Automatic Growth Capture is a feature of the product designed to ensure that the Minimum Outcome has an opportunity to grow during the protection term, if the Protection Portfolio increases in value. Generally, every three months during the protection term, the Minimum Outcome will be automatically increased to capture 50 per cent of growth in value of the Protection Portfolio.

Who should consider this product? Wrap Capital Protection has a pay-off profile which is broadly similar to North’s. Wrap’s greater frequency of resets might appeal to some investors, however, Wrap’s reset feature is less generous. Less protection appears to be accompanied by lower fees: there is an issuer fee of 0.5 per cent p.a. and a protection acquisition fee of 0.7 per cent p.a. of the value of each Protection Portfolio. In the event that a protection payment is made while there are unsettled units in the investment fund, there may be additional protection costs payable.

Aligned with CIPR objectives? Wrap Capital Protection and North have broadly similar pay-off profiles, so our earlier comments carry over.

3. Liquid Lifetime, Challenger

Liquid Lifetime combines GMIB and GMWB features along with a scaled-back GMDB feature. Thus, one of its components is a guaranteed annuity sold by Challenger. For an initial investment, you can receive regular payments for the rest of your lifetime, or for the rest of the lifetime of a second person. This guaranteed annuity product creates a regular cash flow for life, regardless of how long you live or how investment markets perform. As Challenger guarantees the lifetime regular payments, it bears the market risk. There is flexibility to withdraw within the first 15 years with this product. Also, you can choose full or partial indexation of the regular payments so that the annuity can help guard against the effects of inflation. A death benefit is paid in the first 15 years if there is no eligible reversionary nominated or surviving joint owner.

On the view that potential for capturing market upside is a defining characteristic of a VA, then Liquid Lifetime is a product that does not belong here, as all payments are essentially fixed in advance. However, potential customers may perceive some substitutability between Liquid Lifetime and the other three products, so we include it for this reason.
Who should consider this product? Liquid Lifetime has the most complete longevity insurance of all the active products. Moreover, a variant of this product offers inflation insurance. Liquid Lifetime would also alleviate the cognitive problems an investor in late retirement might experience in managing lump-sum assets weighted substantially to growth assets. On the other hand, this product sits less well with bequest motives, although there is scope for nominating a death benefit. Moreover, given the absence of mandatory annuitisation in Australia, along with our means-tested age pension, an investor in Liquid Lifetime would need to consider the effects of adverse selection on the annuity loading, along with consequences of the means tests for access to a part age pension. The Challenger product does not have explicit fees. Costs of providing the annuity payments are incorporated implicitly into the annuity product.

Aligned with CIPR objectives? Among the active products, Liquid Lifetime is evidently the product most aligned with the thinking behind CIPRs.

4. Investment Protection, MLC

Investment Protection offers GMAB, GMIB, GMWB and scaled-back GMDB features, although not all within the one product. It offers two types of protection:

- Protected Capital — provides capital protection over 10 or 20 years
- Protected Income — provides income protection over 10 years, 20 years or for life.

No matter how the market moves, the minimum amount available at the end of the term with Protected Capital or the minimum amount of income available over the term with Protected Income is known with certainty.

For the Protected Capital product, the protected capital value will:

- increase in value on the anniversary date if the protected account balance is greater than the protected capital value. In this case, the protected capital value will equal the protected account balance
- remain at the current value if the protected account balance is lower than the protected capital value.

Note that during the selected term of the product, the protected capital value and the protected account value will decrease with any withdrawals or increase with any additional investments. There are optional extras available such as a death benefit and an additional investment benefit.

For the Protected Income product, the protected income base will:

- increase in value on the anniversary date if the protected account balance is greater than the protected income base. In this case, the protected income base will equal the protected account balance
- remain at the current level if the protected account balance is lower than the protected income base.

Note that during the year, the protected income base and the protected account balance will decrease with any withdrawals that exceed the protected income payments or increase with any additional investments made in the super phase. A spouse benefit is an optional extra available with this product.
Figure 3 illustrates the main features of the Protected Capital product.

**FIGURE 3: Protected Capital**

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
<th>Year 7</th>
<th>Year 8</th>
<th>Year 9</th>
<th>Year 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>$80,000</td>
<td>$100,000</td>
<td>$120,000</td>
<td>$140,000</td>
<td>$160,000</td>
<td>$180,000</td>
<td>$200,000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The blue line indicates a simulation of the protected account balance, while the red line illustrates the protected capital value with the lock-in growth at years 2, 3, 4, 8 and 9. Note that the protected account balance fluctuates with investment performance. In this example, the initial contribution is $100,000 and the selected term is 10 years. For this simulation, the policyholder will receive $185,320 at the end of 10 years, even though the protected account balance is only $167,847.

Figure 4 illustrates the main features of the Protected Income product.

**FIGURE 4: Protected Income**

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
<th>Year 7</th>
<th>Year 8</th>
<th>Year 9</th>
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<th>Year 16</th>
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<th>Year 18</th>
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<td></td>
</tr>
</tbody>
</table>

The blue line indicates a simulation of the protected account balance, while the red line illustrates the protected income base with the lock-in growth at the end of year 1. Note that the protected account balance fluctuates with investment performance as well as decreasing as a result of the protected income payments and fees. In this example, the initial contribution is $500,000 and the selected term is 20 years. For this simulation, the policyholder will receive $25,000 (= 5 per cent of $500,000) in the first year and $26,717 (= 5 per cent of $534,333) until the end of the policy term. The protected income base increases from $500,000 to $534,333 at the end of the first year due to good investment performance. After 17.75 years, the protected account balance runs out of funds but the protected income payments of $26,717 continue to be paid to the policyholder for the remainder of the 20-year term.
Who should consider this product? The pay-off profiles of MLC Investor Protection are broadly similar to those of North and Wrap. However, MLC Investor Protection offers comparatively long terms of protection. This feature would suit investors expecting to spend a long time in retirement. Lifelong income streams are an option. The protection fee varies between 0.4 per cent to 1.75 per cent p.a. for the Protected Capital option and 0.25 per cent to 1.4 per cent p.a. for the Protected Income option. The fees for the optional extras for the MLC product are: 0.2 per cent p.a. for an additional investment benefit and 0.2 per cent p.a. for a death benefit for the Protected Capital product; and 0.1 per cent p.a. for a spouse benefit for the Protected Income product with a term of 10 or 20 years. This fee increases to 0.6 per cent p.a. if the term is for life.

Aligned with CIPR objectives? On the criterion of alignment with the thinking behind CIPRs, MLC Investor Protection ranks only behind Liquid Lifetime.

Policy issues
At odds with the current generation of CIPR designs is the fact that legacies appear to be a significant consideration for Australian retirees of middle means. An international survey by HKSB (2013) found that the average estate planned by Australian retirees was US$501,919. That amount was the highest of all the countries surveyed. HKSB points out that the reason for our top ranking may be our low estate taxes. Indeed, estate taxes are non-existent in the case of a family home sold within two years of inheritance. Historically, of course, the family home has been our main vehicle for estate planning. However, this may change, especially in the case of inter vivos transfers for the purpose of school fees and securing a foothold in the property market for family members. Lockwood (2014) and others point out that lump-sum retirement assets can serve multiple purposes. For example, if you enjoy an unexpectedly long retirement, funds originally planned for legacies can be redirected to personal living expenses. This type of behaviour is more likely if bequests are luxury goods, which is what the data strongly suggest (Lockwood 2014). The wealth protection products surveyed here are instruments which could help with these overlapping and contingent retirement objectives.

The ideal CIPR would probably insure at least partly against estate-planning, market and inflation risks — and longevity risk. A key issue for CIPRs in Australia is the fact that the market for lifetime annuities is thin. One weakness has been the 15 per cent tax on the earnings of the statutory funds that back deferred life annuities. Another is the absence of a requirement that part of an individual’s retirement wealth be annuitised. Finally, whereas Australia indexes the age pension to the maximum of wage and price rises, Switzerland, which has deep annuity markets, indexes first-pillar benefits to the average of their wage and price increases.

Acknowledgement
We would like to thank the Centre for International Finance and Regulation (CIFR) for financial support under project T022. CIFR people also provided helpful feedback on a previous draft; special thanks are due to Geoff Warren. Thanks are also due to seminar participants at the University of New South Wales, Aaron Minney of Challenger Limited and Nicolette Rubinsztein of UniSuper. A JASSA referee made constructive comments, as did the Managing Editor, Professor Kevin Davis.
Notes

1. Workers with labour supply flexibility are the natural ultimate suppliers.
2. Or deferred Group Self Annuitisation. On CIPRs see e.g. Financial System Inquiry Final Report.
3. Of course, protecting against a market fall does not necessarily solve for longevity issues and vice versa.
5. These options are required in the United States for the associated product to qualify for tax-deferral benefits enjoyed by annuities. Accordingly, American usage of the term VA has become influenced by this feature of the US tax code.
6. This definition of VAs rules out (say) term deposits, which do not have significant upside capture potential.
7. The account value is the current market value of the underlying investments.
8. The protected balance is the guaranteed amount. At the end of the specified term, if the protected balance is greater than the account value, the difference between the two amounts is added to the account value.
9. In the terminology of finance theory, BT Capital Protection offers constant-proportion portfolio insurance. See Kingston (1989) for an explanation along with a set of conditions on household preferences under which this investment strategy is optimal.
10. You can nominate a second person to receive regular payments for life after you die. Note that if the annuity is brought with money rolled over within the superannuation system, the reversionary must be your spouse (as defined by law). For most retirees the death benefit in Liquid Lifetime goes to the estate only if the retiree and spouse die before age 80. Accordingly, it is not designed around the large and intentional bequests of the kind we discuss in the concluding section.
11. For more details about this product, see the Challenger Guaranteed Annuity (Liquid Lifetime) Product Disclosure Statement. Note that Colonial First State (which is owned by the Commonwealth Bank of Australia) distributes Challenger and CommInsure annuity products.
12. Specifically, in early retirement the assets test could bind, whereas in late retirement the income test could bind.
13. There are a number of investment options available with this product. See MLC MasterKey Super & Pension Fundamentals Product Disclosure Statement for more details.
14. The protected capital value is the initial amount invested in the Protected Capital product.
15. The protected income base is the initial amount invested in the Protected Income product.
16. The protected income payment is the income you receive from the Protected Income product.
17. The 2016–17 Budget announced that from 1 July 2017 the tax exemption on earnings in the retirement phase will be extended to deferred lifetime annuities and group self-annuitisation products.
18. The Financial System Inquiry recommended that superannuation funds ‘pre-select’ (nudge?) some proportion of a retiring member’s benefit in the direction of a deferred lifetime annuity. However, there is a tension between this recommendation and the ‘suitability rule’ governing product advice; the best advice may be to use all your retirement benefit to become a homeowner, or pay down debt on your existing home, or even to trade up in the property market. The reason is of course that the means tests favour assets in the form of an owner-occupied dwelling.

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INTRODUCTION TO THE SPECIAL SECTION on superannuation

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This section of JASSA includes four papers written by researchers in the CSIRO-Monash Superannuation Research Cluster. Since its inception in September 2013, the Cluster has brought together researchers from Monash and Griffith Universities, the University of Western Australia, the University of Warwick in the UK, and CSIRO’s Data61.

Built around a $3m Flagship Cluster Grant from CSIRO, the Cluster seeks to build connectivity with industry and policy makers to maximise the impact of the research. The research capacity of the Cluster is expanded through industry investment from ANZ, AMP Capital, BT, Cbus, Challenger, Mercer and Vanguard.

Researchers meet with the Cluster’s Stakeholder Group1 four times each year to discuss the research program and present outcomes, which are disseminated in working papers throughout the year. The research projects address two key themes: ‘Superannuation and the Economy’ and ‘Australians over 60’.

The first paper in this section of the journal addresses how people draw down their superannuation savings. A team from CSIRO including Thomas Sneddon, Andrew Reeson, Zili Zhu, Alec Stephenson, Elizabeth Hobman and Peter Toscas use ATO data on SMSFs and APRA data on APRA-regulated funds to undertake a longitudinal study of withdrawals from account-based pensions to provide a better understanding of drawdown patterns in retirement. The analysis indicates that most retirees in their 60s and 70s draw down on their account-based pensions at modest rates, close to the minimum amounts each year, indicating that if these drawdown rates were to continue, most retirees would die with substantial amounts unspent. These findings are consistent with empirical evidence to date that suggests retirees are inclined to draw down their wealth relatively slowly.

One of the great strengths of this research program has been the behavioural finance insights from Cluster Project 3 regarding individuals’ decision-making with respect to their superannuation savings. Led by Professors Gordon Clark and Paul Gerrans, of Monash and Oxford Universities, and the University of Western Australia, respectively, the team utilises a database from Mercer Australia of the accounts of 600,000 superannuation members over 10 years.

In the second of the papers presented here, Paul Gerrans, Maria Strydom, Carly Moulang and Jun Feng examine the extent to which demographic and social factors are associated with changes to individual wealth accumulation trajectories in retirement savings. Specifically, the team investigates the switching behaviour of members, distinguishing between a switch in investment choice for future contributions as opposed to a change in the investment choice for the accumulated balance. The researchers find major differences in both types of investment choice between genders, and also that members with higher balances, larger contributions and greater time in the fund are more likely to make changes.

Very sadly, one of our star young researchers from Cluster Project 3, Maria Strydom, passed away unexpectedly several weeks ago, and the team dedicate this paper to her in view of her outstanding contribution.
In another paper from Cluster Project 3, Jun Feng and Paul Gerrans provide an empirical analysis of long-term trends in voluntary contributions to superannuation in Australia. They assess the role of demographic and socio-economic factors in predicting contribution behaviours with respect to both pre-tax (salary sacrifice) and post-tax savings, and the relationship between the two types of contribution. Their results indicate a decline in participation in both pre-tax contributions and post-tax contributions between 2002–03 and 2011–12 due to lower participation among new members. Participation in pre-tax contributions is higher for males and increases with age and income, whereas participation in post-tax contributions reduces with income and is lower for males.

Finally, Professors James Giesecke, Peter Dixon, and Maureen Rimmer from the Centre of Policy Studies at Victoria University, explore the relationship between the growing pool of superannuation funds and the real economy. Using a new type of computable general equilibrium, the team models the macroeconomic effects of a one-percentage point increase in superannuation contributions. The results indicate that a rise in the superannuation contribution rate increases long-run real GDP, largely via an increase in the savings rate. At the same time, the investment activities of the superannuation sector boost short-run employment and housing investment.

The four papers presented in this edition of the journal are a sample of the work which can be accessed from the website www.superresearchcluster.com

Note
1. The Stakeholder Group also includes the Australian Institute of Superannuation Trustees (AIST), the Association of Superannuation Funds of Australia (ASFA), the Australian Taxation Office (ATO), the Productivity Commission, Federal Treasury, the Financial Services Council (FSC), and the National Seniors Productive Ageing Centre.
Superannuation
drawdown behaviour

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DR PETER TOSCAS, Research Group Leader, Risk Analytics Group, DATA61, CSIRO

This paper provides a longitudinal study of withdrawals from account-based pensions from superannuation savings to provide a better understanding of drawdown patterns in retirement. Our analysis of the data indicates that most retirees in their 60s and 70s draw down on their account-based pensions at modest rates, close to the minimum amounts each year. Indeed, if these drawdown rates were to continue, most retirees would die with substantial amounts unspent. These findings are consistent with empirical evidence to date that suggests retirees are inclined to draw down their wealth relatively slowly.

The Australian superannuation system as we know it commenced in 1992 with the introduction of the Superannuation Guarantee, which requires all employers to contribute a proportion (initially 3 per cent, rising to 9 per cent by 2002 and 9.5 per cent today) of an employee’s earnings into a superannuation fund. It is therefore only in recent years that large numbers of people have begun entering retirement with significant superannuation balances.

On retirement, people have the option to withdraw some or all their superannuation balance (as a ‘lump sum’), set up an account-based pension (providing a flexible income stream) or invest in longevity management products such as annuities (offering a fixed income stream, often for life).

With no upper limits to the amounts retirees can withdraw from their funds, concerns have been raised about the potential for retirees to overspend (Productivity Commission 2015), particularly as those who have exhausted their superannuation savings would generally become eligible for the government age pension. Because this potential incentive for rapid consumption on retirement would have significant implications for public spending there is considerable interest in better understanding drawdown patterns in retirement.

The empirical evidence to date suggests that retirees are inclined to draw down their wealth relatively slowly. Wu et al. (2014) examined Centrelink data covering a sample of aged pensioners between 1999 and 2007, finding evidence that many retirees engage in precautionary saving, holding or even building a buffer of wealth (in addition to the family home) in the order of $50,000 per person. Rather than drawing down their assets, many were living off the income generated from their investments, along with the age pension, often spending less than the Association of Superannuation Funds of Australia (ASFA) standards for even a modest lifestyle. It is unclear to what extent this behaviour is motivated by precautionary or bequest motives, or some combination of both.

The cohort examined by Wu et al. (2014) had very limited superannuation, as the sample began in 1999 when few retirees had significant balances (less than 10 per cent of the sample had money in superannuation). People who retire with small balances (less than $80,000) are likely to withdraw all of their superannuation as a lump sum (Productivity Commission 2015). This is to be expected as money kept in superannuation will be subject to ongoing fees, and the tax benefits are of little relevance to those on low incomes. The median value of lump sums at retirement is $20,000 (using data from 2012–13), which is mostly used to fund housing (including paying down mortgages and renovations) or invested elsewhere, with only a minority using it primarily for consumption (Productivity Commission 2015).
Retirees with larger balances typically take only a small proportion in the form of a lump sum at retirement; the majority then choose to take an account-based pension rather than an annuity (Productivity Commission 2015). Relatively few people buy annuities (O’Meara et al. 2015), which is in line with experience elsewhere (e.g. Benartzi et al. 2011). This lack of interest in annuities is puzzling, as they appear to offer a more efficient way for self-funded retirees to manage longevity risk (Ralston and Maddock 2015).

Retirees with account-based pensions are subject to minimum drawdown rates, which increase with age (see Table 1 below), but are free to withdraw more. The minimum drawdown rates were intended to provide a relatively stable retirement income with low risk of running out of money (Australian Government Actuary 2014), however, this strategy is costly for individuals. The Australian Government Actuary reported in 2014 that on average, a person retiring at age 65 and following the minimum drawdown rates will leave 31 per cent of their account-based pension unspent. To date, there has been little analysis of the actual rates at which retirees choose to draw down their account-based pensions from superannuation savings.

**TABLE 1: Minimum drawdown rates by age for account-based pensions**

<table>
<thead>
<tr>
<th>Age</th>
<th>&lt;65</th>
<th>65-74</th>
<th>75-79</th>
<th>80-84</th>
<th>85-89</th>
<th>90-94</th>
<th>95+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum drawdown</td>
<td>4%</td>
<td>5%</td>
<td>6%</td>
<td>7%</td>
<td>9%</td>
<td>11%</td>
<td>14%</td>
</tr>
</tbody>
</table>

Note: These rates were reduced by 50% in 2008/09, 09/10 and 10/11 tax years, and by 25% in 2011/12 and 2012/13.

This study aims to address that gap using data accessed from the Australian Taxation Office (ATO), which is described in more detail in Zhu et al. (2015), supplemented by industry data. The ATO data covers members of superannuation funds regulated by the Australian Prudential Regulation Authority (APRA), which includes all retail and industry super funds, as well as people with self-managed superannuation funds (SMSFs). APRA funds comprise around 29 million member accounts (many people have more than one account), with $1.25 trillion of savings (APRA 2016). There are now over 550,000 SMSFs, with just over one million members holding around $590 billion of savings, accounting for 29 per cent of total superannuation assets (ATO 2015).

**Data and methodology**

The ATO dataset (Zhu et al. 2015) provided a random sample of 150,000 individuals consisting of: 50,000 individuals with only an APRA-regulated superannuation fund balance in 2004; 50,000 with only an SMSF balance in 2004; and a further 50,000 who had both APRA and SMSF balances. The data covers 11 tax years, for the years ending June 2004 to June 2014, and includes year of birth, superannuation balance at the end of each tax year, total contributions (both personal and employer) in each tax year, and the total amount of benefit payments received (if any) in each tax year (available only for SMSF accounts).

The APRA fund data was drawn from annual member contributions statement forms submitted to the ATO by superannuation funds and subsequently linked to individuals (including all of their superannuation regardless of the number of accounts held). Each SMSF is required by law to submit a tax return annually, including account information for each member of the fund. The SMSF data used for our analysis were at the level of the individual, not the fund, drawn from SMSF annual return forms.

Due to ATO privacy restrictions, balances were rounded to the nearest $1,000, which affected the accuracy of some of the data, such as returns and withdrawal rate calculations (particularly for APRA funds with generally much smaller balances). The process of extracting the data and a range of further descriptive statistics are provided by Zhu et al. (2015); the current paper focuses only on drawdown behaviour. The data did not provide any information regarding transition to retirement arrangements (where retirement age individuals could work part-time while contributing to and withdrawing from retirement savings simultaneously), so this behaviour has not been investigated within this paper.

Because of limitations in the ATO data with respect to the drawdown from APRA funds, a second dataset was also included in the study. This second set of data covers approximately 2,600 retirees with account-based pensions at a large APRA-regulated superannuation fund, across five financial years to June 2015. Further information on this smaller dataset is available from the authors upon request.
Results

Balance at retirement
The ATO dataset does not directly indicate retirement age. For our analysis it was inferred as the age at which an individual ceased making contributions to superannuation. The overwhelming majority of individuals with just APRA superannuation had less than $100,000 at retirement, while a small number had much larger balances. Figure 1 shows the frequency distribution at various account balances on retirement. The median value for data shown in Figure 1 was $67,000. For those who also had an SMSF, they tended to have less in their APRA fund than those who only had an APRA fund; the median retirement balance was $35,000 for this cohort.

![Figure 1: Frequency distribution of balance at inferred retirement age for individuals with an APRA superannuation fund account only](image1)

Individuals retiring with an SMSF had much larger balances. For example, Figure 2 (note the different scale on these charts) shows the frequency distribution for different superannuation balances at retirement. For those with just an SMSF, the median individual balance at retirement was $670,000, while those who also had an APRA fund had a median of $503,000 in their SMSF.

![Figure 2: Frequency distribution of balance at inferred retirement age for individuals with SMSF only](image2)

Balance change in retirement
The ATO dataset includes withdrawal rates for SMSFs, but not for APRA accounts.

Figure 3 shows withdrawal rates by age (the thicker line represents the median, while the upper and lower boundaries of each box represent the 75th and 25th percentiles, respectively, and the upper and lower ends of the whiskers for each box represent the 95th and 5th percentiles, respectively). The median withdrawal rate was 5 to 6 per cent for retirees aged up to 75, and around 6 per cent after that. Note the data were rounded to the nearest $1,000, which introduces some noise into the calculation of withdrawal rates. In five years of the 11-year period, minimum withdrawal rates were reduced (see Table 1), so the lower quartile tracked below the standard minimum withdrawal rates. While most retirees withdrew less than 6 per cent annually, there was considerable variation, and some withdrew much larger proportions of their retirement balances; the upper quartile of withdrawals was 10 to 12 per cent.
FIGURE 3: Withdrawal rate, as a proportion of balance, for SMSF accounts by age

For more detailed analysis, the withdrawal rates were separated into three groups according to retirement account balance level, as shown in Figure 4. As shown clearly in the figure, interestingly, those with the highest initial balances (representing the top third of the sample) showed the lowest withdrawal rates.

FIGURE 4: Withdrawal rates for SMSF retirees classified into three groups based on retirement balance level

Note: Rounding introduces greater errors for the low-balance group.

To gain further insight as to withdrawal behaviour, Figures 3 and 4 were emulated but focusing upon absolute dollar withdrawal figures rather than rates. Figure 5 provides the distribution of withdrawals at each age throughout the dataset period. The median, upper quantile and lower quantile of the withdrawal dollar amount stay fairly constant from ages 65 to 80, suggesting that retirees may be selecting a withdrawal dollar figure at retirement and maintaining this level of withdrawal throughout retirement without change. However, the falling level of the top whisker suggests some retirees may be withdrawing larger amounts or a set percentage of their funds and reducing withdrawals with age. Of additional interest are the levels of the median withdrawal dollar amounts, which approximately equal the current ASFA ‘comfortable’ retirement standard dollar figure of $42,893, and the lower quantiles of the withdrawal dollar amount distributions for each year, which generally equate to the current ASFA ‘modest’ retirement standard dollar figure of $23,651.
Figure 6 provides the median withdrawal dollar amount at each age for the three levels of retirement account balance as in Figure 4. Notably, a similar pattern of withdrawal behaviour as in Figure 5 is apparent across each of the three balance level cohorts, with each group withdrawing a fairly stable dollar amount across all ages. Further, these dollar amounts are notable in that the median level for the medium group is quite low at approximately $20,000, below the current ASFA ‘modest’ retirement standard level, while the median level of the low balance group is extremely low. Also, the median withdrawal dollar level of the high balance group is far in excess of the ASFA ‘comfortable’ retirement standard level.

Retirees’ balances for both APRA and SMSF accounts showed little evidence of declining with age. However, accounts with smaller balances were more likely to be closed, meaning that median balances were higher for older retirees. Figure 7 highlights this behaviour in retirees with only APRA superannuation accounts. The sample size for retirees in their 80s was very small, therefore only retirees of 75 or younger age are selected for the figure.
Figure 7: Balances held by retirees with just an APRA superannuation fund

Solid red lines indicate the median, blue box height represents the interquartile range, blue box width indicates relative sample size.

Figure 8 shows a similar pattern of account balance behaviour for retirees with only an SMSF superannuation account. The sample size for retirees’ with just SMSF accounts became much smaller from the age of 80 years onwards. However, the SMSF account balances stayed relatively stable from the age of 64 years until 80 years.

Figure 8: Balances held by retirees with an SMSF account only

Solid red lines indicate the median, blue box height represents the interquartile range, blue box width indicates relative sample size.

Breaking the data into groups based on balance size (as in Figure 9) shows the same pattern of relatively stable account balances among those who started out with low, medium and high balances.

Figure 9: Balances held by retirees with an APRA fund only, split into groups based on the relative size of their balance in 2004

Solid red lines indicate the median, blue box height represents the interquartile range, blue box width indicates relative sample size.
Similarly for retirees with just SMSF accounts, the data can be broken into groups based on their account balance size with low, medium and high balances. Figure 10 shows the same pattern of relatively stable account balances among these three groups:

**FIGURE 10: Balances held by retirees with an SMSF fund only, split into groups based on the relative size of their balance in 2004**

Examining the net change in accounts that remain open provides a better measure of balance evolution among retirees. Among those with just an APRA fund the median balance change was positive, indicating that for most retirees investment returns exceeded withdrawals (Figure 11), though the changes of APRA account balances were close to zero at the age of 68, 69 and 75 years. Again, meaningful inferences about the 75+ age group cannot be made from this dataset.

**FIGURE 11: Net balance changes for retirees with just an APRA fund**

Across all ages represented in the dataset, the median balance change in SMSF accounts was positive (see Figure 12), indicating that investment returns exceeded withdrawals for most retirees in most years, though for the 79+ age group, the median balance change was nearly all zero. Importantly, there was considerable variation. The lower quartile was consistently below zero, indicating that in more than 25 per cent of cases withdrawals exceeded investment returns. The growth rate of account balances appeared to have declined from the age of 75 (coinciding with an increase in the minimum withdrawal rate), but the data became very thin, and nothing can be reliably inferred for members in their 80s.
Dataset two: APRA-fund

The 2,600 retirees represented in the second dataset had a median age of 65 at the start of the dataset (June 2010). The data provide a detailed picture of drawdown activity by retirees aged between 60 and 75 over the five years, but older ages are not well represented. However, this data is valuable in providing insight as to the balance and withdrawal behaviour of members of an APRA-regulated fund, information which is unavailable for APRA fund members within the ATO dataset. This also allows comparisons to be made between SMSF and APRA account holders about retirement income activity. The median account balance in June 2010 was $151,000, which had risen to $194,000 by June 2015.

Figure 13 plots the median and upper and lower quartiles (25% and 75%) of withdrawal rate by age for this dataset. Withdrawal rates were relatively high among the small number of retirees under age 65 (who were not yet eligible for the age pension), but dropped close to the minimum rate of 5 per cent at 65 (though note for some of the years covered by this dataset the minimum rates were lower). Notably, the median withdrawal rate for each age for this data is almost identical to that of the ATO data SMSF account holders (see Figure 3) although the ATO data SMSF account holders display a far greater range of withdrawal rates around this median. This seems to indicate that most superannuation account holders, regardless of whether their balance is held in an APRA-regulated fund or SMSF, withdraw at or close to the legislated minimum withdrawal rates despite the significant difference in median account balance level between these two cohorts of retirees. Potential reasons for such behaviour are provided in the conclusion section of this paper.

FIGURE 13: Withdrawal rates, as a proportion of account balance, for dataset 2 accounts by age
In 2015 the median withdrawal was 0.56 percentage points above the minimum. In earlier years, when the minima had been reduced, this difference was greater. For example, in 2010 when the minimum rates were halved, the median withdrawal was 3.75 percentage points higher than the reduced minimum. For dataset 2, we do not have data for the period prior to the reduction; our data suggest that retirees were more likely to stay around the regular minimum withdrawal rates, rather than actively tracking the minimum as it was adjusted. The same finding has been reported (Zhu et al. 2015) for retirees with SMSF when their withdrawal behaviour was analysed before and after the period when minimum withdrawal rates were halved from 2008 to 2011. In the financial years ending in 2014 and 2015, 36 per cent of retirees withdrew the same dollar amount while 27 per cent kept the same percentage. There was little evidence of retirees being drawn to round numbers; across the dataset 16 per cent of withdrawals were in multiples of $1,000 and 38 per cent in multiples of $50.

Individuals with larger balances tended to have lower withdrawal rates. The median withdrawal rate for balances over $200,000 was 5.5 per cent, compared to 7.3 per cent for those under $200,000 (and 6.0 per cent overall).

Figure 14 shows the distribution of withdrawals in dollar amounts by age. Notably, this plot differs significantly from that of ATO data SMSF account holders (see Figure 5). The median, upper quantile and lower quantile of the withdrawal dollar amount fall consistently from ages 65 to 75, unlike for the SMSF account holders where the withdrawal dollar distributions at these age are fairly consistent. This may be because older members of this APRA fund have smaller balances (as superannuation covered fewer of their working years).

**FIGURE 14: Withdrawal absolute amount distribution, for dataset 2 accounts by age**

As with the ATO dataset, most balances showed positive net growth in nominal terms over most years. Figure 15 shows median balance growth by age. Across the dataset the median net annual balance change was 0.6 per cent, indicating that investment returns slightly exceeded withdrawals in most cases. However, there was considerable variation. For those with balances below $200,000 the median balance change was -0.4 per cent per year; for larger balances it was 3.2 per cent. From the age of 75 years, the median growth rate reaches zero and turns negative onwards. Again, the median of the net balance changes at each age for dataset 2 account holders replicate those of the ATO data SMSF account holders albeit with a narrower spread around this median. This tends to indicate, given withdrawal rates are similar across these two cohorts also, that net investment return rates across these two cohorts are also quite similar across the relevant time period.
A panel regression model was applied to investigate withdrawal behaviour in greater detail (more information on this is available from the authors). The model confirmed that withdrawal rates were significantly negatively correlated with balance (i.e. the higher the balance, the lower the withdrawal rate). Men withdrew significantly more than women (median of 6.4 per cent versus 5.4 per cent), which may reflect their lower life expectancies.

Withdrawal percentages were positively correlated with investment returns in the current, but not the previous financial year, suggesting some retirees may continually adjust their withdrawals in response to market conditions. The net rate of balance change was significantly correlated with balance, which may be due to individuals with larger balances paying proportionally lower fees or selecting different investment options. The growth rate in balances also declined with age. It was more pronounced from the age of 75 years, perhaps reflecting increasingly conservative asset allocations and higher rates of withdrawals.

Conclusions

Our analysis of the data indicates that most retirees in their 60s and 70s draw down on their account-based pensions at modest rates. This is consistent across both SMSF and APRA funds, and broadly holds for different-sized balances (though smaller balances are drawn down somewhat faster than larger ones). There is no evidence of widespread rapid drawdown of superannuation. Indeed, if retirees were to continue withdrawing close to the minimum amounts each year, most would die with substantial amounts unspent. These results correspond with the findings of Wu et al. (2014) that assets are only drawn down very slowly in retirement.

It is important to note, however, that the data analysed here mainly covers retirees in their 60s and 70s. As superannuants continue to age, withdrawal rates must increase (e.g. at 85 the minimum withdrawal is 9 per cent). The data also cover a time period which includes many years of strong investment returns, which may not continue into the future. Therefore the observation of many (though far from all) retirees growing their superannuation balances was likely restricted to younger age groups and dependent on strong investment returns. The observed growth was also in nominal, rather than real (i.e. inflation-adjusted) terms.

The account-based pension system requires retirees to make complex decisions. Longevity and future expenses are highly uncertain, particularly for younger retirees. Defining the optimal rate of drawdown under such uncertainty is therefore a major challenge. The data suggest that for many retirees the minimum withdrawal rates have come to represent a default option. Once a default or status quo option has been identified it acts as a powerful magnet (e.g. Kahneman et al. 1991).

An alternative explanation is that the mandated minimum withdrawal rates may be acting as a minimum boundary constraint forcing retirees to withdraw some superannuation assets rather than funding their consumption purely through non-superannuation financial assets only. However, this interpretation of the data is questionable in light of the findings of Burnett et al. 2013, which demonstrated by reference to HILDA (Household Income and Labour Dynamics in...
Australia) survey data that few people maintain any significant level of financial wealth outside of superannuation to support their retirement lifestyles.

It may be a psychological challenge for an individual to draw down on a large sum of money that has been saved over many years during one’s working life and is a non-replenishing resource, particularly as superannuation is primarily discussed as being a vehicle for savings rather than consumption. Retaining a lump sum, rather than converting it into an income stream, may give people an illusion of wealth (Goldstein et al. 2016); it also allows an ongoing option, which is valued for its own flexibility (Bobadilla-Suarez et al. 2016).

Many of the retirees represented in this dataset were drawing relatively small incomes from the superannuation. For example, among the cohort in dataset two, median (and even upper quartile) withdrawal amounts were well below both the current ASFA ‘comfortable’ retirement standard annual figure of $42,893 and the ‘modest’ retirement standard of $23,651. However, those aged over 65 are likely to be eligible to receive some age pension if they have no other significant sources of income. The income test for the age pension means that every dollar withdrawn from superannuation can result in a loss of 50c of pension income (for a single person this is currently relevant for withdrawals between $4,264 and $49,707 per year). This is likely to represent a further financial disincentive, and psychological barrier (loss aversion), to drawdown for those with modest balances.

Retirees with account-based pensions are essentially self-insuring for longevity risk. Managing such risks at the individual level is costly and inefficient, requiring a large proportion of savings to be retained, with only those who reach a particularly old age spending all of their savings. It is likely that the perceived costs are substantially reduced, or viewed as a benefit, by the fact that the unspent balance can be passed on as a bequest. While products such as annuities can in theory manage this longevity risk, in practice, people may consider them to be more risky, as the realised value of an annuity is entirely dependent on lifespan (Hu and Scott 2007).

Ralston and Maddock (2015) note that retirees generally need more information and advice; they also suggest that well-designed default options would help many retirees better manage their finances. There may also be opportunities to improve the way annuities and other income stream products are designed and communicated. For example, in a hypothetical choice experiment (Shu et al. 2016), changes in attributes such as timing, duration and increments doubled the proportion of people who selected an annuity. Framing decisions in terms of consumption rather than investment has also been shown to increase the attractiveness of annuities (Brown et al. 2013).

The data analysed here suggest that Australian retirees are more likely to draw down their superannuation slowly to ensure it lasts their whole lifetime than to spend more rapidly in order to increase their age pension entitlement. However, the same may not be true of older retirees, or future cohorts of retirees. Although the superannuation system is still growing, having only commenced widespread application throughout society in the last 20 years, it is suggested that the age-based patterns of low but increasing withdrawals across ages in accordance with the mandated minimum withdrawal rates will probably continue until the full evolution of the superannuation system in another 20 years’ time. Further future investigation will be necessary to determine ‘steady-state’ retiree behaviour once such maturation of the superannuation system is complete.

Further and more detailed analyses of evolving patterns of retiree behaviour will be facilitated by the data now routinely collected by government and industry. As the majority of younger retirees have partners, future analyses would benefit from consideration of the household, rather than just the individual, as this is the level at which most financial decisions are likely to be made.

**Acknowledgements**

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Productivity Commission 2015, Superannuation Policy for Post-Retirement, July.
Individuals confront a considerable array of choices in terms of the occupation they pursue and the employer they select. These choices are constrained, however, by individual characteristics including education, age and skill, as well as external factors such as the state of the economy. These choices are important as they are pivotal in setting the individual’s consumption and wealth accumulation trajectory over their life cycle. Prior to the introduction of the Superannuation Guarantee (SG), the choice of employment carried with it different entitlements to retirement savings or superannuation, which was primarily a feature of white-collar employment.

Since 1992, while the level of entitlement has varied by occupation, all Australian employees have been entitled to a minimum level of employer contributions to a complying superannuation fund. From this common base individuals can choose to alter their retirement savings trajectory and, ultimately, their retirement standard of living through choices they make, most notably through additional savings and the investment strategy applied to these savings in superannuation. Changes in investment strategy carry risk in terms of the asset allocation choice and timing. This paper focuses on the incidence of changes with assessment of the associated outcomes to be investigated in future work.

Investment choice is not universal for all individuals in that the investment choices available are a feature of the particular superannuation fund they are enrolled in, and the provider of that fund. One key dimension of investment choice is whether changes to such choice are applied to future savings (contributions allocations) and/or to accumulated savings (asset rebalancing). These have previously been described as Contributions Investment Changes (CICs) and Balance Investment Changes (BICs) (Gerrans 2012). It is assumed these changes reflect the member’s preferred asset allocation. However, if a member selects from across multiple options their asset allocation drifts from their initial choice. That is, if they initially choose equal proportions of a cash and equity option, the asset allocation changes in line with the performance of each option, hence may not be of equal proportion at the end of the period. Agnew et al. (2003) label CICs and BICs as reflecting the ‘desired’ and ‘actual’ allocations, respectively, and they note that these only coincide if a member subsequently chooses to rebalance these options.

This paper examines the extent to which demographic and social factors are associated with changes to individual wealth accumulation trajectories in retirement savings. Specifically, we investigate member-initiated investment changes to their superannuation accounts, distinguishing between investment changes to future contributions and the accumulated balance. Our findings indicate large gender differences across both types of investment changes and that members with higher balances, larger contributions and greater time in the fund are more likely to make changes.1
Those with small balances in the first few years of opening an account, with higher incomes and therefore higher contributions, are expected to be more likely to be concerned with investment changes to future savings or contributions. Those with large balances, with longer account memberships, and older members are expected to be more likely interested in the investment strategy applying to their accumulated savings. Given this, we identify these two types of choices that are available to members, using the neutral labels CICs and BICs rather than desired and actual.

We investigate investment activity by examining an administrative database provided by a large superannuation fund which includes a large national cross-section of employers and employees from a variety of industries. Our analysis is particularly relevant to fund trustees as well as policy makers and regulators interested in overall engagement in retirement savings investment behaviours and the differences attributable to member and plan characteristics.

**Background and choice literature**

**Australian retirement savings system**

The Australian superannuation system contains a heterogeneous mix of retirement savers who may have had more than a decade accumulating retirement savings at a rate of 9 per cent or more, and some with two decades of accumulation at the lower and higher rates. Since the inception of the superannuation system it has been assumed that member choices would play a central role in driving efficiency and, by extension, beneficial outcomes for members both directly and indirectly.

Individuals face two important choices in terms of their retirement savings: whether to make additional savings beyond the employer contributions (whether it be the compulsory level or higher); and whether to change from the default investment strategy for those contributions. However, these choices are often not exercised. The contributions choice has been examined using the current dataset by Feng and Gerrans (2014a) who document a significant decline in voluntary contribution participation over time. The majority of superannuation fund members rely on SG as their main contribution, with only a minority making additional savings (Feng and Gerrans 2014b).

The ability to make an investment strategy choice is available within 68 per cent of Australian superannuation funds which account for 98 per cent of industry assets (APRA 2014). Again, however, a large proportion of assets remains in the default investment option. Such a pattern may have significant consequences in the retirement benefit members can expect at retirement as the default investment option may not align to a member’s life cycle stages and risk preference. As noted above, investment strategy choice can be applicable to future contributions (CICs) and/or the accumulated balance (BICs). Data is not obtainable on the availability of investment choice at this level across the industry. Within the administrative database used in the current study, members can make both CICs and BICs with few limitations or direct cost. We examine the incidence of these choices and the explanatory role of a rich set of individual and social (including sub-plan level) characteristics which may serve to nudge members into making such choices.

**Retirement planning and relevant characteristics**

In Australia, it is suggested that only 53 per cent of couples and some 22 per cent of individuals are on track to achieve a sufficient level of retirement income (Burnett et al. 2014). Responding to this and attempting to change trajectory appears to be the exception rather than the rule. This behaviour inertia is widely reported in retirement savings across the world (Madrian and Shea 2001; Choi et al. 2002; Mitchell et al. 2006) and several potential explanations have been offered for this lack of appropriate retirement planning.

Thaler and Shefrin (1981) describe an internal struggle between planning and doing, and suggest that self-control plays a role in the theory of individual intertemporal choice. In Australia, the SG mitigates this somewhat given that at least 9.5 per cent of total salary is deposited into an individual’s account for the long-term outcome. In terms of investment strategy, ageing and changed labour supply circumstances are two key factors that can create a need to adjust portfolio asset allocations, given their relationship with the capacity to tolerate risk (Merton 1969; Samuelson 1991; Samuelson 1994; Bodie 2003). Ageing also correlates positively with the size of savings, which is expected to increase the likelihood of attention to the appropriate
investment strategy given the size-of-bet effect (Clark et al. 2009). Agnew et al. (2003) report that age is associated with an increased likelihood of individuals reducing their equity exposure (and thus risk) in their 401(k) plans and rebalancing more frequently. Gerrans et al. (2010) provide Australian evidence that the reduction in equity exposure among active superannuation members occurs at a surprisingly young age (mid-30s).

Different gender propensities have been identified in various retirement savings behaviours. For example, women have been suggested to be more risk averse in terms of their investment choices compared to men (Bajtelsmit and Bernasek 1996; Bernasek and Shwiff 2001; Dwyer et al. 2002; Gerrans and Clark-Murphy 2004; McNaughton and Watson 2007). This gender difference, however, appears to be mitigated by factors such as income, knowledge and confidence (Dwyer et al. 2002; Clark et al. 2004; McNaughton and Watson 2007; Lusardi and Mitchell 2008). Gender differences in types of superannuation contributions (Feng and Gerrans 2014a, b) have been reported and it has been suggested that in later years women are more likely to accelerate their savings activity compared to that of men (Whitaker et al. 2013).

**Data**

Data is sourced from Mercer (Australia) and the Corporate Division of the Mercer Super Trust (MST). We analyse 177 sub-plans of the MST which represents a broad cross-section of industries and employers with a pooled membership over 258,113 individuals and up to 10 years of observed behaviour. While the overarching Mercer imprint is largely common across sub-plans (including investment choice menu and administrative processes for exercising investment choice) there remains variation among sub-plans.

An overview of individual members is presented in panel A of Table 1. Across the observed members the average member is 39 years old when they are last observed, has $62,829 in accumulated contributions (in 2011−12 dollars) and has average employer contributions of some $7,938 per year. Our sample has more men (61 per cent) than women and some 28 per cent of members make additional contributions with an average membership of 4.4 years. A comparison of a subset of characteristics aggregated at sub-plan levels is presented in panel B.

**TABLE 1: Data summary**

<table>
<thead>
<tr>
<th>Panel A: Individual Members (n=258,113)</th>
<th>Mean</th>
<th>Median</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>39.08</td>
<td>38</td>
<td>11.38</td>
</tr>
<tr>
<td>Male (percentage)</td>
<td>61.15</td>
<td>Male</td>
<td>0.48742</td>
</tr>
<tr>
<td>Balance (2011−12 dollars)</td>
<td>$62,829.50</td>
<td>$25,442.49</td>
<td>$115,569.10</td>
</tr>
<tr>
<td>Contributions (2011−12 dollars)</td>
<td>$7,938.23</td>
<td>$6,395.48</td>
<td>$6,669.80</td>
</tr>
<tr>
<td>Additional Contributions (percentage)</td>
<td>28.11</td>
<td>0</td>
<td>44.96</td>
</tr>
<tr>
<td>Existing members (percentage)</td>
<td>12.77</td>
<td>0</td>
<td>33.38</td>
</tr>
<tr>
<td>Membership (years)</td>
<td>4.43</td>
<td>3.62</td>
<td>2.91</td>
</tr>
<tr>
<td>Postcode level: university degree (percentage)</td>
<td>21.82</td>
<td>17.77</td>
<td>15.52</td>
</tr>
<tr>
<td>Postcode level: income</td>
<td>$62,644.81</td>
<td>$57,462.64</td>
<td>$17,762.30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel B: Sub-Plan Averages (177 sub-plans)</th>
<th>Mean</th>
<th>Median</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>39.62</td>
<td>39.80</td>
<td>3.30</td>
</tr>
<tr>
<td>Male</td>
<td>62.98</td>
<td>66.54</td>
<td>18.53</td>
</tr>
<tr>
<td>Balance (2011−12 dollars)</td>
<td>$70,030.32</td>
<td>$61,119</td>
<td>$39,548.03</td>
</tr>
<tr>
<td>Contributions (2011−12 dollars)</td>
<td>$8,359.16</td>
<td>$7,969.80</td>
<td>$2,743.49</td>
</tr>
<tr>
<td>Total Members</td>
<td>5302</td>
<td>1327</td>
<td>8783</td>
</tr>
<tr>
<td>Difference BIC-CIC (percentage)</td>
<td>-1.36</td>
<td>-2.88</td>
<td>9.37</td>
</tr>
<tr>
<td>Additional Contributions (percentage)</td>
<td>30.42</td>
<td>25.87</td>
<td>15.72</td>
</tr>
</tbody>
</table>
Member choice behaviour groups
The previously identified two types of investment strategy choices (CICs and BICs) open up four possible investment strategy choice combinations. The first is where no investment strategy change is made at all over a member’s history (no CIC or BIC). The second is where a member only makes a change to their future contributions (CIC only) and the third is where they only make a change to their accumulated balance (BIC only). The final combination is where members make a change to the investment strategy for both their contributions and accumulated balance (CIC and BIC).

An important caveat to our analysis is that we do not examine the intensity of investment activity (i.e. how many times a member makes a CIC or a BIC), only the fact that a member has made a change over their membership. Intensity is limited to whether a member makes both a CIC and a BIC. We also note that administrative changes are not counted within member-initiated activity. For example, the closure of an investment option or change in sub-plan default results in an investment transaction but we do not count this as member investment activity. Some other activity falls in between being strictly a member initiated investment change and a sub-plan administration change. For example, when a member rolls in funds from another superannuation fund, an investment strategy selection is required for the balance. If that investment strategy is different to the default we count it as member initiated activity though, in some cases, the transaction results from an employer’s decision to select MST as their complying super fund.

Analysis and results
Any CIC or any BIC activity
Overall, the unconditional incidence of a member having made either a CIC or BIC in the sample is 18.9 per cent. A first breakdown of investment choice activity examines whether a member made a CIC, and separately whether they made a BIC at any point over their observed membership. This does not consider whether they made both choices or either choice by itself. These results are presented in the first two columns of Table 2 and presented graphically in the Figure 1.

TABLE 2: Choice group activity overall

<table>
<thead>
<tr>
<th></th>
<th>CIC</th>
<th>BIC</th>
<th>CIC only</th>
<th>BIC only</th>
<th>CIC &amp; BIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>13.15%</td>
<td>14.51%</td>
<td>5.71%</td>
<td>4.34%</td>
<td>8.81%</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>14.60%</td>
<td>16.40%</td>
<td>6.00%</td>
<td>4.20%</td>
<td>10.40%</td>
</tr>
<tr>
<td>Female</td>
<td>10.67%</td>
<td>11.54%</td>
<td>5.24%</td>
<td>4.57%</td>
<td>6.30%</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20s</td>
<td>5.09%</td>
<td>8.57%</td>
<td>5.58%</td>
<td>2.11%</td>
<td>2.99%</td>
</tr>
<tr>
<td>30s</td>
<td>10.90%</td>
<td>13.40%</td>
<td>6.40%</td>
<td>3.81%</td>
<td>7.09%</td>
</tr>
<tr>
<td>40s</td>
<td>14.69%</td>
<td>15.70%</td>
<td>5.86%</td>
<td>4.80%</td>
<td>9.88%</td>
</tr>
<tr>
<td>50s</td>
<td>24.36%</td>
<td>21.65%</td>
<td>4.55%</td>
<td>7.26%</td>
<td>17.10%</td>
</tr>
<tr>
<td>Membership</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 to &lt; 2 years</td>
<td>5.65%</td>
<td>10.00%</td>
<td>6.48%</td>
<td>2.13%</td>
<td>3.53%</td>
</tr>
<tr>
<td>2 to &lt; 3 years</td>
<td>8.29%</td>
<td>11.64%</td>
<td>6.19%</td>
<td>2.83%</td>
<td>5.45%</td>
</tr>
<tr>
<td>3 to &lt; 4 years</td>
<td>11.00%</td>
<td>13.87%</td>
<td>5.82%</td>
<td>2.96%</td>
<td>8.05%</td>
</tr>
<tr>
<td>4 to &lt; 5 years</td>
<td>16.65%</td>
<td>13.68%</td>
<td>5.55%</td>
<td>8.53%</td>
<td>8.13%</td>
</tr>
<tr>
<td>≥ 5 years</td>
<td>20.61%</td>
<td>19.83%</td>
<td>4.92%</td>
<td>5.70%</td>
<td>14.91%</td>
</tr>
<tr>
<td>Balance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bottom third</td>
<td>3.17%</td>
<td>6.64%</td>
<td>5.19%</td>
<td>1.72%</td>
<td>1.45%</td>
</tr>
<tr>
<td>Middle third</td>
<td>10.60%</td>
<td>12.52%</td>
<td>6.41%</td>
<td>4.49%</td>
<td>6.11%</td>
</tr>
<tr>
<td>Top third</td>
<td>25.68%</td>
<td>24.38%</td>
<td>5.52%</td>
<td>6.82%</td>
<td>18.86%</td>
</tr>
<tr>
<td>Contributions</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Bottom third</td>
<td>9.10%</td>
<td>8.85%</td>
<td>4.44%</td>
<td>4.69%</td>
<td>4.41%</td>
</tr>
<tr>
<td>Middle third</td>
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<td>12.99%</td>
<td>5.81%</td>
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<td>7.81%</td>
</tr>
<tr>
<td>Top third</td>
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<td>21.70%</td>
<td>7.50%</td>
<td>4.17%</td>
<td>14.21%</td>
</tr>
</tbody>
</table>
Figure 1 indicates that members are more likely to make BICs (14.5 per cent) compared with a CIC (13.2 per cent). A relatively large gender gap is evident in both choices with 14.6 per cent (10.9 per cent) of males (females) having made a CIC and 16.4 percent (11.5 per cent) a BIC. The proportion making a CIC or a BIC increases monotonically with age. A similar pattern is evident in relation to membership length, and a disproportionate amount of investment choice activity occurs among those in the top third of those ranked by the level of balance or contributions.

**FIGURE 1: Overall any CIC or any BIC activity**

![Bar chart showing overall any CIC or any BIC activity](chart)

**CIC only or BIC only activity**

Three mutually exclusive choice groups can be identified as those who: make a CIC only; make a BIC only; and make both a CIC and a BIC. This breakdown is presented in columns three to five of Table 2 and presented graphically in Figure 2. Though there are three mutually exclusive choice groups there remain three degrees of freedom, as a member can also do nothing, which is a fourth no-choice group.

The largest proportion of members make both a CIC and BIC (8.8 per cent) compared to 5.7 for a CIC only and 4.3 per cent for a BIC only. The previously noted gender difference in CICs and BICs is reflected most in those who make a CIC and BIC together (10.4 per cent for males versus 6.3 per cent for females). While a larger proportion of males make a CIC only, a larger proportion of females make a BIC only. The increasing age and activity trend is reflected in the CIC and BIC grouping as well as those making a BIC only. The CIC only age profile is hump-shaped with the larger proportion being for those in their 30s and the lowest for those in 50s. For CIC only, the proportion declines with membership length and for a BIC only a hump-shaped relationship is suggested, peaking for those with a four year membership.

A member’s balance is a clear discriminator for those who make a CIC and a BIC, with 18.9 per cent of those in the top third of balances having made both choices compared with only 1.5 per cent of those in the bottom third having done so. The same pattern, though less pronounced, is revealed when comparing activity by contributions.
A further analysis can be made of choice activity over time. Here, the focus is restricted to those who make a CIC and separately those who make a BIC in the financial year of their membership. That is, we don’t consider the time pattern in the mutually exclusive choice groups (CIC only, BIC only, CIC and BIC). Figure 3 to Figure 6 present the statistics for CICs and BICs by member characteristics graphically.

While the difference in the rate of CICs between men and women remains fairly stable over the sample period, Figure 3 shows that in 2006–07 there was a much smaller difference in the proportions making BICs. This appears to be due to a disproportionate rise in female members changing investment strategy. The analysis here does not extend to the type of change (i.e., asset allocation). One possible source of the increased activity is the change in government policy through 2006-07 to allow a one-off non-concessional contribution of up to $1 million following the reduction in older members’ contributions limits. With the increased balance, members were more likely to make an investment strategy change. However, an alternative explanation is that this was due to members’ early reaction to the onset of the global financial crisis, at least as it emerged in the US. The former explanation appears to be the most likely with average member contributions doubling in 2006–07 compared with 2005–06, though the increase was greater for males.
Figure 4 indicates that the increase in BICs is much larger for the 50 and older age group and the increase in activity by age widens over time for the 50 and over age group. The gap widens from 2006−07 and is evident for CICs as well.

**FIGURE 4: CIC, BIC activity by age and financial year**

![Graph showing CIC and BIC activity by age and financial year.](image)

The 2008−09 increase in the proportion of members changing their BIC can be linked with the global financial crisis. While the increase in proportion was around 40−50 per cent, it remained relatively small in absolute terms. A relative peak in CICs only occurred in the 40s and 50s age groups. The global financial crisis appears to be the catalyst for investment change, but this was only restricted to those with closer proximity to retirement and, possibly, larger balance sizes. CIC activity was largely constant until 2008−09 when a relative peak for all but the two shortest membership lengths is observed (figures not shown). Post global financial crisis, CIC activity declines before increasing in 2011−12. The two peaks in BIC activity previously noted are again observed across all membership lengths.

Next, we consider investment activity by member balance and contributions (employer contributions) level. The correlation with investment activity is stronger among those in the top and bottom third of balance size, less so among those in the middle third of balances. Figure 5 indicates that there is a consistent overall trend in CIC activity by contributions level (low, middle and top thirds). The previously noted peaks in BIC activity in 2006−07 are observed across contributions levels. The increase in BICs in 2008−09 is largely restricted to the highest contributions level.

**FIGURE 5: CIC, BIC activity by employer contributions and financial year**

![Graph showing CIC and BIC activity by employer contributions and financial year.](image)

Figure 6 provides a breakdown of CIC and BIC activity over time according to balance level. There is less distinctive CIC activity by balance level in the first three years. From 2006−07 those with the highest balance level have a clearly higher CIC activity level. There is a more consistent increase in BIC activity with balance level, and the peaks in 2006−07 and 2008−09 are also evident.
Conclusion

Our analysis of member behaviour indicates that approximately one-fifth of investors make some sort of investment strategy change (CIC or BIC) over the substantial 10-year period examined. While our results are consistent with prior literature in reporting low levels of activity by a majority of investors, we concur with Bateman et al. (2014) that this is not necessarily an indication of a lack of engagement. Remaining with a default investment strategy can be a deliberate, considered choice and our data does not include this information.

We document large gender differences over the sample period, with men consistently making more CICs and BICs than women. Our analysis also suggests that the incidence of changes to investment strategy increase with time in the fund and that those with higher balances and larger contributions are more likely to make changes. However, this appears to be disproportionately among those with much larger contributions and balances. Finally, the policy changes announced in May 2006 appear to have been a significant event associated with an increase in investment activity across a relatively large proportion of members.

Acknowledgements

This research was supported by the CSIRO-Monash Superannuation Research Cluster, a collaboration between CSIRO, Monash University, Griffith University, the University of Western Australia, the University of Warwick, and stakeholders of the retirement system in the interest of better outcomes for all. We would like to thank to Jacqui Whale, UWA Business School, for invaluable research assistance.

Notes

1. With minor qualifications including age and amount earned.
2. Contrast public sector employees, state and federal politicians, and university sector employees for example.
3. A number of sub-plans originally offered defined benefit (DB) benefits to employees though no sub-plans now offer DB benefits to new members. Those retaining a DB membership are not included in the analysis. We also exclude those members who move to the personal division of the MST when they leave their employer (sub-plan).
4. Nonetheless, for all financial years the gender difference is significant at a 95% confidence level.
References


The adequacy of retirement savings remains an important issue for individuals, pension funds and governments. This has been magnified by the ageing demographic and the shift in responsibility for making retirement savings choices from government and employers to individuals. The global financial crisis further highlighted the question of adequacy given its impact on accumulated retirement savings. In Australia, a number of reports suggest that the current compulsory superannuation contributions are not sufficient to provide adequate retirement incomes, or highlight a retirement savings gap (Rice Warner Actuaries 2012; Deloitte Australia 2014), even after including the government’s age pension (Burnett et al. 2014). The planned increase to compulsory employer contributions from 9.5 per cent to 12 per cent will mitigate this issue to some degree, however, voluntary savings will remain important.

In the accumulation phase, individuals have two broad levers within superannuation: the investment strategy applied to retirement savings; and additional voluntary savings or contributions. This paper focuses on the latter, specifically providing evidence on historical patterns of participation in voluntary contributions, including pre-tax contributions (or salary sacrifice) and post-tax contributions. With the overall participation rate in voluntary retirement savings in superannuation at around 30 per cent (Feng 2013; Feng and Gerrans 2014), increasing member engagement in retirement saving is an important policy issue.

Superannuation’s attraction is fundamentally based on tax incentives which provide us with some expectation in terms of participation patterns. Earnings on superannuation are taxed at a maximum rate of 15 per cent, with pre-tax contributions also taxed at 15 per cent.1 This is in contrast with a progressive marginal income tax rate schedule. Hence, we expect participation in pre-tax contributions to rise with income and, to the extent that age and gender correlate with income, we may expect increased participation among males and with age. Post-tax contributions also enjoy the concessional earnings tax rate of 15 per cent once inside superannuation. Additional incentives accrue to low-income earners via the co-contributions scheme whereby the government matches those contributions made by individuals below specified income thresholds.2 Hence we expect higher participation in post-tax contributions among low-income earners and, again, to the extent that this correlates with gender, we expect higher participation among women. Potentially confounding these expectations are characteristics we do not observe including education, financial literacy, family structures, and debt level.

This paper is the first to provide an empirical analysis of long-term trends in voluntary contributions to superannuation in Australia using employer-level administrative data. We assess the role of demographic and socio-economic factors in predicting contribution behaviours. We also examine participation in pre-tax (salary sacrifice) and post-tax savings separately, and explore the interrelationship between both choices. Our results indicate a decline in participation in both pre-tax contributions and post-tax contributions between 2002–03 and 2011–12 due to lower participation among new members. Participation in pre-tax contributions is higher for males and increases with age and income, whereas participation in post-tax contributions reduces with income and is lower for males.
While a relatively rich private retirement savings literature has emerged in the US, existing research in Australia is based on population surveys which potentially suffer from a reporting bias in that they require individuals to correctly classify their voluntary retirement savings by type. No evidence is available as to the accuracy of such classifications but reported knowledge of the superannuation system has been identified as poor (Agniew et al. 2013). Time series information is also limited with existing analysis primarily cross-sectional, thus providing only a snapshot of savings behaviour, without a consideration of trends in retirement savings. Our data allows examination of administrative data which provides this accuracy both in terms of size and timing of contributions. However, the flipside is that we do not see the broader picture of an individual’s superannuation and other assets or debt that they hold individually or in concert with a partner. Hence our focus remains on relative trends over the period by gender and age-group.

Overview of Mercer database and sample statistics
To investigate the trend in voluntary contributions, we utilise individual contribution records from the Mercer Super Trust (MST), Corporate Division. The MST database available consists of 187 employer level sub-plans with employers drawn from a wide cross-section of Australian industry. The MST provides a common overall structure with variation/customisation at the sub-plan level reflecting employer choices for their workforce. The database includes transaction records on contributions for 489,621 members across a 10-year period (from 2002−03 to 2011−12).

Due to our focus on voluntary contribution decisions, we restrict the sample to members between the ages of 20 and 69 as at the end of a financial year, with contributions and salary records. This selection criteria produces 1,111,992 member-year contribution records for 294,072 members. Figure 1 presents the overall profile of membership and highlights the substantial increase in member numbers in the first few financial years of the MST.

Despite the increase in the number of members, the gender ratio varies only marginally. Approximately 63 per cent of the contribution records in each financial year are from male members. The age mixture of the members is also steady. The majority of members are in the early stage of their working career with members in 20−34 years and 35−49 years age brackets each accounting for approximately 40 per cent of all members. Over the sample period, reflecting the ageing membership, the proportion above 50 years old increases by five percentage points. In 2011−12, the proportion aged 50−54, 55−59 and 60−69 accounts for 10 per cent, 7 per cent and 5 per cent of all members, respectively.

The birth years captured in the sample are largely drawn from the 60-year period, 1935−1995. If we divide these into 15-year groupings the 1965−79 cohort (Generation X) is the largest comprising over 46 per cent of total members; twice that of those in the 1980−95 cohort (Generation Y) and 1950−64 (younger baby boomers). Those born between 1935−49 (older boomers and those in the ‘silent’ generation) account for 4 per cent of members. Generation Y is the fastest growing cohort over the period and is as important as the baby boomer cohort by 2011−12.
The vast majority of members have a DC benefit structure, with a small proportion being members of a sub-plan where they have both a DC and DB benefit. DB-only sub-plan membership declines over the sample to none by 2011−12. Hence the voluntary contribution participation trend will not be analysed separately by sub-plan type.

Consistent with overall population data, a wage gap by gender is evident in each year. Females earned less than male counterparts in all financial years although there are salary increases for both genders. For a further discussion on gender differences in balances please see Feng et al. (2015).

**Voluntary contribution participations trends**

**Background system history impacting contributions**

Before reviewing the sample evidence it is helpful to consider the rules applicable and other system-wide changes over the sample period. The Superannuation Guarantee (SG) was first introduced in 1992 at 3 per cent and was gradually increased to 9 per cent by 2002. More recently this has been increased to 9.25 per cent and it is currently 9.5 per cent on a schedule of increments to reach 12 per cent. The current analysis covers the decade from 2002−03 when the SG rate was maintained at 9 per cent. Despite the stability in the SG rate, several policy changes were introduced over the period which directly affected contributions or broader features of the system including taxation and access which are briefly reviewed below.

Since 2003, government co-contributions have provided a matching contribution for post-tax contributions made by low-income earners, replacing the then Low Income Superannuation Rebate. The maximum co-contribution was a 150 per cent match to a maximum $1,500 between 2004 and 2009, and has been reduced to a 50 per cent match with a maximum of $500 currently.

Major changes were introduced to limits on contributions and the taxation of benefits in the 2007 Simpler Super reforms. In the accumulation phase, the age-based concessional contribution limits (ABLs) were replaced with a uniform contribution cap with a transitional period allowing older workers (50 and above) to make higher concessional contributions. In addition to simplifying concessional contribution caps, a cap to non-concessional contributions was introduced at $150,000 to limit excessive retirement savings through superannuation. To compensate for the adjustment, members had the ability to contribute up to $1 million post-tax (non-concessional) between May 2006 and June 2007 as a transitional measure.

In the decumulation phase, a fundamental change was also introduced. Effective from July 2007, the Reasonable Benefit Limits (RBLs), which prescribed the maximum balance that could be accumulated and receive concessional treatment, was abolished. Significantly, withdrawals from superannuation for those 60 and over became tax free. This ‘tax-free’ blanket rule was a significant event in raising the attractiveness of superannuation for retirement savings if not broader wealth management.4

Additional broader system changes over the period included the introduction of portability rules, effective from July 2004, which allowed members to transfer their accumulated balance to a complying fund. Related changes allowing eligible members to nominate a different superannuation fund from the one nominated by an employer to receive SG contributions commenced in July 2005.5

**Preliminary aggregate analysis**

Figure 2 presents the overall trend of participation in additional contributions over the sample period for financial years ending 2003 through 2012, separated by the type of contributions made. Participation rates for both pre-tax (salary sacrifice) and post-tax contributions were lower in 2011−12 than in 2002−03. Despite a temporary rise in salary sacrifice participation in 2007−08, the general trend for both types of contributions was negative. Over the sample period, the participation rate for salary sacrifice was consistently higher than that of post-tax contributions by approximately 5 percentage points.

The estimated participation rate in salary sacrifice contributions is much higher than that reported in the population surveys analysed in comparable years (such as SEARS 2007, SIH 2005−06 to 2009−10, HILDA wave 10) by Feng (2013). In addition, participation in post-tax contributions in population surveys (SEARS 2007) is much higher than that in salary sacrifice.
There are two broad reasons which may individually, or in combination, contribute to this
difference: the different demographic profile of the samples and possible misreporting of the
type of superannuation contribution being made in the population survey, with the reported
knowledge of the superannuation system being identified as poor (Agnew et al. 2013).

**FIGURE 2: Participation rate in voluntary contributions by gender**

The gender difference in voluntary contribution decisions is more pronounced than in cross-
sectional population surveys. Substantially more males choose to make salary sacrifice
arrangements than females. This observation is expected as men earn higher incomes than
women and salary sacrifice is more tax advantaged for higher income earners. On the other
hand, participation in post-tax contributions, has a higher female rate. However, the gender
difference is not as large as that in salary sacrifice arrangements meaning that, in aggregate,
the participation rate is higher for males in making voluntary contributions.

The age pattern in voluntary contributions is consistent with population survey observations.
As individuals age, the probability of making voluntary contributions increases substantially.
This trend is observed in all financial years in our sample and for both salary sacrifice and
post-tax contributions (Figure 3).

**FIGURE 3: Participation rate in voluntary contributions by age bands**

In contrast to the declining participation rates in voluntary contributions in aggregate data, older
employees’ participation in salary sacrifice only reduces modestly and even increases for the 60
and above age group. However, participation in post-tax contributions reduces quickly for older
age groups. Pooling all financial years (results not shown), a hump-shaped participation pattern
is observed for salary sacrifice reaching a peak level at age 60 consistent with the life-cycle
model of savings. Yet, the post-tax contributions has a strict upward trend.
Given the longitudinal nature of the database, we also examine participation rates by population cohorts. When tracking individuals in the same cohort over the sample period, the declining pattern of voluntary contributions is not as distinct as that observed above. The younger generations have a substantially lower participation rate and the participation rate in salary sacrifice is much more stable in contrast with the increasing trend reported previously for older generations, though the declines after 2008 are evident.

Income is expected to be an important factor in voluntary contribution decisions. Figure 4 provides a breakdown of participation by income quintiles for each financial year (where Q1 is the lowest quintile). A clear positive income-participation relationship is observed for salary sacrifice. The previously noted negative time trend in participation is more distinctive in two higher income quintiles with 2007–08 again a clear demarcation line.

**FIGURE 4: Participation rate in voluntary contributions by income quintiles**

The income-participation relationship is not as unambiguous for post-tax contributions with the highest income quintile having the lowest participation, the second lowest quintile having the highest participation, and the lowest income quintile being in between. The declining time trend is exhibited for all income quintiles. However, a large proportion of members move between income quintiles across years and this may influence the longitudinal pattern of voluntary contributions.

The same patterns are observed in pooled data. While there is a near-linear increase in participation in salary sacrifice as the magnitude of the tax benefit increases, the participation pattern for post-tax contributions highlights the skew towards the lower income earners (peaked around 25th percentile), suggesting that the positive income effect only influences the very low income earners. This may be evidence of the incentives provided by government co-contributions.

The above analysis suggests that popularity in voluntary contributions has been declining over time, which is contrary to the reform effort made in promoting voluntary contributions. Why are participation rates declining? We investigate the question further by breaking down participation in voluntary contributions for each member groups examined in terms of the year they joined the sub-plans (Figure 5). In contrast to the declining pattern suggested above, disaggregated figures exhibit a pattern consistent with previous literature — that of a positive relationship between the length of membership and probability of participation in voluntary savings. It is the substantially lower participation rate among new members that drives the overall declining trend over the study period. One possible explanation is that members joining their sub-plan display behaviour influenced by a combination of financial market conditions and the government policy environment, i.e., the continued changes to superannuation rules, which reduce stability and confidence to the system.
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Drilling down further, we disaggregated members by the year they entered and exited the sub-plan. The same trend towards lower participation is highlighted as above. The further analysis also unveils another possible reason for decreased participation which is linked to employment type, specifically increased part-time/casual employment. In most cases, the longer a member stays in the same sub-plan, the more likely they are to participate in voluntary contribution. This is uniform for both salary sacrifice and post-tax contributions.

The breakdown in participation again highlights the significant demarcation provided by 2007−08. Prior to this, participation edged up for all cohorts and both types of voluntary contributions. The declining trend in voluntary savings coincides with two major events within the 2007−08 financial year. The first is the Simpler Super reforms, discussed above which, given the removal of tax on withdrawals, were expected to have a positive effect on savings. Offsetting this is the emerging financial stress of the global financial crisis though this was more evident in 2008−09, which also coincides with announcements of reductions in contributions caps.

While this analysis provides some insights into the general decreasing pattern in voluntary contributions, aside from anecdotal evidence, it is unclear why new members consistently have less enthusiasm for voluntary contributions.

**Determinants and correlations of voluntary contribution decisions**

Regression analyses were also performed to examine the association between demographic and socio-economic factors and the decision to make voluntary contributions. These regression analyses (ranging from pooled logit and bivariate probit models to panel logit models) attempt to identify individual and fund level characteristics that are associated with the decision-making process, the impact of past decisions, and the interaction between the decisions on the two types of contributions. As reported in previous US literature (Copeland 2010; Dushi et al. 2011; Gough and Niza 2011; Agnew et al. 2013; Feng 2013), we find age to be an important predictor of voluntary contribution decisions. An increase in age indicates a higher likelihood of making additional salary sacrifice contributions but, notably, not post-tax contributions, most likely due to salary sacrifice being more tax attractive than post-tax contributions.

**FIGURE 5: Participation rate in voluntary contributions by member starting year**

![Graph showing participation rate in voluntary contributions by member starting year](image)

While this analysis provides some insights into the general decreasing pattern in voluntary contributions, aside from anecdotal evidence, it is unclear why new members consistently have less enthusiasm for voluntary contributions.
As indicated earlier, gender differences are also significant in the estimations. In terms of salary sacrifice, males are more likely to make such arrangements whereas the opposite is true for post-tax contributions. However, once other member characteristics are controlled for in the regression framework (notably age and income), the previously noted gender difference in participation in post-tax contributions (larger for females) is in fact larger than suggested by the preliminary observations in Figure 2.

As expected, participation decisions are significantly associated with member income. Increased income is associated with a significant and positive increase in salary sacrifice participation which can be attributed to both capacity to make contributions and the increased tax advantage with income given higher marginal tax rates. However, income is significantly negatively related to post-tax contribution decisions as observed in the previous section.

Membership length is significant and positively related to voluntary contribution participation, and has a similar magnitude for both types of decisions. A possible peer influence in the decision making process is also significant as indicated by coefficients of fund level participation in voluntary contributions.

To further investigate the magnitude of correlation between voluntary contribution decisions and demographic and socio-economic factors, Figure 6 plots the average marginal effects (AME) for gender (males) at different age and income levels. Though the overall gender differential is positive for salary sacrifice, it is negative for members in the highest income quintiles and older ages, suggesting that females are slightly more likely to make salary sacrifice when older and are at higher income levels. For both types of voluntary contributions, a growing gender differential can be found over age bands. In addition, the differential is distinctive for members of different income levels when making salary sacrifice decisions. For post-tax contributions, however, only the lowest income quintile members are significantly different.

**FIGURE 6: Average marginal effects of gender (males) in pooled logit regression**

In summary, using a number of estimation models, we identify a positive participation pattern by age as observed in population surveys. Gender differential in voluntary contributions is more pronounced in this database in contrast to prior surveys which suggest no significant gender differences in voluntary savings (Purcell 2009). While income is positively related to salary sacrifice arrangements, as often found in surveys, the negative relation with participation in post-tax contributions is somewhat surprising but suggests the strong influence of capacity and/or tax incentives. Further, based on longitudinal contribution records, econometric models also identified the importance of the knowledge of previous contribution decisions in facilitating the prediction of current decisions. Participation is sticky.
Conclusion
Our results suggest a positive age pattern in contributions participation consistent with population surveys and behaviour patterns under different institutional settings. A significant gender differential is observed whereby males are more likely to make salary sacrifice arrangements and less likely to make post-tax contributions. This difference becomes more distinctive when members move to older age groups or higher income groups especially for salary sacrifice arrangements. Income, an important factor identified in both theoretical models and empirical literature, is also found to be positively correlated with salary sacrifice arrangements, however, surprisingly, it does not hold for post-tax contribution participation.

The contribution records exhibit a declining trend in participation in voluntary contributions, which is largely due to the substantially lower participation rate among the new members and early leavers in the sub-plans. Separately tracking member cohorts, the results show an increasing trend in voluntary contributions before 2007–08 and a decline afterwards.

Regression analysis highlights the importance of knowledge of prior contribution behaviour underlying the need to use longitudinal datasets, as used here, in the analysis of voluntary contributions. The regression results also indicate that some unobserved characteristics are driving both the decisions of salary sacrifice and post-tax contributions and that salary sacrifice and post-tax contributions are weak substitutes.

The Federal Government has proposed to enshrine the objective of superannuation is ‘to provide income in retirement and supplement or substitute for the Age pension’ in legislation (The Treasury 2016). With research showing that compulsory contributions are short of that required to fully fund retirement, voluntary contributions remain fundamental to the achievement of at least a reasonable supplementation. The relatively low participation rate documented here is one area future policy could target. Given the stated objective being sought by the government, more needs to be done to reverse the declining pattern of participation among new members. Consistent with previous literature, our study shows that members’ saving behaviours are sticky. The time members join a fund/new employer is a key moment in which voluntary contributions behaviours can be targeted and established.

Several caveats remain in our analysis. Our analysis has focused on participation in voluntary superannuation savings. The related analysis, which is beyond the scope of this paper, is how much is contributed, or the rate of contributions. We do know that there is considerable variation in contribution rates among participants which will be addressed in the future work. We also do not observe savings behaviours outside of superannuation, whether in general or specifically for retirement.

While this study facilitates the analysis of trends in voluntary contributions and provides some new understanding of member behaviours in private retirement savings, it also raises a number of questions and highlights areas for future work. In particular, it will be important to further investigate the sizeably lower participation rate among new members and identify the underlying reasons for this, whether they are employer-specific, education-based, market-driven, or policy-influenced.

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Acknowledgements
This research was supported by the CSIRO-Monash Superannuation Research Cluster, a collaboration between CSIRO, Monash University, Griffith University, the University of Western Australia, the University of Warwick, and stakeholders of the retirement system in the interest of better outcomes for all. We would like to thank David Knox and Dileepa Diyagama for facilitating access to data, and Jacqui Whale for research assistance.

Notes
1. Contributions' tax now increases to 30% for those above the $300,000 threshold (Division 293 tax).
2. For example, in the 2015−16 financial year the Federal Government will provide $0.50 for every $1.00 contributed to a maximum contribution of $500 for those earning $35,454 or less. The $500 maximum reduces progressively and is zero for those earning above $50,454.
3. That is, positive or zero contributions for all types of superannuation contributions and have positive salary for the whole records.
4. The proposed $1.6 million cap on funds transferred from accumulation to pension phase, announced in the 2016−17 Federal Budget, is a return of sorts to the RBL. We note that those funds in excess of $1.6 million would remain in the existing concessonally taxed accumulation phase.
5. Via the Superannuation Industry (Supervision) Amendment Regulations 2003 (No. 5) and Superannuation Legislation Amendment (Choice of Superannuation Funds) Act 2004 (No. 102), respectively.
6. When a member leaves their employer, they are transferred to the Personal Division of the trust, though some individuals are retained within their original sub-plan. It is not possible to track salary for the new employment if commenced, and hence the contribution records after termination are excluded.
7. Regression results are not presented due to the page limit. They are available on request from the authors.

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MODELLING THE MACROECONOMIC EFFECTS of an increase in superannuation contributions

In this paper we describe a new type of computable general equilibrium (CGE) model that integrates detail of the economy’s financial sector with a traditional real-side CGE model. We use the model to explore the macroeconomic effects of the superannuation sector in Australia by simulating a one percentage point increase in the ratio of superannuation contributions to the national wage bill. This simulation has relevance to current policy debate on the merits of further increases in the compulsory contribution rate. Our results indicate that a rise in the superannuation contribution rate increases long-run real GDP, largely via an increase in the savings rate. At the same time, the structure of the superannuation sector’s activities, relative to other savings vehicles, boosts short-run employment and housing investment.

For over half a century, CGE models of increasing complexity and detail have been used to elucidate a diverse range of economic policy questions. These have included matters related to trade, the environment, national security, macroeconomic disruption, taxation, health, productivity, labour markets, education, immigration, and competition (Dixon and Rimmer 2016). Use of these models to analyse financial markets has been less common. This is because traditional CGE models have focused on the economy’s ‘real side’, that is, they have carried theory describing movements in physical quantity units (like hours of employment, quantities of output), and relative prices (like the real wage, i.e. the nominal wage deflated by a price index). Traditional CGE models have not included theory describing movements in the absolute price level, or the behaviour of financial intermediaries, like commercial banks and the superannuation sector.

Australia’s superannuation sector has become both a major institution in allocating the nation’s financial capital across asset classes, regions, and sectors, and a central intermediary in channelling the nation’s savings into domestic capital formation and foreign asset accumulation. We model this important institution within an economy-wide setting by embedding explicit modelling of the sector within a model of the financial sector, and integrating the model of the financial sector with a traditional dynamic multi-sectoral CGE model of the real side of the economy.

Our model carries explicit treatment of: (i) financial intermediaries and the agents with which they transact; (ii) financial instruments describing assets and liabilities; (iii) the financial flows related to these instruments; (iv) rates of return on individual assets and liabilities; (v) links between the real and monetary sides of the economy; and (vi) traditional detailed modelling of the non-financial actions of economic agents.

We explore the economic effects of the superannuation sector by simulating a one percentage point increase in the ratio of superannuation contributions to the economy-wide nominal wage bill.
A financial computable general equilibrium model of the Australian economy

This section summarises the key financial aspects of the financial CGE (FCGE) model used in the simulations described in the next section. For a detailed discussion of the model, see Dixon et al. (2015).

While fully integrated, the FCGE model can be conceived as having two parts:

- A traditional CGE model describing the real side of the economy
- A model of the behaviour of financial agents, the interactions between them, and their links with the real side of the economy.

The real side of the FCGE model is largely as described in Dixon and Rimmer (2002). It identifies:

(i) many industries, which produce, transport and sell goods;
(ii) many investors, which make industry-specific investment plans by comparing returns on physical capital against the costs of financial capital;
(iii) households, who consume and save;
(iv) a government sector, which undertakes public consumption and investment expenditures, raises direct and indirect taxes, and makes transfer payments; and
(v) a foreign sector, which supplies imports and purchases exports.

Real-side CGE models with characteristics like these have been used for decades to answer diverse policy questions. They are, however, silent on, or treat implicitly, the question of how a number of important transactions are financed. For example, how is investment financed? How does the cost of financial capital affect the decision to invest in physical capital? Who is financing government borrowing? How is the current account deficit financed? Who decides on how household savings are allocated? An important role of the financial part of the FCGE model is to elucidate these and other related questions.

The financial side of our FCGE model identifies 11 agents, each of whom is assumed to simultaneously act as an ‘asset manager’ (concerned with the composition of its holdings of five financial instruments on the asset side of its balance sheet) and a ‘liability manager’ (concerned with the composition of its issuance of five financial instruments on the liability and equity side of its balance sheet). The core of the FCGE model is three arrays and the equations describing how these arrays change through time. The three arrays are:

- $A(s,f,d)$: the holdings by financial agent $d$ in their capacity as an asset manager (e.g. households, superannuation) of financial instrument $f$ (e.g. bonds, equity) issued by financial agent $s$ in their capacity as a liability manager (e.g. government, industry).

- $F(s,f,d)$: the net flow of holdings by financial agent $d$ in their capacity as an asset manager (e.g. households) of financial instrument $f$ (e.g. equity) issued by financial agent $s$ in their capacity as a liability manager (e.g. superannuation).

- $R(s,f,d)$: the rate of return on financial instrument $f$ (e.g. bonds) issued by financial agent $s$ in their capacity as a liability manager (e.g. foreigners) and held as an asset by financial agent $d$ in their capacity as an asset manager (e.g. superannuation).
In their roles as asset holders and liability issuers, the model’s financial agents are constrained optimisers. As liability managers, financial agents adjust the composition of their financial instruments on issue to minimise the cost of servicing their total liabilities, subject to constraints that prevent them moving to unrealistic corner solutions. Similarly, as asset managers, financial agents adjust their portfolio asset weights within realistic bounds to maximise the return from their portfolio. The solutions to these optimisation problems generate return-sensitive supply equations for the stocks of financial instruments issued as liabilities by financial agents, and return-sensitive demand equations for the holding of these instruments as assets by financial agents. The solution to these supply and demand equations determines rates of return across financial instruments.

Results from the real side of the FCGE model (while determined jointly with the model’s financial side) can be viewed as providing important constraints on the financial side. Similarly, results for variables in the financial side (while again, determined jointly with the real side) exert an important influence on outcomes in the real side. For example:

> the public sector borrowing requirement determines new liability issuance by government
> gross fixed capital formation by industry determines new liability issuance (equity, debt) by industry
> household saving determines new asset acquisitions by households
> the current account deficit determines new asset acquisitions by foreigners
> superannuation contributions determine new liability issuance by the superannuation sector
> changes in the weighted average cost of financial capital influence the desirability of undertaking gross fixed capital formation.

At the same time, linkages within the financial sector are modelled. For example, the commercial banking sector’s roles as a liability manager and as an asset manager are modelled, allowing representation of the sector’s activities in raising local and foreign deposit, bond and equity finance, and deploying these funds in purchases of financial instruments such as loans to domestic industry and households for capital formation and purchases of dwellings. In this system, changes in the prospects for one financial agent can flow through to consequences for the costs of funds to other agents.²

**Simulation design and key results**

We explore the interactions between the superannuation sector and the economy by simulating a one percentage point increase in the proportion of the national wage bill allocated to superannuation. We decompose the effects into two parts:

> the intermediation effect: the effects of a rise in the proportion of national savings that is intermediated by the superannuation sector rather than allocated across financial instruments by households directly
> the savings effect: effects flowing from changes in the national savings rate caused by changes in the savings rates of those households which would have saved less if not for the influence of compulsory superannuation.³
Figures 1 to 14 report the main macroeconomic results, distinguishing the intermediation effect, the savings effect, and the total (or joint effect). We explain these results as a sequence of cross-referenced arguments.

1. **Private consumption falls relative to baseline over the simulation period, largely due to the savings effect (Figure 1).** This reflects the increase in the average household savings rate generated by the rise in the superannuation contribution rate.

   **FIGURE 1: Real private consumption (% deviation from baseline)**

   ![Figure 1](image1)

2. **The real gross national expenditure (GNE) deviation is below the real GDP deviation (Figure 2).** With private consumption below baseline (point 1) and public consumption unchanged from baseline, the GNE deviation is dampened relative to the GDP deviation throughout the simulation.

   **FIGURE 2: Real Gross National Expenditure (GNE) (% deviation from baseline)**

   ![Figure 2](image2)

3. **The balance of trade (BoT) moves towards surplus, largely due to the savings effect (Figure 3).** The savings effect causes consumption to fall relative to GDP (point 1), dampening the deviation in GNE relative to GDP (point 2). This requires the BoT to move towards surplus throughout the simulation.

   **FIGURE 3: Ratio of the Balance of Trade (BoT) to GDP (% deviation from baseline)**

   ![Figure 3](image3)
4. **The current account deficit (CAD) falls, largely due to the savings effect (Figure 4).**

The movement in the BoT towards surplus (point 3) causes the ratio of the CAD to GDP to fall relative to baseline for the duration of the simulation period. Consistent with the savings effect being the dominant factor in explaining the movement in the BoT, so too is it the dominant factor in explaining the movement in the CAD. Because the intermediation effect has little impact on the ratio of GNE to GDP, and thus little effect on the BoT, it also has little effect on the CAD.

![FIGURE 4: Ratio of the Current Account Deficit (CAD) to GDP (% deviation from baseline)](image)

5. **The savings effect creates pressure for nominal appreciation (Figure 5).** The savings effect reduces Australia’s call on foreign savings to finance the CAD (point 4). But it has little direct effect on rates of return on Australian financial assets. With the CAD financing requirement lower, foreign agents must be induced to supply less financial capital to Australia. This is achieved by nominal appreciation. For any given ratio of domestic rates of return to foreign rates of return, nominal appreciation increases the foreign currency value of foreign holdings of Australian assets above desired levels, inducing an offsetting reduction in foreign fund supply to Australia, consistent with the lower CAD financing requirement.

![FIGURE 5: Nominal exchange rate (% deviation from baseline)](image)

6. **The intermediation effect creates pressure for nominal depreciation (Figure 5).**

The superannuation sector has a much higher propensity to purchase foreign financial assets than does the household sector directly. As a result, an increase in the proportion of household savings intermediated by the superannuation sector generates an increase in Australian purchases of foreign financial assets. But the intermediation effect has little effect on the CAD (see point 4). Hence, foreign financial agents must be induced to increase financial inflows to offset the increase in financial outflows by the superannuation sector. This is achieved by depreciation of the nominal exchange rate relative to baseline throughout the simulation period (Figure 5). Nominal depreciation reduces the value, in foreign currency terms, of foreign holdings of Australian financial assets. For any given ratio of domestic rates of return to foreign rates of return, this induces a countervailing rise in foreign fund supply to Australia.
7. **The savings effect puts downward pressure on the GDP deflator (Figure 6).** The savings effect causes the nominal exchange rate to appreciate relative to baseline (point 5). This reduces the price of traded goods, and thus places downward pressure on domestic prices. As will be discussed in point 10, with sticky short-run nominal wages, the downward pressure on domestic prices raises the real producer wage in the short-run.

![FIGURE 6: GDP deflator (% deviation from baseline)](image)

8. **The intermediation effect puts upward pressure on the GDP deflator (Figure 6).** The intermediation effect causes the nominal exchange rate to depreciate relative to baseline (point 6). This increases the prices of traded goods, thus placing upward pressure on domestic prices. As will be discussed in point 10, with sticky nominal wages in the short-run, the upward pressure on domestic prices lowers the real producer wage in the short-run.

9. **The net impact on the GDP deflator is towards negative deviation. With little change in the nominal exchange rate, this implies a net negative deviation in the real exchange rate (Figure 7).** The impacts of the savings and intermediation effects on the nominal exchange rate are close to offsetting, leaving only a small net negative movement (points 5 and 6). However the movement in the GDP deflator is more substantially negative, producing real exchange rate depreciation. The real exchange rate depreciation is a corollary of the movement towards surplus of the real BoT (point 3). That is, the movement towards real BoT surplus must be facilitated by a fall in domestic prices relative to foreign prices, by real depreciation. Because the movement towards surplus in the real BoT is largely attributable to the savings effect (point 3) it follows that the real depreciation must also be due largely to the savings effect.

![FIGURE 7: Real exchange rate (% deviation from baseline)](image)
10. **In the short-run, the savings effect imparts upward pressure on the real producer wage, while the intermediation effect imparts downward pressure (Figure 8).** With the nominal wage sticky in the short-run, movements in the GDP deflator (points 7 and 8) generate short-run movements in the real producer wage. The savings effect causes a negative deviation in the GDP deflator, thus making a positive contribution to the real producer wage (Figure 8) in the short-run. The intermediation effect causes a positive deviation in the GDP deflator, thus making a negative contribution to the real producer wage in the short-run. In the long-run, the real producer wage deviation is positive, and due largely to the savings effect. This is consistent with the long-run return of employment to baseline (point 11) and the long-run increase in the capital stock (point 14).

**FIGURE 8: Real producer wage (% deviation from baseline)**

![Real producer wage graph]

11. **In the short-run, the savings effect depresses employment, while the intermediation effect raises employment (Figure 9).** In the short-run, the savings effect raises the real producer wage (point 10). This makes a negative contribution to the short-run employment deviation (Figure 9). The intermediation effect lowers the producer real wage in the short-run (see point 10), making a positive contribution to short-run employment (Figure 9). In the long-run, wage adjustment (Figure 8) ensures that employment returns to its baseline level. That is, neither the savings effect nor the intermediation effect exerts a permanent influence on employment.

**FIGURE 9: Employment (% deviation from baseline)**

![Employment graph]

12. **Real GDP falls relative to baseline in the short-run, but rises relative to baseline in the long-run (Figure 10).** In the short-run, there is little scope for the capital stock to adjust (point 14). Hence, movements in short-run GDP are largely attributable to movements in employment. Consistent with the negative contribution to short-run employment made by the savings effect (point 11), the savings effect makes a negative contribution to short-run GDP (Figure 10). Likewise, with the intermediation effect making a short-run positive contribution to employment (point 11), we find in Figure 10 that the intermediation effect makes a short-run positive contribution to GDP. In the long-run, the employment deviation returns to baseline (point 11). Nevertheless, the GDP deviation remains positive in the long-run (Figure 10). This is due to the positive deviation in the capital stock (point 14).
13. **The weighted average cost of capital falls relative to baseline (Figures 11 and 12).** The savings effect generates a rise in demand for financial instruments by financial agents in their roles as asset managers. Ceteris paribus, this lowers the rate of return that capital creating financial agents, (industries and reproducible housing) in their capacities as liability managers, need to offer to raise a given amount of funds to finance physical capital formation. As a result, the weighted average cost of capital falls.

14. **Aggregate investment rises relative to baseline (Figure 13) causing the physical capital stock to rise relative to baseline (Figure 14).** The fall in the weighted average cost of capital (point 13) lowers the cost of financial capital relative to the return on physical capital. This causes real investment to rise relative to baseline (Figure 13). This generates a positive deviation in the physical capital stock (Figure 14), which accounts for the long-run increase in real GDP (point 12). Much of the investment deviation (and thus the capital deviation) is due to the savings effect.
15. *Housing investment falls in the short-run, but rises together with general investment in the long-run (Figure 15).* A common conjecture is that superannuation dampens housing investment by reducing owner equity financing by more than the increase in housing-directed flows from superannuation. However, in Figure 15, we see that while housing investment is below baseline in the short-run, it rises relative to baseline in the long-run by an amount equivalent to non-housing investment (for comparison, Figure 15 also plots the deviations in non-housing and total investment). The short-run negative deviation in housing investment is due to the savings effect. In particular, the transitory short-run employment loss (point 11) depresses consumption spending, and with it, rates of return on housing capital. An interesting attribute of Figure 15 is the positive contribution to housing investment made by the intermediation effect. Figure 16 reports the deviation in the flow of funds to housing investment attributable to the intermediation effect alone, and decomposes this into contributions made by key financial agents. Consistent with the common conjecture, we see household funding of housing investment falling by an amount that greatly exceeds the increased direct flows from superannuation (which are aggregated within ‘Other’ in Figure 16). But bank and NBFI funding rises to more than offset the loss from direct household financing. This reflects purchases of bank and NBFI liability instruments as assets by the superannuation sector.
Figure 16: Fund flows to housing investment, intermediation effect only ($m deviation from base)

Conclusion
Our FCGE model shows that mandated contributions to superannuation raise real GDP in the long-run. This is largely due to the savings effect: mandated contributions raise total Australian savings thereby raising the supply of investable funds to Australian industries and increasing the nation’s capital stock. Application of a traditional real-side CGE model would have produced a similar finding, but such a model would miss important long-run and short-run effects captured by the FCGE model. For example, the FCGE model recognises that the superannuation sector has a higher propensity to invest offshore than the household sector. Thus, the FCGE model shows that diversion of funds into superannuation offsets some of the long-run gain to the Australian capital stock from the increase in total savings. A short-run effect captured by the FCGE model, but missed by a real-side model, is the depreciation of the nominal exchange rate induced as the economy increases its acquisition of foreign financial assets. With sticky nominal wages, depreciation has a useful employment stimulating effect.

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Notes

1. The financial agents are: commercial banks, the Reserve Bank of Australia, foreigners, government, households, industries, non-bank financial institutions, superannuation, life insurance, non-reproducible housing, reproducible housing. The financial instruments are: cash, deposits/loans, bonds, equity, gold and special drawing rights (SDRs). We divide the housing sector into ‘reproducible’ and ‘non-reproducible’ housing in anticipation of future applications concerned with property price bubbles. For non-reproducible housing (inner-city houses in established suburbs) it is conceivable that asset prices can depart from construction costs. For reproducible housing (apartments, units, and houses outside the inner city) we might expect construction costs to anchor asset prices.

2. With some important caveats. For example, while the model carries details of balance sheet connections between financial agents, it does not yet contain specific theory elucidating the systemic risk possibilities of these connections that might arise from fire-sale feedbacks, counterparty risk perceptions, and self-fulfilling asset price expectations. Also, the model presently has one representative household, limiting its capacity to elucidate the financial consequences of demographic change.

3. The movement in the propensity to save is calibrated on the basis of the findings of Connolly (2007), which suggest that each $1 of additional superannuation contribution displaces approximately $0.30 of other savings.

References


