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THE EFFICIENCY OF THE RETIREMENT INCOME SYSTEM IN AUSTRALIA DURING FINANCIAL REFORMS

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Abstract: This paper uses the Malmquist Productivity Index-type DEA technique to measure the efficiency levels in Australia's retirement income system over the period 2000-2005. It covers important segments of the industry focusing on the different fund types and analyses market dynamics under Australia's financial reforms of its pension system. The paper describes the competitive nature of the industry and provides an empirical analysis of the nature of the technical and scale efficiency and the factors driving these efficiencies and finds that overall, the reforms have had efficiency-enhancing effects. Contrary to popular theory, the paper also finds that a key driver of the changes in efficiency in the retirement income system in Australia include the government, which suggests that despite the number of financial reforms introduced since 1992, government interventions can still have positive influences on the country's pension system.

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Keywords: Financial reforms, efficiency, government interventions

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1 INTRODUCTION

During the last decade, the population of most developed countries including Australia have been aging dramatically with the 65+ demographic group ballooning unsustainably high, leaving the economies in these countries vulnerable to the negative consequences of future costs to the budget of their aging population. This is particularly so given that many in the 65+ demographic groups are non-savers and the workforce in these countries is scarcely growing or even shrinking (Bosworth and Burtless, 1997). On current trends, the aging of the population in Australia, as elsewhere in the developed countries is estimated to subject these countries to pension-induced stresses that are likely to have adverse effects on public sector budgets. More importantly, it is also argued that for many retiring workers their pensions would be inadequate to support them in retirement (de Ferranti, *et al,* 2002).

As a result, a number of financial reforms were introduced in Australia and designed to promote stronger and more efficient pension systems capable of supporting this burgeoning in the aging populations. In particular, Australia implemented the 1992 reforms and other reforms to its retirement income scheme designed principally to make the country's retirement income system competitively efficient.

Despite these reform measures, however, critics of Australia's pension fund reforms contend that these changes would only have marginal positive effects given that government continues to intervene heavily in the country's retirement income system through prudential regulation and supervision; thus making the system more rather than less regulated and hence competitively inefficient.

In a submission to the Financial System Inquiry, the Association of Superannuation Funds Australia Limited (AFSA) argued that rather than deregulation, Australia's retirement income system had become increasingly regulated by the government through the Superannuation Industry (Supervision) Act, 1993 (AFSA, 1996). This piece of legislation provides the legal framework through which the government regulates and supervises Australia's retirement income system in order for the retirement funds to achieve their key objective, which is to provide retirement income for retirees. As a result of continued government involvement in the country's retirement income system, critics continue to argue that more than a decade after Australia's pension fund reforms were first implemented, the reforms have had little if any impact on the efficiency levels of the country's pension system.

Government involvement in a country's financial system has long been viewed as being inimical to the performance of financial intermediaries including retirement income intermediaries. The main reason often cited against continued government intervention in the wider financial system and the pension funds industry in particular is that under a large and publicly-run national retirement scheme, there is the inevitable risk of investment decisions being largely influenced by political or public policy rather than commercial considerations, with the likely adverse effects on the overall efficiency of such investments and therefore on the ultimate level of retirement savings (Rocha, Hinz and Gutierrez, 2001; Robinson, 1991).

Critics argue that the reforms have not only led to Australia's pension system becoming financially lucrative, but also operationally inefficient, given the high industry concentration. They also contend that the large management fees and related operational costs of running the country's retirement income system contributes to greater operational inefficiencies in the industry. In addition, the restrictiveness of the regulatory framework under Australia's Superannuation Industry (Supervision) Act, 1993 (SIS) prompts critics to argue that government intervention in Australia's

retirement income system, inhibits industry innovation and hence produces inefficiency (AFSA, 1996).

Already there exists an intense debate in the literature on the efficiency implications of financial reforms aimed at the retirement income system and since the seminal paper by Charnes *et al* (1978), a large body of research output, aimed principally at the measurement of the efficiency of financial intermediaries including retirement income funds, has been produced. [1]In particular, a great number of these previous studies focused on the measurement of the effects that financial reforms has had on financial intermediaries. However, a major weakness of these studies is that there is limited work on the extent to which specific government interventions through supervision and prudential regulation and restrictions in the types of investment options that can be pursued in the retirement income system adversely impacts the efficiency of these financial intermediaries.

In a study by Gelinas (2005:1), it was pointed out that increasing the role played by government in the running of a country's retirement income system can only lead to under performance of this system because,

> "[U]nlike a private fund manager, who only wants to see the value of his investment rise and who will sell it if he loses confidence in the company or its managers, highly political public pension trustees are free to pursue political as well as economic objectives."

Despite the lively debate and the large volume of research interest on the economics of pension systems, limited attention, if any, has been focused on the comparison of the efficiency of the different segments of the industry[2]: corporate, industry, public

[1] For a detailed review of this literature, see Berger and Humphrey (1997) who covered over 60 studies that used the DEA technique to measure the efficiency of the banking industry.

[2] Corporate funds are sponsored by a single employer or group of related employers with contributions limited to the employer and employee of that firm. Industry funds often organized

sector (government) and the retail category. A major difference therefore between the approach adopted by the paper and the previous approaches is that the influence of government will also be considered in order to test the conjecture that continued government regulation impacts adversely on the efficiency of pension funds. Using this approach the paper also aims to add to a new understanding of the dynamic processes within Australia's pension system by investigating the key drivers of the efficiency and productivity of this system.

The paper is motivated by the fact that in the absence of demonstrable empirical evidence, the rapid and unprecedented growth in the asset base of Australia's retirement income system will continue to be linked with industry competitiveness and efficiency. The purpose of this paper therefore is to provide empirical evidence on a key part of the on-going debate on the effects of financial reforms: whether financial reforms have had differential effects on the efficiency of the various segments of the pension system in Australia. The second area that continues to receive limited research attention and which this paper aims to address is the extent to which critics are correct that continued government intervention is inimical to the efficiency of the pension industry.

The paper follows the traditional two-step approach proposed by Coeli (1998), and uses the nonparametric Data Envelopment Analysis (DEA) approach and a Tobit regression framework. It focuses on the Australian experience with reforms to its retirement income system in order to address the following research questions: If Australia's retirement income system is profitable, but operationally inefficient, as critics seem to suggest, does it then mean that the regulatory interventions of the government through its supervisory and prudential regulations is major contributor to the creation of an inefficient pension system and if so, should further liberalization of Australian's pension system be undertaken to enhance competition and therefore

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through industrial workplace arrangements cater for members as a result of an agreement between the parties to an industrial award. Public sector funds or public offer funds are sponsored by a government agency or a government controlled business enterprise. Retail funds are funds with fewer than five members and they must have an approved trustee (AXISS Australia, 2004:8).

efficiency? In particular, what effects do periodic government interventions through prudential regulation have on the efficiency of the retirement income system in Australia? Did the reforms introduced in Australia's retirement income system have differential efficiency effects on the various components of the country's pension system?

The effects of the latest regulatory reforms on the efficiency of Australia's retirement income system will also be assessed using the Data Envelopment Analysis and a Tobit regression model. This will be done by determining how a number of independent variables, interact among each other to influence the level of efficiency (or inefficiency) in the retirement income system in Australia. The DEA nonparametric approach is a useful performance indicator that can be used to help investors, including investors in the retirement income system, to optimize their decision making processes and gauge the investment performance and efficiency of an individual fund relative to all other funds in a sample (Anderson *et al,* 2004). The DEA achieves this goal by constructing an efficient frontier from a linear combination of the perfectively efficient funds and determines fund deviations from that frontier, which represents performance inefficiencies (Anderson *et al,* 2004).

In the first step, the difference in the efficiency of the various categories of the retirement income system in Australia, corporate, industry, public sector, and the retail funds, is measured with the help of the DEA methodology. In the second step, the Tobit regression framework is used to determine the extent to which the (in) efficiency levels are attributable to firm-level variables that were not analyzed using the DEA approach.

Section 2 provides a review of the existing literature while section 3 presents the asset structure of the pension industry in Australia. Section 4 details the various reform programs that were implemented and provide a detailed description of the effects of the pension funds reform process. Specifically, it contains an examination, on a comparative basis, of the effects on competition, efficiency and performance. In

section 5, the estimation methodology, the data sources as well as the main empirical results of the paper are detailed out. Section 6 concludes the paper and draws some policy implications.

2 THE PREVIOUS LITERATURE

Existing empirical evidence provides support for the claim that financial reforms lead to improvements in efficiency of financial intermediaries, including pension funds. This paper aims to measure the effects of financial sector reforms on the retirement income system in Australia using the DEA approach. This is important in light of the rapid expansion in the size of the retirement income system in Australia, particularly after the liberalization in 1992, of Australia's retirement income scheme, which suggests that financial liberalization contributed to this rate of growth. A number studies have used the DEA methodology to document the effects of financial reforms on the efficiency and productivity of Australia's retirement income system by measuring the changes in the efficiency and productivity of the country's retirement income system. Using this approach, Galagedera and Silvapulle (2002) have also conducted an appraisal of mutual funds in Australia covering the period 1995 to 1999; however, there have since been a number of regulatory reforms aimed at enhancing the efficiency of the retirement income system. Earlier studies by Edey et al (1991) and Morling and Subbaraman (1995**)** examined developments in Australia's retirement income system and found that the reform programs introduced since the 1997 Financial System Inquiry have had positive effects on the efficiency of country's pension funds. In another formal study of the extent to which Australia's managed funds industry possesses superior competitiveness vis-à-vis banks, Allen and Perwada (2003) investigate the alleged disintermediation from the banks' core business of deposit-taking in favor of managed funds and discover that the latter do not displace banks' deposit-taking functions, which might suggest that the managed funds in Australia offer relatively lower returns than the traditional banks. In addition, there also exists a voluminous literature on pension economics in

other countries (see Bodie and Davis, 2000). This study builds on the earlier work and includes the more recent changes to Australia's pension system.

Despite the increases in research interest focusing on pension funds or pension systems worldwide, little is known about how efficiencies in this industry react to financial reforms. The phenomenal growth in the asset base of the retirement income system in Australia as evidenced by the rising share in financial markets claimed by this industry suggests that, it remains relatively under researched in comparison with the volume of recent research on pensions systems elsewhere. More importantly, the above Australian studies do not provide direct measurements of the level of efficiency in the different sectors of the country's retirement income system.

This paper builds on other studies in two ways. First, a comparison is made on the effects of financial reforms on the different components of Australia's retirement income system. This will provide empirical evidence on technical and scale efficiencies in the retirement income system in Australia and the public policy implications of this for Australia's rapidly ageing population. The study differs from those of Edey (1991) and Morling and Subbaraman (1995) in that it uses a government intervention index to proxy the degree and effects of government interference through regulation and supervision of the retirement income system in Australia. Thus a second contribution of the paper is the use of a more rigorous methodology to identify the key drivers of the (in) efficiency levels in the retirement income system in Australia including an assessment of the effects of government intervention to protect the industry. It is also expected that the results from the study will interest investors in the industry including the pensioners, and the regulators. Potential competitors to the retirement income system, such as banks, will also find the results to be of interest.

3 ASSET STRUCTURE OF AUSTRALIA'S RETIREMENT INCOME SYSTEM

The retirement income system is a major component of the broader financial system in Australia as evidenced by the considerable growth in assets shown in Table 1. Evidently, in the period since the first key reforms to Australia's retirement income system were introduced in 1992, the asset base of the country's pension fund industry had grown rapidly so that the retirement income system is a major component of the broader financial system in Australia. As a proportion of GDP, the total assets of the pension system rose from almost 14 per cent in 1996 to approximately 22 per cent by 2004. This rapid growth in the asset base of the retirement income system in Australia can be explained by a number of factors. Most importantly, the rapid growth in the asset base of Australia's retirement income system coincided with the introduction of various government initiatives. Government intervention policies such as the income tax system, the wage fixing mechanism and the Superannuation Guarantee Levy aimed at promoting the growth in this industry and have helped to increase the asset base of the retirement income system in Australia (FitzGerald and Harper, 1992).

Table 1

Total retirement income system assets*

Selected assets, 1996-2004, (A$ million)

June	Cash & deposits	Loans & placements	Short-term securities	Equities & units in trusts	Land & buildings	Other assets	Total assets*	Total assets/ GDP (%)
1996	1,610	284	22,650	39,124	3,376	1,303	68,347	14.44
1997	3,427	261	27,792	60,381	6,940	1,327	100,128	19.35
1998	5,557	1,142	32,596	64,678	7,275	453	111,701	20.47
1999	5,420	1,639	39,425	65,562	6,096	444	118,586	20.56
2000	5,510	1,950	40,880	80,390	7,602	321	136,653	21.95
2001	7,620	2,174	37,651	89,126	12,041	559	149,171	22.27
2002	5,379	1,392	39,974	79,235	10,725	802	137,507	19.31
2003	5,375	1,243	45,670	81,958	8,984	716	143,946	18.93
2004	6,953	1,817	52,346	104,901	7,948	896	174,861	21.63

Source: Reserve Bank of Australia statistics.

* Superannuation assets placed with investment managers.

Earlier studies show that the growth in the asset base of Australia's pension scheme in the 1980s was the result of high profitability levels (see Edey *et al* (1991) and Morling and Subbaraman (1995).

4 THE REFORMS OF THE RETIREMENT INCOME SYSTEM

Table 2 presents an overview of the key financial reform measures that have been introduced in the Australian financial system since the first financial reforms were announced by the government following the Financial System Inquiry of 1997. The major changes and objectives of the various reform measures, the effects and the benefits that these changes have had on Australia's retirement income system are outlined in Table 2 below. The table shows that the key financial reforms that had been directed at making the retirement income system in Australia more efficient are (a) the Retirement Income System Guarantee Charge; (b) Financial Services Reform Act (2001) and the Financial Services Reform (Consequential Provisions) Act (2001); (c) Retirement Income System Safety Reforms (2002); and Financial Services Reform Act (2004).

Following these reforms, the regulation of the retirement income system in Australia, which is the country's age-old pension system, underwent significant changes. This reinforced earlier changes brought about by the introduction of the 1992 reforms and other reforms to the country's Retirement Income Scheme.

A major objective of these reforms was to streamline the regulatory processes, reduce compliance costs and enhance competition and efficiency by facilitating the entry of new market players and by the introduction of new services and products (Axiss Australia, 2004). Proponents of the reform programs further argue that, among other things, the changes would have pro-competitive effects by bringing about noticeable changes in the regulatory framework, which ultimately would lead to a streamlined and efficient regulatory structure that does not compromise innovation and competition (Axiss Australia, 2004).

While these regulatory reforms coincided with a dramatic increase in the asset size of Australia's retirement income system, research evidence also shows that the growing size of the pension system in Australia have not been at the expense of other financial intermediaries including banks (Allen and Parwada, 2003; Edey and MacFarlane, 1991). This may suggest that the various reforms to Australia's pension system had created a lucrative retirement income system. Given the poor equity market performance and other factors however, Axiss Australia (2004) argues that the retirement income system is less likely to become competitive given that the consolidation in the service provision will continue to increase over time. Another factor that is likely to contribute to the creation of a less competitive retirement income system in Australia is that fees and charges are on the increase as administrators and custodians in the industry increasingly face a myriad of legislative rules and other technological changes. Critics of the rising fees and charges suggest that government needs to introduce legislative measures that encourage the growth of self-managed funds.

TABLE 2: KEY REFORMS TO AUSTRALIA'S RETIREMENT INCOME SYSTEM

Year

1992 Retirement Income System Guarantee Charge (SGC).

Key changes

Under the SGC Legislation, all employers are required to provide minimum retirement income system support to all employees earning a certain (minimal) amount.

Impact of the changes

From a minimal support of 3 percent in 1992, this minimum retirement income system support rose to 9 percent in July 2002.

2001 Financial Services Reform Act (2001) and the Financial Services Reform (Consequential Provisions) Act (2001).

Impact of the reforms

By putting in place a regulatory regime that provides a single licensing system with respect to the financial services, including the pension funds industry, the two reforms put in place a regulatory system that reduces entry barriers to the provision of markets and remove statutory barriers to competition in clearing and settlement facilities. The ultimate aims of these reforms were to achieve competitive neutrality, cost-effectiveness, transparency, flexibility and accountability.

2002 Retirement Income System Safety Reforms were implemented following the establishment of the Retirement Income System Working Group to reform the prudential framework of Australia's pension system in order to make it more modern and responsive to risk.

Key changes

The reforms contained under the Retirement income system Safety Amendment Bill of 2003 requires all retirement income system fund trustees that are regulated by APRA to obtain a retirement income system trustee license provided the trustee complies with a risk management strategy for the trustee and risk management plan for each entity that the trustee operates. Other important requirements include the condition that the trustee registers with APRA all retirement income system bodies under their trusteeship in order for the entity to be able to accept contributions.

2003 International taxation arrangements reformed to encourage the establishment in Australia of regional headquarters for foreign groups in order to enhance the competitiveness and reduce the compliance

costs of Australian-based managed funds.

Key changes

- Non-residents will be exempt from Australian capital gains tax when investing in:
  - ◊ foreign assets via an Australian managed fund; and
  - ◊ certain Australian assets via an Australian managed fund (in those cases where capital gains tax would not be imposed if the assets were held directly.
- Australian complying pension fund entities will be exempt from the foreign investment fund (FIF) rules.
- The balanced portfolio foreign investment fund exemption will be increased from 5 per cent to 10 per cent (non-exempt foreign investment interests will be exempt from the foreign investment fund rules where their aggregate value is less than 10 per cent of the total value of the foreign investment fund interests of a taxpayer).
- Australian widely held public unit trusts will be exempt from interest withholding tax (IWT) on interest paid on widely distributed debentures issued to non-residents.

Benefits of the reforms

- Removing capital gains tax (CGT) will improve the after-tax returns for non-residents investing in international funds using an Australian-based funds manager, thereby making Australia a more attractive base for funds management activity.
- Amending foreign investment fund will reduce the compliance cost of managed and complying retirement income system funds that invest offshore and allow global firms to more easily offer new financial products and services to Australian investors.
- Removing interest withholding tax will reduce the borrowing costs of Australian widely held public unit trusts.

2004 Financial Services Reform Act (2004)

Aims of reforms

The broad aim of the Financial Services Reform Act (2004) is to help reduce compliance costs while at the same time helping to facilitate the entry of new participants into the market. The reforms also aimed at increasing the number and variety of new services and products.

2005 Super Choice

Aim of reforms

The broad aim of this reform program is to increase effective competition between the various segments in Australia's retirement income system by creating a greater degree of freedom on the part of members to change the pension fund they belong.

Source: Axiss Australia publication, various years.

As Table 2 indicates, the Super Choice reform program aims to increase competition between pension funds that members can join, increase returns and to improve members' benefits (Gallery, 2002). Prior to the introduction of this legislative reform, most employees had to join the superannuation fund specified by their employer or workplace agreement (Gallery, 2002).

Despite the various reforms to Australia's retirement income system, it is nevertheless argued that government intervenes in the country's pension funds industry on a regular basis in order to increase private savings. Government interventions take different forms, but they all aim to effectively increase private savings in the long term. Specifically, two key intervention tools are used to bring about this change in private savings, viz. via inducement (through the income tax system) and via compulsion (through the wage-fixing mechanism) and finally through the Retirement Income System Guarantee Levy (FitzGerald and Harper (1992).

Such interventions are however not unique to the Australian case and where they have occurred they have been justified on a number of grounds. Stanko (2003) writing in the context of the Polish pension system, acknowledges the importance of government intervention particularly in the pension industry, arguing that the self-regulatory framework can also fail even in the advanced economies where consumers are relatively more informed about the industry and therefore that even in the case when the retirement provision is 'opted-out' from the hands of the state and is operated by private entities some sort of supervision is still needed.

4.1 EFFECTS OF THE RETIREMENT INCOME SYSTEM REFROM PROCESS

It is generally agreed in the literature, at least by proponents that the introduction of financial reform programs helps to enhance the efficiency of financial intermediaries (Leong *et al,* 2003). Drawing from the theoretical insights from Hayek (1945), Leong et al (2003) contend that under uncertainty and information asymmetry, competitive pressures are the most effective means of fostering productive efficiency. In order to assess this in the proposition in the context of the retirement income system in Australia, the effects that these reforms have had on the efficiency of country's pension system will next be examined by analyzing the impacts that they have had on the level of competition, efficiency and performance. This will be achieved by examining the level of competition that the retirement income system had undergone both during and after the various reform processes were introduced. As indicated in section 3, a major objective of all the financial liberalization measures outlined in Table 2 is to increase competition, improve efficiency, and enhance the overall performance of the retirement income system in Australia over time. The extent to which this goal had been achieved will be examined in section 4.1.1 to 4.1.3.

4.1.1 Effects on competition

The goal of increasing competition can be achieved by removing the barriers to entry, which effectively increases the number of players in the retirement income system, leading to a heightened level of competition. This intense competition in turn will force the various participants in the retirement income system to become more innovative in offering a wider variety of products and services. The goal of this section of the paper then is to seek an answer to the question; did the various financial liberalization measures increase the level of competition in the retirement income system in Australia? The concentration ratios in Table 3 will be used to

gauge the competitive effects of the various liberalization programs outlined in Table 2. Table 3 shows the market share (by members of clients) of top four service providers among APRA-regulated retirement income system (entities) in Australia, from June 2002 to June 2005. From Table 3 it is evident that over the four year period, the number of retirement income system entities had fallen from 2,930 in 2002 to 1,305 in 2005 and there is a corresponding increase in the concentration ratios, which seems to suggest that the retirement income system market is dominated by a few pension funds. The high level of concentration in the structure of the retirement income system in Australia is reflected in the increasingly large concentration ratios of APRA-regulated pension funds during the period June 2002 to June 2005 that Table 3 documents. Specifically, it can be observed from Table 3 that the number of retirement income system entities had declined from 2,930 in June 2002 to 1,305 by June 2005 indicating that Australia's pension fund industry is effectively dominated by a few large entities.

In the United States for example, there has been little evidence of increasing market-concentration in the pension industry and the five-firm ratio has been between 32% and 34%, the top-5% ratio between 65% and 68%, and the top-10% ratio between 81% and 82% from 1990 to 1996 (Walter, 1999). In the UK, existing evidence show increasing pension fund management concentration, where in 1995 six pension fund managers accounted for about 70 percent of the market (Walter, 1999).

Using the above levels of concentration levels in the pension systems in the UK and US as benchmarks it is clear that Australia's retirement income scheme is relatively less concentrated. The inference that can be drawn from this conclusion is that the various reforms outlined in Table 2 do appear to have had the positive knock on effects by creating relatively lower levels of concentration and by extension a higher degree of competition that theory predicts.

Table 3

Concentration ratios

Entities with more than four members

The concentration of use of service providers among APRA-regulated retirement income system entities representing the four firms servicing the most retirement income system entities each year.

	June 2005	June 2004	June 2003	June 2002
Number of retirement income system entities	1,305	1,768	2,268	2,930
Proportion of entities serviced by top four audit firms	39.4%	33.6%	34.6%	41.5%
Proportion of entities with a custodian	29.2%	24.7%	18.4%	11.5%
Proportion of entities serviced by top four custodians	49.3%	50.0%	55.8%	45.7%
Proportion of entities with an external investment manager	38.0%	34.7%	31.4%	30.3%
Proportion of entities serviced by top four external investment managers	12.2%	13.7%	11.7%	12.9%

Source: APRA Annual Retirement Income System Bulletin June 2005:9

4.1.2 Effects on Performance

What have been the effects of the series of financial reforms outlined in Table 2 on the performance of the retirement income system in Australia? Table 4 will be used to provide an answer to this question.

At the micro-level, however, an analysis of the net investment income as a ratio of total assets, which is used to measure the level of efficiency of the retirement income system in 1996 and 2004, shows that in general the financial liberalization programs do appear to have their desired effects. With the exception of the corporate segment, all the other retirement funds have increased their performance (Table 4). In 1996,

the ratio of the net investment income to the total assets placed with investment managers for the industry sector was 0.5 percent but this increased to 1.3 percent in 2004. Similar performance increases between 1996 and 2004 for the other segments of Australia's retirement income system can also be seen in Table 4. These results suggest that Australia's financial reforms have had positive knock-on effects on the performance of the country's pension system. This finding is consistent with the proposition made by proponents of financial reforms who argue that such reforms have value-creating aspects.

Table 4

Performance of segments of the retirement income system, 1996 and 2004

Segment	Net investment income at June 1996 (A$ million)	Net Investment income as a percentage of total assets*, June 1996 (%)	Net investment income at June 2004 (A$ million)	Net investment income as a percentage of total assets*, June 2004 (%)
Corporate	1,020	1.5	1,866	1.1
Industry	315	0.5	2,273	1.3
Public sector	1,218	1.8	4,311	2.5
Retail	906	1.3	7,104	4.1

Source: Computed from APRA Superannuation Trends September, 2004 (issued 11 January, 2005), pp.16-19.

* Superannuation assets placed with investment managers.

4.1.3 Effects on Efficiency

What have been the effects of the series of financial reforms outlined in Table 2 on the efficiency of the retirement income system in Australia? A causal look at Table 5 will provide an adequate answer to this question as it shows the behavior of the level of pension system efficiency, which is measured by the ratio of total operating expenses to total assets, for 1996 and 2004. Section 3 discussed the proposition that the various financial reforms outlined in Table 2 were aimed at enhancing the overall operational efficiency of Australia's retirement income system by introducing, for example, the Super Choice initiative with the objective of increasing competition

between the various segments in the retirement income system and hence efficiency. Although the evidence on the cost structure is rather mixed, nevertheless it can be seen that efficiency, defined in terms of declining costs and expenses, improved for different segments of the retirement income system in the aftermath of the reforms. However, it can also be observed that there are differences in the extent to which the reform programs have impacted on efficiency of the various retirement funds.

It is clear from Table 5 that the various retirement funds have experienced modest improvements in efficiency. On comparative basis, the corporate, public sector and the retail pension funds experienced the greatest efficiency improvements, with the growth in the ratio of their operating expenses to total industry assets falling respectively from 0.14 percent, 0.11 percent and 0.28 percent in 1996 to 0.04 percent, 0.08 percent, 0.26 percent in 2004. However, the efficiency levels for the industry pension funds did not change during the period under study. The industry retirement funds were shown in Table 4 to have performed relatively better than the other segments of the pension system but further examination of the efficiency levels of the retirement income system by fund type in Table 5 reveals that the level of efficiency for the industry funds did not change. This latter finding confirms the contention that although higher performance is necessary for efficiency to take place, it is not a sufficient condition. These findings further indicate that the competitive pressure that is supposed to emanate from financial reforms impacted the different segments of Australia's retirement income system differently. Despite these differential effects of the reforms, overall these results further show that the financial reforms that had been introduced had efficiency-enhancing effects given the negligible amounts of operating expenses incurred by the different retirement segments.

Table 5

Efficiency of segments of the retirement income system, 1996 and 2004

Segment	Operating expenses at June 1996 (A$ million)	Operating expenses at June 1996 as a ratio of total assets* (%)	Operating expenses at June 2004 (A$ million)	Operating expenses at June 2004 as a ratio of total assets* (%)
Corporate	93	0.14	73	0.04
Industry	50	0.07	115	0.07
Public sector	78	0.11	137	0.08
Retail	193	0.28	456	0.26

Source: Computed from APRA Superannuation Trends September, 2004 (issued 11 January, 2005), pp.16-19.

Notes:

Some indirect expenses have not been reported.

* Total Superannuation assets placed with investment managers

5 ESTIMATION METHODOLOGY & DATA DESCRIPTION

5.1 Methodology

In order to make the necessary analyses of the changes in efficiency in the retirement income system in Australia and to demonstrate the efficiency-effects of these changes on Australia's pension system and with the help of the Data Envelopment Analysis-type Malmquist Productivity Index (MPI), this paper will use a two-stage procedure as suggested by Coeli *et al* (1998), on panel data from the country's retirement income system; obtain the point estimates for efficiency measures for each segment of Australia's pension funds industry for each year in the sample period derived from the DEA estimations (first stage), and then regress the resultant scores on a set of relevant variables (second stage) that describes the characteristics being investigated. These two procedures will help establish whether the 1992 reforms of the retirement income system as well as other reform initiatives did enhance the overall efficiency and productivity of the funds industry in Australia and

to help explain what the individual pension funds as well as the government can do to increase the efficiencies of the country's pension industry.

5.1.1 The DEA model

It is clear from the literature that the choice of input and output variables greatly affects the results of the non parametric approach, Data Envelopment Analysis (Mlima and Hjalmarsson, 2002). Despite this, there are the two main classification approaches to the estimation of the efficiency of financial intermediaries. On the one hand there is the production approach, which is only employed when the financial institutions are seen as producers of services for their customers. In this approach, the size of deposit accounts and the volume of loans granted are viewed as outputs. Recent studies that have adopted this production approach include Berger and Humphrey (1991), Berg *et al*. (1993), Parson *et al.* (1993) as well as Schaffinit *et al*. (1997). These studies have respectively measured and provided analyses of financial institution efficiencies by making direct comparisons of the quantities of services given with the quantities of resources utilized (Mlima and Hjalmarsson, 2002).

A number of other studies have used the second approach, the intermediation approach to estimate the efficiencies of financial intermediaries including the pension funds, since these funds also accept investor deposits and in turn help in the transformation of these investments into other investments on behalf of their clients (Mlima and Hjalmarsson, 2002). It is generally acknowledged that the retirement income system performs the crucial roles of resource mobilization and resource distribution (Berger and Mester, 1997). The rationale for the application of each of these two approaches differs depending on what is being measured. In general, the production approach is only used to estimate technological efficiency analyses, whereas the intermediation approach is adopted when the objective is to provide measures of economic efficiency (Mlima and Hjalmarsson, 2002).

5.1.2 The Malmquist Productivity Index approach (First-stage)

In order to analyze the changes in efficiency over time for a panel of firms such as the pension funds, it is essential to make inter-temporal comparisons between the input-output mixes for a particular time period with its corresponding input-output mix for an adjacent period of time. A key method of capturing the productivity changes between time periods is the Total Factor Productivity, which can be used to calculate the ratio of the distances of each data point relative to a common technology (Sathye, 2002). As noted in Fare *et al* (1994), the Malmquist (output-oriented) Total Factor Productivity (TFP) change index between period *s* and the period *t* is given as follows:

$$m_o(y_s, x_s, y_1, x_1) = 1/[d^s_o(y_t, x_t) * d^t_o(y_t, x_t)/d^s_o(y_s, x_s) * d^t_o(y_s, x_s)] \quad (1)$$

Following the standard interpretations commonly used in the literature, the mathematical notation $d^s_o(x_t, y_t)$ provides a measure of the distance between *t* and *s*. In addition when m_o is greater than 1 this suggests that a positive growth in TFP is registered during the period *s* and *t* and vice versa.

The total changes in the TFP productivity growth can then be decomposed two parts, i.e. efficiency change and technical change where efficiency change and technical change are represented respectively as:

$$\text{Efficiency change} = 1/[d^t_o(y_t, x_t)/d^s_o(y_s, x_s) \quad (2)$$

$$\text{Technical change} = 1/[d^s_o(y_t, x_t) * d^s_o(y_t, x_t) * d^s_o(y_s, x_s)/d^t_o(y_t, x_t) * d^t_o(y^s, x^s)] \quad (3)$$

One strength of the Malmquist productivity index is the fact that it can be de-composed, as shown in (2) and (3), into two separate indices and this then helps in the analysis of the major sources of the changes in productivity and efficiency.

This study will estimate the Malmquist Productivity Indices for each fund in the sample in order to determine whether the efficiency scores for these pension funds reacted positively or negatively to the series of financial reform measures introduced in the Australian financial system including the changes in 1992 to the country's retirement income system, which is believed to have had a marked impact on Australia's pension system. Recent estimates show that employee coverage has since increased from approximately 40 percent in 1985/86 to almost 90 percent by 2000 (Axiss Australia, 2004:41). Similarly, the assets of employee pension funds as a share of Australia national income have increased from 30 percent in 1988 to 70 percent in 2003 (Axiss Australia, 2004:41).

5.1.3 The second-stage Tobit regression methodology

The estimation of the parameters in the Panel Data Tobit Model is carried out by using the scores from the efficiency measures that were obtained from the first-stage DEA as the dependent variables. The explanatory variables for each segment of the retirement income system take the following proxies: (1) government intervention index (2) investment incomes (3) total assets and (4) financial reform dummy.

As shown in (4), this approach will handle the characteristics of the distribution of the efficiency measures and therefore provide results that can guide policies to improve efficiency. As explained above, and using the efficiency measures for each pension funds in the sample for each year derived from the DEA estimation as the dependent variable and following the approach used by Maghyereh (2004) the following Panel Data Tobit Model will be estimated:

$$y_{it}^{*} = \beta' x_{it} + \varepsilon_{it}$$

$$y_{it} = \begin{cases} y_{it}^{*} & if \quad y_{it}^{*} > 0 \\ 0 & otherwise \end{cases} \qquad i = 1,\ldots, N,\ t = 1,\ldots, T,$$

4.

where as shown above, each segment in the retirement income system is indexed by $_{i,}$ the time period by $_{t.}$ x $_{it}$ is a (1xK) vector of exogenous explanatory variables, β is a (k x 1) vector of the parameters of interest. The Y^{*}_{it} is a latent variable and Y_{it} is the DEA score. As is to be expected in a standard Tobit model, the error term ε_{it} is assumed to be serially uncorrelated and homoscedastic for each fund *i* such that $\varepsilon_{it} \sim N(0, \sigma^{2})$.

The significance of using the Tobit regression framework is that it helps to determine the key factors that influence the relative efficiency of the various categories of the retirement income system in Australia. This further means that public policy can then be directed at those factors that have strong effects at improving the overall efficiency of the retirement income system in Australia.

5.2 Data description and sources

The panel data required for this paper were sourced from the Australian Prudential Regulatory Authority (APRA), the Assirt Proprietary (Pty.) Limited (Ltd), Market Share Reports and Assirt Library database on Australian managed funds as well as from Australia's central bank, the Reserve Bank of Australia. The time period covered by the paper is from 2000 to 2005, the period following the major reforms to Australia's retirement income system**.** To be selected for the study sample, a pension fund's data has to be available for the duration of the inclusive period 2000 to 2005 and be on the APRA and Assirt databases.

5.3 Variable definitions

5.3.1 Inputs and Outputs

The data set for the paper is made up of pooled data sourced from APRA during the period 2000 to 2005. In performing the DEA analysis, two input variables and two output variables will be employed. Whereas total investment income and total operating performance will be used to represent the output variables, sales charges and the initial investments will be the input variables. This approach is consistent with the methodology adopted in Galagedera and Silvapulle (2002). However, in order to examine the effects of financial sector reforms on efficiency, a financial reform dummy variable will be used. This dummy variable will take a value of 1 for the period after one of the key reform program (i.e. the Financial Services Reform Act (2001) and the Financial Services Reform (Consequential Provisions) Act (2001) was implemented and 0 otherwise. On the other hand, the variables used in the Tobit regression framework to help explain the efficiency in the retirement income system are investment incomes, total assets and dummy variables for financial liberalization the level of government intervention.

5.3.2 Proxy variable

Unlike Galagedera and Silvapulle (2002), however, a dummy variable, government intervention, will be used to provide estimates of the potential contributions, if any, that government regulation and supervision (which proxy for government interventions) have had on the efficiency of the retirement income system in Australia. It is generally believed that government intervention in a country's financial system has efficiency and productivity-reducing effects (Naastepad, 2001) and the periodic government interventions in the pension system by the government in Australia is thus expected to impact adversely on the country's retirement income system. In contrast, the removal of government intervention in the retirement

income system would suggest that all the input and output decisions on the part of retirement income system would be decided mainly by market forces, which intuitively and from the point of view of the proponents of free market economics would enhance efficiency and productivity over time.

Despite the introduction of a series of financial liberalization measures, government intervention, which take the form of the regulation and supervision of the retirement income system in Australia continue to occur on a periodic basis. The main focus of these regulatory and supervisory interventions is aimed at creating prudential standards and ensuring the proper end-us of funds (Axiss, 2004). As discussed in the introductory section of the paper, the Association of Superannuation Funds Australia Limited (AFSA) believe that rather than deregulation, Australia's retirement income system had become increasingly regulated by the government through the Superannuation Industry (Supervision) Act, 1993 (AFSA, 1996). This piece of legislation provides the legal framework through which the government regulates and supervises Australia's retirement income system. In addition, and following the enactment of the Financial Services Reform Act in 2002, Axiss Australia (2004) argues that such regulatory framework has cemented Australia's reputation as having the most efficiently regulated financial services industry world-wide. Critics however, contend that such regulatory interventions in the face of financial reforms can only increase the regulatory burdens on the retirement income system in Australia by increasing compliance costs.

There has however been no adequate empirical attempt to test whether these regulatory interventions has adverse effects or not on Australia's pension system. Under the approach suggested by the paper, the dummy variable, government intervention, will be used as an input variable to proxy the effects of government intervention on the efficiency changes in the retirement income system in Australia. The dummy variable for government intervention will take the value of 1 when government intervenes in the retirement income system in Australia through regulation and supervision and 0 otherwise.

5.4 EMPIRICAL FINDINGS

The nonparametric DEA methodology and panel data from the different segments of Australia's retirement income system are used to determine the productivity changes in the country's pension scheme. The productivity changes are further decomposed into technical efficiency change, which is termed the catching up index, and the technological change, which is also commonly referred to as the change in best practice index. The Malmquist Index summary of annual means is reported in Table 5. On the other hand, Table 6 reports the Malmquist Index summary of individual retirement income system funds for each year from 2000 to 2005. With the help of Table 6, the efficiency effects that the various financial liberalization measures outlined in Table 2 have had on the retirement income system in Australia explained. Table 7 then reports the results of the Tobit regression to show the key drivers of efficiency.

5.4.1 Malmquist Productivity Analysis

Table 6 reports the annual mean values of the Malmquist Productivity Index (MPI) of effch (Efficiency change), techch (Technological change), pech (Pure Technical Efficiency), sech (Scale Efficiency Change) and tfpch (total factor productivity change). These mean values are relative to the previous year and therefore, there are no values reported for the year 2000. As in Coeli *et. al.* (1998), the results reported in Table 6 will be explained as follows. Technical efficiency (effch) had increased by 1.1 per cent (i.e. from 0.977 in 2001 to 0.988 in 2005). In turn this translated into noticeable increases in total factor productivity index (tfpch), which rose by 12.0 per cent (i.e. from 0.922 in 2001 to 1.042 in 2005). Both results effectively suggest that the reforms have had efficiency and productivity enhancing effects on the retirement

income system. This is particularly so given the significant amount of technological consolidation during the country's financial reforms.

Table 6

MALMQUIST INDEX SUMMARY OF ANNUAL MEANS

This table presents the summary mean Malmquist Productivity Indices for 2000-2005 estimated using the DEAP software developed by Coeli *et al.* (1998)

Year	**effch**	**techch**	**pech**	**sech**	**tfpch**
2001	0.977	0.944	0.982	0.991	0.922
2002	1.062	0.980	0.959	1.063	1.041
2003	0.951	1.086	0.971	0.985	1.033
2004	0.986	1.047	1.033	0.948	1.032
2005	0.988	1.069	1.056	1.067	1.042
means	**0.989**	**1.025**	**1.000**	**1.011**	**1.014**

Notes: effch: Efficiency change; techch: Technological change; pech: Pure Technical Efficiency; sech: Scale Efficiency Change; tfpch: Total Factor Productivity Change. All the reported indices are relative to the previous year and as a result, no index is reported for 2000.

The Malmquist index for each segment of the retirement income system is reported in Table 7, and it is evident that two sectors of Australia's pension scheme (i.e. industry and retail funds) had experienced technical efficiency (effch) improvements: the industry segment experienced the largest level of technical efficiency of 3.1 percent whilst the retail funds showed a 3.0 percent increase. On the other hand, the corporate and the public segments experienced declining levels of technical efficiency. Only the industry funds registered improvements in scale efficiency, which increased by 5.1 percent.

Table 7

Malmquist Index of Individual Retirement Income System Funds, 2000-2005

This Table shows the Malmquist Index by type of retirement income system. The definition of each type of retirement income system was given in page 4.

Category	**effch**	**techch**	**pech**	**sech**	**tfpch**
Corporate	0.973	0.887	0.984	987	0.863
Industry	1.031	1.021	0.981	1.051	1.053
Public Sector	0.960	1.193	0.977	0.982	1.145
Retail	1.030	0.986	1.056	0.973	1.016
Geometric Means	**0.998**	**1.016**	**0.999**	**0.999**	**1.014**

Notes: effch: Efficiency change; techch: Technological change; pech: Pure Technical Efficiency; sech: Scale Efficiency Change; tfpch: Total Factor Productivity Change. All the reported indices are relative to the previous year and as a result, no index is reported for 2000.

5.4.2 The Tobit Regression Analysis

A major objective of the paper is to analyze the real drivers of the efficiency of Australia's retirement income system. The empirical results shown in Table 8 indicate that irrespective of the DEA frontier used, there is a statistically significant positive relationship between efficiency scores (the dependent variable) on the one hand, and the level of government intervention, investment income, asset size, and the proxy variable for the financial reforms on the other. Contrary to theory, there is a positive and significant relationship between the level of government intervention and the efficiency in the retirement income system, which suggests that notwithstanding the various liberalization measures, government can continue to play a role and this intervention is not inimical to efficiency and productivity

improvements in the country's pension system. Government regulatory and supervisory intervention can instill confidence in the soundness of the country's pension system and provide consumer protection. This finding is in sharp contrast to the evidence shown in Berger *et al* (2005) who found that government interference and ownership in the banking system in China to be negatively correlated with bank-level efficiency. It is also clear from Table 8 that investment incomes are among the key drivers of efficiency because there is a positive and statistically significant relationship with respect to scale efficiency and technical efficiency. The positive and statistically significant relationship between both scale efficiency and technical efficiency and investment incomes indicates that highly profitable retirement funds (i.e. retirement funds with greater investment incomes) have a greater chance of operating more efficiently. The empirics shown in Table 8 indicate that size is another key driver of the level of efficiency in the retirement income system in Australia. In particular, the asset size of pension funds in Australia is positively related to efficiency, which seems to suggest that the larger players in the retirement income system are more efficient than the smaller players. The inference that can be drawn from this finding is that smaller players in the retirement income system in Australia need to merge in order to benefit from the positive effects of financial liberalization. More importantly, however, is the finding that financial liberalization has had a positive effect on efficiency of Australia's pension scheme. Given that a major objective of the various financial reforms was to enhance the overall efficiency of the retirement income system in Australia, this result shows that the goals of the country's reform program were achieved.

Table 8

Tobit Regression Analysis of the Variables that Explain Efficiency

Table 7 shows the panel estimates of the combined sample of the retirement income system, using the following Panel Data Tobit framework:

$$y_{it}^{*} = \beta' x_{it} + \varepsilon_{it}$$

$$y_{it} = \begin{cases} y_{it}^{*} & if \quad y_{it}^{*} > 0 \\ 0 & otherwise \end{cases} \qquad i = 1,\ldots, N,\ t = 1,\ldots, T,$$

4.

where as shown above, each segment in the retirement income system is indexed by $_{i,}$ the time period by $_{t.}$ x $_{it}$ is a (1xK) vector of exogenous explanatory variables, β is a (k x 1) vector of the parameters of interest. The Y^{*}_{it} is a latent variable and Y_{it} is the DEA score.

Variables	Coefficients	
DEA Frontiers	Technical Efficiency	Scale Efficiency
Constant returns to scale		
Constant	0.035 (3.774***)	0.451 (2.113**)
Government intervention dummy	2.650 (2.145**)	2.719 (3.711***)
Investment incomes	0.445 (1.992*)	0.537 (2.037**)
Total assets	1.330 (1.731*)	1.900 (3.505***)
Financial reform dummy	1.512 (4.003***)	1.719 (3.210***)
Log Likelihood function	**8.679**	**19.878**

Variable returns to scale		
Constant	0.089 (7.341***)	0.077 (4.220***)
Government intervention dummy	0.915 (2.090**)	0.806 (1.896*)
Investment incomes	0.347 (1.889*)	0.294 (3.341***)
Total assets	1.421 (1.928*)	1.250 (2.407**)
Financial reform dummy	0.301 (3.290***)	0.450 (2.234**)
Log Likelihood function	**8.438**	**9.047**

Note: The numbers in parenthesis are t-statistics.

*, **, *** Show statistical significances at 10%, 5% and 1% respectively.

6 CONCLUSIONS AND POLICY IMPLICATIONS

The purpose of this paper was to estimate the effects of financial reforms on the efficiency of the retirement income system in Australia. The efficiency of the retirement income system was generated by applying the DEA-type Malmquist Productivity Index.

With this the paper was also able to document that the retirement income system in Australia experienced both technical efficiency (effch) and scale efficiency (sech) during the period 2000-2005. It was shown in Table 6 that the pension system in Australia realized a 1.1 percent increase in technical efficiency (effch) and a 12.0 percent increases in total factor productivity (tfpch). On a segment by segment basis, the paper also showed in Table 7 that during the period 2000-2005 (1) the industry segment of Australia's pension system registered a 3.1 percent increase in technical efficiency (effch) whereas the retail funds experienced a 3.0 percent increase in technical efficiency (effch) (2) that the industry sector of the pension system experienced a 5.1 percent increase in scale efficiency (sech). With the help of the

Tobit regression framework it was shown that government regulatory and supervisory intervention was significantly and positively correlated with both technical and scale efficiencies. This finding suggests that contrary to the theoretical prediction, government regulatory and supervisory interventions were among the drivers of the level of efficiency in the retirement income system in Australia. Findings such as these have strong public policy implications for government, the fund managers who are involved in the day-to-day management of the retirement income system and the average pensioner in Australia. Government is particularly interested in ensuring that the pension system is regulated efficiently to enhance the financial returns for the retirees. It was shown earlier in the paper that countries facing potential pension crises need to legislate for higher contributions, delaying retirement ages among other measures (Bosworth and Burtless (1997). However, as the evidence in this paper clearly demonstrates, there are compelling reasons for government to increasingly intervene through supervision and prudential regulation in order to continue to improve the regulatory environment given that such intervention was shown in the paper to have positive effects on both productivity and efficiency. As a result, government in Australia should, on a periodic basis at least, make policy interventions, notwithstanding financial liberalization, to ensure that market failure does not take place. This means that the government can further increase efficiency in the country's pension scheme by increasing the scope and scale of the reform programs. The pension funds industry itself can enhance its efficiency by increasing investment incomes, operating performances and by taking measures that would lead to increases in their market share. Lower operating expenses and higher market shares can be realized by investing further in cutting edge technological innovations and developing a more focused customer service strategy. More importantly, the results suggest that the larger retirement funds have benefited from the financial reforms through economies of scale. The inference that can be drawn from this finding is that smaller players in the retirement income system in Australia need to merge in order to benefit from the positive effects of financial liberalization.

An efficiently managed pension scheme would mean that retirees would, as suggested by Robinson (1991), rely less on the public sector pension scheme, which in turn means that the fiscal policy implications of a large number of retirees would be less onerous for the government. This in turn means that government intervention should be seen as being aimed at the creation of an enabling environment, including a sound legal framework, in which pension fund managers can operate rather than being perceived as being intrusive and inhibitive. Through its competition policy and notwithstanding the various reforms, the government can further facilitate the creation of a greater and more competitive market environment by playing a more proactive role in the regulation and supervision of Australia's retirement income system. But the need for greater competition in the retirement income system will have to be balanced against the safety considerations, including the need to ensure that increased competition does not take place at the expense of depositors' interest. The role of government intervention is thus important in ensuring that while the reform programs are aimed at achieving higher levels of efficiency and productivity, it does not at the same time increase the collective risk of the entire retirement income system in Australia.

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